The following letter was submitted to the Ministry of Finance on 21 March 2002

Expanding the Petroleum Fund's investment universe

1. Introduction

The Petroleum Fund has gradually broadened its investment universe. When the Fund was established in 1996 investments were confined to cash deposits, Treasury bills and government bonds in developed markets. The revision of the guidelines in 1998 provided for the inclusion of equities in developed markets. From 2001, equities in some emerging markets were included in the Fund. and from 2002, corporate bonds and other nominal bonds with investment grade[1)] are also eligible investments.

The Ministry of Finance indicated in the Revised National Budget for 2001 that there was a need for evaluating a further expansion of the investment universe for the Petroleum Fund:

"In 2002, a new evaluation of the country list for investment of equities in emerging markets will be made, and at the same time it will also natural to evaluate bond investments in emerging markets. Over time there will also be a need to evaluate whether it would be appropriate to expand the Petroleum Fund's investments to include other asset classes, even though the Fund will not necessarily be invested in them. Examples of other asset classes that are common among large, institutional investors are inflation-linked bonds, private equity, hedge funds, commodities and real estate."

When the question of changing the equity portion was discussed in the National Budget for 2002, the Ministry of Finance concluded that this should be considered in connection with other investment possibilities.

The choice of assets classes in the portfolio is a fundamental investment strategy issue. In this letter Norges Bank will discuss the constraints imposed by the purpose of the Petroleum Fund with respect to the choice of asset classes and the criteria that should apply to instrument categories that are incorporated into the investment universe or benchmark.

In the annex to the letter, some of the investment alternatives referred to by the Ministry of Finance in the Revised National Budget (RNB) for 2001 are explored in greater detail. The alternatives that are discussed in the annex are inflation-linked bonds, private equity and real estate. These three alternatives are selected primarily because they have become increasingly common among large institutional investment managers. We focus in particular on available instruments, market size, expected return and risk.

In 2002, Norges Bank will undertake a new evaluation of the country list for emerging equity markets, c.f. RNB 2001. The analyses that were made by Norges Bank and presented in a letter to the Ministry of Finance on 30 August 2000 will be updated, with an evaluation of emerging bond markets.

The benchmark and/or the investment universe could be expanded at a later stage to include other instruments than those mentioned by the Ministry of Finance. The external equity indices that are the basis for the Petroleum Fund's benchmark portfolio have a clear target as to coverage in relation to the total stock market in each country. Over time, the target figure might increase, in which case more small and medium-sized enterprises will be included in the stock indexes. If so desired, this could also be applied to the Petroleum Fund's benchmark.

Norges Bank has not given priority to examining investment in commodity markets. As a nation, Norway is heavily exposed to the global commodity market due to its oil and gas resources on the continental shelf.

Hedge funds operate to a large extent in markets that are already included in the Fund's investment universe. As a result, it is not the investment universe but the limitations on private instruments that limit the use of such external managers.

Existing management structures in the Petroleum Fund are adapted to investments in financial instruments with frequently published market prices, which is a necessary precondition for short-term return measurement and risk management using a benchmark. Several of the markets referred to by the Ministry of Finance are private markets where updated market prices are not normally provided. An alternative management structure must be established for such markets. Norges Bank will provide an outline of how return requirements, return measurement and risk management can be adapted to such investments. Investments in inflation-linked bonds can be implemented within existing management structures.

In the National Budget for 2002, the Ministry of Finance indicted that the question of whether the equity portion should be increased should be considered in connection with a possible future expansion of the investment universe. It is reasonable to assume that investment alternatives will be limited in size, or illiquid to the extent that the Petroleum Fund cannot invest in a large portion of these asset classes in the years ahead. If the Ministry of Finance wants to increase risk in order to achieve higher expected long-term return, an increase in the portion of listed equities in the portfolio will have the largest impact, and would be the easiest to implement from an operational perspective. The size of the equity portion is therefore primarily a question of assessing the probability of a positive equity premium ahead in relation to an increased variance in return (absolute volatility) in the short and medium term.

2. Choosing an investment strategy

According to classic financial theory[2)] an optimal investment portfolio includes a risk-minimizing investment and the market portfolio. The market portfolio includes all instruments available in the market. The investor's risk aversion determines the distribution between the risk-minimizing alternative and the market portfolio. As long as the current return on a new financial investment alternative does not move in parallel with an instrument that is already represented in the portfolio it will always be possible to increase returns or reduce the risk on the overall portfolio by including the instrument in the portfolio.

The concept "risk-minimizing instrument" can mean different investments for various managers. What constitutes a risk-minimizing investment depends both on when the manager's obligations arise in the future and the denomination of the obligations. For a manager with a very short horizon, an investment in short Treasury bills can be an investment with little or no risk. For a manager with a long horizon an inflation-linked government bond with a long maturity will be the closest one comes to a risk-free investment. In both cases, it is assumed that the instrument is denominated in the currency or a basket of currencies that corresponds to the manager's obligations. For the Petroleum Fund, a broad currency basket is relevant for measuring return and risk because such a currency basket will minimize the currency risk for the Fund's future international purchasing power.

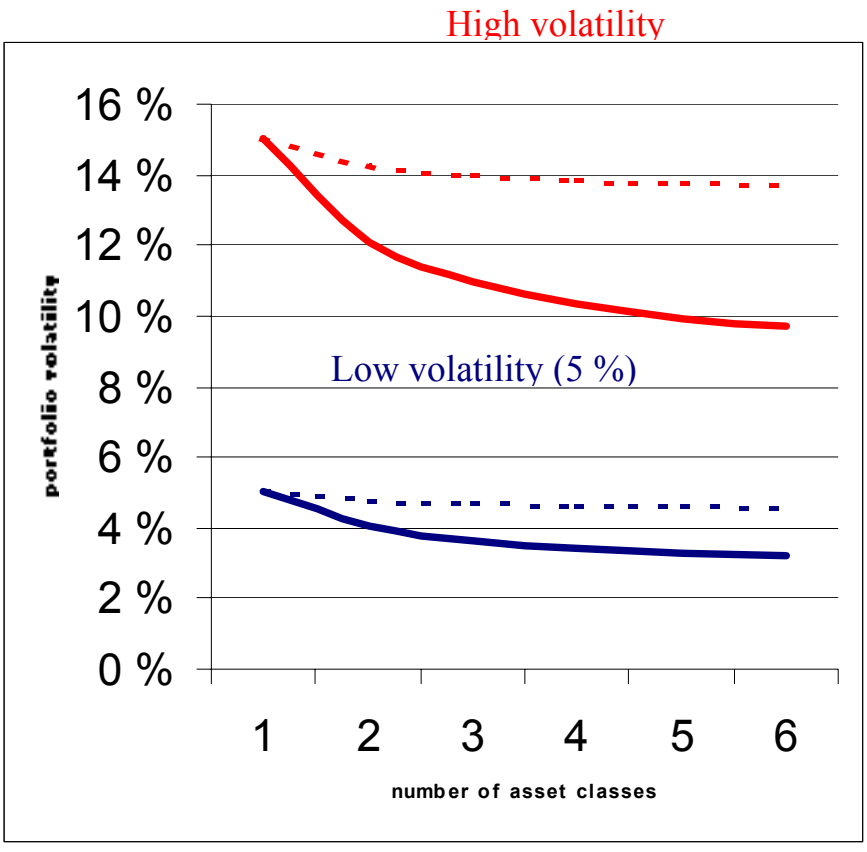
In practice, there are few, if any, investors that have included all available investment alternatives in their portfolios. As a rule, the portfolio will be considerably different from the

constructed market portfolio. There will be fewer asset classes and markets, and normally a smaller selection of investment options for each asset class and market. Both theoretical and practical arguments support the assertion that the market portfolio can hardly be observed by any individual investor:

- The capital market theory is based on the assumption of perfect capital mobility, and rational, utility-maximizing investors, where utility depends on return and risk. If one or several of these assumptions are weakened, the efficient portfolio will not be the same for all investors.
- The portfolio that is managed is not sufficiently large for all available alternatives to be represented in a meaningful way.
- The marginal diversification gains decline, as more asset classes are included in the portfolio, c.f. Chart 1 below.
- A number of instruments are so highly correlated that the gains that can be achieved from including all the instruments are marginal compared with investing in a smaller selection.
- Investors will also be concerned with other risks than return volatility only. An investor will also be concerned with controlling risks such as counterparty risk, liquidity risk, legal risk and political risk.
- Transaction costs are obviously different from one instrument to the next. This should in principle be taken in to account in the market pricing of the instruments, but different investors have different liquidity requirements, and thereby different assessments of transaction costs.

Chart 1 shows that diversification gains are positive but declining as more asset classes are included in the portfolio. The lines in the chart illustrate to what extent the portfolio's total risk decreases when several equally large assets classes with the same correlation and same volatility are included in the portfolio. The solid lines show the result of including asset classes with a low correlation, while the broken lines show the same for asset classes with a high correlation[3)].

