



Toolkit for Risk-based
pensions supervision

Case Study
Netherlands

Risk-based Pensions Supervision provides a structured approach focusing on identifying potential risks faced by pension funds and assessing the financial and operational factors in place to mitigate those risks. This process then allows the supervisory authority to direct its resources towards the issues and institutions which pose the greatest threat.

The IOPS Toolkit for Risk-based Pensions Supervisors provides a 5-module framework for pensions supervisors looking to apply a system of risk-based supervision. A web-based format allows: a flexible approach to providing updates and additions; users to download each module separately as required; and a portal offering users more detailed resources, case studies and guidance. The website is accessible at www.iopsweb.org/rbstoolkit.

This document contains the **Dutch Case Study**.

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NETHERLANDS¹

I. Background

A. Pension System

The Dutch public pension system has two main tiers, consisting of a flat-rate public scheme and earnings related occupational plans. Occupational pensions are 'quasi-mandatory' (*i.e.* membership is obligatory when accepting a labour contract – with over 90% of Dutch workers covered). Though occupational pension plans can be defined benefit or defined contribution, the vast majority of employees (over 90%) are covered by defined benefit plans - although collective defined contribution plans and hybrid schemes are gaining popularity. 80% of all members are covered by mandatory sector-wide plans (the civil servants fund ABP and medical sector fund PGGM being the largest), though individual company pension funds, funds for professional groups (*e.g.* doctors) and group insurance contracts also operate. Voluntary, personal retirement plans (provided by insurance companies) also exist. Total pension investments in 2009 stood at over EUR 664 billion, making the Dutch pension market one of the largest in the world.

B. Risk-based Supervisory Approach²

The primary risk-based supervision (RBS) tool in the Netherlands is the Financial Institutions Risk analysis Method (FIRM) introduced in 2006 to provide a common framework for the evaluation of all types of institutions with the authority of De Nederlandsche Bank (DNB), the Dutch Central Bank which operates as an integrated financial sector supervisory authority.

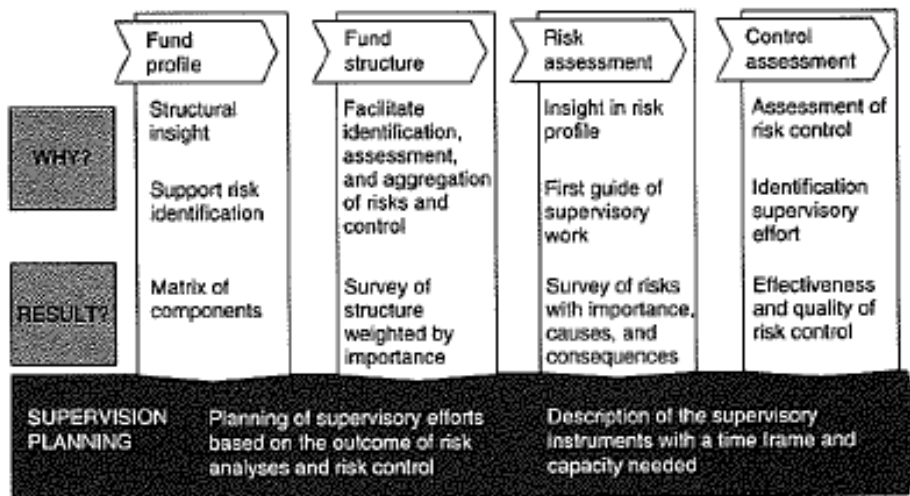
The FIRM consists of two main elements, which result in an assessment of the net risk of the institution that becomes the basis for decisions regarding the supervisory oversight (*i.e.* the degree of future monitoring and potential interventions):

- evaluating the structure of the institution, the nature of risks to which it may be exposed, and considering the quality of risk management procedures;
- assessing the solvency position of the fund using a quantitative, risk-based solvency framework, the Financieel Toetsings Kader (FTK).

¹ This case study was taken from country report produced for the World Bank publication (Brunner et al 2008) and DNB Financial Institutions Risk analysis Method (FIRM) Manual, with updates from DNB. A detailed description of DNB's FIRM system is provided via the on-line manual, available at <http://www.dnb.nl/openboek/extern/id/en/all/41-117136.html>

² Details of the APRA's historical development and moves towards risk-based supervision are available in '*Risk-based Supervision of Pension Funds: Emerging Practices and Challenges*', Brunner et al 2008

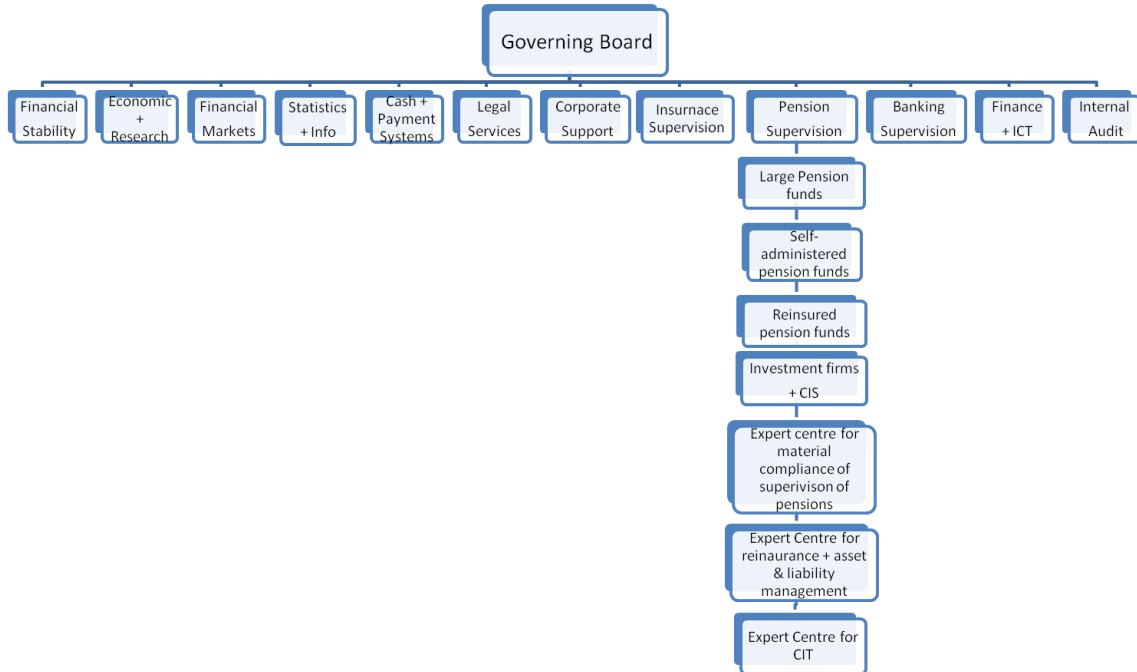
Figure 1: De Nederlandsche Bank FIRM Summary



Source: World Bank (2008)

DNB is an integrated supervisory, organized around several operating directorates aligned with various types of institutions for which it is responsible (e.g. international conglomerates, banks and other financial institutions, insurance companies and pension funds). These groups are supported by a number of units undertaking crosscutting functions (e.g. legal services, audit, research, statistics etc.). An interesting innovation in the organization is the use of a semi-matrix structure in which there is a supervisory policy division with responsibilities across all types of institutions and 'centres of expertise' within each of the functionally distinguished divisions. Within the pension funds unit is one department responsible for large funds and two departments responsible for the smaller funds. There are also 'centres of expertise for material compliance and reinsurance and ALM.

Figure 2: De Nederlandsche Bank Organigram



Source: DNB website

II. Risk-based Supervision Process

Figure 3: RBS Process



1. Risk Focus

Supervisory Objectives

DNB introduced its risk-based supervisory system in order to allow for the allocation of scarce supervisory resources in the most efficient manner possible. This goal is seen as contributing to the achievement of DNB's supervisory objectives, as set out in various pieces of supervisory legislation – including:

- protection of creditors
- protection of the interests of policy-holders
- protection of the integrity of the financial system

Nature of Pension System

DNB's FIRM model uses templates for different types of institutions, including three templates for pension funds (listed below – NB no distinction is made between DB and DC as the number of the latter is limited). The weightings which are automatically (centrally) assigned to the different risk categories vary by template, reflecting the different risk focus of the different institutions:

- pension funds which have been fully re-insured;
- pension funds which outsource nearly all their business;
- others – subdivided into pension funds that perform all functions internally and those which outsource asset management only.

One change to the FIRM model since its introduction is that initially complex financial institutions were divided into units and the risk analysis was conducted on each of these, before amalgamating them to derive a total risk score for the firm. However, this was found to make the process more complex, and the FIRM system now skips this step and analyses institutions on an overall basis.

2. Risk Factors

A. Individual

The FIRM is performed by the supervisory authority in order to gain an insight into the risks related to the activities undertaken by the institutions and into the extent to which such risks pose a potential threat to the achievement of the supervisory objectives. All aspects of micro-prudential supervision (aimed at individual institutions) are brought within the scope of the FIRM.

Reflecting the supervisory legislation for pension funds, the FIRM risk analysis of pension funds focuses on three risk analyses:the

- 1) *Solvency and Solvency Management*
- 2) *Organisation and Control*
- 3) *Business Integrity*

Solvency and Solvency Management is described in the risk indicators section. The **net risk** assessment, which is part of the *Organisation and Control* analysis, along with the *Business Integrity* analysis are described in the risk mitigant section below.

The assessment of **gross risk** is part of the *Organisation and Control* analysis. The purpose of this analysis is to gain insight into the extent to which such aspects as strategy, policies, an institution's activities, its in-house processes and its interaction with the outside world may give rise to risks (along with insight into the extent to which such risks are identified and controlled by the institution itself – as described in the risk mitigants section).

