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The sustainability of the Dutch pension system

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The sustainability of the Dutch pension system

Jan Kakes and Dirk Broeders, with the cooperation of David van As, Sybille Grob, Jessica du Marchie Sarvaas, Jorim Schraven and Martijn Schrijvers *

Executive summary

This study addresses the sustainability of the Dutch system of supplementary pensions, that is, supplementary to the state old-age pension. Traditionally, the system is characterised by high-quality defined-benefit schemes that offer members a high degree of pension security. However, the pension landscape has been subject to vast changes. The population is ageing, the effects of globalisation are making themselves increasingly felt and, in the world at large, defined-contribution schemes are becoming ever more usual. Competition in the pensions sector is being encouraged, for instance by permitting pension funds to operate cross-border schemes within Europe. In addition, a decision has recently been made about a new statutory framework for pension arrangements. The present study reviews the financial consequences of these developments for the Dutch pension system. It does so by describing the principal pension risks in relation to the pension funds' financial policies, by examining recent changes in the Dutch pension system, and by analysing the pension sector's vulnerability to macro-economic shocks through simulations. The study concludes that the recent changes in pension schemes and in pension funds' financing have enhanced the system's controllability and, hence, its sustainability.

* We are indebted to many for inspiring discussions about pension problems and for valuable suggestions that have helped us write this study. We owe a special debt of gratitude to Jan Brockmeijer, Inge van den Doel, Berend Groot, Maarten Hage, Dick den Heijer, Aerdt Houben, Klaas Knot, Peter van Loo, Robert Mosch, Hans Popping, Margreet Schuit, Richard Venniker, Jean Paul Vosse and Peter Vlaar. The views expressed in this study do not necessarily reflect positions of De Nederlandsche Bank.

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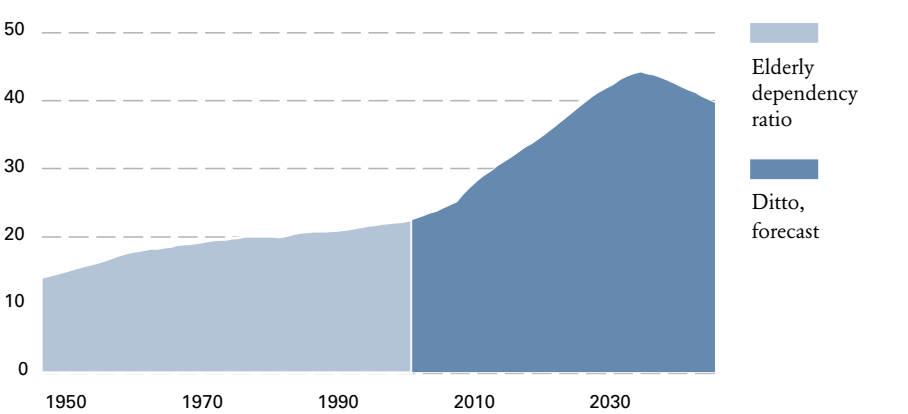
1 Introduction and principal conclusions

In the decades ahead, the Dutch old-age pension system will be faced with several challenges. Expectations are that the number of people of 65 and over as a proportion of the labour force – the so-termed elderly dependency ratio – will more than double, to over forty per cent in 2040 (Chart 1.1). The underlying causes are well-known: average life expectancy is increasing steadily, while birth rates remain at an unduly low level. Moreover, the baby boom generation will shortly reach pensionable age. The latter is, however, a temporary phenomenon, which differs in various respects from the more structural ageing problem (see Box 1.1). Apart from demographic developments, the sustainability of the pension system is governed by such factors as economic growth and productivity, labour market structure and the increasingly rapid developments within the business sector.

The pension system ensures that the Netherlands is well-placed to cope with these imminent changes. In addition to a basic state old-age pension provision, which is financed on a pay-as-you-go basis and is open to all citizens, most employees participate in supplementary funded occupational pension plans. Chart 1.2 shows that,

Chart 1.1 Elderly dependency ratio

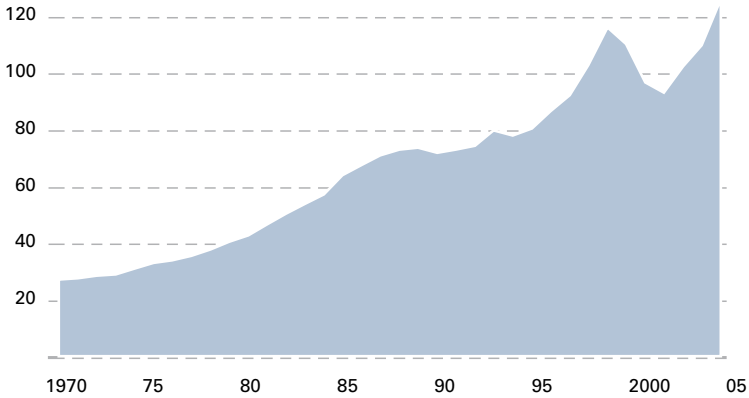
Population aged 65 and over as a proportion of the economically active population



Source: Statistics Netherlands.

Chart 1.2 Balance sheet total of Dutch pension funds

% of GDP



Source: DNB.

expressed as a percentage of GDP, the aggregate amount of the pension assets that have consequently been accumulated has shown a considerable increase over the past decades.[1] Thus, the Dutch system compares favourably with pension systems in many other countries (Table 1.1). Pension plans lend themselves very much to organisation on a collective basis, notably considering the potential for risk-sharing within and across generations. In this respect, the Netherlands has a long-standing tradition, which dates from the nineteenth century.

However, the continuity of the Dutch pension system in its present form is not a matter of course. Recent years have highlighted the vulnerability of pension funds to adverse developments, such as a stock market crash or continuing low interest rates. The lesson to be drawn from the experience of recent years is that such risks need to be adequately priced. This is true of investment risk, but equally so of, for instance, inflation risk and uncertainty about average life expectancy. Another major condition for continuity is an adequate level of pension contributions. A funding system that systematically seeks to operate at levels below the economic cost of the benefits, is bound to collapse. In such a situation, a choice will inevitably have to be made sooner or later between adjusting the pension scheme (and, hence, its cost) to what is financially feasible and adjusting its funding to the pension commitments undertaken. In the former case, members may have to settle for lower or more uncertain pension benefits, whereas in the latter case contributions may have to be raised.

It is worth noting that the reasoning that is applied when such choices have to be made is often based on archetypal models. Viewed from the angle of the pension

Table 1.1 Pension assets in the G10
% of GDP

Country	Pension funds		Life insurance companies	
	2004	1990	2004	1990
Switzerland	112	56	42	47
Netherlands	110	72	55	37
US	95	42	30	33
UK	65	50	51	42
Canada	52	29	25	24
Japan	14	12	34	47
Sweden	13	3	53	32
France	7	-	53	20
Germany	4	3	28	22
Belgium	4	2	32	26
Italy	3	3	20	6

Sources: OECD, DNB.

commitments, the predominant distinction is that between *defined benefit* (DB) and *defined contribution* (DC). From the financing perspective, the terms *funding* and *pay-as-you-go* dominate the field (see the glossary in Annex D). However, in actual practice these pure forms do not exist. Anyone entering into a contract of employment coupled with membership of a pension scheme does not get a separate pension contract in a legal sense. Usually, he receives a pension commitment, formulated as the accrual of an entitlement to future benefits. The commitment usually includes 'contingent' elements, for instance in respect of the cost-of-living adjustment of the pension (Knot and Broeders, 2005). Likewise, the distinction between funding and pay-as-you-go cannot always be drawn with great accuracy. In the event that a funding deficit is fully mended by raising contributions, this represents in fact a pay-as-you-go element in a funded system, the burden being shouldered by the scheme's active members.

These initial considerations already reveal that pensions are complex and multi-faceted. That is also true of the interaction between the pension system and the rest of the economy. The fact is that adjustments to elements of the pension system feed through into the overall economy. Thus, the governance structure of pension funds is among the key factors governing intergenerational solidarity while the level of contributions affects purchasing power whereas, in turn, macro-economic developments influence the financial position of pension funds. In the pension

debate, these interactions sometimes remain underexposed, potentially giving rise to situations where the debate is unduly dominated by a single theme. Over the long term, however, broad-based policy choices must be made in which, for instance, micro-prudential interests are weighed against macro-economic ones. One major constraint in all these respects is that a collective pension system is sustainable only if it is able to continuously rely on the general support of the pension scheme members.

This study seeks to outline the challenges and uncertainties which the Dutch pension system may have to cope with and to provide an insight into the principal policy considerations and decisions. In that context, various issues are deliberately left out of account. For instance, other ageing-related cost increases, such as those concerning the state old-age pension and heath care, are not dealt with. Likewise, no attention is paid to the consequences which the ageing population will have for public finances.[2] The present study focuses in particular on the second pillar, that is, the supplementary pension as an element of labour compensation. Below, the most salient points and principal conclusions are summarised.

- The Dutch pension system is highly collective in nature. Practically each employee automatically joins a supplementary pension scheme by virtue of his contract of employment. This permits risks to be shared within and across generations. The ambition to ensure that pension benefits grow in line with wage growth or inflation makes for a fairly stable and predictable income pattern over members' lifecycle. Collective systems are thus a source of welfare gains.
- Collective schemes reflect the preferences of most employees. Survey results indicate that the Dutch value security and are prepared to pay higher contributions in exchange for guarantees as to their pension benefits. Most of the Dutch consider themselves unable to administer their pensions assets and prefer to leave this to others. The majority prefer DB plans to pure DC plans.
- The pension arrangements and the appurtenant funding should on average be in balance. If they are not, pension risks arise, which may be divided into inflation risk, longevity risk, investment risk and discontinuity risk. Pension risks may be limited by ensuring that the nature of the funding matches that of the liabilities or by means of risk-sharing within the overall system. The residual risk must be borne by the stakeholders (households, companies, financial sector). It is important to note that the residual risk cannot be eliminated 'free of charge'.
- In the Dutch funded system of occupational pension plans, financial buffers play an important role. A pension fund's surplus represents the difference between the marked-to-market value of its assets and that of its liabilities and serves several purposes.[3] First, buffers permit risks to be absorbed without resulting in underfunding. In such an event, financial burdens and risks are either shifted to the future or pension entitlements must be cut. Second, the presence of adequate financial buffers contributes to achieving cost-of-living adjustments, that is, the aim of ensuring that pension benefits keep pace with inflation or

wage growth. That is important for the protection of the purchasing power of the elderly within society. It is essential that the financial buffers provide return and that this return should benefit the pension plan members in the form of indexation. Third, the presence of adequate financial buffers permits a fairly stable development of pension contributions. That is important considering potential procyclical interactions between the pension sector and the overall economy. Adequate funding and supervision to enforce that goal are essential if pension illusions are to be prevented.

- The Dutch pension system is well-developed. The burden has been distributed in a fairly balanced manner among the three pillars, which are, moreover, financed in different ways, enhancing the system's resistance to shocks. In recent years, major measures have been taken to enhance the controllability of the second pillar in particular. For instance, the switch from final-pay schemes to contingently indexed career-average plans has made for a more balanced distribution of risks between employers and employees. In addition, a political choice has been made as to the minimum level of certainty (97.5%) with which pension commitments must be met. This level of certainty is considerably lower than that offered by, for instance, government bonds. These shifts may therefore be viewed as a partial convergence towards DC schemes, which predominate in many other countries. Moreover, allowing a greater amount of risk in the accrual of pension rights for active plan members may be consistent with optimum investment behaviour over the lifecycle. Also, more than before, the pension financing is viewed in relation to the pension commitment. Although this process of adjustment has not yet been completed, the recent changes have enhanced the sustainability of the Dutch pension system.
- Despite this comparatively favourable starting-position, the Dutch pension system will have to face several challenges in the decades ahead. This is due to uncertainty about a number of major external factors. One of them is that the economic structure will change. Labour will become scarcer compared to capital, while some sectors will grow whereas others will contract. Through wage determination and labour mobility, among other factors, this could affect the pension system. Another uncertain factor is a potentially disappointing development of asset returns. Since the Dutch system is based on funding, these returns are of major significance for safeguarding pension benefits.
- Raising the pensionable age in line with the increased life expectancy, for instance by two years, would make for better controllability of pension liabilities. In periods of recovery, this would reduce the need for recourse to cutting back on indexation or raising contributions. Moreover, simulations show that, in the long run, contribution rates could, on average, be one percentage point lower.
- Changes in economic structure may lead to higher inflation risks. For instance, tight labour market conditions in certain sectors may translate into upward pressure on wages. Simulations show that in a situation where the rate of inflation is

one percentage point up on a permanent basis, the real funding ratio is depressed and, on average, drops by five to ten percentage points relative to the baseline projection. Changes in economic structure may also give rise to increasing discontinuity risks during the pension accrual phase.

- For pension scheme members, structurally lower asset returns imply, on average, higher indexation cuts and higher pension contributions. In the event that interest rates or the equity risk premium would turn out to be one percentage point lower, pension contribution rates would in the long run have to be some five percentage points higher. The consequences for indexation are especially marked at low interest rates. Raising the allocation to bonds may be expected to imply lower return prospects, leading to higher average pension contributions. On the other hand, this also affords pension plan members greater certainty as to their pensions, as reflected in the simulations in a lower average indexation cut. Reducing the duration gap between assets and liabilities leads to a slight decrease in both indexation cuts and average contributions.

The remainder of this Occasional Study has been organised as follows. Chapter 2 describes the principal pension risks and the manner in which they are shared among the stakeholders in the various pension systems. Chapter 3 deals with the way in which the pension liabilities are financed and with the possibilities of controlling risks with the aid of asset liability management. Chapter 4 outlines recent changes in the Dutch pension system, identifying the principal trends and discussing the process of further recovery. Finally, Chapter 5 goes into a number of macroeconomic factors that will be decisive for the pension system in the coming decades and illustrates their consequences for pension funds using model-based simulations.

Box 1.1 Baby boom versus structural ageing

The birth wave immediately after the Second World War leads to a situation where, from 2010 onwards, large numbers of employees will retire. That is the direct cause of the rapidly increasing proportion of the elderly within the Dutch population in the years ahead. In addition, birth rates have dropped sharply from the 1970s onwards. Hence, it is not surprising that the debate about the ageing society is often dominated by the problems created by the baby boom generation. Yet, in several respects, the baby boom problem differs from the more structural general ageing problem:

- *The baby boom is temporary, whereas the ageing problem is permanent.* Owing to the baby boom, the elderly dependency ratio will increase rapidly from 2010 until about 2030, followed by a decline (see Chart 1.1). The structural ageing process is much more gradual, causing the elderly dependency ratio to remain at a permanently higher level.
- *The retirement of the baby boomers leads to a younger average labour force, whereas the ageing process leads to an older average labour force.* When the baby boomers retire, the average age of the labour force will initially show a slight decrease. Owing to the structural ageing process, more people will reach pensionable age and are also likely to continue to work longer, so that the age of the average worker will show an increase.
- *The retirement of the baby boomers may give rise to specific problems, such as an asset meltdown*. If the baby boomers were to liquidate their assets on a massive scale so as to make the most of their last few years, asset markets, such as the stock exchange or the housing market, could experience a downward correction (see Chapter 5). The structural ageing process is not likely to lead to such massive action in the short term. It might be noted, incidentally, that the asset meltdown hypothesis is not uncontroversial.

2 Distribution of pension risks

People wish to be assured of an adequate income at the time when, on the grounds of age, they stop working in full or in part. Their retirement pension and other pension forms, such as spouse's pensions and disability pensions, are financed in various ways. In the Netherlands, people may supplement their state old-age pension, which is financed by means of a pay-as-you-go system, by engaging in pension saving or by joining a pension scheme on the basis of a contract of employment. The financing of these schemes is underlain by expectations about such factors as inflation, life expectancy, asset returns and support among the members. If these expectations fail to materialise, the financing may prove to be insufficient. This possibility is denoted here as a pension risk. This Chapter provides an overview of pension risks and of the manner in which they are distributed in the various systems among the stakeholders. At the end of the Chapter, the Dutch pension system is discussed in some detail.

2.1 Overview of pension risks

Pension risks arise when the financing of a pension offers insufficient guarantees for achieving the planned benefits. These risks may relate to either the pension commitment or the appurtenant financing.[4] In addition, the risks may concern the pension benefit level or its time dimension. All this results in the four pension risks as they are summarised in Table 2.1.

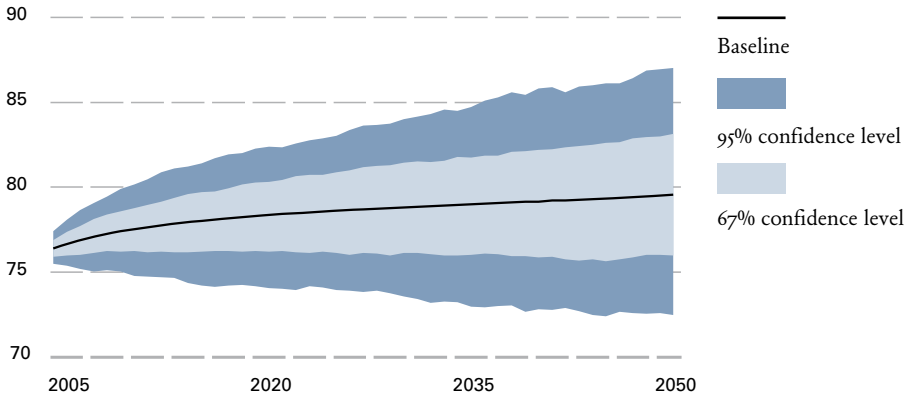
The four pension risks are explained below:
I The aim of keeping pension benefits inflation-proof or wage-index-linked, as is usual in the Netherlands, implies exposure to *inflation risk*. The fact is that a link

Table 2.1 Pension risks

	Pension commitment	*Financing*
Benefit level	I Inflation risk	III Investment risk
Time dimension	II Longevity risk	IV Discontinuity risk

Chart 2.1 Uncertainty in life expectancy forecasts

Estimated movements in life expectancy at birth, men



Source: Statistics Netherlands.

with consumer prices (or wages) causes the pension benefit level to be vulnerable to fluctuations in the inflation rate. Thus, as a result of considerable wage increases in the late 1990s, Dutch pension funds' liabilities showed a sharp increase. Viewed over the full pension accrual phase, the cost-of-living adjustment constitutes an important element of the ultimate benefit.[5]

II Pension benefits payable during a person's remaining lifetime imply a *longevity risk*. Individual life expectancy is highly uncertain. This individual risk can be eliminated by pooling contracts into collective schemes (see also Chapter 3). None the less, even pension funds and insurance companies must allow for uncertainty as to the average life expectancy of their members. After all, a medical breakthrough or a change in lifestyle (e.g. cutting down on smoking) may raise the life expectancy of an entire cohort, causing an unexpected increase in pension fund liabilities. Chart 2.1 gives an impression of the level of uncertainty applied by Statistics Netherlands (www.cbs.nl) in a recent population forecast.

III Pre-funding of pension accrual gives rise to *investment risk*, especially where, under a system of marked-to-market valuation, the nature and volume of the investments differ from those of the pension liabilities. This is sometimes denoted as the mismatch risk. Over the past few years, this risk has been clearly in evidence as a result of the stock market correction in combination with the downward trend of market interest rates. On the other hand, it should be noted that the rise in market interest rates in the period September 2005 – June 2006 has made a material contribution to the financial recovery, given the difference in duration between liabilities and fixed-rate investments.

iv *Discontinuity risk* refers to the possibility that – for whatever reason – pension accrual is terminated or disturbed. Under a pay-as-you-go system, such a situation may arise when there is insufficient support among the active members. A pension fund may be faced with discontinuity in the event of sponsor bankruptcy or if the scheme is closed to new members. Recently, the latter situation has been in evidence in the United Kingdom on a large scale, as a result of the massive switch from DB to DC schemes. In 2004 almost half of all members of British DB schemes found themselves in a closed scheme (Chart 2.2). As a result, contribution income is decreasing, complicating recovery in the unhoped-for event of underfunding. Another example of discontinuity is afforded by the transfer of accrued pension rights when employees change jobs or when companies merge or are taken over. In such cases, problems may arise if the funding is insufficient at the time of the pension transfer.

These risks are, of course, interrelated and may have mutually reinforcing or offsetting effects. Thus, discontinuity risk notably plays a role in combination with other risks if pension accrual is terminated at a time of underfunding.

These pension risks can be addressed in various ways. First, they can be mitigated by ensuring that the pension commitment and its financing match to the extent possible. The potential for matching depends on the availability of financial instruments related to pension risks. For (wage) inflation and longevity risk, this potential

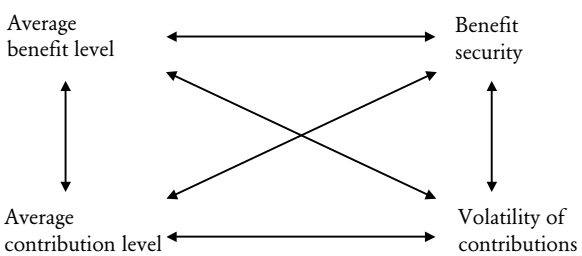
Chart 2.2 Many defined-benefit schemes in UK closed to new members
Number of active members, millions. An open scheme may be joined by new members, a closed scheme may not.

