

An appraisal of the regional weighting of the Petroleum Fund

Norges Bank submitted the following letter to the Ministry of Finance on 11 April 2002

1. Introduction

For the first two years (1996-1997) the Petroleum Fund was only invested in government bonds. The regional distribution was 75 per cent in Europe (distributed among five countries), 18 per cent in the Americas (only the US) and 7 per cent in Asia (only Japan). During the first half of 1998, there were three major changes in the Fund's investment strategy. First, equities were included, with a share of 40 per cent. Second, the regional allocation was substantially changed. The share in Europe was decreased from 75 to 50 per cent, while the share in the Americas was raised from 18 to 30 per cent and in Asia from 7 to 20 per cent. Third, the number of countries in which the Fund invested was expanded from 7 to 21. The reasons for the changes were that the Fund had a long investment horizon, and that it was growing faster than previously assumed.

The new regional weightings meant that the Petroleum Fund would have a high exposure to certain bond issuers. This is because in the regions the Americas and Asia, the US and Japan, respectively, account for virtually the whole regional weighting of the benchmark portfolio. After the inclusion of non-government-guaranteed bonds in the benchmark, the Fund's largest exposure to a single issuer would be to the Japanese government. At end-November 2001, the credit rating of the Japanese government was downgraded by several recognised rating agencies. This downgrading led to Norges Bank's decision to reduce the weighting of Japanese government bonds in the foreign exchange reserves. In a letter of 12 December 2001, the Bank informed the Ministry of Finance of the changes made in the foreign exchange reserves. In January 2002 the Ministry decided to reduce the weighting of Asian bonds in the Fund's benchmark to 10 per cent, while the weightings for the Americas and Europe were raised to 35 per cent and 55 per cent respectively. In a letter of 9 January this year, the Ministry of Finance announced that there will be a broad-based discussion of the Fund's regional allocation in the Revised National Budget for 2002. The Fund's market risk (i.e. exchange rate risk and risk of changes in equity and bond prices) will receive particular attention in this discussion. The Ministry requested input from Norges Bank for this review.

In this submission, Norges Bank will review factors that have a bearing on the regional allocation chosen for the Petroleum Fund. First, the question of a natural breakdown of the Fund's investment universe into markets will be discussed. This will depend, among other things, on the correlation between returns in the equity and bond markets of the various countries. Sector affiliation appears to be a more important explanatory factor than previously for the share price performance of some enterprises, and the implications of this tendency for the regional distribution of the Fund are also discussed. Thereafter, two methods for establishing the regional allocation of the Fund are assessed. The first method considers which regional allocation may represent a risk-minimising investment strategy for the Fund in the long term. This strategy is derived from the purpose of the Fund, which is to assure the Fund's international purchasing power. The other method considers the Fund's regional distribution on the basis of more traditional portfolio analyses. An analysis is provided of the return and risk situation in the largest equity and bond markets. In particular, the relationships between nominal rates of return, inflation and exchange rate changes are examined. The conclusions of the analyses in this submission are summarised in section 6.

2. Choosing the market distribution

It has long been usual for managers to divide up the investment universe by country or region.

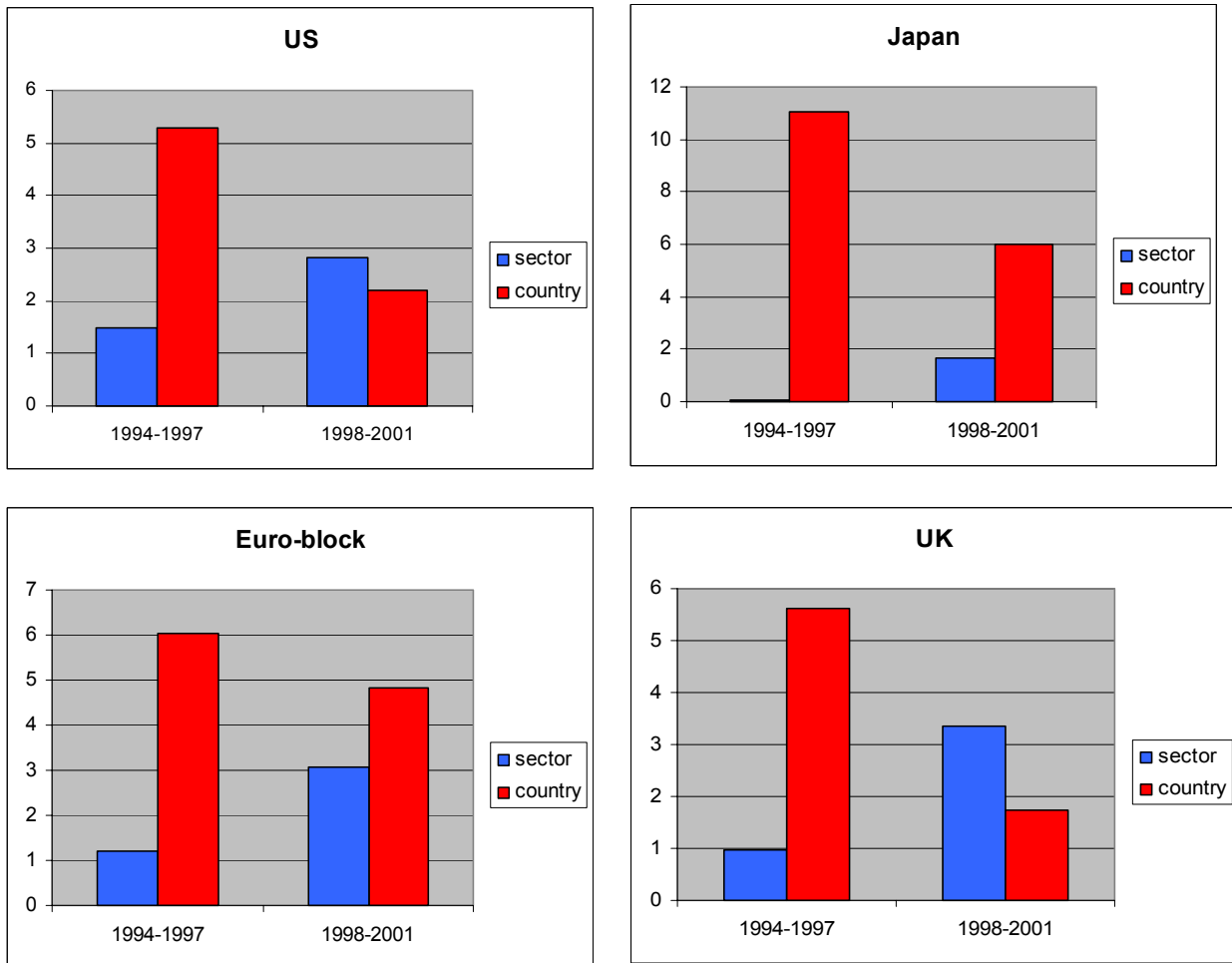
This has formed the starting point for both short-term and long-term allocation decisions. In the light of the increased integration between countries' goods and financial markets, it is an open question whether the traditional breakdown by country or region is still relevant. This applies in particular to equity investments, where the earnings of many companies depend increasingly on economic developments outside their home country. The question of what market distribution it is relevant to use in investment analyses is discussed in this section.