The analysis first focuses on defining gross (inherent) risks. Gross (inherent) risk can be defined as the risk intrinsic to the activities of an institution. Pension funds risk are evaluated within the following categories³:

³ Details of the different risk categories are provided in the on-line FIRM Manual
<http://www.dnb.nl/openboek/extern/id/en/all/41-117763.html>

Table 1: DNB Pension Fund Risk Evaluation Categories

<i>Risk category</i>	<i>Risk item</i>	<i>Risk category</i>	<i>Risk item</i>
Matching/interest rate risks	<ul style="list-style-type: none"> • interest rate • currency • liquidity • inflation 	Operational risks	<ul style="list-style-type: none"> • (pre)acceptance/transaction • processing • payment/clearing/settlement • information • product development • cost • staff • sensitivity to fraud
Market risks	<ul style="list-style-type: none"> • price volatility • market liquidity • concentration and correlation 	Outsourcing risks	<ul style="list-style-type: none"> • business continuity • integrity • quality of services
Credit risks	<ul style="list-style-type: none"> • default probability • concentration and correlation • loss given default • exposure at default 	IT risks	<ul style="list-style-type: none"> • strategy and policies • security • controllability • continuity
Insurance technical risks	<ul style="list-style-type: none"> • mortality • disability • loss • concentration and correlation 	Integrity risks	<ul style="list-style-type: none"> • prejudice to third parties • insider trading • money laundering • financing of terrorism • improper conduct
Environmental risks	<ul style="list-style-type: none"> • competition • dependence • reputation • business climate 	Legal risks	<ul style="list-style-type: none"> • legislation and regulation • compliance • liability • enforceability of contracts

The risk analysis centers on an assessment of the probability of a risk event for the risk categories included in the template – and indeed the supervisor may add items to the template if they are felt to be applicable. The score for the probability of a risk event is assigned on the basis of the scale below. As one of the aims of the analysis of risks and controls is to provide input for the planning and prioritisation process, the scores assigned must be well spread across the scale. Hence, supervisors are encouraged to be explicit when assigning scores and to use the full scale wherever possible.

Table 2: DNB Probability of Risk

1. **Low**
The probability of a risk event leading to a significant to high impact is very low.
 2. **Fair**
The probability of a risk event leading to a significant to high impact is fair. However, if circumstances change, this probability may also change rapidly and possibly become material. Hence, the risk must be monitored.
 3. **Material**
The probability of a risk event leading to a significant to high impact is material.
 4. **High**
In the absence of adequate controls, a risk event will almost certainly arise and have a significant to high impact. Control of the risk by the institution merits a high level of attention.
- Not applicable**
If the risk is not applicable at all to the functional activity concerned, the supervisor must select this option.
- Unknown**
If the supervisor has as yet insufficient information about a certain risk to assign a score, he/she must select this option.

In principle, risks are assessed using simplified scoring. For each risk category, one score is assigned. However, the supervisor may opt for comprehensive scoring of a risk category, leading to an assessment (score) for each underlying risk item if, in the supervisor's judgment, such an in-depth level of assessment is required. In order to support the supervisor in assigning scores, (general) assessment criteria are given for each individual risk category. For each risk, an indication is thus provided of the situations where a probability score of 1, 2, 3 or 4 would be justified.⁴ An example for the Operational Risks category is provided below:

⁴ Detail of such guidance is provided in the on-line FIRM Manual <http://www.dnb.nl/openboek/extern/id/en/all/41-117763.html>

Table 3: DNB Operational Risk Assessment

Low Inherent Risk	Fair Inherent Risk	Material Inherent Risk	High Inherent Risk
<ul style="list-style-type: none"> • Very simple transactions, routine, easily standardised and automated. • Process does not require highly qualified staff or staff with scarce skills. • Portfolio structure and product mix are very stable. • Large cohesion between products; strongly homogenous product mix. • Simple products are offered to the public; upon the sale and in product terms and promotional material, much attention is paid to the risk run by a customer in case a 'negative' scenario unfolds. • Institution's products are not sensitive to (attempted) fraud by customers. • No commercial pressure to develop new products. • In the acceptance and payment process, only simple and modest insurance or credit risks are assessed. • Operational errors or failures can be rectified easily and 	<ul style="list-style-type: none"> • Simple transactions, standardisation possible. • Process requires a limited number of highly qualified staff or staff with scarce skills. • Portfolio structure and product mix show hardly any change. • Distinct cohesion between products. • Hardly any complex products are offered to the public; upon the sale and in product terms and promotional material, ample attention is paid to the risk run by a customer in case a 'negative' scenario unfolds. • Institution's products are hardly sensitive to (attempted) fraud by customers. • Hardly any commercial pressure to develop new products. • In the acceptance and payment process, generally 	<ul style="list-style-type: none"> • Complex transactions, partial standardisation possible. • Process requires highly qualified staff or staff with scarce skills. • Frequent changes in portfolio structure and product mix. • Minor cohesion between products. • Some complex products are offered to the public; upon the sale and in product terms and promotional material, some attention is paid to the risk run by a customer in case a 'negative' scenario unfolds. • Institution's products are sensitive to (attempted) fraud by customers. • Commercial pressure to develop new products. • In the acceptance and payment process, generally complex and relatively sizeable insurance or credit risks are assessed. • Operational errors or failures can be rectified with difficulty and while incurring a loss. 	<ul style="list-style-type: none"> • Very complex transactions, hardly or no scope for standardisation. • Process requires many highly qualified staff or staff with scarce skills. • Frequent changes in portfolio structure and product mix. Changes are important and unpredictable. • Hardly any cohesion between products. • Many complex products are offered to the public; upon the sale and in product terms and promotional material, hardly any attention is paid to the risk run by a customer in case a 'negative' scenario unfolds. • Institution's products are very sensitive to (attempted) fraud by customers. • Significant commercial

<p>without loss.</p> <ul style="list-style-type: none"> • No external service providers are used for data entry. • Data are not privacy-sensitive. • No interfaces with external systems (e.g. through the Internet). Strongly automated internal processing. • Simple payment systems. • Very limited number of employees has access to payment instruments. • Very stable processes; few if any process adjustments over the last twelve months. • Little if any turnover in staff involved in primary processes. • Positive cost-based results every year these last few years. • Reliable steering information (management information) is not of vital importance for adequate and timely managerial fine-tuning and decision-making (e.g. because of stable positions, limited dynamism, predictable results, simple products, simple organisational structure and small size of institution). 	<p>simple and modest insurance or credit risks are assessed.</p> <ul style="list-style-type: none"> • Operational errors or failures can be rectified fairly easily and virtually without loss. • Only a small number of external service providers are used for data entry (i.e. data of minor importance). • Some data are privacy-sensitive. • Some (automated) interfaces. • Fairly simple payment systems. • Limited number of employees has access to payment instruments. • Stable processes; limited number of process adjustments over the last twelve months. • Small turnover in staff involved in primary processes. • Cost-based results, on balance, positive these last few years. • Reliable information (management information) is of average importance for adequate and timely 	<ul style="list-style-type: none"> • Some external service providers are used for important data entry. • Various data are privacy-sensitive. • Various interfaces, some of which are manual. • Complex payment systems. • Processes are not so stable; various process adjustments over the last twelve months. • More than average turnover in staff involved in primary processes. • Cost-based results, on balance, negative these last few years. • Reliable information (management information) is of importance for adequate and timely managerial fine-tuning and decision-making (e.g. because of some complex products, volatile positions, significant dynamism, volatile results, complex organisational structure and medium size of institution). • Various employees have access to payment instruments. 	<p>pressure to develop new products.</p> <ul style="list-style-type: none"> • In the acceptance and payment process, complex and sizeable insurance or credit risks are assessed. • Operational errors or failures can be rectified with great difficulty and while incurring a significant loss. • Various external service providers are used for important data entry. • Many data are privacy-sensitive. • Large number of manual interfaces. • Very complex payment systems. • Many employees have access to payment instruments. • Processes are not stable; large number of process adjustments over the last twelve months. • Significant turnover in staff involved in primary processes. • Negative cost-based results every year these
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	<p>managerial fine-tuning and decision-making (e.g. because of fairly stable positions, limited dynamism, fairly predictable results, fairly simple products, fairly simple organisational structure and fairly small size of institution).</p>		<p>last few years.</p> <ul style="list-style-type: none"> • Reliable information (management information) is of vital importance for adequate and timely managerial fine-tuning and decision-making (e.g. because of complex products, highly volatile positions, large dynamism, highly volatile results, complex organisational structure and large size of the institution).
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Templates for different types of institutions provide default scores for each risk item, and (on the basis of the arithmetic average of each of these) each risk categories in which they are placed. The default scores are assigned by the FIRM Expert Team on the basis of the average or most frequent profile of the functional activity concerned (using a point-in-time principle – *i.e.* based on current, market conditions not longer term averages). The default scores are provided with a brief explanation of the underlying assumptions which are meant to help the supervisor decide whether the default score is applicable to the particular assessment being undertaken or whether they need adjusting to fit the particular circumstances of the activity or institution being assessed. These explanations seek to help answer the question whether the assumptions underlying the default scores are applicable and whether or not they require adjustment (in which case the default score must be overwritten). If a default score is overridden, the reasons for this decision and how the new score has been derived should be recorded within the FIRM system.

Table 4: DNB Risk Item Pension fund not outsourced or reinsured

Risk:	Market risk – price volatility
Assumptions:	Mainly fixed-rate instruments (> x%) Small proportion of equities and real estate (< y%)
Default score:	2
If the pension fund's portfolio includes more equities, the default score might have to be overwritten and replaced by 3 or 4.	

