

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Action to be taken

Voting procedures

For information	FINANCE COMMITTEE 333 rd Meeting 15 December 2010	-
For information	RESTRICTED COUNCIL 157 th Session 16 December 2010	-

PENSION FUND

ACTUARIAL REVIEW AS AT 01.01.2010

The Pension Fund Governing Board invites the Finance Committee and the Council to take note of the actuarial review of the Pension Fund as at 1 January 2010.

PENSION FUND

ACTUARIAL REVIEW AS AT 01.01.2010

Pursuant to the CERN Pension Fund Rules, the Pension Fund Governing Board (PFGB) requested the Fund's Actuary to complete an actuarial review of the Fund as of 1 January 2010. The actuarial review has been drawn up in accordance with Article I 4.02 of the Rules of the Pension Fund, which stipulates that "a technical balance sheet shall be drawn up every three years", in order to inform the Council about the Fund's financial position. The PFGB took note of this review at its meeting of October 27, 2010.

This review presents the technical balance sheet of the CERN Pension Fund, on a closed fund basis, under two different sets of assumptions. In this regard, Council is reminded that at its March restricted session it took note that the actuarial review would be conducted under two different sets of assumptions.

Specifically, the first set of assumptions is the one that was approved by Council in 2005 and that was in force at the time of the prior actuarial review, which was completed in 2007. This was done to allow comparisons with the 2007 actuarial study. Under this set of assumptions, which is laid out in Appendix B1 of the actuarial study, the Fund's actuarial commitments and technical provisions amounted to 4,504.6 million CHF at 1 January 2010. The funding deficit amounted to 601.1 million CHF, vs. 200.0 million CHF at 1 January 2007.

The second set of assumptions is the one adopted by the Pension Fund Governing Board for its report on Funding Principles and Policy and Measures to Restore Full Funding (CERN/2897/RA). This set of assumptions is also sometimes referred to as the "Working Group 2," or "WG2" set of assumptions. This set of assumptions, which is laid out in appendix B2 of the actuarial review, differs from the prior set of assumptions in two important respects: (i) the capitalized value of future pension increases is included in the Fund's liabilities, and (ii) the greater of the transfer value or the deferred pension value is included in the Fund's liabilities. The rate of future pension increases is assumed to be 2%.

Under this set of assumptions, the Fund's actuarial commitments and technical provisions amounted to 5,748.4 million CHF at 1 January 2010. The funding deficit amounted to 1,845.0 million CHF at the same date, corresponding to a funding status of 67.9%.

In his conclusions, the Actuary notes that he observes "a downward trend in the funding ratio in all the historical and WG2 models" and adds that "the Fund is in a structurally imbalanced position at the end of the projection period."

While the Actuary considers the current technical interest rate of 4.5% "still well suited to the Fund's expected rate of return," (which stands at 5.0%), he recommends that the Fund "continue optimising its investment policy in order to guarantee a sufficiently high safety margin with respect to risks foreseen." In this regard, he takes note that "the investment process is being redesigned with assistance of Ortec Finance in order to continue the support of a return target of 5.0%."

Finally, noting that the "mechanism [of under-indexation] alone will not be sufficient to restore full funding till 2033", the actuary adds that "other measures have to be taken urgently in order to restore full funding."

In this regard, the PFGB takes note that CERN management will propose to FC and Council a package of recovery measures (CERN/FC/5498 CERN/2947) for consideration at their December 2010 meetings. The PFGB notes that it is its understanding that all future measures and decisions that bear a real or potential impact on the funding status of the Fund, are to be evaluated under the set of assumptions used in its Report on Funding Principles (CERN/2897/RA), commonly referred to as the "WG2" assumptions. In particular, this is the case for the evaluation of the impact of the recovery package submitted by CERN management.

Annex: Actuarial Report as at 1 January 2010 (CERN/PFGB/24.3/Rev.)



PITTET ASSOCIATES
Pension Fund Advisors

Actuarial Report as at 1 January 2010

**THE PENSION FUND OF THE EUROPEAN ORGANIZATION FOR
NUCLEAR RESEARCH**

October 2010

CONTENTS

1. GENERAL	5
1.1 Remit	5
1.2 Documentation, statistical statements and remarks	6
1.3 Date of the actuarial review	7
1.4 Structure of the report	7
1.5 Terminology	7
2. BASES OF THE ACTUARIAL REVIEW	9
2.1 Legal bases	9
2.1.1 Bases in the Rules	9
2.1.2 Organizations' guarantees	9
2.2 Statistical bases	9
2.2.1 Active members	10
2.2.2 Pension beneficiaries	14
2.3 Financial bases	17
2.3.1 The total net provident assets	18
2.3.2 Performance of the assets	18
2.3.3 Contributions and costs	20
2.4 Actuarial bases	21
2.4.1 Actuarial tables	21
2.4.2 Technical interest rate	22
3. DEATH AND DISABILITY RISK ANALYSIS	27
3.1 Models	27
3.2 Deterministic model	28
3.2.1 Risk premium	28
3.2.2 Average number of claims	30
3.2.3 Extreme values	30
3.2.4 Cost of a claim	31
3.2.5 Total annual cost of claims	31
3.2.6 Actual cost of the risks open between 2007 and 2009	31
3.3 Random model	32
3.3.1 Distribution of the cost of a claim	32
3.3.2 Distribution of the total cost of claims	33
3.3.3 Provision for risk fluctuation	33

4.	FINANCIAL POSITION OF THE FUND.....	35
4.1	Reminder and definition	35
4.1.1	Purpose and method	35
4.1.2	Changes in the calculation method compared to the last actuarial review	36
4.1.3	Financing system	37
4.2	Presentation of the technical balance sheets on a closed-fund basis	37
4.3	Future funding	39
4.3.1	Introductory remarks	39
4.3.2	Method and assumptions	40
4.3.3	Models considered (historical models)	46
4.3.4	Presentation of the results (historical models)	47
4.3.5	Models considered (WG2 models)	61
4.3.6	Presentation of the results (WG2 Models)	62
5.	CONCLUSIONS.....	73
5.1	Preliminary remark	73
5.2	Final observations and recommendations	73

APPENDICES

1. GENERAL

1.1 Remit

In accordance with our terms of reference, we have drawn up the actuarial report of the Pension Fund of the European Organization for Nuclear Research (hereinafter referred to as CERNPF¹ or the Fund) as at 31 December 2009 / 1 January 2010.

Article I 4.02, Section 2, of the Rules of the Pension Fund stipulates that a technical balance sheet be drawn up every three years. The purpose of this operation is specified in paragraph 4.1 of this report.

In the report we essentially examine issues relating to the financial balance of the CERNPF taking account of the funding conditions (contribution rate and financing system applied) and the provident conditions (plan of benefits) defined in the Rules and Regulations currently in force. It should be noted that in view of its special legal status, the Fund is not subject to any national legislation.

This review has been drawn up in compliance with the principles and directives for pension insurance experts jointly laid down by the Swiss Association of Actuaries and the Swiss Chamber of Actuarial Consultants.

In accordance with the code of conduct governing the activities of an actuarial consultant in Switzerland, we have conducted our review independently without being subject to the instructions of those responsible for the management or administration of the Fund.

The main aim of this review is to ascertain to what extent and in what direction the financial position of the CERNPF has evolved in the intervening three years.

¹ For the sake of simplicity, we use this acronym throughout the report, although it is not official. Likewise, we shall henceforth refer to the European Organisation for Nuclear Research as the *Organization* or by its official acronym *CERN*, or sometimes as *the employer*, it being understood that the latter title also includes *ESO (European Southern Observatory)*. We will also have occasion to refer to CERN and ESO as *the Organizations*.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

We wish to underline that the analysis of the financial risk associated with the investment of the Fund's capital does not form part of a consulting actuary's remit.

1.2 Documentation, statistical statements and remarks

We have drawn up our actuarial review on the basis of the following documents and statistical documentation:

- The rules and regulations in force on the date of the actuarial review.
- The Annual Reports and Accounts for the financial years 2007 to 2009.
- The statistics and data of active members and of pension beneficiaries on the date of the review.
- The statistics relating to admissions, resignations, deaths, disability pensions and retirement pensions for the last three financial years (2007 to 2009).

This actuarial review has been drawn up on the basis of the 2009 accounts as verified by the external auditors and approved by the CERN Council.

Actuarial projections have been required in order to examine the Fund's long-term financial balance. These involve a considerable number of calculations which cannot be carried out without IT facilities. The specialised applications used (programs for projections and for determining the distribution of the annual cost of claims for disability and death) made it possible to complete all the operations in good conditions despite the fact that the special features of the Fund's rules are not always conducive to simplified modelling. A computer application which is based on individual data and a stochastic approach was used for the projections. Several simulations have been carried out for each actuarial model considered. The average of the results obtained is shown in the tables in Appendices C2 and ff. The larger the active membership, the more rapidly the results of the projections tend towards this average. In the context of the Fund, we see that, after two hundred simulations, additional simulations have no significant effect on the averages obtained.

ACTUARIAL REPORT AS AT 1 JANUARY 2010**1.3 Date of the actuarial review**

The date chosen for this review [31 December 2009 /1 January 2010] reflects the value date of the overall assets under consideration (31 December 2009) and the date of the most recent statistics concerning the Fund's membership (active members and beneficiaries) and their profile (1 January 2010). The last actuarial review related to the position of the Fund as at 1 January 2007 and gave rise to our report dated 13 September 2007. One of the report's conclusions was that the contribution rate (34.89 %) was such as to be able to guarantee the future financial balance of the Fund based on the assumptions selected for the most probable projection model.

1.4 Structure of the report

Chapter 2 of this report is devoted to the legal, statistical, financial and actuarial bases of the actuarial review. The risks relating to disability and death of active participants are examined in Chapter 3 while Chapter 4 is devoted to the financial balance. Our conclusions are summarised in chapter 5.

1.5 Terminology

In the following pages we have in principle used the terminology used in the Rules governing the operations of the Fund. However, members of the Fund are variously referred to as active members, contributors, active participants or insured members and those in receipt of a pension from the Pension Fund as pension beneficiaries or beneficiaries, the term "pensioners" being generally reserved exclusively for those in receipt of a retirement or disability pension. Unless specified otherwise, salaries must be understood to mean reference salaries within the meaning of the Rules.

All amounts are expressed in Swiss francs and in constant value (2010).

Reference is occasionally made in the report to past and future adjustment. This should be understood to mean both the adjustment of salaries and pensions granted in the past (past adjustment), including that as at the date of the actuarial review (0 % as at 1 January 2010), and that granted in the future (future adjustment) over the projection period (future adjustment relating to the projection period). Future adjustment beyond the projection period is not

ACTUARIAL REPORT AS AT 1 JANUARY 2010

taken into account in our calculations and analyses for the historical models but it is for the WG2 models. The projection period is that taken as the reference for this actuarial review in order to assess the Fund's financial balance. As in the past, it is a 30-year projection period, and for the purposes of this review it runs from the beginning of 2010 to the end of 2039.

2. BASES OF THE ACTUARIAL REVIEW

2.1 Legal bases

2.1.1 Bases in the Rules

The provident conditions relate to all the provisions governing the Fund's operations, of which the Rules and supplementing Regulations of the CERNPF form the basis. These conditions determine the framework and basis of the provident scheme and in particular all the measures and provisions linking the benefits guaranteed by the Fund and their associated financing. Since the last actuarial review, the Fund's Rules and Regulations have been amended, but there are no amendments that could impact the results of our actuarial study. However, there was one change in the employment conditions that will have a small impact on our calculations. The contract of limited duration (LD) has been extended to a duration of 5 years, which means that also these people will have the right to choose a deferred pension in future. The impact of this change has been studied in model M21.

The Fund is funded on the basis of a fully capitalised financial system. Under this system, the Fund's assets must be sufficient to cover all the Fund's actuarial liabilities at all times.

2.1.2 Organizations' guarantees

Article I 3.03 of the Rules states that CERN and ESO guarantee the benefits acquired by the members of their own personnel until the cessation of the rights of the last beneficiary. In the event of mergers, reconstitution or other changes in either of these Organizations, the Council of the Organization concerned takes the necessary steps for the continuation of the pensions.

2.2 Statistical bases

The Fund's IT Service has forwarded to us, via a magnetic-recording medium, the statistical data relating to the active members and to pension beneficiaries (beneficiaries of a retirement pension, a disability pension, a surviving

ACTUARIAL REPORT AS AT 1 JANUARY 2010

spouse's pension or an orphan's pension). The data relate to the situation of those concerned as at 1 January 2010. For reasons linked to the processing of retroactive operations by the Fund's IT application, the data may lead to grouped results that are slightly different from those published in the Annual Report or forwarded by the CERN Management.

2.2.1 Active members

The statistical data relating to the active members are presented and summarised in the following comments, graphs and tables. All monetary values are expressed in Swiss francs (CHF).

The following table provides, for each population (men and women), information on the number of contributors, the average age of insured members, the average period of insurance (periods of membership + added periods of membership purchased), the average annual reference salary, the sum of the reference salary, the average annual retirement pension acquired at the statutory retirement age and the actuarial liabilities calculated according to the WG II reference model and assumptions.

Headings	Men	Women	Total
Number of active members	2'486	641	3'127
Proportion in %	79.5	20.5	100.0
Average age (in years)	43.4	41.0	42.9
Average insured period (in years)	12.02	9.69	11.54
Total annual reference salaries ¹	348'854'229	78'177'006	427'031'235
Average annual reference salary	140'328	121'961	136'563
Total projected retirement pensions ²	223'018'944	49'405'524	272'424'468
Average projected retirement pension	89'710	77'076	87'120
Total actuarial liabilities ³	1'421'800'970	198'344'855	1'620'145'825
Average actuarial liabilities	571'923	309'430	518'115
<p>1) The reference salary is calculated as a function of the reductions defined in Article II 1.14 of the Rules.</p> <p>2) Retirement pension projected to 65 years, without taking account of family allowances.</p> <p>3) For a person with more than 5 years of membership, they are equal to the maximum between the transfer value and the current value of the deferred retirement pension calculated with a technical rate of 4.5 % and 2 % of future inflation.</p>			

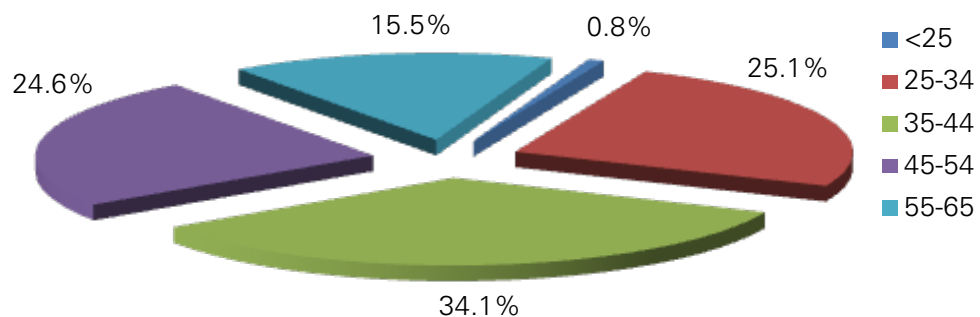
The results shown in the above table call for the following comments:

- As at 1 January 2010, the Fund had 3,127 insured active members. This represents a decrease of 100 units or 3.1 % with respect to the active

ACTUARIAL REPORT AS AT 1 JANUARY 2010

membership of 3,227 units as at 1 January 2007. Of this figure, women represented 20.5 % (19.8 %)² and men 79.5 % (80.2 %). Since the last review, the total number of men (2,588 units) has decreased by 102 units or 3.9 % and the number of women (639 units) has increased by 2 units or 0.3 %.

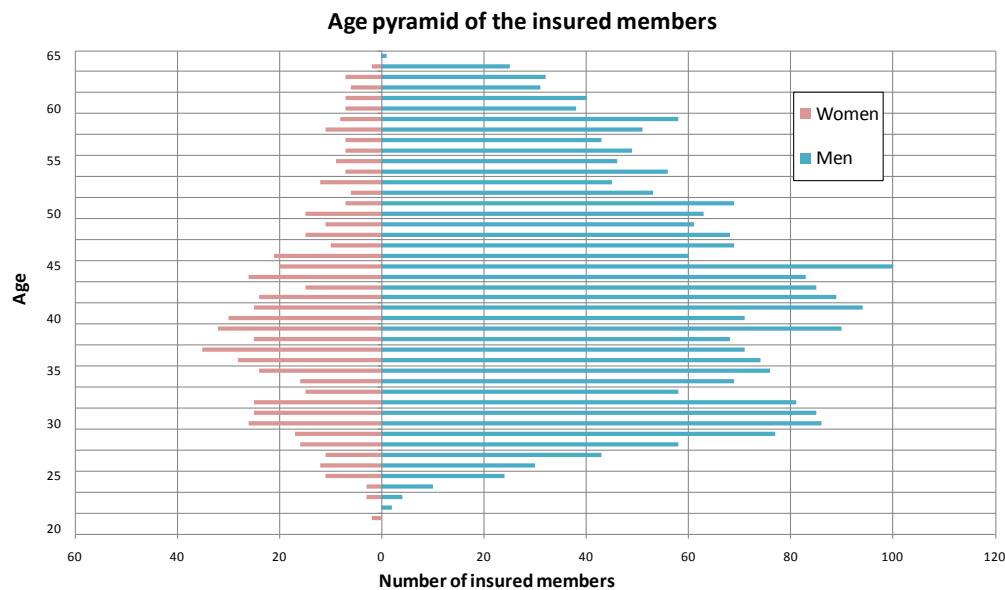
The following graph shows the breakdown of the active members by age range.



The results show, in particular, that the proportion of active members aged 45 years and above has slightly decreased from 41 % to 40.1 % in the space of three years, which confirms the lowering of the average age of the staff complement noted at the previous actuarial review at which this percentage had fallen by 6.11 %. Important changes have occurred in the age classes 45-54 and 55-65 however. In the first age class, the percentage has risen from 20.5 % to 24.6 % whereas in the second age class, it has fallen from 20.5 % down to 15.5 %.

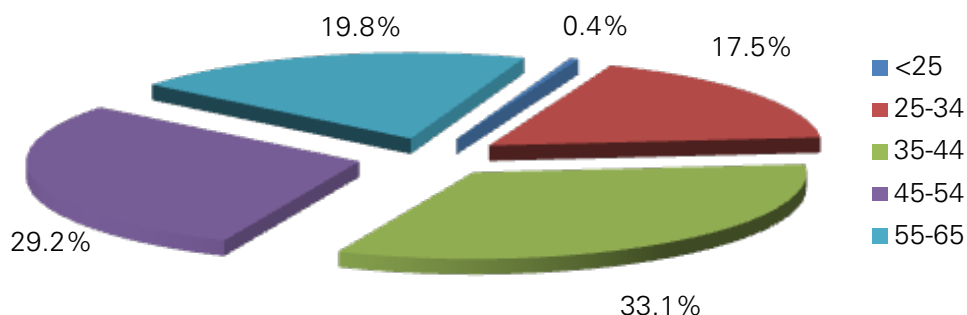
- The average age of the active membership has declined slightly over the period under review. The average age of the active membership has declined by 0.1 years (- 1.5) with respect to 2007. It stood at 42.9 (43.0) years at the beginning of 2010. This is slightly higher than the average age for all Swiss provident institutions, which we estimate to be a little bit lower than 41 years.
- The graph on the following page (age pyramid) shows the composition of the active members by age and sex.

² Unless otherwise specified, the figures in brackets, here and in the rest of the report, refer to the situation as at 1 January 2007, the date of the last actuarial review.

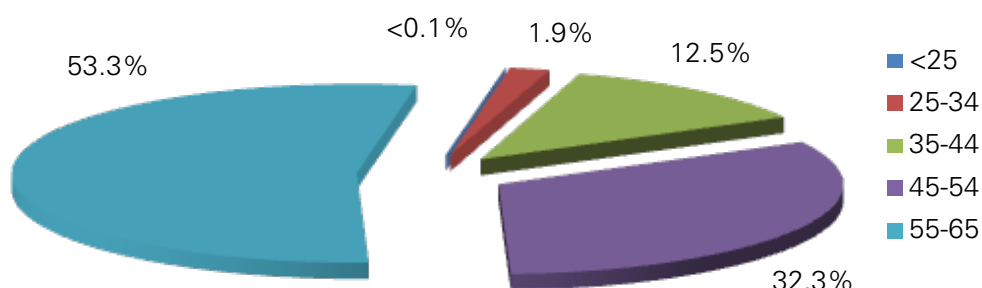
ACTUARIAL REPORT AS AT 1 JANUARY 2010

- The average period of insurance (periods of membership + added periods of membership purchased) is 11.54 (12.32) years on the date of the actuarial review and the average age on entry into the scheme (difference between the current age and the total period of membership) is 31.33 (30.68) years on the same date. The average period of insurance has continuously decreased since 2001 when it still amounted to 17.08 years. During the same period, the average age on entry into the scheme has continuously increased, it being 28.75 years in 2001.
- The average annual reference salary has increased from 131,209 CHF on 1 January 2007 to 136,563 CHF on 1 January 2010, which represents an increase of 5,354 CHF (- 405 CHF) or of 4.08 % (- 0.31 %). The rate of increase was therefore 1.36 % (- 0.1 %) on average per year over the period under review. The difference between the average annual reference salary for men and women is 18,367 CHF (19,143 CHF). It can probably be explained by the different career profiles and by the greater incidence of part-time activities in the case of women. This difference has continuously decreased since 2001. The following pie-chart shows the breakdown of reference salaries per age range.