A key question when choosing the allocation of the Fund's equity portfolio is thus whether equity markets should be broken down by country or region or by sector. In recent years many investors have begun to focus more on the sector affiliation of a share than the country in which it is listed. This is partly because empirical studies show that sector affiliation appears to have become a more important factor for explaining share price performance. However, the same studies also show that the country affiliation of an enterprise still has a strong bearing on its shareprice performance. Chart 2.1 shows the results of a study Norges Bank has conducted of the importance of the sector and country affiliation. The share price performance for a sector in a country is explained in terms of both the global sector return and the return of the sector's country. The results in the chart show that in the period 1994-1997, country affiliation was the most important for all four regions/countries. However, the importance of sector affiliation has increased in all countries in recent years. In the period 1998-2001, the sector factor became more important than the country factor for explaining share price performance in the US and the UK. One reason for this may be that there are many large, global companies registered in these two countries.

It is difficult to determine a market distribution that will be appropriate for long-term investment decisions. This will depend partly on what consequences increased globalisation has for developments in the prices of individual companies. It is conceivable that the increased integration of countries' goods and financial markets will reduce the importance of country affiliation for explaining share price performance. An indication of this trend is that through the 1990s there was an increase in the share of enterprise earnings that came from subsidiaries abroad.¹ The increase has been clearly largest for European enterprises, and the share for these enterprises is now appreciably higher than the shares for enterprises in the US and Japan. This reflects the growing integration of the European countries.

¹ See World Economic Outlook, October 2001, Chapter 3. IMF.

Chart 2.1 The importance of sector and country affiliation. The average t-value² in the regression in which the return on equities in a sector is explained by i) the return on equities of the corresponding global sector and ii) the return in the country of registration's equity market.



The above analyses show that the share price performance of a company appear to be influenced by the region or country in which the company is registered and the sector to which it belongs. However, the relative importance of the factors varies across markets and over time. It is therefore not self-evident whether a breakdown by sector or by country should be used to analyse the market distribution of the Petroleum Fund's equity portfolio. In the analyses in this submission we have elected to focus primarily on country/region. This is because the country factor still appears to be important for explaining share price performance. There is also a more consistent correspondence between country and currency exposure than there is between sector and currency exposure.

It is usual to divide the investment universe according to geographical regions, on the assumption that market developments in countries within the same region are closely correlated. In a separate annex to this submission, the correlation between market return in the largest countries in the Fund's equity and fixed income portfolios is examined. The analyses in the annex reveal that Europe, in particular, distinguishes itself as a natural region with a

² The t-value is a measure of the importance of the individual explanatory factors. An explanatory factor with a t-value of over 2 is regarded as having significant explanatory power.

high correlation between the returns in the individual markets, both equity and bond. In the US, and in Asia in particular, there is a lower correlation between the returns in the various markets. In the analyses in this submission we have therefore elected to operate with three markets: the US, Japan and Europe. In the current benchmark, these three markets account for about 95 per cent of the fixed income portfolio and almost 93 per cent of the equity portfolio.

3. Choice of regional allocation on the basis of long-term considerations

When deciding on the regional allocation of the Petroleum Fund, the Ministry of Finance has elected to have the same currency distribution as market distribution. In principle, currency allocation and market allocation could be chosen quite independently, because the two allocations can be kept separate through the forward exchange market. For the Fund, however, it is not very appropriate to operate with a permanent separation between currency and market distribution. One reason for this is that the Fund's long investment horizon makes it difficult to determine the Fund's real currency exposure, because in the long term exchange rate changes are often offset by interest rate or inflation differentials. A substantial difference over time between currency and market distribution would also mean that short-term contracts (currency swaps) for considerable amounts would constantly have to be renewed, which would result in high transaction costs and increased counterparty risk. In the guidelines and benchmark for the Petroleum Fund the same currency and market allocation has therefore been chosen. Norges Bank is of the view that this principle should continue to apply.

The choice of regional allocation for the Petroleum Fund must be viewed in the light of the purpose of the Fund's management. Since Norway as a nation can only use the Fund for the import of goods and services, the aim is to achieve the highest possible international purchasing power. This means that the value of the Fund must be maximised in relation to a basket of consumer goods and services that reflects the supply of goods and services in the markets in which future imports are to be purchased.

The guidelines for the use of petroleum revenues, which stipulate that only the expected real return on the Fund is to be used, imply that the Fund will have a very long life. In the long term, there will be substitution possibilities between different suppliers in the global market for goods and services. The Fund's international purchasing power should therefore not be measured in terms of a basket of goods and services with weightings corresponding to today's import weightings. The weightings should be determined more by where the production capacity of the world market is located, since it is this capacity that creates the supply of goods and services the Fund can purchase. A risk-minimising investment strategy for the Fund could then be to own a share of the capital that receives income from the world's production capacity. It will not be feasible to achieve this completely, but an acceptable approximation would be to buy a share of all available financial claims on the companies and governments that, directly or indirectly, receive revenues from the sale of goods and services on the world market. With this approach, it might be natural to base an analysis of the Petroleum Fund's regional distribution on market value weightings.

There are also more theoretical arguments for using market value as a basis. According to the international capital asset pricing model (CAPM), market value weightings will under certain conditions represent the optimal trade-off between return and risk and thus the optimal portfolio. In this model, investors are assumed to maximise the expected utility of lifetime consumption. It is also assumed that capital markets are perfectly integrated, and that investors in all countries are concerned with the purchasing power of their international investments. If we assume that purchasing power parity (PPP) holds, all investors will use the same consumer price index to deflate their expected returns. All investors will then have the same expectations, and consequently hold the same portfolios, which have weightings

identical to market value weightings.

Operational grounds can also be given for choosing to use market value weightings for the regional distribution of the Petroleum Fund. Market value weightings imply that investments are concentrated in the largest, most liquid markets. As a rule, these markets are characterised by small differences between bid and offer prices and hence low transaction costs. Another advantage with market value weightings is that they eliminate the problem of having to rebalance the portfolio when price movements in the various markets differ. On the whole, only changes in market value due to securities being included in or dropped from benchmark indices need to be taken into account when rebalancing the actual portfolio.