In various pieces of relevant legislation, *integrity* is included as an important (separate) supervisory objective. Within the FIRM, the integrity risk is among the risks that must be assessed. In cases where integrity risk is relevant within an activity, it has been included in the template. This serves to identify the integrity risk and to ensure an assessment of the quality of the relevant risk-specific controls. Moreover, the risk-mitigating action of the group function Compliance is taken into account. In view of the fact that integrity is among the explicit supervisory objectives, it is presented separately within the FIRM. The total of the aggregated scores relating to the integrity risk and its controls is shown separately on the FIRM dashboard. In fact, this represents an integrity-risk-specific cross-section of the institution.

B. Systemic

Thematic analyses are carried out in order to gain an insight into the risks affecting multiple institutions, entire sectors of even the financial system as a whole and into the extent to which such risks pose a potential threat to the achievement of the supervisory objectives. Macro-prudential aspects, financial stability and payment system operations, which are aimed at several institutions, entire sectors or even the financial system as a whole, are brought within the scope of these thematic analyses but remain beyond the scope of the FIRM.⁵

The focus on thematic risk has increased since the FIRM model was first introduced. Sector-wide risks were initially examined on an ad hoc basis, but since 2009 a booklet covering supervisory themes for each sector has been published (consisting of 10-15 pages, written in a non-technical

⁵ Although macro-prudential aspects are currently beyond the scope of the FIRM, DNB is planning to add these to the FIRM mode.

way, with language appropriate for the wide target audience, including pension fund trustees who are not investment experts). Thematic analyses (such as business integrity, real estate investment, the impact of the crisis) are carried out in order to gain an insight into the risks affecting multiple institutions, entire sectors or even the financial system as a whole and into the extent to which such risks pose a potential threat to the achievement of the supervisory objectives. Macro-prudential aspects, financial stability and payment system operations, which are aimed at several institutions, entire sectors or even the financial and payment system operations, which are aimed at several institutions, entire sectors or even the financial system as a whole, are brought within the scope of these thematic analyses. They are meant as a compliment to the FIRM model.

3. Risk Indicators

A. Quantitative

The FTK has two major elements that correspond to short-term and long-term measures of fund solvency (see **Annex** for further details):

- *a short-term solvency test* based on the composition of assets and liabilities which requires funds to be expected to remain within a specified funding level corridor over a rolling one year period (*i.e.* short-term stress test of the solvency position);
- *a long-term continuity analysis* that requires the fund to demonstrate that its overall benefit structure and investment strategy are able to sustain the required solvency margins over the extended periods appropriate to pension funds.

Key indicators for solvency are included in the FIRM system, providing an insight into the levels of the buffers which are available to absorb the financial consequences of any residual risks.

The solvency indicators reflect both actual and required solvency. The required solvency is based on the outcome of the FTK solvency test. The solvency test determines which solvency is required to ensure that a pension fund has sufficient solvency to meet its liabilities within one year.⁶ Comparing the actual and required solvency enables the supervisor to express an opinion on the adequacy of the *actual solvency* (which is measured on a 4 point scale: **more than adequate, adequate, inadequate** and **heavily inadequate**).

This qualitative opinion about the *adequacy* of actual solvency is supplemented with an opinion about the *quality* of solvency management (*i.e.* the supervisor is asked to assess the quality of the way in which the institution concerned manages and controls its solvency). Pension funds are required to execute a continuity analysis to provide insight to both the fund itself and the supervisor about the quality of solvency management. This continuity analysis, or ALM-study, has to contain several scenarios for the next 15 years and highlights which measures a fund can take to maintain sufficient solvency in those scenario's.

It is up to the individual supervisor to decide whether the current solvency position, combined with their assessment of the solvency management, is acceptable at the current time and with a view to the future. For example, a tight solvency position (though not below statutory minimum) in

⁶ It is a stress test comparable to the one in Solvency II.

combination with very sound solvency management might be acceptable, where as an easy solvency position with moderate solvency management might not be. The assessment of the solvency position and of solvency management adds to the overall picture of the institution's risk management, with the assessment of the level and control of the individual risks being complemented with an insight into the manner in which the institution manages its financial buffers in the longer term. Details of the risk-based solvency requirements for pension funds can be found in the **Annex**.

In addition to risk profiles, the FIRM also includes key indicators and characteristics, which are designed to: enhance insight into the current risk profile; present inter-institutional distinctive features in aid of the planning process; indicate an institution's significance; perform peer group analyses. This may be helpful for prioritisation and in preparing supervisory planning.

The FIRM system does not itself calculate the key indicators, rather these are imported from other environments (either manually or automatically, usually at least once a year, or when there are important changes).

Separate key indicators and characteristics have been defined for different types of institutions, including for pension funds (see table below).

Within the list of key indicators, two specific key indicators are used to enhance insight into and add further detail to the risk profile. Thus, key indicators for liquidity and solvency have been included providing an insight into the levels of the buffers which are available to absorb the financial consequences of any residual risks. These are measured on a both a quantitative and qualitative basis (see section on quantitative indicators above).

Characteristics are mostly qualitative properties, meant to provide a cross-section within a population of institutions, *e.g.* all pension funds that have been labeled as problematic.

Table 5: DNB Key Indicators for Pension Funds

Dashboard key ratios <i>i.e. always shown</i>	Other key ratios <i>i.e. available via a 'pop up' screen</i>	Characteristics
Provision for pension liabilities - own account (EUR)	Provision for pension liabilities - other (guarantee contract and/or for account of participants)	Enterprise pension fund, industry pension fund or pension fund for professions
Required solvency (EUR)	Maturity (provision for pension liabilities (own account) of early leavers and pensioners as a percentage of total provision for pension liabilities - own account)	Problem file
Proprietary investments, % equities	Premium ratio %	Recovery programme (or action plan for reserve deficit)
Solvency ratio (%)	Total number of individuals entitled to pension (participants + early leavers + pensioners)	In liquidation
Total Assets	Explanatory notes (free text field – <i>e.g.</i> information regarding source, financial year)	
Pension Liability coverage ratio (actual funds excluding debts as a % of provision for pension)	Total Indexing % last 3 years, active participants	

liabilities)		
	Total indexing % last 3 years, inactive participants	
	Date last supervision meeting	
	Date last Investigation	

Source: DNB FIRM Manual

B. Qualitative

Indicators for each risk category and risk item are provided in the FIRM Manual (an example of the indicators for operational risk are shown below).

Table 6: DNB Indicators Operational Risk Category

Risk Item	Assessment
(Pre)acceptance / transaction	The risk of insufficiently efficient and/or insufficiently effective processes governing the establishment of new relationships (client acceptance, pricing and negotiations) with existing or new customers or counterparties.
Processing	<p>The risk that the efficiency and effectiveness of processing is affected by:</p> <ul style="list-style-type: none"> • inadequate recording of transactions and data; • inadequate fixation and on-charge of premiums and other fees; • inadequate customer services.
Payment/ clearing/ settlement	The risk that the efficiency and effectiveness of the payment process, settlement and/or clearing process is affected.
Information	The risk associated with the question how crucial the provision of accurate, timely and complete information is for adequate management and control of the activity in question and for support of adequate management decisions.
Product development	<p>The risk that the institution launches products which:</p> <ul style="list-style-type: none"> • do not meet the requirements and demands of potential customers; • do not comply with legislation and regulation; • are insufficiently remunerative; • entail undesired risks (for the institution or its customers); • lack sufficient support
Cost	The risk that current or future cost or cost developments are insufficiently recovered by or translated into in future premiums, fees and/or other activities.
Staff	The risk associated with the question how crucial issues such as the following are for the efficiency and effectiveness of process

	<p>implementation of the activity in question:</p> <ul style="list-style-type: none"> • qualitative and/or quantitative staffing; • staff recruitment process; • remuneration policy; • training and career development policy; • motivating culture; • social policy.
Sensitivity to Fraud	<p>The risk associated with the question how sensitive the institution, its products and processes are to:</p> <ul style="list-style-type: none"> • fraud by the institution's employees; • collusion between employees and third parties; • fraud by external parties.

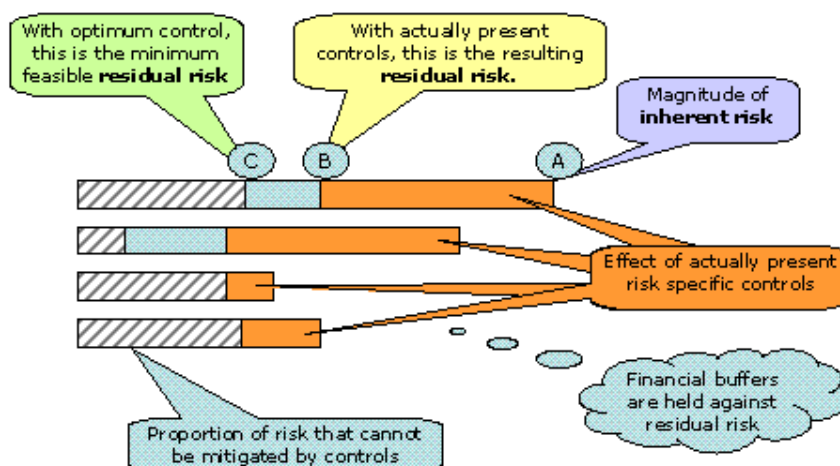
4. Risk Mitigants

The aim of control assessment is to obtain an insight into the quality of the risk controls for each of the individual risk categories to derive a final value that represents the net risks of the entity. The basic formulation that underlies the FIRM may be represented as:

$$\text{Inherent (gross) risk mitigated by controls} = \text{residual (net) risks}$$

It should be noted that inherent risks cannot be reduced to nil, not even with the aid of adequate controls. Phrased differently, even if optimum controls are in place, a residual risk remains in most cases. For some risks, this ultimately resulting residual risk will be larger than for other risks. The supervisor's assessment focuses on the question whether the institution controls the risk concerned in an optimum manner (as best as is realistically feasible). The question whether the risk is thus eliminated in full is of secondary importance. Within the FIRM, optimum control of a certain risk, irrespective of the question whether the risk has been reduced to nil, should lead to the assessment 'strong control' (control score 1).

