The pensionfund situation in the Netherlands, and the introduction of a simple ALM model

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Summary

Low interest rates and low contributions to pensionschemes (caused by high reductions on contributions) bring Dutch pensionfunds in a zone of higher risk of underfunding. Risk management is becoming more and more important. And this means that the use of Asset & Liability Management models is growing.

In this paper we describe the implications of an environment of low interest rates and low riskpremiums, in combination with, in some cases, high reduction on pensionscheme contributions. The board of trustees has to look carefully to the expected financial situations of the pensionfund, and has to consider that at the moment there might be no need for drastic action, but it might be wise to withdraw to certain levels the allowed reductions on contributions.

The growing importance of ALM also means an increasing need for better communication and easier to understand modelling, for the board of trustees as well for the managers of the pensionfunds themselves. In this paper an easy to understand model is presented, a model with no waiting time and clear results.

1. Introduction

The importance in the Netherlands of the role of pensionfunds is growing. Besides the General Old Age Pension in the first pillar, pension is provided through the second and third pillar. The second pillar, of which this paper deals, is based on funding. The asset-mix has to deliver a return which is sufficient to fulfil the needs that are created by the modern pensionschemes nowadays. This means a need for a certain minimum return against the nominal liabilities and an extra return to give guarantee for indexation. All this in combination with the strive for a low risk surrounding. A derived function is the desire for contributions to be as low as possible. The excellent investment returns from the past has often led to, in some cases substantial, reductions on pensioncontributions. We are used to these reductions, the plan sponsor and paying employees expect a lasting situation, as they also do regarding the indexation of their pensions. There is a real danger in this situation: allowed reductions on contributions in combination with a environment of low interest rates and a low riskpremiums could have a negative impact on the funding level of a lot of pensionfunds.

These declining levels of funding ratio's will bring us in a zone of higher risk of underfunding. Normally this should lead to a lower weight of equities in the asset mix, but there is still the need for extra return to fulfil the indexation obligations (or at least indexation expectations). And the funds will try to keep the funding level on a certain minimum position.

Risk management is becoming more and more important. And this means that Asset & Liability Management is becoming common practice. Nowadays ALM is an important riskmanagement instrument.

In the next paragraphs of this paper we will explain what the development was in the Netherlands on the subject of Asset & Liability Management. We also will mention what purposes ALM studies provide for.

The growing importance of ALM means also an increasing need for better communication. We expect from the board of trustees that they understand the processes of strategical asset allocation, riskmanagement and financial planning. They have to make important decisions with an impact on the longer term. But they lack specific knowledge. The ALM manager has to provide them with information that they can understand.

ALM studies often demand a long running time. This makes that there is a need for ALM software that allows real-time calculations for various scenario's. Results should be shown immediately, with no waiting time. The board of trustees likes to have the possibility for real-time "trial and error" approaches. The nowadays available techniques don't allow for these approach. In this paper we present how a model can be developed that can deliver clear and understandable results with no waiting time.

We also go through case studies, in which we focus on the implications of an environment of low interest rates and low riskpremiums and in which we analyse some contributions to the development of the surplus of a pensionfund.

But firstly we shall review the important role of ALM in the investment process.

2. The role of ALM in the investment process

strategical	From a given risk profile and general investment targets we come through ALM studies to a long term optimal strategical asset allocation. Often these targets are embedded in the investment statute.	On all levels subjective preferences on, for example, the weights or choices of the assets or the level of contributions, might have their influence. This influence can be very disturbing if taken in account ex post instead of ex ante.	On all levels monitoring takes place, with attribution and readjustments.
tactical	The tactical asset mix is constructed from the stratigical mix, between given margins. Individual stock selection takes place. The margins has to be consistent with the confidential intervals given by the ALM study. The overall risk level has to remain between the allowed margins.		
operational	On this level managers are selected (in house or externally). Benchmarks and indices have to be defined. There is always the danger that the choice of benchmarks is not consistent with the input that is used in the ALM study that was basis for the strategical asset allocation decision.		

3. Evolution of Asset & Liability Management

ALM evolved very much trough the years. The accent has moved

from: purely optimisation of the asset-mix

to: optimisation of the pension financials as a whole and integral riskmanagement.