ACTUARIAL REPORT AS AT 1 JANUARY 2010



- The average insured retirement pension at 65 years has also increased from 84,963 CHF to 87,120 CHF in the past three years. The average retirement pension rate stands at 63.80 % as at 1 January 2010. It stood at 64.75 % of the beginning of 2007 and has continuously decreased since 1 January 2001. However, this rate shows that a substantial fraction of the members of the Fund are entitled to their maximum pension corresponding to 70 % of the reference salary.
- The actuarial liability towards an active member comprises the transfer value if the total period of membership³ is less than five years, and in all other instances the maximum between the transfer value and the current value of the deferred retirement pension, calculated using the EVK 2000 actuarial tables at 4.5 % with pre-capitalisation of an annual future pension indexation of 2 %. For the last actuarial review, this commitment corresponded to the sum of 90 % of the transfer value and 10 % of the current value of the deferred retirement pension, without pre-capitalisation of 2 % future pension indexation. The following pie-chart shows the breakdown of liabilities per age range.



³ The period of membership corresponds to the number of years of membership of the Fund, i.e. to the number of years of contributions. The period of membership does not therefore include any added periods of membership purchased.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- Taking account of the considerations referred to above, the average actuarial commitment per active member amounts to 518,115 CHF on the date of the review, i.e. 48.8 % higher than as at 1 January 2007 (348,196 CHF), because of the changes in valuation method. The marked difference between the average actuarial commitment for men (571,923 CHF) and for women (309,430 CHF) may be explained by a higher average reference salary, higher average age and longer average period of membership for men.
- The total amount of actuarial liabilities towards the active members as at 1 January 2010 amounts to 1,620,145,825 CHF (1,123,629,860 CHF), i.e. an increase of 44.2 % since the last review. They thus show a sharp increase, largely due to the change in the calculation method, combining two conservative changes (maximum method and pre-capitalisation of 2 % future pension indexation).

2.2.2 Pension beneficiaries

The essential statistical information concerning pension beneficiaries as at 1 January 2010 are given in the following tables and remarks.

It should be remembered that the mathematical reserves referred to later in this report represent, as an expected value, the amount that the Fund must possess on the date of calculation to be in a position to ensure payment of pensions until cessation of the rights of the last beneficiary.

The amount of the mathematical reserves of pensions in payment as at 1 January 2010 has been determined using the EVK 2000 actuarial tables, a technical interest rate of 4.5 % and with taking into account 2 % future pension indexation.

The table on the following page shows the amount of the mathematical reserves of pensions in payment as at 1 January 2010 for all the beneficiaries per category of pension.

The results relating to pension beneficiaries give rise to the following remarks:

- The total number of pensions in payment as at 1 January 2010 amounted to 3,435 (3,140) units, i.e. 295 units or 9.4 % (10.8 %) more than at the time of the last actuarial review.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- The beneficiaries are broken down as follows: 74.64 % (75.8 %) retirement pensions, 3.26 % (2.83 %) deferred pensions, 1.16 % (1.53 %) disability pensions⁴, 16.80 % (15.32 %) surviving spouse's pensions and 4.13 % (4.52 %) dependent child allowances (children of pension or disability pension beneficiaries) and orphan's pensions. It will be noted that the number of disability pensioners has remained very low, contrary to the trend observed in the Swiss occupational provident sector where cases of disability, at least in certain economic sectors, have been increasing, albeit now less markedly than in recent years.

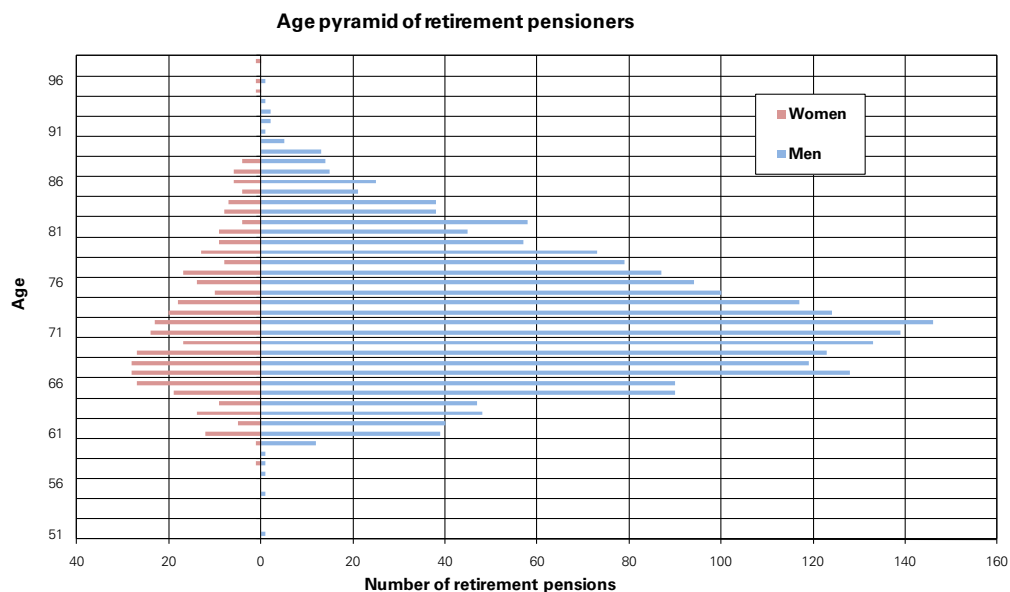
Type of pension	Sex (a)	Number of insured members	Age (b)	Annual pensions		Mathematical reserves according to EVK 2000 at 4.5%			
				Sum (c)	Average	Sum (d)	Average	Ratio (d) / (c)	Proportions (e)
Retirement	M	2,169	72.6	213,995,208	98,661	2,878,113,784	1,326,931	13.449	72.85 %
	W	395	72.0	25,780,176	65,266	331,393,580	838,971	12.855	8.39 %
	M+W	2,564	72.5	239,775,384	93,516	3,209,507,365	1,251,758	13.385	81.24 %
Family allowances for pensioners	M	-	-	13,336,272	-	207,527,414	-	15.561	5.25 %
	W	-	-	653,916	-	9,423,848	-	14.411	0.24 %
	M+W	-	-	13,990,188	-	216,951,263	-	15.507	5.49 %
Deferred pensions	M	89	52.0	5,860,872	65,852	94,768,683	1,064,817	16.170	2.40 %
	W	23	52.3	1,339,512	58,240	19,725,263	857,620	14.726	0.50 %
	M+W	112	52.1	7,200,384	64,289	114,493,946	1,022,267	15.901	2.90 %
Family allowances linked to deferred pensions	M	-	-	344,124	-	6,571,015	-	19.095	0.17 %
	W	-	-	55,680	-	899,813	-	16.160	0.02 %
	M+W	-	-	399,804	-	7,470,828	-	18.686	0.19 %
Disability	M	29	54.6	1,869,960	64,481	36,395,443	1,255,015	19.463	0.92 %
	W	11	56.3	563,664	51,242	10,329,390	939,035	18.325	0.26 %
	M+W	40	55.1	2,433,624	60,841	46,724,834	1,168,121	19.200	1.18 %
Family allowances for disabled members	M	-	-	136,596	-	3,006,628	-	22.011	0.08 %
	W	-	-	29,760	-	526,515	-	17.692	0.01 %
	M+W	-	-	166,356	-	3,533,143	-	21.238	0.09 %
Surviving spouses (f)	M	14	72.2	515,040	36,789	5,453,367	389,526	10.588	0.14 %
	W	563	74.3	28,991,424	51,495	338,443,656	601,143	11.674	8.57 %
	M+W	577	74.2	29,506,464	51,138	343,897,023	596,009	11.655	8.71 %
Children (g)	M+W	142	17.1	1,511,652	10,645	7,942,917	55,936	5.254	0.20 %
Overall summary	M	2,301	-	236,058,072	102,589	3,231,836,334	1,404,536	13.691	81.81 %
	W	992	-	57,414,132	57,877	710,742,067	716,474	12.379	17.99 %
	Children	142	-	1,511,652	10,645	7,942,917	55,936	5.254	0.20 %
Total (h)	M+W+Ch	3,435	-	294,983,856	-	3,950,521,318	-	13.392	100.00 %

(a) M = Men, W = Women and Ch = Children
(b) The ages are expressed in years. The ages expressed are average ages.
(c) Including past or acquired adjustment on the date of the actuarial review
(d) Calculated using the EVK 2000 tables, a technical interest rate of 4.5% and with taking account a future adjustment of 2 % per annum.
(e) Expressed as a percentage of the total mathematical reserves.
(f) The fixed sums are included in the amount of pensions.
(g) The children of beneficiaries of retirement pensions and disability pensions, and orphans.
(h) The family allowances are not counted in the number of pensions.

⁴ We use the term "disability" to refer to "incapacity" within the meaning of the Rules and Regulations of the CERNPF.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- The average age of beneficiaries has increased with respect to that observed at the last actuarial review. On 1 January 2010 the average age of pensioners was 72.5 years (71.1), that of beneficiaries of a disability pension was 55.1 years (58.7) and that of surviving spouses was 74.2 years (72.5). These ages correspond to those usually observed in other Swiss pension funds.
- The distribution of the Fund's retired members by sex and by age is shown in the graph below.



- The following table shows the trend in the numbers of active members and beneficiaries since the last actuarial review.

Year (1)	Active members (A)	Beneficiaries (2)					Ratio (A)/(B) In %
		Retirement pensions	Deferred pensions	Disabled members	Spouses	Total (B)	
2007	3,227	2,380	89	48	481	2,998	107.6%
2008	3,108	2,442	95	40	522	3,099	100.3%
2009	3,067	2,508	96	40	539	3,183	96.4%
2010	3,127	2,564	112	40	577	3,293	95.0%

(1) The results in the table are valid at the beginning of the year concerned.
(2) Children in receipt of benefits are not included in the number of beneficiaries.

- The demographic ratio is expressed as the number of active members over the number of beneficiaries (excluding children). This ratio was 95.0 % (107.6 %) as at 1 January 2010. The combination of the decrease in the number of active members and the large increase in the number of

ACTUARIAL REPORT AS AT 1 JANUARY 2010

beneficiaries has resulted in a clear reduction in the demographic ratio. From 1 January 2009, the number of active members is lower than the number of beneficiaries.

- The annual sum of pensions paid (including allowances) rose from 259.1 MCHF⁵ on 1 January 2007 to 295.0 MCHF, an increase of 35.9 MCHF (38.7 MCHF) or 13.8 % (17.6 %). This rise derives from the increase in the number of beneficiaries and in the average amount of pensions paid. The latter increased by 3,346 CHF (4,896 CHF) or 4.1 % (6.3 %).
- The mathematical reserves of pensions in payment amounted to 3,950.5 MCHF (3,058.4 MCHF) on 1 January 2010, an increase of 892.1 MCHF (609.9 MCHF) or 29.2 % (24.9 %) with respect to the last actuarial review. This increase is explained by the increase in the number of pensions in payment, the increase in the average amount of pensions and allowances and by the pre-capitalisation of an annual future pension indexation of 2 %.
- At the beginning of 2010 total mathematical reserves corresponded to 13.4 (11.8) times the annual sum of pensions in payment. The main reason of this increase in the ratio is the change in valuation method, with taking into account an annual future 2 % pension indexation. This leads to a lower “net” technical interest rate of 2.45 % (see paragraph 2.4.2). As the mathematical reserves represent an updated (or commuted) figure, they should logically be higher with a lower interest rate.

2.3 Financial bases

The financial bases of the Fund consist of the net assets of the provident scheme, the performance of the assets and the other income comprising the contributions and income from the purchase of added periods of membership. The administrative costs of the Fund are also examined in this section.

⁵ Million Swiss francs

ACTUARIAL REPORT AS AT 1 JANUARY 2010**2.3.1 The total net provident assets**

The Fund's overall assets are its capital as shown in the balance sheet published in the annual report, plus the provisions. They amount to 3,903,483,004 CHF as at 1 January 2010, which is the amount that we have taken into account in the technical balance sheet shown in Appendix A and in the projections in Appendices C.

The following table shows the trend in the Fund's net assets since the last actuarial review.

Date	The total net provident assets	Variation	
		Absolute	Relative
01.01.2007	4,473,807,006	-	-
01.01.2008	4,613,976,143	140,169,137	3.13 %
01.01.2009	3,589,680,474	- 1,024,295,669	- 22.20 %
01.01.2010	3,903,483,004	313,802,530	8.74 %
Average (*)	-	- 190,108,001	- 3.44 %
Decrease			
2007 - 2010		- 570,324,002	- 12.75 %
(*) Arithmetical average.			

The results in the above table show that the Fund's net assets decreased by 570.3 MCHF or by 12.75 % from the beginning of 2007 to the beginning of 2010, which represents an average annual decline of approximately 3.44 % or 190.1 MCHF. It can thus be seen that the trend in the Fund's net assets has worsen considerably during the period under review than at the time of the last actuarial review where we observed an overall increase of 19.29 % or 6.09 % per annum (for the period from the beginning of 2004 to the beginning of 2007). The very bad performance achieved in the year 2008 (see paragraph 2.3.2) has substantially contributed to the decrease in the Fund's net assets.

2.3.2 Performance of the assets

The first table on the following page, drawn up on the basis of information communicated by the Fund, shows the various measurements of average performance⁶ obtained on the Fund's investments over various periods. The rates shown were calculated prior to the various reserve fund movements. By

⁶ In the following sections of the document we also use the term "return" to refer to performance.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

way of comparison, this table also shows the assumptions selected for the (closed fund) projections by the Fund's Governing Board on 2 November 2004 and approved by the CERN Council at the end of December 2005 (CERN/FC/4993 CERN/2637)⁷.

Headings	Assumptions used	Periods			
		1957–2009	1990–2009	2000–2009	2005–2009
		53 years	20 years	10 years	5 years
Gross performance TWR (*)	–	4.8%	4.7%	2.2%	3.6%
Gross performance IRR	5.0%	5.3%	4.8%	2.1%	3.6%
Real performance	3.0%	–	3.3%	1.4%	3.2%
Rate of pension adjustment	2.0%	–	1.5%	0.7%	0.4%
Inflation	–	3.0%	1.7%	1.0%	1.0%
(*) Time weighted return					

Naturally, the significant factor in the Fund's long-term financial balance is the average real performance rate (after pension adjustment for inflation). The results in the above table show a deterioration in the situation compared to the results of the last actuarial review with a net annual real performance of 4.9 % over five years (2002-2006) and 4.7 % over 10 years (1997-2006). This is mainly due to the very negative performance for the year 2008. The under-indexation mechanism permits to maintain a relative high level of real performance, because of the reduced allowance for inflation. It should thus be noted that the real performance assumption used is lower than the real performance observed over the periods of 20 years and 5 years, but higher than the observed performance over the last 10 years. This observation shows the importance of the time horizon chosen for determination of assumption for long-term rate of return.

Reference to inflation is justified mainly where salaries and pensions are adjusted for inflation, which is the case for the CERNPF.

The following table gives the annual real and nominal performance rates, since the last actuarial review.

⁷ These assumptions are the ones to which the Fund's consulting actuary refers to determine the most probable projection model(s) for the periodic actuarial reviews.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Years	Inflation	Nominal performance	Real performance
2007	0.00%	6.21%	6.21%
2008	3.20%	-19.28%	-21.78%
2009	-0.80%	13.47%	14.39%
Average (*)	0.79%	-0.91%	-1.69%
(*) Geometrical average			

The average annual nominal rate of return thus rose to -0.91 % over the last three years. This rate is 5.41 percentage points lower than the Fund's technical interest-rate (4.5 %). The nominal performance has fallen substantially since the last actuarial review, which showed that it had been 8.93 % over the years 2004 to 2006. This negative value is mainly due to the financial crisis of the year 2008, which led to a strong negative performance of -19.28 % for the year 2008. The good performance for 2009 hasn't totally covered this big loss.

2.3.3 Contributions and costs

The following table shows the Fund's administrative costs as a percentage of the contributions received.

in Swiss francs

Year	Amount of administrative costs (*)	Amount of contributions (**)	Amounts of reference salaries	Ratio (a)/(b)	Ratio (a)/(c)
	(a)	(b)	(c)		
2007	3,299,655	127,810,887	423,410,419	2.58 %	0.78 %
2008	3,591,544	124,556,883	415,858,579	2.88 %	0.86 %
2009	4,262,660	127,107,032	427,031,235	3.35 %	1.00 %
Average	3,717,953	126,491,601	422,100,078	2.94 %	0.88 %
(*) Administrative costs					
(**) Excluding the purchase of additional years of membership and indemnities received from third parties.					

The average annual costs recorded over the period under review represented 2.94 % of the contributions paid in and 0.88 % of the sum of the reference salaries. They have slightly increased with respect to the last actuarial review, where the corresponding values were 2.52 % and 0.77 %. Moreover, they are consistent with the values that we have observed in other funds of comparable size.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

In the projections, we have set costs at 0.80 % of the sum of the reference salaries, to allow for the future trend of the Fund's administrative requirements and to ensure continuity in the assumptions used for the projection models with respect to the last actuarial review. If the administrative costs remain at an average level of 0.88 % or higher at the next actuarial review, we suggest to increase the costs rate to 0.9 % or higher for the next actuarial review as a precautionary measure. The impact of this new costs rate would be easy to evaluate: the necessary contribution rate would be 0.1 pt higher than today.

2.4 Actuarial bases

2.4.1 Actuarial tables

The actuarial calculations to determine the actuarial liabilities of active members and the mathematical reserves of pensions and allowances in payment have been done using the EVK 2000 actuarial tables. These tables are drawn up by the Pension Fund of the Swiss Confederation (Publica) on the basis of its own observations. They form part of the tables that are most widely used for actuarial calculations in Swiss provident institutions. According to our information, publication of these tables will be discontinued at a future date. The Fund will then have to choose new actuarial tables, this will be the subject of a longevity study that will be reviewed in 2011.

The regular increase in human life expectancy is a phenomenon to which provident institutions must pay particular attention. On average, the actuarial tables are updated every ten years in order to take account of the changes in life expectancy. Past experience with the EVK tables has shown that the introduction of a new version of these tables, after a 10 years period, results in an increase in the mathematical reserves of the pensions in payment of around 5 %⁸. It is therefore advisable, during the ten years that usually lie between the publication of two versions of the tables, to anticipate this increase by setting aside a provision to anticipate changes in the actuarial tables (or "life-expectancy provision").

⁸ This increase is not specific to the EVK tables but also holds good for the other actuarial tables used in Switzerland.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Since the transfer value is not determined actuarially and since, in 2007, the actuarial liabilities towards the insured active members were determined as the sum of 90 % of the transfer value and 10 % of the current value of the deferred retirement pension, it was decided not to include in the above-mentioned provision the Fund's actuarial liabilities towards its active members. The current value of the deferred retirement pension with pre-capitalization of 2 % future pension indexation is determined actuarially and is more often greater than the transfer value. When using the method of the maximum, we therefore suggest following the conclusions of our longevity study and changing the valuation method for this provision in taking into account the actuarial liabilities towards the active members. This change will be introduced at the same time as the new technical bases.

In view of the above, we have used the following formula to determine the life-expectancy provision (LP), which is applied in the technical balance shown in Appendix A, as well as in the projections in Appendices C2 to C22:

$$LP(t) = (t - 2000) \times 0.005 \times CPB(t)$$

Where:

LP(t)	=	Life-expectancy provision at the end of year t;
CPB(t)	=	Vested pension capital at the end of year t;
t	=	Year considered.

2.4.2 Technical interest rate

The nominal technical interest rate applied is 4.5 %. It should be remembered that the technical interest rate corresponds to the average annual rate of return which the Fund hopes to achieve in the long-term future, taking into account a safety margin. It is this rate that the actuary uses for certain updating calculations, in particular to determine the amount of the mathematical reserves of the pension beneficiaries and the current values of deferred retirement pensions. A positive difference between the effective rate of return and the technical interest rate contributes to strengthening the financial health of the Fund.

We must point out that in January 2005 the Swiss Chamber of Consulting Actuaries (CAC) advocated a technical interest rate of between 3.2 % and 3.7 %. These values were obtained taking economic and financial assumptions into account as well as the LPP 93 index for determining the allocation between various asset classes within the portfolio. It must also be

ACTUARIAL REPORT AS AT 1 JANUARY 2010

pointed out that the assumptions adopted by the CAC for the equity risk premium and non-Swiss-franc bond risk premium are 2 % and 1 % respectively. The risk premium represents the excess return required by the investor when he invests his assets in a risky asset class rather than in a risk-free asset. Naturally, pension funds can adapt the CAC's parameters to their own circumstances in order to verify the appropriateness of their technical interest rate.