As the Petroleum Fund grows, it is becoming increasingly important to take market size into account. With the quantity of capital that will be flowing into the Fund over the next few years, it will achieve a significant size, even by international standards. It is therefore important for the Petroleum Fund to be invested in markets that are large enough and liquid enough. This suggests that in this review of the Fund's regional distribution, more emphasis should be placed on the size of financial markets. This could have consequences for the equity portfolio in particular, partly because the Fund's regional distribution for equities now deviates more from market value weightings than it did when the regional allocation was stipulated in autumn 1997. One important reason for this is that the Fund has had fixed regional weightings during a period in which price movements in the equity markets in the various regions have differed. For example, when the current regional allocation of the Fund's equity portfolio was stipulated in autumn 1997, stock markets in the US were about 2½ times as large as stock markets in Asia. Today the US markets are more than 5 times as large as the Asian markets. As a result, the Fund's ownership interests in Asian companies are now about three times as high as in US companies.

It is usual for investors to take market value weightings into consideration when deciding on an investment strategy. However, many investors have chosen to define an investment strategy for both equities and bonds that is not based purely on market value weightings. Norges Bank believes that there are several reasons why the regional distribution of the Petroleum Fund should deviate from market value weightings.

The first reason relates to the purpose of the Fund's management. The objective of the Fund is to maximise international purchasing power, which is measured in terms of a basket of goods and services that Norway will import in the future. Although there will be substitution possibilities over time in the Norwegian import pattern, it seems reasonable to assume that the bulk of Norwegian imports will continue to come from Europe in the future. One important reason for this is that geographical proximity makes it natural for Norway to have extensive economic relations with the European countries. This suggests that European equities and bonds should have a higher weighting than market value weightings alone would imply.

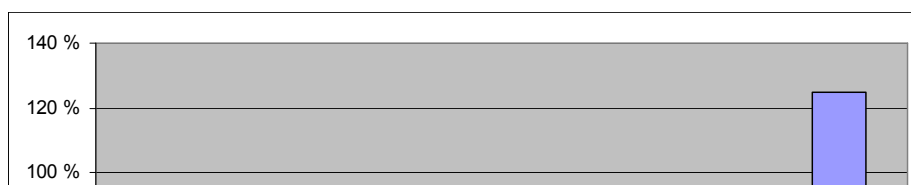
The other reason for deviating from market value weightings in the regional distribution of the Fund is that in view of the Fund's long investment horizon, emphasis should also be placed on risk associated with unique events in a particular country (such as prolonged economic crises, major natural disasters and wars). Since such events seldom occur, it is difficult to quantify the likelihood of their occurring. Nevertheless, it is important to bear in mind that such events may occur. History has shown that if unforeseen problems occur in one country, there may often be similar problems in neighbouring countries. This suggests that investments should be spread across different regions.

A third reason why the Fund's regional distribution should deviate from market value

weightings is that, in principle, the risk in the Petroleum Fund should also be viewed along with the risk in the other components of Norway's national wealth. Most of this wealth is tied up in fixed capital and human resources in Norway, but the petroleum in the North Sea and our foreign assets through the Petroleum Fund are also parts of our national wealth. In theory, the various components of this wealth should be managed together. In practice it may be difficult to accomplish this in a consistent manner. Efforts should nevertheless be made to manage the Petroleum Fund in such a way that the return on the Fund does not co-vary strongly with the other components of Norway's wealth. This may mean that exposure to countries that are geographically close to us or have a similar economic structure should be reduced, since it is conceivable that the return on these investments will have a high correlation with the return on other components of our national wealth. In isolation, this may be an argument for reducing exposure to European equities and bonds.

In an assessment of the regional distribution of the Fund, it is also relevant to look at the relationship between market value weightings and countries' production capacity. Chart 2.1 shows the value of some countries' equity markets as a share of GDP. We see from the chart that there are substantial differences between countries. The equity market in the US, for example, is currently almost 8 times the size of the Japanese market, whereas US GDP is only about double Japanese GDP. There are several reasons why the value of the equity market as a share of GDP varies from one country to another. One reason is that many large, multinational companies that operate in many countries are listed on the stock markets in some countries (such as the US and the UK). Another reason is that the financing structure of companies in different countries may differ. The proportion of the equity market that is available to foreign investors may also cause differences between countries. In Chart 3.1, the value of the equity market is based on the proportion that is available to all investors. In the US and the UK this proportion is very high, whereas in both Japan and Germany a substantial portion of the equity market is not available to all investors. The last reason for the value of the equity market as a share of GDP varying from country to country is that there are activities (particularly in services) that are run by listed companies in some countries whereas in others they are run by the public sector.

Chart 3.1 Market value of equities as a share of GDP. The figures for market values of equities are for end-February 2002 (Source: FTSE), whereas GDP figures are from 2001 (Source: IMF).



Countries also differ widely in terms of the ratio of bond market value to GDP. In some countries, for example, there are large, liquid markets for corporate bonds, while these markets are less developed in other countries. There are also considerable differences between countries with respect to public sector debt as a share of GDP.

The substantial differences between countries with respect to equity and bond market value in relation to GDP have led to some investors choosing a market allocation that is proportional to the countries' GDP weights. However, Norges Bank believes that GDP weights have gradually become less relevant as a basis for the Fund's regional distribution. This applies in particular to the equity portfolio, since there is a weak and diminishing relationship between stock market capitalisation in a country and the country's production capacity.

Summary

It is clear from the above discussion that there are both theoretical and operational reasons for using market value weightings as a basis for an analysis of the regional distribution of the Petroleum Fund. However, there are a number of reasons why it may be wise to deviate from this basis. Taking account of Norway's future import pattern and differences in the capital market structures in various countries, Europe should possibly have a higher share in the Fund than market value weightings alone would suggest. In the interests of achieving broad diversification of the risk of unique events, there should be a level spread across regions. In isolation, the objective of diversifying Norway's national wealth may be an argument for limiting the exposure of the Fund to Europe.