The Dutch Akzo pensionfund played at the end of the eighties an important role in the Netherlands with the use of ALM. The purpose was optimisation of the asset-mix, in the course of which cohorts of categories fund participants an important starting point were. The in fact simple but effective philosophy was: the younger the insured people the longer the investment horizon.

If we use this method today, then for a certain pensionfund might follow, as an illustration:

funding starts at the age of 25:   100% in equities
old age pension at the age of 65: 0% in equities

participants	actual weight in population	average age	weight of equities
active	60%	45	50%
deferred	15%	40	62,5%
pensioners	25%	>= 65	0%
total	100%		39,4%

Although the study in 1988 had a much broader scope, one might say that the somewhat simple approach was very much understandable.

The purpose of ALM has since than broadened into:

investment policy	performance	optimisation of return and risk
riskmanagement	risk-analysis	what if the expectations are not met
	sensitive analyses	which factors do have the most important influence on the financial position
	stress-tests	to what level will sudden events have their impact and how strong is the power to recover
contribution policy	gross and net pensioncontributions	what should be the level of the contribution that is regulated and how much discount can be given on that contribution level
the financial structure	the contribution system and funding	the optimal level of funding
indexation policy	the indexation of the pensions might be conditional or non-conditional	conditional indexation is seen by the public as unconditional. It has to be checked id these expectations can be met
pensionsystem	initial at the start of the scheme, or in case of important changes in the scheme	

Uniformity in input values and method?

At the moment there are no regulations about any uniformity of values of input in the Netherlands. But a discussion with regard to this is going on at the moment. Important is what

the purposes of the ALM study are and whether the study is mentioned to be used in house only or for externally purposes.

If the purpose of the ALM study is a test of the quality of the solvency, related to other pensionfunds and with the intention to publish the results as a measure of a part of the quality and strongness of the fund, then an uniform input of economical values is desirable. The Dutch Supervisory Board is working on new regulations regarding the judgement of the required solvency level. Although at the moment there are no rules given about input values in long term studies, one might expect that this will be the case in time.

Important developments in the Netherlands

Under the influence of:
❑ technical developments in ALM models (which allow extensive research)
❑ indexation expectations by the participants
❑ high levels of surpluses
❑ reductions on contributions
the focus by the Supervisory Board and the trustees of the funds themselves switched over time from a short horizon to a long term horizon. We do find this already in regulations being in force. The Actuarial Principles stated by the Supervisory Board demand a test on the minimum position regarding the nominal pension liabilities and besides that a test on the funding level on the long term. In the annual report the fund should explain why a certain level of discount rate is used for calculating the liabilities. Under influence of International Accounting Standards (IAS), nr. 19 Employee Benefits, the Dutch Board on Annual Reporting is working on regulations regarding incorporation of the fair-value of the pension liabilities in the annual report of the companies, in a way comparable with FAS (USGAAP) principles. It might be expected that in time the valuation of the pension liabilities in the balance sheets of the company and the pensionfund itself and with respect to the solvency tests by the Supervisory Board will converge to each other. In these developments ALM models play an important role, not only for testing solvency but also for calculating values of long term real liabilities.

4. The introduction of a simple but strong ALM model

As already stated in the introduction, ALM models are often complicated and therefore difficult to understand, not only by the board of trustees (who have to make the decisions) but also by the managers of the pensionfunds themselves. To fulfil the need of a clear model we have developed a ALM model that will deliver very quick and clear results.

The model has to produce
❑ clear and understandable calculations
❑ clear scenario analyses
❑ clear input and output
❑ real time calculations without waiting time
with the purpose to
❑ help the board in defining the task for the ALM specialist (internal or external)
❑ help the board in asking the right questions
❑ help the board in understanding the results of the "actual" study

There are two reasons that often make ALM models rather complicated and slow:
- ❑ stochastic approaches
- ❑ demographical / actuarial calculations

Given the strong technical capabilities of modern computers, risk distributions can be derived by calculating a big number of scenario's in a stochastic approach (Monte Carlo simulations) build around a central deterministic projection. But for the purposes as mentioned above, we find it sufficient to stick to the deterministic approach and to express the probabilities of underfunding by using a normal distribution of investment returns around the central projection. This makes the results faster and more clear.