The table on the following page shows the method used by CAC to arrive at its standard technical interest rate compared to that used by the CERNPF, which takes account of its specific portfolio characteristics. This table calls for the following comments on our part:

- The results take into account the Fund's strategic asset allocation, in particular a 48 % equity weighting (34 % in equity and 14 % in alternative investments), a 23 % allocation to non-Swiss-franc bonds and a 15 % allocation to real estate.
- In the CAC's model, the equity risk premium is set at 2.0 %. In view of the equity weighting in the LPP 93 index (25 %), which is the basis used by the CAC, the weighted equity risk premium is 0.5 %. If we consider the proportion of equity in the Fund's portfolio, namely 48 %, we obtain a weighted equity risk premium of 1.0 % ($48 \% \times 2 \%$).
- We have set the real estate risk premium at 0.1 %. This is a relatively prudent rate, bearing in mind that the Fund's target performance for this asset class is 5.7 %. It should be noted that the CAC's method of determining the technical interest rate does not take the real-estate risk premium into account, since the approach used is based on the weightings of the LPP 93 index, which does not include real estate.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Headings	Standard technical interest rate according to the CAC	Technical interest rate according to the characteristics of the CERNPF
Long-term real interest rate	2.0 %	2.0 %
Future inflation rate	1.0 - 1.5 %	1.0 - 1.5 %
Nominal interest rate	3.0 - 3.5 %	3.0 - 3.5 %
Risk premium for equity (*)	0.5 %	1.0 %
Risk premium for foreign bonds(*)	0.2 %	0.2 %
Risk premium for real estate(*)	-	0.1 %
Total potential technical rate	3.7 - 4.2 %	4.3 - 4.8 %
Reduction for periodic life-expectancy tables	-0.5 %	-
Technical interest rate	3.2 - 3.7 %	4.3 - 4.8 %
(*) For a portfolio tracking the LPP 93 index, i.e. consisting of 25% equity and 75% bonds, 20% of which in foreign bonds (no real estate).		

- According to the CAC model, taking account of the future adjustment of the actuarial tables brings about a 0.5 percentage point reduction in the technical interest rate. In our view, this reduction is not required in the case of the CERNPF, since the funding is determined by means of projections that take into account the cost of the increase in life expectancy. This cost is therefore funded through contributions.
- According to the calculations performed, the Fund's technical interest rate therefore lies within the range indicated. It must be added that the target performance (expected return) from the Fund's strategic asset allocation is 5.4 % (estimate from the last ALM study commissioned by the Fund), i.e. 0.9 percentage points higher than the value of the technical interest rate used.

However, before commenting on the appropriateness of the technical interest rate, the results of the theoretical approach presented above must be compared with the actual performance of the Fund over the past years. The results in paragraph 2.3.2 show that the performance of the Fund's asset portfolio has weakened over the last 10 years (owing to the market falls in the years 2000 to 2002 and in the year 2008) and that the performance is 2.4 percentage points below the technical interest rate over 10 years but 0.3 percentage points above the technical interest rate over 20 years. If the deterioration of the effective performance leads the long-term observed rate of return to stand at a lower level than the technical interest rate, a reconsideration of the applied technical rate should be made.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

In the light of the foregoing, we may conclude that the Fund's technical interest rate of 4.5 % is only just appropriate for the time being, bearing in mind the CAC's model and the performance actually achieved in the last 20 years.

3. DEATH AND DISABILITY RISK ANALYSIS

3.1 Models

The concept of insurance associated with provident institutions is based on two models: the deterministic model and the random model. The first model relates to the problems of long-term financing of the institution and the second to the short-term fluctuations inherent in the realisation of insured risks. Naturally these two models are complementary.

The deterministic model is based on two principles:

- Claims arise as a result of the realisation of insured events over a given period, generally a year.
- The premiums (or contributions) corresponding to the insured risks are fixed in advance provided that all the insured risks are well defined.

The above can be simply illustrated by imagining an insurance year during which a group of 1,000 people, all male and aged 40, is insured for a capital of 10,000 CHF in the event of death. Thus all the insured risks are well defined. The actuarial tables (EVK 2000, for example) allow the number of deaths that can be expected for the year concerned to be precisely determined, i.e. $1,000 \times 1.40 \text{ ‰} = 1.40$ (where 1.40 ‰ = the general probability of death for a man aged 40). Ignoring the interest rate and costs, the individual premium required to finance the insurance cover in the case under consideration is 14.0 CHF ($= 10,000 \times 1.40 / 1,000$).

In the deterministic model, the premium thus corresponds to the average expected cost obtained from the observation of a very large number of members exposed to the risk. The greater the number of members exposed to the risk, the better the principle of equivalence between calculated premiums and the actual cost of the risk is verified.

It should be noted that the deterministic model assumes the mutual independence of the risks. This means, for instance, that it is accepted that the death of one person is not influenced by that of anybody else.

The deterministic model has its limits. Clearly, the actual overall cost of claims in a given year rarely corresponds to the average expected amount (in our

ACTUARIAL REPORT AS AT 1 JANUARY 2010

example: $14.0 \text{ CHF} \times 1,000 = 14,000 \text{ CHF}$). In reality, the actual cost will vary around the average expected amount and indeed in reality the insurer will not have to bear the cost of 1.40 cases of death, but 0, 1, 2 or n cases.

The smaller the insured membership, the more diverse the sums at risk and the more heterogeneous the insured risks, the more difficult it is to predict the actual overall cost of claims for a given period. Hence the need, in certain cases, to have recourse to reinsurance to attenuate the effects of risk fluctuation. But the deterministic model provides no indication on this subject. It is the random model that makes it possible to answer the fundamental questions about the size of the insured membership, the consequences of the risk fluctuations around the expected mean and total or partial reinsurance of the risks.

The random model associates the notion of random variable and the corresponding probabilities with the risks considered. It takes account of the fact that risk is not always realised in the same way in identical conditions. It makes it possible to determine all the possible values that the random variable and the probabilities associated with these values can have.

A pension fund normally insures against three types of risk: life expectancy, disability and death. The life-expectancy risk, which is essentially associated with retirement, manifests itself over the long term. It is therefore relatively manageable, notably through the gradual constitution of an adequate life-expectancy provision. The risks associated with disability and death are much more volatile in the short term. This section is therefore devoted to these two risks.

3.2 Deterministic model

3.2.1 Risk premium

The detailed results concerning the risk premium pertaining to the deterministic model and to the plan of benefits used by the CERNPF can be found in following tables:

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Sex	Reference salaries	Sums at risk	
		Death	Disability
Men	348,854,229	2,301,813,994	4,158,465,237
Women	78,177,006	397,836,277	925,023,041
M + W	427,031,235	2,699,650,271	5,083,488,278

The sums at risk for "death" represent the updated amounts of all the benefits that would be payable by the Fund in the event of the death of the whole of the insured population considered, less the corresponding actuarial liabilities (cf. table in section 2.2.1).

The sums at risk for "disability" indicate the updated amount of all the benefits that would be payable by the Fund in the event of the disability of the whole of the insured population considered, after deduction of the corresponding actuarial liabilities.

The cost of the risks is obtained by multiplying the sum at risk for each insured person by the corresponding probability of occurrence, which depends on the sex and age of the insured person. The cost of the risks corresponds to the total net annual risk premium included in the contributions paid in.

Sex	Reference salaries	Cost of risks			Risk Premium
		Death	Disability	Total	
	(a)	(b)	(c)	(d)	(e)
Men	348,854,229	2,805,593	11,460,966	14,266,560	4.09%
Women	78,177,006	217,892	3,474,298	3,692,190	4.72%
M + W	427,031,235	3,023,485	14,935,264	17,958,750	4.21%
(d) = (b) + (c)					
(e) = 100 x (d) / (a)					

The risk premium rate is derived from the ratio between the cost of the risks and the sum of the corresponding reference salaries. The cost of the risk death amounts to 0.71 % and the cost of the risk disability to 3.50 % of the sum of the reference salaries. The total rate of 4.21 % is comparable with the rates obtained by other Swiss pension funds. This rate is much higher than in the last actuarial study (2.64 %) because of the change in valuation method. The sums at risk are now calculated considering a full cover of the future pension indexation of 2 % per annum, which increases the risk premium.

ACTUARIAL REPORT AS AT 1 JANUARY 2010**3.2.2 Average number of claims**

The following table shows the expected average annual number of claims relating to disability and death. This information is obtained for each sex and age by multiplying the number of active members by the corresponding probability of death or disability.

Sex	Number of members	Average age	Average annual number of claims		
			Disability	Death	Total
Men	2,486	43.4	11.09	4.09	15.18
Women	641	41.0	3.17	0.52	3.70
M + W	3,127	42.9	14.26	4.61	18.88

According to the results obtained, the expected average annual number of claims therefore amounts to 18.88 (19.89) cases, including both death and disability. The decrease in this number since the last actuarial review is mainly explained by the lower number of insured members, but also by the slightly reduction of the average age and by the more important part of women in the active membership.

3.2.3 Extreme values

The table below summarises the extreme values of individual sums at risk in the event of disability and death.

Sums at risk in Swiss francs			
In the event of disability		In the event of death	
Minimum	Maximum	Minimum	Maximum
0	3,575,258	0	2,928,571

We note that the minimum individual sum at risk is zero (the negative sums at risk are set at zero) and the maximum sum at risk is 3,575,258 CHF in the event of disability and 2,928,571 CHF in the event of death.

In the event of a claim, the amount at risk is low when the cost (as a probable value) of the death or disability is close to the amount of the constituted actuarial liability towards the active member concerned.

ACTUARIAL REPORT AS AT 1 JANUARY 2010**3.2.4 Cost of a claim**

The calculations show that the expected average cost of a claim (including both disability and death) amounts to 951,380 CHF. This amount is obtained by dividing the cost of the risks (17,958,750 CHF) by the average annual number of claims (18.88 cases).

3.2.5 Total annual cost of claims

The total expected average annual cost of claims is 17,958,750 CHF. It represents 4.21 % of the sum of the pensionable remuneration and is broken down into 14,266,560 CHF for men and 3,692,190 CHF for women.

3.2.6 Actual cost of the risks open between 2007 and 2009

The risk benefits open over the period 2007 to 2009 are summarised for each category of pension in the following table.

Year	Disability			Death		
	Number of claims	Cost of the claims	Cost of the risk (as % of salaries)	Number of claims	Cost of the claims	Cost of the risk (as % of salaries)
2007	2	342,127	0.08%	3	1,599,111	0.38%
2008	3	1,360,953	0.33%	2	0	0.00%
2009	3	1,565,915	0.37%	3	1,784,565	0.42%

For the period 2007-2009, the cumulated costs of the claims amount to 6,652,671 CHF, 3,268,995 CHF for the risk disability and 3,383,676 CHF for the risk death. The average sum of reference salaries amounts to 422,100,078 CHF. Therefore, the average annual actual cost of the risks amounted to 0.53 % of the reference salaries, 0.26 % for the risk disability and 0.27 % for the risk death. The actual annual cost is therefore markedly lower than the theoretical cost of 4.21 % mentioned in paragraph 3.2.1. The Fund's actual level of claims is thus substantially lower than those of the actuarial tables used.

In subsequent sections, as a precautionary measure, we will recognise that the actual cost of the risk disability amounts to 40 % of the theoretical cost of the risk disability but we will continue to consider 100 % of the cost of the risk death. This corresponds to 2.11 % (100 % x 0.71 % + 40 % x 3.50 %) of reference salaries.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

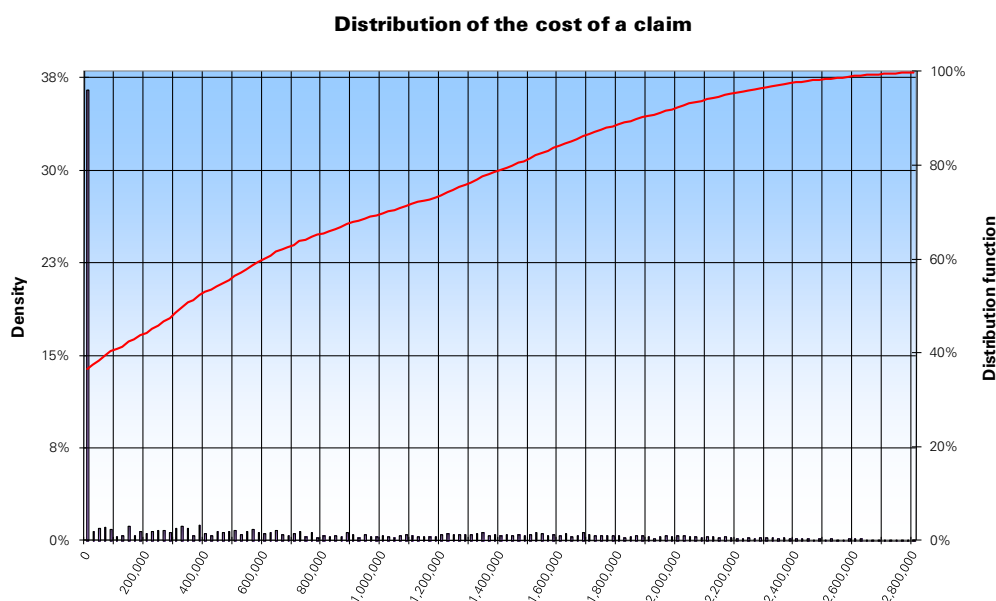
Moreover, we note that the number of cases of disability and death during the period under review is also lower than the average annual number of claims mentioned in the table in paragraph 4.2.2, especially for disability. This will be taken into account in our projection of the financial balance of the Fund in chapter 4.

3.3 Random model

In the random model, we have taken account of the differences observed in the previous paragraph between the actual and theoretical numbers and costs of claims. The mortality rates have been taken into account to 100 % but we have reduced the disability probabilities by 60 % (cf. Paragraph 3.2.6).

3.3.1 Distribution of the cost of a claim

The calculations done using the random model show that the cost of a claim has the following distribution:

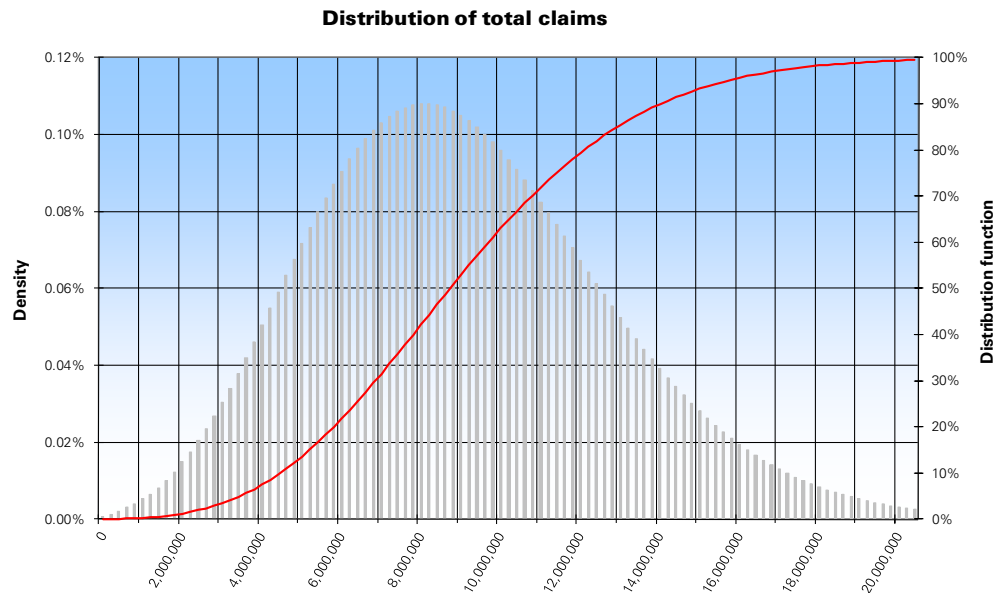


This graph shows us the probability of the cost of the claim being lower than a given value if we know that there is a claim without knowing whether it relates to a disability or death. For instance, there is an approximately 60 % chance that the cost of a claim will be below 600,000 CHF.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

3.3.2 Distribution of the total cost of claims

The calculations done using the random model show that the total cost of claims has the following distribution:



This graph shows the probability that the total annual cost of claims is lower than a given value. For instance, there is approximately a 90 % chance that the total cost of claims is lower than 14,000,000 CHF in a given year.

3.3.3 Provision for risk fluctuation

In practice, it is generally accepted that the complete autonomy of a personal welfare institution is justified if the financial means available to it each year, i.e. the constituted risk fluctuation provision supplemented by the annual risk premium paid in, are sufficient in at least 97.5 % of cases to cover the entire actual total annual cost resulting from the realisation of disability and death risks. Thus a probability of 2.5/100 or less that the total annual cost of claims will exceed the financial resources of the Fund is deemed acceptable. The probability that the Fund will be required to take exceptional financial measures to meet its obligations is therefore set at 2.5/100 (or 2.5 times every 100 years). This probability can be regarded as very low.

According to our evaluation, the total annual amount of claims corresponding to an accumulated probability of 97.5 % stands at 17,220,000 CHF. Consequently, the risk fluctuation provision that the CERNPF should constitute in order to be able to absorb a year of exceptional claims would

ACTUARIAL REPORT AS AT 1 JANUARY 2010

amount to 17,220,000 CHF, less the annual risk contribution paid in. As the Fund applies a uniform contribution rate, no part of the contribution is explicitly earmarked for covering the risks of disability and death. Nevertheless, if on the basis of the results of the actual cost of the risks referred to in paragraph 3.2.1, the actual average annual cost of the risks borne by the Fund is prudently estimated at 2.11 % of the reference salaries, the minimum necessary risk fluctuation provision should amount to some 8.20 MCHF⁹ on 1 January 2010.

As we indicated in the last actuarial review, the level of the risk fluctuation provision can be limited by concluding, for instance, a stop-loss type reinsurance contract. Given its limited history of claims, the Fund has never taken additional precautionary measures (reinsurance or constitution of a risk fluctuation provision). In the light of the aforementioned results, we consider that it can continue to dispense with such measures. However, looking to the future, we consider it important for the CERNPF to continue to periodically analyze the trend in its claims in order to be able to take steps sufficiently early to counter the effects of a change in the trend.

⁹ $17,220,000 - 2.11 \% \times \text{sum of reference salaries at 01.01.2010 (427,031,235)} = 8,209,641$, rounded to 8,200,000.

4. FINANCIAL POSITION OF THE FUND

4.1 Reminder and definition

4.1.1 Purpose and method

In its Principles and Directives, the Swiss Chamber of Consulting Actuaries states that the technical balance sheet allows the personal welfare institution to check whether its assets, as shown in the commercial balance sheet, are sufficient to cover its insurance obligations, debts and other reserves on a given date.

The technical balance sheets of the CERNPF as at 1 January 2010, presented in Appendices A, naturally comply with the above definition.

We have applied the following two-step approach to our review of the financial position of the Fund:

- The first step was to draw up a technical balance sheet that would determine whether the Fund's assets are sufficient to cover all of its actuarial liabilities on a given date.

Actuarial liabilities should be understood to mean:

- In the case of active members, actuarial liabilities towards them as at 1 January 2010.
- In the case of pension beneficiaries, the mathematical reserves for pensions in payment as at 1 January 2010.

The technical provisions consist exclusively of the life-expectancy provision for the beneficiaries.

This technical balance sheet is drawn up on a closed-fund basis as we only take account of members and beneficiaries of the Fund on the date of the review.

- The second step relates to the Fund's future. Its purpose is to determine whether the Fund's current funding is sufficient to guarantee its long-term benefits in a dynamic situation, i.e. taking account of various assumptions

ACTUARIAL REPORT AS AT 1 JANUARY 2010

relating to trends in reference salaries, the turnover of and trends in the numbers of members and beneficiaries, pension and salary adjustments, and the return on assets, etc. This projective approach can be deemed equivalent to the open-fund method (which takes account of future trends in the contributing membership in evaluating the financial position of the Fund). This is the same approach as we have used in our previous reviews.

4.1.2 Changes in the calculation method compared to the last actuarial review

At the request of the Fund's Administration, following the decision by the CERN Council, we have taken the following changes into account in this review:

- Liabilities are now valuated with a 2 % future pension indexation per annum. This change has been applied both for the technical balance sheet on a closed-fund basis and for the projections on an open-fund basis, and has an impact on liabilities towards beneficiaries and active members.
- The amount of the Fund's actuarial liabilities towards each individual active member is now equal to the higher individual amount between the current value of the deferred indexed retirement pension and the transfer value, both for the closed-fund calculations and for the open-fund projections. Previously, a weighted sum of the two above-mentioned amounts was used (90 % for the transfer value and 10 % for the current value of the deferred pension). The method for calculating the Fund's liabilities has not changed for insured members with less than 5 years of service, for whom only the transfer value is taken into account, in accordance with Article II 2.03 of the Rules.
- For the purposes of calculating the current value of the deferred pension, the age at the end of the deferred period has changed from 60 to 65 years for members who joined the Fund after 30 June 1987 but has remained at 60 for all other members. This is because we consider insured members who joined the Fund after 30 June 1987 to be more likely to defer the payment of their pension until age 65 in order to avoid the application of the early retirement reduction factors laid down in Article II 2.05 of the Rules.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

4.1.3 Financing system

The CERN Pension Fund operates on the basis of a capitalised financing system. In this system, the Fund's actuarial liabilities must be guaranteed by equivalent overall assets. As the open-fund technique is used, a match between overall assets and actuarial liabilities must be achieved at least at the end of the financing period considered. Nonetheless, the question has been asked in the past as to what target funding ratio should be guaranteed in the long term, depending on the financial position of the Fund at the date of the actuarial review. On our recommendation, the CERN Council decided (CERN/GB/136.2/Rev.) that the Fund's target funding ratio should be 100 % in the event of initial under-funding, that when the initial funding ratio lies between 100 % and 125 % it should be maintained at that level throughout the projection period, and that the target should be 125 % when the initial ratio is higher than 125 %.

4.2 Presentation of the technical balance sheets on a closed-fund basis

The technical balance sheet in the table in **Appendix A1** summarises the results with the **historical assumptions** at the end of 2009 and at the end of 2006. It calls for the following comments on our part:

- The calculation of the Fund's total assets takes account of the Fund's investments evaluated at their market value. A breakdown of the Fund's assets is given in Paragraph 2.3.1.
- The transfer values of the active members or the current values of deferred retirement pensions (not including future adjustments) represent the total individual amounts of the Fund's actuarial liabilities towards each active member. They correspond to 10 % of the current values of deferred retirement pensions (not indexed), plus 90 % of the transfer value.
- The mathematical reserves of the pension beneficiaries correspond to the current values of the pensions in payment but do not take account of future pension indexation.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- The life-expectancy provision is built up against future costs associated with changes in the actuarial tables. Details of this provision are given in Paragraph 2.4.1.

