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Long-term projections 2009

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TO THE READER

Finnish statutory pensions consist of earnings-related and national pensions, as well as military injuries pensions and pensions from motor liability and workers' compensation insurance. This report presents the projections of the long-term development of pension expenditure and the average benefit level under these acts. In addition, the report includes projections of the financing of private-sector earnings-related pensions.

The previous corresponding report of the Finnish Centre for Pensions was published in 2007. The financial crisis and a turn in the economic conditions took place in 2008. During 2008 and 2009, changes were made to certain parts of the legislation concerning earnings-related pension benefits and the financing of national pensions. In the autumn of 2009, Statistics Finland published a population forecast, on which the present projection is based regarding the population development. The report shows how the realised development and new outlooks on the development of the population and the economy are reflected on the level and financing of statutory pensions.

The projections in this report were prepared using the long-term planning model of the Finnish Centre for Pensions. Kalle Elo prepared the population forecast and the life expectancy coefficient calculation. Tapio Klaavo prepared the national pension and Ismo Risku the earnings-related pension projections. Hannu Sihvonen, Kalle Elo and Tapio Klaavo were responsible for the compiling and editing of the register data used in the projections. Ismo Risku wrote the report in Finnish, and it was translated into English by Lena Koski and Ismo Risku. Markus Rapo of Statistics Finland submitted the necessary data for the population forecast. Merja Raunis prepared the publication for printing.

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Kalle Elo, Tapio Klaavo, Ismo Risku and Hannu Sihvonen

ABSTRACT

The Finnish statutory pensions consist of earnings-related and national pensions, as well as of military injuries pensions and pensions from workers' compensation insurance and from motor liability insurance. The report presents projections of the development of pension expenditure and the average benefit level under these acts, as well as of the financing of private-sector earnings-related pensions from 2009 to 2075. The effects of the most important assumptions on the results are presented through sensitivity calculations.

The results of the report have been calculated using the long-term planning model of the Finnish Centre for Pensions. The model imitates the functioning of the statutory pension scheme and, using this model, it is possible to make calculations for the forecasting and planning needs of the pension scheme. The calculations are based on an average technique by age and gender.

ABSTRAKTI

Suomen lakisääteiset eläkkeet muodostuvat työ- ja kansaneläkkeistä sekä sotilas-vamma-, liikennevakuutus- ja tapaturmaeläkkeistä. Raportti sisältää laskelmat näiden lakien mukaisen eläkemenon ja keskimääräisen etuustason kehityksestä sekä yksityisalojen työeläkkeiden rahoituksesta vuodesta 2009 vuoteen 2075. Keskeisimpien oletusten vaikutus tuloksiin esitetään herkkyyslaskelmien avulla.

Raportin tulokset on laskettu Eläketurvakeskuksen pitkän aikavälin suun-nittelumallilla. Malli jäljittelee lakisääteisen eläkejärjestelmän toimintaa, ja sen avulla voidaan tehdä laskelmia eläkejärjestelmän ennuste- ja suunnittelutarpeisiin. Laskenta perustuu ikä- ja sukupuolikohtaiseen keskiarvotekniikkaan.

EXECUTIVE SUMMARY

This report presents the long-term projections of the Finnish Centre for Pensions in 2009 regarding the development of statutory pension expenditure and the average pension level. Concerning earnings-related pension acts in the private sector, the report also includes a financing projection in which the main results are the developments in contributions and assets under the Employees Pensions Act (TyEL).

The demographic development follows the projection released by Statistics Finland in autumn 2009. The Finnish Centre for Pensions extended this forecast beyond the year 2060. Under this forecast, the life expectancy of 63-year-olds will have increased by 3.1 years (from the current level of 20.9 years) by 2025, and by 8.6 years by 2075. The working age population will decrease until the beginning of the 2030s, after which it will begin increasing again. The working age population will be equally large in 2008 and 2075. The old-age dependency ratio will increase from 25 per cent in 2008 to 42 per cent by 2025 and 53 per cent by 2075.

In 2008, the employment rate was just short of 71 per cent. By 2010 it is expected to have fallen under 67 per cent as a result of the economic recession. Following this, employment will increase and from 2025 onwards, the employment rate is expected to be approximately 71 per cent. The growth in employment rate can be explained by a decrease in unemployment and increase in the effective retirement age. By 2025, the expected effective retirement age is expected to have risen by 1.6 years from the 2008 level, and by 2050 by 2.5 years. Due to the expected increase in life expectancy, the average time spent in retirement at the end of the projection period is estimated to be roughly 6 years longer than today. The annual growth rate of the earnings level in the baseline projection is approximately 1.75 per cent, and the average real rate of return on pension assets is just under 4.0 per cent per year.

The amount of the old-age pension is adjusted to the change in life expectancy for those over 62 years of age, using the life expectancy coefficient. In 2025, the life expectancy coefficient is expected to be 0.90 and in 2075, at the end of the projection period, the coefficient is expected to be 0.75.

The earnings-related pension expenditure for the whole economy was slightly over 22 per cent of the wage sum in 2008. In the years 2009–2010, the pension expenditure percentage will grow quickly due to the decrease in employment. The growth in expenditure percentage will continue until the beginning of the 2030s, when

earnings-related pension expenditure will account for a third of the wage sum. From the end of the 2030s onwards, the pension expenditure percentage will decrease by a total of 3 percentage points by the end of the projection period. The increase in pension expenditure is a consequence of the growth in old-age pension expenditure. Total statutory pension expenditure currently corresponds to 11 per cent of GDP. At its highest, the share is projected to increase to an ample 15 per cent in the 2030s. From the end of the 2040s onwards, the share of pension expenditure in GDP will stabilize at 14 per cent.

Over the projection period, the purchasing power of the average pension will increase from EUR 1,260 to roughly EUR 3,200. Relative to the average wage, the average pension will increase until the end of the current decade. This is explained by the maturing of the earnings-related pension scheme. However, the relative pension level will begin decreasing at the end of the 2010s. The most important reason for this decline is an extended life expectancy and the life expectancy coefficient, which adapts the benefit level to correspond to changes in life expectancy.

The TyEL contribution rate will rise from the current level of 21 per cent to approximately 27 per cent by 2025. Following this, the contribution rate will decrease by two percentage points. The increase in the TyEL contribution rate is a result of the increase in the pension expenditure percentage. In 2008, the TyEL pension expenditure was 18.1 per cent of the wage sum, and by 2030 the expenditure percentage is expected to have increased by 11 percentage points. A sufficient constant level for the TyEL contribution from the beginning of 2010 would be 25.4 per cent. This contribution rate would be sufficient to ensure the long-range financial stability of the scheme.

The sensitivity of the baseline projection in relation to essential economic assumptions is examined in this report.

The rise of the *employment rate* as permanently higher in the baseline projection would at first indicate that the expenditure and contribution percentages would be lower than in the baseline projection. In the long-term, however, a higher employment rate will raise the pension level and the connection between employment and contribution level will disappear.

The decrease in *starting disability pension retirement risk* decreases pension expenditure and increases employment. Both factors decrease contribution and

expenditure percentages. Additionally, the decrease in starting disability pension retirement risk will slightly raise the average benefit level.

Concerning *old-age pension*, the pension expenditure would at first decrease and the wage sum increase if all those who stayed in the labour market until the age of 63 continued to work until the age of 68. However, in the long-term the average benefit level would increase, implying that the pension expenditure relative to the wage sum would not change significantly.

An increase in the *earnings level growth rate* to above the baseline means that the relative pension level will be lower than the level of the baseline projection. This decreases the pension expenditure percentage. However, the growth rate of the earnings level has only a slight impact on the TyEL contribution level. The share of investment returns that exceeds the increase in the wage sum can be used to permanently fund pensions. If the growth in wage sums accelerates, an increasingly smaller share of the pension expenditure could be funded from investment returns.

The *return on pension assets* mainly affects the contribution level in accordance with the principles of the defined benefit scheme. A percentage point in average investment returns has an effect of approximately two percentage points on the TyEL contribution, since the amount of pension funds is approximately double in relation to the wage sum during the projection period.

CONTENTS

1   Introduction

This report presents the Finnish Centre for Pensions' long-term projections of statutory pension expenditure, the average benefit level and the financing of private-sector earnings-related pensions. Statutory pensions under review are earnings-related and national pensions, as well as pensions paid based on the Military Injuries Act, the Compensation for Military Injuries Act, the Motor Liability Insurance Act and the Workers' Compensation Insurance Act (SOLITA pensions).

Earnings-related pension insurance covers all 18-67-year-old gainfully employed wage and salary earners and the self-employed. The earnings-related pension serves to ensure that the insured and his family receive a reasonable income in relation to income earned while working in the event of old age, incapacity for work, or death. The aim of the national pension is to provide each citizen with a minimum income in the event of old age or incapacity for work. SOLITA pensions provide benefits in the event of certain special risks. In 2008, 85 per cent of all statutory pensions were earnings-related pensions, 13 per cent were national pensions and nearly three per cent were SOLITA pensions.

The projections describe the development of statutory pensions in accordance with current legislation, secondary regulations and current procedures. The emphasis is on projections concerning earnings-related pensions. The key results are the developments in the statutory pension expenditure, the average pension level and the TyEL contributions and assets. Descriptions of economic behaviour, e.g. the development of employment, constitute assumptions rather than results in the projections.

The previous long-term projection by the Finnish Centre for Pensions was published in the autumn of 2007. In the following year, the investment activities involving pension funds were unprofitable due to the financial crisis. In the autumn of 2008, the legislation concerning TyEL funding was amended with a temporary act, the aim of which was to avoid extensive forced sales of shares.

In 2009, legislative amendments concerning earnings-related pensions and earnings-related unemployment adjustments were made. These changes will come into force in 2010 and 2011. As a result, the pension of a person who becomes disabled at a young age, as well as the old-age pension following the disability pension, will grow. The accrual rate during part-time pension and job alternation

leave will be reduced. Furthermore, the age limits of part-time pension and the unemployment allowance for additional days in the unemployment security will increase. In this connection, the government and the key labour market organisations agreed on adjustments to the financing of earnings-related and national pensions. The earnings-related pension contribution will increase by a total of 1.6 percentage points during 2011–2014, while the employer's national pension contribution will be eliminated as of 2010.

The aforementioned legislative adjustments have been included in the projections in this report. In 2009, motions have been prepared for raising the effective retirement age with three years by 2025. Preparations have been made for a so-called guarantee pension in connection with the national pension, which would improve the income of those receiving low pensions. These adjustments, which are still under planning, have not been taken into account in the projections.

In the autumn of 2009, Statistics Finland published a new population forecast, which the projections in this report are based on as far as demography is concerned. Correspondingly, in the baseline projection, the economic growth and the retirement risk follow the development of the issued assumptions. The alternative projections examine the sensitivity of the results in relation to essential economic hypotheses.

The content of the report is as follows: Chapter 2 contains an executive summary of the hypotheses and results, as well as a comparison to the report issued in 2007. Chapter 3 describes the key features of Finnish pension legislation. The hypotheses of the baseline projection are presented in Chapter 4, followed by the results in Chapter 5. The sensitivity of the results with respect to the central economic assumptions is examined in Chapter 6. In the appendices, the structure of the projection model and an estimation of the impact of the 2010 and 2011 adjustments to the earnings-related and unemployment security legislation are presented. Furthermore, the appendices include a projection of a constant TyEL contribution level, with which the foreseeable TyEL expenditures could be financed, along with a projection of the required prolongment of the working career to compensate for the life expectancy coefficient.

2   Key results and comparison with previous report

The following events and estimations regarding the future have had an impact on the results of the report at hand.

The financial crisis and recession

The global financial markets faced a crisis in 2008, and the earnings-related pension investments of the private sector suffered a loss of 18 per cent in real terms. Due to the financial crisis, the near-future economic outlook has weakened considerably. The gross national product and earnings were reduced in 2009, and the expected growth in 2010 is modest.

The reduction in the value of pension investments, along with the reduced wage sum, increases the pressure to raise the earnings-related pension contribution. However, due to the recession, the pension expenditure will not grow significantly. In short term, the recession will increase pension expenditure if the number of retirees increases as a result of the weak employment development, but the poor financial development will reduce the amount of accrued pensions, and thus reduce future pension expenditure.

Legislative amendments

During the financial crisis, the legislation concerning TyEL funding was amended with a temporary act, the aim of which was to avoid extensive forced sales of shares. As of the beginning of 2009, the Farmers' Pensions Act was expanded to also cover grant recipients in arts and sciences. Earnings-related pension and unemployment security legislation will be amended in 2010–2011. The amendments in pension legislation concern unemployment, survivors' and part-time pensions, as well as pension accrual during job alternation leave. The right to unemployment allowance for additional days will be reduced by one year.

The legislative amendments will affect funding, pension benefits and employment. However, they do not have a significant and clearly attested impact on the total pension expenditure or contribution rates. The temporary act concerning TyEL funding affects pension institutions' investment allocations. Its impact on

the contribution level depends on the development of investment markets. If the favourable development at the beginning of 2009 continues, the return on pension funds will improve as a result of the temporary act. The 2009 amendments to social legislation will partly increase and partly decrease the pension expenditure. The amendments will increase working among the elderly.

Agreement on the development of the TyEL contribution

In connection with the 2009 amendments to legislation, the government and key labour market organisations agreed on amendments to the financing of earnings-related and national pensions. Excluding temporary contribution discounts, the earnings-related pension contribution is the same in 2010 as it was in 2009, while it will increase by 0.4 percentage points per year from 2011 to 2014. The employer's national pension contribution will be eliminated as of 2010.

Population forecast in 2009

In the autumn of 2009, Statistics Finland published a new population forecast, which extends to 2060. The forecast was extended by the Finnish Centre for Pensions with one adjustment made: the rate of change in the mortality rate was halved as of 2060. Compared to the population forecast of 2007, all demographic components (birth, mortality and migration rates) were changed, resulting in an increasing population growth compared to the previous forecast. The net migration rate is 15,000 persons per year (10,000 in the old forecast). The life expectancy of a 63-year-old person in 2075 is estimated to be 29.5 years (27.8 years), which is an increase of 8.6 years compared to 2008. The total birth rate is 1.85 (1.84).

Finland's total population will grow to 6.4 million persons (5.8 million), of which the ratio of the working population will be of equal size in the first and last year of the projection. In the previous forecast, the amount of the working population decreased by nearly 300,000 persons.

The old-age dependency ratio will increase from 25 per cent in 2008 to 42 per cent by 2025. The ageing of the population will continue until the end of the projection period, at which time the old-age dependency ratio will exceed 50 per cent. The new projection does not significantly change the view on the development of the old-age dependency ratio.

Other assumptions of the baseline projection

A summary of the assumptions of the baseline projection are presented in Table 2.1. The close-term economic outlook has been taken into consideration according to reigning economic development forecasts. However, in the long-term, the economic development will return to the path presented in the 2007 projection. The employment rate will increase to above 70 per cent, and by 2050, the expected effective retirement age will increase by three years from the level prior to the pension reform in 2005. Annual real growth in the earnings level is 1.75 per cent as of 2012.

As a result of the financial crisis, the expected close-term return on pension assets will decrease. Due to the low interest rate, the interest yield will remain modest. In addition, the proportion of shares and other high-risk (and high-return) investments in the investment allocation of pension institutions is exceptionally low. The expected real return for 2010 is 3.4 per cent, and it is assumed to increase steadily to 4 per cent by 2016.

According to the law, the national pension index will only follow consumer prices. As a result of economic growth, this would lead to the national pension becoming trivial in time. However, the national pension is likely to be increased through legislative amendments. Future increases in national pension benefits have been predicted in the calculation by linking national pensions to the changes in earned income as of 2012. In the 2007 projection, national pensions followed the so-called fifty-fifty index. This assumption adjustment has an increasing effect on national pension expenditure and the benefit level.

Table 2.1. *Summary of the assumptions of the 2009 and 2007 long-term projections.*

		2009 projection			2007 projection			
	2008**	2010	2025	2075	2008	2010	2025	2075
Population								
Total fertility rate	1.85	1.85	1.85	1.85	1.84	1.84	1.84	1.84
Net immigration rate (1,000)	15.5	15	15	15	10	10	10	10
Life expectancy, 63-year-olds	20.9	21.4	24.0	29.5	20.9	21.2	23.5	27.8
Old-age dependency ratio*	0.25	0.27	0.42	0.53	0.25	0.26	0.42	0.52
National economy								
Employment rate (%)	70.6	66.9	70.8	71.0	69.6	70.3	71.2	72.0
Expected effective retirement age	59.4	59.5	61.0	61.9	59.6	60.0	61.1	61.9
Real growth rate of income level (%)	1.3	1.3	1.75	1.75	1.8	1.75	1.75	1.75
Real rate of return on investments (%)	-18.3	3.4	4.0	4.0	4.0	4.0	4.0	4.0

* Proportion of those who have turned 65 in relation to those aged 15–64 years.
** Realised value.

Results

Life expectancy coefficient

With the help of the life expectancy coefficient, the size of the old-age pension is adjusted to the change in life expectancy for those over 62 years of age. In 2025, the value of the life expectancy coefficient will be 0.90, and in 2075, it will be 0.75.

The life expectancy coefficient according to the new population forecast will deviate from the former one only slightly up to the 2020s. In the 2010s, the value of the life expectancy coefficient is marginally higher in the new forecast due to the differences in the effective and the predicted development of the mortality rate, as well as to the more detailed projection of the coefficient than before. According to the new projection, the life expectancy coefficient will be smaller as of the 2030s due to the lower mortality rate of the elderly (Figure 2.1).

Figure 2.1. *Life expectancy coefficient 2010–2075.*
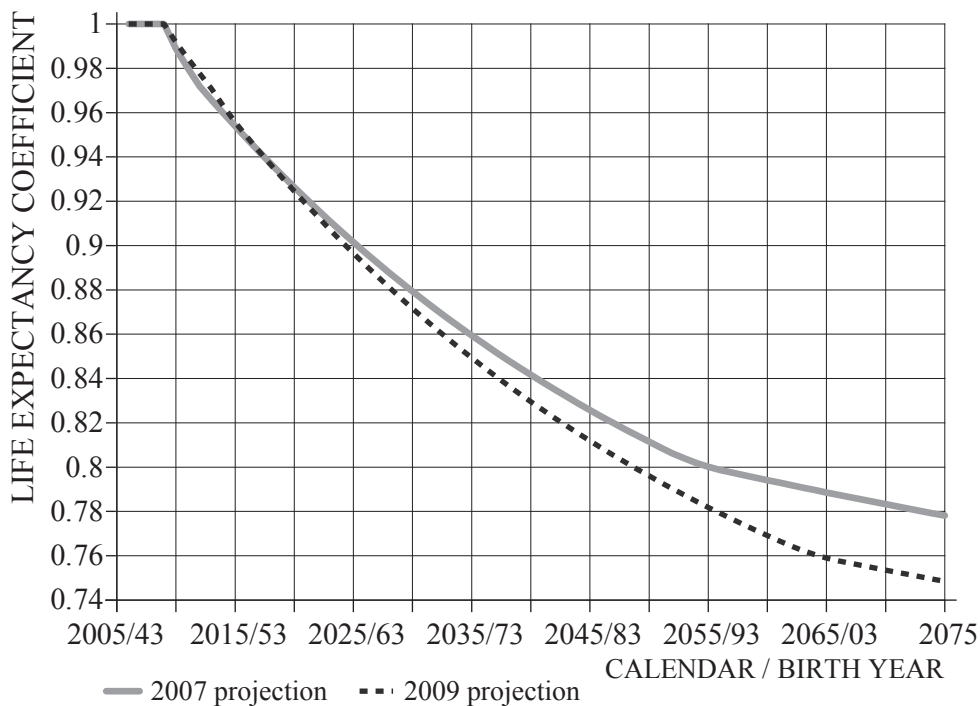
Total pension expenditure

The ratio of the total pension expenditure in relation to the total earnings sum will increase rapidly in 2009 and 2010 since employment will reduce and the increase in the earnings level will remain modest. The pension expenditure rate (per cent of insured earnings) will continue to grow until the early 2030s, after which it will decrease by nearly 4 percentage points by the end of the projection period. The growth is a result of the increase in old-age pension expenditure. The decrease of the expenditure rate later on can be explained partly by the effects of the life expectancy coefficient and partly by legislative changes that have reduced, in particular, the public sector pension accruals. The expenditure rate is also reduced by the fact that the labour force will grow as of the 2030s. In 2008, the statutory total pension expenditure amounted to nearly 11 per cent of the GDP. Due to the recession, the share of pension expenditure in GDP will increase rapidly in the near future. At its highest, the share will increase to an ample 15 per cent in the 2030s. As of the late 2040s, the share of pension expenditure in GDP will settle at 14 per cent (Figure 2.2).

Figure 2.2. *Earnings-related pension expenditure (in per cent of GDP) 1986–2075 (all earnings-related pension acts).*
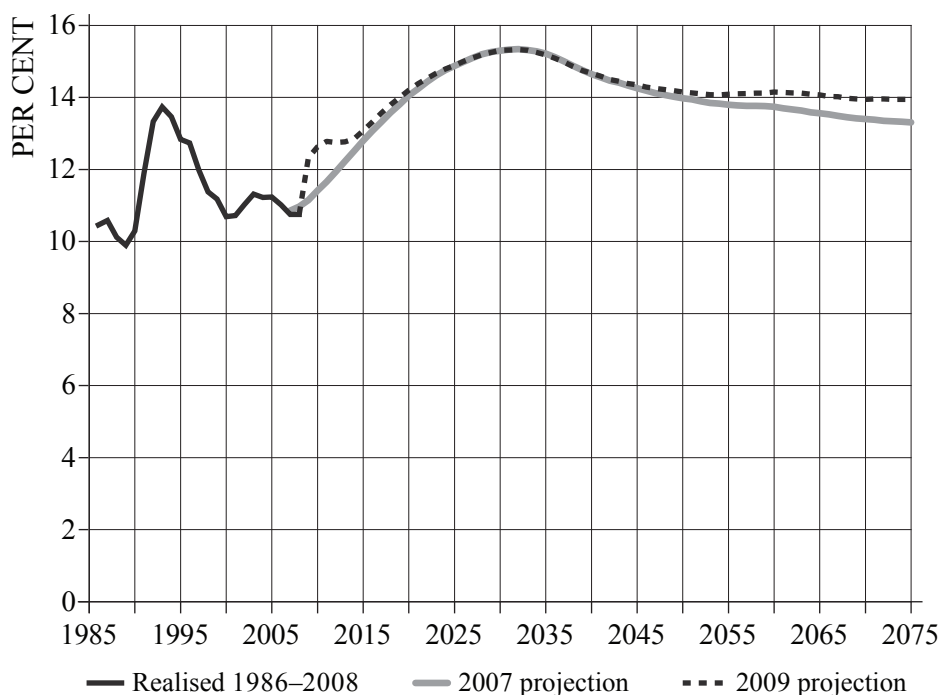
Concerning the share of pension expenditure in GDP, there are differences between the former and the new projection with various effects. The current recession will increase the share of pension expenditure in GDP since the economy will shrink. However, the increasing growth of the GDP due to the more rapid increase of the population will reduce the share of pension expenditure in the GDP in the long term. Tying national pensions to the growth in earnings in the projection will lead to a stabilization of the share of pension expenditure in GDP in the long term. Hence, the share of total pension expenditure in GDP will also stabilize. In the 2007 projection, the share of national pensions in GDP decreased steadily.

Average pension

In 2008, the average pension of persons receiving a pension in their own right and living in Finland was EUR 1,260/month. By 2025, the average pension, at 2008 prices, will rise to EUR 1,700/month, and by 2075 to EUR 3,100/month. The purchasing power of pensions will increase since the earnings-related pension is determined on the basis of the insured's earned income from work. In relation to the average wage of the household, the average pension will increase slightly as the earnings-related pension scheme matures. However, by the end of the next decade, the ratio of the average pension to the average wage will decrease. The most important reason for this is the diminishing life expectancy coefficient due to the rapidly increasing life expectancy. At the moment, the average pension is approximately 50 per cent of the average income of the insured, while it will amount to approximately 40 per cent at the end of the projection period.

The average pension in relation to the average wage develops in the same direction in the 2009 and 2007 projections.[1] With the increasing impact of the life expectancy coefficient, the long-term earnings-related pension share remains lower in the new projection compared to the 2007 projection. On the other hand, as the national pension index follows the earnings level, the importance of the national pension as part of pensioners' income will prevail at the current level.

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1   The comparability of the benefit level between the projections is not absolute. As of 2008, the housing and care allowance of a pension recipient is no longer included in the national pension. On the other hand, as a result of changes in the register, the number of insured employees increased, leading to a reduction of the estimated average salary of the insured, to which the pension is compared.

Figure 2.3. *Average pension (per cent of average wage) 1986–2075.*

Realised 1986–2008   2007 projection   ■ ■ ■ 2009 projection
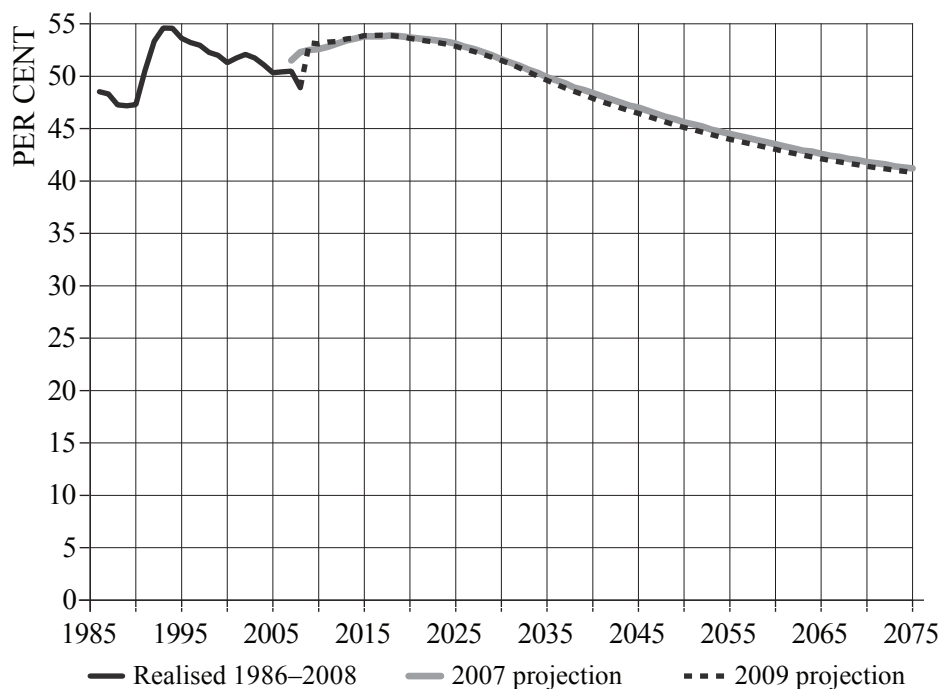
TyEL expenditure, contribution and assets

Due to the recession, the TyEL pension expenditure rate will increase vigorously in 2009 and 2010. Due to the ageing of the population, the expenditure rate will continue to grow until the early 2030s, when the TyEL expenditure will amount to nearly 30 per cent of the wage sum. Although the ageing of the population will continue after the 2030s, the expenditure rate will no longer rise. The life expectancy coefficient will eliminate the effects of the expenditure relating to the ageing of the population in so far as the ageing is due to the increase in life expectancy. On the other hand, the size of the work force will grow from the 2030s to the end of the projection period. In the new projection, the number of employed persons is higher than in the 2007 projection. This will reduce the long-term expenditure rate (Figure 2.4).

Figure 2.4. *TyEL/TEL, LEL and TaEL expenditure (per cent of wage sum) 1986–2075.*
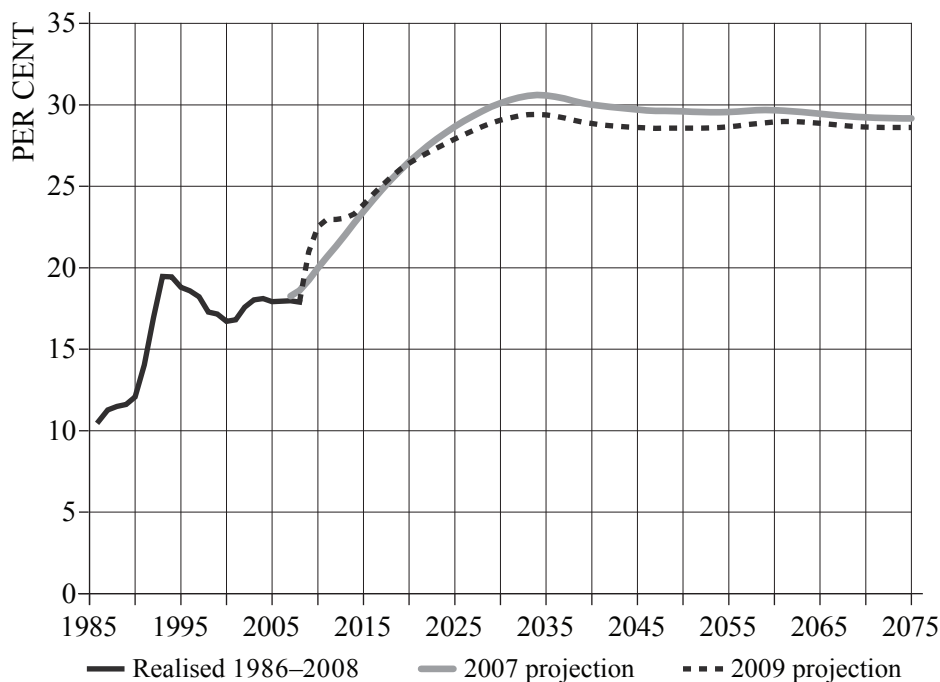
The TyEL contribution will increase from the present approximately 21 per cent to nearly 27 per cent by the mid-2020s. Following this, the contribution level will decrease by approximately two percentage points. The contribution increase is due to the increase in expenditure. The increasing pressure to raise contributions is due to that fact that the pension assets in relation to the wage sum decreased by nearly 40 percentage points in 2008 because of the financial crisis. In 2009–2010, the ratio of pension assets to the wage sum will grow fiercely due to the decreasing wage sum and the favourable return on investments during the first half of 2009. Immediately following that, the amount of pension assets in relation to the wage sum will grow slowly. Along with the recovery from the recession, the wage sum will grow relatively strongly, but the expected return of the pension assets during 2010–2015 is lower than normal (Figures 2.5 and 2.6).

Figure 2.5. *TyEL/TEL contribution rate 1991–2075.*
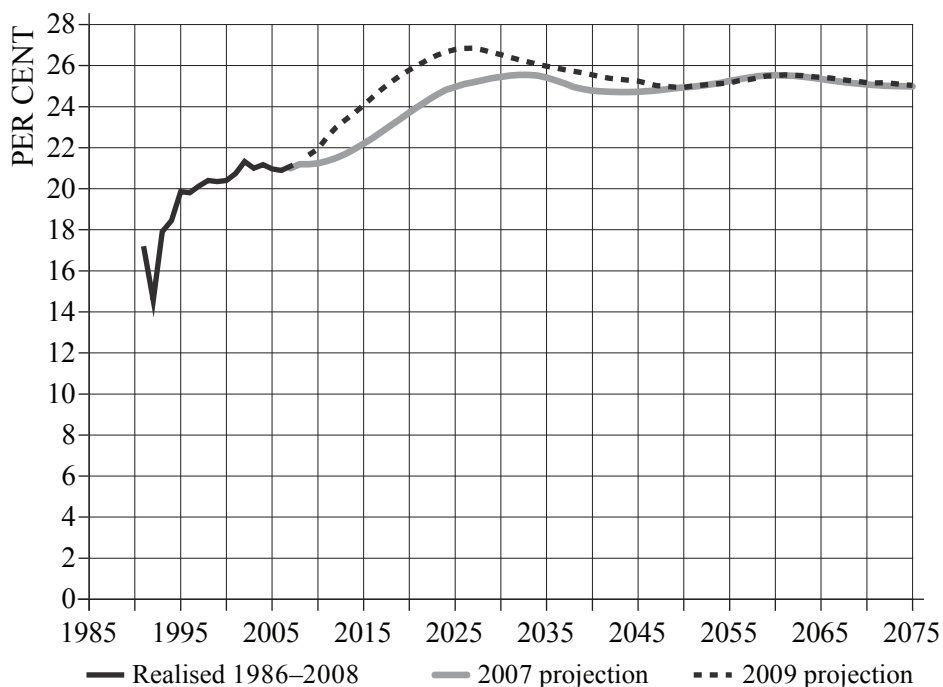
The contribution level according to the new projection will exceed the contribution level of the 2007 projection by almost two percentage points in the 2010s and the 2020s. As of the 2030s, the contribution levels do not differ significantly from each other in the projections. The higher expenditure level in the new projection is a result of a decrease in pension assets and a reducing wage sum due to the recession. In the long term, the differences in contribution levels will disappear since the expenditure rate under the new projection will remain lower than the expenditure rate of the 2007 projection.

Figure 2.6. *TyEL/TEL assets (per cent of wage sum) 1997–2075.*
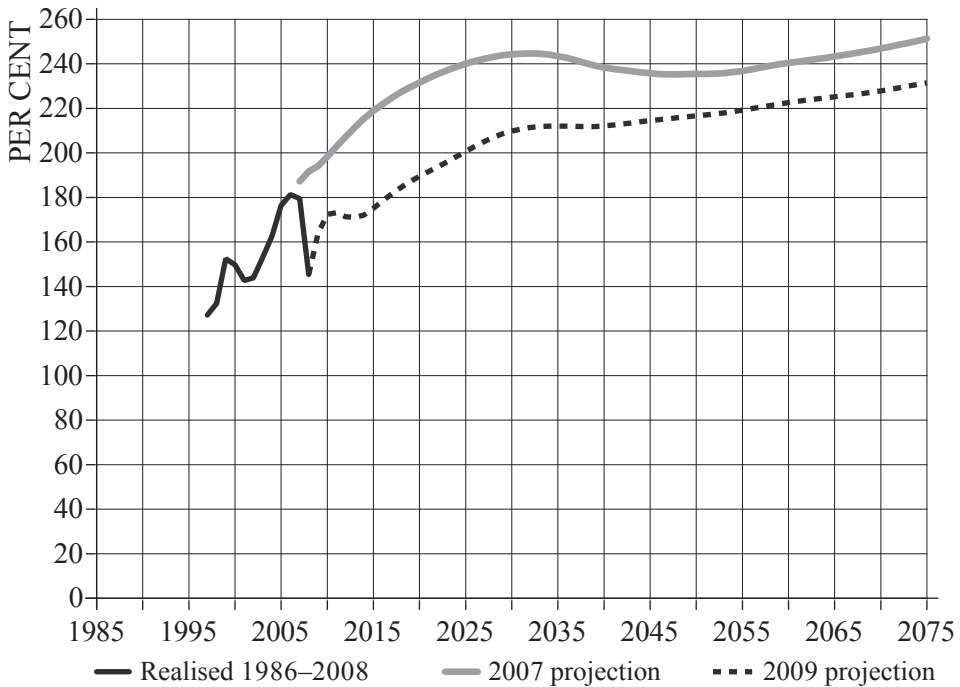
From the point of view of the financing of future pension expenditure, an adequate constant level of the TyEL contribution as of 2010 would be 25.4 per cent. In 2008, the TyEL contribution amounted to 21.1 per cent, so the required increase is 4.3 percentage points. According to the 2007 report, the adequate contribution level as of 2008 would have been 24.3 per cent.

3 Statutory pension benefits and pension financing

3.1 Pension acts included in the report

The earnings-related pension scheme consists of several pension acts, which together cover the different sectors of the economy. In practice, all work performed by persons between the ages of 18 and 67, as employees or self-employed, is insured under some pension act. The national pension guarantees a minimum pension if the earnings-related pension is small.

The following earnings-related pension acts are included in the projections.

Private sector acts:
- Employees Pensions Act (TyEL)
- Seafarer's Pensions Act (MEL)
- Self-Employed Persons' Pensions Act (YEL)
- Farmers' Pensions Act (MYEL), and
- Act on Farmers' Early Retirement Aid (LUTUL).

Public-sector pension acts and regulations:
- State Employees' Pensions Act (VaEL)
- Local Government Pensions Act (KuEL)
- Evangelical-Lutheran Church Pensions Act (KiEL), and
- Pension regulations for the employees and officials of the Social Insurance Institution (KELA), the Bank of Finland and the regional government of Åland.

Both private and public sector acts:
- Act on compensation for pension accrual from state funds for periods of childcare and periods of study (VEKL).

For private-sector pension acts TyEL, YEL and MYEL, both expenditure and financing projections are provided, whereas only the expenditure projection is provided for public-sector pension acts.

Earnings-related pensions are defined benefits. In other words, the size of pension expenditure determines the contribution level and the need for other financing.

Because of this, we shall investigate pension expenditures first, followed by an examination of the financing of these expenditures.

The national pension projection includes benefits under the following acts:
- National Pensions Act (KEL), and
- Front-Veterans' Pensions Act (REL).

The Survivors' Pensions Act (PEL), which was included in the national pension insurance, was abolished as of the beginning of 2008, and the equivalent benefits were incorporated into the National Pensions Act. Until 2007, the housing allowance for pensioners and the pensioner's care allowance were included in the official statistics under national pension expenditure. As of 2008, these allowances have no longer been included in the national pension expenditure. The amended statistical practices have been taken into consideration in the projections of this report.

Furthermore, statutory pensions or life annuities are based on the following acts:
- Motor Liability Insurance Act (LVL),
- Workers' Compensation Insurance Act (TapVakL),
- Military Injuries Act (SoVL), and
- Compensation for Military Injuries Act (SotapL).

These four so-called SOLITA pensions have been included in this projection only in general terms.

3.2   Determination and types of benefits

Earnings-related pension. The earnings-related pension acts and the acts concerning earnings-related unemployment benefits were amended in 2009, and the amendments will come into force in 2010 and 2011. The aim of the amendments was to improve, on the one hand, the future pension of people who become unemployed at a young age, as well as to prevent the reduction of the disability pension (because of the life expectancy coefficient) when it is replaced by an old-age pension. On the other hand, the legislative changes are used to steer those who have maintained their work capacity into increasingly longer working careers. The determination of earnings-related pension benefits and benefit types according to legislation valid at the beginning of 2010 is presented below. Legislative changes made in 2009 are presented in table 3.2.

Earnings-related pension accrues from wage and salary income earned between the ages of 18 and 67 in accordance with the accrual rate shown in table 3.1. Persons under the age of 18 and over the age of 68 do not accrue a pension, nor do they fall under the insurance obligation. For wage and salary earners, the income that accrues a pension equals the salary from which the employee's pension contribution has been deducted. For the self-employed and farmers, pension is accrued from the total sum of insured income without the employee's pension contribution deduction.

Table 3.1. *Earnings-related pension accrual rates.*

Basis for accrual	Accrual rate
Earnings, 18–52-year-olds	1.5
Earnings, 53–62-year-olds	1.9
Earnings, 63–67-year-olds	4.5
Earnings, employment during retirement	1.5
Projected pensionable service	1.5
Social security benefit periods*	1.5

* The basis for the accrual is a per-benefit-specified share of the earnings prior to the benefit period.

According to the earnings-related pension acts, a pension accrues for people between the ages of 18 and 63 years during the following social benefit periods: parenthood allowance, alternating leave and earnings-related unemployment allowance periods, as well as during parallel training periods and sickness allowance periods. Earnings-related pension also accrues from a few other benefit periods that are less significant from the point of view of pension expenditure.

Regardless of age, the accrual rate for social benefit periods is 1.5 per cent per year. The accrual is based on the same earnings that the actual benefit is based on. For the parenthood allowance, the basis for the pension is 117 per cent of earnings; for earnings-related unemployment benefits, the percentage is 75, and for other types of daily allowance, except job alternation leave, the percentage is 65. For job alternation leave, the basis for the pension is 55 per cent of the earnings.

The earnings-related pension acts are supplemented by the Act on compensation for pension accrual from state funds for periods of childcare and periods of study (VEKL). Based on the act, a benefit compensating for pension accrues for studies leading to a vocational or university-level degree, as well as for child-care for children under the age of three. At the 2009 level, the bases for the accrual are

calculated earnings of EUR 624.14 per month, with an annual accrual rate of 1.5. The size of the calculated earnings for which the benefit accrues has been linked to the wage coefficient, and the benefit is paid when any pension other than a part-time pension is granted.

When calculating the initial pension amount, the income from different years is adjusted using the wage coefficient, which is a weighted average equal to 80 per cent of the change in earnings plus 20 per cent of the change in consumer prices. Pensions in payment are adjusted using an earnings-related pension index, which is a weighted average equal to 20 per cent of the change in earnings plus 80 per cent of the change in consumer prices. A one-time raise in pension is carried out for young and middle-aged disability pensioners after the pension has been paid for five years. The increase is 25 per cent for pensioners under the age of 32. For those over 32, the increase will be lowered by one percentage point for each year of age, until it disappears altogether.

Earnings-related pension benefits include disability, unemployment, part-time, old-age and survivors' pensions.

Disability pension can be granted either as a full pension or a partial pension, depending on the degree to which the work ability of the insured has decreased. Partial disability pension is equal to half of a full disability pension. The disability pension is equal to the pension accrued up to the date that the disability occurred, plus an additional amount based on projected pensionable service. The accrual rate for projected pensionable service is 1.5 per cent per year. The salary applied to projected pensionable service is the individual's average salary computed over the five years preceding the incapacity for work. The life expectancy coefficient affects the starting amount of the disability pension as shown below.

The unemployment pension may be granted to long-term unemployed persons born in 1949 or earlier, after they have reached the age of 60. Members of cohorts entitled to the unemployment pension may start receiving the earnings-related unemployment allowance at the age of 55 and the unemployment pension at the age of 60.

Persons born after 1949 are not eligible to receive an unemployment pension. However, they may be entitled to additional days of the earnings-related unemployment benefit until the commencement of their old-age pension. Persons born between 1950 and 1954 may receive the earnings-related unemployment allowance until the commencement of their old-age pension, if they become

unemployed after turning 57. Those born after 1954 are entitled to additional days of unemployment allowance if they become unemployed after they have turned 58. After additional days of unemployment allowance, the unemployed may take out on old-age pension at the age of 62. In that case, he will receive the pension that has been accrued until the day the old-age pension commences, without a reduction for early retirement.

A part-time pension may be granted to an insured person who reduces his working hours in such a manner that the earnings decrease to 35-70 per cent of his stabilised earnings level. The age limit for a part-time pension is 58 years for those born in 1952 or earlier, and 60 years for those born after 1952. The size of the part-time pension is half of the earnings reduction caused by the decrease in working hours. Pension is accrued also for work carried out during retirement. In addition, for those born in 1952 and earlier, the accrual rate of the reduced earnings is 0.75 per cent per year. For those born after 1952, no pension is accrued for the reduced earnings.

The insured is entitled to a normal old-age pension at the age of 63 and an early old-age pension at the age of 62. However, the early old-age pension is reduced by 0.6 per cent for each month of early retirement. If the insured continues working after turning 63 and does not take out old-age pension, the pension accrual rate is 4.5 per cent per year. For those receiving an old-age pension while in gainful employment after the age of 63, the accrual rate is 1.5 per cent. After reaching the age of 68, the pension accrual and the insurance obligation end. If the insured does not take out his old-age pension after turning 68, an increment for deferred retirement of 0.4 per cent per month is added to the pension.

Surviving spouses, former spouses and children may be eligible for survivors' pension. A former spouse is entitled to a surviving spouse's pension if the deceased was obligated to pay alimony to the former spouse. If the deceased had two or more children under the age of 18, the total sum of survivors' pension is as large as the deceased person's pension. If there is only one minor in the family, the total sum of survivors' pension is approximately 80 per cent of the deceased person's pension. If the deceased left no minors, the survivors' pension can be at most half of the deceased person's pension. In this case, the level of the survivors' pension is determined after a reduction of the surviving spouse's pension, where the surviving spouse's own pension income typically reduces or altogether removes the surviving spouse's pension.

Table 3.2. *Amendments to earnings-related pension acts and unemployment security age limits in 2010 and 2011.*

Valid until 31 December 2009	Valid as of 1 January 2010 or later
Disability pension	
1) The accrual rate for projected pensionable service until the age of 50 is 1.5. Between the ages 50 and 63, the accrual rate is 1.3. 2) A lump-sum increase of 21 per cent for those under the age of 27; decreases by 0.7 percentage points per year. 3) When the disability pension is converted into an old-age pension, the life expectancy coefficient confirmed for the year in which the person turns 62 will be applied to the entire pension in payment. 4) Earnings under VEKL are not included in the projected pensionable salary.	1) The accrual rate for projected pensionable service until the age of 63 is 1.5. 2) A lump-sum increase of 25 per cent for those under the age of 32; decreases by one percentage point per year. 3) The life expectancy coefficient of the year in which the disability has begun is applied to the share of accrued pension when the disability pension begins. The life expectancy coefficient is not applied to the projected pensionable service share, or when the disability pension is converted into an old-age pension. 4) Earnings under VEKL (multiplied by two) are included in the projected pensionable salary.
Part-time pension	
5) Age limit 58 years. 6) The accrual rate for the decrease in income is 0.75 per cent a year.	5) Age limit 60 years. 6) No accrual for the decrease in income. The new age limit and accrual regulations apply to those born in 1953 and thereafter.
Pension accrual during job alternation leave	
7) The accrual is based on 75% of the earnings prior to the job alternation leave.	7) The accrual is based on 55% of the earnings prior to the job alternation leave.
Survivors' pension	
8) The life expectancy coefficient affects the survivors' pension only in connection with the reduction of the surviving spouse's pension, when the life expectancy coefficient of the reduction year is applied.	8) The survivors' pension is determined on the basis of the paid pension, in which case the life expectancy coefficient affects the survivors' pension via the pension of the deceased. The limit for the reducing of the surviving spouse's pension is amended so that the survivors' pension of those receiving a small individual pension is increased, while the survivors' pension of others is decreased.
Unemployment allowance	
9) A person who is unemployed at the age of 57 or later may receive an earnings-related unemployment allowance until the onset of his old-age pension.	9) The age limit is raised to 58 years. The new age limit applies to persons born in 1955 and thereafter.

Using the life expectancy coefficient, the initial amount of the old-age pension is adjusted to reflect changes in the life expectancy of 62-year-olds. The size of the starting old-age pension is determined by multiplying the accrued pension with the life expectancy coefficient. For starting disability pensions, the share of accrued pension is also multiplied by the life expectancy coefficient, but the coefficient is not applied to the projected pensionable service. Hence, the closer to the age of old-age pension the individual is when he becomes disabled, the more extensive is the effect of the life expectancy coefficient on the size of the disability pension.

The life expectancy coefficient is defined in such a way that the actuarial present value of an individual's stream of old-age pension remains unchanged, even if the life expectancy of 62-year-olds were to differ from the life expectancy observed in the years 2003–2007. The life expectancy coefficient affects the pensions of those born in 1948 and thereafter. The value of the coefficient is defined separately for each one-year cohort.

National pension

The national pension guarantees a minimum pension if the earnings-related pension is small. The types of pension benefits and the entitlement criteria in the national pension scheme are nearly identical to those in the earnings-related pension scheme. However, partial disability pension and part-time pension are not paid from the national pension scheme. Survivors' pension can only be paid to persons under the age of 65 who do not receive national pension.

The change in the earnings-related pension legislation that took place at the beginning of 2005 did not affect the retirement age in the national pension scheme, which remains at 65. However, any pension accrued from gainful employment after the age of 63 will not lower the amount of the national pension. In addition, lump-sum increases in disability pension based on the earnings-related pension acts, and benefits accrued from periods of childcare and study, will not be taken into account when determining the national pension.

The amount of national pension depends on the size of the pensioner's earnings-related pension and upon his family relations. The amount of the national pension decreases as the earnings-related pension increases, so that half of the monthly earnings-related pension that exceeds EUR 52 is deducted from the national pension, until the national pension is eliminated completely.

In 2009, the full amount of national pension was EUR 518-524 per month. All benefits and earnings limits of the national pension scheme have been linked to the cost-of-living index. A benefit once defined through the national pension scheme is not recalculated due to an index adjustment of the earnings-related pension. Instead, the national pension under payment is adjusted only by the national pension scheme index. The national pension level is occasionally raised by a decision of parliament. The last raise took place at the beginning of 2008. A normal index adjustment in 2010 would mean a reduction of the national pension due to a decrease in consumer prices. To prevent this, the national pension index is frozen at the 2009 level.

SOLITA pensions

Based on the Motor Liability Insurance Act (LVL), disability pension is paid in the event that a permanent injury has led to a loss of earnings. Based on the Workers' Compensation Insurance Act (TapVakL), compensation is paid for accidents at work or occupational diseases. Workers' compensation pension is paid to the injured after a period of daily allowance. Based on the Military Injuries Act (SoVL), annuity is paid to disabled war veterans and others who have become disabled or ill as a result of a military accident taking place before 1991. Based on the Compensation for Military Injuries Act (SotapL), military accidents and diseases incurred during military service in 1991 and thereafter are compensated.

3.3   Pension financing

Private-sector employees[2]

From their inception, pension acts governing private-sector employees (until 2006, TEL, LEL and TaEL; since 2007, TyEL) have applied a partially funded technique.

The payable pension is divided into a funded and a pooled component. Assets for the funded component are accumulated at the pension provider where the employee is insured. Funds for paying the pooled component are collected during the year in which the pension is paid, in accordance with the pay-as-you-go principle. Pension benefits that are partly funded in advance are old-age, disability and unemployment pensions. Survivors' pensions and part-time pensions are financed according to the pay-as-you-go principle.

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2   Tuomikoski, Sorainen and Kilponen (2007) describe the insurance technique of the private sector earnings-related pension insurance.

The pre-funding of the old-age pension takes place between the ages of 18 and 54, while disability and unemployment pensions are funded when the pension begins. Using a common set of projection bases, each pension provider calculates the amount of technical provisions caused by various funded pension components. A three per cent discount rate is used to calculate technical provisions. Financial assets cover the technical provisions of the pension providers. Pension provider funds exceeding the technical provisions constitute solvency capital by which providers prepare for investment risks.

In most years, the returns on pension assets exceed the three per cent discount rate used to calculate the technical provisions. Realised surplus from investments are transferred to the working capital of pension providers to increase their solvency. Realised investment returns affect the growth of old-age pension liabilities, since the funded components of old-age pensions (and therefore also the technical provisions) are increased annually on the basis of the average solvency of the pension providers. Increases to funded pensions can be targeted to different amounts to various age groups in order to achieve an even contribution development. Pension providers may also make transfers from their solvency capital to client bonuses.

Pension expenditure based on the Seafarer's Pensions Act is financed by employers, employees and the state. The state finances a third of the pension expenditure, while the employers and employees have an equal financing responsibility.

Self-employed persons

The pension expenditure of the self-employed and farmers is financed through annual premium income and a state contribution. The state pays that part of the pension expenditure that premium income does not cover. The contribution rate under the Self-Employed Persons' Pensions Act (YEL) roughly corresponds to the Employees Pensions Act (TyEL) contribution. In 2008, the State's share in financing YEL expenditure amounted to approximately seven per cent, while 80 per cent of the Farmers' Pensions (MYEL) expenditure is financed by the state. The large role of the state in regard to MYEL financing is due to an unfavourable age structure and the low contribution level in MYEL. The average MYEL contribution rate is equal to approximately half of the TyEL contribution rate.

Public-sector employees

The state and municipal pension schemes were established purely on the pay-as-you-go system. In 1988, the Local Government Pensions Institution began funding pensions in order to restrain the growth of pension contributions. The aim has been set at keeping the municipal pension contribution below 30 per cent of the wage sum. The State Pension Fund was established in 1990 for the purpose of accommodating future state pension expenditure. The objective of the fund is to collect assets, by which the pension cost burden caused by the post-war baby-boomers can be eased during the peak years.

This report presents projections for financing private-sector pensions but contains only an estimate for the development of pension expenditure in the state and municipal pension schemes

National pension

National pensions are completely financed via the pay-as-you-go system. The expenditure is financed by the state and by the employer's national pension contribution. In 2008, the employer's national pension contribution amounted to EUR 1.1 billion (over 40 per cent of the national pension expenditure). As of the beginning of 2010, the state will finance the national pensions in full.

4 Assumptions of baseline projection

For the projection describing the future pension expenditure and its financing, assumptions concerning the following must be made:
- the demographic development,
- employment rates,
- the retirement risk,
- the growth in earnings level, and
- the return on pension assets.

In the projection, acts and other regulations governing the schemes will stay valid as in 2009, apart from two exceptions. The adjustments made to earnings-related and unemployment security legislation in 2009 will come into force in 2010 to 2011 and are included in the baseline projection. According to valid legislation, national pensions have been indexed to consumer prices. However, in the past, national pensions have been raised based on decisions made by the Parliament. Apparently, this procedure will continue in the future. Projections concerning future national pension increases will be made by linking the national pension level as of the beginning of 2012 to the earnings development.[3] Except for in 2010, when the national pension index will be frozen, national pensions will adhere to the price level development until 2011.

4.1 Population

The population forecast follows the population forecast published by Statistics Finland in 2009, which covers the time period until 2060. The population forecast of Statistics Finland is regional, and the sum of the regional forecasts forms the forecast for the entire nation. This report's population forecast follows the forecast of Statistics Finland, but it has been converted to a nation-wide projection. Therefore, the population figures presented in this report differ to some extent from the forecast published by Statistics Finland. However, the differences are so small that they bear no significance for the results.

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3   In the actuary report of the Social Insurance Institution of Finland, the national pension expenditure is projected under the assumption that the national pension index will adhere to either the price or the earnings level (The Social Security Insurance Institution 2006).

The most important assumptions of the forecast include the following:
- total fertility rate 1.85
- net migration 15,000 persons per year
- the decreasing mortality rate observed in 1989–2008 will continue in the future.

The population forecast has been extended from 2060 to 2075 according to the assumptions above, apart from the decrease in mortality rate, which is expected to be halved after 2060.

The slow-down of the mortality rate according to the forecast means a considerable increase in longevity in the long term. The life expectancy of 63-year-old men is projected to rise from the current approximately 19 to 28 years during the projection period, with a corresponding increase for women from 23 to almost 31 years (Table 4.1). As the mortality rate decreases, these so-called periodical life expectancies will underestimate the life expectancy of each cohort, since they are calculated on the basis of the mortality rates at the time of the review. The cohort-specific life expectancies, on the other hand, are calculated from the time of the review onwards with the help of the projected mortality rates. In 2008, the cohort-specific life expectancy for men aged 63 is 21.2 years and for women 25.8 years.

Table 4.1. *Life expectancy 1985–2075.*

| | **Newborn** | | | **63-year-olds** | | |
	Men	**Women**	**Total**	**Men**	**Women**	**Total**
1985	70.1	78.5	74.4	..	..	..
1990	70.9	78.9	75.0	15.0	19.4	17.5
1995	72.8	80.2	76.6	15.9	20.3	18.4
2000	74.1	81.0	77.7	16.9	21.1	19.3
2005	75.5	82.3	79.0	18.2	22.4	20.6
2008	76.3	83.0	79.7	18.8	22.8	20.9
2009	76.7	83.4	80.1	18.9	23.1	21.2
2010	77.0	83.6	80.3	19.1	23.3	21.4
2015	78.4	84.6	81.5	20.1	24.2	22.3
2020	79.6	85.6	82.6	21.1	25.1	23.2
2025	80.9	86.5	83.7	22.0	25.9	24.0
2030	82.0	87.4	84.7	22.8	26.7	24.8
2050	86.1	90.4	88.2	25.9	29.3	27.6
2075	88.9	92.4	90.7	28.0	31.0	29.5

* These are calendar year life expectancies, based on the mortality rates of the given attained year.

The old-age dependency ratio (the ratio of persons aged 65+ to persons aged 15–64) will increase from the current 26 per cent to 45 per cent by 2030, after which the increase of the ratio will slow down. In 2075, the old-age dependency ratio will be 53 per cent, i.e. slightly more than twice its current level. Until 2030, the increase in the old-age dependency ratio is due to both the increasing number of people over 65 and the decrease in size of the working-age population. After 2030, the number of working-age people will slowly increase, but the number of elderly people will grow faster than the number of working-age people (Table 4.2).

Table 4.2. *Population (thousands) and the old-age dependency ratio 1985–2075.*

	0–14-year-olds	15–64-year-olds	65+	Total	Old-age dependency ratio (%)
1985	952	3,341	618	4,911	18.5
1990	964	3,361	673	4,998	20.0
1995	972	3,413	732	5,117	21.5
2000	936	3,468	777	5,181	22.4
2005	907	3,508	841	5,256	24.0
2008	891	3,543	892	5,326	25.2
2009	888	3,553	912	5,352	25.7
2010	886	3,548	944	5,378	26.6
2015	908	3,463	1,139	5,509	32.9
2020	937	3,409	1,291	5,637	37.9
2025	948	3,390	1,416	5,754	41.8
2030	944	3,382	1,525	5,852	45.1
2050	946	3,462	1,680	6,088	48.5
2075	956	3,544	1,889	6,389	53.3

The assumptions of the new population forecast differ from the previous forecast mainly in terms of immigration figures and the mortality rate. According to the new forecast, net migration is 15,000 persons per year, while it was 10,000 persons per year in the 2007 forecast. According to the new population forecast, the life expectancy of a 63-year-old person at the end of the projection period is 29.5 years, while it was 27.8 years according to the previous forecast. In terms of nativity, the forecasts differ only slightly; in the new forecast, the total fertility rate is 1.85 against 1.84 in the previous forecast.

Due to the increasing immigration and birth rates and the decreasing mortality rate, Finland's population will grow to 6.4 million people by 2075 according to the new forecast, while the figure remained at 5.8 million persons in the previous one.

According to the new population forecast, the old-age dependency ratio in 2075 is 53 per cent, while it was 52 per cent in the previous forecast.

4.2   Employment and effective retirement age

According to the present business cycle forecasts, the employment rate will decrease and the unemployment rate will increase in the near future (Table 4.3). However, in the long term, the employment rate will increase, although it will remain at one percentage point below the 2007 projection. The difference in the long-term employment rate is explained by an increase in the immigration rate. For the main part, immigration to Finland is based on other reasons than finding a job (exile, reunion of families), leading to low employment rates among immigrants. Immigration plays a considerable role in the population increase. The generations born in Finland amount to approximately 60,000 persons, while net immigration amounts to 15,000 persons per year.

The employed are assumed to be divided between the private and the public sector in the same proportions as they are under current circumstances. By 2020, the amount of persons insured under MYEL, excluding grant recipients, will be reduced by nearly 40 per cent from the current figures,[4] while the number of persons insured under TyEL will increase with the corresponding amount. As of 2020, the share of persons in the work force insured under MYEL will remain constant.

The employment and unemployment rates presented in table 4.3 have been adjusted to correspond to the figures presented by Statistics Finland. In the actual projection, pension-act specific employment and unemployment figures which are based on the Finnish Centre for Pensions' register data, have been used. Based on these, there are fewer gainfully employed and more unemployed persons than observed by Statistics Finland. The differences are related to differences in the definition of employment and unemployment.[5]

Due to the economic recession, the near-future increase of the effective retirement age will be slower than predicted. Under TyEL, the retirement risk for old-age pension is predicted to increase by 20 per cent in 2009 compared to in 2008, while

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4   As of the beginning of 2009, persons receiving grants in the sciences and arts will be insured under MYEL (see Chapter 3).

5   The figures for the employed and the population are presented in Table 5.4.

the equivalent percentage is 10 per cent under other pension acts. During 2011–2013, the increasing retirement risk for old-age pension in line with the business cycle will be eliminated, and in the long-term, the retirement risk is assumed to settle at the level presented in the 2007 projection.

Table 4.3. Employment and unemployment rates and expected retirement age 1985–2075.

	Employment rate	Unemployment rate	Expected effective retirement age
1985	72.2	5.0	..
1990	74.1	3.2	..
1995	61.1	15.5	58.8*
2000	66.9	9.8	58.8
2005	68.0	8.5	59.1
2006	68.9	7.8	59.5
2007	69.9	6.9	59.5
2008	70.6	6.4	59.4
2009	67.9	8.8	59.3
2010	66.6	10.2	59.5
2011	67.2	9.6	59.7
2015	69.8	6.9	60.2
2020	70.4	5.9	60.6
2025	70.8	5.3	61.0
2030	70.8	5.2	61.4
2050	70.9	5.2	61.9
2075	71.0	5.2	61.9

* Year 1996.

By 2025, the effective retirement age will increase to 61 years, due to the abolishment of unemployment pensions and the elimination of lower pension ages (excluding certain special groups, e.g. the military). In addition, it is assumed in the projection that the retirement risk for old-age pension will be reduced by 35 per cent and for disability pension by 15 per cent by 2025 compared to the figures in 2008.[6] By 2050, the retirement risk for disability pension will be reduced by 25 per cent and for old-age pension by 50 per cent compared to the figures in 2008. After 2050, there will be no further changes to the retirement risks.

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6   The changes in retirement risk for old-age pension do not apply to those who have turned 68. In the projections, the insured will retire on old-age pension at the age of 68 at the latest.

The lower retirement risk for disability pension is considered appropriate since, according to the demographic forecast, future generations will be clearly healthier than the current ones. Furthermore, the life expectancy coefficient will make it less attractive in the future to retire early. Despite the reduction in the retirement risk, the increase in life expectancy means that the effective retirement period will increase by more than four years by 2050. By 2075, the effective time spent in retirement will be prolonged by more than six years.

4.3   Growth in earnings level and inflation

In the near future, the growth rate in earnings level and inflation will follow the current business cycle forecasts, after which the quantities in question will be set as constants: the real rate of growth in income level at 1.75 per cent and inflation at 1.7 per cent (Table 4.6). The inflation rate has no significant impact on the results of the projection if the economic real quantities are independent of inflation. Pension accruals and benefits are indexed to the earnings and price levels.

The assumed real growth in income level of 1.75 per cent closely corresponds to the realised development. The average real growth in earnings level between 1989–2008 was 1.73 per cent. If the review is extended further back in history, the growth rate in earnings level becomes higher. The average growth rate between 1969–2008 was 2.06 per cent (Table 4.4).

Table 4.4. *Real growth of earnings level index 1969–2008.*

Length of period	Years	Growth rate (%)*
40 years	1969–2008	2.06
20 years	1969–1988	2.39
	1989–2008	1.73
10 years	1969–1978	2.50
	1979–1988	2.28
	1989–1998	1.58
	1999–2008	1.87

* Geometric mean.

Earnings in each age and gender group are expected to grow at the rate of the earnings index. However, as the number of insured under the Farmers' Pension Act (MYEL) diminishes, the size of the remaining farms will increase, and, until 2020,

the average insured wage is expected to rise one per cent faster per year than the general earnings index. The decrease in the number of farms also increases the general earnings level since those insured under MYEL will be replaced by persons insured under TyEL, whose earnings are higher.

The ageing of the work force will also increase the earnings level, as the age profiles of earnings are ascending. However, the impact of the described structural changes on the earnings level is minor.

4.4   Return on pension assets

Considerable uncertainty is associated with investment returns, and experts may hold different views concerning the expected returns. The analysis of investment risks has been bypassed in this report.[7] Instead, the impact of various return assumptions on the development of TyEL contributions and assets are examined via sensitivity analyses (see Chapter 6).

Table 4.5. *Real-return assumptions of pension assets per type of investment.*

	Share 30 June 2009*	2010		2016	
		Share	**Return**	**Share**	**Return**
Short-term interest	5.3	5	1.0	5	1.5
Bonds and mortgages	53.9	51	2.0	40	2.5
Real estate	13.5	14	4.5	15	4.5
Shares and other investments	27.3	30	5.6	40	5.6
Total	100.0	100	3.4	100	4.0

* TyEL companies on average.

The return assumptions of pension assets can be derived from the return assumptions of various investment classes and their share of the investment portfolio. The return assumptions and assumed investment allocations for 2010 and 2016 are presented in Table 4.5. The figures for 2010 provide an approximate description of the current situation, and the figures for 2016 describe the "normal" investment allocation and interest level. The current interest rate level is low; in addition, the ratio of shares and risky investments in the investment portfolios of earnings-related pension

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7   With stochastic simulation, Risku and Kaliva (2009) examined the effects of investment returns on TyEL financing. The results are comparable with the results presented in this report.

institutions is smaller than normal. Hence, the return assumption of TyEL assets is low. In the long term, both factors are expected to be normalised. For simplicity, the transition from the 2010 return assumption (3.4 per cent) to the 2016 return assumption (4.0 per cent) is steady in the projection. The high return assumption for 2009 (6.6 per cent) is explained by the return realised during the first half of the year.

Table 4.6. Inflation, growth in income level and return on assets 1997–2075.

	Consumer price inflation	Nominal growth in earnings level	Real growth in earnings level	Nominal return on pension assets	Real return on pension assets
1997–2008*	1.8	3.6	1.8	5.4	3.3
2005	0.9	3.9	3.0	11.5	10.4
2006	1.8	3.1	1.3	8.7	6.4
2007	2.5	3.3	0.8	5.4	2.9
2008	4.1	5.2	1.0	-15.2	-18.3
2009	0.1	4.2	4.1	6.6	6.5
2010	0.9	2.7	1.8	4.3	3.4
2011	2.0	3.0	1.0	5.6	3.5
2012	1.7	3.5	1.75	5.4	3.6
2013	1.7	3.5	1.75	5.5	3.7
2014	1.7	3.5	1.75	5.6	3.8
2015	1.7	3.5	1.75	5.7	3.9
2016→	1.7	3.5	1.75	5.8	4.0

* Geometric mean.

5 Baseline projection

This chapter presents the key results of the baseline projection, namely:

- the earnings-related pension expenditure and the life expectancy coefficient
- other statutory pension expenditure
- the number of pension recipients and the average pension, as well as
- the financing of TyEL, YEL and MYEL pensions.

The results are reviewed on the level of the total economy and separately for the different pension acts and sectors of the economy. The data for 2008 is partly a result of the projection and may differ slightly from its realised values.

5.1 Earnings-related pension expenditure

The forecast for the life expectancy coefficient is calculated on the basis of the realised mortality in 2003-2008 and the assumed mortality in the population forecast (Table 5.1).[8] According to the population forecast, the mortality rate will decrease so that, for example, the initial amount of the old-age pension for persons born in 1962 is multiplied by 0.9. The slow-down of the mortality rate as of the year 2060, as included in the population forecast, will affect the life expectancy coefficient with a slight delay.

Table 5.1. *Life expectancy coefficient 2010–2075.*

| The year in which person turns 63	2010	2015	2020	2025	2030	2050	2075
Year of birth	1947	1952	1957	1962	1967	1987	2012
Life expectancy, 63-year-olds	21.4	22.3	23.2	24.0	24.8	27.6	29.5
Life expectancy coefficient	1	0.963	0.93	0.902	0.876	0.799	0.749

Due to the employment rate and the strong growth of the earnings level, the TyEL expenditure ratio in relation to the wage sum remained unchanged in 2006–2008, despite the ageing of the population and the maturing of the scheme. During 2009 and 2010, the TyEL expenditure ratio in relation to the wage sum will increase rapidly due to the economic recession and the large number of persons retiring.

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8   Figure 2.1 presents a graph of the coefficient, and Appendix 4 includes the numerical values of the life expectancy coefficient for several generations, as well as the required time of compensating work needed to compensate the effects of the life expectancy coefficient on the pension amount.

The TyEL expenditure rate will continue to increase up to the 2030s, when it will be nearly 30 per cent. After the second half of the 2030s, the expenditure rate will slowly decrease. Due to the life expectancy coefficient, the continuously rising life expectancy will not increase the earnings-related pension expenditure. On the other hand, the birth rate that is near the renewal level, together with immigration, will contribute to an increasing number of working-age people.

The Farmers' Pensions Act was expanded at the beginning of 2009 to include not only farmers but also persons receiving grants in sciences and the arts. The expansion of the group of insured increases the MYEL earnings for 2009 by five per cent in the projection.

Figure 5.1. *TyEL, YEL and MYEL expenditure (per cent of earnings) 2006–2075.*
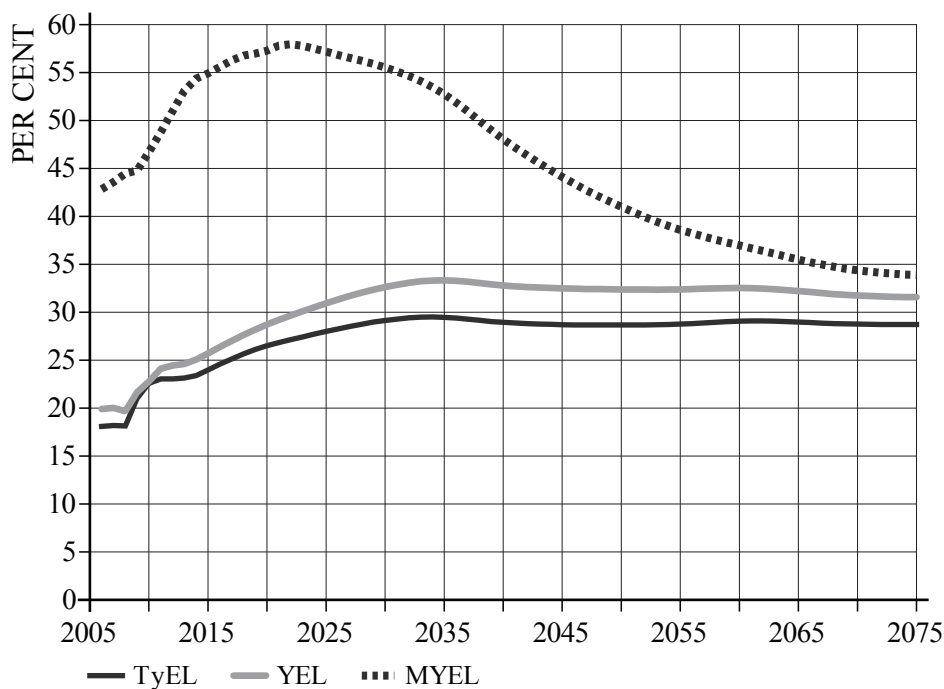

Despite the legislative amendment, the number of persons insured under MYEL will continue to shrink. In 1980, 246,000 persons were insured under MYEL; by 2008, the number had dropped to 84,000. According to the projection, the shrinking of

the active insured group will continue until the year 2020, when 56,000 persons will be covered by MYEL. As of 2020, the development of the number of persons insured under MYEL will follow the development of the other pension acts. The development of the active group will be reflected straightforwardly in the pension expenditure rate. From 2020 onwards, the pension expenditure rate will decrease, and in the long term, the YEL and MYEL pension expenditure rate will settle at a level close to each other.

The Act on compensation from state funds for pension accrual for periods of childcare and periods of study (VEKL) came into force at the beginning of 2005. The impact of VEKL on expenditure will become evident only after decades, since benefits accrue to people who are, for the most part, at the beginning of their careers. The full impact of the act on starting pensions will become evident when these people retire. The full impact of the act on the pension expenditure will become clear once these age groups are among the oldest of the pensioners. This will be the case in nearly 60 years, when the expenditure under VEKL will be approximately 0.6 per cent of the economy-wide wage sum (Figure 5.2).

**Figure 5.2.** *VEKL pension expenditure (per cent of earnings) 2006–2075.*
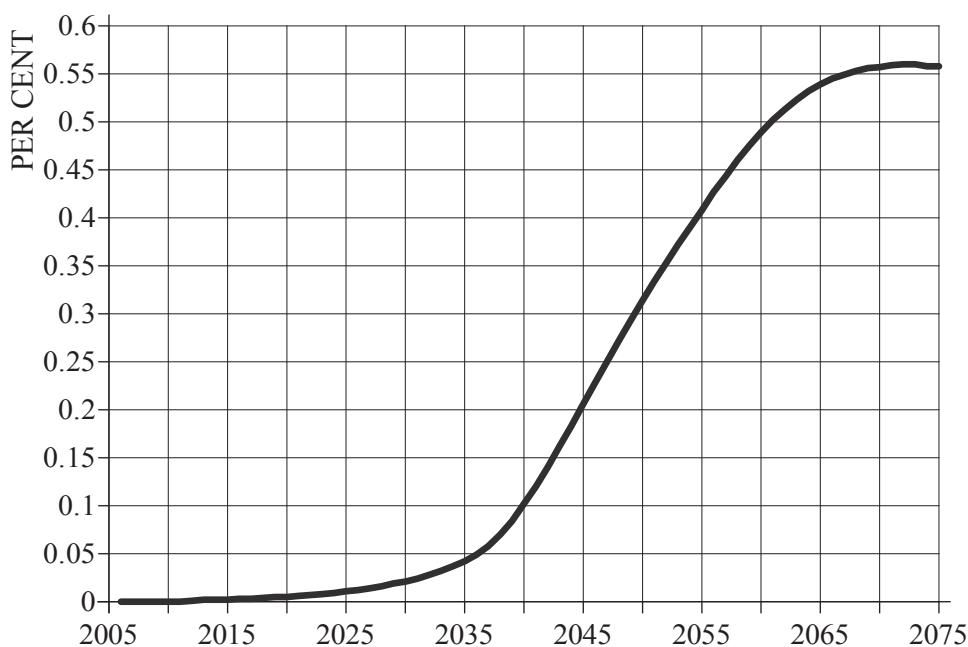
Table 5.2. *Earnings-related pension expenditure and earnings by sector 2008–2075 (EUR billion at 2008 prices).*

	Private*			Public**			Total		
	Earned income EUR bn	Pension expend-iture EUR bn	Expend-iture %	Earned income EUR bn	Pension expend-iture EUR bn	Expend-iture %	Earned income EUR bn	Pension expend-iture EUR bn	Expend-iture %
2008	54.2	10.4	19.3	20.8	6.4	30.7	74.9	16.8	22.4
2010	50.9	12.0	23.6	21.3	7.2	33.9	72.2	19.3	26.7
2015	58.7	14.7	25.1	24.1	8.7	36.1	82.8	23.4	28.3
2020	64.1	17.7	27.6	25.9	10.3	39.6	90.0	27.9	31.0
2025	70.6	20.5	29.0	27.8	11.6	41.7	98.4	32.1	32.6
2030	77.1	23.2	30.1	30.3	12.7	41.8	107.4	35.9	33.4
2050	112.4	33.2	29.5	43.3	14.9	34.3	155.7	48.0	30.9
2075	179.1	53.0	29.6	67.6	21.5	31.8	246.6	74.4	30.2

* TyEL, YEL, MYEL, MEL and special pensions for farmers, as well as a share of VEKL pension expenditure.
** KuEL, VaEL, KiEL pensions and the pensions of the personnel at SSI, as well as a share of VEKL pension expenditure.

Figure 5.3. *Earnings-related pension expenditure by sector (per cent of earnings) 2006–2075.*
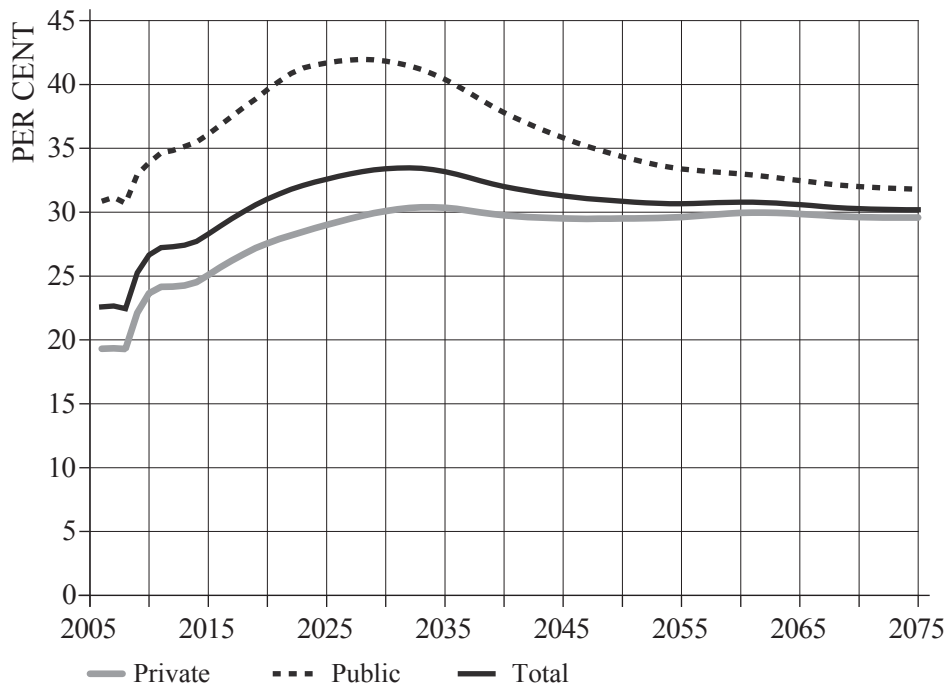
The earnings-related pension expenditure in the private sector consists of TyEL, MEL, YEL, and MYEL pensions, as well as pensions awarded to farmers under the farm-closure schemes and part of the VEKL expenditure. The public sector pension expenditure consists of municipal, state and the Evangelical-Lutheran Church pensions, as well as the pensions of the officers of the Social Insurance Institution (KELA) and part of the pension expenditure under VEKL. The development of the public sector pension expenditure rates differs considerably from that of the private sector. During the next 20 years, the private sector expenditure rate will increase by 10 percentage points to 30 per cent. After that, it will not change significantly. The public sector expenditure rate, on the other hand, will experience a clear peak in the 2020s and 2030s, after which it will slowly decrease to the current level of approximately 30 per cent (Figure 5.3 and Table 5.2).

The public sector expenditure rate, which will remain high for decades, is the legacy of more generous benefit rules in the public compared to the private sector, as well as of privatisation, which has resulted in the transfer of employees from the public to the private sector. In addition, public-sector employees are relatively old and thus accrue more pensions than the gainfully employed in the private sector (Table 5.3). In the long term, the public- and private-sector expenditure rates will settle at a level close to each other because, for the main part, the benefit rules are consistent. In the projection, the development of the number of insured is also consistent; the ratio of public-sector employees of the work force is assumed to remain at the same level throughout the entire projection period.

When reviewed by type of pension benefit, the growth in earnings-related pension expenditure can be explained by the growth in old-age pension expenditure (Figure 5.4). The most important reason for the increase in old-age pension expenditure is the ageing of the population. The maturing of the scheme and the lowering of the age limit for old-age pension from 65 to 63 will increase the old-age pension expenditure rate in comparison with the earnings.

Unemployment pensions can be granted to persons born in 1949 or earlier, so their payment will terminate during 2012.

The ratio of disability pension expenditure to earned income will shrink over the projection period to half of its current level of 3.2 per cent. The expenditure rate is reduced by the already realised and the expected decrease in the retirement

risk of disability pension, as well as by the lowering of the termination age of the disability pension from 65 to 63 years.

Even though the legislative changes that come into force at the beginning of 2010 will benefit those on disability pension, they will not increase disability pension expenditure significantly. However, as a result of the legislative changes, the amount of payable old-age pensions following disability pension will increase. As a result of the change in the legislation, a reduced life expectancy coefficient will be applied already at the onset of the disability pension. Without the change in legislation, the life expectancy coefficient would have been applied to the disability pension when it is converted into an old-age pension (see Table 3.2).

Figure 5.4. Earnings-related expenditure (per cent of earnings) per type of benefit 2006–2075 (all earnings-related pension acts).
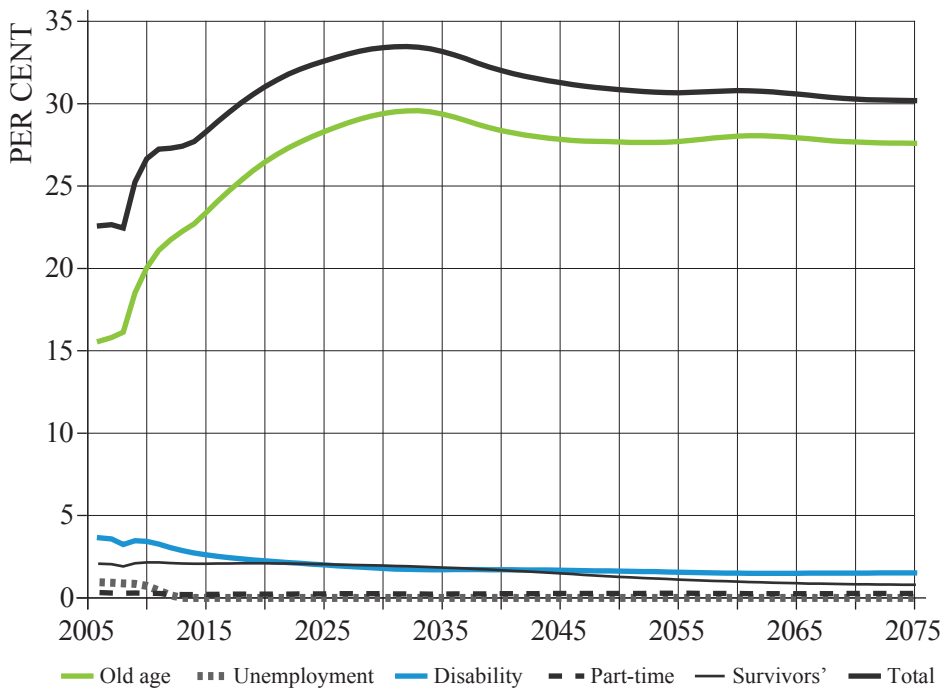
Typically, a survivors' pension is paid to the surviving spouse after the death of a husband who received an old-age pension. As old-age pension expenditure increases, the number of terminations of old-age pensions will also increase, in which case

the number of survivors' pensions also increases. On the other hand, the changes in mortality patterns decrease survivors' pension expenditure. As the mortality rate decreases, the deaths occur at increasingly higher ages. This shortens the average lifetime spent as a widow. As a result of the decreasing number of marriages and the levelling out of the differences in pension level between the spouses, it is assumed in the projection that the annual number of survivors' pension incidences will decrease by 30 per cent by 2030. In 2008, survivors' pension expenditure amounted to 1.9 per cent of the earned income. By the 2020s, the expenditure is projected to rise to 2.1 per cent. By the end of the projection period, it is projected to be slightly less than one per cent of the earned income.

The annual earnings-related pension expenditure consists of pensions accrued during previous decades. It is difficult to specify the currently payable pensions on the basis of the time of accrual, but in the projection, the future pensions can be disaggregated in this manner. In Figure 5.5, the earnings-related pension expenditure is divided into pensions accrued by the end of 2009 and pensions accrued as of the beginning of 2010. The pension components already accrued will dominate pension expenditure for a long time to come. Of the pensions payable in 2040, nearly half have already been accrued by the insured.

The value of accrued pensions at a certain point in time is equal to the money amount sufficient to finance the pensions accrued by that point in time, including future index adjustments. The interest used to discount future pensions have a significant impact on the value of pensions accrued. The value of earnings-related pensions accrued by the end of 2009 amounted to EUR 610 billion, applying a 2.5 per cent discount rate. With a discount rate of 4.0 per cent, the value is EUR 480 billion (Table 5.3). The value of the accrued earnings-related pensions is 3.5–2.7-fold in relation to the GDP.

Both assumed interest rates (2.5 per cent and 4.0 per cent) can be considered appropriate. The lower rate corresponds to the interest rate of bonds and loans, while the higher rate corresponds to the assumed total return of earnings-related pension investments (Table 4.5).

Figure 5.5. *Earnings-related pension expenditure (per cent of earnings) by time of accrual 2010–2075, (all earnings-related pension acts).*
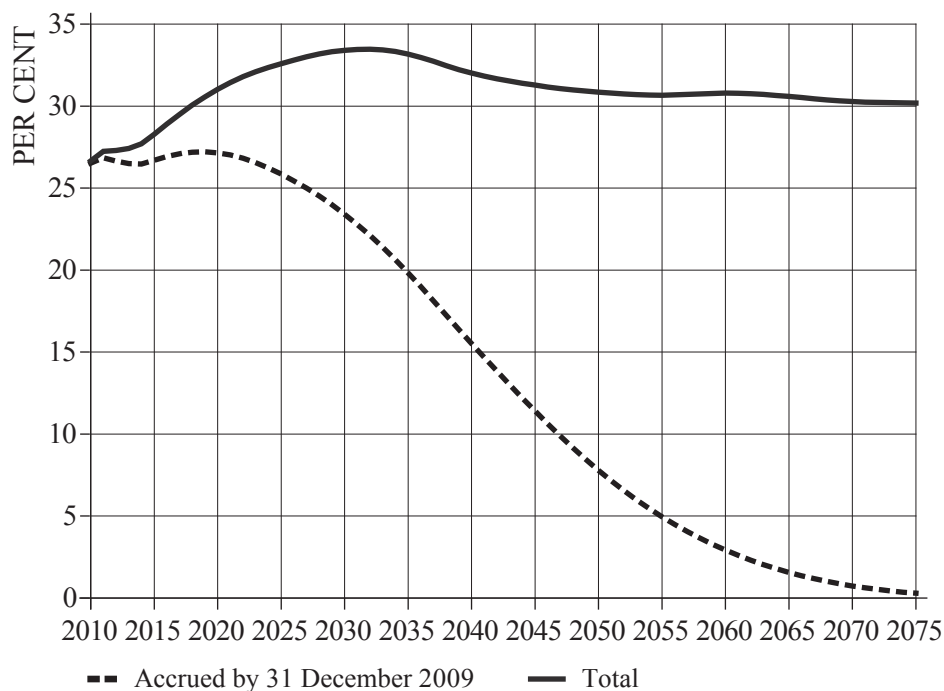
The development during 2009 of the value of pensions accrued is presented in Table 5.3. The insured accrue new pension (EUR 19.8/13.6 billion), and previously accrued pensions (EUR 18.5 billion) are paid to pensioners. The passage of time also implies that previously accrued pensions shift closer to the time of payment. Because of the interest rate, the value of these accrued pensions will increase (EUR 15.5/18.9 billion). By adding the pensions accrued by the end of 2008, the new accruals and the interest, and by subtracting the pensions paid during the year, we are left with the value of the accrued pensions at the year-end. The same result would be achieved by counting the value of the future pension expenditure from the end of the year 2009 forward.

Table 5.3. *Value of accrued pensions and pension assets 2008.*

EUR billion at current prices

	TyEL		Private		Public		Total	
Pension assets* 31 Dec. 08 [a]	72.4		73		28.7		101.7	
Earnings 2009 [b]	46.9		52.2		21.2		73.3	
Discount rate**	2.5%	4.0%	2.5%	4.0%	2.5%	4.0%	2.5%	4.0%
Accrued by 31 Dec. 08 [c]	342.7	263.5	385.4	297.7	208.1	164.3	593.5	461.9
Paid in 2009	-9.9	-9.9	-11.5	-11.5	-7.0	-7.0	-18.5	-18.5
Accrued in 2009 [d]	12.2	8.2	13.8	9.3	6.1	4.3	19.8	13.6
Interest	8.9	10.8	10.1	12.2	5.4	6.7	15.5	18.9
Accrued by 31 Dec. 09	354.0	272.6	397.7	307.6	212.6	168.3	610.3	475.9
Funding ratio 31 Dec. 08 [a/c]	21%	27%	19%	24%	14%	17%	17%	21%
Accrued pension / covered income [d/b]	26%	17%	26%	18%	29%	20%	27%	19%

* Source: Financial Supervisory Authority, TyEL institution assets reduced by the component corresponding to the TEL supplementary pension.
** Real discount rate; for 2009, the corresponding nominal rates are 2.6% and 4.1%.

The funding rate is the amount of pension assets divided by the value of accrued pensions. This figure is heavily dependent on the discount rate used. The funding rate of all earnings-related pensions at the end of 2008 was 17–21 per cent.

The average TyEL contribution is 21 per cent of the wages in 2009. In the same year, with a discount rate of 2.5 per cent, the value of accrued TyEL pensions is 26 per cent, and with a discount rate of 4.0 per cent, the value is 17 per cent of the wages. Depending on the assumed interest, the value of accrued pensions in 2009 will either exceed or fall short of the pension contribution amount.

5.2   Total statutory pension expenditure

The development of all statutory pension expenditures is analysed in terms of the following components:

- private-sector earnings-related pensions (TyEL, MEL, YEL, MYEL, LUTUL, VEKL)
- public-sector earnings-related pensions (KuEL, VaEL, KiEL, KELA, the Bank of Finland, the regional government of Åland, VEKL)
- national pension (KEL, REL)
- SOLITA pensions.

The total pension expenditure for earnings-related pensions (points 1 and 2) follows the expenditure development described above in section 5.1. Voluntary pension provisions, including registered TEL and YEL supplementary pensions, are not included in the projection.

The size and number of national pensions are calculated on the basis of the size of the earnings-related pensions and the population forecast. In the projection, national pensions are increased during 2009–2011 to correspond to changes in the price level. However, the freezing of the 2010 national pension index has been included in the projection. From 2012 onward, national pensions in payment will be increased according to the development of the earnings level. The full national pension, with the help of which the size of beginning national pensions is calculated, is also adjusted according to the development of the earnings level. Tying the national pension to the level of earnings anticipates future raises of national pensions and other legislative amendments, with which the continuous lagging behind of smaller pensions will be prevented.

For SOLITA pensions, the projection does not aim for elaborateness but for an approximate estimate based on the given demographic and economic development. For SOLITA pensions, the starting point is the reigning pension expenditure divided by age and gender. After that, SOLITA benefits for persons of an active age develop in line with the earnings level. From the age of 63 onward, the average SOLITA benefit will follow the earnings-related pension index.

The development of the total pension expenditure is presented in figure 5.6 as a percentage of GDP. In the projection, the GDP decreases in 2009 and 2010 by a total of three per cent. From 2011 onward, it grows at the same pace as the total earnings of the economy.

In 2008, total statutory earnings-related pension expenditure amounted to 10.8 per cent of GDP; in the 2030s, it will rise to over 15 per cent. From the 2030s onward, the GDP share of pension expenditure will decrease throughout the remainder of the projection period (Figure 5.6). The rise in the share of pension expenditure in GDP leading up to the 2030s is due primarily to the ageing of the population. However, the ageing of the population will continue also after the 2030s, while the GDP share of pension expenditure will decrease. This decrease is due primarily to the life expectancy coefficient, which limits the growth of earnings-related pension expenditure. Reviewed by sector, the decrease in the GDP share of

pension expenditure is a result of the decrease of the GDP share of public-sector earnings-related pensions.

Figure 5.6. *Total statutory pension expenditure (per cent of the GDP) 2006–2075.*
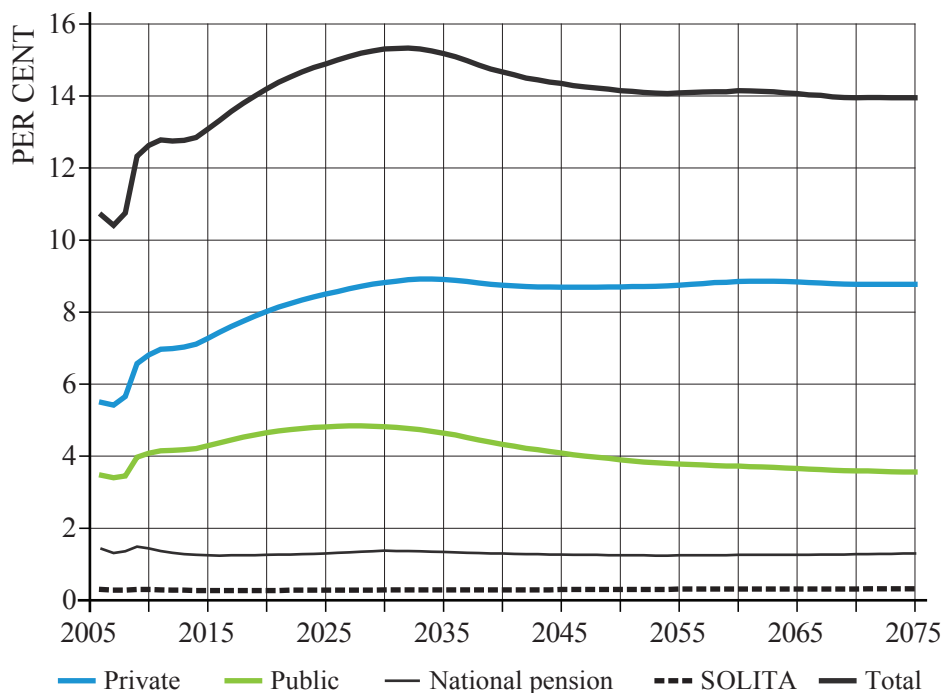
5.3   Number of pension recipients and average pension

At the end of 2008, the number of earnings-related pension recipients was 1.31 million, and when including those receiving a national pension, the total number of pensioners was 1.41 million. These figures include, among others, pensioners who live abroad and those who receive only a survivors' pension. This report reviews the number of persons receiving a pension, limited to persons resident in Finland who receive a pension in their own right, while excluding recipients of a part-time pension. By the end of 2008, there were 1.27 million pensioners fitting this definition.[9]

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9   The number of pension recipients according to the projection deviates only slightly
     from this figure (see Table 5.4).

Demographic development and the retirement risk are the key factors affecting the number of pension recipients. Despite the reduction of the retirement risk, the number of pension recipients will grow to 1.6 million by 2025, and to 2.1 million by the end of the projection period. The number of persons aged 65+ will grow at an even faster rate, from the present 0.9 million to 1.9 million by the end of the projection period. The ratio of pension recipients to gainfully employed grows as the old-age dependency ratio increases. The number of pension recipients per one hundred gainfully employed is currently slightly over 50, but by the end of the projection period, the number will be more than 80.

The purchasing power of the average pension during the projection period will grow 2.5-times, i.e. from slightly over EUR 1,200 to EUR 3,100 per month (Table 5.5). The growth in the purchasing power of pensions is a result of the increase in earnings level; the earnings-related pension is tied to the earnings level via accrual regulations and indexing.

Table 5.4. *Population, pensioners and gainfully employed persons 2008–2075 (figures in thousands).*

	Population 15–64	Population 65+	Old-age dependency ratio	Gainfully employed (18–67)	Pension recipients	Pension recipients / Gainfully employed
2008	3,543	892	0.25	2,427	1,236	0.51
2010	3,548	944	0.27	2,329	1,294	0.56
2015	3,463	1,139	0.33	2,362	1,404	0.59
2020	3,409	1,291	0.38	2,344	1,525	0.65
2025	3,390	1,416	0.42	2,343	1,621	0.69
2030	3,382	1,525	0.45	2,338	1,703	0.73
2050	3,462	1,680	0.49	2,397	1,839	0.77
2075	3,544	1,889	0.53	2,456	2,055	0.84

In 2008, the average pension was half of the average earnings of the insured.[10] The level of the pensions will grow faster than the earnings level until the end of the 2010s due to the coming into force of the earnings-related pension scheme. After that, the growth of pensions will lag behind the growth of earnings, mainly

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10   The ratio of gross pension in relation to gross income. If income transfers and the differences in household sizes are taken into consideration, the relative situation of pension recipients will improve.

due to the life expectancy coefficient. In addition, the removal of the higher accruals in the public compared to the private sector in the 1990s, and an increase in employee pension contributions will lower the ratio of pensions to the earnings level (Table 5.5 and Figure 5.7).

The lag of the pension indexes explains the variations in the ratio between the average pension and the average earnings in 2008 and 2009. In 2008, the index increase was modest, while the prices and wages grew quickly. The index increase in 2009 was exceptionally high, reflecting the price and earnings development of the previous year.

Table 5.5. *Average pension 2008–2075, all pension recipients and 68-year-olds.*

	EUR/month, 2008 prices					% of average income	
	Average earnings*	**Earnings-related pension**		**Total pension**		**Total pension**	
		Total	**68-yr-olds**	**Total**	**68-yr-olds**	**Total**	**68-yr-olds**
2008	2,410	1,070	1,330	1,250	1,430	52	59
2010	2,540	1,180	1,460	1,350	1,550	53	61
2015	2,750	1,320	1,540	1,480	1,670	54	61
2020	3,000	1,450	1,640	1,610	1,790	54	60
2025	3,280	1,570	1,720	1,730	1,890	53	58
2030	3,590	1,660	1,790	1,850	1,990	52	55
2050	5,070	2,060	2,300	2,290	2,530	45	50
2075	7,840	2,860	3,300	3,200	3,670	41	47

* Average income of the insured in the baseline projection.

The pension level of beginning old-age pensions and of successive cohorts can be described through the average pension of 68-year-olds. By this age, the entire cohort has retired, but only a few pensions have ended. However, the average pension of 68-year-olds does not provide comparable data of the total pension income of various generations since, as the life expectancy is extended, future generations will spend a longer time in retirement than their predecessors (Table 5.5).

Figure 5.7. *Average pension (per cent of average wage) 2006–2075.*
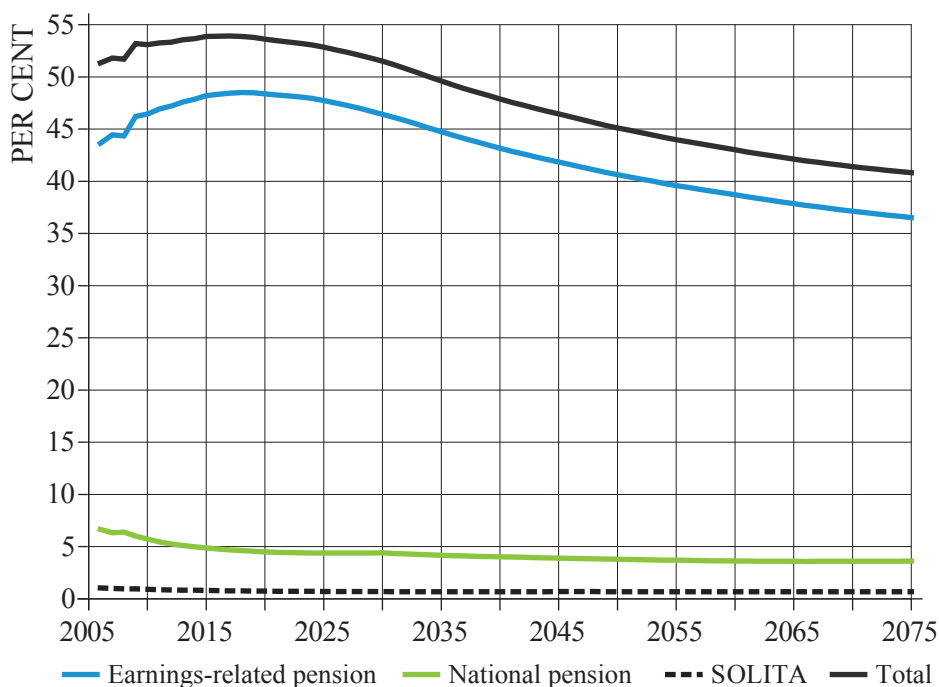
## 5.4　Financing of private-sector earnings-related pensions

In the following section, the financing of pension expenditure under the Employee's Pensions Act (TyEL), Self-Employed Persons' Pensions Act (YEL) and Farmers' Pensions Act (MYEL) is examined. In the financing projection for TyEL, the primary quantities to be analysed are the development of pension contribution and pension assets. In the financing projection for YEL and MYEL, the main quantities to be analysed are the premium income and the state's share of the pension expenditure.

As a result of the 2007 reform of the pension financing under TyEL, increases to the funded components of old-age pensions on the basis of investment returns may be allocated in different amounts to different generations in order to achieve a more stable contribution development. The older the age groups that the increases are allocated to, the faster the liabilities are dissolved, reducing the contribution level. In the baseline projection, prior to 2014, the increases in funded components

are allocated to persons who have reached the age of 55; after 2014, the increases are allocated to persons who have reached the age of 65.

As a consequence of the increase in TyEL expenditure, the TyEL contribution will increase from the current level of 21 per cent to a maximum of approximately 27 per cent in 2025, after which the contribution will decrease by two percentage points (Figure 5.8). Employees' contribution shares will increase more than employers' shares since, in comparison with the employers' shares, the employees' shares are exceptionally low at the moment (Figure 5.8). Due to the economic outlook, TyEL expenditure will surpass TyEL contributions in 2010–2011. Expenditure will surpass the contribution level permanently as of 2016.

Figure 5.8. *TyEL contribution rate 2006–2075, total contribution, and employer and employee contribution rates.*
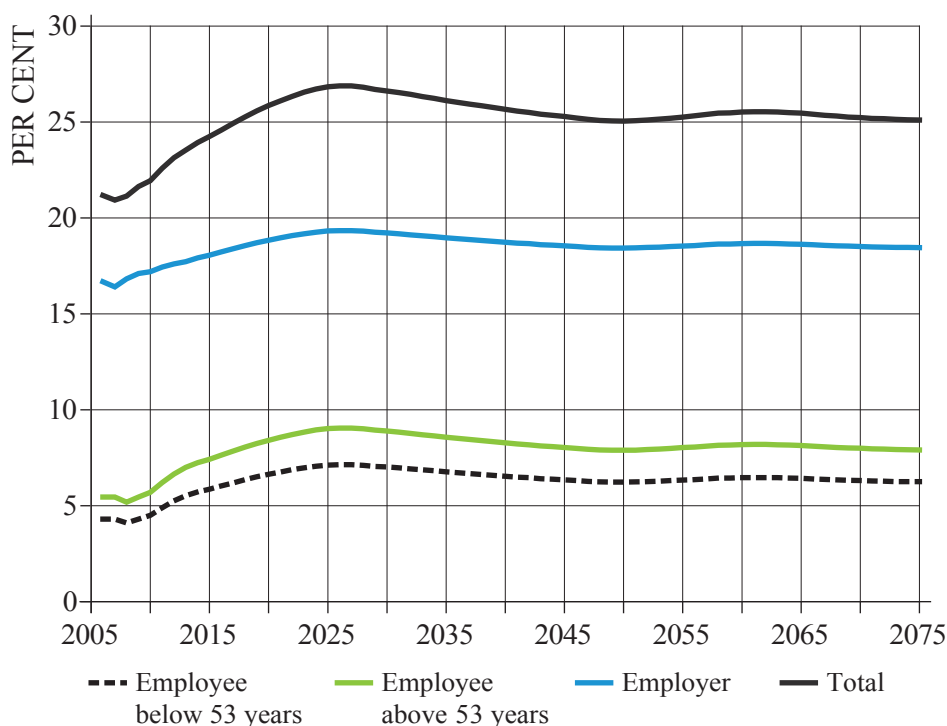

In addition to the division into employee and employer contributions, the contribution development can be reviewed from the point of view of the pooled and the funded component (Figure 5.9). The pooled component is used to finance

the annual pension expenditure, while the funded component is used to cover future old-age and disability pensions. The projected increase in the contribution level is due to the increase in the pooled component; the funded contribution components will stay at 4–5 per cent of the wage sum. The other components of the contribution contain operating expenses and contribution losses, as well as bonuses and temporary contribution cuts.

At the end of 2007, the value of TyEL assets was more than 1.8-fold compared to the wage sum. Due to the financial crisis in 2008, the ratio of assets in relation to the wage sum was reduced by nearly 40 percentage points. In 2009 and 2010, the proportional amount of assets will grow due to the decreasing wage sum and the favourable return on investments during the first half of 2009 (Figure 5.10).

Figure 5.9. *TyEL contribution rate 2006–2075, total contribution as well as pooled and funded components.*
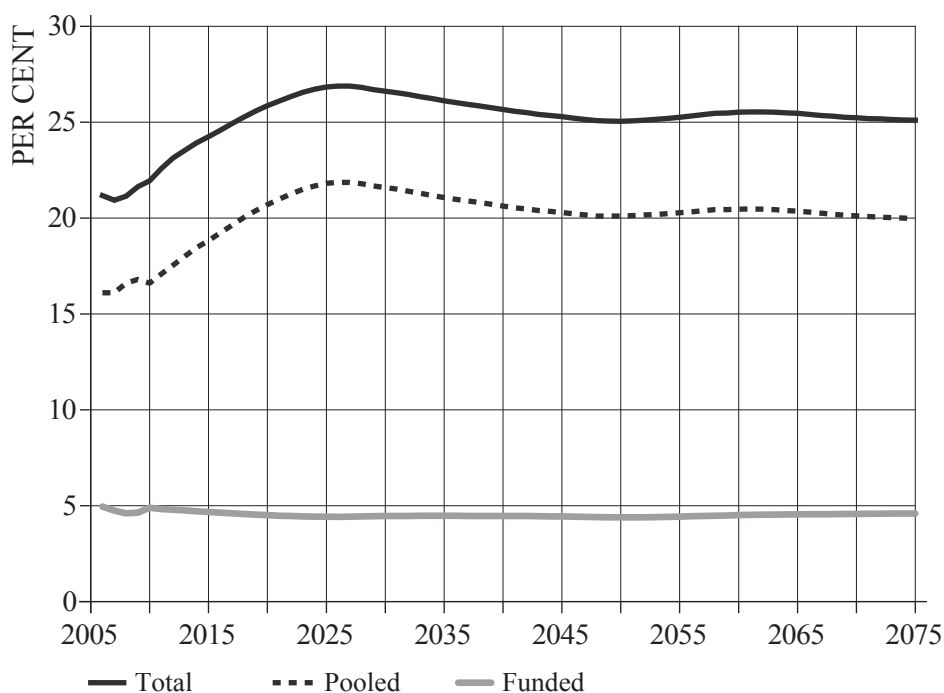
Figure 5.10. *TyEL assets and technical provision (per cent of wage sum) 2006–2075.*
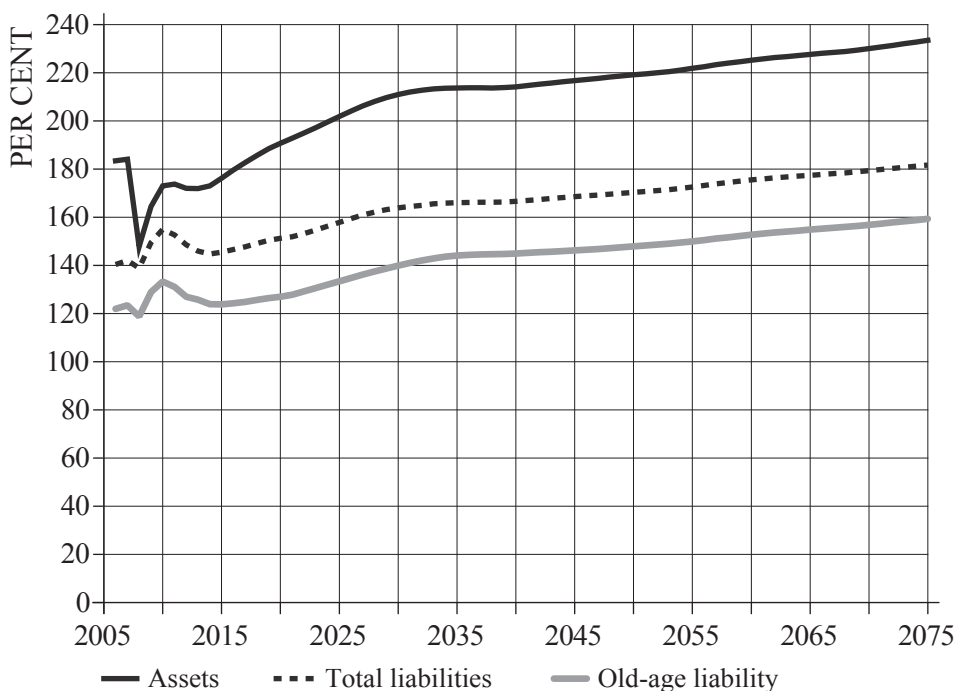
As the wage sum decreases, the old-age pension liability in relation to the wage sum will increase in 2009 and 2010. During the following years, the growth of the old-age pension liability will lag behind the increase in the wage sum because the increases in funded old-age pensions will remain modest as the working capital of pension institutions decreases. Simultaneously, the growth of the wage sum will be exceptionally fast when the recession ends.

Table 5.6 describes the annual accrual of TyEL pensions, the dissolution of accruals and the cumulated value of accruals, as well as TyEL assets and annual cash flows. The projection of pension accruals was explained above (Tables 5.2 and 5.6 contain partly the same information). The value of pensions accrued in 2010 in relation to earnings is higher than in 2009 due to business cycle fluctuations in employment rates.

Table 5.6. *Value of pension accruals, assets and cash flow under TyEL 2009–2025.*

Wage sum and value of pension accruals (EUR billion at current prices)					
	2009	**2010**	**2015**	**2020**	**2025**
Wage sum, EUR billion [a]	46.9	46.4	59.0	70.1	84.0
Accrued pensions 31 Dec. yr-1	263.5	272.6	343.5	424.9	516.7
Pensions paid in year y	-9.9	-10.5	-14.1	-18.6	-23.5
Pensions accrued in year y [b]	8.2	8.2	9.9	11.7	13.8
Interest*	10.8	14.3	19.7	24.3	29.5
Accrued pensions 31 Dec. yr [c]	272.6	284.6	359.1	442.4	536.4
Assets and cash flow (EUR billion at current prices)					
Assets 31 Dec. yr-1	72.4	77.2	98.5	127.3	161.9
Pension contribution	10.1	10.1	14.2	18.0	22.4
TVR contribution**	0.4	0.4	0.4	0.5	0.5
Return on investment	4.8	3.6	5.6	7.3	9.3
TyEL expenditure	9.9	10.5	14.1	18.6	23.5
Other pension expenditure***	0.2	0.2	0.3	0.3	0.3
Administrative expenses	0.3	0.3	0.4	0.5	0.6
Assets 31 Dec. yr [d]	77.2	80.3	103.9	133.6	169.7
Derived quantities					
Pension accrued / wage sum [b/a]	17.5	17.8	16.9	16.7	16.4
Funding ratio [d/c]	28.3	28.2	28.9	30.2	31.6

* The real discount interest is 4.0%; the nominal interest varies according to inflation (see Table 4.6).
** Contribution for pension accrual during periods of unemployment.
*** Expenditure for TEL supplementary pension provision and MEL financed through pooling mechanism.

Table 5.7 describes the annual accrual of YEL pensions, the dissolution of accruals and the cumulated value of accruals, as well as YEL funding. The value of pensions accrued annually under YEL is approximately 20 per cent of the sum of earned income. The difference to TyEL is due to the higher average age of the insured and to the fact that the employee contribution is not deducted from the YEL earnings when the earnings accruing pension are calculated. The value of the accrual in relation to the earned income is age-dependent due to the age-dependent accrual rates, the interest rate, and the accruals for non-working periods and mortality.

If the premium income is insufficient to cover YEL expenditures, the state's share covers the remaining costs. In 2008, the state's share amounted to nearly eight per cent of the pension expenditure. By 2025, it will increase to 25 per cent. The state's

share increases because the YEL contribution follows the TyEL contribution, but future YEL expenditures have not been funded. In the future, the increasing share of TyEL expenditure will be funded by assets released from funds. The corresponding share of YEL pensions will be funded by the state's share.

Table 5.7. *Value of pension accruals and cash flows under YEL 2009–2025.*

Covered income and value of pension accruals (MEUR at current prices)

	2009	2010	2015	2020	2025
Covered income, MEUR [a]	3,513	3,503	4,193	4,985	5,950
Accrued pensions 31 Dec. yr-1	17,781	18,465	23,624	29,641	36,437
Pensions paid in year y	-761	-797	-1,078	-1,431	-1,840
Pensions accrued in year y [b]	717	721	860	1,031	1,210
Interest*	729	967	1,356	1,698	2,084
Accrued pensions 31 Dec. yr	18,465	19,356	24,763	30,940	37,891
Cash flows (MEUR at current prices)					
Pension contribution	715	699	960	1,221	1,512
State's share [c]	102	157	198	316	465
Pension expenditure [d]	761	797	1,078	1,431	1,840
Administrative expenses	56	59	80	106	136
Derived quantities					
Pension accrued / covered income [b/a] %	20.4	20.6	20.5	20.7	20.3
State's share of expenditure [c/d] (%)	13.5	19.7	18.3	22.1	25.3

* The real discount interest is 4.0%; the nominal interest varies according to inflation (see Table 4.6).

The analysis of the value of pension accruals and cash flows under the Farmers' Pensions Act (MYEL) is fully analogous to the analysis performed for YEL. The number of insured persons and pension recipients under MYEL is decreasing and ageing. In table 5.8, the financially unfavourable age structure is evident in the large share of state financing, which currently amounts to 80 per cent of pension expenditure. The low level of the average MYEL contribution, currently 11 per cent of the earned income, also affects the amount of the state's share.

Table 5.8. *Value of pension accruals and cash flows under MYEL 2009–2025.*

Covered income and value of pension accruals (MEUR at current prices)

	2009	2010	2015	2020	2025
Covered income, MEUR [a]	1,401	1,369	1,395	1,578	1,841
Accrued pensions 31 Dec. yr-1	12,120	12,274	13,967	15,741	17,547
Pensions paid in year y	-627	-639	-766	-904	-1,053
Pensions accrued in year y [b]	291	289	318	374	426
Interest*	491	635	793	893	994
Accrued pensions 31 Dec. yr	12,274	12,559	14,312	16,104	17,914
Cash flows (MEUR at current prices)					
Pension contribution	152	148	170	208	253
State's share [c]	495	511	619	724	832
Pension expenditure [d]	627	639	766	904	1,053
Administrative expenses	19	20	24	28	33
Derived quantities					
Pensions accrued / covered income [b/a] %	20.8	21.1	22.8	23.7	23.1
State's share of expenditure [c/d] (%)	79.0	79.9	80.9	80.1	79.0

 * The real discount interest is 4.0%; the nominal interest varies according to inflation (see Table 4.6).

6   Sensitivity analysis

In this chapter, the sensitivity of the results of the baseline projection in relation to assumptions concerning changes in the economic development is analysed. By changing one assumption or a set of assumptions at a time, the effect of this assumption or set of assumptions on the results can be discerned. The sensitivity analysis strives to be clear and understandable, which is why some compromises concerning the realism of the alternatives may have had to be made.

Sensitivity analyses have been made in terms of the following:
- employment,
- disability pension retirement risk,
- old-age pension retirement risk,
- growth in earnings, and
- return on pension assets.

Of the results in each case, the ratio of the average pension to the average earnings, the earnings-related pension expenditure to the covered income, and the TyEL expenditure, contributions and assets to the wage sum are presented.

6.1   Employment

In the baseline projection, according to current economic development assumptions, the employment rate will drop to below 67 per cent and rise to approximately 71 per cent at a later point in time. In alternative projections describing employment, the employment rate will follow the baseline projection until 2010, after which the following will take place:
- In the *low employment rate* projection, the number of employed persons will remain one per cent below the baseline projection per year, until it is five per cent less than in the baseline projection as of 2015.
- In the *high employment rate* projection, the number of employed persons grows by one per cent per year in comparison to the number in the baseline projection, until the number of employed is five per cent more than in the baseline projection as of 2015.

There is no dependency in the projections between employment and income level, i.e. the earnings volume develops in the same proportion with employment. A five-per-cent change in the number of employed affects the employment rate by approximately 3.5 percentage points. The employment rate is reflected partly in the unemployment rate and partly in the work force volume (Table 6.1). The retirement risks are the same in all employment alternatives.

In the low employment alternative, the employment rates remain nearly on the same level as in the early 2000s, regardless of the fact that the effective retirement age will increase by more than two years. In the high employment rate alternative, the employment rates increase close to the levels of Sweden and Norway in the late 21st century. In the balance projections of the EU Commission for Finland's public economy, the employment rate is expected to increase to approximately 74 per cent (EC, DG ECFIN & AWG 2009).

Table 6.1. *Employment and unemployment rates under different employment rate assumptions.*

	Employment rate			Unemployment rate		
	Low	Baseline	High	Low	Baseline	High
2008	70.6	70.6	70.6	6.4	6.4	6.4
2010	66.6	66.6	66.6	10.2	10.2	10.2
2015	66.4	69.8	73.1	9.0	6.9	5.4
2020	66.9	70.4	73.7	7.9	5.9	4.5
2025	67.3	70.8	74.2	7.4	5.3	3.9
2030	67.3	70.8	74.2	7.4	5.2	3.9
2050	67.4	70.9	74.3	7.4	5.2	3.8
2075	67.5	71.0	74.4	7.4	5.2	3.8

As employment increases, pension expenditure will remain unchanged at first, which means that the relative size of pension expenditure decreases. In the long term, increasing earnings also means increasing pension expenditure. This will be evident in the size of the average pension and, simultaneously, the impact of employment on the expenditure rate will be reduced (Figure 6.1).

Figure 6.1. *Average pension in relation to average wage (green), earnings-related pension expenditure in relation to earnings (blue), and TyEL contribution rate (black) under different employment rate assumptions.*
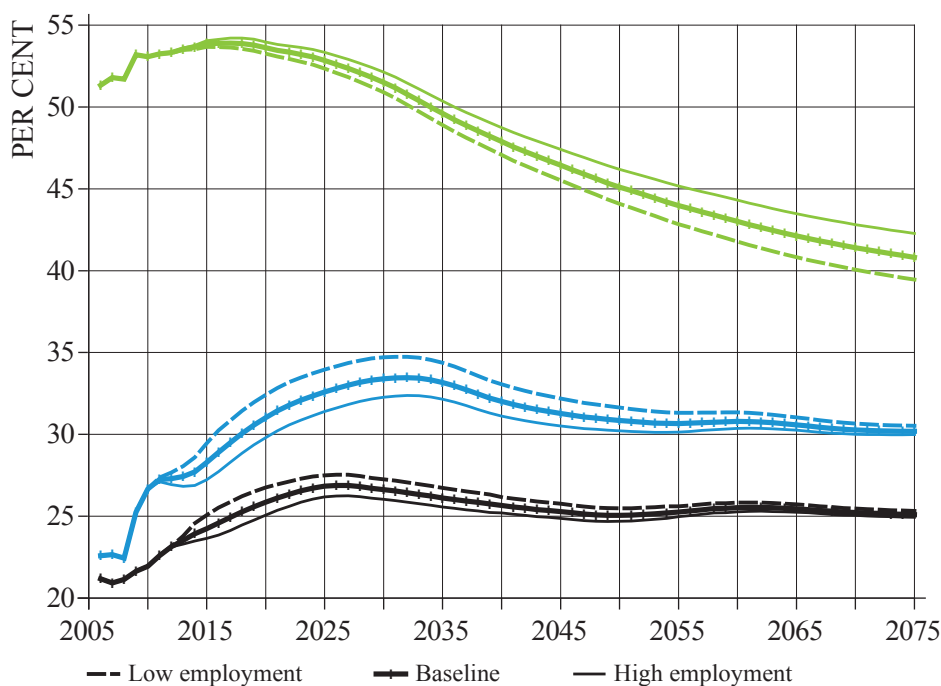
The effect of employment and unemployment on the TyEL contribution rate is lesser than on the expenditure rate because of the partial pre-funding and the contribution from the unemployment insurance fund (TVR). In a pure go-as-you-pay scheme, the effect of employment on the contribution rate would be as high as on the expenditure rate, while the employment rate would not have any impact on the contribution level of the funded pension scheme. For pension accrual during periods of unemployment, the pension contribution is paid as part of the unemployment insurance contribution. The high unemployment rate in the low employment projection means an increase in the TVR premium income for the funding of TyEL expenditure.

Table 6.2. TyEL expenditure, contribution and assets (per cent of wage sum) under different employment rate assumptions.

	Expenditure			Contribution			Assets		
	Low	Baseline	High	Low	Baseline	High	Low	Baseline	High
2008*	18.1	18.1	18.1	21.1	21.1	21.1	148	148	148
2010	22.6	22.6	22.6	21.9	21.9	21.9	173	173	173
2015	25.0	24.0	23.1	25.1	24.2	23.7	183	176	171
2020	27.7	26.5	25.5	26.8	25.9	25.1	199	191	184
2025	29.2	28.0	27.0	27.5	26.8	26.2	210	202	196
2030	30.3	29.1	28.2	27.3	26.6	26.0	218	211	206
2050	29.5	28.7	28.0	25.5	25.1	24.7	222	219	217
2075	29.2	28.7	28.4	25.3	25.1	24.9	235	234	232

* Realised value.

6.2   Disability pension retirement risk

In the baseline projection, the disability pension retirement risk will decrease by 2025 by 14 percent from its current level and by 2050 by 25 per cent. After 2050, the disability pension retirement risk will no longer change. The reduction of the disability pension retirement risk reflects the improved health of the population.

In alternative projections of the disability pension retirement risk, the risk follows the baseline projection until 2010, after which the following will take place by 2020:

- In the projection with a *low disability pension retirement risk*, the risk will be halved in comparison with the baseline projection.
- In the projection with a *high disability retirement risk*, the risk will increase by 50 per cent in comparison with the baseline projection.

From 2020 onward, the disability pension retirement risk will be either 50 per cent higher or 50 per cent lower than the risk in the baseline projection. Since the disability pension retirement risk will be reduced in the baseline projection, as well, the rate will be notably low in the projection with low disability pension retirement risk. In 2025, the retirement risk will be 43 per cent of the currently observed retirement risk, and 37 per cent in 2050. Compared to the present risk, the disability pension retirement risk in the projection with a high disability retirement risk will be 28 per cent higher in 2025 and 12.5 per cent higher in 2050.

The changes in the disability pension retirement risk affect employment in full. In other words, compared to the baseline projection, the increase in the number of disabled persons will be evident in a corresponding decrease of the number of employed persons in the projection with a high disability pension retirement risk. The effect is the opposite in the projection with a low disability pension retirement risk. The employment rates in Table 6.3 depict the dependency between the disability pension retirement risk and the employment rate in the projections. A halving of the disability pension retirement risk in relation to the baseline projection would increase the expected effective retirement age by 1.5 years, while an increasing of the retirement risk by 1.5 times would reduce the expected effective retirement age by 1.3 years (Table 6.3).

Table 6.3. *Expected effective retirement age and employment rate under different projections of the disability pension retirement risk.*

	Expected effective retirement age			Employment rate		
	Low	Baseline	High	Low	Baseline	High
2008*	59.4	59.4	59.4	70.6	70.6	70.6
2010	59.5	59.5	59.5	66.6	66.6	66.6
2015	60.9	60.2	59.6	70.1	69.8	69.4
2020	62.1	60.6	59.3	71.4	70.4	69.4
2025	62.6	61.0	59.7	72.3	70.8	69.3
2030	62.9	61.4	60.1	72.5	70.8	69.2
2050	63.3	61.9	60.6	73.2	70.9	68.8
2075	63.3	61.9	60.7	74.0	71.0	68.5

* Realised value.

The disability pension retirement risk has only a minor effect on the pension level. The majority of the left-out pension accrual due to disability is compensated with the accrual rate for projected pensionable service of earnings-related pensions. Furthermore, the lost pension accrual is also compensated, in part, by the national pension. The effect of the disability pension retirement risk on the expenditure rate does not diminish even in the long run (contrary to the effect of the employment rate). A 50 per cent increase in the disability pension retirement risk would raise the TyEL contribution level by slightly more than one percentage point, while the reducing by half of the retirement risk would reduce the TyEL contribution by slightly more than one percentage point (Table 6.4).

Figure 6.2. *Average pension in relation to average wage (green), earnings-related pension expenditure in relation to earnings (blue), and TyEL contribution rate (black) under different disability pension retirement risk assumptions.*

-- - Low disability retirement risk   —+— Baseline   —— High disability retirement risk
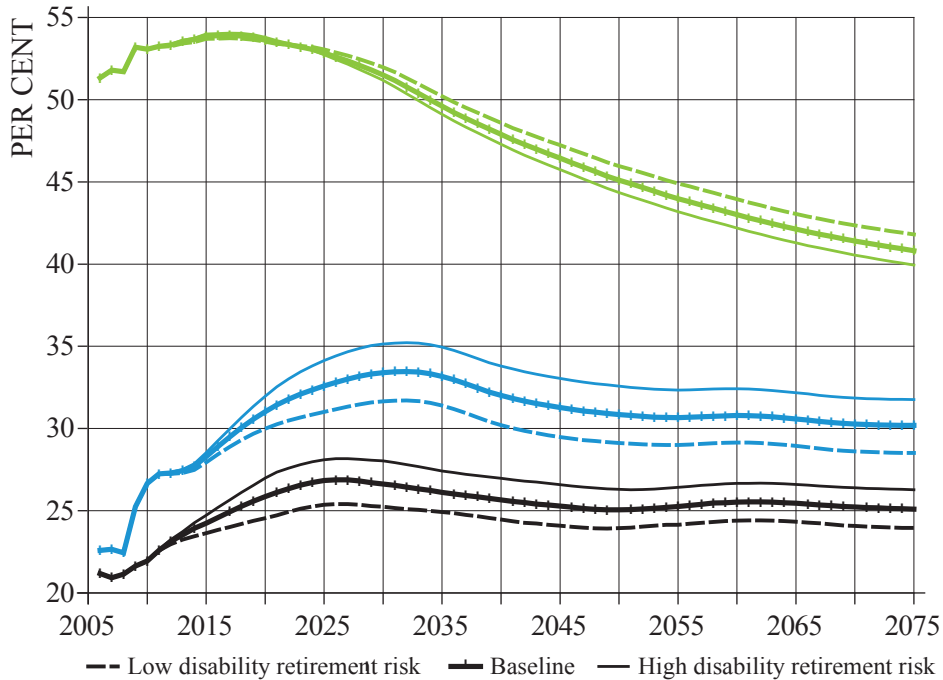
Table 6.4. *TyEL expenditure, contribution and assets (per cent of wage sum) under different disability pension retirement risk assumptions.*

	Expenditure			Contribution			Assets		
	Low	Baseline	High	Low	Baseline	High	Low	Baseline	High
2008*	18.1	18.1	18.1	21.1	21.1	21.1	148	148	148
2010	22.6	22.6	22.6	21.9	21.9	21.9	173	173	173
2015	23.7	24.0	24.2	23.6	24.2	24.7	174	176	178
2020	25.6	26.5	27.3	24.6	25.9	27.0	184	191	196
2025	26.6	28.0	29.3	25.4	26.8	28.1	192	202	210
2030	27.6	29.1	30.7	25.2	26.6	28.0	199	211	221
2050	27.2	28.7	30.2	23.9	25.1	26.3	208	219	230
2075	27.2	28.7	30.2	24.0	25.1	26.3	223	234	244

* Realised value.

6.3 Old-age pension retirement risk

In the baseline projection, the old-age pension retirement risk will decrease by 35 percent from its current level by 2025 and by 50 per cent by 2050. After 2050, the old-age pension retirement risk will no longer change. The descending old-age pension retirement risk is linked to the growth in life expectancy. On the one hand, the increase in life expectancy is a sign of the improved health of the elderly; on the other hand, the increase in life expectancy reduces the attractiveness of early retirement due to the life expectancy coefficient.

In alternative projections of the old-age retirement risk, the rate follows the baseline projection until 2010. After this, the projections are as follows:

- In the projection where the *old-age retirement age is 63 years*, the old-age pension retirement risk increases so that, as of 2016, all insured will retire no later than at the age of 63.
- In the projection where the *old-age retirement age is 68 years*, the old-age pension retirement risk is reduced so that, as of 2016, all those in employment at age 63 will continue working until the age of 68.

The old-age pension retirement risk affects employment and the wage sum in full. The work input of those under the age of 63 is the same in all three projections. In table 6.5, the effect of the old-age pension retirement risk on the expected retirement age and employment is depicted. By 2025, in the old-age-pension-at-age-68 alternative, the expected retirement age will exceed the age presented in the baseline projection by 1.7 years, and in the old-age-pension-at-age-63 alternative, it will remain at 1.2 years below the age presented in the baseline projection. In the long run, in projections describing the impact of the old-age pension and disability pension retirement risk, the impacts on employment and retirement age are close to each other (Tables 6.3 and 6.5).

Table 6.5. *Expected retirement age and employment rate under different old-age pension retirement risks.*

	Expected effective retirement age			Employment rate		
	Old-age pension 68	Baseline	Old-age pension 63	Old-age pension 68	Baseline	Old-age pension 63
2008*	59.4	59.4	59.4	70.6	70.6	70.6
2010	59.5	59.5	59.5	66.6	66.6	66.6
2015	61.2	60.2	59.7	71.2	69.8	68.8
2020	62.3	60.6	59.6	73.8	70.4	68.2
2025	62.7	61.0	59.8	73.9	70.8	68.4
2030	63.0	61.4	59.9	73.7	70.8	68.2
2050	63.4	61.9	60.2	73.5	70.9	68.0
2075	63.5	61.9	60.2	73.7	71.0	68.0

* Realised value.

Figure 6.3. *Average pension in relation to average wage (green), earnings-related pension expenditure in relation to earnings (blue), and TyEL contribution rate (black) under different old-age pension retirement risks.*
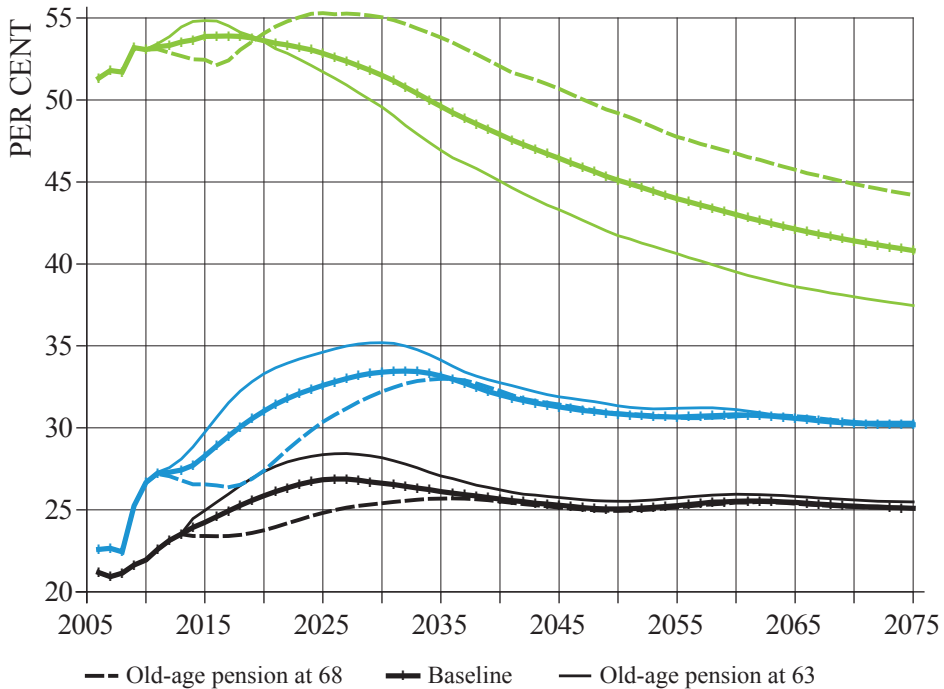
Table 6.6. *TyEL expenditure, contribution and assets (per cent of wage sum) under different old-age pension retirement risks.*

	Expenditure			Contribution			Assets		
	Old-age pension 68	Base-line	Old-age pension 63	Old-age pension 68	Base-line	Old-age pension 63	Old-age pension 68	Base-line	Old-age pension 63
2008*	18.1	18.1	18.1	21.1	21.1	21.1	148	148	148
2010	22.6	22.6	22.6	21.9	21.9	21.9	173	173	173
2015	22.6	24.0	25.1	23.4	24.2	25.0	176	176	176
2020	23.4	26.5	28.3	23.8	25.9	27.3	190	191	191
2025	26.0	28.0	29.7	24.8	26.8	28.4	204	202	202
2030	28.0	29.1	30.8	25.4	26.6	28.2	213	211	211
2050	28.6	28.7	29.3	24.9	25.1	25.5	219	219	218
2075	28.6	28.7	29.0	25.1	25.1	25.5	233	234	234

* Realised value.

In the near decades, the old-age pension retirement risk will have a strong impact on the pension expenditure rate and the TyEL contribution. When the old-age retirement age shifts closer to 68, the pension payment is delayed and the covered income increases. These two factors will decrease the pension expenditure rate. When the old-age retirement age approaches 63 years, the corresponding factors will increase pension expenditure and contribution rate.

Initially, a reduction in the old-age pension retirement risk will reduce the average pension since the flow of commencing, higher-than-average pensions among pensions in payment will slow down. In the long term, the higher accruals will be paid out, leading to a rise of the average pension level.

6.4   Growth in earnings level

In the baseline projection, the growth in earnings level follows the current economic predictions until 2011, after which the real growth in earnings level is 1.75 per cent per year.

In the sensitivity analysis of earnings, the expected growth presented in the baseline projection is adhered to until the end of 2011. After this, the projections are as follows:

- In the *rapid growth* projection, the growth rate of the earnings level is 2.25 per cent per year.
- In the *slow growth* projection, the growth rate of the earnings level is 1.25 per cent per year.

In comparison with the starting level, the average income will slightly more than double during the projection period in the slow growth projection, while it will more than triple in the baseline and more than quadruple in the rapid growth projection (Table 6.7).

Table 6.7. Covered income and average pension under different growth rate assumptions (at 2008 prices).

	Covered income, EUR billion			Average earnings EUR/month		
	Slow growth (1.25)	Baseline (1.75)	Rapid growth (2.25)	Slow growth (1.25)	Baseline (1.75)	Rapid growth (2.25)
2008*	75	75	75	2,410	2,410	2,410
2010	72	72	72	2,540	2,540	2,540
2015	81	83	85	2,690	2,750	2,800
2020	86	90	94	2,870	3,000	3,140
2025	92	98	105	3,060	3,280	3,520
2030	98	107	118	3,270	3,590	3,940
2050	128	156	188	4,190	5,070	6,140
2075	180	247	338	5,720	7,840	10,730

* Realised value.

Table 6.8. TyEL expenditure, contribution and assets (per cent of wage sum) under different growth rate assumptions.

	Expenditure			Contribution			Assets		
	Slow growth (1.25)	Baseline (1.75)	Rapid growth (2.25)	Slow growth (1.25)	Baseline (1.75)	Rapid growth (2.25)	Slow growth (1.25)	Baseline (1.75)	Rapid growth (2.25)
2008*	18.1	18.1	18.1	21.1	21.1	21.1	148	148	148
2010	22.6	22.6	22.6	21.9	21.9	21.9	173	173	173
2015	24.3	24.0	23.6	24.4	24.2	24.1	179	176	174
2020	27.3	26.5	25.7	26.5	25.9	25.3	198	191	184
2025	29.2	28.0	26.9	27.5	26.8	26.2	213	202	192
2030	30.7	29.1	27.7	27.5	26.6	25.8	226	211	197
2050	30.6	28.7	26.9	25.6	25.1	24.5	243	219	199
2075	30.8	28.7	26.8	25.5	25.1	24.7	262	234	210

* Realised value.

The rapid growth of earnings will reduce the level of pensions in relation to the level of wages since the earnings-related pension index and the wage coefficient partly follow earnings and partly prices. In the projection, national pensions have

been linked in full to earnings. Therefore, the earnings-related expenditure rate in Figure 6.4 reacts slightly differently to the growth rate in earnings than the average pension in relation to the average wage.

Figure 6.4. Average pension in relation to average wage (green), earnings-related pension expenditure in relation to earnings (blue), and TyEL contribution rate (black) under different earnings growth rate assumptions.
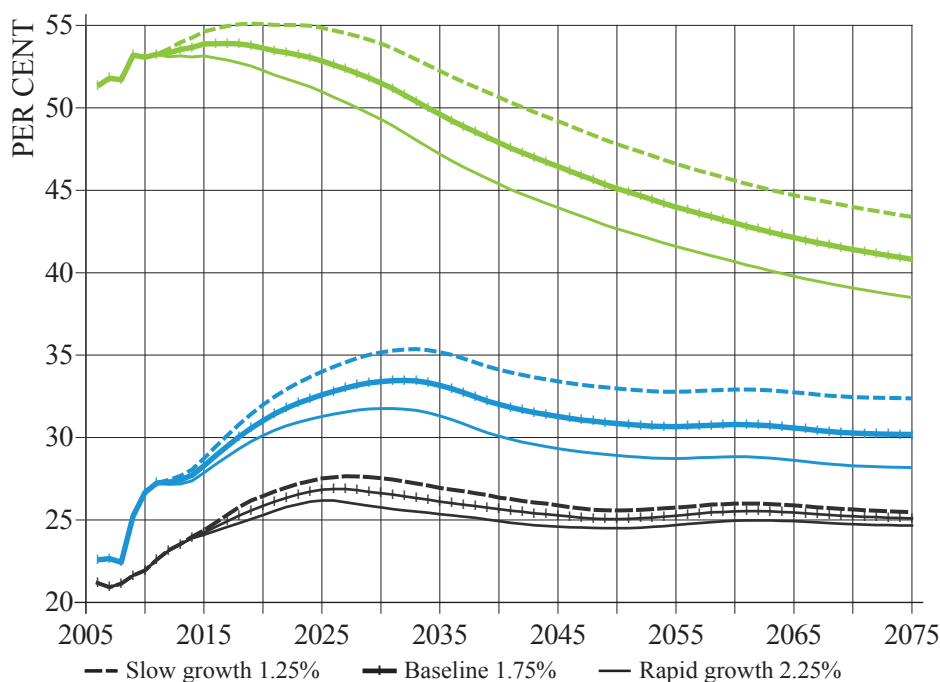
In the rapid growth projection, the TyEL expenditure rate is approximately two percentage points lower than in the baseline projection. The effect on the contribution rate is approximately half a percentage point. The exiguous dependency of the contribution level on the earnings growth rate is connected to the amount of pension assets and their return. The part of the return of the pension assets that exceeds the growth of the wage sum can be used to fund pensions without the ratio of assets in relation to the wage sum decreasing. As the earnings growth rate increases, a decreasing amount of investment assets are left to be used for the reduction of contributions. Therefore, in a fully funded scheme, a more rapid growth of the earnings level would increase the required contribution level. In a pure pay-

as-you-go scheme, the accelerating growth in earnings will reduce the contribution and expenditure rates equally much. In a partly funded scheme, the accelerating growth in earnings may increase or reduce the required contribution level.

6.5   Return on pension assets

In the baseline projection, the expected real return on investments for 2010 is 3.4 per cent. By 2016, it will rise to 4.0 per cent, after which it will remain constant. In the alternative projections, the assumptions are as follows:
  • In the *low return* alternative, the expected return as of the beginning of 2010 is one percentage point lower than that in the baseline projection.
  • In the *high return* alternative, the expected return as of the beginning of 2010 is one percentage point higher than that in the baseline projection.

The return on pension assets has a key role in the long-term development of the TyEL premium. A one percentage point additional return offers the possibility to reduce the TyEL contribution permanently by approximately two percentage points, while a one percentage point reduction in the return compared to the baseline projection would increase the pressure to raise the contribution level by two percentage points. A one percentage point change in the return affects the contribution level by two percentage points since the amount of pension assets is double compared to the wage sum (Table 6.9 and Figure 6.5).

Table 6.9. *TyEL expenditure, contribution and assets (per cent of wage sum) under different return assumptions.*

	Expenditure			Contribution			Assets		
	Low return (3%)	Baseline (4%)	High return (5%)	Low return (3%)	Baseline (4%)	High return (5%)	Low return (3%)	Baseline (4%)	High return (5%)
2008*	18.1	18.1	18.1	21.1	21.1	21.1	148	148	148
2010	22.6	22.6	22.6	21.9	21.9	21.9	171	173	175
2015	23.9	24.0	24.0	24.6	24.2	23.9	167	176	186
2020	26.5	26.5	26.6	26.5	25.9	24.9	175	191	208
2025	27.9	28.0	28.1	27.9	26.8	25.4	180	202	225
2030	29.0	29.1	29.3	28.3	26.6	24.6	186	211	238
2050	28.4	28.7	29.0	27.1	25.1	22.7	189	219	249
2075	28.4	28.7	29.1	27.2	25.1	22.6	199	234	270

* Realised value.

Figure 6.5. *Average pension in relation to average wage (green), earnings-related pension expenditure in relation to earnings (blue), and TyEL contribution rate (black) under different return assumptions.*
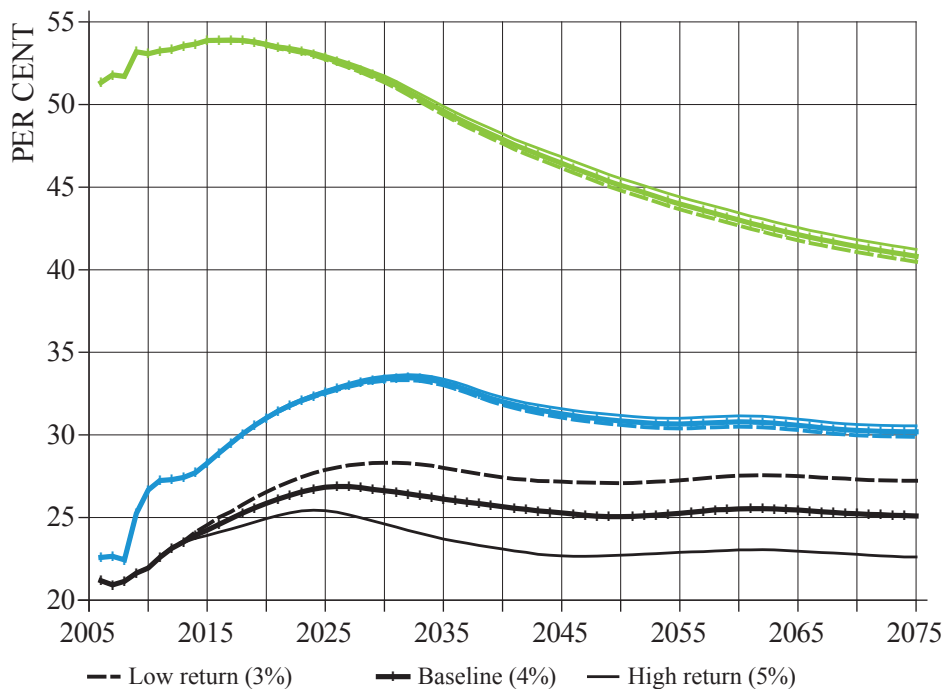
The old-age pension liability supplements through investment returns are allocated in the baseline and in the low return projection to persons older than 55 up to 2014, and as of 2015, to persons who have turned 65. In the high return projection, the increases in the funded components will be allocated as in the baseline projection until 2019. As of 2020, they will be allocated to persons who have turned 75.

By an appropriate allocation of the liability supplements, the projected development of the TyEL contribution can be evened out. However, the current situation, arisen as a result of the 2008 financial crisis, reveals the limitation of the liability supplements in the management of the contribution level. Liability supplements are performed on the basis of pension institutions' average solvency an equity-linked buffer fund. When poor returns are realised, the sources of these supplements may dry up, leaving only a small amount of money available for

liability supplements. If the amount of money available for supplements is small, its allocation cannot be used to influence the contribution level to a great extent.

Via the wage earner's pension contribution, the return on investments affects the pension expenditure and benefit level. High investment returns result in low employee pension contributions; thus, they increase pension expenditure. However, the indirect impact of investment returns on expenditure and benefits is small. In the high return alternative, the TyEL expenditure rate in 2025 is 0.1 percentage points higher than in the baseline projection. By the end of the projection period, the difference is 0.4 percentage points (Table 6.9).

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Appendices

Appendix 1: Projection model

The results of the report have been calculated using the long-term projection model of the Finnish Centre for Pensions. The model simulates the operation of the pension scheme and makes it possible to issue projections to meet the forecasting and planning needs of the pension scheme. Unless otherwise stated, acts and other regulations governing the schemes will stay unchanged until the end of the projection period.

The model consists of several interconnected modules (Figure A1.1).

Figure A1.1. Modules of the projection model.
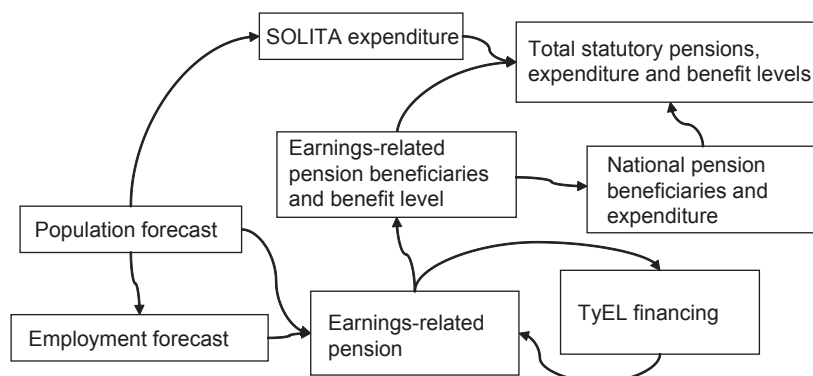
In the *earnings-related pension expenditure module*, the earnings-related pension expenditure is calculated separately for each earnings-related pension act. Pensions are paid out to pensioners annually, insured employees accrue future pensions, and persons move between different states (employed, unemployed, pensioner, etc.) according to given probabilities. The model's states and transitions between these states are presented in figure A1.2. Unemployment pensions will be eliminated by the beginning of the 2010s. In the future, persons will transfer directly from unemployment to old-age pension.

Those active in the model are in gainful employment, their earnings accrue a pension, and their contribution is levied on the basis of the earnings. The unemployed are divided into three different states in the model. Those receiving

an earnings-related unemployment allowance for 500 days are placed in the state of the unemployed. Those entitled to additional days of unemployment allowance are in their own state, and the other unemployed persons (on labour market support, basic unemployment allowance) are categorised as inactive. Persons transferred to the category of inactive also include those who transfer from work covered by the act under observation to work covered by some other act, as well as those who exit the labour force. Thus, the inactive are those who have accrued a pension under the observed act, but who no longer work in a job covered by this act, and who are not drawing a pension. Pensions accrued under other social benefit periods than unemployment are ascribed in the model to active persons.

In addition to the transitions presented in figure A1.2, new employees are added to the active category annually, based on population and employment forecasts. In each state, persons also die over the course of a year, and some of these deaths result in the granting of a survivors' pension to family members.

Figure A1.2. *States in the projection model.*

UE = unemployment pension	PD = partial disability pension
EO = early old-age pensin	DI = disability pension
OA = old-age pension	PT = part-time pension
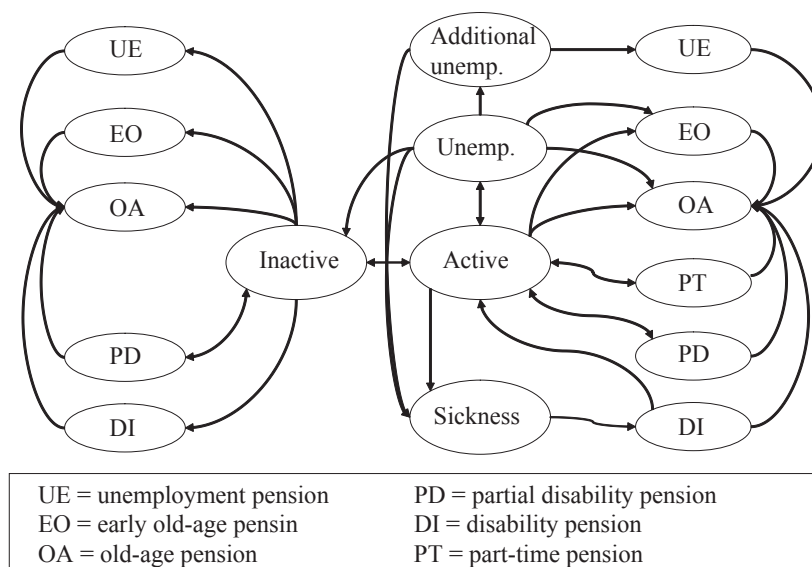
Within the model's states, people are categorised into different classes according to age and gender. An average technique is applied in these classes, e.g., all 50-year-old men insured under TyEL are identical to each other. It is easier to apply an average

modelling technique, as opposed to an individual-level projection, although it produces less information. For example, the projection does not provide information on the distribution of pensions by size.

The following phenomena, associated with selectiveness, have been included in the model:

1) Accrued pension and salary for projected pensionable service for those transferring to disability pension are typically lower than for those continuing in gainful employment.

2) The mortality rate for persons drawing a disability pension is higher than the average for the population in general, while the mortality rate for non-disabled persons is correspondingly lower.

3) Among old-age pensioners, when age and gender are given, a high pension is associated with a low mortality risk.

4) Pension accruals for those dying while still within the active age range are lower than for the insured on average.

The *TyEL financing model* is used to calculate the development of the TyEL contribution rate, technical provisions and assets. It contains a detailed description of the legislation and the bases of calculation pertaining to TyEL financing. The financing module is joined to the TyEL expenditure module via a two-way connection: TyEL expenditure and wage sums affect the contribution rate, and also affect the formation and dissolution of technical provisions. Conversely, the size of the employee's pension contribution affects the size of pension accruals and index adjustments.

Premium income is composed of a pooled, a funded and a remaining component, which includes, among other things, operating expenses. The pooled component is used to finance pay-as-you-go pensions, and the funded premium income is accumulated into technical provisions for the pension providers. Technical provisions are also dissolved to finance annually paid pensions.

The number of earnings-related pension recipients and the average earnings-related pension are calculated once the pension expenditure of all earnings-related pension acts is known. The number of earnings-related pension recipients is calculated using the population and employment forecasts, and also using the transition probabilities from the pension expenditure module.

In the national pension module, the number and size of national pensions is calculated. The earnings-related pension projection and the population forecast serve as the bases for determining national pensions. From the earnings-related pension calculation, the average size per age and gender can be established, but the model does not provide information on the size distribution of earnings-related pensions. For the projection of national pensions, it is assumed that the size distribution will remain in its current form.

The SOLITA module is a simple description of the development of SOLITA expenditure based on the population forecast. The starting point for the projection is the current SOLITA expenditure, divided by age and gender. For those of active age (18–62-year-olds), SOLITA pensions will grow at the same rate as the general wage level, while the pensions are tied to the earnings-related pension index for those who are 63 or older.

The total statutory pension expenditure and the average total pension are calculated as the joint result of different modules. The population, for whom the average pension is projected, can be selected within certain limits. In this report, those under review are persons residing in Finland who receive a pension in their own right, excluding part-time pension recipients. The average pension is calculated for everyone included in the aforementioned group, as well as for 68-year-olds. The pension level of 68-year-olds depicts the size of commencing old-age pension, based on classification by birth year.

The projection model requires the following data to describe the initial situation, specified by pension act as well as by the age and gender of the insured:
- population distribution over different acts and different states under the acts
- salaries of the insured
- amounts of pensions accrued
- technical provisions and the amount of pension assets
- the amounts of payable pensions
- transition probabilities between the different states, particularly the pension retirement risks.

Figures describing the initial values for the projection come from the Finnish Centre for Pensions' employment and pension registers, the joint statistics of the Social Insurance Institution and the Finnish Centre for Pensions, the Local Government Pensions Institution and the State Treasury.

Appendix 2: Impact assessment of the 2010–2011 amendments to pension and unemployment benefit legislation

Table A2.1 contains an assessment of the impact of the 2009 amendments to pension and unemployment benefit legislation on the development of earnings-related pension expenditure and income. The impact assessments were carried out in the spring of 2009.

The legislative amendments under review are the following:

- Amendment to criteria of determining of disability and survivors' pension.
- Amendments to part-time pension (raising the retirement age from 58 to 60 years and abolishing the accrual from the decrease in income).
- Raising the age limit of the right to unemployment allowance for additional days from 59 to 60 years. As a result, the lower age limit entitling to the so-called unemployment route is raised from 57 to 58 years.
- Limiting the pension accrual rate during job alternation leave to 55 per cent of the earnings that form the basis of the benefit. Currently, the accrual rate has been limited to 75 per cent.

Table A2.1. *Impact assessment of the 2010–2011 amendments to pension and unemployment benefit legislation.*

Pension expenditure and income without legislative amendments	2015	2020	2025	2055
Pension expenditure (MEUR, 2008 prices)	23,069	27,589	31,732	50,003
Wage sum (MEUR, 2008 prices)	82,751	88,782	95,805	160,213
Pension expenditure percentages	27.9%	31.1%	33.1%	31.2%
Impact of legislative amendment on income and pension expenditure	**2015**	**2020**	**2025**	**2055**
Impact on earnings-related pension expenditure (MEUR, 2008 prices)	**-44**	**-15**	**36**	**316**
Disability and survivors' pension	20	62	119	437
Part-time pension	-65	-78	-93	-201
Age limit of unemployment route (57 → 58 yrs)	1	3	13	98
Accrual rate during job alternation leave (0.75 → 0.55)	-0.5	-1.6	-3.2	-18
Impact on wage sum (MEUR, 2008 prices)	**203**	**337**	**361**	**612**
Part-time pension	120	121	131	216
Age limit of unemployment route (57 → 58 yrs)	83	216	230	396
Impact on pension expenditure percentages	**-0.12**	**-0.13**	**-0.09**	**0.08**

The changes to the legislation are described in more detail in Chapter 3. As a result of the increases in the lower age limits of the right to unemployment allowance for additional days and of part-time pension, the employment rate of the elderly will rise. As of 2020, the impact of these amendments will be an increase of approximately 0.4 per cent of the wage sum.

Persons on additional days of unemployment allowance or on part-time pension are not included as pensioners in the assessment of the expected effective retirement age. Hence, the legislative amendments have little or no impact on the expected effective retirement age.

Appendix 3: Constant TyEL contribution as of 2010

The baseline projection illustrates the future development of the TyEL contribution according to current legislation. An alternative way to assess the need to raise the TyEL contribution rate is to find a constant level for the contribution, which would enable the financing of TyEL expenditure from 2010 until the end of the projection period. In addition, there must be enough assets at the end of the projection period to make it possible to maintain the same contribution level even after that, assuming that the pension expenditure in relation to the wage sum remains on the same level as in the concluding year of the projection period, and that the growth of the wage sum will follow the growth of the income level in the future. The return assumption of the pension assets is according to the baseline projection.

According to these end conditions, an adequate TyEL contribution level as of 2010 would be 25.4 per cent. Table A3.1 includes pension assets and cash flows according to the projection for a few selected years during the projection period, and Figure A3.1 illustrates the development of pension expenditure, contributions and assets during the projection period.

Table A3.1. *TyEL funding with a constant contribution.*

Assets and cash flow (EUR billion at 2008 prices)				
	2010	**2025**	**2050**	**2075**
Wage sum	45.8	64.2	102.3	163.1
Assets 31 Dec. yr-1	77.1	131.8	207.3	327.1
Pension expenditure	10.3	18.0	29.3	46.8
Operating expenditure	0.4	0.5	0.8	1.3
Premium income	11.6	16.3	25.9	41.4
Return on investment	2.6	5.2	8.2	13.0
Assets 31 Dec. yr	80.7	134.9	211.3	333.3
Per cent of wage sum				
Pension expenditure	22.6	28.0	28.7	28.7
Premium income	25.4	25.4	25.4	25.4
Assets 31 Dec. yr	176	210	207	204

According to the long-term projections in 2007, the adequate contribution level as of 2008 was 24.3 per cent. The increase in contribution level is due to the poor return on investments in 2008 and the less favourable than predicted economic development

and investment returns during the beginning of 2010. In addition, the passing of time itself increases the contribution level. The later the contribution rate is raised, the less time for assets to accumulate for future expenditure. On the other hand, the size of the working age population is larger in the new population projection than in the previous one. This has a reducing effect on the contribution level.

Figure A3.1. *TyEL expenditure, contribution and assets (per cent of wage sum) 2010–2075, constant contribution.*
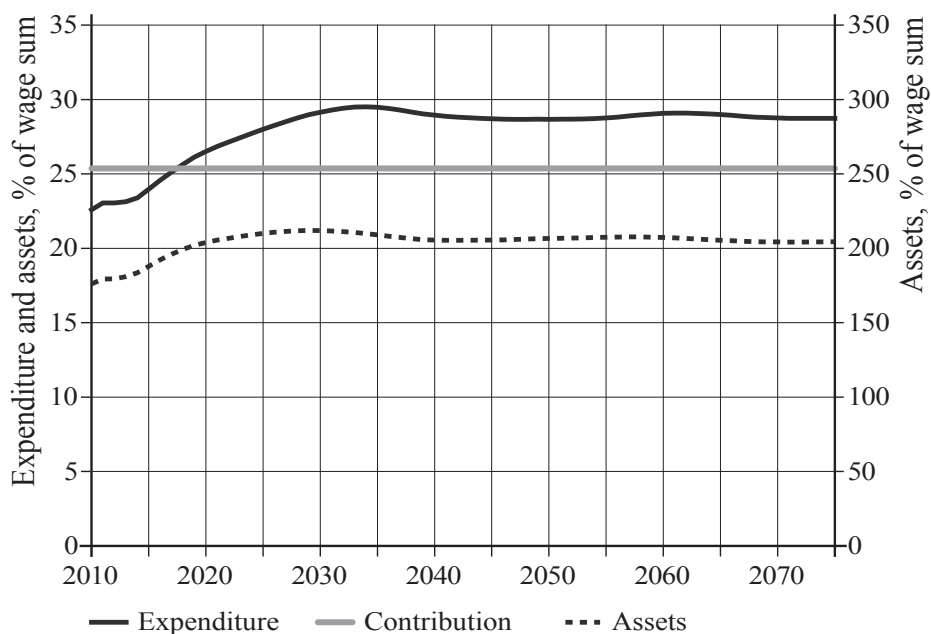
Appendix 4: The life expectancy coefficient and compensating work

A life expectancy coefficient was confirmed for the first time for the year 2009. Its value is 1, and it is applied to those born in 1947. The life expectancy coefficient is determined so that the capital value of the converted pension is the same when calculated on the basis of the mortality statistics of Statistics Finland, which are available for the last respective five years, as when calculating the capital value of the unconverted pension in 2009 on the basis of the mortality statistics for the time period 2003–2007 (Employees Pensions Act, Section 83). The coefficient is cohort-specific and confirmed for the year when the cohort in question turns 62. The cohort born in 1948 is the first one to be affected by the life expectancy coefficient. A mitigated life expectancy coefficient is applied to disability pensions (see Chapter 3).

Table A4.1 presents the calculation of life expectancy coefficient values based on the population forecast. In addition, the table presents the required additional time of working after reaching the age of 63 for each cohort in order to compensate for the impact of the life expectancy coefficient on the pension. In the projection, the pension accumulation is assumed to be either 50 or 60 per cent of the wage prior to retirement, from which no pension contribution has been deducted. The real growth of the earnings is 1.75 per cent, and the pension accrual rate is 4.5 per cent per year of the wages from which the employee's pension contribution has been deducted.

According to the population forecast, people are expected to live increasingly longer, which means that the younger cohort's life expectancy coefficient is always smaller than that of the older age group. Hence, the time of work required to compensate for the coefficient is longer for the younger employees. If the accrued pension is 50 per cent of the wages, the cohorts born prior to 1960 would have to prolong their careers with less than one year, while those born in the 1980s would have to work for over 2 years longer. On the other hand, the last column of the table shows that the extended life expectancy as of 2010 is more than twice the required compensating working time for a 50 per cent accrual. The size of the pension accrual also affects the required compensating working time: the more pension that has accrued in relation to the wages, the longer the required additional working period is to compensate for the life expectancy coefficient.

Table A4.1. *The life expectancy coefficient and compensating work.*

| Date of birth | Year in which turns 63 | Life expectancy of a 63-year-old | Life expectancy coefficient | Employee's contribution, %* | Compensating work after turning 63 | | Change in life expectancy of a 63-year-old after 2010 |
					Pension 50% of wages	Pension 60% of wages	
1947	2010	21.4	1.000	6	0 mth	0 mth	0 mth
1948	2011	21.6	0.992	6	1 mth	1 mth	2 mths
1949	2012	21.8	0.984	7	2 mths	2 mths	4 mths
1950	2013	22.0	0.978	7	3 mths	3 mths	7 mths
1951	2014	22.1	0.971	7	4 mths	5 mths	9 mths
1952	2015	22.3	0.963	7	5 mths	6 mths	11 mths
1957	2020	23.2	0.930	8	10 mths	11 mths	1 yr 9 mths
1962	2025	24.0	0.902	9	1 yr 2 mths	1 yr 4 mths	2 yrs 7 mths
1967	2030	24.8	0.876	9	1 yr 6 mths	1 yr 9 mths	3 yrs 5 mths
1972	2035	25.6	0.854	9	1 yr 10 mths	2 yrs 2 mths	4 yrs 2 mths
1977	2040	26.3	0.833	8	2 yrs 1 mths	2 yrs 6 mths	4 yrs 11 mths
1982	2045	27.0	0.815	8	2 yrs 5 mths	2 yrs 9 mths	5 yrs 7 mths
1987	2050	27.6	0.799	8	2 yrs 8 mths	3 yrs 1 mths	6 yrs 2 mths
1992	2055	28.2	0.785	8	2 yrs 10 mths	3 yrs 4 mths	6 yrs 9 mths
1997	2060	28.8	0.772	8	3 yrs 1 mths	3 yrs 7 mths	7 yrs 4 mths
2002	2065	29.0	0.761	8	3 yrs 3 mths	3 yrs 10 mths	7 yrs 7 mths
2007	2070	29.3	0.755	8	3 yrs 5 mths	3 yrs 11 mths	7 yrs 10 mths
2012	2075	29.5	0.749	8	3 yrs 6 mths	4 yrs 1 mths	8 yrs 1 mths

* The projected contribution rate for a 53-year-old in the year in which this cohort turns 63.

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6.5   Average pension in relation to average wage, earnings-related pension expenditure in relation to earnings, and TyEL contribution rate under different return assumptions.

Appendices
A1.1 Modules of the projection model.
A1.2 States in the projection model.
A3.1 TyEL expenditure, contribution and assets 2010 – 2075, constant contribution.

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Appendices

The Finnish Centre for Pensions is the statutory central body of the Finnish earnings-related pension scheme. Its research activities mainly cover the fields of social security and pension schemes. The studies aim to paint a comprehensive picture of the sociopolitical, sociological and financial aspects involved.

Eläketurvakeskus on Suomen työeläkejärjestelmän lakisääteinen keskuslaitos. Sen tutkimustoiminta koostuu pääasiassa sosiaaliturvaan ja työeläkejärjestelmiin liittyvistä aiheista. Tutkimuksissa pyritään monipuolisesti ottamaan huomioon sosiaalipoliittiset, sosiologiset ja taloudelliset näkökulmat.

Pensionsskyddscentralen är lagstadgat centralorgan för arbetspensionssystemet i Finland. Forskningsverksamheten koncentrerar sig i huvudsak på den sociala tryggheten och på de olika pensionssystemen. Målet för forskingsprojekten är att mångsidigt belysa aspekter inom socialpolitik, sociologi och ekonomi.

Finnish Centre for Pensions
ELÄKETURVAKESKUS