Source: Government Actuary's Department.

is limited (see Chapters 3 and 5). Second, the risks borne by individual members can be limited by pooling pensions into a collective arrangement, such as a pension fund. In this way, use can be made of intra- and intergenerational risk-sharing. Intragenerationally, the individual longevity risk can be almost entirely diversified by pooling. Intergenerationally, the uncertainty surrounding the upward trend of life expectancy as well as inflation and investment risk can be shared on a broader basis and spread over a longer period of time. If the risk-sharing is agreed in advance by the stakeholders, they are said to have entered into a pension deal.[6] Finally, pension risks may simply be borne by the stakeholders; in this respect, it is important that this should be done in well-balanced manner. For instance, members may receive less than full cost of living adjustment, may have to pay higher contributions or retire at a later age. A sponsor company, too, may bear risks, for instance in the form of an occasional lump-sum contribution. As a last resort, members' entitlements may be cut.

It is important to note that – diversification possibilities apart (see Box 3.1) – pension risks cannot be eliminated 'free of charge'. Chart 2.3 shows the possibilities for trade-offs between benefit security, benefit level, contribution volatility and contribution level. Increased benefit security means that either investment risk must be reduced, leading to lower expected benefits, or that greater reliance must be placed on the contribution instrument (that is, higher or more volatile contributions).[7] The combination of high and secure benefits with low and stable contributions is not realistic. In a sense, pension accrual is somewhat like a water bed: depressing the mattress in one spot causes it to go up in others. The water bed contents remain the same; only leakage to future generations may change the absolute level of risks and the attendant costs for one specific generation. Cui *et al.* (2005) shows that intergenerational risk-sharing gives rise to welfare gains, since it permits income fluctuations to be better spread over the lifecycle.

Chart 2.3 Trade-offs in a pension deal



2.2 Description of pension systems

After this overview of pension risks, we proceed to a description of the various pension systems. These systems may be characterised in terms of the following three dimensions:[8]

- Finance arrangement: funding versus pay-as-you go;
- Pension commitment and distribution of pension risks: DB versus DC;
- Solidarity: collective versus individual.

The first dimension, *funding versus pay-as-you-go*, refers to the manner of financing. Under a pay-as-you-go system, the pension benefits are financed from current contributions paid by the economically active generation. In a funded system, however, the contributions are invested in assets, which are used to finance the benefits in the future. More precisely, in a funded system, capital is set aside and invested with the explicit purpose of providing pension benefits in the future. The members have a claim on the fund. In a pay-as-you-go system, however, there is 'no more than' an intention to pay benefits in the future and to collect the requisite resources at that future time. This intention does not provide the beneficiaries with any degree of certainty. The state old-age pension, for instance, is contingent upon the political will to shoulder the burden, and thus on the support it enjoys within society. Such a system is thus sensitive to demographic changes, whereas a funded system is more vulnerable to inflation and investment risk. A funded system calls for a well-developed capital market that is sufficiently accessible to pension savings. In this respect, pension funds and insurance companies play a key role. It might be noted, incidentally, that the differences between funded systems and pay-as-you-go systems must not be exaggerated. In both cases, the economically active generation generates the output from which the elderly benefit as well. In the extreme case where pension savings were fully invested in central government bonds, an intertemporal pay-as-you-go system would in fact be created, since central government bonds in essence represent claims on future tax revenues. Hence, basically, a funded system differs from a pay-as-you-go system in that capital implies ownership rights over means of production.

The second dimension concerns the *distribution of pension risks* among the stakeholders. This distribution may take various forms, depending on the system chosen. In this respect, the distinction between a DB system and a DC system is often taken as the starting-point. In a pure DB system, the pension benefits are fixed, but contributions can be adjusted to guarantee adequate financing. In a pure DC system, on the other hand, the contributions are, in principle, fixed, but no guarantees are given as to the level of benefits. Hence, in a DB system, the active members and the sponsor company bear a significant proportion of the pension risks, whereas in a DC system these risks are shouldered in full by the members, both active and inactive.

The third dimension relates to solidarity: *individual versus collective arrangements*. Since at the level of the individual there is a high degree of uncertainty about such things as remaining life expectancy, it is often wise to pool this risk into a collective arrangement (principle of diversification, see Box 3.1 in Chapter 3). Moreover, collective pension schemes are a source of welfare gains, because, by spreading windfalls and setbacks among more persons or generations, more stable income and expenditure patterns are created over the lifecycle (see Boender *et al.*, 2000; Cui *et al.*, 2005). One danger that may arise here is the possibility that not all generations may have an equally strong position, so that discontinuity risks could materialise. Thus, in times of adversity, members may tend to shift deficits to future generations (Teulings and de Vries, 2004; Cui *et al.*, 2005; Ambachtsheer, 2005b). Also, young people may decide to terminate pension plan membership when their solidarity with the elderly is severely tested. One means of enhancing the attraction of intergenerational risk- sharing for all cohorts consists of the compulsory holding of additional capital that are passed on to each future generation (Knot and Broeders, 2005). Another means of encouraging collective systems is government intervention. Mandatory participation is an important element of the Dutch system.

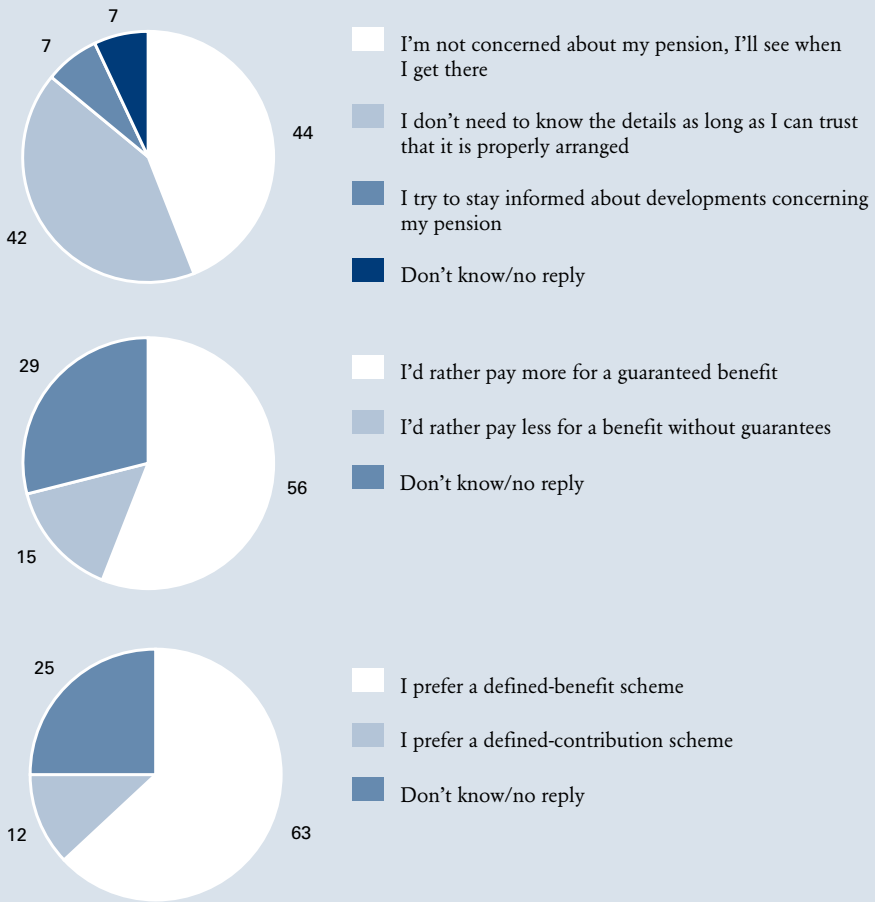
Most pension forms may be characterised fairly well on the basis of these three dimensions, although it stands to reason that in actual practice each and every pension plan has its own specific characteristics. Moreover, different systems may exist side by side. Thus, the Dutch system consists in part of pay-as-you-go (first pillar) and in part of funded systems (second and third pillars); see Chapter 4. Below, a stylised description is given of five types of pension systems, ranging from an individual DC system to a final-pay DB system (see Chart 2.4), and of the manner in which risks are shared among the stakeholders in each of them.[9] One system is not inherently 'better' than another, although in practice it is, of course, essential that a pension system should reflect to the extent possible the preferences of its stakeholders (see Box 2.1).

Box 2.1 How the Dutch view their pension

It is important that pension plans should reflect the preferences of their members. In an attempt to gauge these preferences, De Nederlandsche Bank uses the DNB Household Survey (DHS). In this survey, about 2,000 households are questioned annually about all sorts of financial subjects, such as their savings and investment behaviour, mortgages, home ownership, and old-age pension provisioning. The resulting data are made available for academic research and contribute significantly to an insight into the financial behaviour of Dutch households.

Attitude towards pension

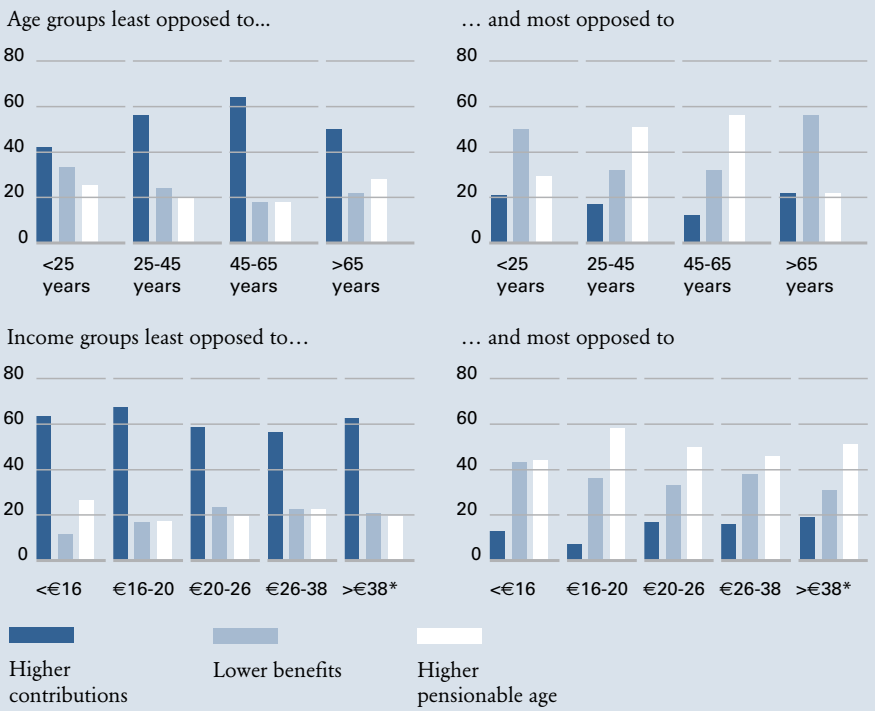
Per cent



Using the DHS results as a basis, various studies have been conducted about households' attitudes towards pensions.[10] These have shown that the Dutch are passive in this regard. Almost half of them do not worry about their old-age pension, adopting a 'we'll see when we get there' attitude. Moreover, the average respondent feels unable to manage his own pension assets and gladly leaves this task to others. This passive attitude is not be regarded as a high degree of risk acceptance. On the contrary, the Dutch greatly value security when it comes to their old-age income. More than half of them are even prepared to pay higher contributions in exchange for guarantees about their pension benefits. In the same vein, the vast majority prefer a DB scheme to a DC scheme. Apparently, people are more easily prepared to pay higher and fluctuating contributions than to accept uncertainty about their pension benefits.

How can we keep the state old-age pension system sustainable financially?

Per cent



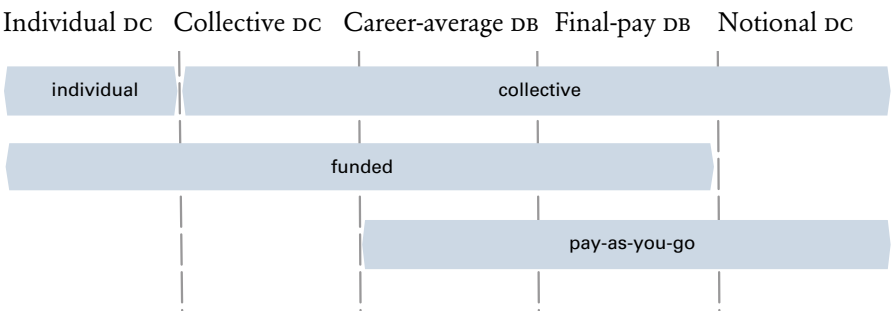
*Net income in thousands

Source: DNB Household Survey (2005).

The preference for benefit security is also clear when respondents are asked to choose the lesser of three evils for ensuring the continued sustainability of the first pillar (state old-age pension): (1) higher contributions; (2) lower benefits, and (3) a higher pensionable age. Increased contributions meet with least opposition, across all age groups and income brackets. People are more opposed to measures affecting the duration or level of pension benefits. Increasing the pensionable age is the least popular measure across all income brackets. Viewed in terms of age groups, this is less categorical: people under 25 and over 65 hold that an increase in pensionable age is a lesser evil than lower benefits. For those who are already enjoying their pension this is understandable, since they can no longer be affected by measures to raise the pensionable age but they would be affected directly by measures to lower pension benefits.

Below, these pension systems are worked out in greater detail and subjected to analysis.

Chart 2.4 Pension systems



1 *Individual DC system*

Under an individual DC system, individuals save for their own pension. This system can be characterised exactly with the aid of the three dimensions discussed above: it is individual and funded, and is purely DC in nature. The system can be administered by an insurance company or a pension fund, but the investment risks during the accrual stage are borne entirely by the individual. In addition, in order to protect any surviving dependants, a term life insurance is mostly taken out during the accrual stage at an insurance company or pension fund. When pensionable age is reached, the total amount accrued is converted into benefits or an annuity.[11] Often, this is a lifetime annuity, so that the individual longevity risk is in fact shifted to an insurance company.

A major advantage offered by an individual DC arrangement is that the contribution can be kept constant as a percentage of earnings. Moreover, the accrued pension is by definition equal to the value of the assets, so that no problems need arise in the

Table 2.2 Distribution of pension risks: individual DC scheme

	Inflation risk	Longevity risk	Investment risk	Discontinuity risk
Before retirement	Individual	Individual	Individual	Individual
After retirement	Individual Insurance company	Individual Insurance company	Individual Insurance company	Individual

event of a pension transfer. On the other hand, there is a relatively high degree of uncertainty about the level of the pension benefits, which depend in full on the contributions paid, the investment return on these contributions and, in the case of conversion into a lifetime annuity, the level of interest rates and life expectancy. Moreover, such an arrangement confronts the elderly with pension risks at a very time – pensionable age – when they are poorly equipped to absorb these risks, given the fact that they have only limited opportunities left for obtaining an income from labour.

Risk-sharing apart, a role is also played by human behaviour. In respect of pension saving, people often do not act in a rational way owing to such factors as a lack of self-control or inertia (Mitchell and Utkus, 2004). For instance, people participating in individual DC plans in the United States prove to be systematically underinsured. They do not save enough to build up an adequate pension and take unnecessary investment risks, for instance by investing in their own employer's stock. Such irrational behaviour provides an argument in favour of paternalism, in such forms as mandatory participation in collective pension schemes.

Another drawback of an individual DC scheme lies in the fact that the costs are in general higher than those of collective arrangements. The annual costs of an individual DC arrangement in the United States are estimated at up to 2.5% of total assets, against 0.4% for collective DC arrangements (Ambachtsheer, 2005a). For the United Kingdom, estimates suggest that the costs of individual DC arrangements average 10 to 20% of contributions, against 5 to 7% for collective arrangements (Blake, 2003). One explanation is that individual DC arrangements do not exploit the opportunities offered by intergenerational risk-sharing. In addition, the high cost level of DC schemes may be ascribed to a principal-agent problem. Because a participant in a DC arrangement (the principal) is not fully aware of the costs incurred by the pension fund or insurance company (the agent), the latter is easily able to skim off part of the investment profits. Finally, the higher cost level may be attributed in part to the often larger number of options offered by DC plans, efforts to raise pension awareness among participants (information costs) and legal costs as a result of possible misselling.

2 *Collective DC system*

Under a collective DC system, members bear the residual risk within the fund, both before and after retirement. In this respect, some reliance may be placed on intra- and intergenerational solidarity. The extent to which this is actually done (for instance, solely between active members and pensioners or also with future generations) depends on the arrangements made. The growth of the pension assets depends on the amount of the contributions and the investment results, which ultimately govern the level of the pension benefits as well. Often, a pension is built up using a career-average system (see below), with the essential characteristic of a collective

Table 2.3 Distribution of pension risks: collective defined-contribution scheme

	Inflation risk	Longevity risk	Investment risk	Discontinuity risk
Before retirement	Members	Members	Members	Individual
After retirement	Members Future members	Members Future members	Members Future members	Individual

DC scheme that contributions are fixed for a certain period. At the time of retirement, that may, on balance, work out favourably or unfavourably. All in all, this system can be characterised less precisely than an individual DC scheme. One essential feature, though, is that the risk run by the sponsor is minimised because any deficits cannot be remedied by raising contributions.

3 Collective career-average DB system

Under a collective career-average system, members save collectively for their old-age pension income, which is paid after retirement in the form of an annuity. The benefits are related to average earnings over the accrual period. This means, among other things, that the early career maker will receive higher pension benefits than

Table 2.4 Distribution of pension risks: career-average defined-benefit scheme

	Inflation risk	Longevity risk	Investment risk	Discontinuity risk
Before retirement	Members	Members Future members Sponsor	Members Future members Sponsor	Individual
After retirement	Members Future members Sponsor	Members Future members Sponsor	Members Future members Sponsor	Individual

someone doing so late, even if they enjoy the same final salary. In principle, this system can be financed either on the basis of pay-as-you-go or by funding.

In the case of setbacks, the pension fund may call on the active members (higher contributions), the employer or sponsor company (occasional lump-sum payment) or future generations (running down assets). Another possibility is to suspend indexation, limiting both pension accrual for active members and benefits for pensioners.[12] The inflation risk is then borne by the members. In better times, backlog indexation may be applied, reducing the risks over a longer period of time. All in all, the potential for intra- and intergenerational risk-sharing is properly exploited. In addition, a higher risk level during pension accrual for active members may be consistent with optimum investment behaviour over the lifecycle (see Bovenberg, 2005).

In the same way as for collective DC plans, arrangements are usually made about the distribution of pension risks among the stakeholders, for instance by means of a policy ladder (see Chapter 3). In this respect, the two systems may show similarities in actual practice. A major difference is that, under a DB plan, the sponsor company may be called upon to remedy deficits by means of an occasional lump-sum payment, whereas under a DC system the risk is fully borne by the members..

4 *Collective final-pay DB system*
Like under a collective career-average DB system, pension benefits under a collective final-pay DB system are based on income before retirement. The principal difference is that in this case the final pay is taken as the basis. Thus, by definition, the full pension accrual until the retirement date is fully wage-index-linked. Notably

Table 2.5 Distribution of pension risks: final-pay defined-benefit scheme

	Inflation risk	Longevity risk	Investment risk	Discontinuity risk
Before retirement	Members Future members Sponsor	Members Future members Sponsor	Members Future members Sponsor	Individual
After retirement	Members Future members Sponsor	Members Future members Sponsor	Members Future members Sponsor	Individual

considerable promotions at the end of a person's working life may lead to considerable increases in the pension burden. These past service (or back service) obligations are shouldered by all active members. This may be viewed as a form of both inter- and intragenerational solidarity or, perhaps more precisely, adverse solidarity. After all, members who reach their career peak early contribute, on balance, to the pension benefits of those reaching their career peak late during their working life.

A final-pay plan offers members security as to their pension benefits, but is less easily controlled financially than a career-average scheme. Moreover, indexation cuts cannot be used during the accrual stage, considerably detracting from this instrument's efficacy compared to a career-average scheme. As a result, it is more likely that active members and the sponsor company may have to be called upon to come to the rescue in the case of setbacks.

5 *Notional DC system*

A notional defined-contribution (NDC) system combines characteristics of a pay-as-you-go system with those of a regular DC system. Pension benefits are financed from current contributions, but each member also builds up notional pension assets. The growth of these notional assets is determined not by the investment results as under a regular DC plan, but by an indexation procedure. In order to keep pension expenditure under control, the system offers possibilities for applying indexation cuts for both active members and pensioners. At the time of retirement, the accrued notional assets are converted into an annuity related to life expectancy at that time. Hence, the longevity risk before retirement is borne by the individual member.

The system has an advantage in that it permits reliance on intra- and intergenerational risk-sharing, while the benefit level is governed by individual elements. This may, for instance, enhance the attraction of postponing retirement, since that carries a reward in the form of higher pension benefits. There is also a drawback in that

Table 2.6 Distribution of pension risks: notional defined-contribution scheme

	Inflation risk	Longevity risk	Investment risk	Discontinuity risk
Before retirement	Members Future members	Individual	Not applicable	Individual
After retirement	Members Future members	Members Future members	Not applicable	Individual

the pay-as-you-go nature may give rise to discontinuity risks. If younger generations are no longer prepared to pay, they may disrupt the system, at the expense of those in or nearing retirement. Another risk inherent in NDC systems is that the indexation procedure might be adjusted gradually under political pressure. This system does not, incidentally, exist in the Netherlands, but it has been introduced in Italy and Sweden, among other countries.

2.3 Macro-economic effects of various system choices

In the preceding section, a description was given of the way in which pension risks may be distributed among the various stakeholders. Pensioners, active members and employers will adjust their behaviour to match these risks. They may do so by cutting down expenditure, putting in higher wage demands or trimming down the pension scheme. Moreover, confidence effects make themselves felt. In this manner, interactions arise between the pension system and the economy.