When the Fund's actuarial liabilities were assessed in the last actuarial review, a technical surplus of 200.0 MCHF and a funding ratio or rate of capitalisation¹⁰ of 104.7 % were observed on liquidation. As at 1 January 2010, using the same assessment method, an actuarial deficit of approximately 601.0 MCHF is observed, corresponding to a funding ratio of 86.7 %.

The technical balance sheet in the table in **Appendix A2** summarises the results with the **WG II assumptions** at the end of 2009 and at the end of 2008. It calls for the following comments on our part:

- The calculation of the Fund's total assets takes account of the Fund's investments evaluated at their market value. A breakdown of the Fund's assets is given in Paragraph 2.3.1.
- The transfer values of the active members or the current values of deferred retirement pensions (including future pension adjustments) represent the total individual amounts of the Fund's actuarial liabilities towards each active member. They correspond to the individual maximum between these two values. Details are provided in Paragraph 2.2.1.
- The mathematical reserves of the pension beneficiaries correspond to the current values of the pensions in payment and future survivors' benefits. It takes account of a 2 % future pension indexation. Details are provided in Paragraph 2.2.2.
- The life-expectancy provision is built up against future costs associated with changes in the actuarial tables. Details of this provision are given in Paragraph 2.4.1.

When the Fund's actuarial liabilities were assessed at the end of 2008, an actuarial deficit of approximately 2,096.0 MCHF and a funding ratio of 63.1 % were observed on liquidation. As at 1 January 2010, using the same assessment method, an actuarial deficit of approximately 1,845 MCHF is observed, corresponding to a funding ratio of 67.9 %. This represents an increase of 251.0 MCHF and 4.8 percentage points respectively during the

¹⁰ Ratio between the net assets of the Pension Fund and the total actuarial liabilities, including the life-expectancy provision.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

year 2009. These results indicate a significant improvement in the Fund's financial position.

With a funding ratio of 67.9 %, the Fund's financial and actuarial position at the end of 2009 is however not satisfactory.

The above results allow us to conclude that the Fund's financial position is unbalanced on the date of the review in that the standards of the applicable financial system (capitalisation) are not met, on a closed-fund basis, at the end of 2009.

However, the Fund's closed-fund position on a given date does not allow any conclusions to be drawn on the financial balance of the Fund in the long-term. If we think in open-fund terms, we must examine the financial balance not on a given date but in the medium and long term. The results of the projections presented in Chapter 4.3 and in Appendices C thus allow us to assess the foreseeable trend in the financial position of the Fund.

4.3 Future funding

4.3.1 Introductory remarks

The method used in this review is the projected annual budget method (or "projective" method), in which projections are used to determine the assumed trend in the Fund's income, expenditure and actuarial liabilities for a certain number of years, referred to as the financing period (or projection period). By then updating, on the date of the review, the difference between the Fund's net assets and the actuarial reserve fund at the end of the projection period, the actuarial balance for each actuarial model considered is obtained. This balance corresponds to the amount that would have to be added to (in the event of a technical deficit) or deducted from the Fund's net assets at the beginning of 2010 (if there is a technical surplus) in order to obtain a balance between the Fund's net assets and the actuarial reserve funds at the end of the projection period, taking account of the expected average annual rate of return of the model concerned.

We have made two sets of projection, depending on valuation assumptions for liabilities:

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- the **first set**, called “**historical models**”, uses the “old” model for valuation of liabilities, i.e. we use the same method as in the previous actuarial review. In this set, future pension indexation of 2 % because of inflation is not taken into account for valuating liabilities, and liabilities towards active members correspond to the sum of 90 % of the transfer value and 10 % of the present value of deferred pension. The behaviour of the vested members also takes into consideration this method: it is assumed that 10 % of terminated members chose the deferred pension instead of transfer value, regardless of the difference between the transfer value and the actual value of pension.
- the **second set**, which corresponds to the **WG2 model**, uses the same valuation method for liabilities as presented previously, i.e. future pension indexation of 2 % per annum is pre-capitalised and the actuarial liabilities towards active members is equal to the maximum value between the transfer value and the present value of deferred pension. The behaviour of terminated members is also changed: they choose the deferred pension if its present value is higher than the transfer value paid.

4.3.2 Method and assumptions

As already mentioned, the aim of the second step of our review is to check whether the future financing of the Fund is guaranteed with the contribution rate of 30.88 % of the reference salary laid down in the Rules. To this end, we have made projections using a stochastic simulation program which determines for each year of the projection, based on a set of parameters, whether each individual insured member is new, remains in active service, resigns, passes away, becomes disabled or retires. By also modelling the future trend in the insured population, the variation in salaries by sex and age, the average annual adjustment rates of reference salaries and pensions and the average net annual return on the assets, we are able to anticipate the trend in the Fund's actuarial and financial liabilities in the years to come and thus determine the contributions/return coupling needed to fund the CERNPF in the medium and long term. We have made several simulations for each model concerned and have included their average values in Appendices C2 to C20 (C2 to C15 for the historical models and C16 to C20 for the WG2 models).

ACTUARIAL REPORT AS AT 1 JANUARY 2010

We have determined the various assumptions behind the choice of parameters according to the statistics of the Fund over the last three years (2007 to 2009). The main assumptions adopted are set out below and are valid for both sets:

a. Trends in the insured population

Trends in the number of beneficiaries depend on trends in the number of active members (disability, retirements and deaths) and on the mortality rate among pension beneficiaries. They are also influenced by other factors, namely the age at which children cease to be entitled to a pension, the remarriage of widows and widowers and the cessation of disability (transition from the disabled to the active state). However, as statistical observations show that remarriage and the cessation of disability play a secondary role in pension funds with well developed benefit plans, we have not taken them into account in our calculations.

Trends in the number of active members depend on mortality, disability, resignations, retirements and the arrival of new members. We have used the EVK 2000 tables to measure mortality and life expectancy for both beneficiaries and active members. In the WG II models, we have used additionally the method of Nolfi to reduce the EVK 2000 mortality rates in the simulation of the number of death cases during the projection but not to calculate the liabilities.

Our measurement in paragraph 4 of the frequency of claims for death and disability of active members in accordance with the EVK 2000 tables shows that the actual number of claims observed by the Fund was lower than the theoretical number deriving from the application of these tables, especially in the case of disability. We have therefore reduced the disability probabilities of the tables by 60 %, as already made in the last actuarial report. However, to be prudent, we have left the death probabilities of active members unchanged, given that the actual and theoretical numbers of deaths are relatively similar.

The annual number of resignations expressed as a proportion of the total populations observed and their breakdown by age are also based on the Fund's own statistics as observed in the period between 1 January 2007 and 1 January 2010. The rate of resignations corresponds to average annual "turnovers" of 6.57 % for men and 6.36 % for women, compared to 4.45 % and 5.35 %, respectively, in the last actuarial review. The breakdown by age

ACTUARIAL REPORT AS AT 1 JANUARY 2010

has changed since the last actuarial review. It now fits the observations made during the last three years.

The Administration of the Fund asked us to take future personnel policy into account in order to be as close as possible to actual future trends in the contributing membership. To this end, we took account of three different populations: the CERN staff, the CERN Fellows and the ESO staff.

In the case of the CERN staff population, we distinguished members according to the type of their contract, i.e. limited duration (LDC) or indefinite (IC). All new insured members of the staff population joining the Fund during the projection period are assumed to hold a 4-year LDC. After the initial 4 years, 40 % of members leave the Fund and 60 % are awarded an IC. This applies to insured members who joined after 1 January 2006. Insured members who joined before this date are all deemed to hold an IC.

We have assumed that Fellows are awarded a two-year LDC and that at the end of the two years 10 % become staff members with an LDC and 90 % leave the Fund.

Among the insured population of ESO, all active members follow the general trend of the insured members as defined in the parameters of the model.

The forecast trend in the active membership is supposed to be constant.

The table below presents a summary of the proportion of personnel taking early retirement for each of the different populations, based on the Fund's statistical observations for the period 1998 to 2009.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Age	Probability of retirement with an ordinary retirement age of	
	60	65
50	0.00%	0.00%
51	0.10%	0.00%
52	0.00%	0.00%
53	0.10%	0.00%
54	0.40%	0.00%
55	0.40%	0.00%
56	0.40%	0.00%
57	0.80%	3.30%
58	2.10%	0.00%
59	2.90%	0.00%
60	34.70%	10.30%
61	12.70%	3.80%
62	15.10%	16.00%
63	15.20%	0.00%
64	12.20%	4.80%
65	100.00%	100.00%

The number of new members depends directly on the number of departures (deaths, disability, resignations and retirements) observed in the course of the projection period, based on the assumptions used for the trends in each population of active members. The age distribution among new members is based on the Fund's own statistics of the last three years. According to this distribution, the average age of new members is approximately 35.2 years for Staff members and 28.9 years for Fellows.

b. Trends in reference salaries

The reference salaries (RS) change each year due to two different factors: the member's age and the conditions prevailing at the point in time under consideration.

- Age-related trends in the RS vary from one individual to another as they depend on the career, and thus age, of the person concerned. These age-related trends essentially comprise individual salary increases such as ordinary annual steps and increases due to promotion. They have been measured using a mathematical function in the projections. This mathematical function bases on the observations made on the membership as at 31 December 2009.
- Variations in the RS depend on the conditions prevailing at the given point in time and take account of inflation, general salary increases (changes in

ACTUARIAL REPORT AS AT 1 JANUARY 2010

the salary scale) and sectoral changes (reassessment of functions, etc.). They are represented by a global annual rate (j), which may vary from year to year. This rate is one of the parameters of the various evolving models considered and in this actuarial review essentially relates to inflation.

c. Pension adjustment

The modified Rules of the Pension Fund state that, as long as the expected funding ratio of the Fund is below 100 % in 2033, only part of the pension adjustment of the model concerned will be granted. The pension adjustment factor for the years 2011 - 2013 is thus determined in such a way as to ensure that, based on the actuarial parameters of the historical reference model as set in the actuarial study of 1 January 2007, the funding ratio reaches 100 % at 31 December 2033. Thus, a single pension adjustment rate is applied until 2033, but the cumulative loss of purchasing power incurred by an individual beneficiary from 1 January 2005 cannot exceed 8 %.

At the next three-yearly review, at the end of 2012, in compliance with the principle of having a 100 % funding ratio in 2033, and taking into account the assumptions of the historical reference model, the rate of adjustment for the coming three years will be recalculated using the same projection method and so on until 2033, but always taking into account that the cumulative loss of purchasing power incurred by an individual beneficiary from 1 January 2005 may not exceed 8 %. The table below shows the under-indexation of pensions observed since 1 January 2005:

Year	Inflation	Pension adjustment rate	Loss of purchasing power
2004	1.70%	0.00%	1.70%
2005	1.20%	0.99%	0.21%
2006	1.40%	1.16%	0.24%
2007	0.00%	0.00%	0.00%
2008	3.20%	2.60%	0.60%
2009	-0.80%	0.00%	-0.80%
Total :			1.95%

According to the above table, a member who started to receive a pension before 2004 has incurred a total loss of purchasing power of 1.95 % since the under-indexation measure came into force. This means that members in this position cannot incur a loss of purchasing power of more than 6.05 % (8 % minus 1.95 %) over the period of the projection.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

As soon as the funding ratio of the Fund is 100 % as at 31 December 2033, the whole of the assumed pension adjustment (2 % in the reference model, for example) is granted for the next 3 years.

To obtain a proper measurement of the sensitivity of the Fund's financial position to the various parameters, the under-indexation of pensions has not been introduced into all the models. The only model to include the under-indexation is M19.

d. Actuarial liabilities

As already explained, two sets of simulation have been done, with different methods for valuating actuarial liabilities.

In the historical models, we have deemed the actuarial liabilities to be the total amount of the pensions in payment added to the amount of the Fund's actuarial liabilities towards each individual active member, which are equal to 10 % of the current value of the deferred (non-indexed) retirement pension, plus 90 % of the transfer value. The current value of pensions in payment has been calculated taking into account the pension adjustment of the year of calculation but not future adjustments. Future adjustments are integrated gradually into the liabilities with each year of the projection that goes by, in accordance with the parameter of the model considered.

In the WG2 models, we have deemed the actuarial liabilities to be the total amount of the pensions in payment added to the amount of the Fund's actuarial liabilities towards each individual active member, which are equal to the maximum between the current value of the deferred (indexed) retirement pension and the transfer value. The current value of pensions in payment has been calculated taking into account future pension adjustments of 2 % per year.

As in the technical balance sheets in Appendices A, we have integrated a provision for increased life expectancy in the projections of Appendices C2 to C20. Thus, the current value of pensions in payment is increased by 0.5 % per year, or 5.0 % every 10 years. This provision is built up throughout the projection period to take account of trends in life expectancy over time, given that the calculations are based on the same actuarial tables (EVK 2000) throughout the period under review.

ACTUARIAL REPORT AS AT 1 JANUARY 2010*e. Other elements*

The projections are based on administrative costs amounting to 0.8 % of the total reference salaries.

4.3.3 Models considered (historical models)

The chosen projection period is 30 years for all historical models. It runs from 1 January 2010 to 31 December 2039. This duration allows measures to be taken sufficiently in advance to counter any adverse long-term trends in the financing of the Fund.

The main characteristics of the various models chosen are summarised in the table in Appendix B1.

The models were chosen in order to answer a number of questions (such as "what is the impact of the salary and pension adjustment on the financial balance of the Fund?") and to measure the influence of the main factors on the Fund's future trends. The various models have been grouped together as a function of the factor they are designed to illustrate. Thus:

- Model M00 is the reference model in that it serves as a basis for comparison to evaluate the trends in the Fund's financial position over the period under consideration and as a yardstick of the validity of our results. Models M02, M05, M10, M13, M14, M16, M18 and M20 are identical to Model M00. They have been interpolated into the table for the purposes of comparison.
- Models M01 to M03 will allow us to measure the impact of trends in the contributing membership.
- Models M04 to M08 show the impact of trends in salaries and pensions as a result of cost-of-living adjustments.
- Models M09 to M11 illustrate the influence of the return on assets, excluding management fees.
- Models M12 and M13 show the impact of changing the technical interest rate taken into consideration.
- Models M14 and M15 illustrate the consequences in the future of the increase in human life expectancy as observed in the past.
- Models M16 and M17 are designed to measure the impact of a change in the contribution rate.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

- Models M18 and M19 are designed to measure, in the framework of the under-indexation mechanism laid down in the Fund's Rules, the under-indexation of pensions required to achieve a 100 % funding ratio in 2033. This mechanism provides that, as long as the funding ratio is below 100 % in 2033, only part of the pension adjustment of the reference model is granted. However, the cumulative loss of purchasing power incurred by an individual beneficiary from 1 January 2005 onwards cannot exceed 8 %.
- Models M20 and M21 are designed to measure the impact of the new contract policy of the CERN towards new members. In this model, new entrants cannot terminate their contract within 5 years.

4.3.4 Presentation of the results (historical models)

a. General

The tables in Appendices C2 to C15 summarise the detailed 30-year projections for each model considered. Explanations of the abbreviations used in the headings of the columns of these tables are given in Appendix C1.

Model M00 is the reference model for the calculation of under-indexation and has a funding ratio lower than 100 % in 2033. This implies that the under-indexation mechanism laid down in the Fund's Rules must be implemented and that the under-indexation of the pensions enabling the reference model to reach 100 % in 2033 must be determined using Model M19. In this way, taking into account the under-indexation mechanism and on the basis of the assumptions in the reference model, the pension adjustment rate that allows a 100 % funding ratio to be achieved in 2033 is negative, i.e. even an indexation of 0 % cannot lead to a full funded situation at the end of 2033. This means that the under-indexation amounts to 2 percentage points, corresponding to the difference between the adjustment rate in the reference model (2 %) and that in Model M19 (0 %).

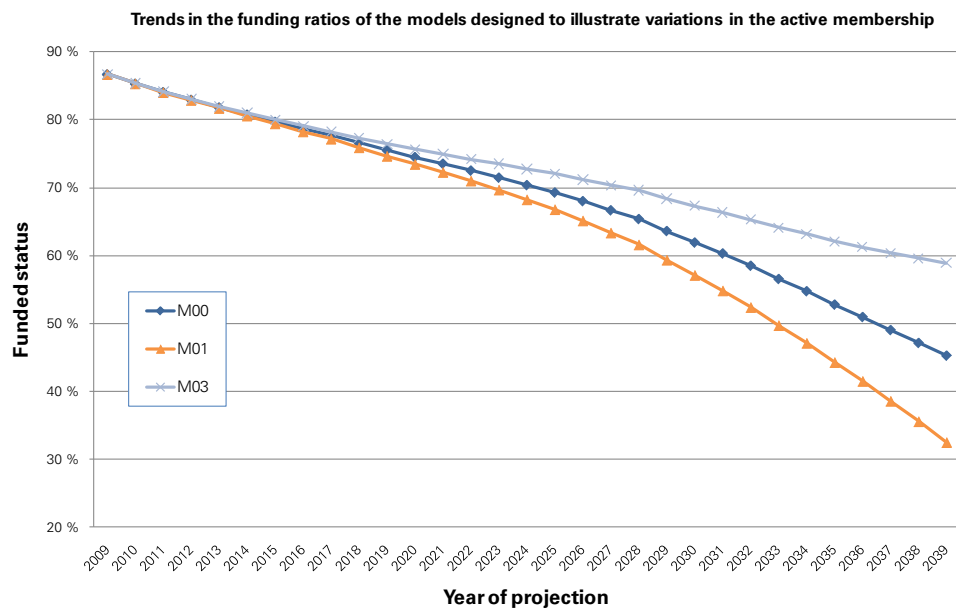
In the table on the following page, we show the funding ratio at the end of 10, 20 and 30 years for each model, as obtained by applying the contribution rate and the rate of return of the model concerned. This table also shows the difference in the funding ratio after 10, 20 and 30 years for each model compared to the reference model M00.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

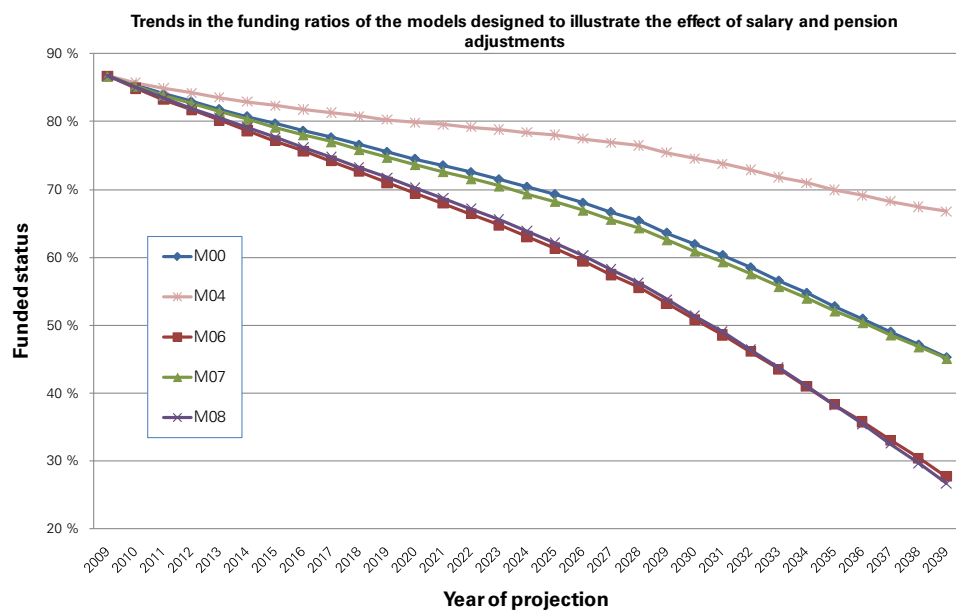
Model No.	Funding ratio after			Difference compared to model M00		
	10 years	20 years	30 years	10 years	20 years	30 years
M00	75.5 %	63.6 %	45.2 %	-	-	-
M01	74.7 %	59.4 %	32.5 %	- 0.9 %	- 4.2 %	-12.7 %
M02	75.5 %	63.6 %	45.2 %	-	-	-
M03	76.5 %	68.4 %	58.9 %	0.9 %	4.8 %	13.7 %
M04	80.3 %	75.4 %	66.7 %	4.8 %	11.8 %	21.5 %
M05	75.5 %	63.6 %	45.2 %	-	-	-
M06	71.0 %	53.2 %	27.7 %	- 4.5 %	-10.4 %	-17.5 %
M07	74.7 %	62.6 %	45.1 %	- 0.8 %	- 1.0 %	- 0.1 %
M08	71.7 %	53.8 %	26.7 %	- 3.8 %	- 9.8 %	-18.5 %
M09	70.8 %	52.6 %	26.6 %	- 4.7 %	-11.0 %	-18.6 %
M10	75.5 %	63.6 %	45.2 %	-	-	-
M11	80.4 %	75.8 %	67.5 %	4.9 %	12.2 %	22.3 %
M12	73.2 %	61.7 %	43.8 %	- 2.3 %	- 1.9 %	- 1.5 %
M13	75.5 %	63.6 %	45.2 %	-	-	-
M14	75.5 %	63.6 %	45.2 %	-	-	-
M15	80.8 %	70.2 %	51.9 %	5.3 %	6.6 %	6.7 %
M16	75.5 %	63.6 %	45.2 %	-	-	-
M17	79.2 %	73.5 %	64.5 %	3.7 %	9.9 %	19.3 %
M18	75.5 %	63.6 %	45.2 %	-	-	-
M19	82.3 %	75.7 %	65.0 %	6.8 %	12.1 %	19.8 %
M20	75.5 %	63.6 %	45.2 %	-	-	-
M21	75.5 %	63.8 %	46.0 %	0.0 %	0.2 %	0.7 %

The following graphs highlight more clearly the trend in the funding ratio over the projection period, depending on the model considered.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

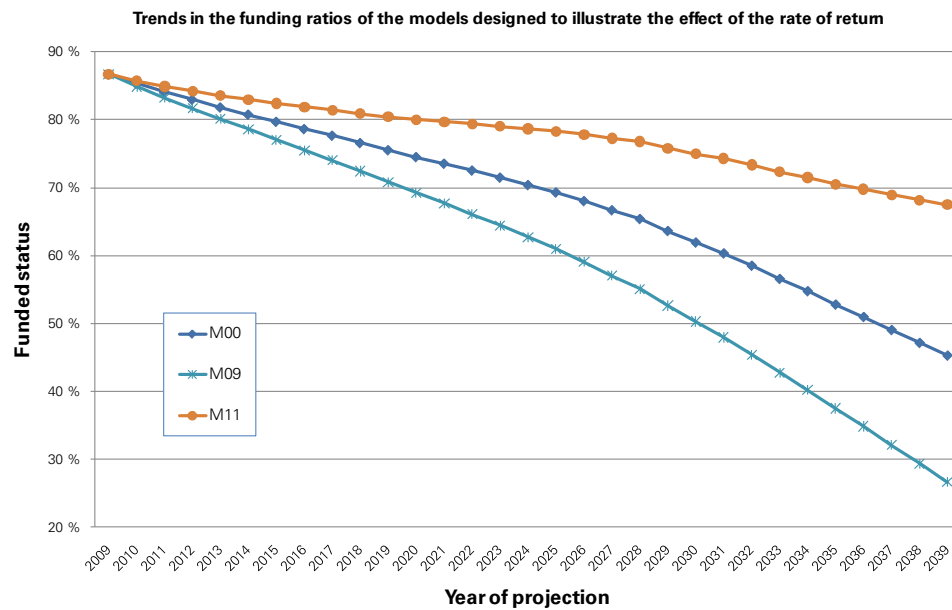


We note that a 1 % reduction in the population of active members per year leads after 30 years to a reduction in the funding ratio of 12.7 percentage points; a 1 % increase leads to a 13.7-point increase in the funding ratio.