Figure 4: DNB Risk Control



Risk control is evaluated within three categories:⁷

- *risk-specific controls*: evaluated separately for each of the risk categories;
- *risk-transcending controls*: evaluated within a five-element framework that addresses the scope of crosscutting management activities;
- *risk-mitigating effects of group functions*: the management of the organization has a similar control effect that is not specific to the categories of risk identified.

⁷ The FIRM model also considers solvency risk in relation to pension funds –i.e. supervisors consider not only whether solvency requirements have been met but also consider the quality of the solvency management. See the on-line FIRM manual for further details.

Table 7: DNB Risk Control

Risk-specific Controls	
<i>Control item</i>	<i>Description</i>
Risk identification	The degree to which and the manner in which the institution has independently mapped the specific risk category, through such means as a risk inventory and risk analysis.
Risk policy	The quality of the written policy with regard to the degree to which (risk appetite) and the manner in which (outline of controls to be implemented) the institution plans to control the risk category concerned.
Administrative organisation/internal control	The degree to which and the manner in which procedures, function segregations, authorisations, limits and other preventive measures or other measures have been implemented in order to control the risk category concerned and thus to implement the appurtenant risk policy.
Risk monitoring	The degree to which and the manner in which the specific risk is monitored (and required adjustments are made) and the controls have been implemented, for instance by means of performance, incident or exception reports and analyses.
Risk-transcending controls - Organisation	
<i>Control item</i>	<i>Description</i>
Organisational structure	The transparency of the legal or organisational structure, and the extent to which it lends itself to promoting effective operations.
Supply of management information	The extent to which timely and reliable financial and operational information is available to responsible staff (including management) permitting them to make timely and well-informed decisions and, where necessary, make timely adjustments.
Human resources	The extent to which adequate HR policies and sound HR instruments are in place, and the qualitative and quantitative adequacy of staff.
Internal cooperation and communication	The extent to which the internal communication and cooperation among departments and business units and with group functions operates, aimed at effective cooperation in the pursuit of the objectives.
Audit measures	The extent to which internal and external audits by auditors and actuaries contribute effectively to the identification, analysis, control, monitoring and reporting of risks.
Risk-transcending Controls – Management	

<i>Control item</i>	<i>Description</i>
Management quality and structure	<p>The manner in which the institution's leadership function is effectively performed. Cases in point are:</p> <ul style="list-style-type: none"> • the competence of the (board of) management as a whole to manage the institution; • the extent to which the (board of) management is adequately balanced in terms of expertise and background; • the extent to which the management structure and composition match the size and complexity of the operations; • the extent to which responsibilities have been assigned in an adequate manner to the individual members of the (board of) management and the extent to which an adequate span of control has been realised; • the extent to which the (board of) management sets an example for the institution's staff (for instance, by propagating ethical norms and standards); • the (board of) management's leadership style and the extent to which • the (board of) management is respected within the institution.
Strategy	<p>This concerns:</p> <ul style="list-style-type: none"> • the manner in which the strategy is formulated within the institution; • the extent to which this process takes place on an institution-wide basis; • the transparency of the process; • the substance and consistency of the strategy; • the degree of specificity of the strategy, and • the extent to which the institution's strategy is clearly and consistently communicated.
Risk/control attitude	<p>This concerns:</p> <ul style="list-style-type: none"> • the extent to which the (board of) management is aware of and interested in, and has an insight into, the risks to which the institution is exposed; • the preparedness of the (board of) management to use adequate controls (both in-house and underlain by statutory rules) and to make sufficient funds available for that purpose; • the extent to which the (board of) management is prepared to take risks and, when doing so, perform an adequate risk-benefit analysis; • the extent to which the (board of) management complies with the existing internal controls.
Management and decision-making	<p>The extent to which the (board of) management is sufficiently actively and substantively involved in operational management and results. This is reflected in such aspects as the frequency, degree of substantiveness, intensity and action-oriented nature of management consultations.</p> <p>This also concerns the effectiveness of the delegation of powers to (decision-making) bodies (such as risk committees).</p>

Risk-specific controls comprise controls that are specifically aimed at mitigating one single risk category. Thus, collection procedures are aimed specifically at reducing credit risk. Likewise, disaster recovery and back-up procedures are aimed specifically at reducing IT risk. Such risk-specific controls generally seek to reduce the probability of a risk event or, in the case of a risk event, to reduce its impact.

The control category Organisation may exert a risk-mitigating effect on inherent risks through such means as a transparent organisational structure, clear links between activities, management units and group functions, and through an adequate reporting structure. Organisation is a non-risk-specific control, also known as a risk-transcending control. This means that the aspects of Organisation do not relate to a single risk, but have a risk-mitigating effect on the entire functional activity and the risks distinguished in that activity.

The control category Management may exert a risk-mitigating effect on inherent risks through such means as a management structure and composition matching the size and complexity of the operations, an effective decision-making process, effective strategic planning and the encouragement of a corporate culture marked by an awareness of risks and the need for risk control. Like Organisation, Management is a non-risk-specific control, also known as a risk-transcending control. This means that the aspects of Management do not relate to a single risk, but have a risk-mitigating effect on the entire functional activity and the risks distinguished in that activity.

The control items are scored in the same manner as the risk categories – *i.e.* weak to strong⁸.

Table 8: DNB Risk Control Categories

1. **Strong control:** High control quality makes for a strong reduction of inherent risks. The control framework is fully in line with the requirements set by the nature of the business.
2. **Adequate control:** Adequate control quality makes for an adequate reduction of inherent risks. The control framework is adequately in line with the requirements set by the nature of the business.
3. **Inadequate control:** Control must be improved. Inherent risks are not adequately reduced. The control framework is insufficiently in line with the requirements set by the nature of the business.
4. **Weak control:** Control must be improved drastically and/or immediately. Inherent risks are not or barely reduced. The control framework is barely in line with the requirements set by the nature of the business.

Unknown: If the supervisor has as yet insufficient information about a certain form of control, he/she should use this option.

It is up to the individual supervisor to decide whether the net risks arising from organisation and control are acceptable at the current time and with a view to the future.

The FIRM Manual provides very detailed guidance on the assessment criteria for each specific risk control (market risk, credit risk etc.) The Manual describes what strong, adequate, inadequate and weak controls would look like in terms of risk identification, risk policy, administrative organisation and internal control, and risk monitoring for each risk category. An example for operational risk control follows:

⁸ Details are available in the on-line FIRM Manual <http://www.dnb.nl/openboek/extern/id/en/all/41-117136.html>

Table 9: DNB Assessment of Operational Risk Control

	Strong Control	Adequate Control	Inadequate Control	Weak Control
Risk Identification	<p>Frequent identification of all relevant operational risks at business unit level, process level and product level.</p> <p>New products, initiatives and projects are preceded by a thorough analysis of related operational risks and sensitivity to fraud.</p> <p>Institution frequently performs risk or control self-assessments at various levels.</p> <p>Management and those concerned at all relevant levels and competencies involved in risk identification. Full understanding of all aspects of operational risk among responsible staff.</p> <p>Risk identification also identifies risks in the tail of the probability distribution (very high impact, very low probability).</p> <p>Risk identification transparently documented in each business unit.</p> <p>Risk identification based on a</p>	<p>Periodic identification of relevant operational risks at institution level.</p> <p>Important new products, initiatives and projects are preceded by a broad analysis of related operational risks and sensitivity to fraud.</p> <p>Institution periodically performs risk or control self-assessments.</p> <p>Management and other staff sufficiently involved in risk identification. Sufficient understanding of all aspects of operational risk among responsible staff.</p> <p>Risk identification also identifies risks in the tail of the probability distribution (very high impact, very low probability).</p> <p>Risk identification acceptably documented in each business unit.</p> <p>Risk identification generally based on a systematic</p>	<p>Occasional identification of operational risks at institution level.</p> <p>Important new products, initiatives and projects are generally only analysed retrospectively in broad terms in respect of related operational risks and sensitivity to fraud.</p> <p>Institution occasionally performs risk or control self-assessments.</p> <p>Insufficient involvement of management and staff in risk identification. Insufficient understanding of all aspects of operational risk among responsible staff.</p> <p>Risk identification identifies risks in the tail of the probability distribution (very high impact, very low probability) to a limited extent only.</p> <p>Risk identification poorly documented.</p>	<p>No identification of operational risks.</p> <p>Important new products, initiatives and projects are not analysed in terms of related operational risks and sensitivity to fraud.</p> <p>Institution does not perform risk or control self-assessments</p> <p>Hardly any involvement of management and staff in risk identification. Hardly any understanding of all aspects of operational risk among responsible staff.</p> <p>Risk identification does not identify risks in the tail of the probability distribution (very high impact, very low probability).</p> <p>Risk identification not documented.</p> <p>Risk identification not based on a systematic approach.</p> <p>Risk identification not translated into prioritisation.</p> <p>No detailed analysis is made of the possible underlying causes of</p>