Since demographical and actuarial developments are basically not related to economical surroundings, the actuarial calculations and demographical developments are disconnected from the actual ALM model. The calculation of the expected actuarial and available contributions and cashflows is done separately from the model in an earlier stage, and than transferred into the model trough an interface. In the ALM calculations the given flow of nominal contributions and liabilities is made subject to economical and demographical variables. So the impact of inflation, wage inflation, and certain demographical developments is added afterwards. The model is strongly based on a retrospective approach instead of a prospective one.

The model is built on the next basic ideas:

BALANCE SHEET

ASSETS (A)	LIABILITIES (L)
	SURPLUS (S)

Funding ratio:
$$A / L$$

Retrospective development of the liabilities:
$$\delta (L) = AC - PP + AI * (L + AC - PP) + IB * L$$
where

AC = Actuarial Contributions
PP = Pension payments
AI = Actuarial Interest (percentage)
IB = Indexation backservice (percentage)

Development of the surplus:
$$\delta (S) = (TIR - AI - IB) * (L + AC - PP) + TIR * S - ROC$$
where

TIR = Total Investment Return (percentage)
ROC = Reduction On Contributions = AC - CA
   where CA = contributions available

and where excess investment return is created over the liabilities and total investment return over the surplus

and where
- ❑ the actuarial contribution contents all components and costs of backservice
- ❑ pensions include costs of payment
- ❑ indexation backservice include all participants (active, deferred and pensioners)
- ❑ reduction on contributions is the difference between the required actuarial contribution and the available contributions paid by sponsor and participants

Actuarial neutral
The model is neutral on actuarial results, which means that, except for the result on interest, actuarial results on mortality, disability and administration costs, are supposed to be neutral. So actuarial assumptions does not affect the surplus in the model.

Pensionscheme
The input of the cashflow of contributions and pensions is for the total of the provisions offered through the scheme. There is no need to calculate the liabilities for the separate components of the scheme, which is also a contribution to the speed of the ALM program.

Cashflow
The cashflow of actuarial contributions, available contributions and pensions paid, is on a nominal basis. The initial values of these flows are adjusted over time for inflation and (if relevant) for demographical developments.

5.   The Dutch pensionfund situation, the impact of low interest rates
A case study

Interest rates have declined to a rather low level. In the year 1999 we had to deal with a long term (10 years) interest rate which was drawing near to the level of 4%, with an inflation of around 2%. Because of the declined rates the contributions for life insurance's were upgraded and some people said that pensions were in danger. But was this a realistic statement? Are the returns on investments really so low and what are the expectations for the longer term? After the year '99 interest rates did rise to the level of 5 1/2 % with an inflation of 3%. Today in the Netherlands we see an long term interest rate of around 5% but an expected inflation for the year 2001 of around 4%. So the real interest has come down to a level of only 1%, which is rather low. But the expectations on the longer term are more in the direction of interest rates between 5 and 6% and an inflation of 2 to 3%.

One might say that in the 1999 situation, the upgrade for life insurance contributions in the Netherlands was a necessity, but pensionfunds were not so much in danger. Pensionfunds are dealing with real liabilities, while life insurance companies give a nominal guarantee, at least regarding traditional contracts.

But with an increasing inflation rate in combination with low interest rates and very volatile equity markets, the financial situation of Dutch pensionfunds may develop in a more downwards direction. The impact of all this is that pensionfunds are looking critically to their investments and are trying to improve their returns on investments. That can be done by increasing the amount of equities and to add credits to the bond portfolio.

Depending on the profession one might look differently to these challenges:

Profession	Attitude
actuary	prudent
investment manager	challenge
general manager	long term horizon

The actuary will, as always, choose a careful and prudent approach. There's nothing against that, but contributions should be calculated on a realistic base and that does not imply a too prudent approach. Even if only a bond-portfolio is allowed as a match for nominal liabilities, credits might add value through riskpremiums of around 0,6% (investment grade). A pensionfund might use a long term horizon and a matching long term investment horizon. Therefore equities and credits may be added. That will add portfolio returns. Pensionfunds and insurance companies do not only invest in low yielding government bonds as they earn a return that is substantially higher then the returns on such bonds only.