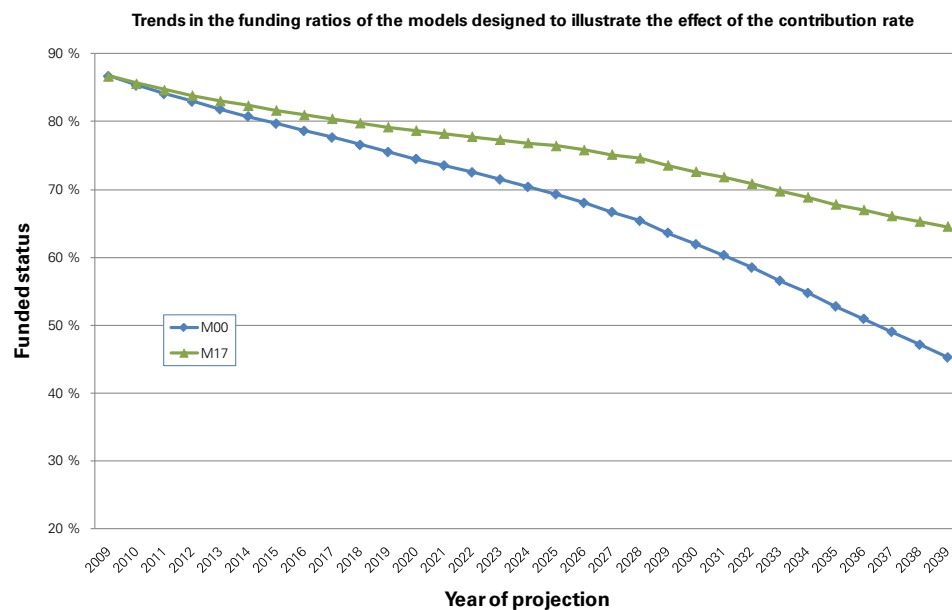


The above graph shows how divergences from the pension and salary adjustment parameters from those of the reference model M00 impact on the funding ratio. It clearly shows that pension adjustment has much more influence on the funding ratio than salary adjustment. It's due to an equivocal mechanism: salary increase has a strong impact on liabilities towards active members (negative effect), but also on contribution (positive effect).

ACTUARIAL REPORT AS AT 1 JANUARY 2010

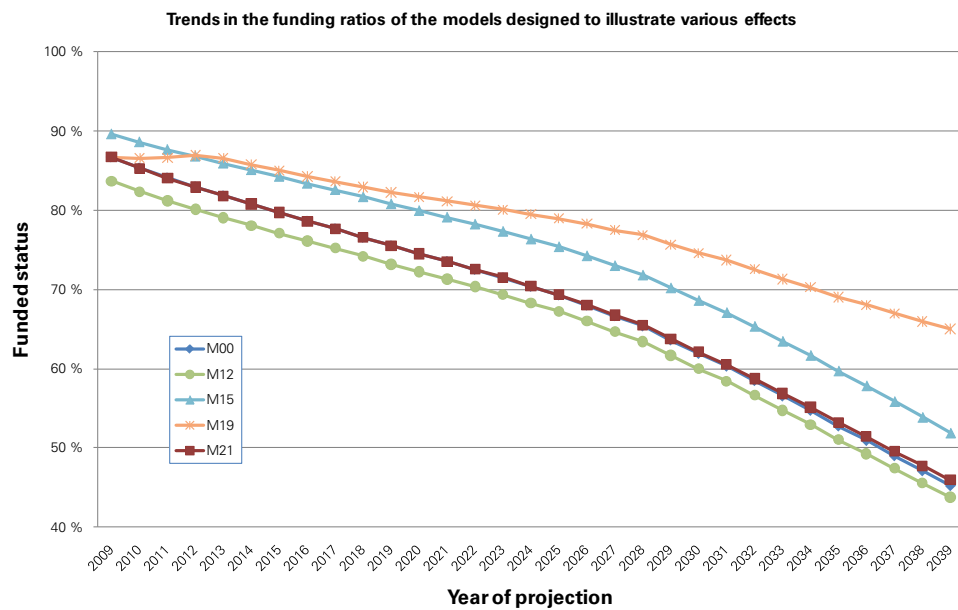


The above graph reveals that the return on assets is a decisive factor in the trend in the funding ratio of the Fund. Its impact is much greater than that of the contribution rate, as can be seen in the graph below.



In the following graph, it may be noted that the technical interest rate and the method for the new employment contract have a lesser impact on the funding ratio than the parameters examined previously. The building-up of a life-expectancy provision of 0.5 % of the pension capital of the beneficiaries per year has a non-negligible impact since its cost accounts for the equivalent of 6.7 percentage points of the funding ratio after 30 years.

ACTUARIAL REPORT AS AT 1 JANUARY 2010



All the models reveal a downward trend in the funding ratio. It is due to an insufficient initial funding ratio, which cannot generate enough performance to cover the interest cost due on the liabilities.

The two models with the most significant positive result compared to the reference model M00 are M04 and M11. This is due to a higher performance for the model M11 and a lower pension indexation for the model M04.

The funding ratio concerned does not evolve uniformly over time in all the models. In some models, it decreases more rapidly than in others. However, we consider that a 30-year period is long enough to evaluate the long-term financial balance of the Fund, despite the fact that the longer the projection period, the greater the inaccuracy of the results. It is less the results themselves than their trends in the fairly long term that count.

For the models with a different technical interest rate, a different mortality table or without taking account of the longevity provision, the initial funding ratio as at 1 January 2010 is not the same, since these three factors have not only an impact in the long term but also an immediate impact on the level of liabilities.

b. Trends since the last review

Model M00 (2010) is comparable to Model M03 of the last review [M03 (2007)]. It therefore allows us to measure the trend in the Fund's

ACTUARIAL REPORT AS AT 1 JANUARY 2010

financial position from one review to another, assuming decisive factors that remain constant; however, although the parameters relating to the adjustment of reference salaries and pensions are comparable in the aforementioned two models, Model M00 integrates the actual trends over the last three years in the overall assets, the contributing membership, the cases of death and disability, resignations and retirements as well as the adjustment of salaries and pensions.

The table below summarises the trends in the main headings between the last and the present review.

Heading/Model	M03 (2007)	M00 (2010)	Difference¹
Necessary contribution rate ²	33.82 %	39.75 %	5.92 %
Necessary target rate of return ³	5.3 %	6.1 %	0.8 %
Final technical balance ⁴	- 720.2	-3,128.9	_ ⁹
Updated technical balance ⁵	- 192.3	- 835.4	_ ⁹
Updated technical balance ⁶	- 219.4	- 835.4	- 616.0
Final funding ratio ⁴	87.8 %	45.2 %	_ ⁹
Technical balance in the 2036 ⁷	- 720.2	-2,729.2	-2,009.0
Updated technical balance ⁸	- 219.4	- 831.6	- 612.1
Funding ratio in 2036	87.8 %	50.9 %	-36.9 %
1) The difference between M03 (2007) et M00 (2010) is not cumulative. 2) If the average annual rate of return is 5%. 3) If the contribution rate is 30.88% 4) At the end of 2036 for model M03 (2007) and at the end of 2039 for model M00 (2010). 5) Updated final technical balance as at 1.01.2007 for model M03 (2007) and as at 1.01.2010 for model M00 (2010). 6) Updated final technical balance as at 1.01.2010 for both models. 7) 2036 is the last year of the projection of model M03 (2007). 8) Technical balance in 2036 updated as at 1.01.2010. 9) The difference has no significance here as the value dates are not the same.			

The contribution rate required to balance Model M03 in the last review was 33.82 % and the corresponding technical deficit after 30 years stood at 720.2 MCHF, whereas at 1 January 2010 the necessary contribution rate is 39.75 % and the technical deficit after 30 years is 3,128.9 MCHF. The difference between these results shows that there has been a significant decrease in the Fund's 30-year financial position. In our opinion, the main reason for this is the marked decrease in the Fund's assets as a result of a very bad performance over the last 3 years (see Paragraph 2.3.2), much lower than the 5 % assumption of the reference model M00.

ACTUARIAL REPORT AS AT 1 JANUARY 2010*c. Analysis of the financial position according to the reference model*

Model M00 is referred to as the "reference model" for measuring sensitivities. It provides for an average salary adjustment, in addition to normal merit-based increases, of 2 % per year, an average annual pension adjustment of 2 % and an average net annual rate of return on assets that is 3 percentage points higher than the pension adjustment rate. This model also takes into consideration an annual charge of 0.5 % of the mathematical reserves for the pensions in payment to reflect increased life expectancy and does not take account of future pension adjustments in the calculation of the actuarial liabilities.

The projection results show that, in Model M00, if the rate of return is 5 %, the contribution rate of 30.88 % is insufficient for the purposes of achieving a 100 % funding ratio in the long term and, to an even greater extent, for the purposes of maintaining the initial funding ratio of 86.7 %. In this model, the funding ratio is 45.2 % at the end of the 30-year projection period. In order to reach full funding after 30 years in accordance with the CERN Council's decision (CERN/GB/136.2/Rev.) (see paragraph 4.1.3.), the required contribution rate and return target are 39.75 % and 6.10 % respectively.

If, as provided for by the Fund's Rules, the under-indexation mechanism is included in the calculation (Model M19), the contribution rate needed to reach full funding after 30 years falls to 36.40 % or the rate of return to 5.69 %. As mentioned above, an under-indexation of 2 percentage points (giving a pension adjustment rate of 0 % instead of 2 %) is insufficient in order to achieve a 100 % funding ratio in 2033 under the assumptions of model M00. Because a negative indexation isn't possible, this means that the under-indexation mechanism cannot lead itself to a full funded situation at the end of 2033. The level of this under-indexation is strongly influenced by the 8 % maximum cumulative loss of purchasing power to be incurred by each individual pension, stipulated in paragraph b) of Annex C of the Fund's Rules. Once this maximum has been reached, the pensions have to be fully indexed again according to the Geneva consumer price index for the following years. With this mechanism, the greater the under-indexation is, the shorter the period during which an individual pensioner will have to contribute to this measure will be.

ACTUARIAL REPORT AS AT 1 JANUARY 2010*d. Necessary contribution rates and return targets*

We should like to point out that the necessary contribution rate corresponds to the contribution rate that would need to be applied from 1 January 2010 onwards, based on the return assumption of the model concerned, in order to achieve the target funding ratio. The return target represents the average annual rate of return that would need to be achieved, based on the contribution rate of the model concerned, in order to reach the target funding ratio.

In the following tables, we present the contribution rates and return targets needed to reach a target funding ratio of 100 % after 10, 20 or 30 years.

Model	Necessary contribution rate			Return target		
No.	10 years	20 years	30 years	10 years	20 years	30 years
M00	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M01	53.1 %	44.3 %	42.3 %	7.4 %	6.5 %	6.3 %
M02	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M03	50.1 %	40.3 %	37.3 %	7.2 %	6.2 %	5.9 %
M04	47.1 %	38.2 %	35.8 %	6.8 %	5.9 %	5.6 %
M05	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M06	56.0 %	46.4 %	43.6 %	7.8 %	6.8 %	6.6 %
M07	52.2 %	42.7 %	40.1 %	7.4 %	6.4 %	6.2 %
M08	55.5 %	46.0 %	43.4 %	7.7 %	6.8 %	6.5 %
M09	56.2 %	46.5 %	43.8 %	7.3 %	6.4 %	6.1 %
M10	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M11	47.0 %	38.1 %	35.7 %	7.3 %	6.4 %	6.1 %
M12	54.3 %	43.3 %	40.3 %	7.5 %	6.5 %	6.2 %
M13	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M14	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M15	46.1 %	39.4 %	37.7 %	6.7 %	6.0 %	5.9 %
M16	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M17	51.6 %	42.3 %	39.7 %	6.9 %	6.0 %	5.7 %
M18	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M19	45.3 %	38.3 %	36.4 %	6.6 %	5.9 %	5.7 %
M20	51.6 %	42.3 %	39.7 %	7.3 %	6.4 %	6.1 %
M21	51.7 %	42.3 %	39.8 %	7.3 %	6.4 %	6.1 %

ACTUARIAL REPORT AS AT 1 JANUARY 2010

The table above summarises the results that are needed to assess the trends in the Fund's financial balance in a projective dynamic situation. Analysis of the most important factors leads to the considerations set out below.

e. Sensitivity of the various projection parameters

The following table shows the sensitivity of each parameter compared to the reference model in terms of the 10, 20 and 30 year funding ratio.

Sensitivity of the funding ratio					
Funding ratio of model M00			10 years	20 years	30 years
			75.51 %	63.61 %	45.23 %
Parameters	M00	Variations			
Number of active members	constant	- 1.00 %	- 0.86 %	- 4.25 %	- 12.74 %
		+ 1.00 %	+ 0.94 %	+ 4.77 %	+ 13.66 %
Cost-of-living adjustment salaries / pensions	2.0 % / 2.0 %	-0.5 % / -0.5 %	+ 4.76 %	+ 11.83 %	+ 21.51 %
		+0.5 % / +0.5 %	- 4.49 %	- 10.41 %	- 17.49 %
		+0.5 % / +0.0 %	- 0.77 %	- 1.02 %	- 0.15 %
		+0.0 % / +0.5 %	- 3.79 %	- 9.77 %	- 18.55 %
Rate of return	+ 5.00 %	- 0.50 %	- 4.69 %	- 10.97 %	- 18.62 %
		+ 0.50 %	+ 4.92 %	+ 12.22 %	+ 22.27 %
Technical interest rate	+ 4.50 %	- 0.50 %	- 2.33 %	- 1.94 %	- 1.48 %
Provision for increased life expectancy	YES	NO	+ 5.28 %	+ 6.59 %	+ 6.66 %
Contribution rate	+ 30.88 %	+ 3.12 %	+ 3.69 %	+ 9.93 %	+ 19.27 %
Under-indexation of pensions	NO	YES	+ 6.77 %	+ 12.07 %	+ 19.79 %
Contract Policy	Old	New	- 0.00 %	+ 0.18 %	+ 0.73 %

The following table shows the sensitivity of each parameter compared to the reference model in terms of the contribution rate required to achieve a funding ratio of 100 % after 10, 20 or 30 years.

Sensitivity of the contribution rate to reach the full funding					
Contribution target of model M00			10 years	20 years	30 years
			51.60 %	42.31 %	39.75 %
Parameters	M00	Variations			
Number of active members	constant	- 1.00 %	+ 1.50 %	+ 2.03 %	+ 2.53 %
		+ 1.00 %	- 1.51 %	- 2.04 %	- 2.49 %
Cost-of-living adjustment salaries / pensions	2.0 % / 2.0 %	-0.5 % / -0.5 %	- 4.47 %	- 4.12 %	- 3.93 %
		+0.5 % / +0.5 %	+ 4.44 %	+ 4.06 %	+ 3.83 %
		+0.5 % / +0.0 %	+ 0.57 %	+ 0.43 %	+ 0.32 %
		+0.0 % / +0.5 %	+ 3.94 %	+ 3.71 %	+ 3.61 %
Rate of return	+ 5.00 %	- 0.50 %	+ 4.59 %	+ 4.24 %	+ 4.02 %
		+ 0.50 %	- 4.57 %	- 4.23 %	- 4.02 %
Technical interest rate	+ 4.50 %	- 0.50 %	+ 2.69 %	+ 0.99 %	+ 0.55 %
Provision for increased life expectancy	YES	NO	- 5.53 %	- 2.95 %	- 2.08 %
Under-indexation of pensions	NO	YES	- 6.29 %	- 4.00 %	- 3.35 %
Contract Policy	Old	New	+ 0.07 %	+ 0.03 %	+ 0.03 %

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Taking the example of the technical interest rate, the results of the above table should be interpreted as follows: in Model M00, where the technical interest rate is 4.5 %, the contribution rate needed to reach a full funding situation after 30 years is 39.75 %; if the technical interest rate is reduced by 0.5 % to 4.0 %, the necessary contribution rate increases by 0.55 %.

The following table shows the sensitivity of each parameter compared to the reference model in terms of the target rate of return required to achieve a 100 % funding ratio after 10, 20 or 30 years.

Sensitivity of the rate of return to reach the full funding					
Return target of model M00			10 years	20 years	30 years
			7.29 %	6.36 %	6.10 %
Parameters	M00	Variations			
Number of active members	constant	- 1.00 %	+ 0.07 %	+ 0.13 %	+ 0.17 %
		+ 1.00 %	- 0.08 %	- 0.15 %	- 0.21 %
Cost-of-living adjustment salaries / pensions	2.0 % / 2.0 %	-0.5 % / -0.5 %	- 0.49 %	- 0.49 %	- 0.49 %
		+0.5 % / +0.5 %	+ 0.49 %	+ 0.49 %	+ 0.48 %
		+0.5 % / +0.0 %	+ 0.10 %	+ 0.09 %	+ 0.08 %
		+0.0 % / +0.5 %	+ 0.39 %	+ 0.40 %	+ 0.41 %
Technical interest rate	+ 4.50 %	- 0.50 %	+ 0.26 %	+ 0.10 %	+ 0.06 %
Provision for increased life expectancy	YES	NO	- 0.56 %	- 0.32 %	- 0.22 %
Contribution rate	+ 30.88 %	+ 3.12 %	- 0.35 %	- 0.37 %	- 0.39 %
Under-indexation of pensions	NO	YES	- 0.66 %	- 0.47 %	- 0.41 %
Contract Policy	Old	New	+ 0.00 %	+ 0.00 %	- 0.00 %

Based on the results of the above tables, we note that the parameters with the greatest impact on the financial balance of the Fund are the adjustment of pensions and the return on assets.

The above results call for the following comments on our part:

- A salary adjustment of half a percentage point corresponds to an increase of 0.32 percentage points in the necessary contributions or 0.08 points in the rate of return over 30 years.
- A pension adjustment of half a percentage point requires additional contributions of 3.61 percentage points or an increase in the rate of return of 0.41 percentage points over 30 years.
- The application of an adjustment factor of 0 % according to Annex C of the Rules and Regulations of CERNPF (i.e. 0 % pension indexation as long as the maximum of 8 % is not reached) allows the funding ratio in 30 years to increase by 19.8 points and represents a contribution saving of 3.35 points or a saving in return of 0.41 point with respect to model M00.