	<p>systematic approach. A specific place has been assigned to operational risks under this approach.</p> <p>Risk identification translated into adequate prioritisation.</p> <p>Detailed analysis is made of the possible underlying causes of potential risks.</p> <p>Institution uses a model for modelling operational risks. The assumptions used in risk modelling are up-to-date, complete, accurate and reliable.</p>	<p>approach.</p> <p>Risk identification translated into reasonable prioritisation.</p> <p>Detailed analysis is made of the possible underlying causes of important potential risks.</p> <p>Institution uses a model for modelling operational risks. The assumptions used in risk modelling are fairly current, complete, accurate and reliable.</p>	<p>Risk identification insufficiently based on a systematic approach.</p> <p>Risk identification inadequately translated into prioritisation.</p> <p>No detailed analysis is made of the possible underlying causes of important potential risks.</p>	<p>potential risks.</p>
Risk Policy	<p>Risk policy is well geared to identified risks that have been designated as important.</p> <p>Risk policy indicates the extent to which risks should be insured and/or controlled.</p> <p>Institution has an adequately staffed operational risk management department, the powers and responsibilities of which have been laid down in a charter. Any amendments in policy are timely incorporated in the charter.</p> <p>Institution has a broadly composed operational risk committee whose tasks, powers</p>	<p>Risk policy is reasonably geared to identified risks that have been designated as important.</p> <p>Risk policy indicates whether risks should be insured and/or controlled.</p> <p>Institution has an operational risk management department, the powers and responsibilities of which have been laid down in a charter.</p> <p>Institution has an operational risk committee.</p> <p>The operational risk committee meets periodically and top management is sufficiently</p>	<p>Risk policy is insufficiently geared to identified risks that have been designated as important.</p> <p>Risk policy does not adequately indicate whether risks should be insured and/or controlled.</p> <p>Institution has an operational risk management department, whose powers and responsibilities are not laid down in a charter.</p> <p>Institution appoints an operational risk management working group on an ad hoc basis.</p>	<p>Risk policy is not geared to identified risks that have been designated as important.</p> <p>Risk policy does not indicate whether risks should be insured and/or controlled.</p> <p>Institution does not have an operational risk management department.</p> <p>Institution does not have an operational risk management working group.</p> <p>Personnel policy is highly inadequate.</p> <p>Institution does not have any fraud prevention policies.</p>

	<p>and responsibilities have been laid down in a charter.</p> <p>The operational risk committee meets very frequently and top management is closely involved.</p> <p>Personnel policy is well developed and in line with the strategy and is laid down by senior management.</p> <p>Institution has drawn up policies with regard to fraud prevention, the discouragement of fraud and the punishment of fraud, both internal and external.</p> <p>Institution has drawn up standards for operational indicators, such as turnaround times, working stocks and downtime.</p> <p>Operational risk policy is adequately documented and laid down by senior management.</p> <p>Policy is of high quality (completeness, level of documentation, quality of content, depth).</p>	<p>involved.</p> <p>Personnel policy is sufficiently developed and sufficiently in line with the strategy.</p> <p>Institution has drawn up fraud prevention policies.</p> <p>Institution has drawn up standards for important operational indicators.</p> <p>Operational risk policy, insofar as not consistent with the frameworks adopted by senior management, is submitted to the latter for approval.</p> <p>Policy is of satisfactory quality (completeness, level of documentation, quality of content, depth).</p>	<p>The operational risk management working group meets periodically and there is limited involvement on the part of top management.</p> <p>Personnel policy is of inadequate quality.</p> <p>Institution has drawn up sketchy fraud prevention policies.</p> <p>Institution has drawn up hardly any standards for important operational indicators.</p> <p>Operational risk policy, insofar as not consistent with the frameworks adopted by senior management, is regularly not submitted to the latter for approval.</p> <p>Policy is of unsatisfactory quality (completeness, level of documentation, quality of content, depth).</p>	<p>Institution has not drawn up any standards for important operational indicators.</p> <p>Operational risk policy, insofar as not consistent with the frameworks adopted by senior management, is not submitted to the latter for approval.</p> <p>Policy is of ambiguous quality (completeness, level of documentation, quality of content, depth).</p>
Administrative Organisation and Internal Control	<p>Strong embedding in the organisation of the adopted risk policy (as reflected in procedures, segregation of duties, powers, limits and preventive measures).</p>	<p>Sufficient embedding in the organisation of the adopted risk policy (as reflected in procedures, segregation of duties, powers, limits and</p>	<p>Insufficient embedding in the organisation of the adopted risk policy (as reflected in procedures, segregation of duties, powers, limits and</p>	<p>Virtually no embedding in the organisation of the adopted risk policy (as reflected in procedures, segregation of duties, powers, limits and preventive measures).</p>

	<p>Quality of procedures for approval of new clients, products and activities is good.</p> <p>Procedures adequately documented and up-to-date.</p> <p>Tasks, responsibilities and powers are clear and adequate.</p> <p>Segregation of duties and four-eyes principle adequately incorporated in risky processes.</p> <p>Solid escalation procedures for the authorisation of exceptional items.</p> <p>Adequate and independent checks and balances for the development of new products.</p> <p>Product launches based on detailed business cases and decided by senior management.</p> <p>Operational controls are of high quality (in relation to input, independence of staff, independence of and coordination between front, middle and back office).</p> <p>Adequate complaints procedure.</p> <p>Good, independent and frequent analysis of and reporting on suspense accounts.</p> <p>Large amount of straight-</p>	<p>preventive measures).</p> <p>Quality of procedures for approval of new clients, products and activities is satisfactory.</p> <p>Procedures adequately documented and generally up-to-date.</p> <p>Tasks, responsibilities and powers are generally clear and adequate.</p> <p>Sufficient segregation of duties.</p> <p>Provision has been made in the case of important procedures for the authorisation of exceptional items.</p> <p>Sufficient checks and balances for the development of new products.</p> <p>Product launches based on business cases and involvement of senior management.</p> <p>Operational controls are of adequate quality (in relation to input, independence of staff, independence of and coordination between front, middle and back office).</p> <p>Acceptable complaints</p>	<p>preventive measures).</p> <p>Quality of procedures for approval of new clients, products and activities is inadequate.</p> <p>Procedures regularly not laid down and/or not up-to-date.</p> <p>Tasks, responsibilities and powers are generally unclear and inadequate.</p> <p>Insufficient segregation of duties.</p> <p>A number of important procedures do not make provision for the authorisation of exceptional items.</p> <p>Insufficient checks and balances for the development of new products.</p> <p>Product launches regularly not based on business cases and involvement of senior management.</p> <p>Operational controls are of inadequate quality (in relation to input, independence of staff, independence of and coordination between front, middle and back office).</p>	<p>Quality of procedures for approval of new clients, products and activities is poor or procedures are unavailable.</p> <p>Hardly any procedures laid down and not up-to-date</p> <p>Tasks, responsibilities and powers are unclear and inadequate.</p> <p>Virtually no segregation of duties.</p> <p>Procedures do not make any provision for the authorisation of exceptional items.</p> <p>No checks and balances for the development of new products.</p> <p>Product launches not based on business cases and involvement of senior management.</p> <p>Operational controls are of particularly poor quality (in relation to input, independence of staff, independence of and coordination between front, middle and back office).</p> <p>No complaints procedure.</p> <p>No analysis of and reporting on suspense accounts.</p> <p>Hardly any straight-through processing and substantial use of interfaces.</p>
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	<p>through processing and minimal use of interfaces.</p> <p>Very strict and adequate procedures concerning initiation and authorisation of outward money flows (including adequate authorised signatory arrangements).</p>	<p>procedure.</p> <p>Periodic analysis of and reporting on suspense accounts.</p> <p>Sufficient amount of straight-through processing and fairly limited use of interfaces.</p> <p>Procedures concerning initiation and authorisation of outward money flows (including adequate authorised signatory arrangements) of sufficient quality.</p>	<p>Inadequate complaints procedure.</p> <p>Ad hoc analysis of and reporting on suspense accounts.</p> <p>Insufficient straight-through processing and more than average use of interfaces.</p> <p>Inadequate procedures concerning initiation and authorisation of outward money flows (including an authorised signatory arrangement).</p>	<p>Poor procedures concerning initiation and authorisation of outward money flows (including an authorised signatory arrangement).</p>
Risk Monitoring	<p>Clear reports on operational performance (operational key indicators and thorough explanatory notes).</p> <p>Frequent and detailed exception reporting in respect of exceptional (<i>i.e.</i> large or risky) transactions.</p> <p>Management is periodically informed about status of risks, quality of control and status of improvement measures.</p> <p>Apart from reports on the usual operational activities, frequent standard reports are also submitted on complaints, incidents, fraud and exceptions.</p>	<p>Management information on operational performance is of an acceptable standard.</p> <p>Periodic exception reporting in respect of exceptional (<i>i.e.</i> large or risky) transactions.</p> <p>Management is broadly informed with sufficient regularity about risks and their control.</p> <p>Apart from reports on the usual operational activities, reports are also submitted on complaints, incidents, fraud and exceptions.</p> <p>Periodic reporting on key risk</p>	<p>Management information on operational performance is inadequate.</p> <p>Occasional exception reporting in respect of exceptional (<i>i.e.</i> large or risky) items.</p> <p>Management is informed on an ad hoc basis about important risks and their control.</p> <p>Apart from reports on the usual operational activities, ad hoc reports are also submitted on complaints, incidents, fraud and exceptions.</p>	<p>No management information on operational performance.</p> <p>No exception reporting in respect of exceptional (<i>i.e.</i> large or risky) items.</p> <p>Management pays hardly any attention to information on important risks and their control.</p> <p>Apart from reporting on the customary operational activities no further reports are submitted on complaints, incidents and exceptions.</p> <p>No reporting on key risk indicators for crucial processes.</p> <p>Poor or no recording and</p>