Chart 1: Diversification gains achieved by including several asset classes in the portfolio



The Petroleum Fund clearly has a narrower investment universe than what is normal among other large institutional managers. Table 1 shows a comparison of the Petroleum Fund's benchmark and recently published figures for the asset allocation in the benchmark of the largest pension fund in the US (CalPERS), Canada (Ontario Teachers), the Netherlands (ABP), the UK (BT Pension, Denmark (ATP) and an average for the four AP funds in Sweden. Total capital under management at the institutions (in billions of USD) is also shown[4)].

Table 1: Asset allocation in benchmarks[5)]

	Petroleum Fund	CalPERS	OTPP	ABP	BTP	ATP	AP1-4
Country of domicile	Norway	US	Canada	The Nether-lands	UK	Denmark	Sweden
Listed equity	40%	58%	56%	40%	78%	45%	59%
Nominal fixed income	60%	28%	17%	40%	3%	43.5%	33%
Private equity		6%	4%	6%	1%	1.5%	
Real estate		8%	8%	9%	10%	4%	3%
Inflation-linked bonds			13%	1%	8%	6%	5%
Commodities			2%	2%			
Other assets				3%			
Net investments (USD bn)	69.1	151.8	43.6	133.6	41.7	29.4	51.0

It is not a foregone conclusion that the Petroleum Fund should be invested in the same asset classes as the large pension funds in Table 1. In addition to different histories and growth, the Petroleum Fund can be distinguished from other pension funds in terms of the definition of the Fund's obligations. Pension funds have clearly defined obligations, denominated in the home country's currency, and must honour pension obligations every year. The time horizon and the currency basket that should be used to find the appropriate balance between return and risk is less clear in the case of the Petroleum Fund.

The balance between expected long-term return and the portfolio's risk in the somewhat shorter term determines the distribution between bonds and equities in the Petroleum Fund. This has resulted in a portfolio composition that deviates from global market weights for equities and bonds. Regional GDP weights and to some extent Norway's import pattern have been considered to be a more relevant reference with respect to the Fund's long-term purpose. Some country weights and sector weights also deviate from market weights because of specific risk assessments. Reference is made to a separate letter to the Ministry of Finance on regional weights in the Fund's equity and fixed-income portfolio.

The Petroleum Fund is an instrument for long-term international financial saving on behalf of the nation. According to the existing guidelines, the Fund's real value (measured in terms of international purchasing power) shall be protected. Each year, an amount equivalent to the Fund's expected real return will be withdrawn from the Fund. In the coming years, net transfers of capital to the Fund are expected. In the longer run, the Fund's international real value will level off when this fiscal rule is applied. Taking into account the long-term use of the Fund, an ideal investment strategy would be to own a portion of the instruments where the

return directly or indirectly comes from future total international production of goods and services. The Petroleum Fund would then feature a broad exposure to these instruments through investments in equity markets and the ongoing phasing in of corporate bonds. However, over time it may be more appropriate to shift to an even better representation of the world market portfolio of instruments that finance international goods and services production.

Given the Petroleum Fund's purpose, it is the volatility of international real return that is the relevant measure of financial risk. It has been repeatedly underlined that the Petroleum Fund has a long-term objective, and that it has to be in a position to accept wide fluctuations in return from one year to the next if this is countered by higher expected returns in the long term. When the question of including equities in the Petroleum Fund was discussed in the Revised National Budget for 1997, the Ministry of Finance stated:

*In principle, the **objective** of the management of the Fund should be to invest the capital so that the Fund's international purchasing power is as high as possible at the time when it is likely that we will have to draw on the Fund, taking due account of an acceptable risk exposure. Overriding emphasis should be placed on the risk linked to the value of the Fund at the time that the capital is to be drawn from the Fund. The risk that the Fund's returns will vary from one year to the next is of less importance in this connection.*

On the basis of this principle, the risk of variations in the Fund's international real return over periods of a year or less should not be an important consideration when deciding the Fund's investment strategy.

In order to avoid substantial negative real returns over periods that are somewhat longer than this (in this context 3-5 years), one should in principle define explicit portions of instrument categories that are expected to have prominent hedging features in relation to the rest of the portfolio over the time horizon concerned.

If variations in real returns over a few years are considered to be of importance, it is in a situation with marked, unexpected changes in global inflation that the value of holding instruments that hedge the real return is highest. Both hedging against unexpected increases in inflation, and an unexpected fall in inflation or deflation, are relevant in this context. Furthermore, it should be assumed that it is the changes in inflation over a period of several years that should be hedged. Changes that are temporary do not normally lead to long-term effects on financial markets.

In a situation with an unexpected sharp fall in global inflation, or deflation, equity returns may drop as a result of falling corporate earnings. The best hedging instrument in this context is nominal bonds without credit risk. Since the lower inflation rate is not factored into the yield on these bonds, this scenario will lead to a fall in yields and thereby a positive (high) real return. With its exposure to nominal government bonds, the Petroleum Fund already has a substantial portion of such hedging instruments in its portfolio.

In the opposite case – an unexpected rise in inflation - longer nominal bonds will have a weak or negative real return. Hedging of real returns via equities is effective only over a long time horizon, because expectations concerning nominal corporate earnings are not necessarily adjusted as fast as inflation developments[6)]. In this case, the best hedging instrument is inflation-linked bonds in the currencies where such instruments are found. Investment in real estate with a high rental ratio and long-term, inflation-linked rental contracts may also be an

appropriate means of hedging real returns. Neither inflation-linked bonds nor real estate can hedge real returns over shorter periods (see description in Annex). For the time being, instruments with these hedging properties are not included in the Petroleum Fund's benchmark.

3. Criteria for defining asset classes and instrument categories in the investment universe and the benchmark index

Most of the possible new investment alternatives referred to by the Ministry of Finance in RNB 2001 have a common feature, which is that separately they are small markets. Because of the Petroleum Fund's size, the portion of these alternatives in the portfolio must be limited irrespectively. If a possible broadening means that they are defined at fixed portions in the benchmark, the transaction costs in the actual portfolio will rise[7)] – and the risk difference in relation to a more simple composition will be limited.

In principle, the universe for permitted investments and for the benchmark is determined at two levels: At the highest level – asset classes – the weights of equities and bonds are determined. At the next level regional weights, country distribution and type of instrument within in each asset class are determined.

When new investment alternatives are to be assessed, the following requirements must be satisfied for the alternative to justify a separate weight and limits as a separate asset class on a par with equities and nominal bonds:

1. The distribution between asset classes shall primarily reflect the owner's desired balance between expected return and risk. For the Petroleum Fund, the risk of a loss in international purchasing power is the most relevant risk measure. New separate asset classes can primarily be justified to the extent that they contribute to risk diversification. This is only achieved if a new asset class has a low expected correlation with the other asset classes in the portfolio. If new asset classes with appurtenant limits are to be defined in the portfolio, a criterion should be that it has a low correlation with equities and nominal bonds over the same time horizon that is applied to the selection of the equity portion. This weakens the argument for defining private equity as a separate asset class since the underlying conditions that influence listed equities will also affect unlisted companies/private equity.
2. The asset class has to be expected to offer a meaningful allocation for the Petroleum Fund in the medium term. If the allocation is smaller than a few percentage points of the total portfolio in the longer term, the effect on the portfolio's overall return and risk will not be sufficiently great to justify defining the investment alternative as a separate asset class. The costs of including the asset class must be taken in to account.

Among the investment alternatives mentioned, the real estate market is probably the only market that satisfies both the criterion as to low expected correlation with nominal bonds and equities, and the criterion that it should be sufficiently large for the Petroleum Fund to achieve a higher allocation in the longer term, if so desired. As mentioned in Chapter 2, both real estate and inflation-linked bond instruments are expected to contribute to hedging the portfolio's real return in the medium term. Even if real estate and inflation-linked bonds are very different investment alternatives, their cash flow profile can have common features. One possibility is therefore to combine these two instruments into one common asset class for long-term inflation hedging.[8)]

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. This will have consequences for assessments of new emerging equity and bond markets in the benchmark . If the market is so small that the cost of a broad exposure to the market could exceed the gains, the alternative will be to include the market in the investment universe, but not in the benchmark.[9)] General requirements as to capital mobility, legislation and stability must be satisfied before a market can be included in the investment universe.

Objectives and limits for the asset classes' portions in the benchmark index and the portfolio are determined by the owner's desired balance between return and risk and the relevant time horizon. This balance may imply significant differences between the weights of the asset classes in the portfolio and the weights in the "world market portfolio". Differences between the weights of the instruments within each assets class and market weights should not occur to the same extent since the weights of the individual asset classes should in principle secure the risk profile of the portfolio. It is Norges Bank view that any deviations from market weight within the different asset classes should only be permitted after a separate assessment, and when the deviations are justified on the basis of factors that could have a significant impact on the portfolio's expected return and risk. Particular regional weights in the asset classes, and a down-weighting of US mortgage-backed bonds in the benchmark are examples of the result of such evaluations.