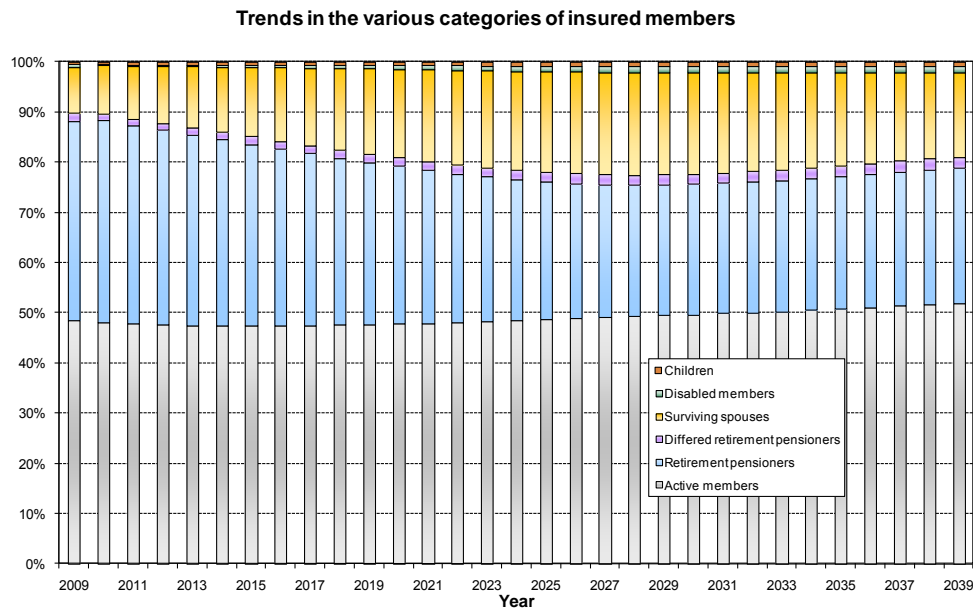
ACTUARIAL REPORT AS AT 1 JANUARY 2010

- An increase in the average annual rate of return by half a percentage point allows a saving of 4.02 percentage points in contributions over 30 years and increases the funding ratio after 30 years by 22.27 percentage points. It may be concluded that a leverage effect of 1 to approximately 8 exists between the rate of return and the contribution rate. Because of the degradation of the funding ratio, this value is lower than the ratio between the assets and the total reference salaries as at 1 January 2010.
- The building-up of a reserve for increased life expectancy over the projection period requires additional contributions of 2.08 percentage points or an increase in the rate of return of 0.22 percentage points. It should be borne in mind that life expectancy is, of course, a parameter that cannot be modified or negotiated. We nonetheless present the sensitivities of this parameter for information purposes.
- Sensitivity to mortality table will be the subject of a longevity study that will be reviewed in 2011.
- The technical interest rate has a relatively small impact as the funding ratio after 30 years decreases by 1.4 percentage points compared to the beginning of the projection period.
- The new contract policy of CERN towards new members (no termination allowed less than 5 years of employment) brings about a 0.73-point increase in the funding ratio over 30 years. Thus, this measure has almost no impact because it is applied in the historical model where the liabilities toward active members correspond to 90 % of the transfer value and 10 % of the deferred pension value and where only 10 % of the terminated members choose the deferred pension.

f. Trends in demographic structure, in liabilities and in cash flows

The following graph highlights the average trends of the Fund's demographic structure in the future. It shows the trends in the categories of insured members, including the pension beneficiaries. It should be noted that the "children" category covers the children of retired members, orphans and the children of beneficiaries of a disability pension.

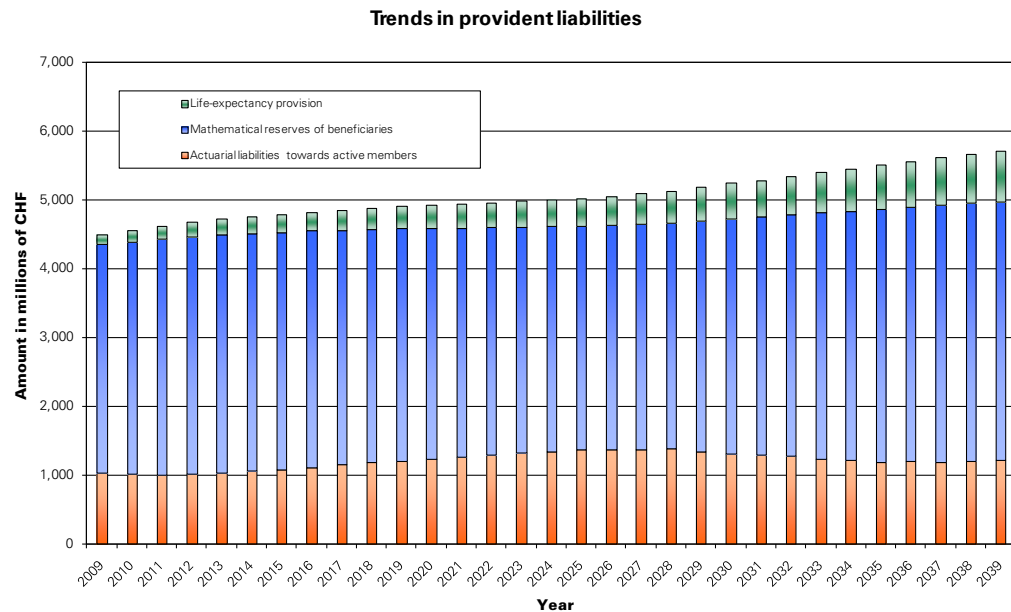
ACTUARIAL REPORT AS AT 1 JANUARY 2010



The points where the grey and blue zones meet represent the demographic ratio of the Fund. The ratio of active members to pensioners is lower than 1:1 at the beginning of the projection period but then rise slightly over that ratio after 2033. However, it should be borne in mind that Model M00 assumes that the number of active members remains constant for the whole period considered, so there is a renewal in the insured population that can maintain the parity between active members and beneficiaries. With a decrease in the active population, this consideration isn't relevant anymore.

The graph also shows a continual fall in the number of pensioners from 40 % at the end of 2009 to 27 % at the end of the projection period. On the other hand, the number of surviving spouses increases steadily until around 2028, then decreases slightly in the following years.

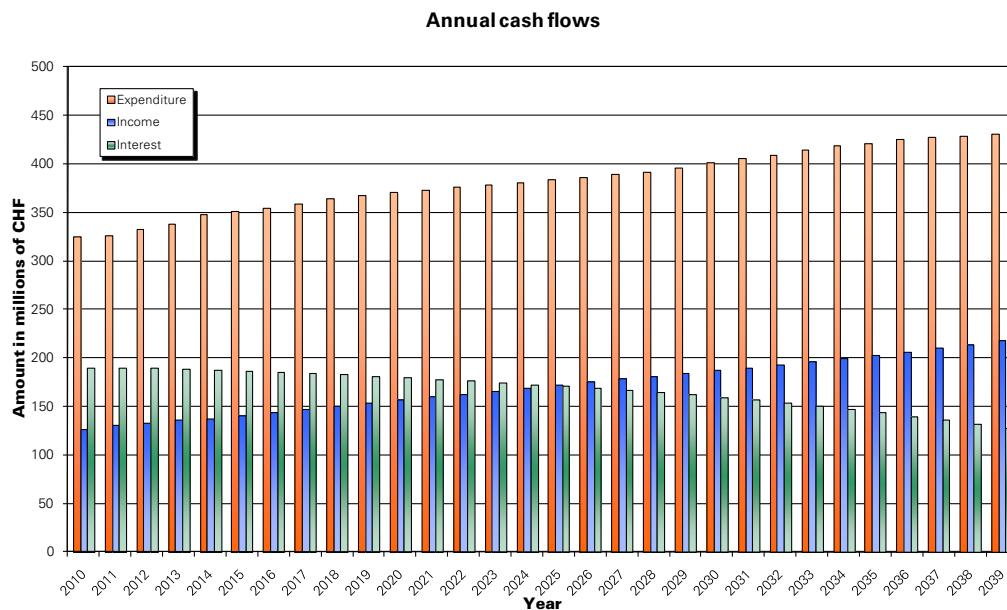
ACTUARIAL REPORT AS AT 1 JANUARY 2010



The Fund's sensitivity to the pension adjustment rate is the natural result of the significant proportion of liabilities accounted for by the mathematical reserves for pension beneficiaries. Throughout the projection period, the mathematical reserves for the beneficiaries represent between 64 % and 74 % of the Fund's total liabilities. A 2 % pension indexation results in an increase in liabilities of about 1.36 % per year or 50.0 % over 30 years.

It is interesting to note that the reduction in the demographic ratio only partially impacts the breakdown of liabilities.

The much smaller sensitivity to the contribution rate than to the pension adjustment lies in the fact that, on average, contributions amount to only 44 % of the total pensions paid over the projection period. This means that an increase in pension indexation has an impact on the Fund's cash-flows nearly twice that of an increase in the contribution rate. The graph below is a good illustration of how contributions and the interest on the Fund's assets contribute to the funding of the CERNPF, and of the Fund's strong dependence on the performance of the financial markets. It should be noted that expenditure is made up of pensions and transfer values paid, plus overheads, while income consists of contributions.

ACTUARIAL REPORT AS AT 1 JANUARY 2010*g. Observations*

The technical balance sheet results in Appendix A1, drawn up on a closed-fund basis, lead us to conclude that the actuarial and financial position of the Fund is insufficient as at 31 December 2009, given the historical method applied to calculate the Fund's liabilities towards the active members. The funding ratio or rate of capitalisation is 86.7 %. In the event of total liquidation of the Organization, the total actuarial liabilities according to the historical method are not fully covered.

The detailed projective analysis we have presented shows that the current contribution rate of 30.88 % is insufficient to reach a funding ratio of 100 % at the end of the 30-year projection period even if the policy of under-indexation of pensions is followed in accordance with the Rules of the Fund, and assuming that the Fund is capable of achieving an average annual return of at least 5 %. Moreover, the current contribution rate does not allow the Fund to maintain its initial funding ratio. If the Fund wishes to avoid a capitalisation shortfall and provided that any reduction in staff numbers is compensated and there is no adjustment of pensions as long as the under-indexation limit of 8 % is not reached, the contribution rate must be increased to 36.40 % (+5.52 percentage points) or the average annual rate of return must increase to 5.69 % (+ 0.69 percentage points), which is not realistic given the target return of the Fund's current strategic allocation (5.4 %).

ACTUARIAL REPORT AS AT 1 JANUARY 2010

4.3.5 Models considered (WG2 models)

The chosen projection period is also 30 years for all WG2 models. It runs from 1 January 2010 to 31 December 2039. This duration allows measures to be taken sufficiently in advance to counter any adverse long-term trends in the financing of the Fund.

The main characteristics of the various models chosen are summarised in the table in Appendix B2.

The models were chosen in order to measure the influence of the main factors on the Fund's future evolution. The various models have been grouped together as a function of the factor they are designed to illustrate. Thus:

- The models MM03a and b are the reference models in that they serve as a basis for comparison to evaluate the trends in the Fund's financial position over the period under consideration and as a yardstick of the validity of our results.
- Models MM01a and b are models which use the old method of calculation for the liabilities towards the active members ($90\% \times \text{transfer value} + 10\% \times \text{mathematical reserves of deferred pensions}$).
- Model MM08 shows the impact of changing the technical interest rate¹¹.

For the models MM03a and MM08, the initial funding ratio is the real one at the end of December 2009, so 67.9 %. For the model MM01a, the initial funding ratio is 74.6 % with the same assets level as in models MM03a and MM08. For the models MM03b and MM01b, the initial situation at the end of 2009 is a hypothetical full-funded situation. This difference allows us to separate the effect of the financial crisis and the effect of the structure of the fund.

Finally, we would like to emphasize that the hypotheses of the actuarial models are the same that those that were chosen by WG II.

¹¹ According to the request of WG II, the rate of return varies in the same proportion as the technical interest rate, i.e. 4.5 % of return for a technical interest rate of 4.0 %.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

4.3.6 Presentation of the results (WG2 Models)

a. General

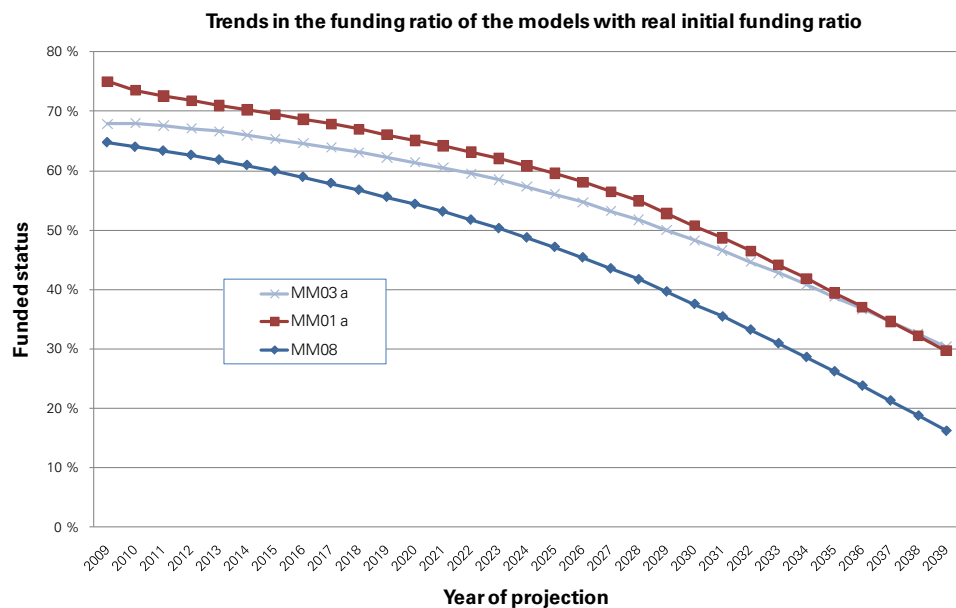
The tables in Appendices C16 to C20 summarise the detailed 30-year projections for each model considered. Explanations of the abbreviations used in the headings of the columns of these tables are given in Appendix C1.

In the table on the following page, we show the funding ratio at the end of 10, 20 and 30 years for each model, as obtained by applying the contribution rate and the rate of return of the model concerned. This table also shows the difference in the funding ratio after 10, 20 and 30 years for each model compared to the reference model MM03a.

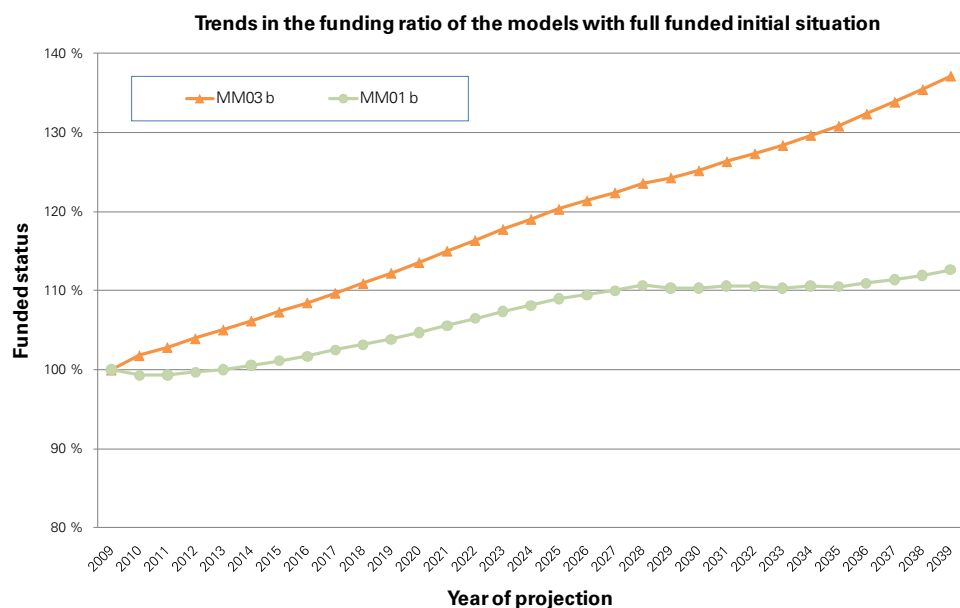
Model No.	Funding ratio after			Difference compared to model MM03 a		
	10 years	20 years	30 years	10 years	20 years	30 years
MM03 a	62.3 %	50.0 %	30.3 %	-	-	-
MM03 b	112.2 %	124.3 %	137.1 %	50.0 %	74.3 %	106.8 %
MM01 a	66.0 %	52.8 %	29.7 %	3.8 %	2.8 %	- 0.7 %
MM01 b	103.8 %	110.3 %	112.6 %	41.6 %	60.3 %	82.3 %
MM08	55.5 %	39.6 %	16.2 %	- 6.7 %	-10.4 %	-14.1 %

The following graphs highlight more clearly the trend in the funding ratio over the projection period, depending on the initial funding ratio considered (real or 100 %).

ACTUARIAL REPORT AS AT 1 JANUARY 2010



We note that the change in the valuation method for the liabilities towards active members (maximum method versus weighted-sum method) has little impact in the long-term.



The above graph contains all full-funded models. It clearly shows that a full-funded situation at the end of 2009 leads to a positive trend in the future in all the models.

All the models with a real initial situation reveal a downward trend in the funding ratio. It is due to an insufficient initial funding ratio, which cannot generate enough performance to cover the interest cost due on the liabilities.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

All the models with a full cover at the end of 2009 have a positive trend. It means that if the initial gap would be covered, the performance generated would be sufficient to maintain and increase the future funding ratio.

The funding ratio concerned does not evolve uniformly over time in all the models. In some models, it decreases more rapidly than in others. However, we consider that a 30-year period is long enough to evaluate the long-term financial balance of the Fund, despite the fact that the longer the projection period, the greater the inaccuracy of the results. It is less the results themselves than their trends in the fairly long term that count.

Not all the models have the same initial funding ratio as at 1 January 2010 since either a different method is used for calculating liabilities towards the active members, or a different initial funding situation (real or full funded) or a different technical interest rate are considered.

b. Trends since the last review

Model MM03b (2010) is comparable to Model MM03b of the WG2 study (2009). It therefore allows us to measure the trend in the Fund's financial position from one review to another, assuming decisive factors that remain constant; however, although the parameters relating to the adjustment of reference salaries and pensions are comparable in the aforementioned two models, Model MM03a integrates the actual trends over the last three years in the contributing membership, the cases of death and disability, resignations and retirements as well as the adjustment of salaries. It also integrates the real rate of return for the year 2009 and the effective indexation of pension for the last year.

The table below summarises the trends in the main headings between WG2 study and the present review.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Heading/Model	MM03b (2009)	MM03a (2010)	Difference¹
Necessary contribution rate ²	53.95 %	45.60 %	-8.35 %
Necessary target rate of return ³	7.5 %	6.7 %	-0.8 %
Final technical balance ⁴	-7'390.3	-5'202.0	_ ⁹
Updated technical balance ⁵	-1'973.2	-1'388.9	_ ⁹
Updated technical balance ⁶	-2'062.0	-1'388.9	673.1
Final funding ratio ⁴	-3.4 %	30.3 %	_ ⁹
Technical balance in the 2038 ⁷	-7'390.3	-4'981.1	2'409.1
Updated technical balance ⁸	-2'062.0	-1'389.8	672.2
Funding ratio in 2036	-3.4 %	32.5 %	35.9 %
1) The difference between MM03b (2009) and MM03a (2010) is not cumulative. 2) If the average annual rate of return is 5%. 3) If the contribution rate is 30.88% 4) At the end of 2038 for model MM03b (2009) and at the end of 2039 for model MM03a (2010). 5) Updated final technical balance as at 1.01.2009 for model MM03b (2009) and as at 1.01.2010 for model MM03a (2010). 6) Updated final technical balance as at 1.01.2010 for both models. 7) 2038 is the last year of the projection of model MM03b (2009). 8) Technical balance in 2038 updated as at 1.01.2010. 9) The difference has no significance here as the value dates are not the same.			

The contribution rate required to balance Model MM03b in the WG2 study was 53.95 % and the corresponding technical deficit stood at 7,390.3 MCHF, whereas at 1st January 2010 the necessary contribution rate is 45.60 % and the technical deficit is 5,202.0 MCHF. The difference between these results shows that there has been a significant increase in the Fund's 30-year financial position. The main reason for this is the marked increase in the Fund's assets as a result of a good performance for the last year (see Paragraph 2.3.2), higher than the 5 % assumption of the reference model MM03a.

c. Analysis of the financial position according to the reference model

Model MM03a is referred to as the "reference model" for measuring sensitivities. It provides for an average salary adjustment, in addition to normal merit-based increases, of 2 % per year, an average annual pension adjustment of 2 % and an average net annual rate of return on assets that is 3 percentage points higher than the pension adjustment rate. This model also takes into consideration an annual charge of 0.5 % of the mathematical reserves for the pensions in payment to reflect increased life expectancy and

ACTUARIAL REPORT AS AT 1 JANUARY 2010

takes account of future pension adjustments in the calculation of the actuarial liabilities.

The projection results show that, in Model MM03a, if the rate of return is 5 %, the contribution rate of 30.88 % is insufficient for the purposes of achieving a 100 % funding ratio in the long term and, to an even greater extent, for the purposes of maintaining the initial funding ratio of 67.9 %. In this model, the funding ratio is 30.3 % at the end of the 30-year projection period. In order to maintain the initial funding ratio in accordance with the CERN Council's decision (CERN/GB/136.2/Rev.) (see paragraph 4.1.3.), the required contribution rate and return target are 45.60 % and 6.65 % respectively.

d. Necessary contribution rates and return targets

We should like to point out that the necessary contribution rate corresponds to the contribution rate that would need to be applied from 1 January 2010 onwards, based on the return assumption of the model concerned, in order to achieve the target funding ratio. The return target represents the average annual rate of return that would need to be achieved, based on the contribution rate of the model concerned, in order to reach the target funding ratio.

In the following tables we present the contribution rates and return targets needed to reach a target funding ratio of 100 % after 10, 20 or 30 years.