	<p>Availability of loss events database built up from both external and internal data.</p> <p>Frequent and sufficient in-depth report on key risk indicators for crucial processes (including standard/limit values).</p> <p>Areas for improvement suggested by the IAD and the supervisory authority, etc., are recorded and monitored independently of the business.</p> <p>Frequent performance of (reliable) short-term scenario analyses and stress testing in which a very broad range of possible disasters/external events is examined.</p>	<p>indicators for crucial processes.</p> <p>Areas for improvement suggested, among other things, by the IAD and the supervisory authority are recorded and monitored.</p> <p>Periodic performance of (reliable) short-term scenario analyses and stress testing in which a very broad range of possible disasters/external events is examined.</p>	<p>Occasional reporting on key risk indicators for crucial processes.</p> <p>Inadequate recording and monitoring of areas for improvement suggested, among other things, by the IAD and the supervisory authority.</p> <p>Occasional performance of (reliable) short-term scenario analyses and stress testing in which a very broad range of possible disasters/external events is examined.</p>	<p>monitoring of areas for improvement suggested, among other things, by the IAD and the supervisory authority.</p> <p>Absence of any (reliable) short-term scenario analyses and stress testing in which a very broad range of possible disasters/external events is examined.</p>
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5. Risk Weightings

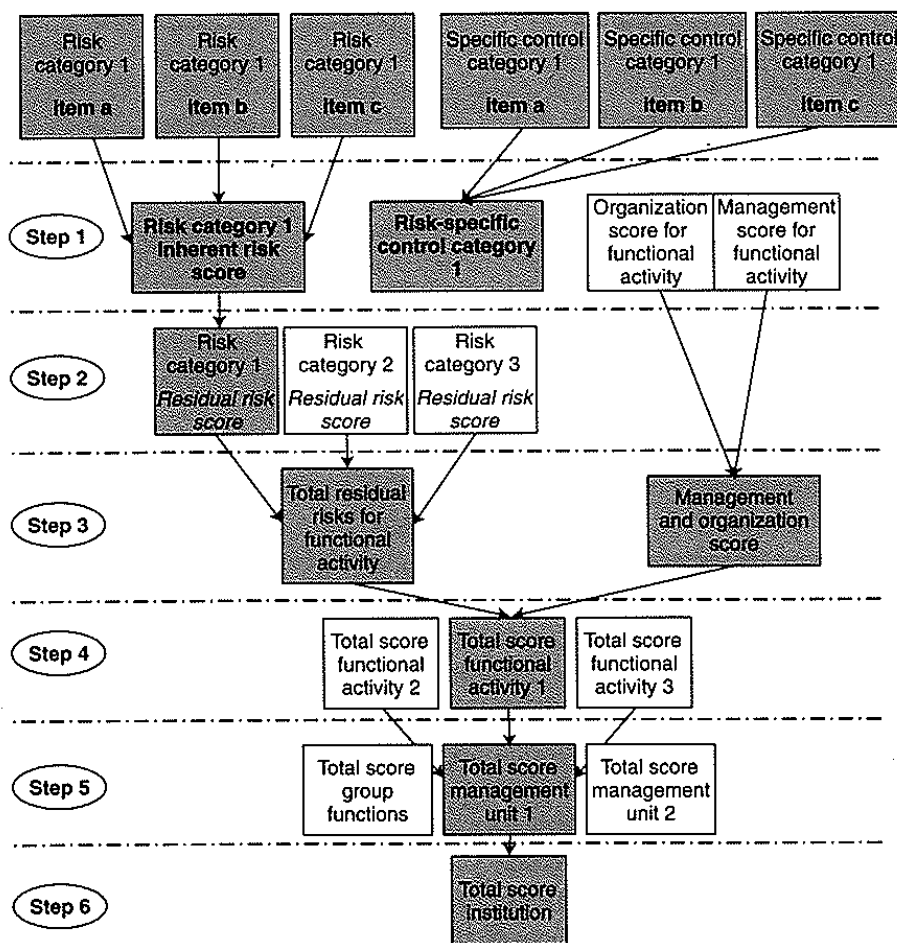
Just as the templates for the different institutions have been assigned *default score* to the risk categories and controls, *default weights* denoting the importance of the different functional activities are also input centrally. These default weights (**high**, **medium** or **low**) serve to indicate the importance which is assigned to the category concerned from a supervisory perspective.

The reasons for using weights are related to the fact that certain risk categories (such as operational risk, IT risk and integrity risk) feature relatively more often in the templates than other risk categories (such as credit risk and matching risk). The more frequently used categories are assigned a lower weight to stop them assuming a disproportionately high influence on aggregate scores. In order to adjust for this discrepancy, credit risk, matching risk, market risk and insurance technical risk have been assigned high weights in the relevant functional activities, whereas all other risks have been assigned medium weights.

The scores from the risk-specific analysis are then combined with the supervisor's judgements on the crosscutting risk-management capacities of the fund (in terms of organisation and management) to derive an overall risk score for the fund. The scores for organisation and management are given equal weight to reach a combined score, which is then combined with the aggregate risk specific score to reach a total score. This ratio represents the overall policy decision of the relative weighting of the various components.

Aggregation of assessment results is based on a mathematical algorithm that takes into account the weighting factors of the breakdown structure. The algorithm is based on the principle that emphasis is placed on high risks and poor controls to reduce the likelihood that scores are averaged out. This aggregation process is supported by the risk analysis software tool, which automatically calculates the aggregate scores at each institution (though the process is not totally automatic – each supervisor has to verify that the computed scores and weighted outcomes against his/her own judgement).

Figure 5: De Nederlandsche Bank Accumulation of Scores



Source: World Bank (2008) / DNB FIRM Manual

6. Probability

Probability is not dealt with separately by DNB FIRM model. Rather the risk score attributed to the different risk categories reflects the probability of that risk occurring.

Unlike some other risk-based supervision systems, the FIRM framework does not evaluate probability and impact of risks separately but rather combines these into a single score – i.e. probability is taken to mean the probability of the risk event leading to a significant to high impact on the four pillars of the supervisory objectives (solvency, liquidity, organisation and control, and integrity). This approach is based on the assumption that there is a high degree of interdependence between the probability of a risk and the magnitude of its impact. For example the probability of a market risk event leading to a major impact (e.g. a loss of 30%) is usually smaller than the probability of a market risk event leading to a minor impact (e.g. a loss of 5%). Probability is therefore assessed on the basis of a given impact. The concept has been left implicit, as the information required for a more quantitative approach (such as probability distribution and models) is not widely available.

7. Impact

Combined with probability analysis – as described above.

8. Quality Assurance

As described, DNB's FIRM model uses templates for different types of institutions, including three templates for pension funds (pension funds which have been fully re-insured; pension funds which outsource nearly all their business; others – subdivided into pension funds that perform all functions internally and those which outsource asset management only). The scores for the risk categories, risk mitigants and the weightings for these are already programmed into the template by the central FIRM expert team. The individual supervisor then has to decide whether to override these scores and must record an explanation for any overrides.

The lack of knowledge amongst supervisors of the internal control measures of a pension fund has frequently led to problems in determining specific scores. This has often been the case in relation to IT risk and operational risk of outsourcing. In these cases, the relevant net risk had to be scored as high, because not knowing the extent of control measures taken by the pension fund implies a high risk from a supervisory point of view. This meant that the pension fund had to be visited very soon to fill this gap in supervisory control. In addition, staff members were afforded some discretion to add risks not included in the categories and determine a risk score based on their professional judgment.

The supervisory departments or divisions have measures in place that seek to warrant the quality of the risk analyses performed. Cases in point are the four-eyes principle, team discussions, peer reviews or quality assurance on behalf of the management of the supervisory function.

The FIRM model was developed by a project team comprising representatives from all supervisory divisions, as well as IT. As the project developed, input from the team was obtained via information meetings and substantive discussions on specific issues with experts from within the supervisory divisions. One of the division directors in charge of one of the supervisory functions (currently internationally active conglomerates) has been appointed as the **owner** of the FIRM model, and is supported by the **FIRM Expert Team**, which is made up of representatives from all operational supervisory divisions. The team is responsible for maintaining the model, providing support to users, and updating risk definitions, assessment criteria and default values in the FIRM Manual.

A **Functional Application Manager** has also been appointed for the day-to-day management of the FIRM model, covering issues such as user rights, the management existing data on institutions, adjusting default values, maintaining risk and control categories and types of key indicators and characteristics. Technical support is provided via the IT department. Staff with requests for substantive information and assistance are directed to the Manual, to the relevant member of the Expert Team or the Functional Application Manager.

9. Supervisory Response

DNB has an interesting approach to determining its supervisory response, involving a wide range of inputs. Though a risk score is derived for each institution under the FIRM model, this is by no means the only or even the most important element which goes into the supervisory planning process – *i.e.* there is not a 'mechanistic' relationship between the risk score and the supervisory response. Where

a supervisor is responsible for, say, 50 small pension funds, his quarterly planning programme will involve a combination of regular visits and visits or investigations of those institutions which are seen as requiring additional attention. These could be determined by a particularly bad control environment, bad solvency conditions or bad solvency planning (the three main indicators used to assess pension funds) or particularly warning results arising from the further (7) indicators which the supervisor checks.

Apart from the FIRM, other supervisory themes are also worked into the planning process. For example, particular indicators may be seen as more important in certain times and under certain conditions than others.

The FIRM model is also used to direct the supervisors' attention within the firm, to various areas, divisions or types of risk which are seen as particularly in need of attention.

In the manual relating to the FIRM, Chapter 9 deals with the link between the FIRM and supervisory planning. Though the relationship between the FIRM and supervisory planning is neither strictly mathematical nor uniform for all forms of prudential supervision (e.g. depending on the size of the institution and therefore whether the focus is on prioritising across or within institutions -with other factors such as topics of current interest, sectoral studies for benchmarking also being taken into account in the planning process), the following basic principles can be established:

- (a) the breakdown and risk analysis should contain only those functional activities that are relevant from a supervisory perspective and should therefore be included in some form or other in the supervisory practice;
- (b) in the planning schedule, a logical and visible relationship should exist between the supervisory intensity (the frequency and depth of inspections and supervisory interviews) and the risk profile (the size of operations, reflected in the relative weight, in combination with the aggregated risk score) of a functional activity or management unit, or a specific risk category;
- (c) at institutions with relatively less adequate solvency and/or liquidity, solvency management and liquidity management should be given a relatively greater amount of attention;
- (d) the internal control of a functional activity, management unit or institution with high inherent risk should be given more, and earlier, supervisory attention than the internal control of entities with low inherent risk;
- (e) institutions or functional activities whose risk profile is deteriorating over time should be given extra attention;
- (f) planning capacity should be reserved for functional activities in respect of which the supervisory authority lacks information as regards internal control.