4. Private instruments and the Petroleum Fund's management model

Investments in private markets such as private equity instruments or real estate[10)] are substantially different from the Petroleum Fund's existing investment in listed equity and bond markets. The main differences are:

- Norges Bank is owner of the instruments in today's portfolio, whether the Fund is managed by internal managers or external managers. This means that Norges Bank can define separate guidelines for management of the individual instruments or portions of the portfolios, as stipulated in the general guidelines. In private markets indirect investments in mutual funds, organised as partnerships, would be the most relevant alternative. In this case, the guidelines would be the same for all participants. Participants in the fund can control how much capital is committed to the fund, but it is the fund's general partner that decides when the capital is to be invested and which investments are to be made.
- When an external manager in a listed market is used, the management agreement can in principle be terminated at one day's notice. In private markets, however, it is not unusual that participation in closed-end funds (which are the most relevant for institutional investors) have a horizon of over 10 years. Units in the fund can be sold in the secondary market, but normally at a substantial discount in relation to actual value.
- Private markets are illiquid. The estimates of market values that are made by fund managers for their investments are highly uncertain. The estimates are also difficult to verify in the markets. Transactions occur much less frequently than in listed markets. Investments in private markets are therefore most suitable for managers of portfolios with a long-term horizon, with a minimal probability of having to liquidate holdings at short notice.
- Prices for the present benchmark for the Petroleum Fund are updated on a daily basis. The indexes available in private markets are updated on a monthly, quarterly or annual basis. As mentioned, market values that are not based on actual transactions are highly

uncertain, and inappropriate for controlling actual investment performance over shorter periods.
- In contrast to listed markets, it will not be possible or desirable to use indexing strategies in private markets.

These differences pose challenges to the Petroleum Fund's management model. A management model for investing in private markets must satisfy strict requirements as to risk control and accountability of managers, while taking into account that investments in listed and private markets are structurally different.

It is possible to establish a management model for investments in private markets that safeguards considerations concerning risk control, measurement of long-term returns and management transparency. In this chapter, the main elements of such a model are presented. Other investments in private markets can also be adapted to such a model, and may include direct debt investments or investments via mutual funds that invest in listed markets (for example hedge funds).

Measuring return

The return requirement for each market must be specified. For example, the return on an alternative investment in a listed market, in addition to a risk premium for differences between the debt portion in the companies in the private portfolio and in the equity market in general, could be a reasonable return requirement for investments in private equity instruments. For indirect investments in the real estate market, the real interest rate on long inflation-linked bonds, in addition to a risk premium, is a possible long-term real required rate of return.

It should be stipulated that it is the net return on the Petroleum Fund's investments in private markets, adjusted for fees to external consultants and managers, that is the relevant basis of comparison for long-term returns. In private markets, this cost will be substantially higher than in listed markets. Excess return requirements must take account of this additional cost.

A comparison of actual returns and the required rate of return is meaningful primarily in the long term. In the shorter term, comparisons against published market figures (such as Venture Economics for private equity or IPD[11)] in private real estate investments) can provide some information about returns relative to the market in general. The limitations inherent in short-term performance analyses in private markets will require supplementary information using qualitative analysis of the portfolio.

Risk management

The updating frequency of indexes or date bases for market returns in private markets varies from each quarter to each year. The return series will be available a few months after the time of the update. Consequently, these indexes cannot be used as a basis for measuring absolute or relative volatility.

The principle of managing the portfolio against a benchmark also presupposes that the management institution can actually control the portion that is invested in each asset class or instrument at any given time. With the existing investment universe, Norges Bank can at any time change the asset mix through transactions in the market. As mentioned, this is not the

case in private markets. If the intention is to invest certain portions of the Fund in such asset classes, several imponderables must be taken into account when the capital is committed:

- the Fund's annual growth
- expected return on other asset classes included in the Fund
- how fast the general partners with whom agreements are concluded will draw on the committed capital
- cash distributions from established funds in which the Petroleum Fund participates

It will not be possible for Norges Bank as manager to control strictly the size of the amount invested. Allocating assets to such markets must therefore be subject to an objective for invested capital and/or an annual upper limit on the capital that can be committed. The short-term measurement of return and risk against a defined benchmark will have to be confined to the dominant portion of the portfolio that is invested in listed markets.

As both absolute and relative volatility are difficult to measure in private markets, it is above all the risk linked to achieving an unacceptable low return in the long term that the regulations must limit. Besides an objective for invested capital and an upper limit for committed capital, risk can be limited by applying broad diversification requirements for the portfolio. Without defining a concrete diversification objective, the regulations should stipulate that the portfolio of private instruments be diversified over geographically segmented markets and different sectors in each regional market. (For example venture/buy out in the market for private equity, and office/retail in the real estate market.

Under the existing guidelines, the guidelines for relative volatility are supplemented with other limits for risk, for example absolute limits for geographical distribution. It is possible to specify a broad guideline for regional distribution, but in principle specific limits should not be stipulated in addition to a general requirement as to a broad diversification. A concrete country list will be very difficult to apply in full, see the presentation of the market for private equity instruments in the annex.

Ownership limitations

As a limited partner in a private equity fund or fund-of funds, Norges Bank will not be a direct owner of shares. However, the Petroleum Fund's committed capital in a private equity fund could account for more than 3% of this fund's total committed capital. The general partner will tend to set a minimum limit for each participant's committed capital, which prevents the private equity fund from having a large number of participants with marginal ownership interests. The private equity fund can be the only shareholder in several companies in the portfolio. As a result, the Petroleum Fund's ownership portion will most likely exceed 3%. Active ownership will not be executed by Norges Bank, but by the general partner in the private equity fund from which it has bought the unit.

Indirect investments in real estate can be made via minority or majority owners of listed or private real estate companies, as a participant in a private equity fund or as an owner of units in an investment trust. In all these cases, a 3% limit will severely restrict investment opportunities.

Reporting

Under the current reporting system, the Petroleum Fund publishes its management results on a quarterly basis. The same could apply to investments in private instruments. Because of the

reliance on reporting by a private equity fund in which the Fund may participate, such reports would, however, be available at a later stage than at present. It should be considered whether annual reporting on activity in private markets is acceptable. The reporting will include:

- Committed and invested capital per private equity fund
- any direct ownership interest in private companies (most relevant for exposure to real estate companies and any co-investments in private equity markets together with a private equity fund in which the Fund participates)
- the concrete portfolio investments that are made (which companies and reported value per investment by private equity fund)
- sector distribution of investments
- internal rate of return - both per market and per vintage year.

In the longer term, reporting can also include realised return compared with the return requirements set for the programmes, both aggregated and per vintage year. Before considering the actual allocation of assets to private markets, it must be clarified whether the necessary changes to the management model are acceptable.

5. Conclusions and recommendations

An expansion of the Petroleum Fund's investment universe to include inflation-linked bonds and real estate will probably improve the return on the Fund and its risk profile as a result of diversification benefits. Private equity instruments can increase the potential for higher returns through a successful active management strategy.

In principle, an overall assessment of all possible changes in the Fund's investment strategy should be undertaken. It would therefore be appropriate to consider the question of the Fund's equity portion in connection with any new asset classes and new emerging markets. However, it will probably take a long time before the Fund can achieve a meaningful allocation to new asset classes and new emerging markets, primarily because these markets are relatively small and illiquid. Operational preparations must also be made before investing in private markets. This is an argument in favour of considering the question of the equity portion independently of other possible changes in the Fund's strategy.

Investments in private equity and real estate presuppose that investments in private markets are permitted, and that the management structure for this portion of the portfolio is adapted to the functioning of these markets. A management model for investing in private markets will have to be subject to certain return requirements, greater emphasis on long-term return figures than on short-term figures, and qualitative risk analyses that ensure sound risk management and management transparency. The Bank will subsequently elaborate proposals as to how such a management model can be structured.

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ANNEX:

Presentation of the markets for inflation-linked bonds, private equity and real estate

1. Inflation-linked bonds

1.1 Definition and available instruments

In markets where inflation-linked bonds exist, the bond price is either quoted as a real price or a real yield. The bond issuer pays the investors a fixed, real coupon rate at regular intervals, and a real redemption amount at maturity. In addition the issuer pays the investor compensation for the current developments in a defined inflation index. As the real yield in the market changes, the real price of the bond changes. The nominal bond price (including accrued interest) depends on the marked-determined real price, and the pre-defined compensation for inflation. The method for calculating the inflation compensation varies from one market to another.

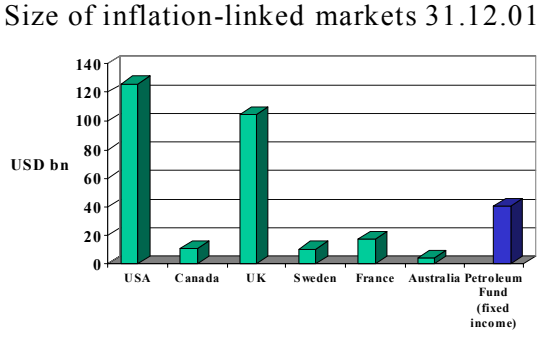
In some markets, the bonds have deflation protection. Investors in these markets are guaranteed that the principal's nominal value at maturity is at least at the level prevailing at issuance.