Model No.	Necessary contribution rate			Return target		
	10 years	20 years	30 years	10 years	20 years	30 years
MM03 a	70.0 %	50.8 %	45.6 %	9.0 %	7.2 %	6.7 %
MM03 b	18.2 %	21.2 %	23.0 %	4.0 %	4.2 %	4.3 %
MM01 a	63.7 %	48.0 %	44.4 %	8.4 %	6.9 %	6.6 %
MM01 b	27.2 %	27.1 %	28.5 %	4.7 %	4.7 %	4.8 %
MM08	81.0 %	57.8 %	51.4 %	9.4 %	7.3 %	6.7 %

The table above summarises the results that are needed to assess the trends in the Fund's financial balance in a projective dynamic situation. Analysis of the most important factors leads to the considerations set out below.

ACTUARIAL REPORT AS AT 1 JANUARY 2010

e. Sensitivity of the various projection parameters

The following table shows the sensitivity of each parameter compared to the reference model in terms of the 10, 20 and 30 year funding ratio.

Sensitivity of the funding ratio					
Funding ratio of model MM03 a			10 years	20 years	30 years
			62.26 %	50.00 %	30.33 %
Parameters	MM03 a	New value			
Initial funding status	real (67,9 %)	full funded (100 %)	+ 49.98 %	+ 74.27 %	+ 106.80 %
Method of valuation of liabilities towards active members	Max(VT ; RMPD)	0.9xVT+0.1xRMPD	+ 3.76 %	+ 2.79 %	- 0.65 %
		0.9xVT+0.1xRMPD + full funded	+ 41.58 %	+ 60.32 %	+ 82.29 %
Technical interest rate / rate of return	4.5 % / 5.0 %	4.0 % / 4.5 %	- 6.72 %	- 10.36 %	- 14.10 %

The following table shows the sensitivity of each parameter compared to the reference model in terms of the contribution rate required to achieve a funding ratio of 100 % after 10, 20 or 30 years.

Sensitivity of the contribution rate to reach/maintain the full funding					
Contribution target of model MM03 a			10 years	20 years	30 years
			70.01 %	50.81 %	45.60 %
Parameters	MM03 a	New value			
Initial funding status	real (67,9 %)	full funded (100 %)	- 51.81 %	- 29.60 %	- 22.56 %
Method of valuation of liabilities towards active members	Max(VT ; RMPD)	0.9xVT+0.1xRMPD	- 6.33 %	- 2.81 %	- 1.23 %
		0.9xVT+0.1xRMPD + full funded	- 42.83 %	- 23.67 %	- 17.14 %
Technical interest rate / rate of return	4.5 % / 5.0 %	4.0 % / 4.5 %	+ 10.95 %	+ 7.03 %	+ 5.83 %

Taking the example of the technical interest rate, the results of the above tables should be interpreted as follows: in Model MM03 a, where the technical interest rate is 4.5 %, the contribution rate needed to reach a full funding situation after 30 years is 45.60 %; if the technical interest rate is reduced by 0.5 % to 4.0 % with a parallel reduction of the rate of return, the necessary contribution rate increases by 5.83 %.

The following table shows the sensitivity of each parameter compared to the reference model in terms of the target rate of return required to achieve a 100 % funding ratio after 10, 20 or 30 years.

Sensitivity of the rate of return to reach/maintain the full funding					
Return target of model MM03 a			10 years	20 years	30 years
			8.97 %	7.15 %	6.65 %
Parameters	MM03 a	New value			
Initial funding status	real (67,9 %)	full funded (100 %)	- 4.98 %	- 2.96 %	- 2.32 %
Method of valuation of liabilities towards active members	Max(VT ; RMPD)	0.9xVT+0.1xRMPD	- 0.54 %	- 0.24 %	- 0.09 %
		0.9xVT+0.1xRMPD + full funded	- 4.29 %	- 2.50 %	- 1.88 %
Technical interest rate	+ 4.50 %	+ 4.00 %	+ 0.46 %	+ 0.17 %	+ 0.09 %

ACTUARIAL REPORT AS AT 1 JANUARY 2010

Based on the results of the above tables, we note that the initial funding situation (real or full-funded) has a great impact on the financial balance of the Fund.

The above tables call for the following comments:

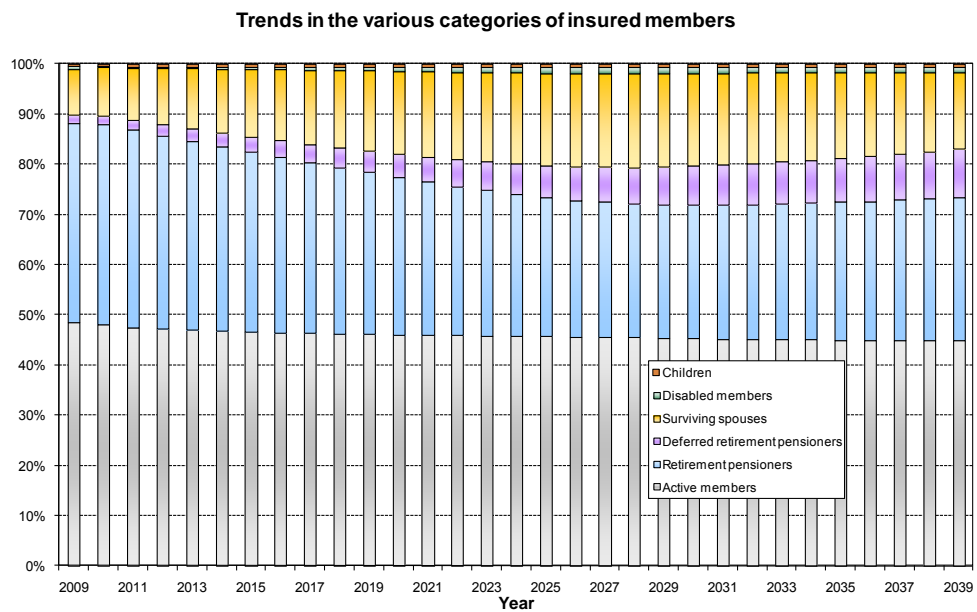
- The new method of calculating the Fund's actuarial liabilities towards active members (maximum value between the transfer value and the mathematical reserves for deferred pensions) has almost no influence on the funded status after 30 years: +0.65 (-3.2)¹² points of funded status over 30 years projecting from 31 December 2009 if the initial level of assets is the real one.
- The necessary contribution rate of model MM03a (reference model starting with the effective funded status as of 31 December 2009) which permits to aim at a funded status of 100 % in 30 years amounts to 45.60 % (53.95 %). The return target that allows the same result amounts to 6.65 % (7.50 %).
- Considering a full-funded situation (model MM03b) implies a decrease of 22.56 points on the necessary contribution rate over 30 years. This gap of contribution could be considered as a "remediation contribution".
- The reduction of the technical interest rate with an equivalent reduction of performance rate on assets has a relatively high impact over 30 years, because this reduction implies an increase of 5.8 percentage point of additional contribution rate over 30 years.

f. Trends in demographic structure, in liabilities and in cash flows

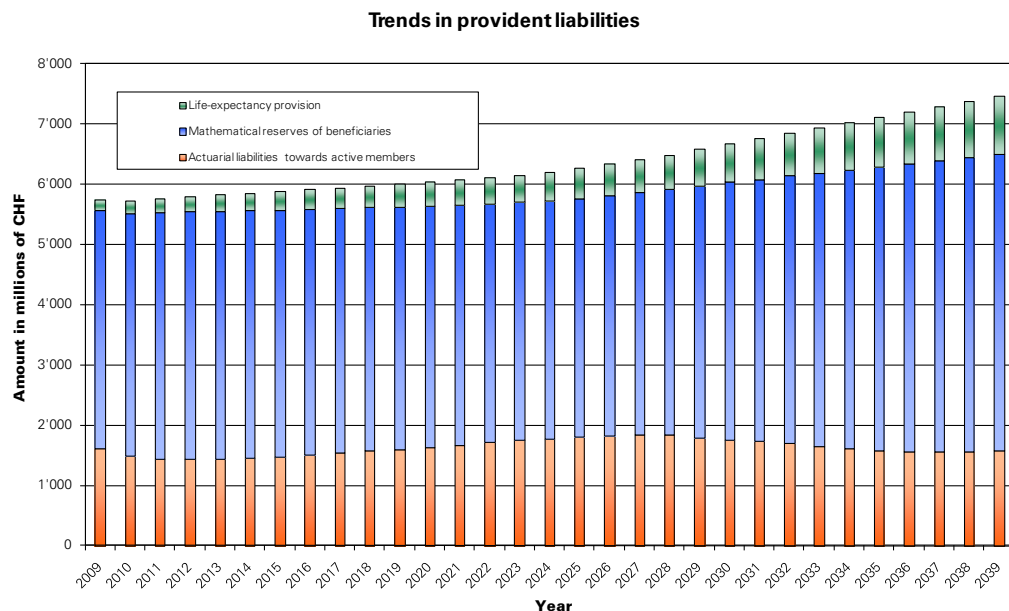
The following graph highlights the average trends of the Fund's demographic structure in the future, as already shown for the historical reference model M00.

¹² In brackets the values obtained in the WG II actuarial report 2009, based on valuations as of 31 December 2008.

ACTUARIAL REPORT AS AT 1 JANUARY 2010



There are some difference between the demographic trend in the table above and the demographic trend in the historical reference model M00. This is mainly due to the simulation of terminations: in WG2 models, vested members are more likely to choose the deferred pension than the transfer value. This explains why the number of deferred pensions is more important in WG2 reference model MM03a than in M00.

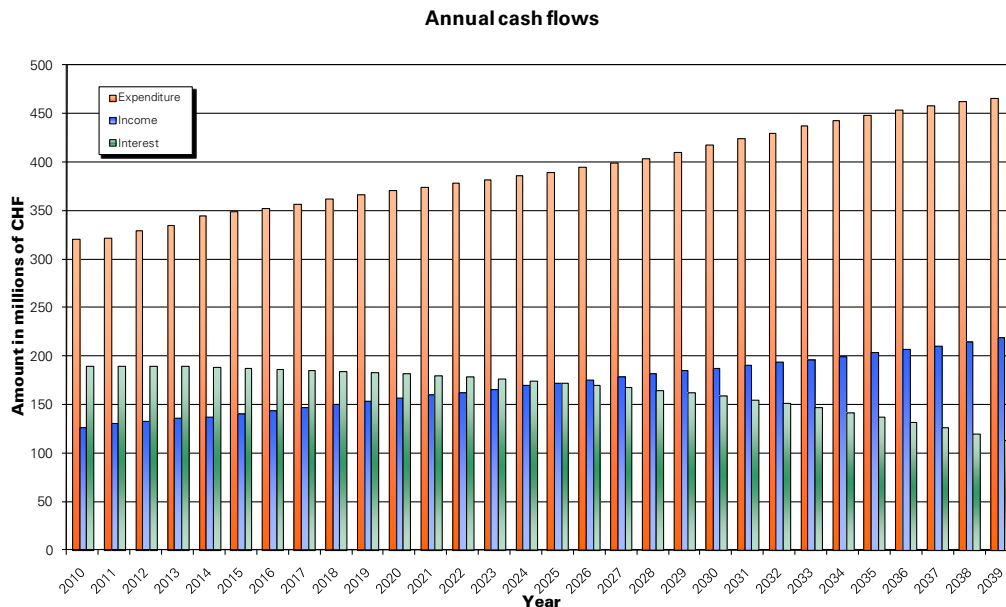


Throughout the projection period, the mathematical reserves for the beneficiaries represent between 63 % and 71 % of the Fund's total liabilities. This is lower than in historical reference model M00, because liabilities toward

ACTUARIAL REPORT AS AT 1 JANUARY 2010

active members are much higher in the WG2 model due to a very conservative method.

The graph below illustrates how contributions and the interest on the Fund's assets contribute to the funding of the CERNPF. It should be noted that expenditure is made up of pensions and transfer values paid, plus overheads, while income consists of contributions.



g. Observations

The technical balance sheet results in Appendix A2, drawn up on a closed-fund basis, lead us to conclude that the actuarial and financial position of the Fund is insufficient as at 31 December 2009, given the WG II method applied to calculate the Fund's liabilities towards the active members. The funding ratio or rate of capitalisation is 67.9 %. In the event of total liquidation of the Organization, the total actuarial liabilities according to the WG II method are not fully covered.

The detailed projective analysis we have presented shows that the current contribution rate of 30.88 % is insufficient to reach a funding ratio above 100 % at the end of the 30-year projection period assuming that the Fund is capable of achieving an average annual return of at least 5 %. Moreover, the current contribution rate does not allow the Fund to maintain its initial funding ratio. If the Fund wishes to avoid a capitalisation shortfall and provided that any reduction in staff numbers is compensated, the contribution rate must be increased to 45.60 % (+14.72 percentage points) or the average annual rate of

ACTUARIAL REPORT AS AT 1 JANUARY 2010

return must increase to 6.65 % (+ 1.65 percentage points), which is not realistic given the target return of the Fund's current strategic allocation (5.4 %).

5. CONCLUSIONS

5.1 Preliminary remark

The fundamental question to be answered is whether the CERNPF is in financial balance in the long term, taking into account the current conditions of financing and benefits. The methods of assessment available to us to answer this question consist of the results presented, commented on and analysed in this report, as well as our own view of the future in general and of the future development of the Fund in particular. Of course, it is impossible to have a precise and definite picture of what will happen to the Fund in the next thirty years.

The results obtained are also influenced by the Fund's past and by the actuarial models considered, hence the need to base one's assessment on the model which appears to be the most realistic. For our final analysis, we have chosen Model MM03a, which integrates prudent parameters relating to future trends in the contributing membership, the salary and pension adjustment rates (in particular 2 % future pension indexation is pre-financed and already capitalized in the liabilities), the rate of return and probable early retirement. Concerning future life expectancy trends, 0.5 % of the pension capital of the beneficiaries is accumulated every year in a longevity provision.

5.2 Final observations and recommendations

Our objective analysis of the current and future financial position of the Fund leads us, by way of a conclusion, to make the following remarks:

1. As already mentioned in Paragraph 4.2, the results of the closed-fund technical balance sheet in Appendix A2 lead us to conclude that the standards of the capitalised funding system are not met on the date of the actuarial review as the funding ratio is 67.9 % as at 1 January 2010 on the basis of the rules in force. We recall here that the liabilities towards beneficiaries in the balance sheet as at 1 January 2010 do not take into account the effect of the future pension under-indexation. This effect would not be material in the balance sheet. It is only taken into account in

ACTUARIAL REPORT AS AT 1 JANUARY 2010

the projections and will result in future annual actuarial gains for the Fund till the under-indexation limit of 8 % is reached.

2. The results of the projections obtained using the open fund method in the framework of the model MM03a have considerably improved since 1 January 2009 (model MM03b of 2009 WG2 study), with an increase in the funding ratio in 2033 of 27.3 percentage points (42.7 % instead of 15.4 %), a decrease in the necessary contribution rate of 8.35 percentage points (45.60 % instead of 53.95 %) and a decrease in the return target of 0.84 percentage points (6.65 % instead of 7.49 %) over 30 years. This turnaround is attributable to the good performance of the stock markets in 2009.
3. In order to restore full funding at the end of the projection period (30 years) without any additional measures or plan changes, it would be necessary to increase the contribution rate to 45.60 % or to achieve a 6.65 % average annual return on assets over 30 years. A fully funded situation at the end of 2009 would lead to a positive trend in the future in all the models studied.
4. The plan is experiencing actuarial losses with regard to longevity. It is expected that the longevity table will be reviewed during 2011 and continue to evolve over time as this has been the case in the past.
5. We confirm that, for the time being, the current technical interest rate of 4.5 % is still well suited to the Fund's expected rate of return. The investment process is being redesigned with assistance of Ortec Finance in order to continue the support of a return target of 5.0 %. Any change in this return target would imply a reconsideration of the technical interest rate.
6. The mechanism for the under-indexation of pensions introduced as at 1 January 2007 aimed at achieving a 100 % funding ratio in 2033. Due to the degradation in the funding ratio, calculations have shown that this mechanism alone will not be sufficient to restore full funding till 2033. Following that, we can conclude that an adjustment factor of 0 % will have to be applied for the period 2011-2013. The quoted under-indexation is individually applied until the cumulative under-indexation for an individual beneficiary reaches a maximum of 8 %. Once this maximum has been reached for a beneficiary, their pension increase will correspond

ACTUARIAL REPORT AS AT 1 JANUARY 2010

to the inflation assumption made (2 %) so that his cumulative under-indexation remains at the 8 % ceiling.

7. We observe a downward trend in the funding ratio in all the historical and WG2 models. Other measures have to be taken urgently in order to restore full funding.
8. In the light of the above, we are able to conclude that, according to Model MM03a, the Fund is in a structurally imbalanced position at the end of the projection period. Future actuarial studies will have to be realised at regular intervals in order to assess the impact of measures in a changing environment (longevity change, uncertain asset return, ...). In particular, the Fund remains very vulnerable to a stock-market fall that could increase dramatically the time needed to reach full funding.
9. It is important that the pensions adjustment regulation provided for in Appendix C of the Rules continue to be applied. We recommend the Fund to continue optimising its investment policy in order to guarantee a sufficiently high safety margin with respect to risks foreseen. We also suggest that the Fund should closely monitor the trends in its financial balance in the coming years by making test projections at the beginning of each year between actuarial reviews, based on the statistical adjustments of the present review, the new individual data and the parameters of Model MM03a of this review, possibly revisited to take into account the impact of new measures.

* * * * *

ACTUARIAL REPORT AS AT 1 JANUARY 2010

We make the usual caveats in case information or facts have not been brought to our attention, and would alter our conclusions.

We do not wish to end this important report without thanking the Fund's authorities for their continued trust in us, the members of the Working Group on Actuarial Matters for their fruitful collaboration and the Administration of the Fund for its cooperation.

**OLIVIER KERN**

Senior Vice President
Accredited Swiss Pension Actuary

**STEPHANE RIESEN**

Senior Vice President
Accredited Swiss Pension Actuary

Geneva, 15 October 2010.

APPENDICES A

Technical balance sheet as at 31.12.2009

APPENDIX A1

Technical balance sheet

CERN Pension Fund

(in closed fund with EVK 2000 at 4.5%)

in CHF

	31.12.2009	31.12.2006
NET PROVIDENT OVERALL ASSETS (PA)	3'903'483'004	4'473'807'006
Transfer values of active members or current value of deferred pensions (without future adjustment) ¹	1'052'046'382	1'123'629'860
Mathematical reserves of the beneficiaries	3'303'898'383	3'058'417'250
Actuarial liabilities	4'355'944'765	4'182'047'110
Provision increase in life expectancy ²	148'675'427	91'752'517
Technical provision	148'675'427	91'752'517
ACTUARIAL COMMITMENTS AND TECHNICAL PROVISIONS (AC)	4'504'620'192	4'273'799'627
TECHNICAL BALANCE³	- 601'137'188	200'007'379

DEGREE OF COVERAGE OF ACTUARIAL LIABILITIES OR FUNDING RATIO⁴	86.7 %	104.7 %
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Remarks :

- 1) Corresponds to 10% of the current value of deferred retirement pensions and to 90% of the transfer value.
2) 0.5 % of the provident capital of beneficiaries of pensions and retirement pensions per annum since 2000.
3) = PA - AC.
4) = PA / AC.

APPENDIX A2

Technical balance sheet

CERN Pension Fund

(in closed fund with EVK 2000 at 4.5%, WG2 assumptions)

in CHF

	31.12.2009	31.12.2008
NET PROVIDENT OVERALL ASSETS (PA)	3'903'483'004	3'589'680'474
Transfer values of active members or current value of deferred pensions (without future adjustment) ¹	1'620'145'825	1'630'783'782
Mathematical reserves of the beneficiaries	3'950'521'318	3'898'542'440
Actuarial liabilities	5'570'667'143	5'529'326'222
Provision increase in life expectancy ²	177'773'459	155'941'698
Technical provision	177'773'459	155'941'698
ACTUARIAL COMMITMENTS AND TECHNICAL PROVISIONS (AC)	5'748'440'603	5'685'267'920
TECHNICAL BALANCE³	- 1'844'957'599	- 2'095'587'445

DEGREE OF COVERAGE OF ACTUARIAL LIABILITIES OR FUNDING RATIO⁴	67.9 %	63.1 %
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Remarks :

- 1) Corresponds to the maximum value between current value of deferred retirement pensions and transfer value.
- 2) 0.5 % of the provident capital of beneficiaries of pensions and retirement pensions per annum since 2000.
- 3) = PA - AC.
- 4) = PA / AC.