An example of a DNB quarterly planning programme follows (see Table 10)..

In addition the risk-based solvency requirements laid out under the FTK contain specific recovery periods for situations in which pension funds fall short of funding requirements. Funds are required

at all times to have assets that have the market value at least equivalent to the technical provision plus a minimum solvency requirement of about 5% of the technical provision. If this is not met, the fund must immediately submit a recovery plan to DNB, explaining how the minimum capital requirement will be restored within no more than three years (DNB may require full funding within 1 year in specific circumstances). In addition, under the FTK pension funds are required to maintain a capital solvency buffer that is able to fulfil the short-term solvency stress test (see **Annex** for details). If the fund's actual funding ratio is below this requirement again a recovery plan must be submitted, this time with a maximum recovery period of 15 years. The continuity analysis (*i.e.* long-term solvency stress test) is given considerable weight in the determination of the acceptability of the recovery plan. The Minister of Social Affairs has the power to extend the maximum duration of recovery plans in case of extreme and economic conditions – as were experienced in 2008/2009

The policy with regard to the communication of risk analysis results to the institutions will be formulated by the management of the supervisory divisions. Any such information to be provided will have to meet certain minimum requirements as to quality. Moreover, an adequate understanding of the FIRM methodology by the institution concerned, is important for a correct interpretation of the results.

Table 10: DNB Quarterly Planning

Institution	Investments (own account) - % of shares plus real estate	Provision for liabilities - own risk x € 1.000	Total inherent risk score institution	Total net score	Inherent risk score Matching- / interest rate risk	Control Matching- / interest rate risk	Net score Matching- / interest rate risk	Inherent risk score Market risk	Control Market risk	Net score Market risk	Inherent risk score Credit risk	Control Credit risk	Net score Credit risk	Inherent risk score Insurance technical risk	Control Insurance technical risk	Net score Insurance technical risk	Inherent risk score Environmental risk	Control Environmental risk	Net score Environmental risk
1 Name	48	112161	2.7	2.2	3.5	3	3	3	3	2.7	2.5	2	1.9	2	2	1.7	2	2	1.7
2 Name	39.4	57715	2.7	2.2	3.5	3	3	3	2	2.2	2.5	2	1.9	2	3	2.1	2	2	1.7
3 Name	15	50213	1.8	2.1	2	2	1.7	1.7	2	1.5	1.5	2	1.4	1	2	1.1	3	2	2.2
4 Name	19	43116	2.5	2	3.5	2	2.5	2.3	2	1.9	2	2	2	2.3	2	1.9	3	2	2.2
5 Name	41	271138	2.5	2	3.5	2	2.5	2.3	2	1.9	2	2	1.7	2.3	2	1.9	3	2	2.2
6 Name	23	2000567	1.8	1.7	2	1	1.5	1.7	2	1.5	1.5	2	1.4	1	2	1.1	3	2	2.2
7 Name	34	1500005	2.5	2.1	3.5	4	3.7	2.3	2	1.9	2	2	1.7	2.3	2	1.9	3	2	2.2
8 Name	40	118384	2.5	2.2	3.5	3	3	2.3	2	1.9	2	2	1.7	2.3	2	1.9	3	2	2.2
9 Name	14	145009	1.8	2.5	2	1	1.5	1.7	1	1.3	1.5	2	1.4	1	1	1	3	4	3.3
10 Name	23	171	2.7	2.1	3.5	2	2.5	3	2	2.2	2.5	2	1.9	2	2	1.7	2	3	2.1
Average	30	429848	2.4	2.1	3.1	2.3	2.5	2.3	2.3	1.9	2.0	2.0	1.7	1.8	2.0	1.6	2.7	2.3	2.2

Institution	Inherent risk score Outsourcing risk	Control Outsourcing risk	Net score Outsourcing risk	Inherent risk score Operational risk	Control Operational risk	Net score Operational risk	Inherent risk score IT-risk	Control IT-risk	Net score IT-risk	Inherent risk score	Control Integrity risk	Net score Integrity risk	Inherent risk score Legal risk	Control Legal risk	Net score Legal risk	Score Organisation	Score Management	Score Solvency management	Score solvency position
1 Name	2.8		2.8	2.7	2	2	3		3	2	2	1.7	2.8	2	2.1	2	2	2	2
2 Name	2.8		2.8	2.7	2	2	3		3	2	3	2.1	2.8	3	2.5	2		2	2
3 Name				3	3	2.7				1	3	1.4	2	3	2.1	3	3	2	2
4 Name				3	2	2.2				1	3	1.4	2.3	2	1.9	2		2	2
5 Name				3	2	2.2				1	2	1.1	2.3	2	1.9	2	2	2	2
6 Name				3	2	2.2				1	2	1.1	2	2	1.7	2	2	2	1
7 Name				3	3	2.7				1	2	1.1	2.3	2	1.9	2	2	3	3
8 Name				3	2	2.2				1	3	1.4	2.3	2	1.9	2	3	2	3
9 Name				3	4	3.3				1		1	2	3	2.1	4	4	1	2
10 Name	2.8	2	2.1	2.7	2	2	3	2	2.2	2	2	1.7	2.8	3	2.5	2	2	2	2
Average	2.8	2.0	2.6	2.9	2.4	2.4	3.0	2.0	2.7	#	2.4	1.4	2.4	2.4	2.1	2.3	2.5	2.0	1.9

ANNEX 1: FTK RISK-BASED SOLVENCY⁹

Consistent with the EU's IORP,¹⁰ the FTK requires that DB, occupational pension funds must have asset liability balances sufficient for all accrued benefits.¹¹ The technical provisions should be calculated with regard to all unconditional pension liabilities without taking into account possible future salary increases (accrued benefit obligation) on a mark-to-market basis. The valuation is defined as the present value of the amount of accrued benefits and other unconditional claims using the most realistic assumptions and current interest rates. Forseeable demographic, social, legal, medical, technological and economic trends must be taken into account when determining the expected value of the liabilities. Expected longevity improvements (including specific considerations regarding the nature of the membership of the fund) are required to be reflected in the mortality table and incorporated in the valuation of the liabilities. In terms of discount rate, the FTK requires a term structure of zero-coupon interest rates that are derived from the euro swap rate to be used. Funds are required at all times to have assets that have the market value at least equivalent to the technical provision plus a minimum solvency requirement of about 5% of the technical provision.

Figure 6: Pension Fund Balance Sheet Statement

1 Balance sheet on realistic value 31 December 2004 (amount in 1000 €)			
Assets		Liabilities	
Investments		L1 Free Capital	€
A1 Fixed income		L2 Technical Provisions	
government bonds	€	Pension provision	€
index linked bonds	€	Other technical provisions	€
mortgages	€	Total	€
corporate bonds	€	L3 Subordinated loans	€
short-term receivables on banks	€	L4 Long-term liabilities	€
A2 Participations		L5 Short-term liabilities	€
capital stock	€		
loans	€		
A3 Stocks			
listed in developed markets	€		
listed in emerging markets	€		
private equity	€		
A4 Property	€		
A5 Commodities	€		
A6 Other assets	€		
Total of investments	€		
A7 Portion reassurers in techn provision	€		
A8 Receivables and transitory assets	€		
A9 Cash	€		
Total	€	Total	€

⁹ Taken from World Bank publication (Brunner 2008).

¹⁰ EU Directive 2003/41/EC <http://www.efrp.eu/KeyIssues/IORPDirective.aspx>

¹¹ The FTK is currently evaluated by DNB and the Minister of Social Affairs.

Figure 7: Present Value Pension Provision Statement

4 Breakdown present value pension provision (old age and widowers pension)
amount in € 1000

Pension provision	€	
Duration of liabilities		yr
Valuation method Market Value Margin		standard/own experience
If calculated with standard method (book of tables):		
- retirement age		yr
- average age of all participants (members, pensioners, etc.)		yr
- amount of future mortality trend uncertainty (TSO)	€	
- total number of all participants (members, pensioners etc.)		(text)
- amount of negative stochastic variances	€	
If calculated with 75% percentile:		
- what is the underlying distribution?		(text)
Amount of Market Value Margin	€	

Minimum annual contributions must be equivalent to the value of the benefits accrued during the year plus any additional costs to retain the solvency requirement. In contrast to the technical provision calculation, the contribution may be smoothed using a smoothed or even fixed discount rate. Every pension fund must disclose the cost-based contribution rate and the actual (stabilized) contribution rate for the applicable year in its annual accounts. In assessing the solvency of pension funds, the supervisor will take into account the differences between the actual and the cost-based contribution. A complete report of on the calculation of the cost-based contribution is required to be filed with the supervisor.

Figure 8: Report on the Determination of the Contribution

2 Report on the determination of the contribution

A Cost-based contribution rate (realistic value)

1 Nominal current service cost + Backservice	€	
2 Mark up for administrative costs	€	
3 Solvency levy	€	
4 Actuarial premium for constructive obligations	€	
Cost-based contribution rate	€	

B Contribution set out in the abtn

a Is based on the cost based contribution under A ?

b Is based on a stabilized discount rate ?

Answer

In case of situation b: amount of abtn contribution

€

C Actual contribution

Same as a or B ?