Sovereigns are the predominant issuers of inflation-linked bonds. The first bonds of this type were issued by the UK in the early 1980s. At that time, the UK's inflation record prompted investors to price in a high risk premium on nominal bonds. Inflation-linked bonds provided investors who were concerned about future inflation with a low-risk instrument, while the authorities wanted to earn money should inflation developments prove to be more favourable than the market assumed. A few years later, Australia, Canada and Sweden followed suit. These countries had a similar inflation history, with high risk premia on nominal bonds like the UK. In the latter half of the 1990s, the US and France also started issuing inflation-linked bonds, with overriding emphasis on diversifying the supply of securities rather than their inflation history.

1.2 Market size

Chart 1 shows the size of the markets for inflation-linked bonds by issuer country at end-2001, compared with the size of the Petroleum Fund's fixed-income portfolio at the same time. The chart illustrates that given the current size of the markets it is only possible to invest a limited portion of the Petroleum Fund's fixed-income portfolio in inflation-linked government bonds, because the Fund can only hold a smaller portion of each market in order to avoid a dominant position in the individual market.

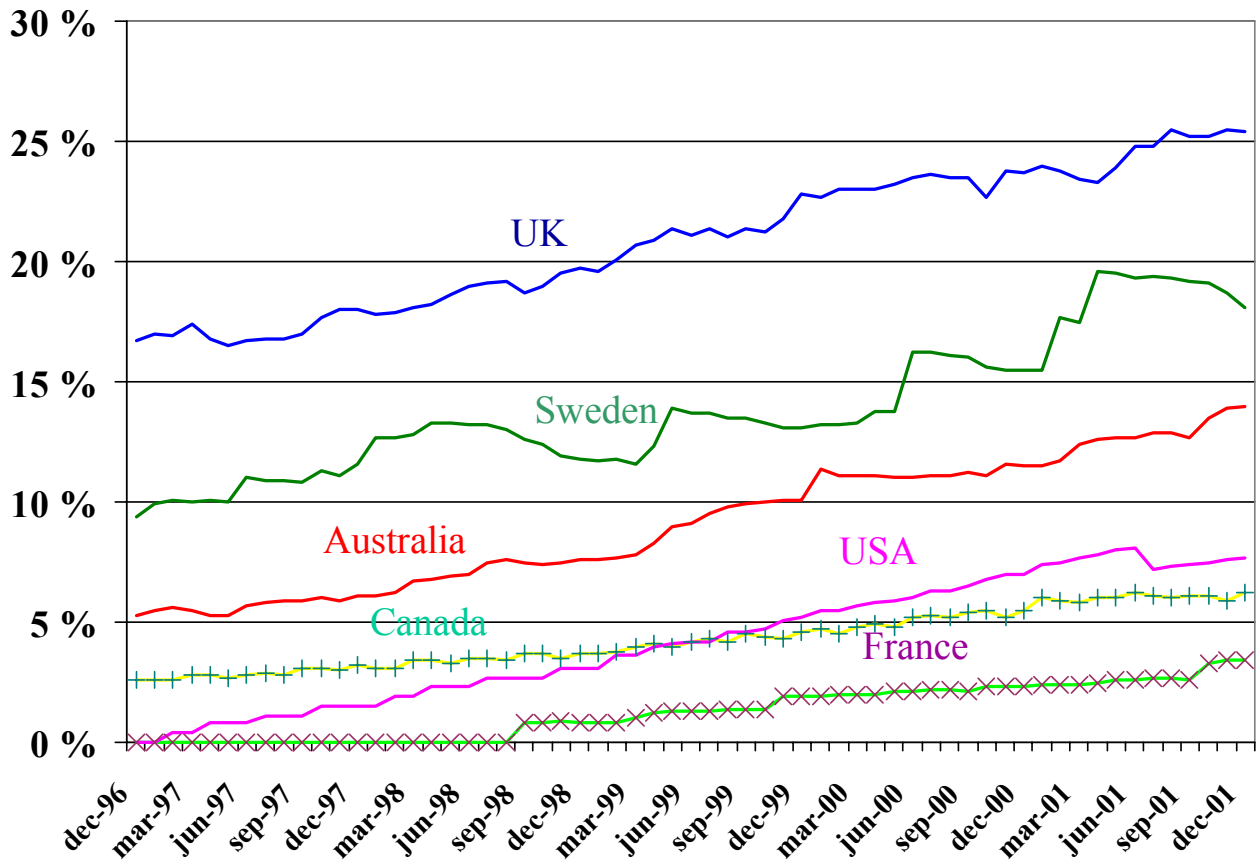
Chart 1: Size of the market for inflation-linked government bonds (in billions of USD), December 2001



Sources: Lehman Brothers, Barclays Capital

Chart 2 shows developments in the portion of inflation-linked government bonds in relation to the overall government bond market (both nominal and inflation-linked government bonds). The trend increase in the portion of inflation-linked bonds is expected to continue. For example, inflation-linked bond debt accounts for about 10% of total bonds that France is planning to issue in 2002.

Chart 2: Inflation-linked bonds as a percentage of the government bond market, 1997-2001



Source: Barclays Capital, Salomon Smith Barney

1.3 Return and risk

There is no basis for expecting that inflation-linked government bonds will generate higher returns than nominal government bonds in the longer term. The reason for considering the inclusion of inflation-linked bonds must therefore be that the portfolio's expected risk will decline. This can occur if the volatility of inflation-linked bonds is lower than for nominal bonds, or if diversification features lead to a decrease in the portfolio's overall volatility.

It reasonable to assume that a financial investors' objective is to achieve a certain rate of return on the portfolio over time. An investment in an inflation-linked government bond features a guaranteed real rate of return over the bond's residual maturity equal to the quoted real yield. The investor cannot be expected to buy a nominal government bond with the same maturity, unless the expected real return is at least similar to what an inflation-linked bond yields. The difference between the nominal interest rate and the market-quoted real interest

rate must therefore be at least the same as expected inflation in the period to the maturity of the bonds. If the investor is averse to risk, i.e. that she prefers a safe return rather than an uncertain return with the same expected value, she must be compensated for the inflation uncertainty in excess of expected inflation. If such an inflation premium exists, higher returns can be expected in the longer term by investing in nominal bonds rather than inflation-linked bonds.

Historical time series for returns on nominal government bonds and inflation-linked bonds are not suitable for determining the existence of such an inflation premium. When inflation falls more than expected in the market, nominal bonds have a higher return than inflation-linked bonds. This has been the case in the 1980s and the 1990s, which is the period during which these bonds have existed. Excess returns cannot then be explained by an inflation premium. An inflation premium can instead be estimated by analysing to what extent the yield differential between government bonds and inflation-linked bonds approaches the market's actual inflation expectations. While the yield differential can be observed in the market, the market's actual inflation expectations cannot be derived directly from any instruments in the capital market.

Table 1 shows the interest rate differential between nominal government bonds and inflation-linked bonds as of 31 December 2001 in the US, the UK and France and the most recently published annual inflation figures at that time. The implied inflation premium is estimated applying the simple assumption that the market expects that the more recently published inflation figures will also be the inflation rate in the long term.

Table 1: Interest rate differential, inflation and implied inflation premium, US, UK and France, 31 December 2001[12)] **.**

Country	*Maturity*	*Yield differential (nominal yield – real yield)*	*Annual inflation*	*Implied inflation premium*
US	9 year	1.46%	1.90%	- 0.43%
UK	10 year	2.40%	1.80%[13)]	0.59%
France	8 year	1.48%	1.40%	0.08%

There may be several reasons why the inflation premium varies among markets, and why it is completely non-existent in some markets:

- the issuer may be willing to accept a somewhat higher expected real interest cost on inflation-linked bonds. These bonds have a cash flow profile that is better adapted to government revenues. The nominal level of direct and indirect tax revenues depends on real growth in the economy, and on wage and price inflation. Inflation-linked bonds reduce the uncertainty associated with real government interest expenditure.
- there may be liquidity differences between nominal bonds and inflation-linked bonds that entail an extra liquidity premium.
- there may be differences between how the inflation indexes are defined in different markets, which leads to different pricing in the markets.

The implied inflation premium in each market will also vary over time.

Since changes in the real interest rate have the same influence on a nominal government bond and an inflation-linked bond with the same maturity, it is the changes in inflation relative to market expectations that are the source of both volatility differences and diversification benefits among instruments.

Because of the real yield volatility, inflation-linked bonds are not a suitable instrument for hedging the real return on a portfolio with a horizon that is considerably shorter than the average period to maturity of the bonds. Over a shorter horizon, the correlation between nominal bonds and inflation-linked bonds should be expected to be high, as the total return will be dominated by real yield changes. When the time horizon increases, the probability of a negative real return on investments in inflation-linked bonds declines. At the same time, the correlation with nominal bonds decreases because the changes in inflation relative to market expectations have a greater impact on the return on nominal bonds.