Notably in respect of DB schemes, it is often noted that pension risks may have disturbing effects on the economy. Because the pension commitment in a DB-system is a given fact, recovery will usually have to be effected through the financing side. In practice, this may lead to an increase in contributions in times of adversity, because in these very times losses may be incurred on investments. In such a situation, pension fund behaviour is procyclical, adding to the business cycle fluctuations. Under a DC system, such adjustments are not necessary because setbacks directly affect the accrued pension rights. This does not alter the fact, though, that DC schemes may also have procyclical effects in that members may seek to offset pension asset losses by saving more and spending less. Under both DB and DC systems, procyclical effects can be limited by controlling pension risks.[13]

The labour market is another conduit for interactions between pension funds and the economy. In the Netherlands, pension commitments usually constitute a standard element of contracts of employment. This means that, when an employee changes jobs or when a company merges or is taken over, accrued pension rights are transferred. If, at the time of such a transfer, the investments do not match the accrued pension rights, labour mobility is hampered.

The interactions between the pension sector and the economy are complex. In order to gain a measure of insight, Westerhout *et al.* (2004) have analysed the effects of three recovery strategies for a career-average system: reducing deficits by (1) raising contributions only; (2) putting an end to indexation, and (3) lowering the ambition level of pension commitments. Their results are presented in Box 2.2. It is worthy of note that an increase in contributions in particular has negative effects on the economy, given its influence on employment and public finances. This con-

Box 2.2 Macro-economic consequences of pension fund recovery strategies

Westerhout *et al.* (2004) have analysed the economic consequences of pension fund recovery strategies, using a dynamic general equilibrium model. The analysis is based on a pension sector having an investment portfolio consisting of equities and bonds (each accounting for fifty per cent). The initial nominal funding ratio is 115%, while the aim is 150% in order to permit full realisation of the indexation ambition. The calculations assume a recovery period of 35 years.[14]

Three recovery strategies are examined: (1) reducing deficits by raising contributions only; (2) putting an end to indexation, and (3) lowering the ambition level of pension commitments from 70 to 60% of indexed career-average pay. The results are summarised in the Table below.

Economic effects of pension reserve recovery strategiess
Deviations from baseline projection

	2010	2015	2025	2050
Increase in contributions				
contributions paid (% of wage bill)	8.4	7.4	3.5	-1.3
benefits (% of wage bill)	1.3	2.4	3.8	2.6
employment (man-years)	-1.0	-1.2	-0.8	0.2
public debt (% of GDP)	2.9	6.7	13.5	12.3
End to indexation				
contributions paid (% of wage bill)	-2.6	-6.4	-10.6	-2.0
benefits (% of wage bill)	-0.1	-1.0	-3.7	-7.7
employment (man-years)	-1.5	-0.7	0.6	0.0
public debt (% of GDP)	0.7	-0.4	-8.7	-24.3
Lower pension commitments				
contributions paid (% of wage bill)	-0.2	-0.9	-2.1	-2.2
benefits (% of wage bill)	0.0	0.0	-0.3	-2.2
employment (man-years)	-0.5	-0.4	-0.2	-0.2
public debt (% of GDP)	0.3	0.3	-1.0	-7.4

Source: Westerhout *et al.* (2004).

trasts with the effects of an indexation cut, which leads to a more balanced distribution of the burden between active members and pensioners.

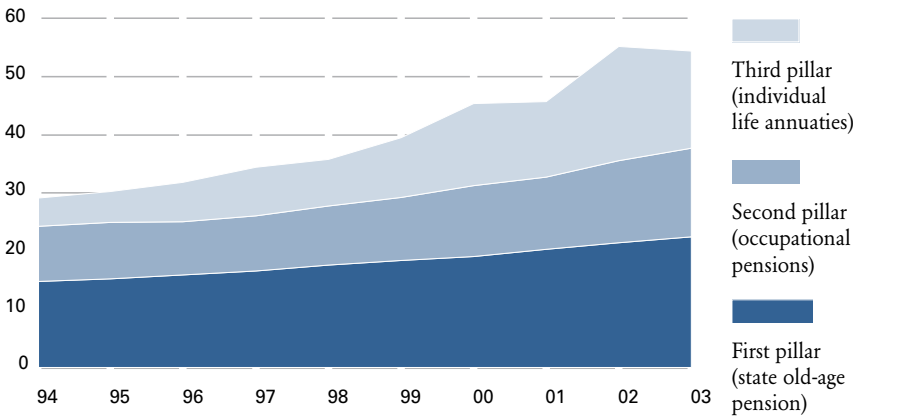
2.4 The Dutch system

The Dutch pension system may be characterised in terms of the usual three pillars. The first pillar is constituted by the state old-age pension, which is financed on a pay-as-you-go basis and provides for a basic income for all citizens of 65 and over. For singles, the gross benefit is € 948.21 a month. For couples, if both partners are 65 or over, the gross income for each partner is € 650.78 a month (both amounts exclude holiday allowance; for the most recent amounts, see www. svb.nl). It should be noted, however, that these amounts are only paid if a person has uninterruptedly lived in the Netherlands from the age of 16 onwards. Hence, many immigrants who came to the country at a later age receive less than the full pension when they become 65, even if they have contributed throughout their stay in the Netherlands.

The second pillar is constituted by the occupational pension, which is primarily financed by means of funding.[15] The third pillar consists of private saving for retirement, which is also funded. This covers tax-favoured pension saving, such as life annuities. Finally, other private savings may also be used as retirement pensions at the individual level (these are sometimes denoted as the fourth pillar). Chart 3.5 gives an impression of the relative importance of the three pillars, on the basis of the benefits paid per annum.[16] The burden is spread in a fairly balanced manner,

Chart 2.5 Size of pension pillars in the Netherlands

Benefits per annum (EUR billion)



Sources: Statistics Netherlands, DNB.

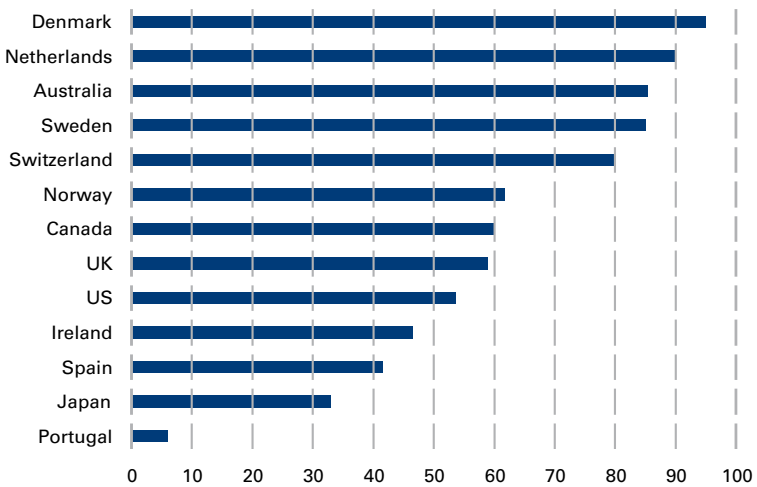
although the shares of the second and notably the third pillar have increased over the past ten years. This points to an increasing significance of funding.

For most employees, participation in a pension plan is automatically linked to the contract of employment, under which the employer usually pays the bulk of the contributions. This participation by employees under their contract of employment is known as the 'employment-related mandatory participation' (see the glossary). In actual reality, it is more important for the achievement of a collective system than the so-termed 'legal mandatory participation', under which companies in certain industries are, in principle, obliged to take part in an industry-wide pension fund.

The bulk of the accrued assets is administered by pension funds. They usually have the legal form of a foundation and are governed by representatives of employers and employees. A limited proportion of the pension assets under the second pillar is accounted for by so-termed direct schemes. Instead of being administered by pension funds, they have been outsourced by employers to insurance companies.[17] Viewed internationally, the second pillar is substantial in the Netherlands. That goes not only for total assets (Table 1.1), but also for the participation rate, which is close to 100% (Chart 2.6).

Chart 2.6 Participation rates in funded second pillar in various countries

Participation as percentage of the number of employees.
The figures relate to the year 2000.



Source: OECD (2004).

The second pillar serves to supplement the first. Hence, in pension accrual, account is taken of a basic benefit, known as the pension offset. This offset is not equal across all pension plans. Thus, the offset may be a fixed amount that is indexed annually or it may be an amount equal to the state old-age pension for a single or non-single person. The supplementary pension is built up on the basis of pensionable earnings, that is, income from labour less the offset. If, under a final-pay system, we assume an annual accrual rate of 1.75% of pensionable earnings, the result after forty years of service is a pension equal to 70% of final salary.[18] Under a contingently indexed career-average scheme, higher accrual rates are mostly used, of up to more than 2% (see Chart 4.7 in Chapter 4). At the end of 2005, the assets held by pension funds totalled € 635 billion. The level of benefits under the second pillar was over 4% of GDP and is expected to increase to almost 13% in 2040 (Van Ewijk *et al.*, 2000).

A number of key figures are summarised in Table 2.7. Pension funds may be linked to a single company or to an entire industry. Most employees take part in industry-wide pension funds, and only some 14% are members of a company pension fund.[19] The funds operate a broad range of pension plans. Currently, the most usual among them are DB arrangements based on contingently indexed career-average pay. In over half of all cases, indexation is based on wage growth, usually those in the industry concerned. For over 20% of pension plan members, pension accrual is linked to the movements in the general level of consumer prices.

Table 2.7 Pension fund key figures

Percentages of active members, 2004

Type of pension fund		Type of scheme		Benchmark for indexation	
Industry-wide funds	84.9	Defined benefit	96.7	Overall wage movements	9.8
Company funds	14.4	*Career-average plus indexation*	*79.3*	Industry-wide wage movements	46.8
Other	0.7	*Modified final pay*	*11.0*	Company wage movements	1.3
		Pure final pay	*1.5*	Overall price movements	20.3
		Defined contribution	3.2	Periodic board decision	10.8
		Mixed	8.9	Other	11.0
		Other	1.3		
	100		100		100

Source: DNB.

Distribution of pension risks
The Dutch system is well-developed, especially compared to systems in other countries. The burden has been spread fairly equally among the three pillars, which are, moreover, financed in different ways. This form of diversification contributes to the system's resistance to shocks. The first and the second pillar are collective in nature and are, hence, able to exploit the opportunities offered by inter- and intergenerational risk-sharing. Thus, pension risks are spread among large numbers of persons, reducing the individual longevity risk to virtually nil.

An important issue regarding collective pension schemes is the risk of discontinuity. The state old-age pension in particular, seeing as it is financed by a pay-as-you-go system, depends on the willingness of younger generations to continue to provide the requisite finance. This solidarity is not a matter of course under all circumstances (see Box 5.1 in Chapter 5).[20] Even in the case of DB schemes it must be, in principle, attractive throughout for new entrants to join. Moreover, in the event of DB schemes the discontinuity risk may materialise when the sponsor company is adjudicated bankrupt or when pensions are transferred between pension funds. The latter is a consequence of job changes, mergers or acquisitions. Considering the prospect of potentially substantial sectoral shifts within the Dutch economy (see Chapter 5), this risk would appear to gain relevance in the coming decades.

3 Pension finance and integral risk management

Depending on the design of the pension system, the four pension risks described in Chapter 2 (inflation risk, investment risk, longevity risk and discontinuity risk) are shared in various ways by the stakeholders. This Chapter views the issues from the perspective of a single pension fund. A fund's objective is to implement the pension scheme as agreed between employers and employees in the context of the conditions of employment. The pension fund's key tasks centre on administration, contribution policy and investment policy. Under the new Dutch Pensions Act, responsibility for formulating and realising the indexation ambition is also vested in the pension fund. This Chapter deals successively with the cost of pensions, pension fund liabilities, pension fund investments and integral risk management on the basis of Asset and Liability Management (ALM), reflecting Dutch institutional practice. Subsequently, a number of considerations are reviewed which play a role in pension fund investments in equities. The last section briefly outlines recent developments in the area of accounting standards.

3.1 The cost of pensions

A pension is an arrangement seeking to ensure the continuation of the same standard of living once income from labour ceases. The expected proportion of gross income just after to that just before retirement in the Netherlands is typically about 70% (see Van Soest *et al.*, 2006). On the basis of this replacement rate and subject to certain assumptions, the capital that is required to purchase the pension can be computed. This lump sum is in effect the amount which a subject must have at his free disposal when reaching the age of 65 in order to be able to live the rest of his life in the manner to which he is accustomed. This amount of capital can be used as a basis to compute the amount that must be saved annually. In essence, this is a simple way of approximating the cost of an old-age pension, expressed, for instance, as a (fixed) percentage of earnings.

The required lump sum depends on various factors, such as the final salary or the career-average salary, the pension promise, the state old-age pension, life expectancy, the indexation ambition and current market interest rates. Suppose, for example, that a subject's final salary is € 60,000. At a replacement rate of 70%, the gross

pension is € 42,000 during the first year of retirement. Part of this amount is accounted for by the state old-age pension, which totals about € 8,250 a year for non-singles, including holiday allowance. The difference of € 33,750 is required each year in order to achieve the stated annual income. At a remaining life expectancy of 20 years and market interest rates as they stood at end-June 2006, the lump sum would be about € 450,000, being the present value of 20 times an amount of € 33,750. Together with the state old-age pension, the subject is thus assured of an annual gross income of € 42,000 for the coming 20 years. In this calculation, no allowance has been made for a possible link of the state old-age pension or the retirement benefit to wage growth or inflation. If such a link were taken into account and pension income were, for instance, to be raised annually by 2%, the required lump sum would be about € 530,000. Hence, this 2% indexation leads to a lump sum that is 18% higher than that for the nominal pension.[21]

Let us now see what our subject would have to set aside annually as a percentage of his earnings in order to accrue this required capital. It is assumed that our subject has a smooth career path, with a salary increasing from € 20,000 in the first to € 60,000 in the fortieth year of service. On the basis of an average risk-free interest rate of 4.3% a year, the fixed contribution percentage comes out at 13.6% per annum. The risk-free interest rate has been derived from the term structure of interest rates as at the end of June 2006.

Table 3.1 shows the results of a sensitivity analysis of the contribution percentage for three different career paths, indexation ambitions and risk-free returns. The average contribution percentage in the Table is 13% of earnings, with a variation ranging from 7 to 22%. At a low level of earnings, the amount to be saved is relatively less, since in that case a large proportion of pension income is accounted for by the state old-age pension. The figures in the Table also show that an indexation level after retirement which is on average 1 percentage point up requires a 1 percentage point higher contribution during the accrual stage. Here, the variation ranges from 0.5 to 1.5 percentage points. In addition, a higher level of interest rates leads to a lower contribution percentage, and conversely. In this example, a 1 percentage point lower interest rate requires a 4 percentage point higher contribution, with a variation ranging from 2 to 6 percentage points. For more information, the reader is referred to the simulations described in Chapter 5.

The figures shown in the Table only concern the old-age pension.[22] If a spouse's pension is to be built up at the same time, the percentages roughly come out one-third higher. Likewise, the Table does not allow for operational costs, such as costs of administration and those of the investment operation. At pension funds, there is considerable potential for economies of scale in this regard. This is analysed in Bikker and De Dreu (2006). Table 3.2 provides an overview of these costs for various size classes.

Table 3.1 Sensitivity analysis pension contributions

Contribution as a fixed percentage of salary required for pension benefits equalling 70% of final pay
Per cent

Initial – final salary (EUR)		30,000-90,000			
Indexation ambition		0	1	2	3
Average interest rate	3.3	17.5%	18.8%	20.2%	21.8%
	4.3	12.7%	13.6%	14.7%	15.8%
	5.3	9.5%	10.2%	11.0%	11.8%
Initial – final salary (EUR)		20,000-60,000			
Indexation ambition		0	1	2	3
Average interest rate	3.3	16.1%	17.4%	18.7%	20.2%
	4.3	11.8%	12.6%	13.6%	14.6%
	5.3	8.8%	9.4%	10.1%	10.9%
Initial – final salary (EUR)		10,000-30,000			
Indexation ambition		0	1	2	3
Average interest rate	3.3	12.2%	13.1%	14.1%	15.2%
	4.3	8.9%	9.5%	10.2%	11.0%
	5.3	6.7%	7.1%	7.7%	8.2%

The costs of administration average some 0.15% of investments or € 48 per member per year. Across the board, the costs of investment come to 0.10% of investments. In other words, a pension plan member pays an average of € 31 a year for a widely diversified, professionally administered investment portfolio. For small pension funds, these figures are considerably higher in relative terms than for large funds. This section has made clear that, during their working life, pension fund members must save considerable amounts in order to build up an adequate pension. In the light of the long duration of the pension contract, it is essential that the pension fund should operate in a cost-efficient manner.

Table 3.2 Costs of administration and investment, by size class[1]

Number of active members, dormant members and pensioners	Costs of administration as percentage of investments	Costs of administration per member per year (EUR)	Costs of investment as percentage of investments	Costs of investment per member per year (EUR)
<100	0.59	927	0.13	270
100-1,000	0.46	302	0.14	101
1,000-10,000	0.23	156	0.14	97
10,000-100,000	0.17	86	0.11	45
100,000 – 1 million	0.24	28	0.13	13
More than 1 million	0.07	33	0.08	39
Average	0.15	48	0.10	31

Source: Bikker en de Dreu (2006).

1 The data shown the Table may underestimate reality, because not all pension funds report their actual costs.

3.2 Pension fund liabilities

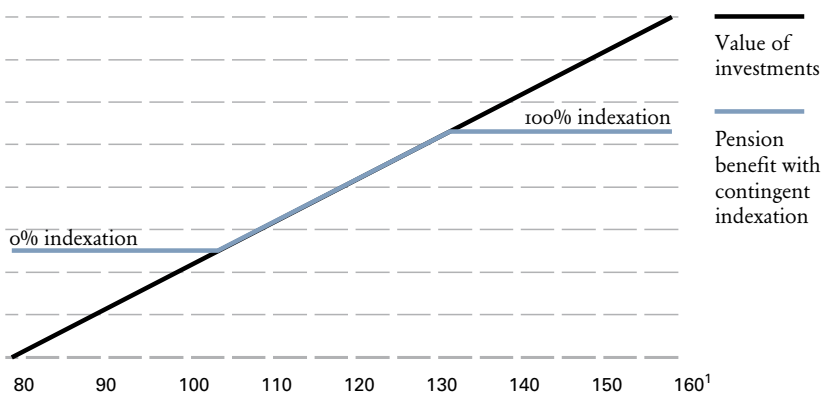
With the receipt of contributions, a pension fund incurs liabilities. The Dutch Pensions Act makes a distinction between guaranteed and contingent elements of the pension deal (Ministry of Social Affairs and Employment, 2003). The guaranteed liabilities are usually expressed in nominal terms and are, for instance, linked to earnings, years of service and the pension offset. Typical of contingent liabilities is the fact that their actual fulfilment depends on a future decision to be taken by the pension fund. Often, this concerns indexation or cost-of-living adjustment. For an assessment of the financial position and risk exposure, it is important that a realistic insight be obtained into the amount of the pension obligations.

Determining the marked-to-market value of pension liabilities involves the implicit assumption that there is a market for such liabilities (see Annex B). This assumption is not unreasonable. Owing to the increased discontinuity of pension accrual and the attendant pension transfers between pension funds, there is a growing need for a marked-to-market valuation of pension liabilities. In the absence of arbitrage, the marked-to-market value of pension liabilities equals the market value of the replicating investment portfolio (see Box 3.1 and Knot and Broeders, 2005), being the investment portfolio that generates the same cash flows under all circumstances. The replicating portfolio for *guaranteed nominal* pension liabilities is that constituted by fixed-rate investments that involve no or minimal credit risk, such as government bonds and interest rate swaps. The same line of reasoning can be used for

a *guaranteed real* pension benefit. The replicating portfolio of indexed liabilities is constituted by index-linked bonds. These are (government) bonds or inflation swaps where the coupon rate and/or the principal is adjusted periodically to reflect actual inflation. In theory, the marked-to-market value of contingently indexed liabilities is determined in the same way, that is, using the replicating investment portfolio, the contingency being proxied by a series of financial options. In this respect, numerous possibilities are conceivable. Chart 3.1 shows an example of a so-termed policy ladder. Under such a decision rule, the level of indexation is linked to the funding ratio. At funding levels in excess of the minimum required capital of about 5% of the provision, the degree of indexation may be raised in line with the funding ratio until full indexation has been achieved. In practice, agreements may also be made about backlog indexation, that is, offsetting past indexation cuts by additional indexation when conditions are more favourable.

In actual practice, the indexation commitment often cannot be modelled in such a simple way. The fact is that the periodic indexation is a discretionary power of the pension fund board, and may be influenced by a large number of considerations and indicators. Hence, in practice there is no requirement for the valuation of the contingent claims of the pension contract. Still, a pension fund must ensure consistency between the expectations raised, the level of financing achieved and the actual indexation granted. For more information about the prudential supervision of pension funds, the reader is referred to Box 3.2.

Chart 3.1 Pension benefit with contingent indexation



1 Funding ratio in %.

Box 3.1 Basic principles in pension finance

Diversification principle
Diversification is among the principal justifications for the existence of pension funds. Each and every individual is uncertain about his remaining life expectancy after retirement. This stochastic mortality risk may be diversified: when individual pension contracts are pooled, the risk averages out. This may be compared to playing dice. If you throw just a few times, the average score will be somewhere between 1 and 6. The more you do it, the more will the average be near 3.5. In terms of pension accrual, the diversification principle implies that, when you are alone, you have to save much to cover the risk that your might become very old, whereas, if you are with many, you just have to save an amount in line with average life expectancy.

Another well-known example of diversification relates to investment portfolios. Each investment in e.g. each company carries its own specific risk. Including different equities in a portfolio causes the specific risks to cancel each other out. Hence, one general feature of diversification is that risks are reduced by including large numbers of different investments or policy-holders in the portfolio. Risk reduction by means of diversification is simple and can be achieved at very low cost. However, not all risks average out. Such non-diversifiable risks are additive, so that large numbers of members or policy-holders do not give rise to a lower risk. One example of such a risk is the uncertainty about the longevity risk for the insured population. If this is under- or overestimated, the entire portfolio is affected.