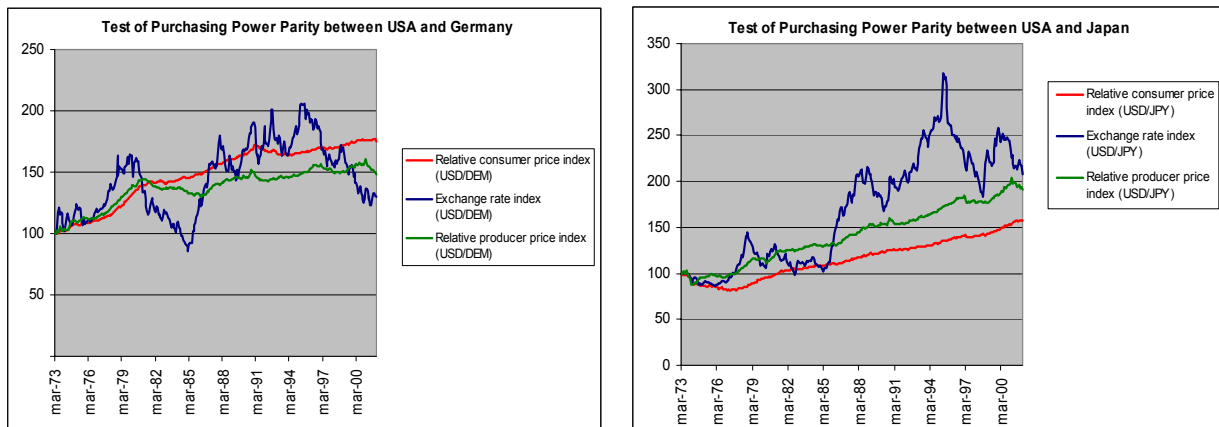
4. Choice of regional distribution based on portfolio analyses

The previous section discussed the Petroleum Fund's regional distribution on the basis of more long-term considerations. This section looks at the consequences that the choice of regional allocation may have for the Petroleum Fund's return and risk in the short and medium term.

The real return on the Fund depends on the nominal return (on equities and fixed income instruments), inflation and exchange rate changes. It is therefore important to analyse the relationships that exist over time between exchange rate changes, inflation differentials and differences in the nominal return.

If purchasing power parity holds, inflation differentials will result in corresponding exchange rate changes. In Chart 4.1 we have looked more closely at the relationship between inflation differentials and exchange rate changes for the US, Japan and Germany over the last 30 years. The chart confirms the results of empirical studies, which find that over time there is a correlation between exchange rate changes and inflation differentials, but that the deviations can be substantial in the short and medium term.³ This result seems reasonable since it is unlikely that we will observe considerable differences in prices for relatively similar goods over a long period as long as there are no limitations on international trade.

Chart 4.1 Relationship between inflation differentials and exchange rate changes in the US, Japan and Europe in the period March 1973 to December 2001



In the long term, an attempt can be made to avoid the exchange rate risk that arises when some goods become more expensive over time (measured in a common currency) by shifting the pattern of imports away from those goods that have recorded the sharpest rise in prices. This means that even though there may be deviations from purchasing power parity over time, the Fund's purchasing power may to some extent be maintained by changing the country composition of imports.

The return on equity and bond investments in various countries depends on the relationships between nominal return differences and exchange rate changes. Most empirical studies that test the relationship between nominal return differences and exchange rate changes focus on the relationship between short-term interest rates (interest rates with a maturity of 1 or 3 months) and exchange rate changes. The studies find little support for the existence of interest rate parity. For our purposes, it will be more relevant to test whether return differences for equity and bond investments are correlated with

³ See, for example, Froot, K.A. and K. Rogoff (1995): "Perspectives on PPP and long-run real exchange rates" in Grossman, G. M. and K. Rogoff (eds.) "Handbook of International Economics", Vol. 3, pp. 1647-1688. North Holland, Amsterdam.

exchange rate changes over time. Chart 4.2 illustrates these relationships in the three main markets: the US, Japan and Europe. The chart shows a relative return index that represents cumulative differences in local rates of return and an exchange rate index which reflects cumulative exchange rate changes. If the two indices shadow each other, return differences will result in corresponding exchange rate changes. The chart indicates that in the short term differences in return (measured in a common currency) may be substantial across countries. This applies to both equity and bond markets. In the long term, the return in the various markets appears to be somewhat more uniform. For the period as a whole (1986-2001), the return in the three bond markets has been approximately the same (measured in a common currency). The lower return on Japanese bonds has been offset by an appreciation of the yen. We also see that there has been some similarity between the return on US and European equities in this period. However, there have been considerable differences in the return on US/European equities and Japanese equities. The substantially lower return on Japanese equities has only to a small extent been offset by an appreciation of the Japanese yen. This illustrates that even though capital mobility is very high, the return in the long term will not necessarily be the same (measured in a common currency) in all markets. Both risk premia and expectation errors for exchange rates and equity and bond prices may generate differences in returns across markets.

Chart 4.2 Relationship between inflation differentials and exchange rate changes in stock and bond markets in the US, Japan and Europe