Table 2 shows the annualised volatility of US inflation-protected securities (monthly real return figures) and a curve of US nominal government bonds with a comparable average maturity for the period April 1998-December 2001[14)].

Table 2: Volatility and correlation, inflation-linked bonds and nominal bonds with comparable maturities, US 1998-2001

US	*Volatility*	*Correlation*
Inflation-linked bonds	*3.2%*	
Nominal bonds	*5.9%*	*0.69*

For the short time horizons that apply in Table 2 (one month), it is not surprising that the correlation between nominal bonds and inflation-linked bonds is as high as it is in this set of data.

2. Private equity instruments

2.1 Definition and available instruments

Investments in private equity instruments are equity investments either through funds or directly in companies that are not listed on an exchange. There are two main segments, with venture products on the one hand and leveraged buy-outs (LBOs) on the other. In the venture segment, there is a high risk linked to each investment. Several investments will probably fail, but there is potential for a very high return on investments in commercially successful companies. In the LBO segment, a dominant portion of the ownership in an unlisted or listed company is acquired, with the aim of increasing the market value of the company through strategic and active management. A common feature of these segments is that the investments have a finite time horizon. The objective is to realise a generated value added by disposing of ownership interests at some point in the future.

Mezzanine financing is often part of the investment universe of managers that are active in the private market. This is still a limited universe compared with venture capital and LBO investments.

The objective of investing in private equity instruments is to achieve a long-term return that is higher than the return on investments in the ordinary equity market. The most important factor behind securing a higher return is the generation of long-term value added through active ownership management. Active ownership may entail a change of management in the

company, a change in the company's financial structure, network-building, and strategic advice in areas where the general partner has particular expertise. Institutional investors seldom have such expertise. For institutional investors, the most common channel for investing in private equity is to commit capital over a longer period to asset management companies with documented expertise in the area of strategic, active ownership in their field. These companies will collect capital from other investors in a fund, and they then inject fund capital in a private equity fund that is established for this purpose. Each private equity fund comprises a general partner and a number of investors (limited partners). The capital is invested by the general partner over time in a limited number of companies. While the end-investor controls the amount of capital that is committed, it is the general partner that controls when the capital is actually invested in the market.

As in the case of external management in the ordinary market, the manager selected is fully authorised to make investment decisions, subject to pre-defined risk limits. Since the investor injects capital together with others, the limits must be the same for all investors. The relationship between the investors and the management company is governed by a private equity fund agreement. Since the other investors transfer irrevocably all rights to the asset managers, the private equity fund agreement is the most important means of ensuring that the fund manager and other investors in the private equity fund have common interests. Some of the key provisions of a private equity fund agreement are:
- What is to be the focus of the private equity fund's investments (geographical area, particularly industry sectors, venture or buy-out, other limitations on the manager's discretion for choosing investment alternatives)
- How much capital the management company shall raise in the relevant fund.
- Key personnel provisions: if named persons employed by the general partner resign, the investment mandate is revoked.
- Fee structure: Normally the management company will demand a fixed share of committed capital as a management fee each year (1½ - 2½%) plus a performance-based fee (carried interest) (as a rule 20% of net earnings of the private equity fund), estimated on portfolio basis.
- Possible hurdle rate for net earnings before the performance-based fee (carried interest) kicks in.
- Limitations on the management company's rights to raise new funds for investments in private equity. The investors in a fund tend to demand that a certain portion of committed capital in a fund be invested before the management company can raise capital for a new fund.
- The term of the private equity fund: How many years the general partner has to realise and return the investments to the other participants in the private equity fund.

There is a market for trading units in a private equity fund that has already invested (portions of) committed capital in companies. The secondary market is small, but expanding. If one wishes to sell one's units in a private equity fund in the secondary market before the private equity fund is dissolved pursuant to the private equity fund agreement, the price will be at a not insignificant discount in relation to the most objective value possible.

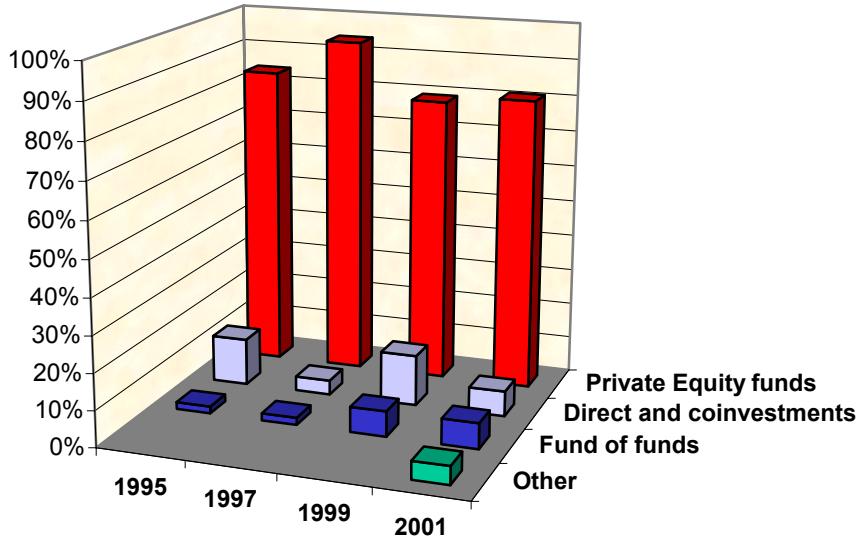
In order to avoid excessive exposure to investments in a single private equity fund, a portfolio of private equity should be invested via participation in several private equity funds with varying focus and different time intervals for their investments. This also implies a certain requirement as to the size of the investor. The institutions that are too small to build a diversified portfolio of private equity funds, or that do not find that it is of interest to have the required internal expertise for selecting private equity funds, can still take positions in private

equity instruments. These institutions will then have committed capital to fund of funds. These are private equity funds where the general partner invests the capital raised in a diversified portfolio of other private equity funds.

Several general partners will offer participants in the private equity fund the option of co-investing with the private equity fund in individual companies. Such co-investments are regarded as direct investments.

Chart 3 shows actual investor preferences for the various channels to exposures to private equity. The chart shows that exposures via committed capital to private equity funds are the dominant investment form among institutional investors.

Chart 3: Investor preference of channels to exposures to private equity[15)]

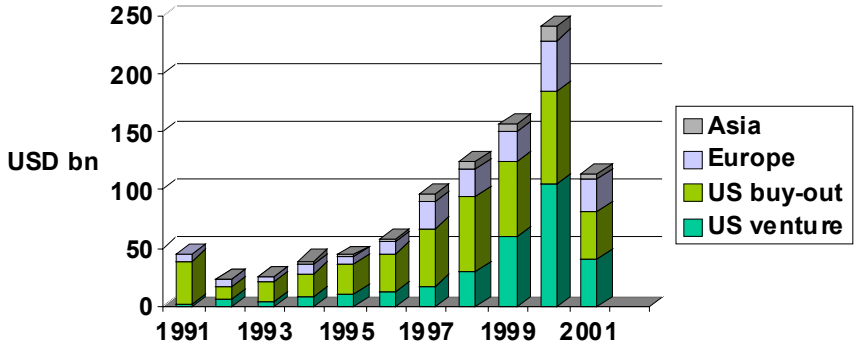


2.2 Market size

For listed companies, the total market value of all listed companies can be estimated by aggregating the market values of the companies that are listed on the exchanges in the countries concerned. A comparable index does not per definition exist for unlisted companies. Since investments in unlisted companies are totally illiquid, such an estimate is of limited interest, regardless. It would not be possible (or sensible to try) to invest in a broad market index. Various consultancies publish return data for investments in private equity, both on an aggregate and detailed level. Over a longer period, a comparison of actual return figures and these indexes can be made.

Figures for capital flows into unlisted markets via private equity fund investing are more relevant as an estimate of market size. Chart 4 shows figures for gross capital flows into private equity (private equity fund investing) in North America, Europe and Asia/Oceania in 1990-2001[16)], defined as committed capital. The chart illustrates the sharp growth in the market in the latter half of the 1990s. The decline in equity markets from March 2000 to end-2001 has reversed the trend to a large extent in 2001.

Chart 4: Committed capital in private equity fund investing in private equity, 1991-2001



Committed capital will be invested over a period of several years. There may be risk that a sharp increase in committed capital over a shorter period will influence the long-term returns on the investments. When committed capital increases, competition for the investments increase. If the supply of profitable investment projects does not increase proportionately, the expected return on the investments will fall.

The increase in committed capital has occurred partly because the existing management companies have increased the size of new funds they have raised, and partly because of the presence of new operators. As of 2001, there is an estimated 2000 funds that are operating as general partners in the global market[17)].