Replication principle
Valuation of liabilities using the replication principle is another major point of departure for pension funds. Ideally, the market value of liabilities is determined in a liquid and well-ordered market. In the event of, for instance, pension transfers between pension funds or when companies merge, are taken over or are split up, accrued pension rights are 'traded' and a market price is established. Marking-to-market is also possible on the basis of the replication principle. Thus, in a world without arbitrage opportunities, the marked-to-market value of a pension liability equals the market price of that investment portfolio that generates exactly the required cash flows under all future states of the world.

The law of one price
The third starting-point is the law of one price. One euro is one euro, irrespective of whether it has been invested in equities or government bonds. Phrased differently, the risk-adjusted expected return of all possible investments is equal to the risk-free interest rate. Investors are risk-averse, meaning that for an uncertain outcome they will pay less than for a certain outcome. Hence, a bond issued by

a private sector company has a lower market price than an otherwise identical bond issued by the Dutch government. In the pension fund context, this implies that the market value of the assets in the fund does not change if a different investment mix is chosen. The risk-sharing, however, does change. For instance, by opting for investment in categories with high expected returns, the probability of indexation goes up but so does the probability of underfunding with all the consequences that this entails.

Other possibilities for risk reduction
In addition to diversification, as outlined above, there are more ways of reducing risks. Insurance is accomplished by paying a certain amount (the insurance premium), transferring certain risks to a third party. A pension fund, may, for instance, transfer the actuarial risks to a reinsurance company by paying a market-based premium. Hedging is achieved by taking an opposite economic position. A pension fund holding short-term fixed-rate investments may convert them into long-term fixed-rate investments using an interest rate swap. To that end, the fund agrees with a counterparty to pay the short-term rate for a certain principal in exchange for the long-term interest rate.

3.3 Pension fund investments

Now that the nature and volume of pension liabilities have been highlighted in the previous section, we may turn to pension fund investments. Investment policy is among the responsibilities of the pension fund board. This section seeks to describe current practice and recent insights. Also in respect of investments, the starting-point is a realistic valuation. In many cases the market value can be observed directly when investments are traded on a regular market. In the absence of such a market value (for instance, for real estate or private equity), estimates are used based on comparable products for which market data are available. If the latter are also lacking, model-based valuation is applied (for instance, for specific over-the-counter options contracts). Such an approach is underlain by the principles discussed earlier, such as replication and the absence of arbitrage.

Aside from valuation, the investment mix is an important factor. The diversification principle is among the golden rules of investment (see Box 3.1). At a given level of expected return, it is possible to minimise an investment portfolio's risk. Diversification is feasible because a decrease in value for one asset category or specific asset is offset by a lower decrease in value or even an increase in value for another. When composing the portfolio, potential investments are thus assessed in terms of their interrelationship and in the light of the nature and volume of the pension fund's liabilities. If financial markets operate efficiently, it is not possible to pur-

chase an asset with a higher return relative to comparable assets while carrying a lower degree of risk. If such an asset were to exist, many investors would wish to buy it, causing its price to go up and its return to go down.

The willingness to accept risk constitutes the basis for the choice of assets. Risk is often viewed in terms of the volatility of expected return and especially in relation to a risk-free investment: what is the probability and extent of a lower than risk-free return? Historically, equities are marked by higher returns but also by higher levels of volatility, as discussed in more detail in section 3.4. Bonds are generally characterized by a low risk profile, but also by an attendant relatively low level of return. On the other hand, a portfolio of bonds provides a fair match for the characteristics of the nominal pension liabilities, which are, after all, valued as if they were a nominal bond.

A frequently used procedure for quantifying risk consists of determining the amount of money that is lost if the return is negative by a number of standard deviations (the so-termed Value at Risk). For instance, one may take a negative return of two standard deviations, on the assumption that returns are distributed normally. However, the outcomes often underestimate actual risk, since extreme outcomes are more frequent in the financial markets than would be expected on the basis of a normal distribution. Another factor is that extremely negative returns are more frequent than extremely positive returns. Apart from bonds and equities, there are also other investment categories, such as real estate, private equity, commodities and hedge funds, each of which has specific features as regards historical returns, volatility and interdependence. For a description of a number of investment possibilities, the reader is referred to Annex C.

3.4 Integral risk management based on Asset and Liability Management

As already noted in passing, a modern pension fund assesses its overall risk in terms of the characteristics and coherence of the assets and the liabilities on its balance sheet. This process is known as Asset and Liability Management (ALM) and has now been relied on for some twenty years by pension funds and insurance companies. Under ALM, the liabilities constitute an integral element of an institution's financial structure. In recent years, changes in disclosure and regulation have increasingly highlighted the significance of pensions funds' overall risk profile, underscoring the role of ALM. Another term that is used to indicate the focus on liabilities in the choice of assets is 'Liability Driven Investment' (LDI).[23]

In the event of DB commitments, as they predominate in the Netherlands, a major role is played by interest rate risk. In practice, many pension funds prove to encounter a degree of mismatch between the – usually very long – maturities of their liabilities and those of their fixed-rate investments. The market value of pension liabili-

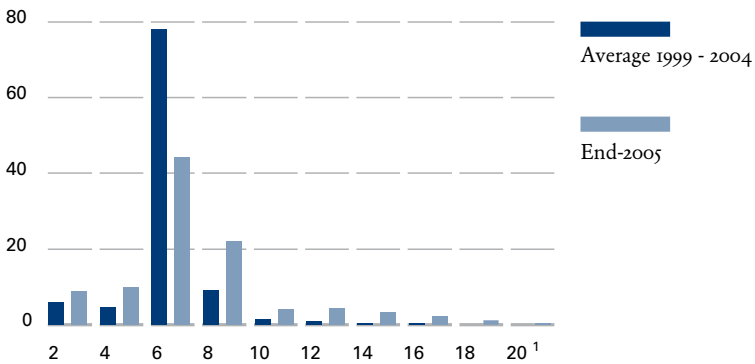
ties is strongly influenced by movements in long-term interest rates. The assets of many pension funds include a large proportion of bonds, which are less sensitive to movements in interest rates. This maturity mismatch is sometimes referred to as the duration gap and can be mapped by means of an ALM study. The duration gap can be reduced in various ways: duration matching, duration and convexity matching and cash-flow matching. The last is the most accurate method, under which for each period the estimated cash flows arising from the liabilities are matched to the extent possible with those generated by the assets. In most cases, bonds are used for this purpose as well as swaps for longer maturities. Chart 3.2 shows that, at the end of 2005, a number of pension funds had increased the duration of their fixed-rate investments compared to the situation in the period 1999-2004.

The interest rate risk as outlined above relates to the nominal pension liabilities. However, in addition to these nominal obligations, most pension funds have an ambition to ensure that liabilities are indexed. It was already noted earlier that in practically all cases indexation is optional rather than guaranteed. Depending on the financial position, indexation is effected to a larger or lesser extent. For the pension plan members this contingent indexation claim is, however, of major significance, since inflation erodes the saved capital. Pension funds finance their indexation ambition from contributions, the formation of financial buffers and the return earned on their investments. One important condition that is imposed by the Pensions Act is that there should be consistency between the expectations raised, the financing and the actual indexation granted (see Box 3.2).

One way of directly hedging the inflation risks inherent in the liabilities is to invest in assets that afford protection from inflation shocks, such as index-linked loans. In

Chart 3.2 Frequency distribution duration

Frequency in %



Source: DNB.

1 Duration in years.

addition, in recent years inflation swaps have been developed while banks offer inflation-linked structured products – tailor-made financial constructions reducing inflation risk. Often, pension funds also seek to finance indexation by investing part of their portfolio in equities, on the assumption of a long-run relationship between the valuation of equities, inflation and productivity growth within the economy.

3.5 **Pros and cons of pension fund investments in equities**

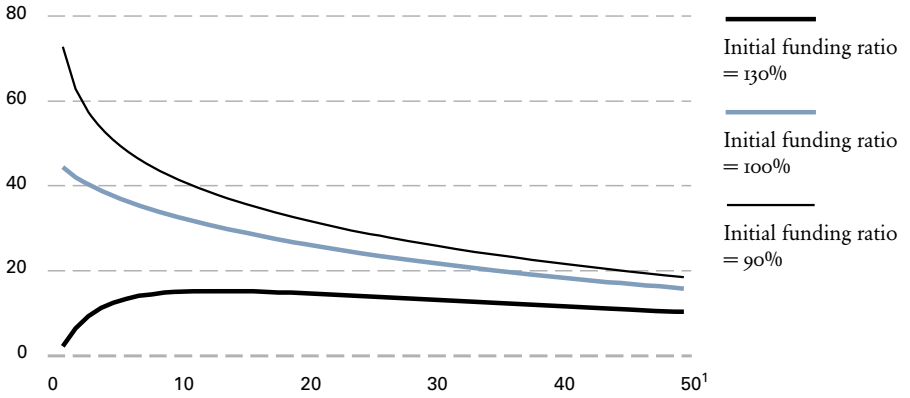
On average, Dutch pension funds invest 48% of their portfolios in equities and 47% in fixed-rate assets (see Chart 4.3). In other countries, the portfolio composition is often quite different. DB pension funds in the United Kingdom, for instance, traditionally invest to a much larger extent in equities. This optimum asset allocation problem is the subject of an intensive academic debate about the pros and cons of investing in equities by pension funds with DB liabilities. The discussion seems to centre on the assessment of the risk and return of equity investments in the long run.

Advocates of equities (Siegel, 1998, and Campbell and Viceira, 2002, among others) in the investment portfolio refer to the expected higher returns on equities. As a reward for the additional risk, investors require additional return in the form of the equity risk premium. Apart from a higher expected return, equity investments offer another advantage in that the risk of a loss being incurred on an equity portfolio decreases as the investment horizon increases. This is known as the time diversification effect and is depicted in Chart 3.3 in the context of a pension fund where the investment portfolio consists of equities to the extent of about one-half. The probability of underfunding decreases in the long run, even if, depending on the initial funding ratio, it still varies between 15 and 30% for a period of 20 years.[24]

Both the expected additional return and the time diversification effect are arguments advanced by long-term investors to underpin their choice in favour of equity investments. Often, they add the assumption that equity returns are mean-reverting, meaning that periods of disappointing returns are followed by periods of above-average returns, and vice versa. This ensues from the assumption that investors have a natural tendency to exaggerate price movements in a positive as well as a negative sense. A long-term investor benefits because the bandwidth of potential outcomes is smaller than in a world without mean reversion. A subsequent argument is more economic in nature. The value of equities is governed by a company's discounted future dividends. These dividends, in turn, depend on profits. On average, these profits are a fairly stable component of gross national product. In the long run, profits and, hence, equity prices go up in line with the growth of the economy. A pension fund's real liabilities are determined by the movements in wages and infla-

Chart 3.3 Probability of underfunding

In per cent



1 Maturity in years.

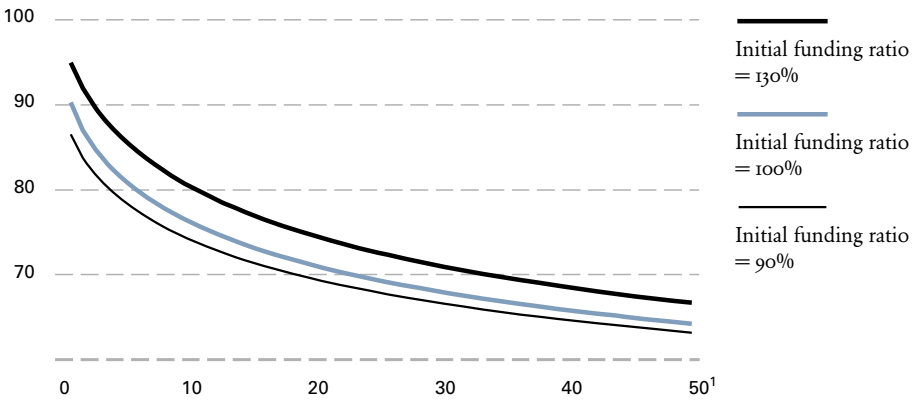
tion. If equity prices move in line with nominal economic developments, they are an – admittedly imperfect – hedge against both the movements in inflation and the productivity growth which may trigger wage increases.

The critics rely on a number of counter-arguments, including the following. It is true that expected return on equities is higher than on bonds, otherwise investors would not be prepared to accept the risk. None the less, there have also been prolonged periods in history, mostly years of sustained economic depression, during which equities returned less, on balance, than bonds. In addition, on the basis of economic theory, the risk-adjusted return is equal for all investments (see Box 3.1). Phrased differently, investing in equities or mismatch risk does not in itself create value for the pension fund, but makes for a different risk profile for the stakeholders (see Siegelaer, 2003). The expected higher return is attended by a higher probability of indexation, but also by a higher probability of future increases in contributions.

In line with the time diversification effect, an increasing investment horizon is attended by a decreasing probability that the return on equities will fall short of the growth of liabilities. In this context, it is assumed that the liabilities increase annually by the risk-free, nominal rate of interest. However, this risk of underfunding is not negligible and, from the perspective of risk management, it is essential that the amount of a conditional loss is estimated. After all, a prolonged presence in the equity market also involves a realistic possibility that the investor will have to weather a recession, a crash or a period of deflation. Hence, the amount of the (conditional) loss increases with time. This is shown in Chart 3.4, which depicts the expected funding ratio in the event of pension fund underfunding. This condi-

Chart 3.4 Expected funding ratio in the event of underfunding

In per cent



1 Maturity in years.

tional degree of underfunding increases with the time horizon. This may be accounted for by the fact that, with a longer horizon, the possibility of sharply negative outliers increases.

The conclusion in the literature about the mean reversion of equity returns is not unambiguous. Some researchers do find (significant) negative autocorrelation over a horizon of several years. However, this is often accounted for by the specific measurement period and by the presence of measurement errors due to a small sample bias. Even if it exists, mean reversion is not a valid argument, at least that is what Bodie (1995) concludes on the basis of option valuation theory. If it is assumed that in the longer run equities are less risky, that implies that the premium for insurance against underfunding decreases with time. However, Bodie shows that the opposite is true. The longer the maturity, the higher the value of a put option affording protection from underfunding. Here, too, there is the background notion that a longer maturity involves more uncertainty and, hence, a higher premium for insurance against undesired outcomes. Bodie's reasoning is based on options theory, such as that of Black-Scholes-Merton. This theory has a special feature in that it is underlain by risk-neutral or arbitrage-free valuation, meaning that the value of an option is independent of the stochastic process of the expected return on the underlying asset. Therefore, the time-increasing insurance premium also holds when equity returns do show characteristics of mean reversion. It should be noted, incidentally, that there is no liquid market for options contracts with very long maturities and, hence, that there is no efficient price determination process permitting the validity of this theoretical analysis to be assessed. Finally, there is the alleged interrelationship between equity returns and inflation, which is by no means a

settled matter. Notably the 1970s, a period of marked inflation, were one of the worst decades in terms of equity returns.

Pension funds are free to choose their investments (the prudent person principle).[25] However, under the Dutch system of funding (see Box 3.2), the risk incurred by the fund must be in proportion to the available financial reserves. With a view to achieving its indexation ambition, the pension fund may allocate its risk budget to investments which it expects to produce the highest returns. There is a complication, though, in that the pension fund's ambition is expressed in real terms, whereas the constraints are expressed in nominal terms. Only at very low funding ratios does the nominal restriction become binding. In this context, some authors refer to a 'solvency trap', meaning that, at a very low funding ratio, a pension fund with DB liabilities is no longer able to undertake risk-bearing investments. In such a situation, it is not a matter of course for the nominal pension rights to be put at risk with a view to achieving the real objective. This will depend on such factors as the sponsor company's ability and willingness to cover any new losses. In the absence of such an option, the incurrence of high risk levels at low funding ratios, is a variant of what is known in the academic literature as 'gambling for resurrection' or a 'go for broke strategy'. Here, there is moral hazard in the form of a possible ultimate government bail-out (Sijben, 2003). In all these respects, pension issues are difficult and complicated and require that a course be steered in between an excessive focus on short-term security, on the one hand, and the danger of structural underfunding, on the other.

3.6 International Financial Reporting Standards (IFRS)

Changes in the accounting field also affect the Dutch pension arrangements. Notably the introduction of IAS 19 about employee benefits has had an effect on companies which must apply the IFRS, because it relates to the financial consequences of the pension commitment. In the Netherlands, companies have to comply with RJ 271, which is similar to IAS 19.[26]

The basic principle underlying IAS 19 is that the cost of providing employee benefits should be recognised in the period in which the benefit is earned by the employee. In this respect, IAS 19 distinguishes strictly between DC and DB schemes. A DC scheme involves the periodic payment of contributions, which are recognised in the profit and loss account. For the company, that is all there is to it, since the pension risks are borne entirely by the employees. Matters are more complicated under a DB scheme, which involve pension commitments. During the prolonged period between the points in time when the benefits are earned and when they are paid, pension risk may arise. In addition, using a going-concern approach, IAS 19 allows for future salary increases, meaning that the amount of the pension liabilities is

Box 3.2 Prudential supervision of pension funds

The administration of pension capital is to high degree a matter of trust, comparable with, for instance, the pharmaceutical business. Hence, supervision is indispensable for the protection of consumers. 'A promise is a promise' is a major principle underlying pension arrangements. The pension plan members must be able to trust that their interests will not be harmed by ill-considered decisions taken by the pension fund governors. This is all the more important because participation in a pension plan is linked to the contract of employment and is, hence, in fact mandatory. Thus, the costs of leaving the plan are high: one has to change jobs in order to leave the plan. And, once retired, one does not even have that option any more.

De Nederlandsche Bank exercises prudential supervision over banks, insurance companies and pension funds. All three types of institution typically work with risk arrangements and financial contracts with variable maturities. Because of their participation in the payments system, banks are marked by a high degree of systemic risk, which is limited for the other two categories. For that reason, depositors at banks are offered additional protection in many countries in the form of a deposit guarantee scheme. The difference between pension funds and (life) insurance companies is smaller, though still essential. Pension funds can exploit the potential of intergenerational risk-sharing, whereas insurance companies cannot. The basis for this solidarity is constituted by mandatory participation in pension schemes. The older generations need the younger, and conversely. The elderly use the young as a safety net if need be, while the young benefit from the wealth of the elderly.

Solvency supervision
Consumer protection in the financial sector is traditionally aimed at: (i) defining, (ii) overseeing, and (iii) enforcing minimum requirements as to the solvency of the supervised institutions. After all, if an institution has considerable free capital, it is able to absorb setbacks. In the absence of adequate reserves, institutions run the risk of failure and stakeholders may consequently see their claims and rights evaporate into thin air. Pension fund supervision centres on the continuity of the pension entitlements. That raises the question as to when this continuity is endangered. One could argue that, for as long as a pension plan attracts new members, there is a safety net guaranteeing the benefits for the elderly. This argument relies on the assumption that it must be attractive for younger people to take part in the pension system. If younger generations have to pay disproportionately more than the amount required for the accrual of their own pensions, that is no longer automatically so. In that event, intergenerational solidarity is no longer assured. It is, therefore, of major importance that the distribution of pension contributions and benefits among the generations should

be kept in equilibrium within a certain bandwidth. This is a subtle equilibrium that may easily be disturbed and, hence, needs to be carefully guarded by the legislator and the supervisor. Maintaining the equilibrium is underlain by application of the assumption that a pension fund should be able at any point in time to distribute the claims and rights in money to the beneficiaries.

Liquidation fiction
The liquidation fiction is the rationale for marked-to-market valuation, since it represents the implicit recognition that a pension should at all times be able to meet its obligations. A pension fund must, at any point in time, be able to balance its accounts and distribute its assets among the rightful claimants in proportion to their respective entitlements. If a pension fund is unable to do so, for instance because it is underfunded, the system comes under pressure. New entrants pay too much, members leaving the scheme are given too much. If this goes on for a prolonged period of time, members will attempt to realise their claims and rights. At that time, however, the pension fund has insufficient resources to pay all of them in full. Transparency as to pension entitlements is also relevant in pension transfers, which are increasingly in evidence owing to the higher levels of labour mobility and corporate discontinuity. In pension transfers, it is important that marked-to-market valuation should be used, since is it thus possible to ensure to the extent possible consistency with other financial transactions.

Financial Assessment Framework
The Financial Assessment Framework as it is operated in the Netherlands brings out the characteristics of supervision as discussed above. Assuming the full funding requirement, the Framework encourages sound risk management. To that end, one major condition is marked-to-market valuation of both investments and liabilities. In addition, the Framework imposes a number of requirements on pension funds' capital, depending on the risks incurred by a fund. It includes a stringent restriction with regard to the guaranteed pension liabilities, which must in principle be covered by actual capital at all times. This contrast with the less stringent condition regarding contingent liabilities: here the pension fund must strive for consistency between the expectations raised, the level of financing achieved and the degree to which contingent claims are awarded to members.

determined on the basis of projected benefit obligations. This differs from the Financial Assessment Framework, which is underlain by the liquidation notion (see Box 3.2), meaning that the assessment is based on the accrued benefit obligations. This difference in valuation may give rise to a negative difference between the assets available to cover the pension liabilities and the amount of the liabilities on the basis of IAS principles. This difference is then reflected in the company's balance sheet.

All this may give rise to a potential problem for companies that are affiliated with an industry-wide pension fund. Such a company may have insufficient information at its disposal to permit reliable disclosure about its DB scheme. Comparatively new are the so-termed collective DC arrangements (see Chapter 2), under which long-term agreements are made about fixed employers' contributions that should permit a DB pension plan to be recognised in the accounts as a DC plan.

