*The following letter was submitted to the Ministry of Finance on 1 April 2003*

Expansion of the benchmark index for the Government Petroleum Fund's equity investments

1. Introduction

FTSE is a British company that constructs the equity benchmark indices currently used by the Government Petroleum Fund. Norges Bank's submission dated 6 February 2003 concerning new emerging equity and bond markets refers to FTSE's intention to introduce a new global equity index in September 2003. The existing indices, the FTSE World and FTSE All-World, will be continued, but will be replaced by the new index as FTSE's main product. This submission presents an assessment of whether the Government Petroleum Fund should use the new FTSE Global Equity Index Series (GEIS) as a basis for the Fund's benchmark index. In the new index, coverage will be further expanded as regards total market capitalisation and it will be possible to divide the index into large, medium-sized and small companies, as illustrated in Chart 1.

Chart 1:   Change from the FTSE All-World to the FTSE Global Equity Index Series
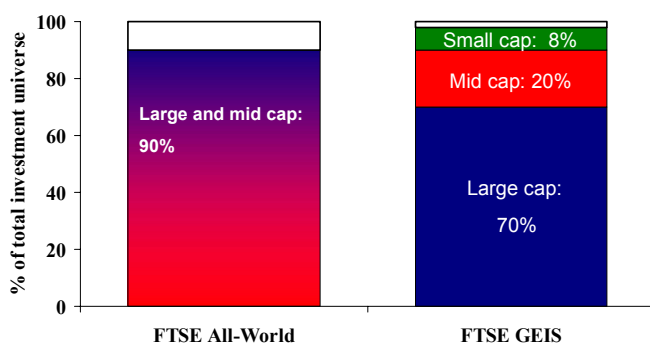
As of February 2003, 2218 companies were included in the FTSE All-World Index. Of these, 1760 companies were included in the Petroleum Fund's equity benchmark index as the Fund's index includes fewer countries than the FTSE All-World index. By comparison, 26261 companies were listed on stock exchanges in the markets the Petroleum Fund is permitted to invest in, and 48220 were listed worldwide at the end of 2001[1]. When FTSE introduces GEIS, coverage will be expanded to include a greater number of medium-sized as well as small companies in the index. This will result in a substantial increase in the number of companies in the index, while the rise in market value will naturally be less pronounced. In total, GEIS intends to cover 98 per cent of the market capitalisation in the markets included in the index. The number of companies will be expanded from about 2200 in the current FTSE All-World index to about 7000 companies in the FTSE GEIS. Annex 1 provides more detailed information about the differences between the FTSE All-World and FTSE GEIS.

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[1] Source: S&P Emerging Stock Market Factbook 2002.

FTSE GEIS will be constructed in modules based on companies' size and regional classification. Separate indices will be produced for large companies (large cap), medium-sized companies (mid cap) and small companies (small cap) in the individual regions (4 regions for developed markets and 3 for emerging markets). The segment for large companies will cover 70 per cent of the market capitalisation in each region, the segment for medium-sized companies the next 20 per cent and the segment for small companies the next 8 per cent – in all 98 per cent of the total market value. All the segments in the seven regions will together make up the new FTSE GEIS. It will still be possible to draw up a list of permitted individual markets in the benchmark index that is more narrowly defined than the country list used by FTSE in its indices, since data are published at country level.

The FTSE GEIS index, with its segments for large and medium-sized companies, will be the index that most closely resembles the existing FTSE All-World. The FTSE GEIS index will include a greater number of medium-sized companies than is the case for the existing FTSE All-World. If the FTSE GEIS is to be used as a benchmark index in the future, the portfolio will in any case have to be adapted to a new index. With the publication of separate index data for large, medium-sized and small companies, the Ministry of Finance has the opportunity to choose between different compositions of the benchmark index. In view of the expected growth of the Petroleum Fund, Norges Bank is of the opinion that it is most appropriate to consider an expansion of the existing benchmark index for equities.