For the investor there is, more then ever, the challenge of finding the optimal risk / return-ratio of a portfolio, given the level of risk for the whole of the pensionfund. Of course the costs of managing the assets have their weight upon investment returns. But pensionfunds do succeed in managing the portfolio's in an efficient way. Looking into annual reports it seems that the costs of managing the assets are around 15 to 20 basispoints. Insurance companies seem the calculate with an fee of 50 basispoints.

For the general manager of a pensionfund, the actual level of the economical variables is not so important. As the fund has to do with liabilities which range over a long term, there are management tools available to adjust the financial situations in the future. Normally surpluses are available that can be used to spread risks over time. This means that the equities might be added to the portfolio and somewhat more risky bonds as well. The manager will select a ALM provider and will try to find out, together with the board of trustees, to what maximum level the possibility of underfunding is acceptable. This will also call for an investigation on the solvability rules, which the Dutch Supervisory Board is developing at the moment.

Implications of the low (real) interest rate on the long term

On average Dutch pensionfunds have at their disposal a funding surplus of around 40%. This means that the level of funding is 40% higher than the present value of the liabilities earned at the end of the year, calculated on a (fixed) discount rate of, in most cases in the Netherlands, 4%. The in overall favourable returns on investments have in many cases led to, often substantial, reductions on contributions. For this case, the definition of reduction is: the difference between the actuarial premium and the available actual contributions. But if real interest rates will decline on the long term (because of rising inflation) and given unfavourable demographical developments, reductions on contributions might be withdrawed. The term on which reduction should be withdrawed depends of course heavily on the combination of the actual level of reduction of contributions and the level of the surplus.

For this case study we have calculated some scenario's for certain combinations of funding levels and reduction on contributions. Assumed is that the higher the initial funding level, the higher the actual reduction on contributions. In the table below it is mentioned after how many years the funding level will decrease to the level of 120%, which in this case is regarded

as a certain minimum level. The moment this level is reached, the contributions have to rise (or, which has the same meaning, one has to withdraw the reduction on contributions). The supposed interest rate is 5,5%, inflation is 3% and discount rate on liabilities is 4%. The asset-mix is fixed on 40% equities, 10% property and 50% bonds.

Other input variables are:

	Riskpremium %	Standard deviation %
equities	3.0	21.5
bonds		7.3
property	1.5	8.8

	Correlation coefficients of the investment returns		
	equities	bonds	property
equities	1.00	0.35	0.10
bonds	0.35	1.00	0.10
property	0.10	0.10	1.00

The results of the calculations are:

Initial situation		Number of years after which contributions have to rise
surplus	reduction on contributions	
20%	0%	at once
40%	35%	10 years
60%	60%	13 years
80%	80%	15 years