2.3 Return and risk

Private equity that is owned via private equity funds has no externally fixed price. The general partner regularly publishes (as a rule quarterly) an assumed value of the companies it owns. However, these values normally do not reflect the market value. Often the partners report historical cost until the whole company or parts of it are realised. Upward or downward valuations can occur based on the partner's judgement. There is no common, accepted global standard for how valuations are to be made, and partners apply varying degrees of prudence in their accounting practices. The return figures that are largely based on unrealised holdings, are thus unreliable, and show a stability that is not necessarily related to changes in the actual underlying value. In this market, the internal rate of return is the most common return concept. This is a cash-weighted return measure. It is only once actual cash flows account for a large share of total accumulated value added in a private equity fund that the reported internal rate of return approaches the true value. Reported internal rate of return in the first years of a private equity fund's life has limited indicative power.

In the first years of a private equity fund the reported internal rate of return will most probably be negative. Investments that have been made are new, and are reported by the

general partner at a value that is close to historical cost. At the same time, the investors in the fund pay an annual management fee. As a result, the internal rate of return will only be positive after a few years when cash flows from the individual investments start to accrue to the investors (J-curve effect).

Table 3 shows the return figures for an average of all private equity investments in the US that are reported to the company Venture Economics over a longer period up to and including the third quarter of 2001. The return figures for the listed companies are shown for the same period. The figures are not directly comparable since the internal rate of return of the unlisted companies is cash-weighted return figures while the return series for the listed companies are time-weighted. The sharp fall in equity markets since March 2000 has also had a considerable negative impact on the value estimates for unrealised investments in private equity. However, it is highly likely that a substantial share of these investments is reported at a value that overestimates actual market value.

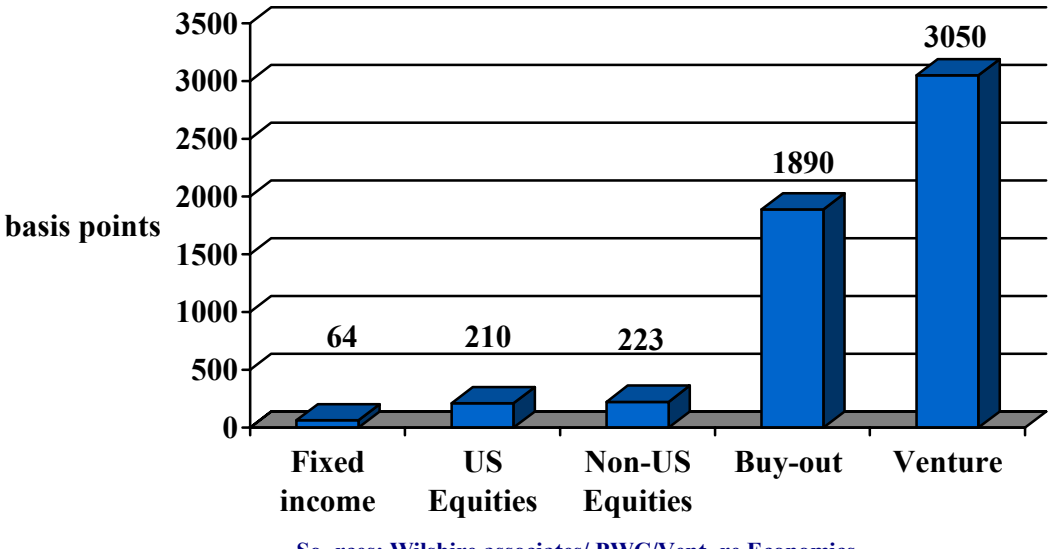
Table 3: Annualised return on listed and private equity, US at 30 September 2001

	5 year	10 year	20 year
Venture	37,9 %	27,4 %	18,2 %
Buy Out	8,1 %	12,7 %	15,6 %
PE total	17,9 %	18,8 %	16,9 %
S&P 500	14,5 %	15,1 %	15,3 %
Nasdaq – ex div.	12,8 %	16,3 %	12,2 %

In a detailed analysis of private equity markets in the UK[18)], the London Business School concludes that the average return over a 10-year period up to 1998 on private equity was only marginally higher than in the ordinary equity market in the same period. In this analysis, investments in the listed equity market were weighted using cash flows that actually took place in the private equity market.

As the figures above indicate, it is uncertain whether the long-term average return on private equity is markedly higher than on listed equity. The performance spread among managers is however significantly broader in private equity markets. Chart 5 shows the annualised spread (basis points) between the median manager and the upper quartile manager in US equity and bonds markets for the period 1990-2000.

Chart 5: Implications of manager choice - spread between median and upper quartile manager



The chart shows that assumptions about average return on private equity should not be decisive for investing in the market. The choice of manager is decisive also for the absolute return. It is therefore more important to focus on whether it is possible to identify the manager with the highest expected return a priori. If this is the case, investing in private equity via private equity funds will most likely provide a markedly higher return than investing broadly in listed equity. Similarly: if the management model limits the possibility of choosing the best managers, there is little basis for this type of investment.

When choosing a fund for investing long-term, it is particularly important to focus on the qualities of the general partner that are to result in a high return on the capital invested:

- Proprietary information about investment opportunities
- Broad and industry-specific operational experience on the part of management of similar companies that are included in the investment universe
- Network access (external expertise, potential clients, etc.), which it would not be easy for others to gain access to
- Well-documented corporate governance structure
- Well tested (exit) strategy for how the highest possible price is achieved when the investments are realised

Return also depends on factors that general partners can influence to a varying extent, but that cannot be attributed to the general partners' expertise. Examples of such factors are the capital structure of the underlying companies, the size of the companies, general market returns in the region or sectors, and the timing of the investment.

The main challenge associated with investing in private equity is to identify the managers with expertise within a defined core area. At the same time, the portfolio must be diversified among several different managers, and over investment periods, so that a balanced exposure is achieved with regard to the factors that the manager cannot or should not attempt to control.

The absence of reliable short-term return figures also involved a challenge as regards risk measurement. Measuring volatility based on reported company values will underestimate volatility and overestimate diversification benefits in relation to the listed equity market. Diversification benefits in relation to listed equity must be attributable to the fact that manager-specific factors determine decisive portions of total returns. These factors will only be reflected in the portfolio over a longer period.

Measurements of the volatility of return series for longer period (5 years) in the US and the UK do not indicate any significant difference in tracking error between listed and private equity[19]. The number of non-overlapping 5-year periods for private equity markets is limited, however. It is difficult to draw any conclusions about long-term differences in tracking error based on so few independent observations.

An alternative measurement of risk is to apply the share price of listed management companies that manage portfolios of private equity. Only a small number of relevant management companies are listed on an exchange. Most management companies are organised as private equity funds. Developments in stock prices for listed management companies in the UK over time are more or less on a par with the average for other financial undertakings.

A third approach is to assume that the spread between active management performance increases when the general volatility of the asset class increases. The documented wider spread in management performance in private equity market will then indicate that risk is also higher than what is the case for listed equity.

Even with conservative estimates of volatility and correlation with the listed markets, total portfolio volatility will not increase significantly if a smaller portion of the overall equity portfolio is invested in private equity.

2.4 Management model

The likelihood of high returns will depend on the stipulated limits on such investments, and the mandated operational institution's ability to identify private equity funds and a fund of funds with higher returns.

A precondition for achieving a high return is that there are no limits on the investment universe that reduce the number of possible managers or that compel the management unit to choose managers for reasons other than return expectations. Only a very limited portion of available manager will be used in reality, but they should be chosen primarily on the basis of an assessment of their competence and not on automatic screening factors that are not related to expected returns. An example of a limitation that could weaken return potential is geographical requirements. A dominant portion of all investments in private equity would be in markets that are already included in the Petroleum Fund's investment universe. A number of potential management companies can, however, choose to invest a smaller portion of committed capital in companies with their head office in another country. If these companies were consequently excluded from the investment universe, investment opportunities would be considerably narrowed. Other requirements that should be avoided are narrow requirements as to allocating to each region or that a specific portion of the equity portfolio should at any given time be invested in private equity. Narrow requirements of this type could entail allocating committed capital to some management organisations because of the allocation rules and not because the management organisation has expertise in its field.

The unit responsible for investment management constructs a portfolio of private equity funds or fund of funds. This unit's internal procedures and competence in choosing managers will be of paramount importance for management performance. Optimal knowledge of the universe of potential managers increases the likelihood of choosing the best manager. A good network can provide proprietary information about the management companies that can influence future returns in new funds that are raised. It can also provide a better basis for assessing new and promising organisations, in which other investors do not want to invest because of a lack of history. Such a network cannot be created and maintained by an internal management unit alone. External consultants must be used to procure extensive information. Strategic alliances could be established with consultancies or management companies, where access to proprietary information is decisive for the relationship. The quality of the internal investment team and stability are still of key importance because of the considerable costs of extensive changes in portfolio composition and because performance is only measurable in the longer term.

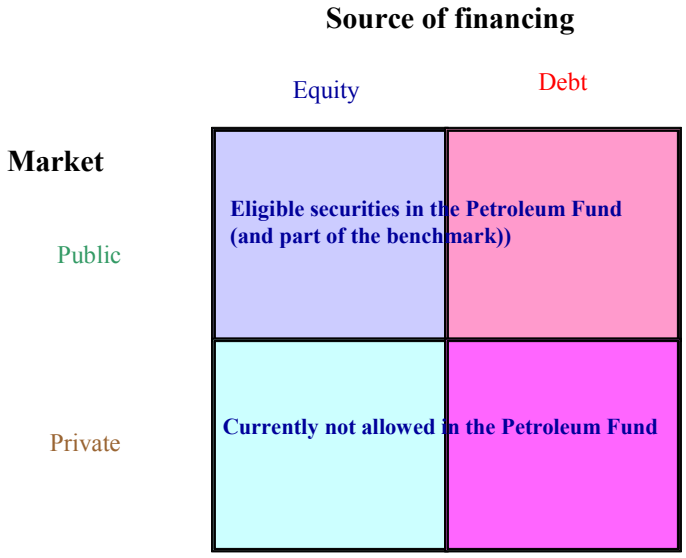
3. Real estate

3.1 Definition and available instruments

Real estate is often referred to as an alternative asset class, like, for instance, private equity. This asset class has, however, been part of institutional investors' portfolios for a longer period. A broad definition of real estate includes all forms of debt- or equity-funded investments in buildings or developed sites. Investments can be direct or indirect investments in financial instruments with exposures to such real estate. Real estate investing primarily involves offices and retail premises. In addition, industrial and residental buildings and some specialised buildings have been relevant real estate investment products for institutional investors.

There are thus various real estate instruments and markets available to institutional investors. The main alternatives are outlined in Chart 6. The Petroleum Fund already has exposures to some segments, as shown in the Chart.

Chart 6. Real estate investment alternatives



Collateralised bonds accounts for the debt side. Some of the available instruments in the listed collateralised bond market are included in the Petroleum Fund's benchmark index as from 2002. Mortgages issued directly to buyers of real estate, with security in the building that is bought, is an example of a debt instrument that is not on the listed market. Mortgages will have an expected excess return in relation to listed bonds because of illiquidity. The return on bonds issued by borrowers with a high credit rating and with security in real estate should be expected to have a high correlation with the general bond market. In the further description of this asset class, the focus is therefore on equity instruments that can be expected to provide diversification benefits.

On the equity side, stock issued by listed real estate companies has accounted for a small portion of the Petroleum Fund's market-weighted benchmark index in each region since equity investing started in 1998. An important distinction between direct and indirect investment exists within the unlisted investment segment. In the case of direct investments, the investor is registered as owner of a building. This has been the traditional form of investment in equity instruments in the real estate market for pension funds, life insurance companies and other large institutional investors that have invested in real estate in their home country. Indirect (unlisted) investments can be majority or minority holdings in unlisted real estate companies, units in open or closed-end funds that invest in different segments of the real estate market, or private equity funds whose business concept consists of active, value-added management of real estate.

For the vast majority of end-investors, indirect investment in real estate instruments is the most realistic alternative for investing abroad. This is due to several factors:

- Only a small minority of end-investors have a real estate portfolio outside their home market that is sufficiently large to achieve necessary diversification benefits in the market. The foreign real estate portfolio is normally confined to a small portion of total capital under management. Real estate portfolio management and maintenance are more labour-intensive than financial management of securities portfolios. Achieving economies of scale requires a certain size of the real estate portfolios in each market, which few investors manage to achieve.
- Professional management of real estate investments requires legal and financial expertise that varies from one market to the next. Large market participants in each country will be better positioned to recruit experts than smaller international end-investors.
-Even if all operating services are outsourced, an internal management organisation responsible for international direct investments could become disproportionately large.

The choice between listed and unlisted indirect investments may be influenced by tax considerations. In some countries, such as the UK, an investor that is exempt from taxes will incur tax disadvantage by buying stock in listed real estate companies. In other countries, primarily the US, there are available instruments also in the listed market that are as tax efficient for investors that are tax-exempt, as unlisted alternatives are.

3.2 Market size

The market value of a broad selection of listed real estate companies[20)] was on global basis a little more than USD 384 billion at end-2001. In the Petroleum Fund's benchmark (FTSE World), real estate companies accounted for 32% of this market value.

The market value of listed real estate companies only accounted for a portion of total equity capital invested in real estate. In the US, the unlisted market is estimated to be almost 4 times as large as the listed market[21] . Comparable percentages are estimated to be even higher in unlisted markets outside the US. The institutional real estate capital market is characterised by the fact that only a smaller share of the market is available via investments in listed companies. However, it should be taken into account that the companies' real estate stock is included in the market's valuation of the stock price in all sectors, also outside the real estate company sector.

3.3 Return and risk

The return on equity investments in real estate stems from two sources:

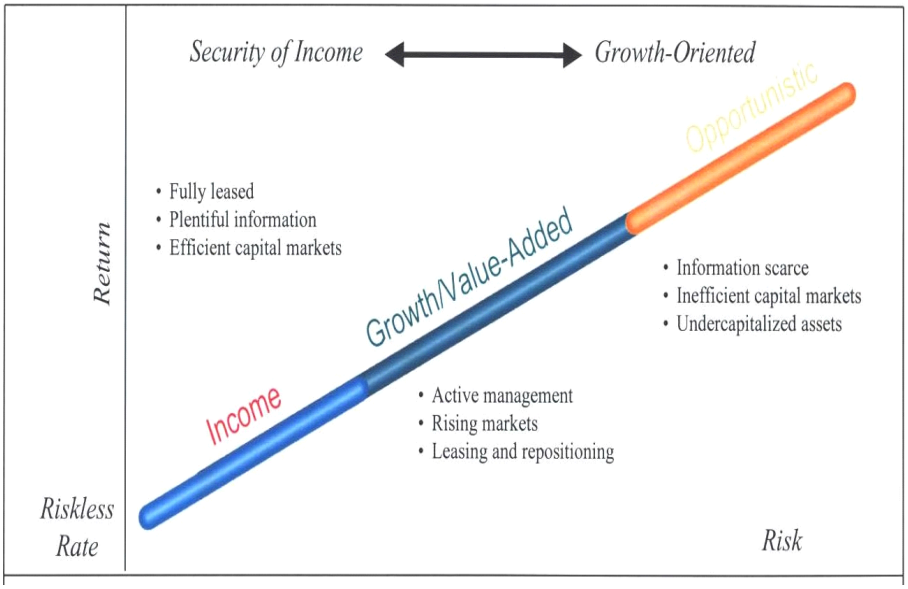
- net rental income (which is actually cash flows in the same way as share dividends or coupon income on bonds)
- changes in real estate values (an unrealised return component as long as the real estate is not sold)

The relative importance of these two components varies among properties and real estate managers according to the managers' business strategy. A rise or fall in value can have a substantial impact on the book return on all types of real estate investments over a period. In the long term, however, net rental income on investments in real estate that is centrally located, with a long-term lease and high rental ratio, can be expected to be have a greater influence on total return than the rise in value. If the rental income is indexed against changes in the price level, and renegotiations of rental contracts are spread over time, the volatility of real returns that stem from rental income will be limited. The cash flows from such real estate are very similar to the cash flows from long-term inflation-indexed bonds. However, a relative safe real return each year with limited volatility will entail an expected real return that is not much higher than bond returns.

The rise in value will be expected to be of greater importance when investing in projects where the owner seeks to benefit from a particular information edge or unique skills through active management, and has a limited (a priori) investment horizon. Rental income will account for a limited share of each project's return, while the rise in real estate value between the time of purchase and sale is decisive for performance. The expected return on each project is high, while the risk (volatility) will also be higher than for long-term investments in standard premises with a central location. A considerable portion of debt-financing also increases the risk. One must therefore weigh the objective of achieving a real return over a shorter period and achieving relative secure diversification benefits in relation to equity and nominal bonds against the objective of achieving the highest possible expected return.

This balance between return and risk, and the resulting focus for management, is illustrated in Chart 7[22] .

Chart 7: Return/risk profile, real estate



Institutional investors normally argue that the inclusion of real estate in their portfolios contributes to securing a real return (low real return volatility) and/or diversification benefits in relation to equity and nominal bonds. These features are best secured via long-term investing, where rental income is the main determinant of total return.

The longest return series for investments in real estate are found in the US and the UK. Table 4 shows key figures for long-term returns and volatility in the equity market, bond market and real estate market in these two countries. Annualised volatility figures for an investment horizon of both 1 and 3 years are presented, cf. discussion on measurement problems relating to returns in the real estate market over shorter periods. The return figures cannot be used as estimates for future returns on the asset classes. The period is characterised by a sharper fall in bond yields than in inflation, particularly in the UK, and by the extraordinary high returns in stock markets in the latter of the 1990s. If the return figures in Table 4 are adjusted for the trend decline in interest rates, the return on bonds over the period would have been about 2 percentage points lower in the UK.

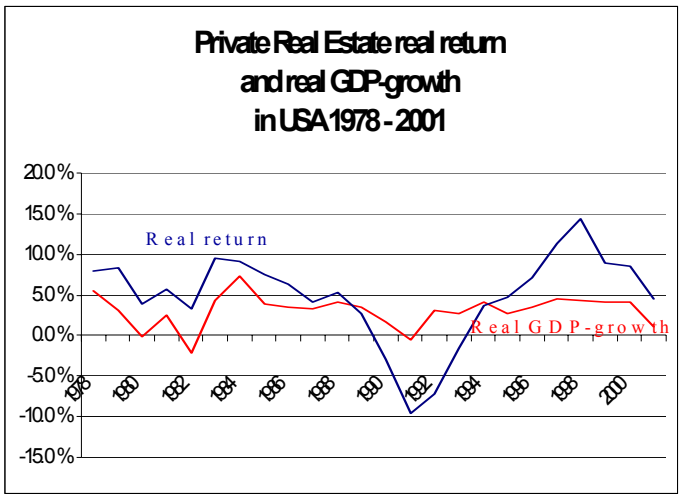
Table 4 also shows the years in which the different asset classes have had a negative real return, and the average negative real return for these years (average shortfall). The number of years where there was a negative real return in both the stock market and the real estate market, or in both the bond market and the real estate market, is also shown.

Table 4: Real return and volatility, US and UK, 1978 (1981)-2001

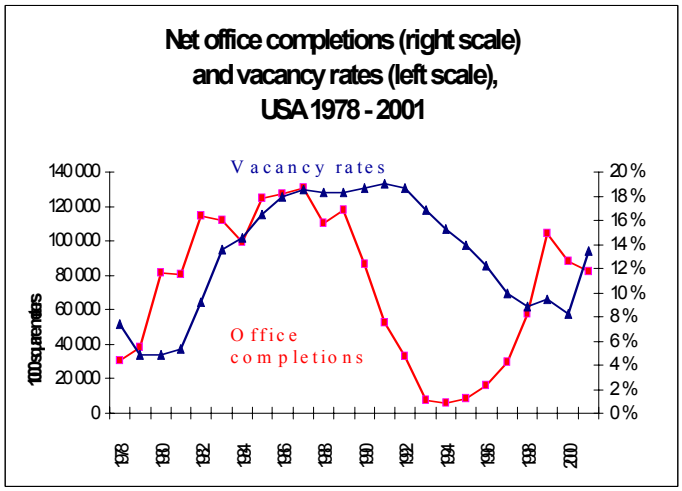
	US 1978 - 2001			UK 1981 - 2001		
	Equities	Fixed income	Real estate	Equities	Fixed income	Real estate
Average real return	9.9%	4.5%	48%	10.6%	7.0%	55%
Volatility 1 year horizon	14.6%	8.3%	54%	13.8%	11.4%	89%
Annualized 3 year horizon	18.2%	10.9%	95%	15.4%	7%	14.9%
Number of years with negative real return	6	7	4	4	5	3
Number of years with coincident negative real return in equities/real estate or fixed income/real estate	1	1		1	1	
Average real return in years with negative number	-8.5%	-5.1%	-51%	-12.1%	-4.4%	-92%

- For both the US and the UK, the years with negative real returns in the real estate market are concentrated in the period 1990-1993. This was a period where a combination of a sharp build-up of capacity over a longer period in the real estate market coincided with low/negative economic growth. The reaction in the real estate market was markedly different from that of the early 1980s in both markets, when GDP growth was also low and at times negative. This is illustrated in Chart 8a, which compares annual real returns in the real estate market in the US in the period 1978-2001 with real GDP growth. Chart 8b shows annual net supply of new office premises in the US in the same period, and the share of vacant office premises. The wide difference in market returns in the period 1990-1993 compared with the situation 10 years earlier is clearly due to the different supply situation in the real estate market during these two periods.

Chart 8: Real estate market and developments in the real economy, US 1978-2001



Source: NCREIF, OECD



Source: LaSalle Investment Management / Torto Wheaton Research

It is well known that the return indexes for the private real estate market underestimate short-term volatility. This applies in particular to the indexes that are used in the US because of appraisal and lag effects. The empirical correlation that is obtained when using real estate indexes with short intervals will therefore also overestimate actual diversificationbenefits. The price volatility of listed real estate companies is an alternative source for estimating real estate risk and correlation with other financial markets. This volatility is typically much higher than indicated by the indexes for the private market[23)]. In the US, the indexes for listed real estate companies are diversified to the extent that the indexes are less vulnerable to company-specific events. There was a particularly strong increase in the number of these companies and their market value (in excess of that implied by the stock market advances in the period) in the latter half of the 1990s. Empirical analyses of these markets indicate that the correlation between other financial markets and the listed real estate market was low in the period. Other studies conclude that the listed and private real estate markets have the same long-term expected return, although it may appear that the correlation between the indexes that track the listed and private market are limited when short time horizons are applied.

The return figures for the private market referred to above do not take into account differences in transaction costs or management costs between the asset classes. Direct investments in real estate entail both higher annual management costs and markedly higher transaction costs than for equity and bonds. The more frequent transactions occur, the greater the effect on returns will be. Some studies indicate that real estate should be included in a portfolio first and foremost for the purpose of achieving diversification benefits, not because of return, when taking account of transaction and management costs[24)].

3.4 Management model

The substantial operational challenges associated with investing directly in real estate would indicate that investments should be confined to indirect investment alternatives such as investment trusts, participation in private equity funds or the purchase of ownership interests

in listed or private real estate companies. Since only a small share of the institutional real estate market is owned by listed real estate companies, indirect investments cannot be limited to listed real estate companies only. Different tax treatment of listed and private instruments in several countries also suggests that there should be flexibility with regard to choice of instruments.

A more thorough analysis of available instruments, liquidity and transaction costs in the largest real estate markets should be carried out before undertaking a further evaluation of possible size and operational consequences of (indirect) investments in real estate.

[1)] Bonds where the issuer has a credit rating of Baa or higher from Moody's, or BBB or higher from Standard & Poor's.
[2)] The capital asset pricing model (CAPM), Sharpe (1964), Lintner (1965), Mossin (1966), Fama (1968)
[3)] Correlation coefficients of 0.3 and 0.8 respectively.
[4)] The Petroleum Fund, CalPERS, ATP, OTPP and AP funds at 31 December 2001, ABP and BTP at 31 December 2000.
[5)] In Sweden only AP-1 has defined an explicit target for allocating to "alternative investments" (2%). At end-2001 both AP-2 and AP-3 had committed smaller amounts to private equity, but they are measured in the long term against listed equities. AP-2 is invested in real estate, but has not set an explicit target for the portion in the portfolio. Investments in real estate in this fund are measured in the long term against the bond market.
[6)] For example, both equities and nominal bonds in the US had a negative real return in the 10-year period 1972-1981. In this period, average inflation rose by about 6% on the previous 10-year period. The real return on equities in this 10-year period averaged –4% (annualised), and –6.7% for nominal government bonds. (source: Ibbotson Associates)
[7)] The magnitude of this increase depends on the portions in the portfolio and the rebalancing regime.
[8)] Such a model has been chosen by the Canadian pension fund Ontario Teachers, which combines real estate, inflation-linked bonds and commodities into one asset class called "inflation-sensitive assets".
[9)] This was formally decided for the emerging equity market in Thailand, c.f. letter of 30 August 2000 from Norges Bank to the Ministry of Finance.
[10)] Some investments in real estate can be made using listed instruments, see description in Annex.
[11)] Investment Property Databank, which publishes annual return figures for the total real estate market and for some sectors in the market in some European countries.
[12)] Sources: Bloomberg, Norges Bank
[13)] The inflation–linked bonds issued by UK are indexed against the Retail Price Index (RPI). The annual rise in the RPI was 0.9% as of 3 December. 2001. However, this number is significantly impacted by the interest rate cuts effected by the Bank of England in 2001. In Table 1, this number is replaced with the last published growth figure for RPI ex. mortgages as the estimate of future inflation.
[14)] Sources: Lehman Brothers, Bloomberg, Norges Bank
[15)] Source: Goldman Sachs/Frank Russel: Alternative investing by tax-exempted organizations 2001
[16)] Sources: National Venture Captial Association (NVCA), USA, European Venture Capital Association (EVCA), Venture Economics, the Asian Venture Capital Journal (capital flow figures) ECB/Eurostat Yearbook (annual average rates Euro/Ecu against USD)
[17)] Source: Goldman Sachs
[18)] London Business School (2000): UK Venture Capital and Private Equity as an Asset Class for Institutional Investors
[19)] Source: Merrill Lynch Investment Managers: « Private Equity Investing »
[20)] Global Real estate Research (GPR) General Index
[21)] Source: Investment Real estate & Real Estate Capital Market Report/Journal of Portfolio Management (autumn 2001)
[22)] Source: LaSalle Investment Management
[23)] The volatility of the price of listed real estate companies is also a source of error when used as an estimate of the "actual" volatility in the real estate market. These prices will to some extent be influenced by the volatility in the stock market in general. Systematic differences between listed segments and data for private segments as regards the degree of debt-financing also give rise to differences in volatility.
[24)] Chua (1999): The Role of International Real Estate in Global Mixed-Asset Investment Portfolios, Journal of Real Estate Portfolio Management, Vol. 5, No. 2, 1999.