It is natural to assume that the Petroleum Fund's benchmark portfolio should provide the broadest possible coverage of the investment alternatives in the respective markets. Expected growth in the Fund over the next few years supports this argument. This would indicate that small companies should be included in the equity benchmark index of the Petroleum Fund. But since the existing benchmark index covers around 90 per cent of the market value in the respective equity markets, an assessment will naturally be made of the advantages and drawbacks of further expansion. Norges Bank's submission dated 21 March 2002 concerning the possible expansion of the Petroleum Fund's investment universe stated the following:

> *"Moreover, when broader market coverage within an asset class that is already included in the benchmark is to be assessed, a criterion should be that the expected, measured positive effect for the portfolio's return and risk exceeds the additional administrative costs of changing the benchmark."*

In line with this, we will first examine the effect of an expansion of the Fund's equity benchmark index on return and risk, and then evaluate the effect on management and transaction costs.

2. Effect on return and risk of expanding the benchmark index

According to the original capital asset pricing model (CAPM)[2], an individual equity's excess return above and beyond the risk-free return is a function of the equity's market exposure and random deviations. The model has since been further developed, with the addition of a number of independent explanatory factors for share price performance. An important contribution to financial theory has been made by Fama and French[3], who use the size of the

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[2] Sharpe (1965): "Capital Asset Prices, A Theory of Market Equilibrium under Conditions of Risk", Journal of Finance, Lintner (1965): "The Valuation of Risky Investments in Stock Portfolios and Capital Budgets", Review of Economics and Statistics, and Mossin (1966): "Equilibrium in Capital Asset Market", Economtrica 34.
[3] Fama and French: "A test for the number of Factors in an Approximate Factor Model", Journal of Finance (1993) , "Common Risk Factors in the Returns of Stocks and Bonds", Journal of Financial Economics (1993) and "Multifactor Explanations of Asset Pricing Anomalies", Journal of Finance (1996).

company and the ratio of the equity price to book capital, as well as general market risk, as independent explanatory factors. Recent studies point to additional independent explanatory factors. The notion that multifactor models to a considerable extent explain the variation in return on individual equities in regional equity portfolios[4] is supported by empirical research.

It has previously been documented that small companies have historically provided higher returns than large companies in most stock markets in the world, even when adjusted for differences in risk. This effect was first documented in the US, but has also been reflected in research in the UK and a large number of other countries.[5] These studies were based on empirical observations of the excess return for small companies compared with large companies up to the 1980s.[6] In Chart 2, the results from these studies are shown as "initial research". Dimson, Marsh and Staunton (2001)[7] show that the excess return demonstrated in the initial research is countered by underperformance for small companies in the following period (from the 1980s up to 2000) in virtually all markets (Chart 2). This shows that while small companies would have contributed to increasing the return on a global equity portfolio in earlier periods, the opposite effect would apply in more recent periods.

Chart 2:   Historical monthly return differentials between small and large companies in international equity markets.
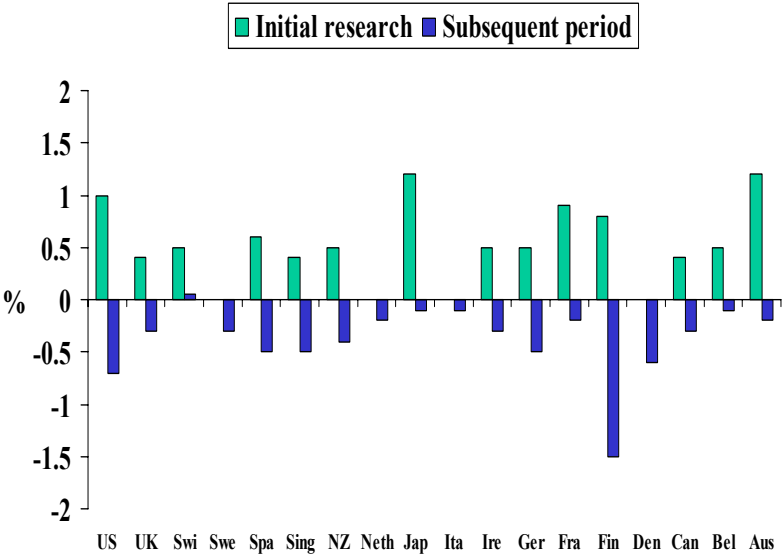
In the US, Ibbotson Associates publish returns for small companies that cover an even longer period than those presented in Chart 2. In the period 1926-2001, the average annual excess