As is the case in each Asset Liability Management Study, the assumptions on economical variables are crucial. In this case study we used a simple and straight forward input in a deterministic way, of economical variables. The relationship between interest, inflation, riskpremiums and correlations is supposed to be stationary.
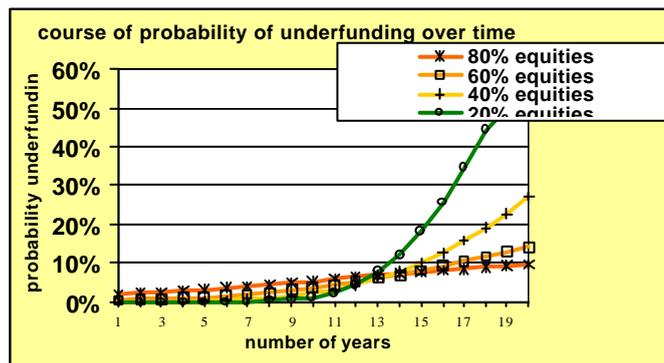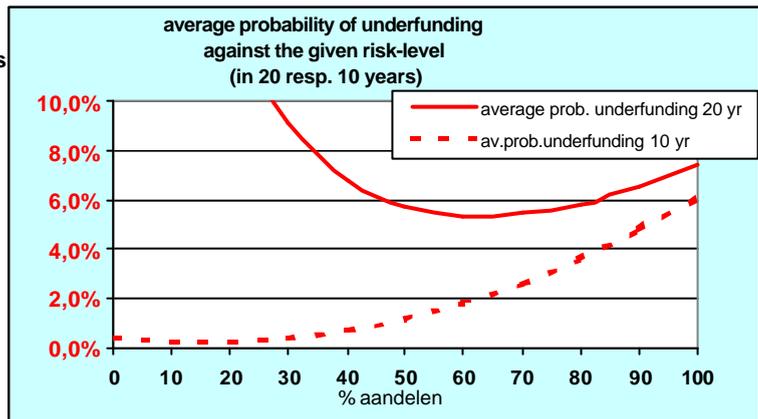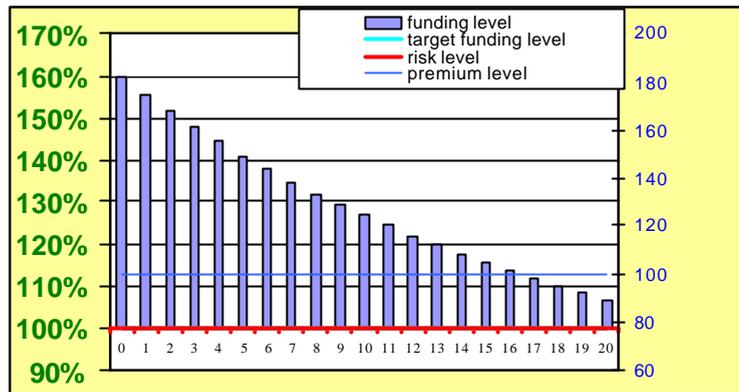
Conclusions on the situation of low interest

At the moment for most pensionfunds there is no reason to worry too much about a possible diminishing surplus, but it might be wise to rise contributions before it is to late. Drastic increase of contributions will be necessary over time, on a somewhat longer term. But if there is a desire to keep the funding on a level higher then 120%, one might decide to increase the contributions gradually in advance, instead of waiting until it is to late. A high funding level will also act as a generator of income and as a additional buffer for worse days to come, especially if expected low returns on bonds are compensated through a increased weighting of equities and credits, which of course will increase the overall risk level.

An illustration

Mentioned below an illustration of one of the cases used above, the situation of a funding ratio of 160% and a 60% reduction on contributions.

INVESTMENT POLICY
   40%   **equities**
   10%   **property**
   50%   **bonds (calculated)**
INITIONAL VALUES OF INPUT
   160%   **funding level**
   60%   **discount on contributions**
   100   **contribution starting level**
   1000   **present value liabilities**
   55   **actuarial contribution**
   35   **endowments**
CONTRIBUTION POLICY
   100%   **target funding level**
   100%   **risk funding level**
   60%   **new discount on contributions**
   0,0%   **yearly increase of contributions**
ECONOMIC EXPECTATIONS
   5,5%   **long term interest**
   3,0%   **inflation/wages**
   3,0%   **riskpremium equities**
   1,5%   **riskpremium property**
   0,6%   **extra return on bonds**
   1   **risk horizon in years**
FIXED INPUT
   4%   **discount rate liabilities**
DEMOGRAPHICS rate of growths on:
   2,0%   **actuarial contributions**
   2,0%   **available contributions**
   2,0%   **endowments**

FUNDING LEVEL (left axle) and CONTRIBUTION (right axle)

Legend: funding level, target funding level, risk level, premium level

average probability of underfunding against the given risk-level (in 20 resp. 10 years)

Legend: average prob. underfunding 20 yr, av.prob.underfunding 10 yr
X-axis: % aandelen

course of probability of underfunding over time

Legend: 80% equities, 60% equities, 40% equities, 20% equities
Y-axis: probability underfundin
X-axis: number of years

With an expected decrease of the funding level the board might decide (in the case 160% initial level of funding and 60% reduction on contributions) to lower the reduction from 60% to, for instance 30% and further on to increase the contributions with yearly for instance 0,5%, and to raise the weight of equities in the portfolio from 40% to 60% . This will keep the funding up to a level of around 140% instead of only around 110 % after 20 years. The risk level will be still around 1% which is very reasonable. The action will lead to an increase of the contribution of around 100% in 20 years.

INVESTMENT POLICY
60%	equities
10%	property
30%	bonds (calculated)

INITIONAL VALUES OF INPUT
160%	funding level
60%	discount on contributions
100	contribution starting level
1000	present value liabilities
55	actuarial contribution
35	endowments

CONTRIBUTION POLICY
100%	target funding level
100%	risk funding level
30%	new discount on contributions
0,5%	yearly increase of contributions

ECONOMIC EXPECTATIONS
|	
5,5%	long term interest
3,0%	inflation/wages
3,0%	riskpremium equities
1,5%	riskpremium property
0,6%	extra return on bonds
1	risk horizon in years

FIXED INPUT
4%	discount rate liabilities

DEMOGRAPHICS rate of growths on:
2,0%	actuarial contributions
2,0%	available contributions
2,0%	endowments

FUNDING LEVEL (left axle) and CONTRIBUTION (right axle)

average probability of underfunding against the given risk-level (in 20 resp. 10 years)
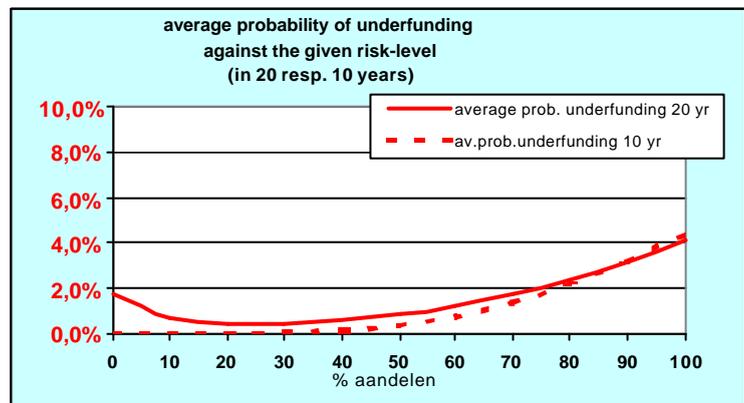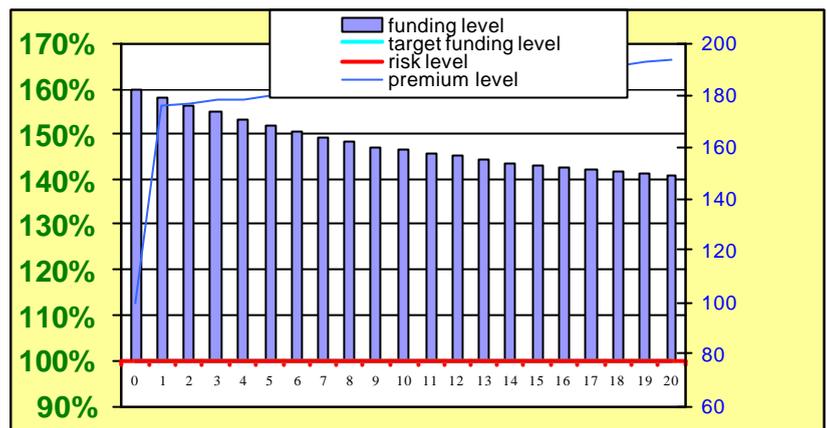
Factors that have an impact on the funding level

Of course there are more factors that have an impact on the funding level than interest rate, inflation and reduction on contributions alone.

Using the relations for liabilities and surplus, as mentioned earlier:

$$\delta (L) = AC - PP + AI * (L + AC - PP) + IB * L$$

where
AC = Actuarial Contributions
PP = Pension payments
AI = Actuarial Interest (percentage)
IB = Indexation backservice (percentage)

$$\delta (S) = (TIR - AI - IB) * (L + AC - PP) + TIR * S - ROC$$

where
TIR = Total Investment Return (percentage)
ROC = Reduction On Contributions = AC - CA
where CA = contributions available

we find (simplifying L)

$$\delta (L) = (AC - PP) + (AI + IB) * L$$
$$\delta (S) = (TIR - AI - IB) * L + TIR * S - ROC$$

the funding ratio develops in one year as follows:

$$(A / L)\, t+1 = [L + S + \delta (L) + \delta (S)]\ /\ [L + \delta (L)] =$$

$$[\, L + S\ + (AC - PP) + TIR * (L + S) - ROC]\ /\ [L + (AC - PP) + (AI + IB) * L]$$

so we see that the development of the funding ratio depends on
❑ the net cashflow (actuarial contributions minus pensions paid)
❑ the (excess) return on investments
❑ the reduction on contributions

Of course excess (positive or negative) investment returns will deliver an important contribution to the future financial situation. Further on, the allowed reductions on contributions have there negative impact on the surplus (because the reductions are supposed to be financed through the surplus). But also the ageing process of the population has an impact. For a relative young fund with a positive cashflow the surplus will keep relative behind with the development of the liabilities. On the other hand, with an aged fund, the negative cashflow will implicate that the surplus is related to declining liabilities, which means a flattered funding ratio.

Changing the positive cashflow into a negative, in the case of 40% equities, 160% initional level of funding and 60% reduction on contributions, will show the positive effect on the funding ratio. The original cashflow of 55 contributions minus 35 pensions is altered into 35

contributions and 55 pensions. The following graph shows the funding ratio's before and after the altering of the input.
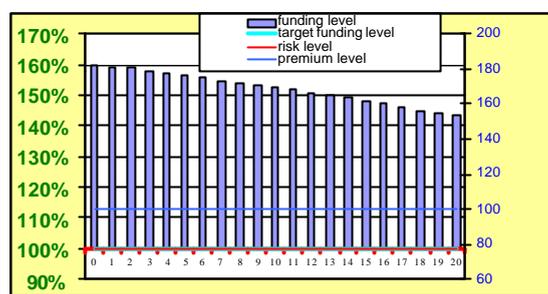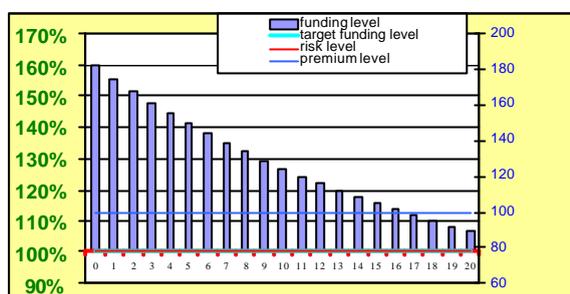
It might also be interesting to see in what way the probabilities of underfunding are dependent to various combinations of the weighting of equities and the initial values of funding. As in the examples before, this illustrates the dependence of the specific situation of a certain pensionfund. This is important in the discussion in the Netherlands on the role of the Supervisory Board regarding the test of the financial position of Dutch pensionfunds.

For this case an average pensionfund was taken into account, with no reduction on contributions.

	funding ratio				
	120%	130%	140%	150%	160%
weight of equities					
30%	5,3	1,2	0,2		
40%	6,7	2,0	0,6	0,2	
50%	8,4	3,1	1,1	0,4	0,2
60%	10,1	4,5	2,0	0,9	0,4
70%	11,7	6,0	3,0	1,6	0,8

As expected, the probability of underfunding is very much dependent of the specific situation of the fund. The shaded figures reflect the part in which the risk of underfunding might be considered as acceptable.

6. Conclusions

The solvency of pensionfunds in the Netherlands is more and more judged on the situation of a going concern. This means a growing need for risk management tools, as Asset & Liability Management models in fact are.

For a quick overview of the expected levels of funding and the development of probabilities of underfunding, the present ALM models are to complicated and to slow. Therefore real-time working models can be very useful. Such a model is presented in this paper.

A case study is presented on the implications of the present economical environment in the Netherlands (low interest rates and growing inflation). The conclusions are that there is no reason for immediate alarm but it might be wise to anticipate by undertaking some action.