If not:

- increased because of a recovery plan?	y/n
- increased for other (transitional) reasons?	y/n
- contribution discount, - holiday or refund?	y/n
- reversal of solvency levy?	y/n

Amount of the actual contribution

€

In addition to fulfilling the technical provisions related to the funding of the present value of accumulated liabilities, pension funds are required to maintain additional capital that provides a solvency buffer. Consistent with the European IORP Directive, the buffer capital is a function of the pension fund's risk profile. The relevant risks are deemed to be related to the nature of investments, the matching of assets and liabilities, and the volatility of liabilities. The risk-related portion is derived from an estimation of the potential duration mismatch of assets and liabilities and the evaluation of the volatility of the asset portfolio. The legal requirement is that the fund must have sufficient capital to ensure that there is a probability of 97.5 percent that the market value of the assets will not decline below the market value of the liabilities (that is a funding ratio of 100 percent). For a typical pension fund that invests 50 percent in equities, has bond duration of 5 years and liabilities with duration of 16 years, this will require buffer capital of about 25 to 30 percent over the market value of liabilities.

Considerable flexibility is provided to funds in deriving the level of buffer capital. Three methods are permitted: the *standardized method*; the *simplified method*; and the *internal model method*.

Standardized Method

Under the standard method the required buffer capital is derived from an assessment of risks based on a number of scenarios defined by the pension act. The scenario approach is based on the assumption of a single shock occurring in each risk factor. The shock for each risk driver is based on relevant historical experience. This standardized approach takes account of all of the characteristics of risks and their potential interactions. It is anticipated that this will encourage pension funds to implement their own internal models which are expected to result in lower buffer capital requirement.

The following factors are utilized in the standard model:

- *Interest risk (S₁)*: a standard table that sets an expected change in the value of the assets or liabilities that are sensitive to interest rate movements, as shown in Table 11, is used in the standard model. This table is derived from standard assumptions about the term structure of interest rates and distinguishes each affected element (liabilities, fixed-income instruments of various terms) in relation to their calculated duration.
- *Equity and real estate risk(S₂)* that is defined as the effect of a decrease in value of :
 - 25% for equities and real estate investment trusts listed on a stock exchange in mature markets (S_{2A})
 - 35% for equities in emerging markets (S_{2B})
 - 30% for private equity (S_{2C})
 - 15% for direct investment in real estate (S_{2D}).
- *Currency risk (S₃)* that is defined as the effect of a decrease of all foreign currencies against the euro of 20%.
- *Commodities risk (S₄)* that is defined as the effect of a decrease of the benchmark of commodities of 30%.

Table 11: Interest Factors

Duration (year)	Factor: interest decrease	Factor: interest increase
1	1.60	0.63
2	1.51	0.66
3	1.45	0.69
4	1.41	0.71
5	1.37	0.73
6	1.35	0.74
7	1.34	0.75
8	1.33	0.75
9	1.33	0.75
10	1.32	0.76
11	1.32	0.76
12	1.31	0.77
13	1.31	0.77
14	1.31	0.77
15	1.29	0.77
16	1.29	0.77
17	1.29	0.77
18	1.28	0.77
19	1.28	0.78
20	1.28	0.78
21	1.28	0.78
22	1.28	0.78
23	1.28	0.78
24	1.28	0.78
25	1.27	0.79
>25	1.27	0.79

Source: DNB 2006c

- *Credit risk (S₅)* that is defined as the effect of an increase of 40% of the actual credit spread on the bond portfolio with credit risks. The credit spread of a portfolio is taken as proxy risk. This implies that the higher the credit spread and the longer the maturity of the credit portfolio, the larger the impact of the shock. The assessments of market risk and credit risk are based on well-diversified portfolios.
- *Insurance risk (S₆)* that is defined as the required solvability needed for insurance risks is a prescribed percentage of the value of the liabilities, based on the average age and number of participants in the scheme.

For each of these elements a separate calculation is made to establish the required buffer capital. The cumulative value of these amounts in addition to the fair value of the current liabilities is the capital that is required to maintain the solvency margin.

The six categories of risk (denoted as S₁ through S₆) are then combined using the formula:

$$Total = \sqrt{S_1^2 + S_2^2 + 2 \times 0.5 \times S_1 + S_2 + S_3^2 + S_4^2 + S_5^2 + S_6^2}$$

In this formula the value 0.5 is the degree of diversification between the effects of equity risk and interest rate risk. The correlation between interest rates and equities or other types of variable-yield securities has been unstable over time; consequently, the standardized method uses a robust estimate, allowing for the parameter uncertainty (97.5 percent probability level) in the correlation. The S_2 in this formula is given by the following formula.

$$S_2 = \sqrt{S_{2A}^2 + S_{2B}^2 + S_{2C}^2 + S_{2D}^2 + 2 \times 0.75 \times (S_{2A}S_{2B} + S_{2A}S_{2C} + S_{2A}S_{2D} + S_{2B}S_{2C} + S_{2B}S_{2D} + S_{2C}S_{2D})}$$

This assumes a correlation of 0.75 between the categories equities mature markets, direct real estate investment trusts, equity emerging markets, private equity, and direct real estate investments.

Simplified Method

For a number of pension funds whose solvency requirements can be valued in a relatively simple manner, the standardized method may be overly complex. Pension funds with a simple risk profile and operations are allowed to perform the solvency test using a simplified method. Only a few pension funds with high funding levels and relatively low investment risks are given permission to use the simplified method. Under this method the solvency test is confined to assessing the market value of assets against the market value of liabilities. The simplified test requires that the ratio of assets to liabilities on this basis remains in excess of 130 percent.

Internal Model Method

The most accurate way of establishing the required risk capital is on the basis of the fund's own internal model. Unlike the standardized method, the internal model method offers the possibility of incorporating the effect of risk management measures, such as risk limiting systems and stop-loss coverage. A pension fund may, with the consent of the supervisor, use such an internal solvency model. Pension funds using an internal model must establish that their available assets risk will be sufficient to cover the liabilities at a 97.5 percent probability level over a one-year horizon. The requirements for use of an internal model address the following:

- Organization: administration, risk control, internal control
- Model input: portfolio data, market data
- Model: instruments, adequate risk factors, adequate stochastic processes
- Risk control: risk limits, management information, stress tests

The models must permit for a demonstrably accurate estimate of the risks and be thoroughly incorporated into day-to-day operations as an integral part of risk management. A proper internal model relies on a stochastic process for the cash flows of liabilities and investments. The pension fund must provide detailed information on the model's theoretical basis and empirical evidence of its validity. It must also state the circumstances under which the model is not reliable.

Continuity Analysis

Continuity analysis provides an important adjunct to the basic contributions, funding, and buffer capital rules by requiring that the fund demonstrate the viability of the financing arrangements over the extended time periods relevant to pension funds. The continuity analysis allows the board of an institution and the supervisor to identify at an early stage whether the institution will be in a position to continue meeting its solvency requirements in future.

In contrast to the solvency test that is based on one-year scenarios, the continuity analysis is required to extend over a period of 15 years. In addition, the continuity analysis includes a broader set of factors such as development of the structure and number of participants, anticipated salary increase, and longer-term economic forecasts. The continuity analysis is also required to incorporate stochastic measures.

The components required to be addressed in the continuity analysis are as follows:

- Objectives, policies and policy instruments of the funds
- Economic assumptions and expectations: substantiation of the future projections
- Future projections based on pension funds own expectations
- Sensitivity analysis of assumptions
- Application of stress testing
- Variance analysis between projections and experience

Pension funds generally conduct a continuity analysis once every three years. A deteriorating financial position, new pension policy, or changing external circumstances in terms of demography or economic trends also require an updated analysis. In some circumstances, depending on the risk profile or other factors, the supervisor may ask for a continuity analysis and set the assumptions to be used. To assess whether the contribution is adequate, a fund may also be asked to show compliance with the main principles in the future.

One important objective of the continuity analysis is to assess the indexation quality in the future, both in terms of expected value and risk. The following parameters prescribed in the pension act must be applied to the continuity analysis:

- Minimum wage growth of 3% and minimum inflation of 2%
- Maximum expected return on fixed-income investments of 4.5%
- Maximum risk premium for equities in mature markets and indirect real estate of 4.5% (arithmetic) or 3% (geometric)
- Maximum risk premium for private equity of 5% (arithmetic) or 3.5% (geometric)
- Maximum risk premium for equities in developing markets of 5.5% (arithmetic) or 4% (geometric)

- Maximum risk premium for real estate and commodities of 3.5% (arithmetic) or 2% (geometric)
- The future term structure of interest rates (for discounting the liabilities), which must be derived from the current term structure, that is, the forward curve.

Institutions whose risk rating is deteriorating over time may also require more intensive or urgent supervision (this being one factor considered by DNB, for example).

Figure 9: Solvency Test Statement

6 Solvency test amount in € 1000				
RISK FACTORS	EXPLANATION	EFFECT ON ASSETS	EFFECT ON LIABILITIES	TOTAL EFFECT
S 1 Interest risk	shock, depending on duration	€	€	€
S 2 Non fixed assets				
- stocks, developed markets		€	€	
- stocks, emerging markets		€	€	
- private equity		€	€	
- property		€	€	
Total				€
S 3 Currency risk		€	€	€
S 4 Commodities risk		€	€	€
S 5 Credit risk		€	€	€
S 6 Underwriting risk			€	€
Solvency target in actual situation (based on standardized method) (square root)				€

Figure 10: Actuarial Statement

7 Actuarial statement**CHARACTERISTICS OF THE SOLVENCY POSITION**

In the policy rule of 21 October 2004 three situations have been distinguished.
Which situation of the fund is applicable in the opinion of the actuary?

- A. Under funding
- B. Shortfall of buffers
- C. Situation with free capital

The pension fund is in situation

A/B/C

In addition:

Minimum capital requirement:

€

Capital requirement in equilibrium:

€

Funding level (realistic value):

%

This conclusion must be underpinned in an explanatory note

FREE TEXT:

