Financial Solidity of Pension Insurance Companies and Pension Funds within the Finnish Employment Pension System

Jaakko Tuomikoski

Ilmarinen Mutual Pension Insurance Company, Helsinki, Finland
Mailing address: FIN-00018 Ilmarinen, Finland
Telephone: +358 9 184 3447
Fax: +358 9 184 3480
e-mail: jaakko.tuomikoski@ilmarinen.fi

Summary

The paper describes the present solvency mechanism of the pension institutions operating within the Finnish statutory employment pension system. Its development is traced and comparisons are made with the system prescribed by the EU insurance directives. Risks related to longevity and disability are taken care of by an equalization reserve, which is excluded from this discussion.

With the Finnish case in mind, the general question of whether a solvency margin is necessary or useful in the context of pension institutions is discussed against the fundamental question of pension schemes, the question of who carries the different risks according to the design of a pension system.

Keywords: solvency, pension insurance, pension funds, investment portfolio, asset risk

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1 What is Financial Solidity of Pension Providers?

Pensions are long-time commitments; in fact, there are hardly any other commitments comparable to pensions in this respect. Among other things, this means that pension provision cannot be left totally to the initiative of individuals, and the effects of market forces must be given careful consideration. Any significant market failure is fatal when pensions are regarded, as an individual who at the time of retirement finds out that his or her pension arrangement does not perform as expected has no opportunity to start afresh and try again.

On the other hand, it goes without saying that providing for pensions includes a significant amount of saving and investment. Pension funds are major players in most national and international investment markets. The risk of making bad investment decisions is a major risk as regards pensions. Another important risk, linked to the length of pension commitments, is the risk of politicians changing either the rules of the playing field or, when statutory systems are considered, changing the benefit formula or to some extent cancelling promised benefits.

The familiar relation between risk and return has a very clear-cut role when the financial solidity of pension providers is considered.

On the one hand, popular opinion frowns at failures in investment decisions also when these failures are not real but only apparent, for example reflecting temporary changes in asset values. This has behavioural effects at several levels. Individuals tend to monitor investment performance at a very short term, which leads to risk aversion. The same may happen within the investment decision process of a pension fund. If regulators setting requirements to pension providers fall victim to excessive short-termism, the consequences may prove detrimental to pension provision in general. Cases emerge where pension authorities want to restrict downside risk eg. by setting too severe requirements on minimum funding levels or solvency margins. (see Gelder, Martin & Valkenberg, Falco R. (1999)). This is not to say that prudence is unnecessary in the field of pensions, but it should not be pursued paying no regard to the cost involved.

For, on the other hand, pension savings are invested at a very long perspective and accordingly it is of the utmost importance that these savings yield good returns. Too prominent risk aversion at the short term may jeopardize the investment performance of pension funds in the long run.

In the tradeoff between absolute security at any time interval and good investment returns in the long run, a satisfactory answer can only be found after analysing the structure of the pension scheme concerned from the risk bearing viewpoint. This analysis leads to different conclusions for different pension schemes.

2 Interlude: Risk as the Fundamental Issue

Pension debate revolves around concepts such as defined benefit (DB) versus defined contribution (DC), funding versus pay-as-you-go (PAYG), equality between generations etc. At times the conversation may continue for a considerable time before it is realized that different people give different meanings to supposedly common concepts. Realizing this leads to better discussion but it is not sufficient unless it leads to a thorough analysis on who bears the risk in different situations and whether this functions as intended.

Risk is here understood in its broadest sense, as the consequences, both negative and positive, of uncertainty.

The essence of the difference between DB and DC schemes is not in the formulae by which the ultimate benefit is calculated in each case, but - using oversimplification - in the fact that in a DB scheme the risk is borne by the plan sponsor, in a DC scheme by the beneficiary.

Of course, it is not that simple. If in a DB scheme the original benefit is based on past earnings via a well-defined formula and the sponsor guarantees RPI adjustments to the benefits being paid, the plan sponsor indeed bears all risk in the first place. If the scheme is a company scheme without an external guarantee, the beneficiaries are secondary risk bearers, the risk becoming reality if the sponsor goes out of business. However, if there are external guarantees, the risk is again moved further away from the beneficiaries, and so forth. Instead of announcing support to DB, or voting for DC, we should trace the consequences of uncertainty in different situations.

Similarly, the essence of the difference between funded and PAYG schemes can be found in the risk carrying profile. In a statutory PAYG employment pension scheme with defined benefits the risk is borne by future premium payers. If the scheme is not obligatory, the beneficiaries are again secondary risk bearers in case employers leave the scheme in great numbers. In a funded scheme the beneficiaries are not subjected to this risk, but in such schemes they normally bear most of the investment risk.

Longevity offers an additional example. In a system where individual funds are accumulated and then an annuity is bought at the time of retirement the insured carries the risk of general decline in mortality, as this is certainly reflected in annuity prices. The insurance company, after selling the annuity, of course bears the longevity risk at the individual level. In the new Swedish ATP system the longevity risk is borne by the

beneficiaries but in a collective manner well suited for obligatory systems and very probably worth copying. In a traditional DB system also the longevity risk is borne by future premium payers.

Also the question of setting the level of solvency requirements, if any, for pension funds is best resolved by analysing the consequences of uncertainty for the funds concerned.

3 Case Study: the Finnish Statutory Employent Pension System TEL

3.1 The TEL System and Its Financing

As an example we give the details of the solvency requirements as regards investment risks in the field of statutory occupational pensions in Finland. In a preliminary form (see Tuomikoski (1998)) these requirements have been in force since the beginning of 1997. Since then some amendments have been made and the scope of application has been extended to pension funds, pension foundations and certain special pension institutions. Minor developments can be expected also in the future, but it can be said that by the end of 1999 the requirements had reached their final form.

The most important innovation is that the requirements reflect the structure of the investment portfolio of each pension institution, higher expected volatility leading to higher demands on the solvency position. We believe this feature can be strongly recommended for other environments as well, providing that solvency emerges as an issue from the risk analysis. Solvency requirements corresponding to other stochastic risks are excluded from the following discussion, as an appropriate solvency mechanism, based on equalization reserves, has already been in use for a long time in Finland.

The statutory occupational pension system in Finland has been described in several papers (see eg. Korpela & Lundqvist (1988), Hännikäinen (1992), Nokelainen (1992), Tuomikoski (1995)). For the purpose of the present paper it is sufficient to note some of the main features of the system only, and a deeper look into the references given above is recommended to the reader with a more general interest in the pension system itself.

In essence the TEL system is an earnings-related pension system of the DB type with no salary ceiling for either benefits or premium calculation. The benefits and funding principles are defined in a number of pension laws for different sectors in the Finnish economy. The most important of these laws is TEL, which covers most wage earners in the private sector, or roughly one half of the Finnish labour force.

The administration of the Finnish occupational pension system is decentralized according to the different laws and also within the scope of application for some of these laws. Six insurance companies (special companies called TEL companies in the sequel) and 45 funds or foundations run the TEL scheme. These are covered by the umbrella term "pension institution".

The TEL scheme is partially pre-funded with a rate of some 25-30% according to different definitions of the funding rate. The premium (21.5% of the payroll in 2000) is paid partly by employers (in the average 16.8%) and partly by employees (4.7%). After a period of some 5 years a gradual increase in the premium rate is expected, and there is an understanding, written into the law, that each of the two parties will assume one half of future premium rate increases.

The portion to be pre-funded of each individual pension is defined in the law according to pension type (retirement, disability, unemployment, survivor's pension). The institutions use prospective techniques to calculate their technical provisions for the pre-funded parts of the pensions. The parts that are not pre-funded are financed via a pay-as-you-go (PAYG) pool where different institutions participate obeying identical rules.

The rules of the pool are simple. The pool supplies each pension institution with the means for the pooled part of the pension expenditure. Before 1997 each pension institution contributed into the pool a specified component in the TEL premium and the investment income corresponding to the interest rate difference between a common "calculated interest rate" or "technical interest rate (TIR, defined in the calculation bases and confirmed by the supervising authority, which is the Ministry of Social Affairs and Health. Ranne, Kivisaari & Mannonen (2000) explain the method used in determining the TIR) and the discounting rate, 3%, which is used in calculating the technical provisions. Since the beginning of 1997 the interest rate difference has no longer been used for financing current pensions. Instead, as of the year 2000 it will be used for increases in the pre-funded parts of the benefits, and during the transition period 1997-1999 it was used for strengthening the solvency margins of the TEL companies, funds and foundations.

An identical financing system is applied to pensions under three other pension laws in the private sector, which brings into the pool three institutions running non-TEL schemes.

Although pre-funding is only partial, the size of the pension funds in the private sector is considerable in context of the national economy. They amounted to 50 thousand million EUR in the end of 1999. This was some 160% of the relevant payroll and roughly 40% of the GNP. Inclusion of the pension fund for local government would change this figure to 50%. The funds of the TEL companies amounted to 35 thousand million EUR, which was about 28% of the GNP. Projected conservatively, these

figures will increase to 37 thousand million EUR or 30% of the GNP by the end of the year 2000. Respective figures for the entire private sector are expected to be 53 thousand million EUR, 41% of the GNP.

Accordingly, the investment policy pursued by the TEL companies is of considerable interest within the Finnish national economy. This gives rise to controversy between different actors in the society.

3.2 The Nature of TEL Business

The decision to arrange the administration of statutory occupational pensions by private insurance companies, funds and foundations has many favourable features. It brings into the system a healthy element of competition between institutions as regards investment results. As regards administration costs the efficiency effects of competition probably do not offset the contrary effects of having many institutions running one scheme. On the other hand, the solution keeps the pension system at arm's length from the government thus safeguarding the private sector nature of the pension rights and the independence of investment decisions. The administration costs amount to some 3 % of the premium, or 0.6 % of the insured payroll, which compares very favourably with most decentralized systems, let alone those systems which include an element of individual savings.

On the other hand, the system is obligatory, and neither employers nor employees can escape the duty to contribute to it. The system is also definitely a part of the national social security system. Accordingly, there has always been a tacit agreement to the effect that a TEL company cannot be used as an instrument of making money. This agreement was made more concrete in 1997 by a special law, defining the special characteristics of the TEL companies, according to which the owners of a TEL company are entitled to a moderate yield on the invested capital only, while the major part of the solvency margin belongs to the premium payers. This is also well in accordance with the agreement, reached with the EU, of leaving the TEL institutions outside the scope of application of the EU insurance directives. Moreover, all TEL companies except the two smallest are mutual companies.

3.3 Risk and Risk Carriers in the TEL System

As a justification for the solvency requirements we shall look into the risk bearing features in the TEL system, keeping in mind what was said in Chapter 2.

As was mentioned earlier, the TEL is a defined benefit system with benefits independent of the institution in question. There is a national guarantee system according to which unreduced benefits are to be paid to the beneficiaries also in case of an institution going bankrupt. In such a case the extra cost falls on all the other institutions, and the premium is increased correspondingly.

Thus the pensioners and the insured, regarded as future beneficiaries, do not bear the risk of an institution going bankrupt. The bankruptcy risk is borne in the first place by future premium payers. The risk affecting the beneficiaries is secondary in this respect and restricted to the possibility that politicians decide to change the laws defining the benefits. Should this happen, all pensioners, present and future, are affected in a moderate degree only, in remarkable contrast to privatized individual pensions where one would expect some individuals to suffer severe losses while others go unharmed.

No tax money comes into the system, which means that there are no extra revenues beside premiums and investment income.

As explained in section 3.1, technical provisions are calculated by a prospective system with a discount rate of 3%, and the yield corresponding to the difference between the TIR and the discount rate has a use which is defined by the law. If the investment income of a pension institution exceeds the TIR, the institution can use the excess income either to increase its own financial solidity or (within a range depending on the solvency capital and solvency position of the company and calculated by identical rules for all companies) as reductions to the premium rate on the institution level. This feature gives each institution an incentive for pursuing higher investment yields, as these contribute either to the solidity of the company or its ability to attract new customers, or both.

It is self-evident that in a defined benefit system higher investment income reduces the premiums in some way or other. It is inherent in the TEL rules that this can happen on two different levels. On the one hand, the TIR is broadly determined by the anticipated average performance of all institutions (see Ranne, Kivisaari & Mannonen (2000)). The higher this rate, the greater is the funded part of the pensions in the long run, whereby the PAYG part of the pensions and consequently the PAYG component in the premium can be kept at a lower level. On the other hand, an institution which outperforms the others also has the greatest possibilities for premium reduction.

The relevance of this lengthy discussion comes from the following feature: part of the overall investment risk of all institutions concerned is borne by future premium payers, i.e. employers and employees, as bad investment performance leads to higher premiums. Part of the risk is carried by future premium payers at institution level in the form of smaller premium reductions. If the risks are realized severely enough to make the institution go bankrupt, the risk is again borne by all future premium payers via the national guarantee system. Although the consequences of the bankruptcy of a single small institution would be effectively diluted so as to affect the system only a little, a bankruptcy of one of the biggest TEL-companies would hit the system badly.

Hence the necessity for careful measures to eliminate the danger of such a bankruptcy. The elimination is pursued by means of the solvency system. Thus the motivation for

the solvency requirements comes from the common benefit structure for all institutions and the national guarantee system.

4 Modelling Asset Risks in the TEL Context

4.1 The Ranne Model

The calculations for the new requirements were made by a simulation model prepared by Antero Ranne. This model is described in detail in Ranne (1998) which the interested reader is strongly recommended to consult. We shall give here a general description only.

The model builds on the tradition by Professor Wilkie and subsequent Finnish risk theoretical studies. The main interest in the model lies on the stochastic properties of the investment portfolio. However, in order to focus on the specific TEL environment the model is connected to a deterministic model describing the insurance business of a TEL company (for this model see Nokelainen (1988)). The stochastic properties of the investment model are reflected in the insurance business model as regards inflation and the different interest rates, but otherwise the deterministic structure of the insurance model is maintained.

In the Ranne model asset risk has been approached by developing time series models for the observed yields of different investment instruments and forming the correlation and autocorrelation structure of the different variables. The investment portfolio is divided into six categories, the choice of which reflects the portfolios of the TEL companies: cash, premium loans, other direct loans, bonds, real estate and equity. The distribution of the total portfolio into these asset classes can be freely varied. Modelling of the yields of the different asset classes requires several submodels for different interest rates (short rates, bond rate, premium loan rate, rate for other direct loans), indexes for equity and real estate prices, and cash yields of real estate and equity investments. The starting point of the stochastic structure of the model is inflation, which gives rise to the different interest rates. Careful attention to the interrelationships of different instruments in different years leads to a realistic model for the risk inherent in the whole portfolio, the concept of greatest relevance in solvency considerations.

The assumptions on future behaviour of the different variables are mainly based on historical data, but adjustments have been made where considered necessary due to known changes in the surrounding real world.

4.2 Some Principal Results

Modelling the investment portfolio serves two purposes:

By using a realistic and flexible model one can gain valuable insight into the phenomenon itself and make correct judgements about the relevance and relative importance of the different factors involved. This chapter concentrates on this viewpoint.

On the other hand, results obtained with such a model provide invaluable guidance for constructing the solvency requirements themselves. To this we shall return later on.

Several tentative steps and iterations were needed before reaching final conclusions on what would form a relevant set of solvency requirements in the case at hand. For this historical perspective see Tuomikoski (1998). In short, it was considered appropriate to concentrate on distributions broadly resembling the asset distributions of the TEL companies at that time in order to arrive at feasible criteria for relevant distributions. If big changes were to occur in the distributions, new calculations would be necessary anyway. Since then the asset distributions of the TEL institutions have indeed changed considerably to include much more equity exposure, and the calculations have been renewed accordingly.

For the convenience of the reader, we reproduce a table from Tuomikoski (1998).

Table 1: The effect of asset distribution on the requirement of solvency margin (as % of mathematical provisions). Time horizon 1 or 3 years, ruin probabilities 2.5% or 5%

	Distribution						
	1	2	3	4	5	6	7
Premium loans	33%	40%	30%	30%	30%	30%	30%
Other loans	6%	5%	15%	5%	5%	5%	5%
Cash	8%	5%	5%	15%	5%	5%	5%
Bonds	34%	35%	35%	35%	45%	35%	35%
Equity	6%	5%	5%	5%	5%	15%	5%
Real estate	13%	10%	10%	10%	10%	10%	20%
1 year, 2.5%	3.8%	3.3%	3.3%	3.5%	3.5%	5.8%	4.9%
3 years, 2.5%	8.1%	7.5%	7.2%	7.7%	7.9%	11.2%	9.7%
3 years, 5%	6.8%	6.2%	5.9%	6.3%	6.4%	9.7%	8.4%

The table gives rise to a couple of remarks.

a. The results confirm the obvious fact that the need for a solvency margin is strongly dependent on the asset structure. In addition to confirming this anticipated notion they also provide a quantification of this dependence in certain situations.

b. If the required margin for the one-year calculation with 2.5% ruin probability is duplicated, one arrives at a fairly safe estimate for the corresponding quantity in a three-year calculation with 5% ruin probability.

These findings were implemented into the new solvency requirements. It goes without saying that a great number of additional simulations have been made before reaching sufficient confidence in the new approach, and since then the calculations have been many times repeated with current distributions.

Also it was found out that if need be, it is possible to set an upper limit on the solvency margin without disturbing the smooth functioning of the solvency mechanism. Such an upper limit is provided by a limit that is four times the value provided by the 1-year study.

5 From Theory to Practice

5.1 A Model for Every Institution?

It would have been possible and not without a precedent to demand every TEL institution to have at its disposal a simulation model similar to the one described in section 4. However, time was not yet thought to be ripe for such a solution. Moreover it is hoped that the TEL system will maintain its rich non-centralized organization with several smaller funds and foundations. As many of these are run by sponsoring companies without great actuarial resources at their disposal, a demand for a simulation model would have been unfeasible. Hence, a solution was needed where the results of the simulation model are translated into a relatively simple supervisory form.

5.2 Seeking a Convenient Formula

In order to find a suitable regulatory formula one has to use information readily available for each institution. Natural candidates are the proportions of different investment classes in the investment portfolio of the institution and the general parameters used in model construction.

Several variants were considered. By including for each investment class - in addition to the proportion of the said class in the portfolio - the mean yield relative to the TIR, the standard deviation and the correlation coefficients for these relative yields, several convenient approximate formulae were derived by Mr. Ranne (see Ranne (2000)).

A linear formula, extremely simple and convenient to use, was chosen in 1997 as a basis for the solvency requirements in their original form (see Tuomikoski (1998)). However, since then the asset disributions of the TEL companies have changed and slipped out from the scope of application of the linear formula, and a more complicated alternative using square roots has been in use since 31.12.1999. It is documented in chapter 5.4 below.

5.3 Changing the Classification

The step from simulations to practical purposes was considered to need some further modifications.

The model described in chapter 4 takes into consideration the asset allocation between the six main categories. In reality, of course, the actual structures of the sub-portfolios corresponding to the six main asset classes of the model vary considerably from institution to institution. Moreover, several of these classes are in reality rather non-homogeneous. For example, the class "real estate" comprises very different objects ranging from housing, which is relatively stable, to one-purpose industrial property. It goes without saying that all this variety cannot be implemented in a regulatory formula, but some further considerations were thought to be appropriate when moving from the realm of the model to the final solvency requirements.

In the final regulations (formula (1) in Chapter 5.4) the asset classification is somewhat different from the classification used in the model. There are seven main classes, numbered broadly in rising order of volatility. The classification of individual investments is made via a decree of considerable detail, and outlined in the following examples:

Class I Premium loans with TIR as interest rate; OECD money market instruments with high degree of security, etc.
Class II Other premium loans; bonds issued by OECD states, communities or banks and denominated in EUR; housing with a certain type of state guarantee, etc.
Class III non-EUR bonds issued by institutions similar to those in Class II; EUR bonds issued by companies whose stock is traded on regulated OECD markets, etc
Class IV housing, other than those included in Class II; other OECD bonds than those in Classes II and III, etc
Class V Other real estate than those in Classes II and IV
Class VI Shares of OECD companies, traded on regulated OECD markets
Class VII Other shares; investments not included in Classes I-VI.

The parameters for each class and correlations between classes were chosen using extraneous information by investment experts and having regard also to other risks than market risks. In spite of these modifications the adopted solvency rules are in

sufficient conformity with the results provided by the simulation model for relevant asset distributions.

5.4 The Final Formula for the Solvency Border

The fundamental concept and building block in the new set of solvency rules is the so-called *solvency border* which is defined as the amount of solvency margin corresponding to a 2.5% ruin probability within a 12-month period. The solvency border is calculated as the proportion p given by formula (1) from the mathematical provisions of the pension institution:

$$(1) \qquad p = c\left(-b \sum_i \beta_i m_i + a \sqrt{\sum_{ij} \beta_i \beta_j s_i s_j r_{ij}}\right)$$

Here the parameters β_i $(i = 1, ..., 7; \ \Sigma \beta_i = 1)$ correspond to the asset allocation, the parameters m_i give the average yield over the TIR, the parameters s_i are volatilities and r_{ij} correlations, a=1.98, b=1.08 and c=0.90.

Table 2: Parameters of the solvency border formula

	m_i	s_i	r_{ij}						
Class I	0.1	1.0	1	-0.1	-0.2	0.0	0.0	-0.1	-0.1
Class II	0.6	3.5	-0.1	1	0.4	-0.1	-0.1	0.1	0.1
Class III	0.6	4.4	-0.2	0.4	1	-0.1	-0.1	0.1	0.1
Class IV	3.7	8.2	0.0	-0.1	-0.1	1	0.7	0.3	0.3
Class V	3.7	15.0	0.0	-0.1	-0.1	0.7	1	0.3	0.3
Class VI	6.2	21.4	-0.1	0.1	0.1	0.3	0.3	1	0.7
Class VII	6.2	29.9	-0.1	0.1	0.1	0.3	0.3	0.7	1

6 The Present Solvency Regulations for the TEL Institutions

6.1 The Overall Structure

The requirements have been shaped around the fundamental concept of the solvency border by defining several zones and defining the consequences of being within the different zones. Above the solvency border the consequences are formulated as rules regarding the division of surplus between enhancing the financial solidity of the institution and giving premium reductions to customers. Below the solvency border the

consequences are more or less similar to those imposed in the EU insurance directives on companies failing to satisfy the EU solvency requirements.

6.2 A Multitude of Zones

The *target zone* for the solvency margin is limited by the lower limit of the target zone, which equals two times the solvency border, and the upper limit of the solvency margin, which is equal to four times the solvency border.

Solvency considerations as such do not indicate any need for an upper limit for the solvency margin. In the TEL context such a limit was felt to be necessary, as there is no sense in increasing the costs of the system more than is absolutely necessary. Thus an *upper limit* of four times the solvency border was checked by simulations and found not to endanger the smooth functioning of the solvency mechanism.

It does not make sense, however, to let for example occasional peaks in asset prices force the company to reduce its solvency margin by sending money out in the form of excessive premium reductions. Accordingly, a solvency margin that exceeds the upper limit should, in the first phase, lead to a closer scrutiny of the situation only. This examination could point out, for example, that the anticipated growth in the mathematical provisions (estimated as 6-8 % annually in the next two decades) will reduce the solvency margin to the target zone without any further ado. Or it may be that a fall in asset prices is anticipated, which will eliminate the excess margin. Or, the company may, making use of its very good solvency position, decide to adapt its asset structure to a somewhat riskier conception, which in turn will increase the different limits and accordingly return the solvency margin within the target zone. Only if, despite all these measures, the solvency margin obstinately stays above the target zone, it would be natural to demand the company to remedy the situation by increasing its premium reductions.

Unfortunately, the present rules have a rather strict attitude also to temporary excess solvency. This is one of the areas where the rules still need further fine-tuning.

As the name of the target zone already indicates, a solvency margin fitting into it is in conformity with the risks inherent in the assets of the company. Such a company can feel at ease and has a relatively great freedom to operate as it pleases. However, a company pursuing a wise policy will even while within the target zone use a considerable part of its surplus to strengthen its own financial solidity.

It can be said that within the target zone the obligation to take care of the solvency of the company is in balance with the obligation to avoid excessive costs to the customers.

The lower limit of the target zone is intended to act as an early warning border. If the company falls below this border, its possibility to use surplus to premium reductions is considerably restricted. The lower the solvency position sinks, the more severe these restrictions become. This zone is called *the zone of limited freedom.*

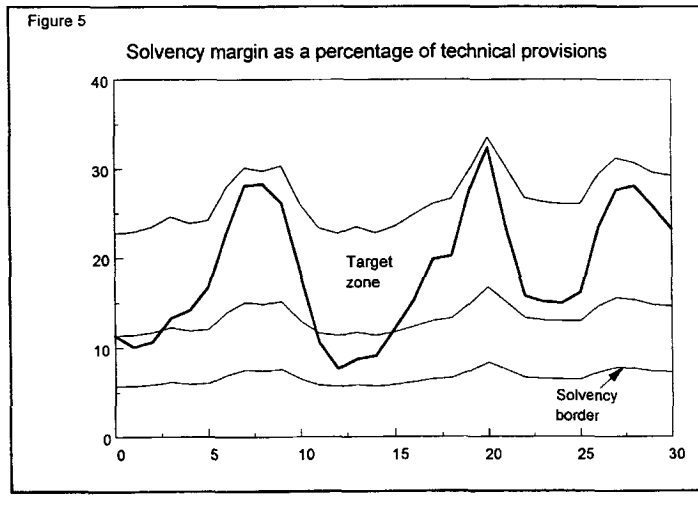
The three borders and two zones discussed above are essentially new features in the present solvency system for the TEL companies.

The system includes also four additional borders below the solvency border. When the solvency position of a TEL company deteriorates further and its solvency margin crosses the solvency border, the company enters a world broadly similar to the one defined by the solvency rules in the EU life insurance directives (see eg. Articles 29L, 30L and 38L in CEA (1994)). As these rules are well known, we will not pursue the subject further.

6.3 An Illustration

The interplay between the level of the solvency requirements, market conditions and the solvency position of a company is displayed in Figure 1, which contains one realization from the simulations in Ranne (1998).

Figure 5



6.4 Empirical Data

In the end of 1996 the solvency borders of the companies were between 4% and 6% of the technical provisions, and the lower limits of the target zone correspondingly

between 8% and 12%. Since then the companies have exercised the possibilities, brought about by enhanced solvency, to increase their exposure to riskier assets with higher expected yields. The average solvency position of the companies is displayed in table 3.

Table 3: The solvency position of the TEL companies

	A Mathematical Provisions thousand million FIM	B Solvency Margin thousand million FIM	B/A %
1987	51.3	4.3	8.4%
1988	58.4	6.5	11.1%
1989	67.7	5.8	8.6%
1990	79.8	4.6	5.7%
1991	91.8	3.8	4.2%
1992	99.7	3.7	3.7%
1993	110.3	5.7	5.2%
1994	114.0	4.0	3.5%
1995	126.0	6.8	5.4%
1996	138.6	12.9	9.3%
1997	148.5	20.6	13.9%
1998	155.9	33.9	21.7%
31 Aug. 1999	163.7	36.2	22.1%

(1 EUR = 5,945730 FIM)

One can see how the average company was already well on its way to the target zone in 1996, helped by very positive development of equity prices in the Helsinki stock market during that year. Indeed, some companies were already in the target zone before the new legislation came into force in the beginning of the year 1997. Since then the positive development in the Helsinki Stock Exchange has continued in an unprecedented way. On the other hand, the situation was much worse in 1995, not to speak of 1994 when the solvency margins were in the average only 3.5% of the technical provisions.

However, the real test to the requirements comes only when stock prices decline for a long period. Such a time is bound to come sooner or later, and only then will it be seen whether the new requirements are a success story or not.

7 The Solvency Rules Evaluated from Different Viewpoints

7.1 Criteria Relevant to the TEL

The solvency mechanism satisfies the side conditions for any appropriate set of solvency requirements as regards investment risks for the TEL companies.

They are in conformity with the aim of maintaining the defined benefits, which are independent of the institution, partial pre-funding complemented by a PAYG pool, and the national guarantee system, which presuppose identical calculation of premiums and technical provisions by prospective methods for all institutions.

The balance between prudence and yield expectations is taken into account. Enhancing investment yields leads to smaller premiums and accordingly strengthens the solidity of and general support for the system. On the other hand, money collected within obligatory insurance must not be exposed to remarkable risk, wherefore bankruptcy of any TEL institution must be avoided even if some cost is involved, but unnecessary cost is to be avoided.

Taken together, these aims imply that the requirements have to reflect the real risks of the portfolio as accurately as possible. No analysis is needed for the qualitative conclusion that risks vary greatly according to the asset distribution, and the Ranne model is able to quantify this dependence. Thus the requirements have to depend on asset distribution, which prevents the use of EU life insurance rules which, as is well known, are the outcome of information available quite a long time ago and diluted by the need to reach a compromise between different national aspirations.

7.2 The TEL Companies and the EU Insurance Directives

Finland joined the EU as of January 1st, 1995. In the negotiations the TEL system proved to be a concern touching some rather deep issues.

As was explained earlier, the benefits provided by the TEL system are independent of the administrating institution and most of them are financed by the PAYG principle. In order to function properly the PAYG pool needs common rules for calculating both the PAYG premium and the technical provisions. This in turn means that adherence to the rules in the directives, which forbid prior confirmation of calculation bases, would have ruined the system. The TEL system proved to be even more incompatible with the principle of free provision of services across borders.

In the negotiations a solution was found, on the one hand enabling the TEL system to survive and on the other hand creating a sufficiently level playing field from the EU viewpoint. The Finnish entry agreement included an addendum to Article 4 of the first life assurance directive to the effect that, on the one hand, TEL activities are outside

the scope of the insurance directives, and on the other hand, in order to fulfil the principle of a level playing field, the TEL companies have to restrict their activities to TEL and YEL (a somewhat similar, entirely PAYG system for the self-employed) activities only, and Finland will commit herself not to discriminate against non-Finnish EEA owners or founders of TEL companies.

As a by-product this result gave Finland the freedom to set solvency requirements for the TEL companies as she chose, without undue regard to the EU directives which, as compromises of national needs in the EU member states, are hardly optimal to any existing situation.

7.3 Impact of Possible Changes in Insurance Accounting

The Insurance Accounting Standards Committee (IASC) is working on a project for establishing international accounting standards for insurance products. The project will be completed in a few years. It can be expected that the new standard will by and by impact insurance accounting for domestic purposes as well.

At the moment one of the most alien features in the IASC project compared to present accounting for TEL institutions is the expected move towards fair value in accounting for assets and especially liabilities. As regards assets, there would be no big problems outside taxation issues, as assets are already accounted for in more or less current values when the solvency margin is calculated. On the liability side fair value accounting, if and when such a method is developed and implemented, will revolutionize the present calculation of liabilities in the TEL context. The choice of interest rate, now fixed at 3%, will be changed into a changing interest rate related to current market conditions; buffers for insurance risk, built inside the liabilities, will perhaps be prohibited, etc. Precise rules for a solvency margin presuppose a well-defined and common method of calculating the liabilties. If the latter changes profoundly, also the solvency rules must be taken into consideration.

This, however, should not affect the fundamental idea of basing the requirements on the stochastic variation ensuing from the asset structure and the probabilistic definition of the different zones. The modelling, however, will be affected and the formulae must then be revised accordingly.

7.4 Formula versus Model

The decision not to demand sophisticated models but to rely on a regulatory formula may well be critisized as severe loss of information is experienced when moving to the formula. However, as the results obtained by the simulation model also include an amount of inaccuracy inherent in the method itself and laws must be relatively simple in order to be easily obeyed, the formula approach can be considered to offer a good enough compromise.

7.5 Choosing the Confidence Level

One of the most crucial steps in formulating solvency rules is the choice of the tolerated ruin probability. The probabilities on which the TEL requirements are based may seem rather lax.

However, it is hardly to be expected that the management of a pension instituton would sit back and passively observe whether the institution goes bankrupt or whether a swing in the investment market comes to its rescue. Instead, the management monitors the solvency position and uses this information actively to make adjustments. It is, to some extent, possible to model allocation decisions between the main six asset classes, but decisions affecting single assets cannot be modelled. These decisions, present in the real world but absent from the model, bring an extra element of safety into the situation which means that in reality the ruin probabilities are much smaller.

A more strict choice of ruin probability would turn the balance definitely on the side of excessive prudence, resulting in considerable extra cost in form of lost opportunities to higher investment yields.

Without the side conditions imposed by the benefit structure and national guarantee system in the TEL, the confidence level should be further relaxed. For a free-standing fund without such ties to other institutions it it doubtful whether solvency rules would make sense at all. An example is provided by the pension fund for the local government in Finland, whose operations are backed by the taxation rights of the local municipalities and which has been very succesful in using equity investment opportunities monitoring its success with long-term pension cost projections only.

7.6 Where to Find More Solvency Capital

One cannot cope with adverse developments with solvency requirements; for such a purpose solvency margin is needed.

As was explained in section 3.2, TEL insurance is not a business offering opportunities for remarkable profits. Thus it would be fairly unrealistic to rely upon the owners of the company to invest considerable amounts of extra capital into the company in times of need.

Operating expenses are only some 0.6% of the insured payroll, or 0.4% of the bottom line of the balance sheet. On the other hand, the TEL companies run obligatory insurance forming part of the social security system in Finland. Cuts in operating costs are accordingly rather difficult to implement, and their effect would be negligible anyway. Thus cuts in operating expenses are no solution to solvency problems.

A company in need can change its asset structure and thus remedy an inferior solvency position.

The initial question was how to bring the TEL companies to the target zone in the first place. This problem was solved by temporarily changing the use, defined in the law, of the investment yield corresponding to the difference between the TIR and the 3% discount rate. This difference was used for strengthening the solvency margins of the companies during a transition period of 3 years. Now all companies are safely within the target zone. If they are hit by extremely bad luck, the question of where to find more solvency capital may emerge as a major isssue, and then the only possibilities may be to resort to diminishing the TIR, or changing temporarily the use of the interest rate difference between the TIR and the discounting rate.

8 The Structure of the Benefits and the Solvency Requirements

The final comments in Tuomikoski (1998) are still valid. Readers from countries with a different pension culture may find the whole subject matter of the preceding sections rather odd. Why not move to a defined contribution system with unit linked features and let the benefit level depend on the investment performance of the institution in question? This would be a solution eliminating the need for cumbersome solvency requirements and, besides, very fashionable.

As stated in Chapter 2, these decisions must depend on the fundamental objectives and intended risk structure of the pension system. The TEL and corresponding systems for other sectors are a part of the national social security system, forming the principal source of income for pensioners in Finland, although, as there is no ceiling for the wages and salaries covered, these schemes leave little room for supplementary arrangements. Thus, the TEL is classified as a first pillar scheme. According to Finnish thinking the aim of an occupational pension is to ensure the possibility of maintaining a consumption level reasonably close to that of the active years. Moreover, it is not sufficient to take care of this purpose in the average: failures at the individual level are not to be tolerated. The different risks must be borne collectively.

This major choice excludes solutions leaning exclusively, or even to a significant degree, on the DC concept, let alone personal pensions. Schemes based on defined contributions are well suited to act as supplementary pension arrangements, but hardly able to satisfy the basic need for an occupational pension. The employee whose investment strategy fails badly has no opportunity to try again. The randomness inherent in defined contribution schemes also implies that the very considerable resources demanded by pensions on the national level cannot be used in the most effective manner.

In Finland the above reasoning has led to support to the DB concept in order to avoid excessive individual differences in pensions relative to earnings. On the other hand the TEL system, although based mainly on the PAYG principle, contains a significant degree of pre-funding, as was seen in section 3.1. The non-centralized administration adds a healthy element of competition to the system.

In other words, the priorities in the Finnish statutory earnings-related pension system can be clearly ranked. Top priority is granted to the rule determining the benefits. The next rating is reserved for the decentralized, private sector administration with partial pre-funding, the PAYG pool and the national guarantee system. Appropriate solvency rules come next, and they have to serve the preceding objectives. The new solvency regulations are expected to satisfy the needs implied by these priorities, allowing each institution to conduct its investment activities in accordance with the investment environment in an effective manner subject to its own solvency position. In this way the requirements contribute to the general well-being of the statutory occupational pension system in Finland.

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