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[4] Cf. Arshanapalli, Coggin and Doukas (1998): "Multifactor asset pricing of international value investment strategies", Journal of Portfolio Management.
[5] For the US: See Banz (1981): "The relationship between return and market value of common stocks", Journal of Financial Economics. For the UK: See Dimson and Marsh (1986): "Event study methodologies and the size effect" , Journal of Financial Economics. For other markets: See Hawawini and Keim (2000): "Security market imperfections in world wide equity markets", Cambridge University Press.
[6] The length of the period varies across countries in the studies. The longest studies are based on data for a 50-year period up to the 1980s, while other studies are based on shorter periods (down to 5 years).
[7] Dimson, Marsh and Staunton (2001): "Millennium Book II – 101 Years of Investment Returns", ABN-AMRO/London Business School.

return for small companies in the US was 1.8 per cent[8], compared with large companies[9]. In the US, it is also interesting to note a statistically significant "January effect": The entire excess return for small companies has historically been recorded in January, while the premium for small companies has on average been negative for the other 11 months of the year.

Annex 2 examines the return and risk associated with equity portfolios for large, medium-sized and small companies. It shows that return differentials for large/medium-sized and small companies vary both over time and across markets. The same applies to the differences between the risk of a portfolio consisting of large/medium-sized companies and the risk of a portfolio comprising small companies. The Annex also shows that including small companies in an equity portfolio that initially only consisted of large and medium-sized companies may contribute to reducing the risk of the portfolio.

3. Changes in management and transaction costs
Expected transaction costs are somewhat higher in a broad portfolio that includes small companies than in a portfolio reflecting the existing benchmark index. This increase is due to the following:

- There are greater differences between bid and offer prices when buying equities in small companies. This increases transaction costs by an estimated 12 basis points of the amount traded in connection with the initial purchase of equities in small companies.
- The proportion of the most cost-effective forms of trading (large program trades and the use of crossing networks) will be reduced, and the proportion of individual trades will rise. This increases transaction costs by an estimated 13 basis points of the amount traded in connection with the initial purchase of equities.

These estimates are based on normal transaction costs in connection with the purchase of a global equity portfolio in large and medium-sized companies of 25 basis points. If the benchmark index is expanded to include small companies, total transaction costs may be estimated at 50 basis points (0.5 per cent) of the purchase price. It is then assumed that the phasing in of small companies is financed by a proportionate sale of equities in large/medium-sized companies. Since the share of small companies is expected to be about 8 per cent of the entire equity benchmark index, the one-off cost of phasing in is estimated at 4 basis points of the entire value of the equity portfolio at the time of the change.

In connection with the investment of capital allocations in the equity market, program trading could also be used for a larger share of investments in small companies. Very little use of crossing networks is made in any event when investing new capital. Total transaction costs will therefore increase by an estimated 13 basis points of the amount invested in small companies compared with the current situation when capital is initially invested. The reduction in relation to the 50 basis points in connection with the initial adaptation can be attributed to the elimination of offsetting sales (25 bp) and to the fact that there will only be a marginal change in the distribution between program trades and individual trades compared with the current portfolio. The 13 basis points correspond to about 1 basis point of the total amount invested in the equity market. As shown above, this is largely due to greater

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[8] This is not comparable with the return premium in the same country in Chart 2. The difference may be related to a difference in period, a considerable difference in the composition of underlying indices for small companies, and a difference between arithmetically and geometrically calculated returns.
[9] Source: Ibbotson Associates: Stocks, Bonds, Bills and Inflation Yearbook 2002.

differences between bid and offer prices for equities in small companies. In addition, although indexing costs will increase at the margin, this effect is very limited.

Given the current size of the equity portfolio, settlement and custodian costs will increase by about USD 2 million per year if the benchmark index is changed. This corresponds to 0.5 basis points of the value of the portfolio as a whole.

4. Evaluation and conclusion

Small companies will constitute a limited share of the benchmark index. It is therefore reasonable to assume that expected return and risk for the total portfolio will not be affected to any extent. There will be some increase in transaction costs and other management-related costs, but only to a very limited extent compared with the transaction costs that always accrue in connection with the investment of new capital and rebalancing of the benchmark index.

Other administrative challenges will be modest, even though there will be a sharp increase in the number of equities in the benchmark index and the actual portfolio. The use of automated, electronically-based trading systems from the initiation of a trade to the final registration with the custodian (straight-through processing) makes it possible to effect large program trades with a limited use of resources. Automated procedures will also reduce the need for resources in connection with risk management and other important support and control functions.

On the basis of an overall evaluation, Norges Bank recommends that the benchmark index for the equity portfolio in the Government Petroleum Fund be based on the FTSE GEIS (large, medium-sized, small companies) in the markets the Ministry of Finance has decided will be included in the benchmark index. The main reason for the recommendation is that the expansion will be more representative of the investment universe. In general, the size and growth of the Government Petroleum Fund imply that the Fund should be broadly invested.

If the Ministry of Finance decides to expand the benchmark index, Norges Bank recommends that this is carried out as soon as possible after the FTSE GEIS is implemented by the index supplier[10]. This will enhance the possibility of achieving optimal cost-effectiveness when the actual portfolio is adapted to the change in the benchmark index.

It is not necessary to phase in the recommended change in the benchmark index over time. However, a decision concerning the change should be made and communicated to Norges Bank well before the change is actually implemented in the benchmark index.

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2 Annexes

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[10] FTSE GEIS replaces FTSE All-World as FTSE's main index as from 22 September. Daily data for the new FTSE GEIS series are, however, available via normal distribution channels from 30 June.

Annex 1
Transition from FTSE All-World to FTSE GEIS
Table 1 shows the number of equities, total market value and average market value per equity
in the developed markets in each region in the FTSE All-World at end-December 2002.
Tables 2-6 provide the same information for the FTSE GEIS at end-December 2002,
including both the sum of the various size categories (large, medium-sized and small
companies) and figures for the individual categories[11].

Table 1: FTSE All-World for developed markets, December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	543	8170	15.0
Europe	551	4124	7.5
Asia/Pacific	500	1588	3.2

Table 2: FTSE GEIS for <u>large, medium-sized and small</u> companies in developed markets,
December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	2565	10376	4.0
Europe	1510	5437	3.6
Asia/Pacific	1709	2842	1.7

Table 3: FTSE GEIS for <u>large and medium-sized</u> companies in developed markets,
December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	722	9105	12.6
Europe	497	4902	9.9
Asia/Pacific	696	2564	3.7

Table 4: FTSE GEIS for <u>large</u> companies in developed markets, December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	238	7269	30.5
Europe	184	3995	21.7
Asia/Pacific	279	2124	7.6

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[11] Source: FTSE

Table 5: FTSE GEIS for <u>medium-sized</u> companies in developed markets, December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	484	1836	3.8
Europe	313	907	2.9
Asia/Pacific	417	440	1.1

Table 6: FTSE GEIS for <u>small</u> companies in developed markets, December 2002

Region	Number of equities	Total market value (in billion USD)	Average market value per equity (in billion USD)
North America	1843	1270	0.7
Europe	1013	535	0.5
Asia/Pacific	1013	278	0.3

Annex 2
This annex presents figures for return and risk for equity portfolios consisting of large, medium-sized and small companies.

Return
Chart 1 shows the return on large, medium-sized and small companies in the US, Japan, the UK and Germany starting in 1974 (US), 1980 (Japan), 1986 (UK) and 1988 (Germany).[12]

Chart 1:   Index showing accumulated return for small, medium-sized and large companies, varying lengths of period
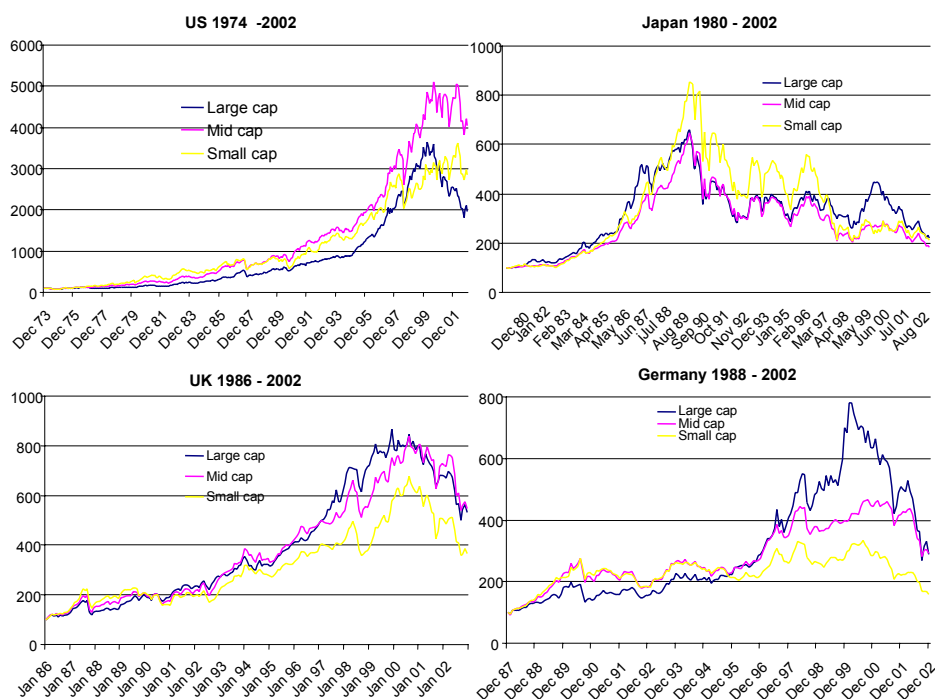

Table 1 sums up return differentials between small and large companies in the four specified countries for two periods: the longest available data series in each market, and 1996-2002. 1996-2002 represents the IT bubble period with extraordinarily high returns followed by extraordinarily low returns in the TMT[13] sectors.

Table 1:   Historical differences between annualised geometric return on small and large companies (the return on small companies minus the return on large companies) for varying periods

Period	US	Japan	UK	Germany
Longest	1.3 % (1974-2002)	-0.3 % (1981-2002)	-2.2 % (1986-2002)	-4.2 % (1988-2002)
1996-2002	2.7 %	-3.2 %	-2.1 %	-7.8 %

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[12] Sources: The S&P indices in the US, the Barra/Nikko indices in Japan, the FT indices in the UK and the DAX/SMAX indices in Germany.
[13] Technology, media and telecommunications.

We see from Table 1 that small companies have generated lower returns than large companies in Japan, the UK and Germany over the past 15 to 20 years. In the US, however, small companies have generated higher returns than large companies.

Salomon Smith Barney's (SSB) Global Equity Index includes data series dating back to July 1989 for both large and medium-sized companies and for small companies. While Chart 1 and Table 1 cover individual markets, SSB includes data for regional and global equity portfolios. The method of selecting companies for inclusion is the same for all markets, and is broadly similar to the method used by FTSE in selecting companies for its index. Figures showing changes in value in these indices can therefore provide a good estimate of how small companies would have influenced a regional and a global equity benchmark index in this period. Table 2 shows the return on broad equity portfolios including and excluding small companies, globally and regionally, in the period 1990-2002 based on the SSB indices.

Table 2: *Historically annualised geometric return (in USD) on regional equity portfolios including and excluding small companies 1990 –2002*

	World (with the Petroleum Fund's regional weightings)	North America	Europe	Asia/Pacific
Incl small companies	5.7 %	9.7%	7.2 %	- 4.8 %
Excl small companies	5.9 %	9.5 %	7.6 %	- 4.4 %
Effect on total portfolio return of including small companies (percentage points)	-0.2	+0.2	-0.4	-0.4

Table 2 shows that small companies have generated lower returns than large companies both in Europe and Asia/Pacific. In North America, small companies have generated the highest returns.

Risk

Table 3 shows the volatility (annualised standard deviation based on monthly time series) of small and large companies in the periods on which return figures in Table 1 are based.

Table 3: *Historical risk (annualised standard deviations) for large and small companies in the US, Japan, the UK and Germany*

Period		US	Japan	UK	Germany
Longest	Small companies	19.9 % (1974-2002)	22.7 % (1980-2002)	19.0 % (1986-2002)	19.3 % (1988-2002)
	Large companies	16.4 %	19.2 %	17.0 %	22.7 %
1996-2002	Small companies	20.2 %	23.5 %	18.6 %	22.4 %
	Large companies	19.1 %	17.6%	15.3 %	26.8 %

The main impression from Table 3 is that the risk associated with small companies is somewhat higher than that of large companies. The exception is Germany, where a portfolio

consisting of small companies has involved lower risk than a portfolio comprising large companies.

Table 4 shows the historical risk of broad equity portfolios including and excluding small companies, globally and regionally, in the period 1990-2002, based on Salomon Smith Barney's indices.

Table 4:   Historical risk (annualised standard deviation) of a regional equity portfolio including and excluding small companies, monthly data 1990 - 2002

	World (with the Petroleum Fund's regional weightings) in USD	North America	Europe	Asia/Pacific
Incl small companies	14.9 %	15.3 %	15.6 %	22.8 %
Excl small companies	15.0 %	15.4 %	15.8 %	23.0 %
Changes in total portfolio risk of including small companies (percentage points)	-0.1	-0.1	-0.2	-0.2

We see from the table that even though small companies carry a higher risk than large companies, the portfolio's total risk is reduced when small companies are included. This is because of the diversification gains provided by small companies.

Some observations
The conclusion cannot be drawn that the return and risk differentials illustrated in tables 1-4 are exclusively due to differences in the size of companies. The indices used to calculate return and risk diverge not only in terms of the market capitalisation for the companies included. The sectoral distribution of large and small companies in the group will also vary. Sectoral classification and distribution has over time become an increasingly important factor in explaining return differentials across markets and companies. A different sectoral distribution will therefore result in return and risk differentials between a market-weighted portfolio comprising large companies and a corresponding portfolio of small companies. Return figures for the regional portfolios will also be influenced by different country weightings in the portfolios of large and small companies. Adjustments should be made for such structural differences between portfolios when comparing return and risk[14].

The share of manufacturing enterprises and producers of cyclical consumer goods such as cars and household products is consistently higher in the regional global indices for small companies than in the indices for large and medium-sized companies. On the other hand, indices for small companies have a smaller share of telecommunications firms, oil and gas companies and producers of non-cyclical consumer goods, particularly within the health sector.

In order to draw statistically valid conclusions about the long-term relationship between return and risk, longer time series would be required. Access to long data series is limited, particularly outside the US and the UK.

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[14] Dimson/Marsh (1999): Murphy's law and Market Anomalies, Journal of Portfolio Management, shows that about half of the underperformance of small companies in the US and the UK in the mid-80s was due to a different sectoral composition in the group of small and large companies.

Further comments on the features of the total portfolio
Even though small companies in isolation may have somewhat higher volatility than large companies, this does not necessarily mean that the risk of the total portfolio will increase if the benchmark index is expanded. Small companies with favourable diversification features can offset the potentially higher volatility of the sector. This has been the case in recent years. Return differentials between small and large companies have shown a slightly negative correlation with general market movements in the US, Japan, the UK and Germany over the past few years. In the period 1996-99, when markets rose sharply, the value of small companies rose less than the rest of the market. From 2000 to 2002, however, small companies fell much less in value than the rest of the market. The share of TMT companies[15] is lower in the small company sector than in the market in general. The particularly favourable diversification features in this period must therefore be seen in connection with this structural deviation.

Charts 2 and 3 show three-year rolling historical return and risk (standard deviation) on a broad global portfolio comprising large, medium-sized and small companies. The charts also show changes in annualised return and risk differentials compared with a global portfolio consisting of large and medium-sized companies. Salomon Smith Barney's data series (in USD) have been used, but the regions are weighted in accordance with the weightings in the current strategic benchmark index for the Government Petroleum Fund. The charts can give an indication of what the return and risk on the Petroleum Fund's benchmark index would have been over the past 10 years if the FTSE GEIS had been the benchmark index, and what the differences would have been compared with the current benchmark index.

Chart 2:   Three-year rolling return on a broad equity portfolio and return differential (ie the return on a broad portfolio minus the return on a portfolio of large and medium-sized companies)