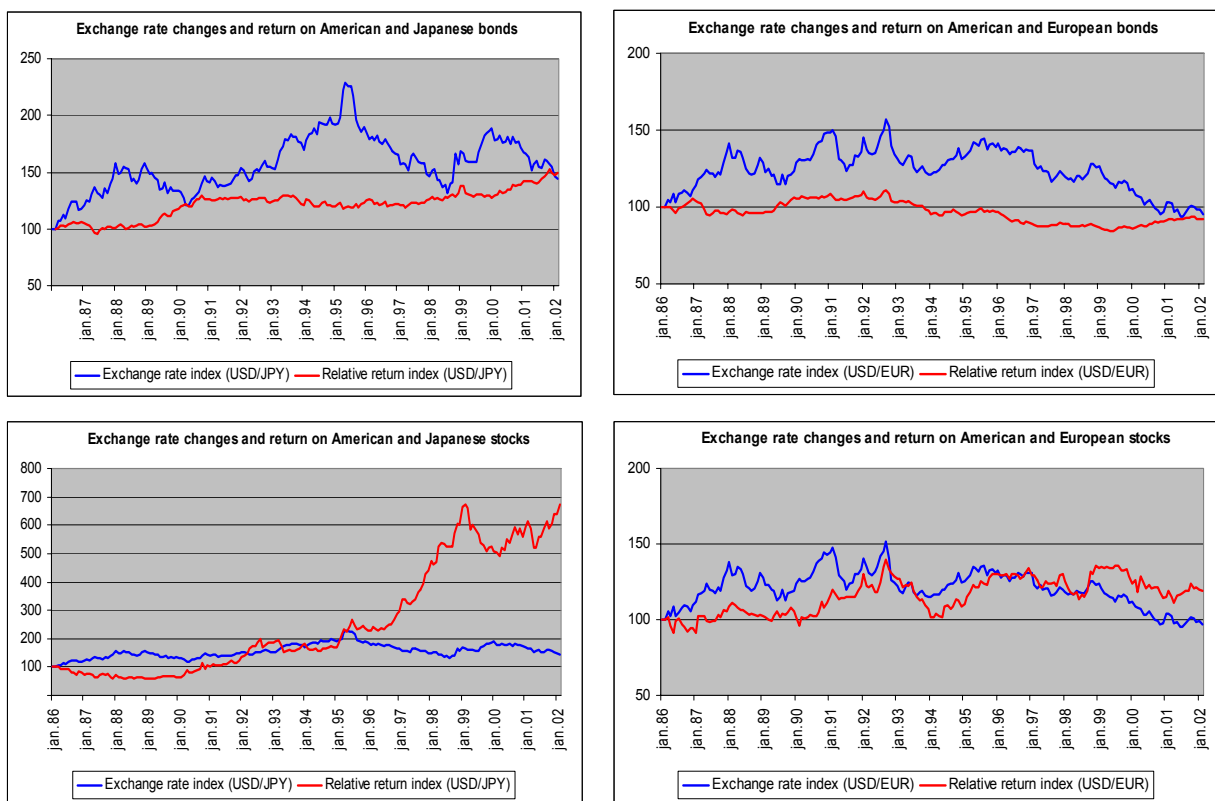


Chart 4.2 shows that, in periods, return differences between the various markets have been considerable. For bond markets, these return differences have mainly been driven by exchange rate changes. For stock markets, the differences can to a greater extent be ascribed to different returns in the various countries' stock markets.

A key question in the choice of a new regional allocation for the Fund is whether different rates of return in the various markets are to be assumed in the years ahead. The high

correlation between the US and European markets makes it difficult to assume that differences in the returns in these markets will be substantial in the long term. Over the last 10-15 years, however, the difference between the return in Japanese markets and the return in European and US markets has been considerable. It is uncertain what implications this has for future returns in various equity and bond markets. The current very low interest rate level in Japan means that the future return on Japanese bonds can only be the same as the return on US and European bonds if the Japanese yen appreciates against other currencies or if the rise in interest rates is less in Japan than in the US and Europe. Another question is how the Japanese stock market will evolve if it takes time for the country to emerge from recession and deflation that now characterise economic developments. A decisive factor is what economic developments have been factored into current Japanese equity prices and how actual developments will be compared with investor expectations.

Since there may be considerable differences in returns over time, it is important when deciding on the regional allocation of the Petroleum Fund to spread the risk associated with the Fund's return. Chart 4.3 compares the exchange rate risk and the risk of changes in equity and bond prices with the help of historical data. The US dollar is used as the currency of measurement in the calculations. The chart provides a basis for several interesting conclusions. First, the risk associated with changes in bond prices is approximately the same in all three markets. The risk associated with changes in equity prices is somewhat higher in Japan than in the US and Europe. Second, the exchange rate risk is of considerable importance to the overall risk for bonds, whereas for equities the exchange rate risk constitutes a smaller portion of the overall risk. Third, the positive correlation between exchange rate changes and the return on equities for Japan contributes to increasing the overall risk for Japanese equities. For European equities, the correlation between the return and exchange rate changes is negative, which means that the risk for European equities is approximately the same when the return is measured in a local currency as when it is measured in US dollars.

Chart 4.3 *Decomposition of the variance of the return on equity and bond investments in the US, Japan and Europe. Monthly data for the period 1986-2001*

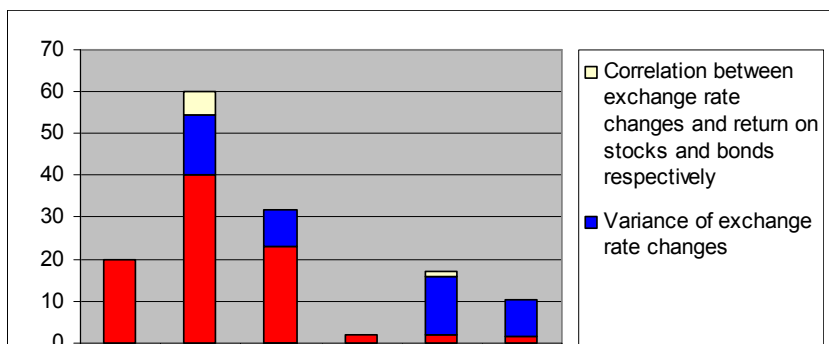
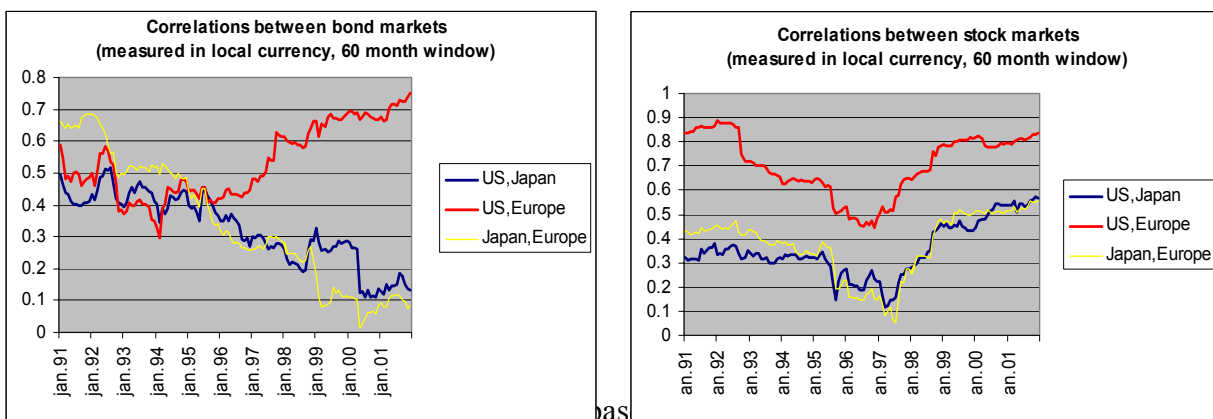


Chart 4.4 shows the correlation between the return on equity and bond investments in the US, Japan and Europe. We see from the chart that the return on bond investments in Japan shows little correlation with the return on bond investments in the US and Europe. This correlation has been reduced over time, a factor that has strengthened diversification gains by investing in Japanese bonds. The chart also shows that the correlation between US and European bonds has increased in recent years. This reflects a higher correlation between bond yields in the US and Europe. With regard to equity investments, it is seen from Chart 4.4 that the correlation between the return in the US, Europe and Japan has increased in recent years. However, the correlation between the return on Japanese equities and the return on equities in the US and Europe respectively is still lower than between the return on US and European equities. The strong correlation between the US and Europe indicates that it is particularly Japan that has generated diversification gains in a global equity portfolio. These diversification gains must, however, be seen in connection with the unusual developments in the Japanese stock market over the past ten years.

Chart 4.4 Correlation between the return on equity and fixed-income portfolios in the US, Japan and Europe. The correlation coefficients are calculated using moving 60-month windows. This means that the first observation in all the charts shows the correlation coefficient in the period January 1986 to December 1990. The last observation shows the correlation coefficient in the period January 1997 to December 2001



studies fluctuations in exchange rates and equity and bond prices in the various markets (market risk). When assessing the Fund's overall risk, however, credit risk should also be taken into account. Credit risk depends on the credit rating of the bond issuer. This risk can be limited in two ways. One way is to set minimum credit rating requirements for the issuer of bonds that the Fund can purchase. The Petroleum Fund can only invest in bonds for which the issuer has a credit rating of BBB/Baa or higher from S&P and Moody's respectively. The second way is to spread investments among many issuers. The Petroleum Fund's largest exposure to individual issuers is to sovereign states. With the

current regional distribution, when the phasing in of non-government-guaranteed bonds has been completed, the US Federal Government will be the largest individual issuer with a share of just over 13 per cent. The US is followed by the governments of Germany, France, Italy and Japan, each accounting for about 6-7 per cent of the fixed income portfolio. Italy and Japan have a rating of AA, while the other countries have a rating of AAA. Norges Bank is of the view that maximum limits should be set for exposures to individual issuers that depend on the credit rating of the issuer.

Summary

Portfolio analyses in this section have shown that in the short and medium term there may be considerable differences in returns across markets. It is therefore important to spread the risk associated with the Fund's investments. This reinforces arguments based on more long-term analyses in the previous section that the Fund's equity and fixed income portfolios should be broadly diversified. Credit risk considerations imply that the Fund should not have excessive exposure to individual issuers. This may place constraints on the Fund's exposure in regions where one country dominates. It may be particularly relevant for Asia/Oceania where Japan is the largest country. Japan's sovereign debt is now under observation for a possible further downgrading of its credit rating.

5. Fixed or variable regional weightings

A key question in the choice of regional weightings is whether regional weightings should remain stable over time (fixed weightings) or whether the weightings shall be allowed to change in line with relative price developments across regions (variable weightings).

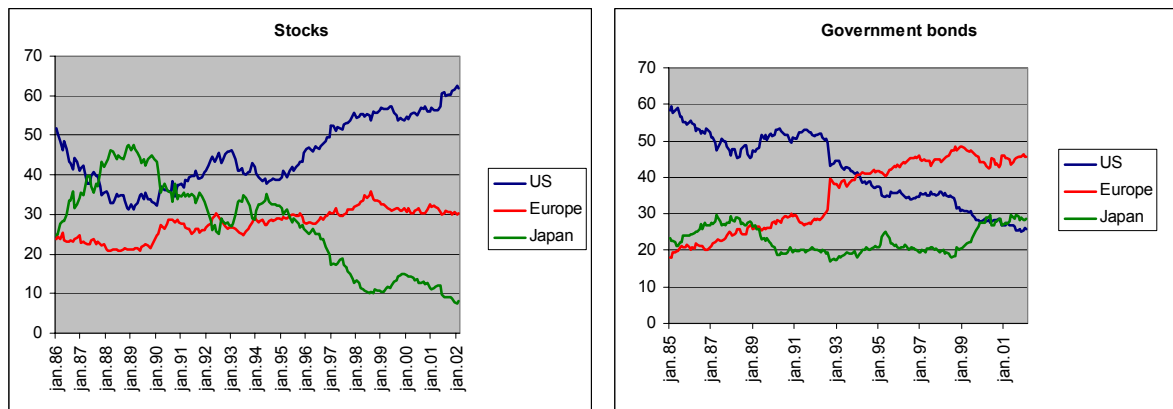
The existing guidelines for the management of the Petroleum Fund call for stable regional weightings over time. This is ensured in two ways. First, the composition of the monthly transfers to the Fund is determined in such a way that the regional weightings (and the equity portion) are brought back to the strategic weightings to the greatest possible extent. This means that the capital transfer is used to buy securities in those markets that have declined most in value. Second, conditional rebalancing of the Fund's benchmark portfolio is used if the deviations from the strategic weightings are too great. The condition for rebalancing is that the weighting of the six asset classes in the actual benchmark portfolio (equities and bonds in three regions) deviates more than 3 percentage points from the strategic weighting.⁴ This capital transfer and rebalancing regime ensures that the regional weightings (and the equity portion) do not deviate too much from the strategic weightings over time.

An important reason for rebalancing the Fund's benchmark portfolio is to prevent a substantial change in the composition of the benchmark portfolio over time. In periods when price movements in the various markets are very different, the weightings of countries with sharp price increases may in fact increase rapidly if the portfolio is not rebalanced. This is illustrated in Chart 5.1, which shows market value weightings for equities and bonds respectively. As the chart indicates, the variations in market value weightings for equities in particular have been considerable over time. For example, the weighting of the Japanese stock market was just below 50 per cent at the end of the 1980s, while it was only 7 per cent at the end of 2001. It is also worth noting that the use of

⁴ The strategic weightings of these six asset classes are: European bonds (33%), US bonds (21%), Asian bonds (6%), European equities (20%), US equities (12%) and Asian equities (8%).

market value weightings means that about 60 per cent of the equity portfolio should have been invested in the US stock market in recent years. With regard to bonds, we see that the large government budget deficits in Japan in recent years have resulted in a rise in the market value weighting of the Japanese government bond market to almost 30 per cent in 2001. This illustrates one of the disadvantages of using such weightings, since it involves an increase in the exposure to bond markets in countries with rising debt.

Chart 5.1 Historical changes in market value weightings for equities and bonds. For equities, the market value weightings are from the FTSE indices, while for bonds the market values are from Schroder Salomon Smith Barney's government bond indices⁵



The large variations in the market value weighting of the Japanese stock market are ascribable to the accumulation of a bubble in this market at the end of the 1980s which was followed by a sharp fall in prices at the beginning of the 1990s. When stock market prices are affected to this extent, calculations show that the return on the portfolio may be higher if it is rebalanced at regular intervals than if the country weightings in the portfolio are allowed to vary with changes in equity prices. At the end of the 1990s, global stock markets were marked by a sharp rise in prices for technology stocks which was followed by a sharp fall in prices. In this situation it would have been profitable to rebalance the sectoral weightings in the equity portfolio. A regime with fixed weightings is therefore more robust to potential bubbles and incorrect pricing in stock markets. Naturally, it is difficult to know whether we will also experience stock market bubbles in the future. Moreover, it is uncertain whether any bubbles will arise in countries or sectors (or both).

Summary

Norges Bank would recommend that mechanisms be established for both the equity and fixed income portfolio which ensure that the weightings of each country's stock and bond markets are not permitted to change to any extent over time. This implies that the main elements of the current regime for capital transfers and rebalancing should be maintained. In addition, regular reviews should be made of the valuation of stock and bond markets with a view to revealing any signs of incorrect pricing in the markets.

⁵ The market value weighting for European bonds increased in October 1992 because Belgium, Italy, Spain and Sweden were included in Schroder Salomon Smith Barney's government bond indices that month.

6. Conclusions

The choice of the regional allocation for the Petroleum Fund must be viewed in the light of the purpose of the Fund. The purpose of the management of the Fund is to invest capital in such a way that the Fund's international purchasing power is as high as possible when the Fund is to be used. Given this purpose, it is important for the Fund to have an exposure to the world's production capacity, since it is this capacity that creates the supply of goods and services on the global market.

The guidelines for the use of petroleum revenues, which imply that only the expected real return on the Petroleum Fund shall be used, means that the Fund has a long investment horizon. The choice of the regional allocation of the Fund should therefore be based on assessments of the Fund's return and risk in the long term.

The current regional distribution was chosen when the greatest emphasis was placed on GDP weightings, but some importance was also attached to Norway's pattern of imports. Norges Bank is of the view that there are two reasons why this revision of regional weightings should place greater emphasis on market value weightings. One is that the sharp growth of the Fund implies that the Fund's investments should be concentrated in large and the most liquid financial markets. The second reason is that as a result of the increased integration of goods and capital markets, country affiliation has become a less important explanatory factor for the equity price performance of the various companies.

The current regional weightings for the Fund deviate somewhat from that implied by market value weightings (see Table 6.1). The greatest difference is that Europe has a higher weighting and the US a lower weighting than market value weightings would have given. Market value weightings for equities have changed somewhat since the Fund's regional distribution was established in autumn 1997. This is because US and European stock markets have recorded stronger price increases than Asian stock markets.

Table 6.1 Alternative regional weightings

	Existing regional distribution EQUITIES	Existing regional distribution BONDS	Market weightings EQUITIES	Market weightings BONDS	GDP weights	Import weights
Americas	30	35	61	50	45	13
Asia	20	10	11	19	24	7
Europe	50	55	28	31	31	80

The market value weightings for equities are based on values from the FTSE index for end-February 2002. The market value weightings for bonds are based on values from Lehman Global

Aggregate (which includes non-government-guaranteed bonds) for end-February 2002. GDP weights are based on figures for 2000 (source: IMF). Import weights are calculated on the basis of the value of merchandise imports in 2001 from Norway's 25 most important trading partners (source: Statistics Norway).

Norges Bank sees no reason to change the regional allocation of the Fund's fixed income portfolio. On the basis of the discussion above, this distribution seems to provide a sound diversification of both market risk and credit risk. In the light of the sharp growth of the Fund, however, guidelines should be established for credit risk which prevent excessive exposure to individual issuers.

When deciding on the regional distribution of the Fund's equity portfolio, it may be natural to use market value weightings as a starting point. However, there are several factors which imply that in the Fund's regional distribution it may be sensible to deviate from this. Consideration for Norway's future pattern of imports and differences in capital market structures across countries may indicate that Europe should have a higher portion in the Fund than the level implied by market value weightings alone. The objective of achieving a sound diversification of market risk and the risk of unique events imply a level spread across regions. In isolation, the objective of diversifying Norway's national wealth is an argument for limiting the Fund's exposure to Europe.

On the basis of an overall assessment, Norges Bank would recommend that the portion for European equities remain at 50 per cent, and that the distribution between the various countries' stock markets in this region be based on market value weightings. Norges Bank is of the view that in the equity portfolio it is no longer appropriate to maintain fixed regional weightings between Asia and the Americas. The current regional weightings mean that the Fund's ownership interests in Japanese companies are about three times as high as in US companies. Norges Bank proposes that the distribution between Asia and the Americas be set in such a way that the Fund on average has the same ownership interests in companies in the two regions. This means that the distribution between the two regions will be adjusted over time in step with relative market developments (market value weightings). Based on current regional weightings, this implies that the weighting for Asia will be reduced by about 12 percentage points and that the US weighting will be increased correspondingly.

Table 6.2 Proposal for new regional weightings for the Petroleum Fund

	Equities	Bonds
The Americas	42*	35
Asia and Oceania	8*	10
Europe	50	55

* Distribution at end-February 2002. The distribution will fluctuate with relative market performance in the Americas and Asia.

Norges Bank's proposal implies that there will only be two regions in the equity portfolio: Europe and other markets. This means that the regulation for the Fund must be changed.

Separate regional distributions for the equity and fixed income portfolio must be introduced in Section 6. This distribution should be:

Bonds		Equities	
Europe:	45-65%	Europe:	40-60%
The Americas:	25-45%	Other markets:	40-60%
Asia and Oceania:	0-20%		

The midpoint of the intervals above should be the starting point for the composition of the Fund's benchmark portfolio (strategic weightings). The new regime for capital transfers and rebalancing that was implemented in January 2002 may be continued with the new regional classification and regional distribution. This means that through the monthly allocations of capital to the Fund an attempt will be made to maintain the strategic weightings for the equity portion and regional distribution. A full rebalancing of the Fund's benchmark portfolio should continue to be carried out if the actual weighting for one of the five asset classes (bonds in three regions and equities in two regions) deviates by more than 3 percentage points from the strategic weighting.

Even though the Petroleum Fund has a long investment horizon, new information may make it desirable to reassess the Fund's regional distribution and other aspects of the investment strategy at regular intervals. This applies to both information concerning investment alternatives in the long term and information about more short-term changes in the return and overall risk.

Annex

An empirical study of the pattern of correlation between the return in the largest markets in the Fund's equity and fixed income portfolio

It is common to classify the investment universe by geographical region. This is based on the assumption that market developments in countries within the same region are closely correlated. This correlation may reflect a high degree of integration in commodity and capital markets of countries in the same region. Table A.1 shows the correlation between market developments in the largest countries in the Fund's equity portfolio.

Table A.1 Correlation coefficients for selected countries in the Fund's equity portfolio (in local currency) in the period 1994-2001. The colour code for the correlation coefficients is: Red: 0.75-1, Pink: 0.50-0.74, Green: 0.25-0.49, Blue: ≤ 0.24 .