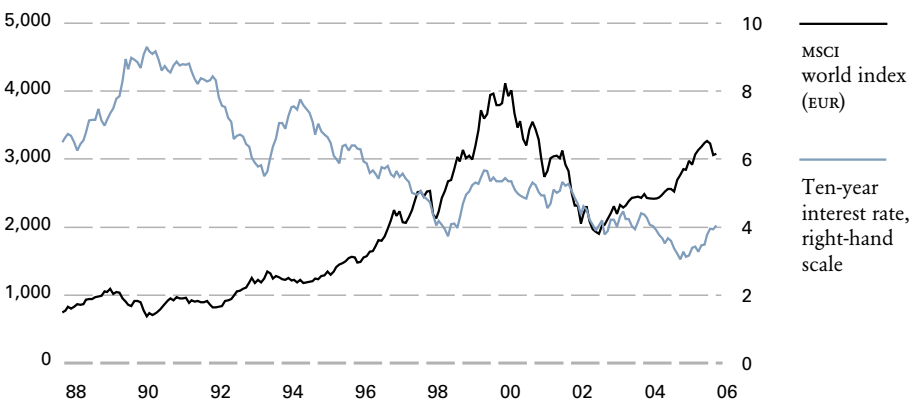
4 Recent developments in the Dutch pension system

The Dutch pension system, as described at the end of Chapter 2, has undergone major developments in recent years. Thus, investment policies have changed in a several respects and many pension plans have been adjusted recently from DB final-pay to career-average. In addition, pension funds are working to improve the match between funding and liabilities as part of integral risk management. These developments constitute major contributions to controlling pension risks.

4.1 Evolution of the funding ratio

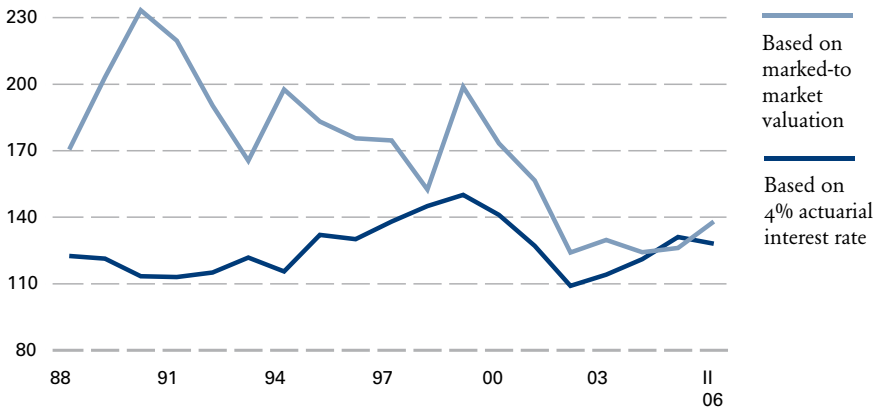
Owing to the persistently low level of interest rates and substantial stock market losses, pension risks have manifested themselves in the second pension pillar in recent years (see Chart 4.1). This is also evident from the movements in the funding ratio, which suffered a considerable decrease in the period 2000-2002. Chart 4.2 shows two measures of the funding ratio. The traditional funding ratio has been computed using a fixed discount rate for liabilities of at most 4%. It clearly reflects the effects of the stock market boom and the subsequent crash. In addition, the

Chart 4.1 Equities and interest rates



Source: Statistics Netherlands, DNB.

Chart 4.2 Funding ratio of Dutch pension funds



Source: DNB.

Chart presents the funding ratio on the basis of marked-to-market valuation (market interest rates), the valuation method used under the new Pensions Act. This measure of the funding ratio reflects the steady decline of long-term interest rates since the early 1990s, showing that the erosion of the financial position began much earlier than is suggested by the measure based on the fixed actuarial rate of interest. Where this measure of the funding ratio is concerned, it must be noted, incidentally, that it solely relates to the guaranteed liabilities. These are the accrued benefit obligations. If allowance is made for pension funds' indexation ambitions, the situation turns out to be less favourable. Assuming liabilities adjusted for inflation, the funding ratio in mid-2006 was about 100%. If additional allowance is made for pension funds' ambitions to cause pension benefits to increase in line with wage growth, the real funding ratio comes out at some 90%.[27] Measured in terms of aggregate pension liabilities, this corresponds to a deficit of about € 65 billion.[28]

Although the deterioration of the funding ratio is a direct consequence of the developments in the financial markets, it must also be viewed in the wider context of the changes that have taken place at the pension funds themselves. The next two sections deal in greater detail with the developments in pension funds' investment policy over the past two decades, and with the adjustments that pension funds have undertaken recently to improve their financial position.

Table 4.1 Trends in pension funds' investments

Percentages of balance sheet total

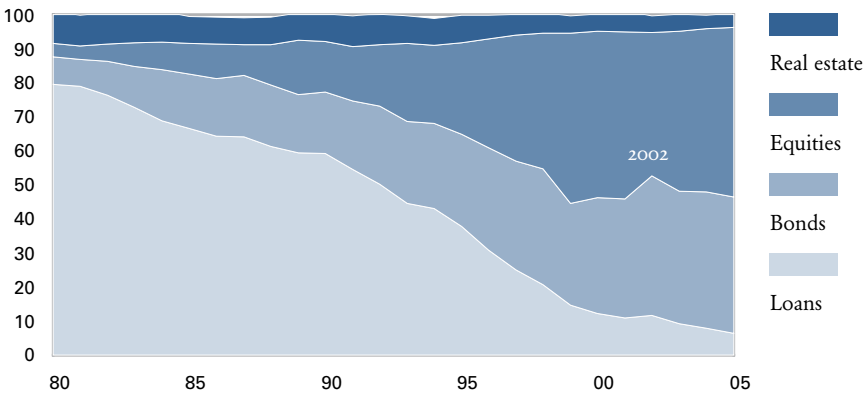
	Equities	Equities and bonds	Foreign
1985	7	23	8
1995	26	54	21
2005	49	88	76

Source: DNB.

4.2 Changes in investment policy

Over the past two decades, pension funds have adjusted their investment policy in three respects (see Table 4.1 and Chart 4.3). First, there has been a gradual shift from fixed-rate investments to equities and real estate, with the portfolio share of equities increasing to about one-half. Second, within the category of fixed-rate investments, (private) loans have been replaced in large part by bonds. The increased share of equities and bonds reflects a growing preference for liquid investments; by now, these account for the bulk of portfolios.[29] The third trend is a growing share of investments abroad. In 1985, foreign assets still represented no more than a marginal proportion of portfolios, but now they account for some three-quarters of the balance sheet total.

Chart 4.3 Dutch pensions funds' asset allocation



Sources: Statistics Netherlands, DNB.

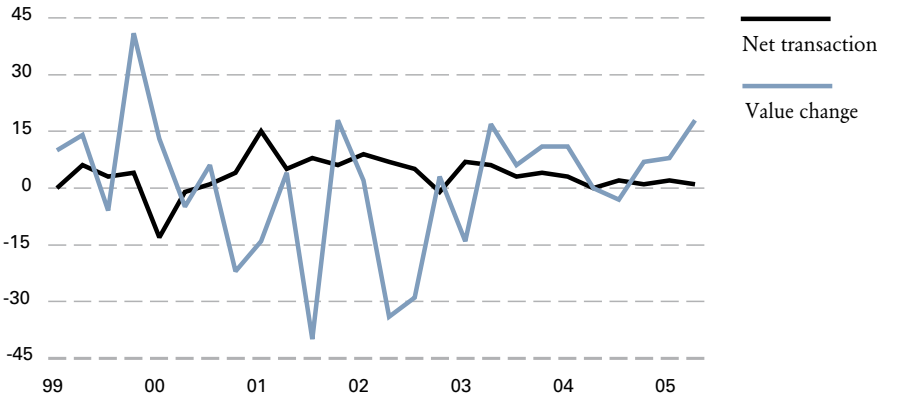
The shifts in pension funds' investment policies may be attributed to a changing perception of risk and return, but also to a growing need for flexibility in terms of portfolio adjustment. Moreover, these developments are in line with the changes in the investment opportunities. Thus, since 1993, the Dutch central government has relied in full on issuing bonds for its long-term financing. Previously, a large proportion of new central government debt issues was effected by means of direct placements with institutional investors. Another example of the more liquid supply is constituted by the repackaging of mortgage loans into tradable products by means of securitisation. An alternative to direct investments in real estate is now provided by exchange-traded real estate funds. In pension funds' balance sheets, this gives rise to a higher share of equities and a lower share of (direct) investments in real estate.[30] The increasing international orientation of pension funds reflects the search for high-yield investments and for a high degree of liquidity. The Dutch market offers no more than limited capitalisation and is strongly interwoven with foreign stock markets, lowering the threshold for investing internationally. Moreover, since the introduction of the euro, one can no longer truly speak of a separate Dutch capital market. Consequently, the home bias of the Dutch pension funds now concerns the euro area rather than the Netherlands. This is most clearly evident for bonds, three-quarters of which relate to the euro area. Where equities are concerned, the orientation is much more global, with two-thirds of portfolios invested outside the euro area.

Some pension funds aim at maintaining a fixed asset allocation. This is known as rebalancing and implies that changes in the relative value of financial assets give rise to offsetting purchases and sales, so that the relative weights in the portfolio remain fairly constant. Alternatively, it is also possible to accommodate value changes within defined bandwidths, because a certain upward or downward tendency is expected to continue. Since, in that case, no offsetting transactions are effected, the investment mix changes over time. Chart 4.4 shows the movements in net equity transactions and the changes in the value of equity investments in recent years, illustrating how Dutch pension funds have responded to the volatile movements in the market. For the period as a whole, there is a slightly negative correlation between value changes and net purchases (amounting to -0.33), suggesting that at least part of the pension sector engaged in a rebalancing strategy.[31]

This does not alter the fact that in some quarters considerable value changes have been accommodated. Thus, in 1999-2000 equity investments increased sharply, as price gains were barely attended by net sales. When in 2000 stock market prices began to decline, some pension funds kept their equity allocation constant by engaging in purchases. In the course of 2002, this policy was abandoned temporarily, not least because of the increased risk of underfunding. In this period, the funding ratio hit a historical low, prompting the supervisor to urge for more cautious investment policies.[32] The subsequent stock market rally was again accommodated

Chart 4.4 Transactions in equities versus value changes

Per quarter, EUR billion



Sources: Statistics Netherlands, DNB.

in part, restoring the equity allocation to about 50%. Chart 4.3 clearly brings out the temporarily reduced equity exposure in 2002.

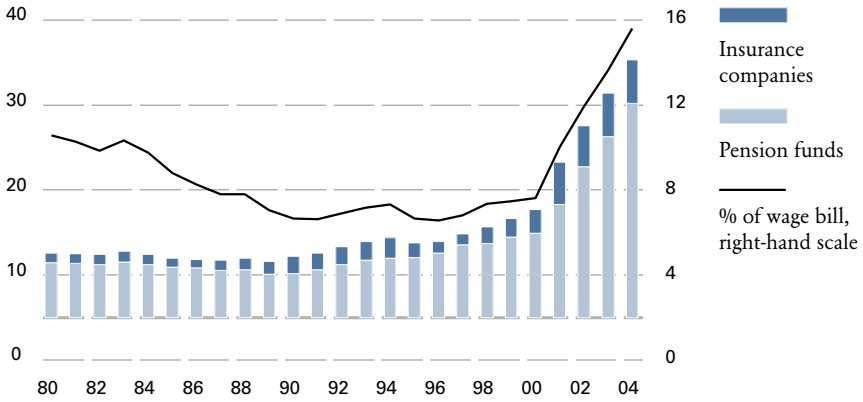
4.3 Adjustment of contributions and pension plan design

In response to the deterioration of their financial position, pension funds embarked on a number of recovery measures from 2000 onwards (see also DNB, 2004b). For instance, contributions were raised by a considerable amount (Chart 4.5) and indexation was skipped in part.

Also, pension plans were modified. Over the years, these pension plans had become ever more generous in several respects. The sharp wage increases of the 1990s, for instance, were fully reflected in pension liabilities, while contributions remained relatively low during that period.[33] With the benefit of hindsight, it may be noted that for many years pension plans were on offer at prices below their econonic cost. Moreover, gradually an awareness evolved of the fact that final-pay schemes would be ever more difficult to control in the future. After all, as pension funds 'age', the contribution policy becomes less effective whereas past service obligations continue as a major cost item (see Chapter 2). Hence, the employers' and employees' organisations decided to switch from final-pay to career-average schemes (Chart 4.6). Since, under such schemes, indexation is conditional both during the accrual stage and during the benefit stage, the inflation and investment risks are shifted in part to the active fund members.

Chart 4.5 Pension contributions

EUR billion

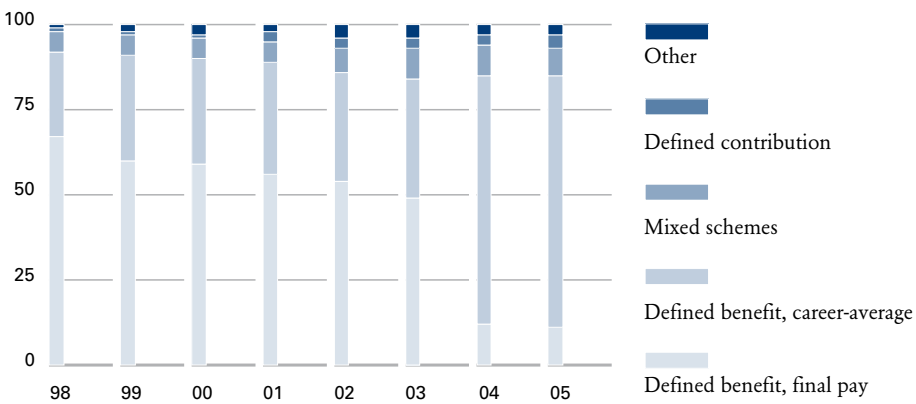


Source: DNB.

In itself, for the members this switch constitutes a step backwards, because it creates uncertainty about indexation during the accrual stage. Yet, the switch to career-average schemes cannot be viewed as a deterioration in all respects. For instance, accrual rates have been raised in many cases (Chart 4.7), affording compensation for the fact that career-average pay is usually lower than final pay. In addition, some pension funds have lowered the amount of the pension offset and the minimum age for new entrants, thus also enhancing pension build-up. At level of the indi-

Chart 4.6 Pension schemes

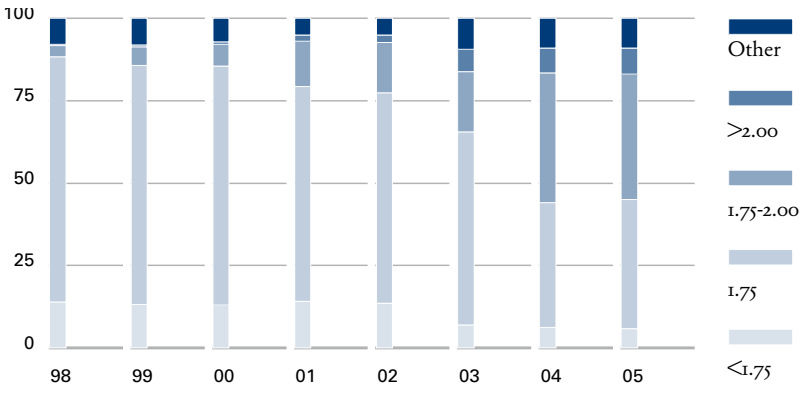
Active members of Dutch pension funds



Source: DNB.

Chart 4.7 Accrual rates for defined-benefit schemes

Active members of Dutch pension funds



Source: DNB.

vidual, other factors also play a role, such as the career path and the level of the initial versus the final salary. A final-pay scheme favours employees whose salary shows a sharp increase towards the end of their career, whereas an employee who peaks early in his career is better off with a career-average scheme. Also, under a career-average scheme, it is more attractive to take it easier towards the end of one's career (voluntary demotion), since that has only limited consequences for pension benefits. This may contribute towards increased labour market flexibility.

Internationally, the Dutch pension system, characterised as it now is by career-average schemes, holds a special position. Other countries, such as the United Kingdom and the United States, have seen a massive switch to (individual) DC plans, under which the pension risks are borne in full by the members. In the Netherlands, such a switch to DC has not been in evidence yet.[34] In a sense, career-average schemes may be seen as an intermediate solution, with the DB nature being continued but the risks shifted in part to the members. Viewed in this way, there has been a measure of convergence towards the Anglo-Saxon model. It stands to reason that practice will have to show whether career-average schemes with contingent indexation are actually able to ensure an index-linked pension. It is also important that pension funds inform their members of their indexation ambitions and deploy their policy instruments in order to realise that ambition. Among the possibilities in this regard are deliberate indexation (that is, creating an adequate financial buffer over and above the 'hard' liabilities) and setting contributions at cost-effective levels. Under the new supervisory framework, transparency about the indexation ambition and the appurtenant policies is imposed.[35]

Finally, the opportunities for early retirement have been adjusted. In the mid-1990s,

funded pre-pension schemes were introduced. Intentions were that these schemes should gradually supersede the early retirement arrangements, which were financed on a pay-as-you-go basis.[36] However, as from 2006, the Early Retirement and Life-Course Savings Scheme Act ('Wet VPL') has been in force. One major element of this Act is a firmer embedment of 65 as the pensionable age. Ceasing work at an earlier age is still possible, but more than before the costs have to be borne by the employee himself. In this way, working longer before taking retirement is rewarded, thus encouraging the labour participation of the elderly.[37] The abolition of the early retirement and pre-pension schemes has been offset in part by a higher annual old-age pension build-up (for members born after 1 January 1950) by means of a higher accrual rate and/or a lower offset.[38]

4.4 Further recovery

The changes discussed in this Chapter have considerably enhanced the sustainability of the Dutch pension system. Yet, the question remains to what extent the Anglo-Saxon shift towards DC schemes will leave the typically Dutch system unaffected in the long term. The recovery process has not yet been completed. Even though most pension funds have eliminated their solvency deficits, there are still opportunities for improving the match between the investment mix and the nature of the liabilities. In this respect, new regulations play an important role, including the introduction of the Financial Assessment Framework (see Box 3.2). One of the elements of the Framework is that the pension liabilities – and, hence, the funding ratio – must be valued on the basis of marked-to-market value (see Chart 4.2).[39] Such valuation makes clear that the difference in duration between liabilities and fixed-rate investments is an important risk factor for pension funds. In anticipation of the new regulations, pension funds have already gradually raised the average duration of their fixed-rate investments since 2004.[40] It is unclear to what extent the funds will reduce the duration gap to nil in the future. In this respect, the limited supply of long-term debt instruments may constitute a constraint.[41]

During the further recovery process, the investment risks are larger than in the equilibrium situation. Notably in combination with a solvency deficit – as was evident in the past few years – the risk remains that substantial recourse may have to be had to the pension plan members, in the form of higher contributions or lower indexation. This is also clear from calculations performed with the PALMNET pension model (see Box 4.1). With the situation in the comparatively unfavourable year 2002 as the basis, about half the simulations result in distinctly higher contribution percentages and indexation cuts for a number of years.

Box 4.1 Simulations using PALMNET

The PALMNET model (Pension Asset Liabilities Model for the Netherlands) relates a pension fund's liabilities to its policy instruments, such as the level of contributions, the degree of indexation and investment policy. In addition, allowance is made for uncertainty about the underlying variables. By means of stochastic simulations, probability distributions are obtained for the funding ratio, contribution level and indexation cuts over prolonged periods of time. This Box briefly discusses the model and presents some simulation results.[42]

PALMNET has been designed in line with the ALM tradition as it has been observed within pension funds for a large number of years.[43] The model assumes an average Dutch pension fund operating a DB career-average scheme. The Table below presents an overview of the assumptions regarding the equilibrium values and volatilities for interest rates, equity returns and wage and price inflation. The level of contributions and the degree of indexation are set annually using a policy ladder as it is employed by various pension funds.[44] If the funding ratio is sufficiently high, full indexation may be granted and pension contributions can be lowered. If the funding ratio is insufficient, the financial position is restored by a combination of higher contributions and lower indexation. In major respects – such as marked-to-market valuation of liabilities and recovery periods used – the model is consistent with the supervisory rules under the Financial Assessment Framework as they apply from 2007 onwards (see Chapter 3).

By linking the funding ratio with the control instruments and, at the same time, allowing for uncertainty, PALMNET is eminently suited to highlight risk versus return assessments. This holds in particular for inflation risk, longevity risk and investment risk. As the model does not consider the premature cessation of pension accrual, discontinuity risks are left out of account.[45]

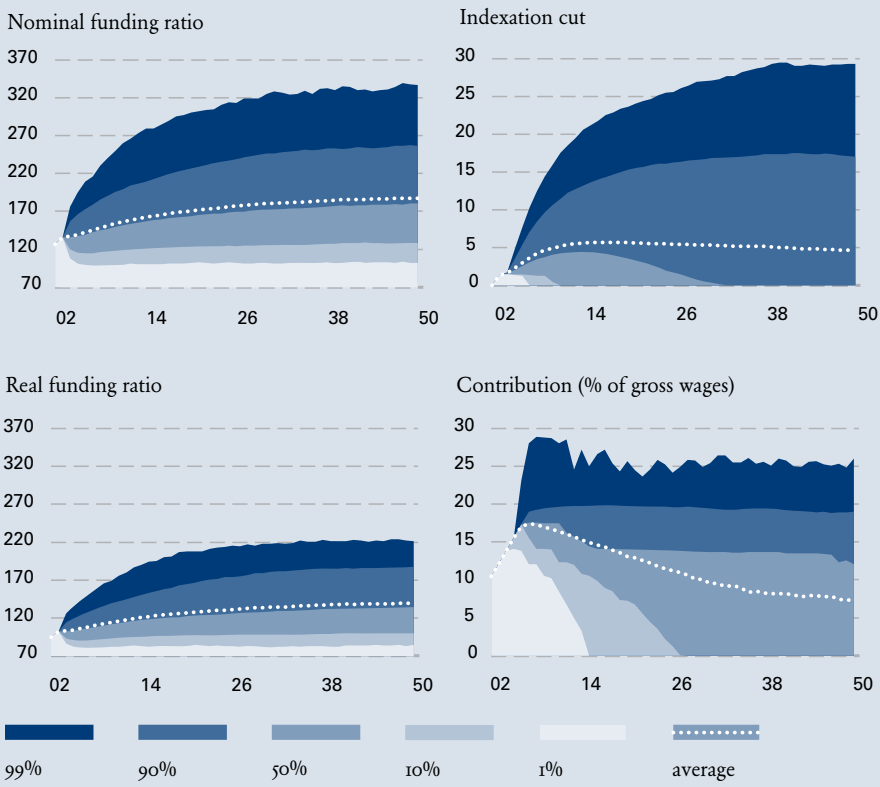
The Charts below show the movements in the funding ratio, the degree of indexation and the level of contributions in the period 2002-2050 covered by the simulations. It should be noted that in the initial year 2002 the pension sector was, relatively speaking, in poor shape. The funding ratio is shown in both nominal and real terms. Under the assumptions used, the average nominal funding ratio will move towards a level of 180%, amply sufficient to meet the pension liabilities. However, in more than half of the simulations, the funding ratio turns out lower, owing in part to the comparatively unfavourable starting position in the initial year. Hence, during the first few years to come, the risk of a solvency shortfall is still substantial and allowance should be made for a possible need to keep contributions at high levels and to apply indexations cuts.[46]

Assumptions underlying the baseline scenario in the PALMNET simulations

Asset allocation	50% equities, 50 % bonds
Equilibrium values	
Short-term interest rate	4.2%
Equity premium	3%
Inflation	1.9%
Real wage growth	1.1%
Volatility*	
Return on equities	18.4%
Short-term interest rate	71 basis points
5-year interest rate	69 basis points
16-year interest rate	66 basis points
Inflation	53 basis points
Pensionable age	65 years
Policy ladder	
Indexation	No indexation below a real funding ratio[47] of 85%, full indexation as from 105%, full backlog indexation as from 125%. At funding ratios in between these values, partial (backlog) indexation is applied.
Contributions	The aim is a real funding ratio of 122%. At lower funding ratios, contributions are computed in such a way that the funding ratio may be expected to recover to 122% in fifteen years' time. At higher funding ratios, contributions are lowered (as from 125%) or set at nil (as from 140%) or paid contributions are returned (as from 200%).
Rules under the Financial Assessment Framework	Recovery periods of one year in the event of underfunding (nominal funding ratio $<$ 105%) and fifteen years in the event of a solvency deficit (probability of underfunding $>$ 2½ %). Liabilities are calculated using marked-to-market valuation.

* Annual standard deviation.

PALMNET simulations: baseline scenario



Explanatory note: The distributions shown are based on 10,000 simulations. The colour differences mark the first, tenth, fiftieth, ninetieth and ninety-ninth percentile.

5 Pension risks and macro-economic factors

In the preceding Chapters, pension risks have been charted, financing issues have been discussed and recent changes to the Dutch pension system have been outlined. This last Chapter centres on two macro-economic environmental factors which will be crucial for pension funds in the decades to come. The first concerns the changes in economic structure. Owing to the ageing population, labour will become scarcer relative to capital. Moreover, some economic sectors will grow and others will contract. Through wage determination and labour mobility, this may affect the pension system. The second factor is the development of the capital markets. If pensions are financed by means of funding, it is essential that adequate returns should be realised in order to absorb the cost of the old-age pension arrangements. PALMNET simulations are used to illustrate how pension funds are affected by inflation and investment risk and how risks can be controlled by raising the pensionable age or, for instance, by adjusting the investment policy.

5.1 Changes in economic structure

The ageing of the population causes the labour force to decrease in proportion to the overall population. Hence, labour becomes scarcer, making it more difficult to maintain the level of economic production. In addition, the changing composition of the population will lead to shifts in the demand for goods and services. The fact is that the elderly have a different expenditure pattern from younger generations and have more recourse to labour-intensive services, such as medical care. The economic structure will have to reflect these changes: substitutes will have to be found for the lower supply of labour and sectoral shifts will be in evidence. Below, the decrease in the labour supply and the sectoral shifts, as well as their consequences for the pension system, are discussed in greater detail.

Offsetting a lower supply of labour

The decreasing supply of labour can be offset in three ways:

1 adding to the supply of labour by increased *labour participation* and *labour migration;*

2 increasing *labour productivity*;

3 greater input of *capital*, substituting scarce labour with a higher capital intensity of output.

Re 1 Increased labour participation and immigration
Table 5.1 shows that the participation rate for men – especially those of 55 and over – is considerably lower than it was in the early 1970s, although it has shown an increase since 1990. Women, on the other hand, have been catching up.[48] The Table implies that, especially in the category aged 55-64, there is considerable potential for raising the labour participation rate. The situation in other countries shows that this is possible; in Sweden, for instance, almost three-quarters of all citizens aged 55-64 are economically active.

Is it possible to encourage older people to work longer before taking retirement? At first sight, the Dutch would not appear to like the idea. According to the DNB Household Survey, a majority prefer higher pension contributions or lower pension benefits (see Box 2.1). However, in a more detailed analysis on the basis of the survey, Bruinshoofd and Grob (2005) show that the resistance to a higher pensionable age may be overcome in part. Three out of every five Dutch people would be prepared to work longer under certain conditions. They set great store by possibilities to work part-time with increasing age. In addition, financial incentives would appear to be effective. In this regard, the recent adjustments under the Early Retirement and Life-Course Savings Scheme Act (see section 4.3) would seem to represent a move in the right direction, with the cost of earlier retirement having to be shouldered more than before by the employees themselves.

Still, a greater preparedness to work longer is not enough. An increase in the supply of labour must be matched by demand. The longer one forms part of the active labour force, the greater the likelihood of one or more job changes, with the attendant need to acquire the necessary know-how and master the required skills. Moreover, it is expected that the decades ahead will see considerable sectoral shifts (see below), which will also make considerable demands on labour mobility.

Table 5.1 Gross labour participation of Dutch men and women
Percentages of total population (in persons)

	Men			Women		
	1971	1990	2003	1971	1990	2003
15-64 years of age	89.0	80.0	83.7	35.3	53.1	69.9
55-64 years of age	84.6	46.7	57.9	19.4	16.7	31.9

Source: Bruinshoofd and Grob (2005).

The rest of the world is an alternative source of labour supply. Labour migration is notably effective to the extent that immigrants have higher labour participation rates and, as a group, age less rapidly than the current Dutch population. Bosman (2003) concludes that, subject to certain conditions, migration could help alleviate the ageing problem. According to Roodenburg *et al.* (2003), limited labour migration may favourably influence the Dutch labour market, but large-scale immigration is not effective. It should be noted in this context that other countries, too, are being faced with ageing problems, limiting the scope for labour migration.

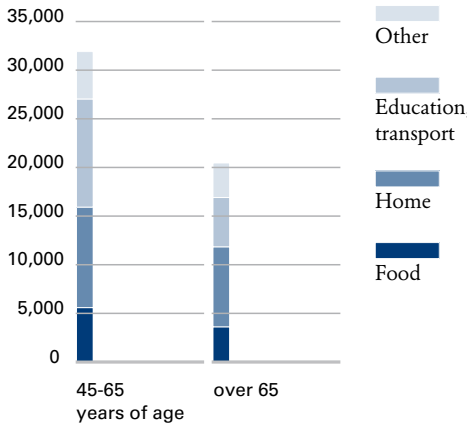
Re 2 Higher labour productivity
When labour is more productive, the same level of output can be generated with the aid of fewer workers. The possibilities that are open to the government to actively encourage higher productivity levels are limited. Cases in point are better education and policies creating a suitable climate in certain segments. Thus, innovation can be encouraged by boosting the supply of risk-bearing capital, such as venture capital (Houben and Kakes, 2002a and 2002b). The government may remove obstacles, permitting such markets to evolve.[49] Stimulating innovation is among the European Union's principal economic objectives. In 2000, the European heads of state or government formulated the ambition of making the EU the most competitive and dynamic knowledge-based economy in the world in ten years' time. Although appearances are that this aim will not be realised in 2010, the Lisbon agenda provides a useful guideline for policies aimed at innovation. The positive effects for the European economy have been analysed by Gelauff and Lejour (2006).

Re 3 Greater input of capital
The effectiveness of this instrument depends on the possibilities of substituting capital for labour. The services sector, for instance, offers only limited opportunities. Moreover, increasing the input of capital implies investment and, hence, savings. This could be achieved indirectly by way of the international capital market, pension savings being invested abroad and channelled back in the longer run. This would be attended by a net inflow of goods, offsetting the lower supply of labour. This is in line with Dutch practice, since some three-quarters of Dutch pension assets have been invested abroad (see Chapter 4).[50]

Sectoral shifts
For many decades, sectoral shifts have been in evidence in employment (see DNB, 2005c), with employment in agriculture and industry declining in favour of the services sector. The principal cause of this shift is constituted by the structural growth of labour productivity in agriculture and industry, reducing the demand for labour in these sectors. In addition, there is the fact that demand for, for instance, agricultural products becomes saturated with increasing prosperity.

Chart 5.1 Changes in spending pattern after the age of 65

Average annual expenditure in EUR per household, 2003



Source: Statistics Netherlands.

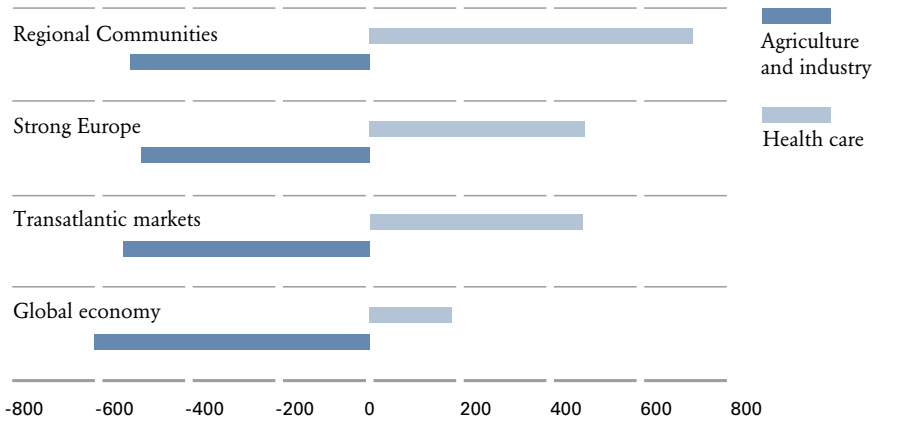
The changing composition of the population will also lead to changes in the demand for certain goods and services. Thus, people of 65 and over use transport to a much lesser extent than younger people, whereas they continue to spend a relatively large proportion of their income on housing (Chart 5.1; see also Börsch-Supan, 2003). Moreover, in an ageing society, medical care will be increasingly needed.

These changes cause considerable shifts in employment. In the health care sector, productivity gains are not easily achieved, so that increasing demand for health care services directly translates into a higher demand for labour. Just how large the shifts will be is difficult to predict. Huizinga and Smid (2004) have estimated the changes in employment in the various sectors under four long-term scenarios elaborated by the Netherlands Bureau for Economic Policy Analysis (Chart 5.2). In industry and agriculture combined, employment will decrease in the coming decades by 500,000 to 600,000 persons, that is, by roughly one-half. The increase in employment in health care varies more strongly from one scenario to the next, but may, in the most extreme variant, total more than 700,000 persons. Especially for medical care, it is difficult to estimate the increase in demand.[51]

One interesting question that arises in this context is whether the shifts in the demand for goods and services will also affect wages and prices in the sectors concerned. In principle, these effects could remain limited in a small open economy to the extent that such prices are determined by international competition, that is, the extent to which the goods concerned can be imported. The possibilities for substitution of domestic production with imports from abroad are, however, limited,

Chart 5.2 Sectoral shifts under four scenarios for 2002-2040 drawn up by the Netherlands Bureau for Economic Policy Analysis

Employment (thousands of man-years)



Regional Communities, Strong Europe, Transatlantic Markets and Global Economy are four long-term scenarios elaborated by the Netherlands Bureau for Economic Policy Analysis. See De Mooij and Tang (2003).
Source: Huizinga and Smid (2004).

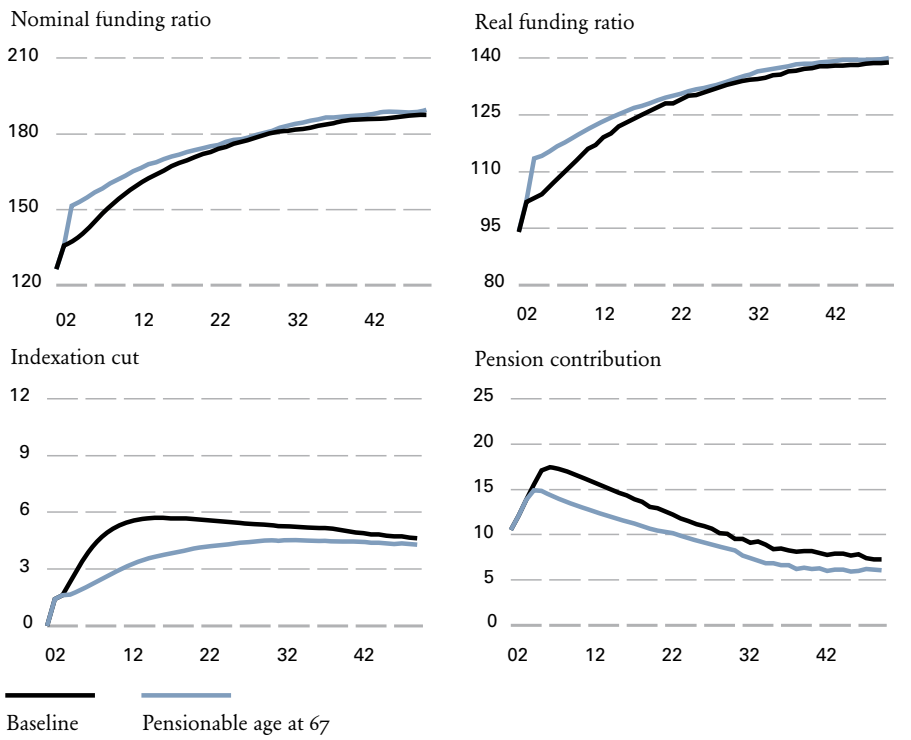
since other counties, too, are confronted with ageing problems. Moreover, a large proportion of expenditure concerns non-tradables.[52] Hence, most of the additional demand for labour in such sectors as health care will have to be met from the Netherlands itself; if the supply of labour falls short of this additional demand, this may give rise to upward pressure on wages.

Implications for the pension system

The changes in economic structure in the coming decades are highly relevant for the pension system. A higher labour participation rate contributes to the system's controllability. Chart 5.3 shows the effects of an increase in pensionable age from 65 to 67, based on PALMNET simulations. The direct effect is a decrease in liabilities as a result of the shorter benefit period. This means that, during the first few years, the indexation and contribution instruments will have to be deployed to a lesser extent. Moreover, in the long run, contributions will be lower than in the baseline scenario (by an average of about 1 percentage point).

The changes in economic structure may cause inflation risks to increase, especially to the extent that pension accrual is linked to wage growth. As noted above, tight labour market conditions in certain sectors may translate into wage pressure. PALMNET simulations show that this erodes the real funding ratio. At an inflation rate which is one percentage point up, the real funding ratio drops to a level that is

Chart 5.3 PALMNET simulations: increase in pensionable age

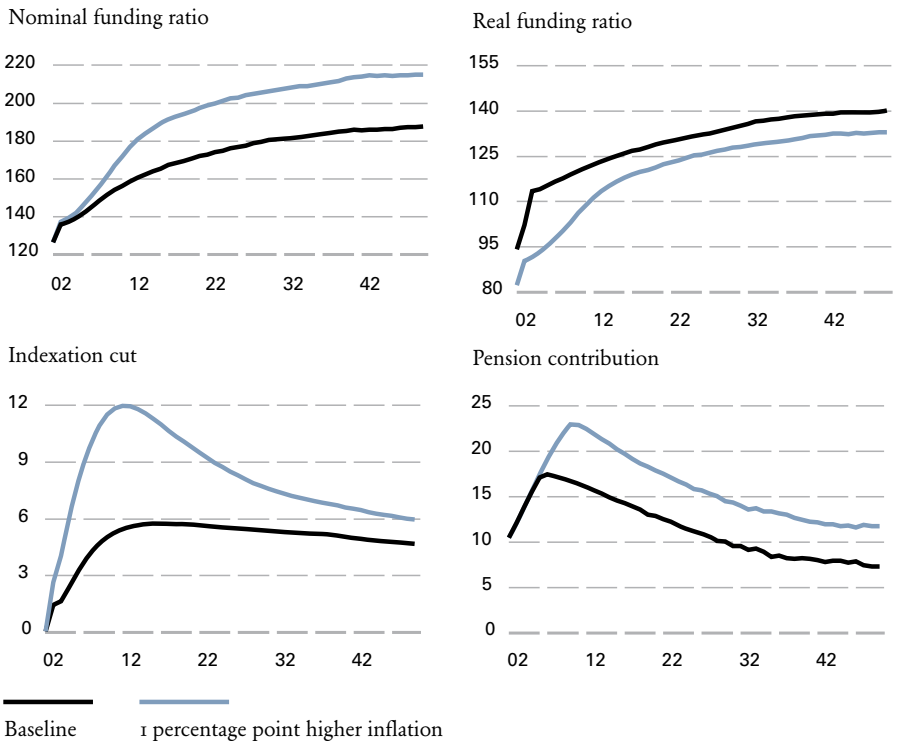


Based on 10,000 stochastic simulations. The black curves represent averages, as also presented in Box 4.1 (see Chapter 4). The grey curves represent averages in a situation where the pensionable age has been raised from 65 to 67. It has been assumed that this is not offset by higher pension benefits. The complete distributions are presented in Annex A.
Source: PALMNET.

an average of 5 to 10 percentage points lower than in the baseline scenario (Chart 5.4). Eventually, this inflation risk is borne by pensioners in the form of higher average indexation cuts and by companies and active pension plan members in the form of higher contributions.

Finally, discontinuity risk may show an increase. After all, working longer before taking retirement combined with sectoral shifts leads to more job changes and pension transfers.[53] If this is attended by mergers and acquisitions in the business sector, it also implies that pension funds will merge or be split up. In such cases, it is essential that the funding ratio is adequate.

Grafiek 5.4 PALMNET simulations: inflation risk



Based on 10,000 stochastic simulations. The black curves represent averages, as also presented in Box 4.1 (see Chapter 4). The grey curves represent averages in a situation where a 1 percentage point higher equilibrium value has been assumed for inflation. The complete distributions are presented in Annex A.
Source: PALMNET.

5.2 Developments in capital markets

To the extent that the pension system is financed by means of funding, developments in the capital markets are of crucial importance. The fact is that a substantial proportion of pension accrual must be realised from future investment returns. Moreover, notably for DB schemes, it is desirable that the features of the investment portfolio should match those of the liabilities as closely as possible (see Chapter 3). At present, the latter is difficult, given the limited supply of financial instruments that afford protection from pension risks. A more ample availability of very long-term bonds and index-linked bonds would make it easier for pension funds to reduce their interest rate and inflation risks.[54]

A baby-boom-related phenomenon which has attracted much attention is the so-termed asset meltdown hypothesis. The underlying notion is that, when the baby-

boom generation retires, this could lead to a massive decumulation of savings. In itself, this notion would appear plausible: older generations must draw on their pension capital and will reduce their savings. In addition, it is conceivable that excess supply might arise in some segments of the housing market. However, various studies conclude that the magnitude of a possible asset meltdown will be limited. Baby boomers will not immediately use up all their capital, while country-specific differences will have dampening effect. The baby boom differs from country to country in terms of timing, while pension accrual also differs from one country to the next (Börsch-Supan *et al.*, 2005). For instance, the Netherlands, like most Anglo-Saxon countries, has a funded system, while other countries are still working to build up such systems.[55]

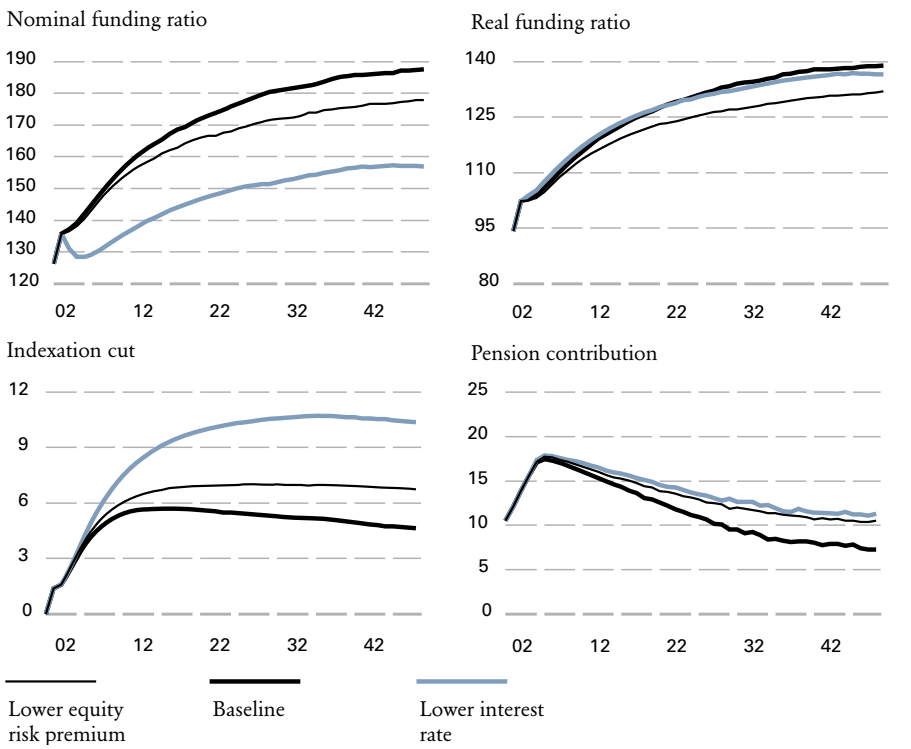
Implications for the pension system

The imminent ageing of the population will lead to further increases in the scale on which pension assets are built up.[56] This will increase the system's sensitivity to developments in the capital markets, especially if other controls such as the contribution instrument become less effective. Some capital market developments, such as persistently low levels of interest rates or a stock exchange correction, may affect the pension sector as a whole. Chart 5.5 illustrates the effect of lower-than-expected asset returns computed with the aid of PALMNET simulations. The simulations extend to both the bond market (i.e. lower interest rates) and the equity market (i.e. a lower equity risk premium). Both setbacks are shouldered by the sponsor company and the pension plan members in the form of higher average indexation cuts and higher contributions. If short-term interest rates or the equity risk premium are 1 percentage point lower, pension contributions come out about 5 percentage points higher in the long run. The consequences in terms of indexation cuts are especially marked when interest rates are lower than expected.

Pension funds may reduce their sensitivity to capital market developments by adjusting their investment policy. For instance, the proportion of fixed-rate instruments can be raised to, say, three-quarters of the portfolio. Chart 5.6 shows the consequences of such a course of action, as calculated with PALMNET. On average, indexation cuts will be higher during the first few years. That may be attributed in particular to the lower expected return, delaying the expected recovery of the financial position. In the longer run, however, the indexation cuts are smaller than in the baseline scenario while contributions remain fairly high. This may be viewed as the price for a lower degree of risk.[57]

Chart 5.6 also shows that interest rate risk may be reduced substantially by matching the maturities of fixed-rate investments to those of liabilities. The baseline scenario assumes a duration gap of ten years, as is now the case within many pension funds. If this duration gap is closed, interest rate risk decreases, reflected in lower average indexation cuts and lower average contributions.[58]

Grafiek 5.5 PALMNET simulations: lower interest rate and equity premium



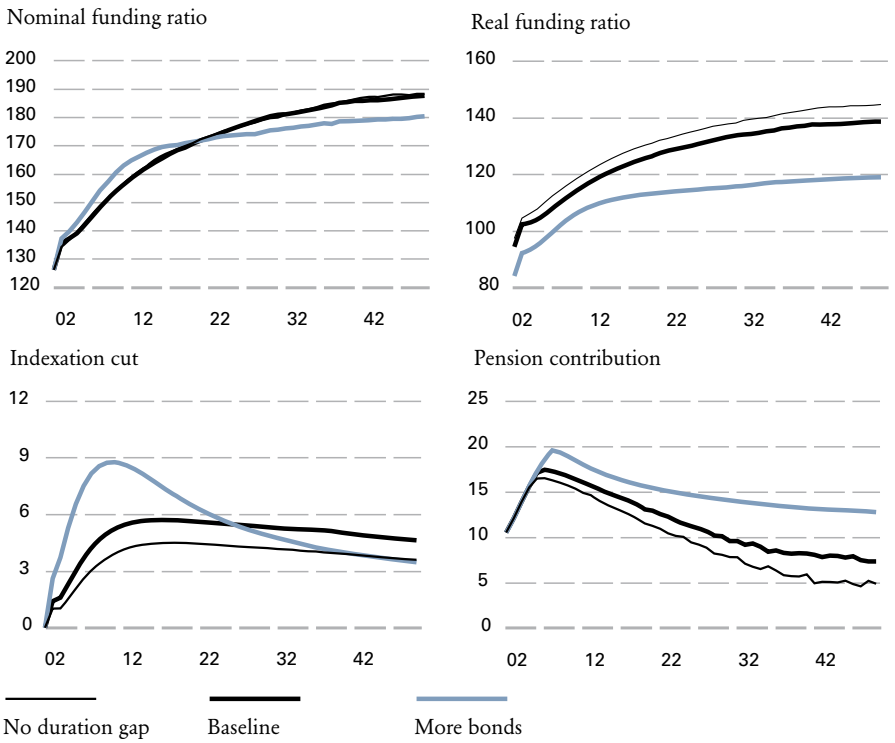
Based on 10,000 stochastic simulations. The bold black curves represent averages, as also presented in Box 4.1 (see Chapter 4). The grey curves and the thin black curves represent simulations in which a 1 percentage point lower equilibrium value has been assumed for the short-term interest rate and the equity risk premium, respectively. The complete distributions are presented in Annex A.
Source: PALMNET.

5.3 Concluding remarks

The preceding sections have outlined a number of environmental factors that may result in pension risks. Changes in economic structure may affect wage and price movements, reflected in pension accrual as inflation risk. Moreover, sectoral shifts may give rise to discontinuity problems. Finally, in the decades ahead, owing to the ageing of the population, major recourse will be had to the capital markets, possibly leading to investment risk.

The trends as they have been described above do not merely have consequences for the pension system; the reverse is also true. A well-functioning pension system is of major significance to ensure that necessary changes are effected smoothly. Inadequate pension fund financing may hamper necessary sectoral shifts. Growth sectors

Grafiek 5.6 PALMNET simulations: reducing interest rate risk



Based on 10,000 stochastic simulations. The bold black curves represent averages, as also presented in Box 4.1 (see Chapter 4). The grey curves and the thin black curves represent simulations in which the proportion of bonds has been raised to three-quarters and the duration gap of fixed-rate investments has been reduced to nil, respectively. The complete distributions are presented in Annex A.
Source: PALMNET.

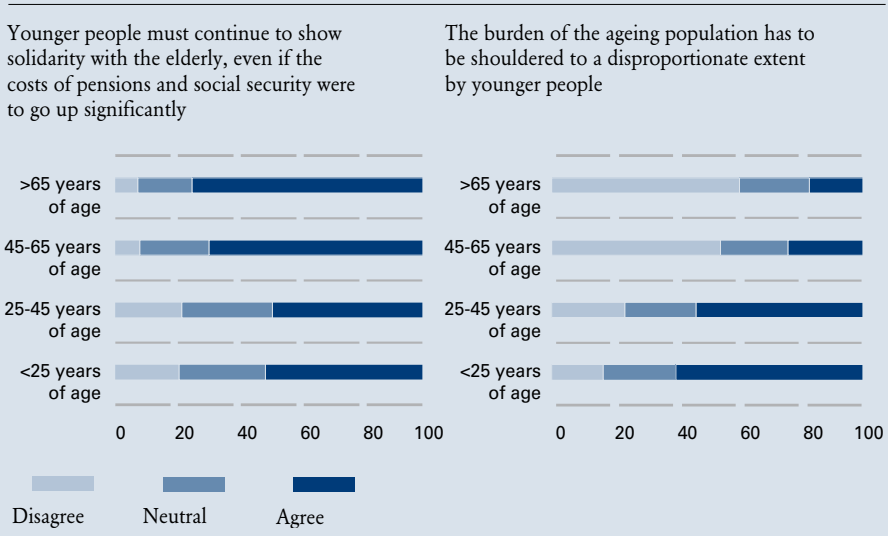
must be sufficiently attractive for new employees, and that also means that adequate pension plans must be in place. Contracting sectors must encounter no problems in transferring accrued pension rights, and that also makes demands on the level of financing.

In the final analysis, the sustainability of the pension system depends on our own choices. The preceding Chapters have clearly brought out the collective nature of the Dutch pension system. Moreover, this collective nature is marked by a high degree of organisation: the first pillar is a national insurance scheme covering all Dutch citizens, while the mandatory nature of the second pillar ensures that practically all employees take part in occupational pension plans. Thus, effective use is made of inter- and intragenerational risk-sharing. This broad base is not, however, a matter of course for the future. First, it is essential that the system should continue

to enjoy broad-based support among the working population. Survey data show that the solidarity between groups – the younger generations versus the elderly, high versus low incomes – is limited (see Box 5.1). Furthermore, it must be noted that the institutional frameworks are increasingly designed at the European level. Increasing corporate cross-border activity and an ever more integrated labour market may prompt increasing harmonisation of pension schemes within Europe. The challenge is to respond flexibly to this changing environment and to ensure that the strong points of our pension system – especially its collective nature – are not abandoned.

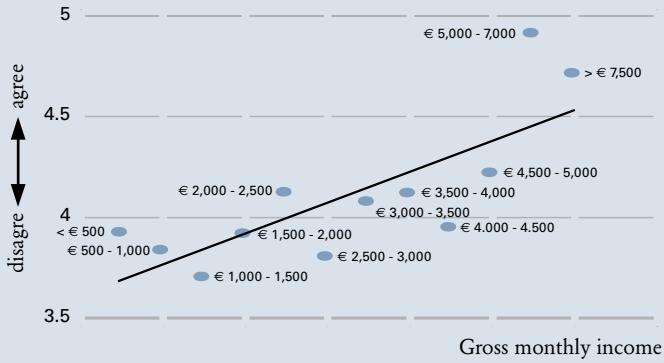
Box 5.1 What is the degree of solidarity among the Dutch as regards pensions?

Intra- and intergenerational solidarity is among the cornerstones of collective pension schemes. This is most clearly evident for pay-as-you-go systems, where benefits are financed from current contributions paid by the economically active generation. Yet, collective funded systems also rely on risk-sharing, in that, in the event of setbacks, recourse may be had to groups enjoying a higher degree of flexibility, such as the younger generations or higher-income groups. There is one major condition, however, and that is that these groups remain prepared to engage in risk-sharing.



Explanatory note: All respondents were asked to react to the above statements, using a scale ranging from 1 (fully disagree) to 7 (fully agree). Subsequently, the reactions were divided into three main categories, viz. 1-3 (disagree), 4 (neutral) and 5-7 (agree). The charts show the distribution by age group.
Source: DNB Household Survey (2005).

Individuals should to a greater extent provide for themselves rather than rely on the solidarity of others



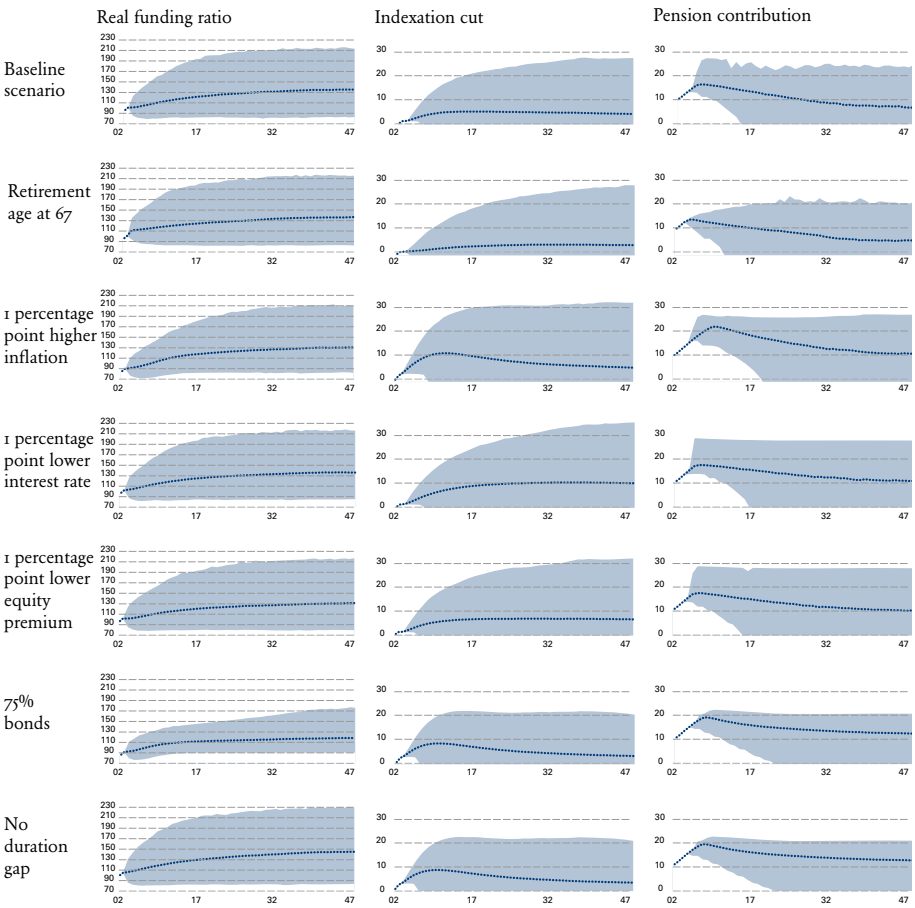
Explanatory note: The respondents were asked to react to the above statement, using a scale ranging from 1 (fully disagree) to 7 (fully agree). Subsequently, averages were calculated by income group.
Source: DNB Household Survey (2005).

Data from the DNB Household Survey show that different generations and income groups are aware of the fact that their interests do not always coincide. Although the view that the younger generations should continue to show solidarity with the elderly enjoys broad support, this support is clearly less pronounced among younger people. Moreover, most people under 45 years of age already hold that the burden of the ageing population has to be shouldered to an undue extent by the younger generations. These differences might suggest potential intergenerational tensions. Thus, the support among the younger generations for a pension system underlain by solidarity could crumble, prompting them to leave existing DB schemes or put in offsetting wage demands. Such tensions are most likely to arise when certain generations must make an undue contribution.[59]

Solidarity between different income groups would not seem a matter of course either. Especially the higher-income groups often hold that, more so than at present, individuals must provide for themselves. This might give rise to tensions, for instance when higher-income groups would be asked to make an extra contribution in order to ensure the continued financial sustainability of the state old-age pension, which is financed on a pay-as-you-go basis. In themselves, these survey results are not surprising, since they reflect the particular interests of the groups concerned. None the less, they illustrate that the solidarity among the various groups of the population is not unlimited.

Annex A Distributions in PALMNET simulations

In Chapter 5, various scenarios were presented, calculated with the aid of the stochastic PALMNET pension model. In that Chapter, only averages were shown. Below, the full distributions are given for the real funding ratio, the indexation cut and pension contributions. The Charts show the average (dotted line) and the area between the first and the ninety-ninth percentile.



Annex B Marked-to-market valuation of liabilities

Below, the principle of the replicating portfolio as discussed in Chapter 3 is explained through a simple example. Suppose that, in year 15, a pension fund will have a liability of 100 to a cohort of pension plan members. In the determination of this cash flow, account has been taken of the mortality risk for each member between now and 15 years hence. In addition, the expected improvement in the survival rate over the next 15 years has also been allowed for, given the fact that, on average, people tend to live longer as time goes on. If actual mortality equals expected mortality, the pension fund will disburse an amount of exactly 100 in 15 years' time. If actual mortality is lower than expected, a higher amount must be disbursed whereas, if it is higher than expected, a lower amount will be disbursed. However, a disbursement of 100 in 15 years' time represents the best estimate.

The pension fund can exactly hedge this liability by investing in a zero-coupon bond that will pay exactly 100 in 15 years' time. This choice in favour of a bond without periodic coupon payments is due to the fact that the pension fund does not have to make any interim disbursement between now and 15 years hence (coupon payments would imply reinvestment risk). The market value of this zero-coupon bond is 50, corresponding to a 15-year spot rate (see the Glossary) of 4.73%. The relationship among the variables is as follows:

$$50.0 = \frac{100}{(1+0.0473)^{15}}$$

Hence, the marked-to-market value of the pension liability is also 50. It might be noted that discounting the cash flows to present value provides an insight not only into the marked-to-market value of the guaranteed liabilities but also into the sensitivity of these liabilities to changes in the term structure of interest rates. For instance, if market interest rates were to drop from 4.73% to 3.73%, the marked-to-market value of the liability would go up to 57.7.

For the purposes of the valuation of an unconditionally indexed pension liability, it is assumed that there is a zero-coupon index-linked bond with a maturity of 15 years whose principal is adjusted annually by the rate of inflation. The marked-to-market value of this bond is 66.8, corresponding to a real rate of interest of 2.73%. The relationship among these variables is as follows:

$$66.8 = \frac{100}{(1+0.0273)^{15}}$$

That is also the marked-to-market value of the unconditionally indexed pension liability in the example. By investing in an index-linked bond, the beneficiary is sure to receive an inflation-proof payment in year 15, whose purchasing power equals current purchasing power. It is evident that a fully indexed liability has a

higher value than a nominal liability. The marked-to-market value of the real liability can also be determined by annually indexing the cash flow of 100 and then discounting it to present value at the nominal rate of interest of 4.73%. If the cash flow of 100 in the example is indexed by 1.95% every year, the calculation produces the same result:

$66.8 = \frac{100*(1+0.0195)^{15}}{(1+0.0273)^{15}}$. The percentage of 1.95% equals $\left(\frac{1.0473}{1.0273} - 1\right)*100\%$.

The percentage determined in this manner need not necessarily reflect inflationary expectations, because the market price of a nominal bond usually includes an inflation risk premium.

The marked-to-market value of *contingently indexed* liabilities also follows from replicating investment instruments, including options. Suppose again that the unconditional nominal pension liability equals a cash flow of 100 in 15 years' time. In addition, the pension fund seeks to index its liability, subject to a maximum of 1.95% per annum. However, the actual indexation to be granted depends on the funding ratio in year 15 and is determined on the basis of a so-termed policy ladder (see Chart 3.1). At a funding ratio of 133% or more, the maximum indexation is granted. At lower funding ratios, the indexation is reduced linearly until a funding ratio of 100% at which no more indexation is granted. (In order to avoid undue complication, no allowance has been made for the minimum required capital of about 5% of the technical provision.) In the unhoped-for event of underfunding in year 15, the sponsor makes up the difference, raising the funding ratio to 100%. This contingent indexation commitment may be viewed as a combination of a long put option on the fund's investments, with a funding ratio of 100% as the exercise price, and a written or short call option with an exercise price of 133% (Broeders, 2006). The maturity of both options is 15 years; they can only be exercised in year 15. The marked-to-market value of this commitment equals the value of the put option less that of the call option: put(100%) – call(133%) = 10.3-6.2 = 4.9. The option prices have been calculated using the standard Black-Scholes-Merton model with a volatility of the underlying investments of 14% on an annual basis and a risk-free interest rate of 4.73%. In this example, the marked-to-market value of the contingently indexed commitment is about 10% higher than that of the guaranteed nominal commitment.

Annex C Financial instruments

Pension funds may use their investment mix in order to hedge pension risks, spread investment risks and benefit from diversification gains. In practice, numerous varieties and combinations of financial instruments are traded on the financial markets. It would be beyond the scope of this study to deal with all of them. The discussion below centres on the most commonly used instruments.

Traditional investments

Pension funds mainly invest in the following asset categories:
– *Bonds* are tradable debt instruments issued by governments or corporations which usually carry a fixed rate of interest until maturity. For pension funds, it is relevant that the cash flows of their liabilities also have a bond-like nature. Assuming marked-to-market valuation of these liabilities, bonds thus constitute a logical instrument for hedging interest rate risk. Whereas this affords certainty, there is also the fact that, viewed historically, the return on bonds is less on average than that on many other investments. Bonds issued by less highly rated governments and corporations are marked by higher expected returns, but also carry a higher degree of default risk reflecting the possibility of failure of the issuer.
– *Equities* may be viewed as claims on a corporation's assets and income. Historically, equities are marked by a higher expected return than bonds, but they also carry a higher degree of risk. This risk is two-sided: when conditions are favourable, the increase in value is, in principle, unlimited, but in the event of failure of the issuer the stockholder has to bear the residual risk. A bond, on the other hand, does entail a claim on the winding-up value. The higher degree of risk involved in equities is also reflected in the higher volatility and – specifically for pension funds – the limited correlation with the defined benefit pension liabilities.
– Investments in *real estate* may be effected by direct purchases of buildings or by acquiring units in real estate funds. Such investments have an advantage in that the proceeds (mainly rents) are often correlated with the rise in the general price level in the economy, thus providing a partial hedge against inflation risk. The correlation with bonds and equities is not perfect, so that diversification gains may be obtained. Drawbacks include the limited degree of liquidity (especially in the case of direct purchases) and the frequently required specific know-how about the local market.
– *Deposits* are balances held with banks. They generate a stable return, but the depositor is exposed to credit risk vis-à-vis the bank, which may be reduced by means of collateral.

Alternative investments

Pension funds often add so-termed alternative investments to their portfolios in order to achieve a higher degree of diversification. Such investments usually have a low correlation with standard investments in such instruments as bonds and equities. Examples are:

– *Commodities* are often traded by means of futures contracts. The most frequently traded commodities are oil and metals, such as gold and silver. Apart from providing diversification gains, commodities are sometimes viewed as a reasonable hedge against inflation.

– *Private equity* is an interest in unlisted companies, such as an investment in a company which has just started operations and/or seeks to achieve a rapid expansion; in that case, the term 'venture capital' is often used. Usually, the investments are marked by a relatively high degree of risk. The investors are often closely involved in the management, calling for great effort and much expertise. These investments, too, are illiquid while returns are difficult to estimate.