Three-year rolling return and return differentials

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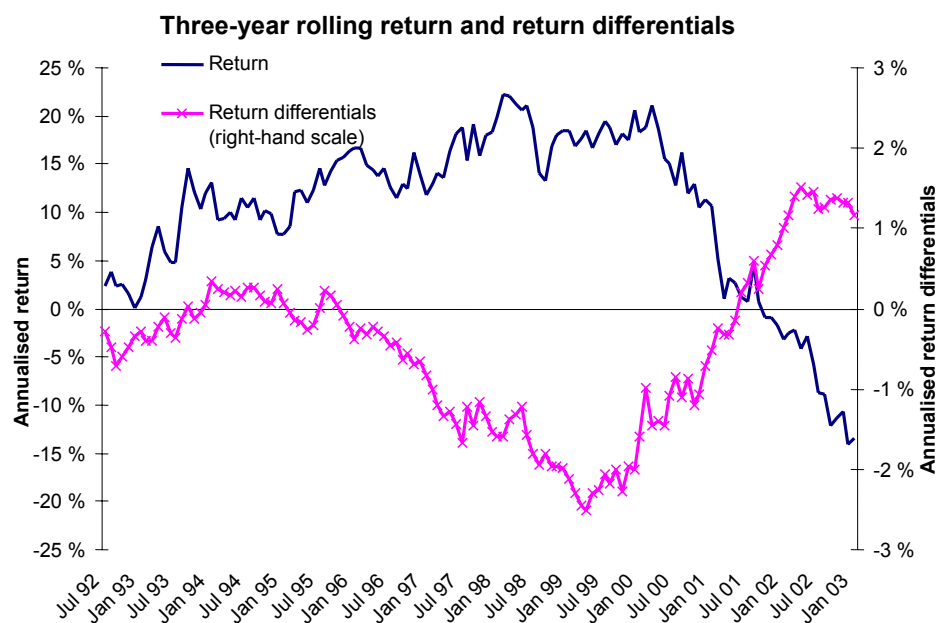
[15] Technology, media and telecommunications.

Chart 3: *Rolling annualised standard deviation for a broad equity portfolio and risk differential (ie the standard deviation of a broad portfolio minus the standard deviation of a portfolio consisting of large and medium-sized companies)*

3-year rolling volatility (standard deviation) and volatility differentials
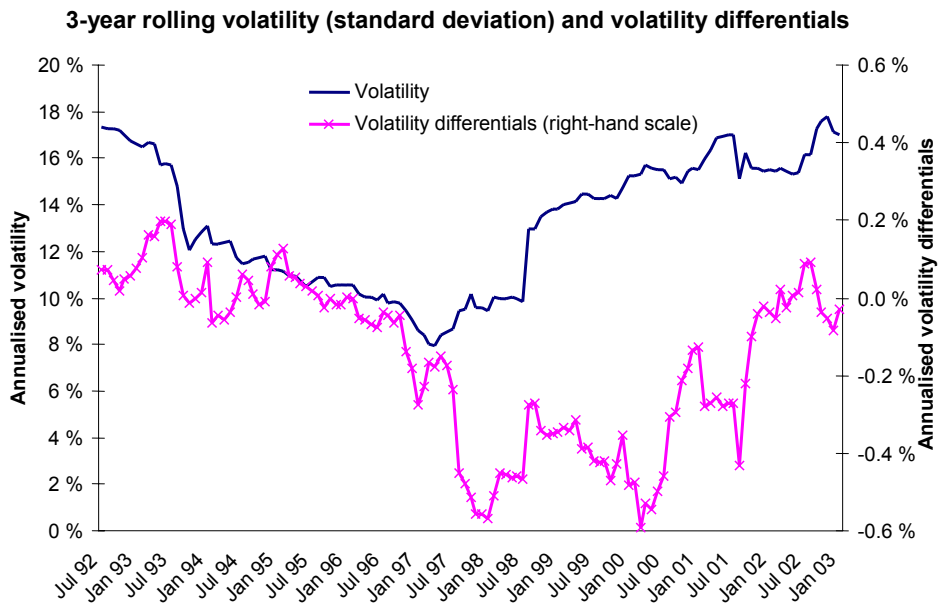
In the period 1990 – 2002, the broadest equity portfolio had an annualised standard deviation that is 0.2 percentage point lower than the standard deviation of the equity portfolio comprising large and medium-sized companies. The annualised return is 0.2 percentage points lower on the broadest portfolio. Consequently, small companies have in this period contributed to reducing both the return and risk of a global equity portfolio. However, the changes in return and risk are within what must be defined as statistical margins of error. If estimates of future return and risk are based on these historical time series, the conclusion will be that the expected effect on the portfolio's absolute return and risk in the long term are probably marginal.