US	1	0.77	0.54	0.56	0.49	0.37	0.48	0.62	0.62	0.57	0.57	0.73	0.52	0.71	0.73	0.79
Canada	0.77	1	0.61	0.58	0.40	0.37	0.40	0.62	0.62	0.52	0.55	0.67	0.52	0.71	0.68	0.70
Mexico	0.54	0.61	1	0.57	0.39	0.41	0.36	0.54	0.55	0.51	0.40	0.50	0.34	0.49	0.44	0.56
Brasil	0.56	0.58	0.57	1	0.54	0.32	0.30	0.45	0.51	0.60	0.51	0.55	0.50	0.62	0.60	0.59
Japan	0.49	0.40	0.39	0.54	1	0.32	0.40	0.33	0.38	0.44	0.31	0.50	0.35	0.47	0.48	0.44
Taiwan	0.37	0.37	0.41	0.32	0.32	1	0.46	0.38	0.38	0.31	0.33	0.33	0.32	0.34	0.40	0.34
Korea	0.48	0.40	0.36	0.30	0.40	0.46	1	0.52	0.50	0.41	0.45	0.36	0.29	0.39	0.35	0.56
HongKong	0.62	0.62	0.54	0.45	0.33	0.38	0.52	1	0.81	0.63	0.48	0.50	0.22	0.43	0.49	0.58
Singapore	0.62	0.62	0.55	0.51	0.38	0.38	0.50	0.81	1	0.58	0.55	0.55	0.33	0.51	0.51	0.59
Australia	0.57	0.52	0.51	0.60	0.44	0.31	0.41	0.63	0.58	1	0.57	0.59	0.44	0.48	0.55	0.66
NewZealand	0.57	0.55	0.40	0.51	0.31	0.33	0.45	0.48	0.55	0.57	1	0.55	0.44	0.52	0.53	0.62
Netherlands	0.73	0.67	0.50	0.55	0.50	0.33	0.36	0.50	0.55	0.59	0.55	1	0.68	0.84	0.84	0.80
Italy	0.52	0.52	0.34	0.50	0.35	0.32	0.29	0.22	0.33	0.44	0.44	0.68	1	0.75	0.70	0.59
France	0.71	0.71	0.49	0.62	0.47	0.34	0.39	0.43	0.51	0.48	0.52	0.84	0.75	1	0.84	0.76
Germany	0.73	0.68	0.44	0.60	0.48	0.40	0.35	0.49	0.51	0.55	0.53	0.84	0.70	0.84	1	0.71
UK	0.79	0.70	0.56	0.59	0.44	0.34	0.56	0.58	0.59	0.66	0.62	0.80	0.59	0.76	0.71	1

The table shows that there is a high mutual correlation between countries in Europe where the average correlation coefficient is 0.75. In the Americas, there has also been a reasonably high correlation between the return on equities in the various countries. In Asia, however, the picture is somewhat more mixed where the return on Japanese equities appears to show little correlation with the return in other markets in the same region.

A key question is whether the historical pattern of correlation between countries in the same region will be maintained in the years ahead. EMU in Europe will strengthen the integration of European countries. European companies will to an increasing extent look upon all of Europe as their "domestic market". In the Americas, it is difficult to know whether the emerging stock markets of Brazil and Mexico will continue to shadow developments in the US and Canada. Asia does not initially appear to be a homogenous market. Japan, which is the dominating country in the region, has in the last ten years been influenced by the after-effects of the sharp fall in equity prices at the beginning of the 1990s. The return in the Japanese stock market has therefore shown little correlation with the return in other Asian markets. New Zealand and Australia have substantial trade flows with other Asian countries, but the financial markets seem to shadow developments in US and European markets to a greater extent.

It makes most sense to make separate decisions on allocations to a region if there is a high correlation between the return in stock markets in the region. On the basis of this criterion, it is primarily Europe that stands out as a natural region.

Market distribution for bonds

When choosing the market distribution for bonds, it is appropriate to distinguish between market risk and credit risk. Market risk is ascribable to changes in bond prices (due to changes in yields) and changes in exchange rates. Credit risk is due to the possibility of a change in the credit rating of the bond issuer. For example, deteriorating creditworthiness of a bond issuer may result in a decline in the bond's price. In some cases, the issuer is incapable of servicing the loan and the value of the bond can fall considerably.

For those bonds in which the Fund can invest, market risk will account for most of the overall risk of a bond. When choosing the market distribution for bonds, greatest emphasis should therefore be placed on risk that is due to changes in exchange rates and bond prices. To what extent the choice of market distribution should be made at the regional level or country level depends on whether the return on bond investments in countries in the same region is highly correlated. Table A.2 shows this correlation for selected countries in the Fund's fixed income portfolio.

Table A.2 Correlation coefficients for selected countries in the Fund's fixed-income portfolio (in local currency) in the period 1994-2001. The correlation coefficients between European countries are based on data from 1999 (following the establishment of EMU). The colour code for the correlation coefficients is: Red: 0.75-1, Pink: 0.50-0.74, Green: 0.25-0.49, Blue: ≤ 0.24

US	1	0.77	0.23	0.68	0.65	0.77	0.79	0.77	0.78	0.69
Canada	0.77	1	0.22	0.77	0.65	0.69	0.70	0.69	0.70	0.69
Japan	0.23	0.22	1	0.26	0.31	0.14	0.11	0.14	0.15	-0.13
Australia	0.68	0.77	0.26	1	0.72	0.58	0.57	0.58	0.60	0.54
New Zealand	0.65	0.65	0.31	0.72	1	0.71	0.70	0.71	0.72	0.60
Netherlands	0.77	0.69	0.14	0.58	0.71	1	0.99	1.00	1.00	0.81
Italy	0.79	0.70	0.11	0.57	0.70	0.99	1	0.99	0.99	0.81
France	0.77	0.69	0.14	0.58	0.71	1.00	0.99	1	1.00	0.81
Germany	0.78	0.70	0.15	0.60	0.72	1.00	0.99	1.00	1	0.81
UK	0.69	0.69	-0.13	0.54	0.60	0.81	0.81	0.81	0.81	1
	US	Can	Jap	Aust	NewZ	Neth	Ital	Fran	Germ	UK

We see from the table that there is a high degree of mutual correlation between the return on bond investments in the various countries in North America and Europe. The correlation is particularly high between countries that participate in EMU. This is because it is only credit risk that distinguishes these bonds, and this is very marginal for the countries in question. In Asia, we see that Japan shows little correlation with Australia and New Zealand. Since both Australia and New Zealand are highly correlated with the US and Canada, it may perhaps be natural to treat the four countries as a region. On the other hand, bond investments in Australia and New Zealand combined account for only about 0.5 per cent of the Fund's fixed income portfolio. When, in addition, there are some operational costs associated with shifting these two countries to the Americas region, it may be natural to retain the existing regional distribution in the fixed income portfolio.