– *Hedge funds* may be typified with the aid of a number of characteristics. The principal characteristic of a hedge fund concerns the large number of degrees of freedom – relative to traditional investment funds – regarding the categories and instruments (including numerous derivatives) in which investments may be made and regarding the techniques (such as short selling and leverage) that are used. Hedge funds owe these degrees of freedom to the fact that – contrary to traditional asset managers – they are not or barely subject to supervision, but also to the fact that their investment policies do not centre on a benchmark. Hedge funds usually seek to achieve a positive absolute return under all market conditions. In view of this absolute return objective, the remuneration structure for hedge fund managers is often characterised by a fixed management fee and a performance-related fee. The performance fee structure may be related to certain watermarks (with the performance fee being paid only after all previous losses have been recovered) or hurdle rates (with the performance fee being paid only when a certain minimum return is exceeded). Furthermore, hedge funds often impose certain clauses that protect them from massive withdrawal of funds by investors, in the form of predetermined redemption schemes and lock-up periods. One of the risks is that transparency is not always what it should be, making it difficult to estimate expected return and risk.

Derivatives

In recent years, the derivatives market has shown very rapid growth. Derivatives are financial products whose return is linked to another asset. Hence, derivatives permit investment in an underlying asset without the need to purchase that asset. Using limited amounts, an exposure can thus be obtained having the same risk and

return characteristics as a much larger position in the bond or equity market. This strategy is known as leverage, permitting additional risk exposure in a search for additional return. Moreover, derivatives can be used to change the risk profile of an investment portfolio without any need to sell assets, thus entailing advantages in terms of transaction costs and flexibility. The most usual derivatives are the following:

– An *interest rate swap* entails exchanging a stream of fixed long-term interest payments with a counterparty (often a bank) for a stream of floating short-term interest payments. The party receiving the long-term interest rate payments obtains a cash flow comparable to that generated by a long-term bond. Only the interest payments are swapped, not the principals. Swaps are highly liquid and can, in principle, be bought for any maturity. Bonds are limited in this respect, because, in the long-term segment in particular, no bonds are available for certain maturities. There is a fairly liquid market for swaps with a maturity of up to 50 years. Swaps also entail drawbacks in that sound legal documentation must be in place and that processing by the *back office* is more difficult than for bonds. In addition, swaps involve credit risk exposure in respect of their positive market value, insofar as no or insufficient collateral has been posted.

– A *future* is a contract where the seller undertakes to sell and the buyer undertakes to buy a certain asset at a future date at a price specified in advance. Examples are stock index futures and bond futures. Advantages of futures are their very high degree of liquidity and their low transaction costs. In many financial markets, the prices of the underlying instruments are derived from the price movements of futures. As a rule, futures are short-term instruments, with liquid futures often having a maturity of at most one year. Thus, futures lend themselves to taking short-term positions and to portfolio fine-tuning rather than to effecting long-term transactions.

– *Options* are divided into put and call options. A put option gives the buyer the right but not the obligation to sell a certain asset at a future date at a price specified in advance. Thus, the value of the option goes up as the price of the underlying asset goes down. A call option gives the buyer the right but not the obligation to buy a certain asset at a future date at a price specified in advance. Thus, the value of the option goes up as the price of the underlying asset goes up. Options can be bought or sold, the rights and obligations of buyer and seller being each other's mirror image. Options contracts may relate to equities, but also to interest rate swaps, known as swaptions. A 10-year receiver swaption (the right to receive a fixed rate) on the 20-year interest rate with a strike rate of 3% is comparable with a 10-year put option on the 20-year interest rate with an exercise price of 3%. If the 20-year interest rate falls below 3%, the value of the receiver swaption goes up. Options can be used to alter a portfolio's risk profile. For instance, by buying put options or receiver swaptions, the downward risk of equities or bonds can be mitigated. There is, however, a premium to be paid up front. By combining options, complex positions can be constructed meeting the investor's demands. Options constructions

also entail a potential drawback in terms of costs and complexity. One way of reducing costs is to combine the purchase of an option with the sale of an option at another exercise price level (known as a collar).

Annex D Glossary

Accrual rate The percentage of pension entitlements built up by a member for each year of service. For final-pay schemes, the accrual rate in the Netherlands is subject to a maximum of 2% and for career-average schemes to a maximum of 2.25%.

Annuity Benefit (or payment) in equal instalments. Contrary to a life annuity, an annuity is not contingent on the annuitant(s) being alive.

Asset and Liability Management (ALM) Integrated approach to both pension liabilities and investments, constituting a framework under which such factors as risk management and indexation policy are quantified and analysed as a whole.

Career-average scheme Pension scheme whereby the level of pension benefits is linked to average pensionable earnings over a member's working life.

Closed scheme Pension scheme which does not accept new members.

Contributions The periodic contribution received by the fund to finance the pension entitlements.

Defined benefit (DB) scheme System under which pension benefits are guaranteed, their level being determined by earnings (final pay or career average), the accrual rate, the offset and the number of years of service.

Defined contribution (DC) scheme System under which contributions are paid regularly by the employer/employee, the ultimate pension benefits depending on total contributions paid and the return earned on the invested contributions. The investment risk is borne in its entirety by the pension scheme member.

Dependency ratio Population aged 65 and over and children under 15 as a proportion of the economically active population, that is, those between 15 and 65 years of age. It is often split up into the elderly dependency ratio (population aged 65 and over as a proportion of the economically active population) and the youth dependency ratio (population aged 0-14 as a proportion of the economically active population).

Direct scheme Pension scheme which is not administered by a pension fund but is operated directly by an insurance company.

Discontinuity risk Risk of the pension accrual being disturbed or terminated prematurely.

Dormant member A dormant or former member is entitled to future pension benefits, but is no longer in the service of the employer.

Duration The average weighted remaining time to maturity of a bond's cash flows or of a series of pension benefits, expressed in years. Duration is also a measure of the sensitivity of the market value of a bond or a series of pension benefits to changes in market interest rates.

Elderly dependency ratio The population aged 65 and over as a proportion of the economically active population (between 15 and 65 years of age).

Equity risk premium Additional expected return on equities relative to a risk-free investment, demanded by investors for the higher risk exposure.

Final-pay scheme Pension scheme under which the level of pension benefits is linked to the last earned salary. See also past service pension adjustment.

Financial Assessment Framework Risk-based supervisory framework used to assess the adequacy of the pension liabilities' funding for supervisory purposes.

Funding ratio The ratio of a pension fund's assets to its liabilities. In the context of the Financial Assessment Framework, this is the marked-to-market value of the assets divided by the marked-to-market value of the guaranteed liabilities.

Funded system System of financing under which pension entitlements and capital to cover such entitlements are built up at the same time.

Index-linked bonds Bonds whose annual coupon payments and/or principal are linked to a certain index, such as that of the level of prices.

Inflation risk Risk of the wage or price increase turning out higher than anticipated during pension accrual.

Investment risk The risk of the invested pension assets being insufficient to meet the pension liabilities.

Life annuity A periodic payment during the life of one or more annuitants. Subject to certain conditions, premiums for a life annuity are to some extend tax-deductible.

Longevity risk Risk of outliving the retirement resources.

Mandatory participation The Act on mandatory participation in industry-wide pension funds 2000 ('Wet BPF 2000') empowers the Minister of Social Affairs and Employment, acting at the request of the employers' organisations and trade unions, to make membership of an industry-wide pension fund mandatory for persons working in a certain industry. This is also known as the legal mandatory participation. There is also an employment-related mandatory participation, under which employees must in many cases take part in a pension plan in the context of a collective labour agreement.

Member An active member builds up pension entitlements within the framework of a contract of employment with an employer. A former or dormant member no longer works for the employer but retains rights to future pension benefits (unless a pension transfer is effected). The former member's rights are non-contributory.

Notional DC system Pay-as-you-go pension system under which notional pension assets are built up using an indexation procedure.

Past service pension adjustment Past service adjustment concerns the purchase of pension rights relating to past years of active service. Under a final-pay scheme, such adjustment must be effected in the event of, for instance, a salary increase, the pension commitment being raised by an increase in pensionable earnings.

Pay-as-you-go system System of financing under which pension benefits are financed from current contributions paid by the active labour force. In the Netherlands, the pay-as-you-go system is, for instance, used to finance the state old-age pension.

Pension commitment Promise to pay benefits as from pensionable age. Under the Dutch system of supplementary pensions, the pension commitment is undertaken by the employer to the employee. The pension commitment may include contigent elements, for instance regarding indexation.

Pension deal Arrangements between the parties involved about the distribution of pension risks.

Pension offset That part of earnings that is left out of account when determining the level of the supplementary pension. The pension offset is usually linked to the amount of the state old-age pension. Pensionable earnings under the second pillar consist of earnings less the pension offset.

Pension risk Risk of the pension financing offering insufficient guarantees to pay the intended benefits. It may take the form of *inflation risk, longevity risk, investment risk or discontinuity risk.*

Pension system pillars Pension systems often consist of three components:
- First pillar: basic publicly-financed pension provision. In the Netherlands, this is the state old-age pension, which is financed on a pay-as-you-go basis.
- Second pillar: supplementary, occupational pension provision, usually organised on a collective basis. In the Netherlands, the second pillar is funded. Virtually all the pension assets are administered by pension funds.
- Third pillar: supplementary, individual pensions, often administered by life insurance companies.

Policy ladder Mechanism whereby the indexation and/or contribution policy is explicitly linked to a pension fund's financial position.

Procyclicality Phenomenon whereby the behaviour of economic agents intensifies the business cycle.

Rebalancing Investment strategy seeking to achieve a fixed asset allocation in terms of asset classes. Portfolio weights are kept constant, changes in the relative value of financial assets giving rise to offsetting purchases or sales.

Solvency deficit A situation where the pension fund, though satisfying the minimum capital requirement, does not meet the full solvency requirements. If this is the case, the pension fund must recover its financial position in less than 15 years.

Sponsor Parties which help finance pension accrual by paying contributions or making occasional lump-sum payments. In practice, these are the employer and the active members.

Spot rate Also known as the zero-coupon rate or the internal rate of return derived from a zero-coupon bond.

Underfunding A situation where the ratio of investments to liabilities is less than 1. Under the Financial Assessment Framework, it is a marked-to-market funding ratio below 100%. In this context, it is possible to allow for the minimum required capital base, in which case underfunding is in evidence at a funding ratio below 105%.

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Notes

1 The pension assets shown in Chart 1.2 only relate to pension funds and, hence, do not include the direct schemes under the second pillar operated by insurance companies, which account for less than 10% of total assets. In addition, households engage in pension saving on an individual basis, but the size of this pillar is more difficult to quantify (see Chapter 4).
2 In the studies on population ageing conducted by the Netherlands Bureau for Economic Policy Analysis (Van Ewijk *et al.*, 2000, 2006), these issues are dealt with in detail.
3 These financial buffers are also referred to as the pension fund's equity or surplus.
4 In this context, the term 'pension commitment' should be interpreted in a broad sense. Under the first pillar, it concerns the right to a state old-age pension whose level is ultimately determined by the government. In the case of a second-pillar pension, it concerns a concrete promise by the pension fund on behalf of the employer. Under the third pillar, private individuals save for their own retirement pension and thus in fact make a commitment to themselves. It is important to note that a pension commitment does not always offer guarantees but may also contain contingent elements.
5 At an annual inflation rate of 2%, the purchasing power of one euro is eroded to the extent of about one-third over a period of fifteen years (see DNB, 2005a).
6 See Knot and Broeders (2005) for an explanation of risk-sharing between successive generations by means of a pension contract. Under such a contract, the purchasing power of the elderly is protected – in exchange for a fee – by the younger generations, who are able to do so because they earn an income from labour and are thus less vulnerable to inflation and investment risk.
7 It should be noted in this context that the pension fund cannot simply adjust contribution levels. The willingness and the financial soundness (counterparty risk) of the contributors are of major importance in this respect.
8 Lindbeck and Persson (2003) make an additional distinction on the basis of the degree to which the pension plans are actuarially neutral.
9 See Van Rooij *et al.* (2004), Van Els *et al.* (2004) and Bruinshoofd and Grob (2005), as well as various articles in the Quarterly Bulletin (DNB, 2003, 2004a, 2005d).
10 The stakeholders include the members or households. A distinction is made between risks that are borne by individual members ('individual'), by the joint members ('members') and by future generations ('future members').
11 In principle, the total assets accrued may also be made available directly to the member. This is not, however, usual in the Netherlands.
12 This is, of course, only possible if indexation is contingent on the financial position of the fund, which it now is in virtually all career-average schemes.
13 De Geus (2005), Minister of Social Affairs and Employment, wrote in a letter to the Second Chamber of Parliament: 'It is important to note that generally prudential supervision has the effect of ensuring that a sector's acts are less procyclical than they might have been in the absence of such supervision.'
14 The calculations also allow for the new supervisory framework for pension funds (the Financial Assessment Framework, see Chapter 3), including the constraint of a recovery period of 15 years for the unconditional liabilities.
15 Disability and surviving dependants' pensions are often financed on a risk basis.
16 The benefits paid under the second pillar slightly underestimate reality, since the figures only relate to pension funds (and, hence, exclude so-termed direct schemes). The benefits under the third pillar concern individual life insurance contracts. This is to be viewed as an approximation, because other assets are also held (in part) for pension purposes.
17 In 2002, the number of active members of direct schemes totalled 845,000 (pension funds: 5.9 million). In that same year, total liabilities came to € 28 billion (pension funds: € 361 billion).
18 Suppose, for instance, that the pension offset is 10/7 times the state old-age pension. At an accrual rate of 1.75%, a member of a final-pay scheme reaches exactly 70% of final pay, being state old-age pension + 1.75% x 40 x (final pay –10/7 state old-age pension).
19 In this context, it must be noted that a large number of members is accounted for by the two largest funds, ABP and PGGM. These are mainly civil servants and semi-public sector employees. If ABP and PGGM are left out of consideration, a more balanced membership of company and industry-wide pension funds becomes evident.
20 In 1998, the government decided to maximise contributions for the state old-age pension at 18.25%. This means that any further increases in the costs of the arrangement cannot be recov-

ered from employees, but must be paid from tax revenues, thus broadening the financing base.

21 Indexation of past service obligations during the accrual stage has been included implicitly in the lump sum because the career path has been assumed to be known.

22 The examples do not allow for actuarial risk, such as stochastic uncertainty about individual life expectancy (longevity risk). When the number of members is large, this risk averages out (see Box 3.1).

23 In the event of contingent indexation, the reverse applies in effect: the liability is a function of the investments. In that case, the term Investment Driven Liability may be used.

24 For a pension fund with an initial funding ratio of 130%, Chart 3.3. shows that the probability of underfunding increases during the first few years. This is because the available buffer affords adequate protection for a period of one year, but falls short in the event of several successive years of negative investment returns. In the long run, the probability of underfunding decreases because the equity risk premium causes the investments to grow faster on average than the pension liabilities.

25 There is, however, a statutory restriction regarding investments in the company paying contributions.

26 IAS 19 is mandatory for listed companies. Other companies must apply RJ 271, unless they opt for IAS 19. See Eeftink (2005) for the differences between IAS 19 and RJ 271.

27 This calculation is based on an average price inflation of 2.0% and on an annual wage growth of 2.9% as witnessed in the period 1980-2004.

28 At end-June 2006 the 15-year zero-coupon rate was 4.508% and the nominal funding ratio at marked-to-market valuation 138%. Assuming 2% indexation for inflation, the resulting real inflation-proof funding ratio is about 100%. If the liabilities are indexed for 2.9% wage growth, the real index-linked funding ratio is 90%. The real funding ratio may also be approximated on the basis of the real rate of interest derived from index-linked bonds. At end-June 2006, the real rate of interest on the 3.15% OAT issued by the French Trésor and maturing in 2032 was 1.977%. On this basis, the real funding ratio is about 95%.

29 It may be expected, though, that many pension funds, taking the view of a long-term investor, will continue to invest part of their portfolios in less liquid investments so as to benefit from the expected liquidity premium.

30 In the data of Statistics Netherlands shown in this study, real estate funds are included under equities.

31 Unfortunately, these data are only available for a sufficiently long period for equities. In order to be able to make more definite pronouncements about investment behaviour, *all* categories must, of course, be taken into account, including off-balance sheet derivatives positions. Some pension funds are, incidentally, known to pursue a rebalancing strategy (see, for instance, Bikker *et al.*, 2006, and Kakes, 2006a).

32 Through a circular letter, pension funds were urged to reconsider their investment policies, given the low levels of the financial buffers. This may have limited the scope for a rebalancing strategy. It might be noted that, in practice, this did not lead to net equity sales by the pension sector, but merely to reduced purchases. None the less, the portfolio share of equities showed a temporary decrease during this period.

33 In this respect, various factors made themselves felt, including the threat that additional financial buffers would be taxed in the framework of the overall tax review then being conducted. This caused pension funds to keep contributions low so as to prevent an undue increase in the funding ratio.

34 However, various company pension funds have introduced, or have indicated that they are considering to introduce, collective DC plans. Incidentally, Frijns (2006) argues that collective DC plans will at most be a temporary phenomenon.

35 Bikker and Vlaar (2006) use PALMNET simulations to analyse the indexation policy of a pension fund operating a career-average scheme. The analysis shows that a cost-effective contribution level combined with deliberate provisioning for inflation offers good prospects of realising the indexation ambition. Moreover, such an approach fits in well with the supervisory requirements under the Financial Assessment Framework.

36 A major difference between early retirement schemes and pre-pension schemes is that the former bestowed no rights on members, whereas the latter do.

37 See DNB (2005e) for more details about recent changes in early retirement pensions.

38 To what extent compensation has been afforded by means of an employer's contribution to the life-course savings scheme is not yet known.

39 Moreover, from 2005 onwards, European listed companies have been subject to new

accounting rules, the International Financial Reporting Standards (IFRS). Under these standards, companies must recognise the marked-to-market value of their pension commitment in their financial disclosure (see Section 3.6).

40 At the end of 2005, the average duration of fixed-rate assets was about six years; in 2004, it had still been five years (see DNB, 2005f). See also section 3.4.

41 During the process of adjustment, demand for long-term fixed-rate investments will exceed supply. Moreover, this policy change is not restricted to Dutch pension funds; it also extends to institutional investors in other countries. For as long as such excess demand continues to exist, it will depress long-term interest rates (see DNB, 2005b, G10, 2005, and Kakes, 2006b). An alternative would be the use of interest rate swaps, but this, too, will ultimately depress interest rates to the extent that counterparties will, in turn, also engage in a search for long-term cash flows.

42 See Van Rooij *et al.* (2005) for an extensive discussion of PALMNET.

43 See Boender *et al.* (2000).

44 See, for instance, ABP (2005). The operation of a policy ladder is illustrated in Chart 3.1 in Chapter 3.

45 PALMNET is a partial model in which the entire Dutch pension sector is in fact viewed as a single, average pension fund. The model does not allow for differences between pension funds that could, for instance, hamper a smooth effectuation of pension transfers. Moreover, it makes no allowance for interactions between the pension sector and the rest of the economy. These interactions are allowed for in Westerhout *et al.* (2004), among other studies. See also Box 2.2.

46 This is in line with Chart 3.3 in Chapter 3, which shows that, at low funding ratios, the probability of underfunding – and, hence, the need for recovery measures – is substantial.

47 The real funding ratio is determined using a discount rate of 3.1%.

48 This does not alter the fact that there is still considerable scope for improvement. According to the latest study of the ageing problem conducted by the Netherlands Bureau for Economic Policy Analysis, the increase in the labour participation rate of women has been disappointing in recent years (Van Ewijk *et al.*, 2006).

49 A case in point is the Risk Capital Action Plan of the European Commission (2003), which seeks to encourage venture capital being made available and to remove impediments for new entrepreneurs.

50 A broader measure is constituted by the Dutch total external position, of which pension fund assets are a component. The national savings balance has been positive for many years on end, so that each year the Dutch add to their external reserves. However, in these times, the external position is largely governed by valuation effects (fluctuations in equity prices and exchange rates, etc.) and, according to the official statistics, it is now even slightly negative (DNB, 2005g).

51 This increase might be less pronounced than is sometimes feared, to the extent that people increasingly age in fairly good health (Westerhout and Pellikaan, 2005). On average, most costs for medical care are incurred in the last few years before death. If this remains the case with increasing life expectancy, that would mean that the demand for care will shift in line with life expectancy instead of showing an increase.

52 According to Knaap *et al.* (2003), the 1999 share of total employment accounted for by the sectors producing non-tradable goods was over 30%.

53 The number of job changes also increases because employees remain in a job for a shorter period than in former times (see e.g. Gregg and Wadsworth, 2002, for the United Kingdom). Another reason why pension transfers are so important is the wish on the part of pension plan members to have pension dealings with just a single party.

54 This limited supply is also evident in other countries. The potential demand on the part of pension funds for index-linked bonds in the major economies is roughly estimated to total five times the available amount (G10, 2005; Kakes, 2006b).

55 In the long run, it is also important how the emerging economies in Asia in particular will develop. In these countries the ageing problem is less severe and/or will make itself felt later than in the industrialised countries; as a result, these countries could play a useful role in absorbing pension capital. See Batini *et al.* (2006) for a number of projections.

56 According to a forecast of the Netherlands Bureau for Economic Policy Analysis (Van Ewijk *et al.*, 2000), the total assets of Dutch pension funds will equal almost 200% of GDP in 2040, after which a slight decline will set in.

57 It should be noted that average contributions and the average indexation cut as shown here afford no more than a limited insight into the risk reduction that is achieved by investing more in bonds. The full distribution of all 10,000

simulations also shows that bonds considerably reduce the probability of large outliers (see Annex A).

58 Vlaar (2005) shows that, under certain conditions, it may work out favourably if a pension fund were to invest in fixed-rate assets with a longer duration than its liabilities, creating a positive duration gap.

59 In Van Ewijk *et al.* (2000, 2006) and Westerhout *et al.* (2004), the distribution effects are charted for each cohort for the coming decades.

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