APPENDICES B

Description of the projection models

CERNPF

Appendix B1

Models used for the actuarial review as at 1.01.2010 (classical models)

Model considered	Models	Basic parameters				Other parameters				
		Number of active members	Cost-of-living adjustment rate		Rate of return	Technical interest rate	Mortality table	Provision for increased life expectancy	Contribution rate	Actuarial liabilities for the active members
	(a)	(b)	reference salaries	pensions				(d)		(e)
1. Reference model	M00	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
2. Models devoted to variations in numbers of members	M01	-1%	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M02	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M03	1%	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
3. Models devoted to the adjustment of salaries and pensions	M04	constant	1.5 %	1.5 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M05	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M06	constant	2.5 %	2.5 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M07	constant	2.5 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M08	constant	2.0 %	2.5 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
4. Models devoted to the impact of the return on the assets	M09	constant	2.0 %	2.0 %	4.5 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M10	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M11	constant	2.0 %	2.0 %	5.5 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
5. Models devoted to the impact of the technical interest rate	M12	constant	2.0 %	2.0 %	5.0 %	4.0 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M13	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
6. Models devoted to the impact of life expectancy	M14	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M15	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	No	30.88%	90% VT, 10% RMPD
7. Models devoted to the impact of the contribution rate	M16	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M17	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	34.00%	90% VT, 10% RMPD
8. Models devoted to the application of the Council's decisions	M18	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M19	constant	2.0 %	x% (*)	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
9. Models devoted to the impact of the new employment contract policy (f)	M20	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD
	M21	constant	2.0 %	2.0 %	5.0 %	4.5 %	EVK 2000	Yes	30.88%	90% VT, 10% RMPD

a) The models highlighted in blue are identical. They are repeated and interpolated in the table for the purposes of comparison.

b) Annual evolution of the number of active members.

c) With effect from 1 January 2010.

d) The change in the actuarial tables every 10 years induces an increase in the Fund's actuarial liabilities. This phenomenon may be anticipated by the creation of a provision for increased life expectancy (PL). Thus PL = 0 if No and PL ≠ 0 if Yes.

e) The actuarial commitment to an active member is equal to 90 % of the transfer value (VT), plus 10 % of the mathematical reserve of the deferred pension (RMPD) in the reference model M00, in line with the CERN Council's decision. Hitherto, this commitment was calculated on the basis of the greater of these two values.

f) In Model M21, the simulation of departures is done considering no departure under 5 years of employment.

CERNPF

Appendix B2

Models used for the actuarial review as at 1.01.2010 (WG2 models)

Model considered	Models	Data as at	Base of funded status	Liabilities towards active members are determined as	Technical interest rate	Duration of contributions	Maximum retirement age
1. Reference model	MM 03 a	31.12.2009	real (67.9%)	Max(VT ; RMPD)	4.5 %	35 years	65
	MM 03 b	31.12.2009	100 %	Max(VT ; RMPD)	4.5 %	35 years	65
2. Models related to the base to determine the liabilities towards active members	MM 01 a	31.12.2009	real (74.6%)	$0,9 \times VT + 0,1 \times RMPD$	4.5 %	35 years	65
	MM 01 b	31.12.2009	100 %	$0,9 \times VT + 0,1 \times RMPD$	4.5 %	35 years	65
3. Models related to the technical interest rate	MM 08	31.12.2009	real (67.9%)	Max(VT ; RMPD)	4.0 %	35 years	65
VT : transfer value Pension increase for all the models : 2 %. Future pension increase during the period of deferment for all the models : 2 %.				RMPD : Mathematical reserves for deferred pensions Salary for all the models : reference salary.			

APPENDICES C

C1	List of abbreviations
C2 to C15	Results of the projections according to the models (historical models)
C16 to C20	Results of the projections according to the models (WG2 models)

List of abbreviations used in Appendices B2 to B27

CPA(t)	Actuarial liabilities towards active members at the end of year t.
RMP(t)	Mathematical reserves for pensions in payment and deferred pensions at the end of year t.
PL(t)	Longevity provision for increased life expectancy at the end of year t.
ENG(t)	Actuarial liabilities at the end of year t $[CPA(t) + RMP(t) + PL(t)]$.
VE(t)	Variations in the actuarial liabilities at the end of year t.
TR(t)	Sum of reference salaries in year t.
FS(t)	Overall net provident assets at the end of year t.
DC(t)	Funded status at the end of year t $[FS(t) / ENG(t)]$.
PV(t)	Pensions paid in year t.
VV(t)	Transfer values paid in year t.
FR(t)	Operating costs in year t.
DEP(t)	Total expenditure in year t.
COT(t)	Contributions received in year t.
REV(t)	Return achieved in year t on the overall assets at the end of year t-1 and on the average cash flow (*) of year t.
REC(t)	Total income in year t.
EXC(t)	Difference between income and expenditure in year t (**) $[EXC(t) = REC(t) - DEP(t)]$.
(*)	$COT(t) - DEP(t)$.
(**)	Corresponds to the increase in overall assets in year t.

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Appendix C2

Model M00

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.6	3'373.3	168.7	4'564.6	59.98	408.4	3'894.8	85.3%	288.8	32.9	3.3	325.0	126.1	190.3	316.4	- 8.7
2	2011	1'012.5	3'425.6	188.4	4'626.5	61.95	424.9	3'890.0	84.1%	302.5	20.1	3.4	326.0	131.2	189.9	321.1	- 4.9
3	2012	1'024.8	3'445.9	206.8	4'677.4	50.90	431.9	3'880.1	83.0%	311.9	17.4	3.5	332.8	133.4	189.6	323.0	- 9.9
4	2013	1'038.5	3'462.6	225.1	4'726.2	48.78	441.3	3'867.0	81.8%	318.7	16.1	3.5	338.4	136.3	189.0	325.3	- 13.1
5	2014	1'061.6	3'456.3	241.9	4'759.8	33.57	444.3	3'844.2	80.8%	325.0	19.6	3.6	348.2	137.2	188.1	325.4	- 22.8
6	2015	1'088.5	3'447.0	258.5	4'794.0	34.19	456.8	3'821.0	79.7%	330.4	17.3	3.7	351.3	141.1	187.0	328.1	- 23.2
7	2016	1'116.9	3'435.8	274.9	4'827.6	33.61	467.6	3'796.0	78.6%	335.0	16.5	3.7	355.2	144.4	185.8	330.2	- 25.0
8	2017	1'157.2	3'407.0	289.6	4'853.8	26.19	477.8	3'769.3	77.7%	339.1	15.9	3.8	358.8	147.6	184.6	332.1	- 26.7
9	2018	1'185.4	3'391.4	305.2	4'882.0	28.25	486.1	3'738.0	76.6%	342.7	18.0	3.9	364.6	150.1	183.2	333.3	- 31.3
10	2019	1'212.7	3'373.9	320.5	4'907.2	25.13	497.8	3'705.6	75.5%	346.1	17.7	4.0	367.8	153.7	181.6	335.3	- 32.4
11	2020	1'242.3	3'350.9	335.1	4'928.3	21.14	508.0	3'671.7	74.5%	349.2	17.5	4.1	370.8	156.9	180.0	336.9	- 33.9
12	2021	1'274.8	3'322.2	348.8	4'945.9	17.56	518.3	3'636.8	73.5%	351.7	17.4	4.1	373.3	160.0	178.3	338.4	- 34.9
13	2022	1'305.0	3'296.4	362.6	4'964.0	18.11	527.6	3'599.8	72.5%	353.7	18.5	4.2	376.4	162.9	176.6	339.5	- 36.9
14	2023	1'332.6	3'274.4	376.6	4'983.6	19.60	538.4	3'562.1	71.5%	355.7	18.8	4.3	378.7	166.3	174.7	341.0	- 37.7
15	2024	1'348.7	3'266.0	391.9	5'006.6	22.97	549.2	3'523.3	70.4%	357.5	19.3	4.4	381.2	169.6	172.9	342.5	- 38.8
16	2025	1'367.9	3'252.7	406.6	5'027.1	20.58	559.2	3'483.0	69.3%	359.7	19.8	4.5	384.0	172.7	170.9	343.6	- 40.3
17	2026	1'372.2	3'262.7	424.1	5'059.0	31.91	568.1	3'440.8	68.0%	361.9	20.1	4.5	386.6	175.4	168.9	344.4	- 42.2
18	2027	1'378.6	3'274.8	442.1	5'095.5	36.46	578.2	3'396.8	66.7%	364.2	20.6	4.6	389.4	178.6	166.8	345.4	- 44.0
19	2028	1'384.6	3'281.4	459.4	5'125.5	29.96	588.4	3'350.8	65.4%	366.3	21.3	4.7	392.3	181.7	164.6	346.3	- 46.0
20	2029	1'345.2	3'358.4	487.0	5'190.6	65.17	598.3	3'301.6	63.6%	369.4	22.0	4.8	396.2	184.8	162.3	347.1	- 49.2
21	2030	1'318.5	3'414.0	512.1	5'244.6	53.96	606.3	3'247.0	61.9%	374.3	22.5	4.9	401.7	187.2	159.8	347.0	- 54.7
22	2031	1'305.5	3'446.9	534.3	5'286.7	42.13	615.5	3'188.0	60.3%	377.7	23.3	4.9	406.0	190.1	157.0	347.1	- 58.9
23	2032	1'276.1	3'507.8	561.2	5'345.1	58.39	626.4	3'126.3	58.5%	380.2	24.0	5.0	409.3	193.4	154.1	347.5	- 61.8
24	2033	1'241.0	3'577.8	590.3	5'409.1	63.93	634.7	3'058.2	56.5%	384.6	25.3	5.1	415.0	196.0	150.9	346.9	- 68.1
25	2034	1'224.4	3'616.6	614.8	5'455.8	46.79	645.6	2'986.1	54.7%	387.3	26.4	5.2	418.9	199.4	147.5	346.8	- 72.1
26	2035	1'197.7	3'677.2	643.5	5'518.5	62.63	657.7	2'911.5	52.8%	389.5	26.8	5.3	421.6	203.1	143.9	347.0	- 74.6
27	2036	1'201.0	3'695.6	665.2	5'561.8	43.29	668.1	2'832.6	50.9%	392.2	27.9	5.3	425.4	206.3	140.2	346.5	- 78.9
28	2037	1'197.2	3'727.3	689.6	5'614.1	52.31	680.7	2'751.2	49.0%	393.1	29.2	5.4	427.8	210.2	136.3	346.5	- 81.3
29	2038	1'205.2	3'747.4	712.0	5'664.6	50.52	694.2	2'668.4	47.1%	394.3	29.6	5.6	429.5	214.4	132.2	346.6	- 82.9
30	2039	1'219.1	3'760.8	733.3	5'713.2	48.59	708.2	2'584.2	45.2%	395.1	30.2	5.7	431.0	218.7	128.2	346.9	- 84.1

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C3

Model M01

i = 4.50 % Technical interest rate in %
i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.5	3'372.8	168.6	4'564.0	59.35	406.6	3'894.5	85.3%	288.8	32.7	3.3	324.8	125.6	190.3	315.8	- 9.0
2	2011	1'011.8	3'426.0	188.4	4'626.3	62.30	419.6	3'888.1	84.0%	302.5	20.0	3.4	325.9	129.6	189.9	319.4	- 6.4
3	2012	1'023.0	3'445.4	206.7	4'675.1	48.83	422.9	3'875.4	82.9%	311.9	17.4	3.4	332.7	130.6	189.4	320.0	- 12.7
4	2013	1'035.7	3'461.1	225.0	4'721.9	46.75	428.3	3'858.2	81.7%	318.6	16.1	3.4	338.1	132.3	188.7	320.9	- 17.2
5	2014	1'057.1	3'454.3	241.8	4'753.1	31.30	428.0	3'830.5	80.6%	324.9	19.2	3.4	347.5	132.2	187.6	319.8	- 27.7
6	2015	1'082.5	3'444.2	258.3	4'785.0	31.83	436.3	3'801.3	79.4%	330.2	16.5	3.5	350.2	134.7	186.2	320.9	- 29.2
7	2016	1'108.6	3'432.6	274.6	4'815.8	30.85	442.9	3'768.8	78.3%	334.8	15.5	3.5	353.9	136.8	184.7	321.5	- 32.4
8	2017	1'146.0	3'401.9	289.2	4'837.1	21.30	448.8	3'733.4	77.2%	338.8	14.7	3.6	357.1	138.6	183.0	321.6	- 35.4
9	2018	1'169.2	3'389.0	305.0	4'863.2	26.05	452.7	3'692.1	75.9%	342.3	16.3	3.6	362.2	139.8	181.2	321.0	- 41.3
10	2019	1'191.8	3'374.1	320.5	4'886.4	23.26	459.4	3'648.1	74.7%	345.8	15.5	3.7	365.0	141.9	179.1	321.0	- 44.1
11	2020	1'218.2	3'348.2	334.8	4'901.2	14.76	464.7	3'600.6	73.5%	348.9	15.2	3.7	367.8	143.5	176.9	320.4	- 47.5
12	2021	1'247.6	3'315.8	348.2	4'911.6	10.35	469.7	3'550.4	72.3%	351.3	14.6	3.8	369.7	145.0	174.5	319.5	- 50.2
13	2022	1'273.2	3'288.0	361.7	4'922.9	11.37	474.0	3'496.1	71.0%	353.1	15.7	3.8	372.6	146.4	171.9	318.3	- 54.3
14	2023	1'294.0	3'264.6	375.4	4'934.0	11.09	479.1	3'438.6	69.7%	355.0	15.9	3.8	374.7	148.0	169.2	317.2	- 57.5
15	2024	1'304.1	3'254.5	390.5	4'949.2	15.16	484.5	3'378.0	68.3%	356.6	16.0	3.9	376.5	149.6	166.3	315.9	- 60.5
16	2025	1'316.1	3'239.7	405.0	4'960.7	11.58	488.8	3'313.8	66.8%	358.7	15.8	3.9	378.4	150.9	163.3	314.2	- 64.2
17	2026	1'310.7	3'248.3	422.3	4'981.3	20.58	491.6	3'244.9	65.1%	360.7	16.1	3.9	380.7	151.8	160.0	311.8	- 68.9
18	2027	1'307.8	3'258.0	439.8	5'005.6	24.31	495.3	3'171.6	63.4%	362.7	16.2	4.0	382.9	152.9	156.6	309.5	- 73.3
19	2028	1'304.4	3'259.7	456.4	5'020.5	14.82	498.7	3'093.0	61.6%	364.7	16.8	4.0	385.4	154.0	152.9	306.9	- 78.6
20	2029	1'255.0	3'330.6	482.9	5'068.6	48.10	502.0	3'008.6	59.4%	367.4	16.9	4.0	388.3	155.0	148.9	303.9	- 84.4
21	2030	1'219.6	3'377.6	506.6	5'103.9	35.37	503.2	2'915.1	57.1%	371.9	17.5	4.0	393.4	155.4	144.6	299.9	- 93.5
22	2031	1'192.3	3'411.4	528.8	5'132.5	28.61	505.4	2'814.4	54.8%	374.9	17.6	4.0	396.6	156.1	139.8	295.9	-100.7
23	2032	1'151.6	3'461.4	553.8	5'166.8	34.30	508.7	2'706.8	52.4%	377.1	18.3	4.1	399.4	157.1	134.7	291.8	-107.6
24	2033	1'101.8	3'524.0	581.5	5'207.3	40.48	509.2	2'589.2	49.7%	380.7	19.2	4.1	404.1	157.2	129.2	286.5	-117.6
25	2034	1'071.4	3'554.6	604.3	5'230.3	22.97	512.4	2'464.2	47.1%	382.8	19.7	4.1	406.6	158.2	123.3	281.5	-125.0
26	2035	1'028.6	3'607.0	631.2	5'266.8	36.53	516.2	2'332.2	44.3%	384.3	20.0	4.1	408.4	159.4	117.1	276.5	-132.0
27	2036	1'015.0	3'614.8	650.7	5'280.4	13.59	518.4	2'191.6	41.5%	386.1	20.9	4.1	411.1	160.1	110.4	270.5	-140.6
28	2037	995.2	3'632.1	671.9	5'299.3	18.90	522.4	2'044.2	38.6%	386.2	21.8	4.2	412.1	161.3	103.4	264.7	-147.4
29	2038	983.6	3'640.1	691.6	5'315.3	16.00	527.0	1'890.6	35.6%	386.3	21.9	4.2	412.4	162.7	96.0	258.8	-153.6
30	2039	979.5	3'638.1	709.4	5'326.9	11.63	531.8	1'730.8	32.5%	385.9	22.3	4.3	412.4	164.2	88.4	252.6	-159.8

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C4

Model M03

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.3	3'373.1	168.7	4'564.0	59.41	410.1	3'895.4	85.3%	288.9	32.9	3.3	325.0	126.6	190.3	316.9	- 8.1
2	2011	1'013.0	3'426.4	188.5	4'627.9	63.85	430.6	3'892.2	84.1%	302.5	20.2	3.4	326.1	133.0	190.0	323.0	- 3.1
3	2012	1'025.9	3'446.8	206.8	4'679.6	51.69	441.4	3'885.1	83.0%	311.9	17.8	3.5	333.2	136.3	189.7	326.1	- 7.2
4	2013	1'041.8	3'462.6	225.1	4'729.5	49.93	455.0	3'876.2	82.0%	318.8	16.4	3.6	338.8	140.5	189.4	329.9	- 8.9
5	2014	1'066.1	3'456.0	241.9	4'764.0	34.52	461.5	3'858.1	81.0%	325.0	20.6	3.7	349.3	142.5	188.7	331.2	- 18.1
6	2015	1'094.6	3'446.4	258.5	4'799.4	35.43	478.5	3'841.3	80.0%	330.3	18.2	3.8	352.3	147.8	187.9	335.6	- 16.7
7	2016	1'125.6	3'434.9	274.8	4'835.3	35.83	493.8	3'824.3	79.1%	335.0	17.6	4.0	356.6	152.5	187.0	339.5	- 17.0
8	2017	1'168.3	3'406.9	289.6	4'864.8	29.48	509.3	3'807.2	78.3%	339.0	17.4	4.1	360.5	157.3	186.2	343.5	- 17.1
9	2018	1'198.9	3'393.0	305.4	4'897.3	32.52	522.5	3'787.0	77.3%	342.7	20.0	4.2	366.9	161.3	185.3	346.6	- 20.3
10	2019	1'228.9	3'378.4	320.9	4'928.2	30.92	539.7	3'767.6	76.5%	346.2	19.8	4.3	370.3	166.6	184.3	351.0	- 19.4
11	2020	1'263.6	3'355.9	335.6	4'955.2	26.96	555.5	3'749.0	75.7%	349.4	19.7	4.4	373.5	171.5	183.4	354.9	- 18.6
12	2021	1'300.5	3'328.7	349.5	4'978.7	23.52	572.1	3'731.3	74.9%	352.1	20.3	4.6	376.9	176.7	182.5	359.2	- 17.8
13	2022	1'337.6	3'303.3	363.4	5'004.3	25.63	587.8	3'714.1	74.2%	354.1	21.5	4.7	380.4	181.5	181.7	363.2	- 17.2
14	2023	1'371.0	3'283.0	377.5	5'031.6	27.29	605.5	3'698.3	73.5%	356.1	22.7	4.8	383.6	187.0	180.8	367.8	- 15.8
15	2024	1'395.3	3'276.8	393.2	5'065.3	33.66	623.5	3'684.8	72.7%	358.0	23.2	5.0	386.2	192.5	180.1	372.7	- 13.5
16	2025	1'421.7	3'267.7	408.5	5'097.8	32.57	641.2	3'672.6	72.0%	360.4	24.2	5.1	389.7	198.0	179.5	377.5	- 12.2
17	2026	1'436.2	3'279.9	426.4	5'142.5	44.68	657.9	3'661.6	71.2%	362.8	25.0	5.3	393.1	203.2	178.9	382.1	- 11.0
18	2027	1'452.6	3'295.4	444.9	5'192.9	50.42	676.4	3'652.2	70.3%	365.4	25.9	5.4	396.7	208.9	178.4	387.3	- 9.4
19	2028	1'469.8	3'304.5	462.6	5'236.9	44.00	695.1	3'644.7	69.6%	367.9	26.7	5.6	400.2	214.6	178.0	392.7	- 7.5
20	2029	1'443.0	3'386.2	491.0	5'320.2	83.26	714.2	3'638.0	68.4%	371.3	27.9	5.7	404.9	220.5	177.7	398.2	- 6.7
21	2030	1'432.1	3'444.0	516.6	5'392.7	72.51	731.8	3'629.7	67.3%	376.6	29.1	5.9	411.5	226.0	177.3	403.3	- 8.2
22	2031	1'433.9	3'484.5	540.1	5'458.5	65.84	751.3	3'622.3	66.4%	380.4	30.0	6.0	416.4	232.0	176.9	408.9	- 7.5
23	2032	1'423.4	3'547.2	567.6	5'538.2	79.67	772.5	3'616.6	65.3%	383.3	31.4	6.2	420.9	238.6	176.6	415.2	- 5.7
24	2033	1'404.8	3'626.2	598.3	5'629.3	91.07	791.8	3'610.0	64.1%	388.0	33.1	6.3	427.4	244.5	176.3	420.8	- 6.6
25	2034	1'407.4	3'674.5	624.7	5'706.6	77.29	814.1	3'604.9	63.2%	391.4	34.6	6.5	432.5	251.4	176.0	427.4	- 5.1
26	2035	1'400.3	3'747.2	655.8	5'803.3	96.69	838.3	3'603.2	62.1%	394.4	35.3	6.7	436.4	258.9	175.9	434.7	- 1.7
27	2036	1'424.2	3'779.7	680.3	5'884.2	80.98	861.0	3'602.9	61.2%	398.1	36.9	6.9	441.9	265.9	175.8	441.7	- 0.3
28	2037	1'443.8	3'822.8	707.2	5'973.8	89.55	886.6	3'606.7	60.4%	400.4	38.4	7.1	445.9	273.8	175.9	449.7	3.8
29	2038	1'474.2	3'859.8	733.4	6'067.4	93.58	913.5	3'615.1	59.6%	402.8	39.7	7.3	449.8	282.1	176.2	458.3	8.5
30	2039	1'512.0	3'891.1	758.8	6'161.8	94.46	941.6	3'628.8	58.9%	404.9	41.4	7.5	453.8	290.8	176.7	467.5	13.7

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C5

Model M04

i = 4.50 % Technical interest rate in %
i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'017.3	3'356.7	167.8	4'541.8	37.20	408.4	3'894.8	85.8%	288.8	33.0	3.3	325.0	126.1	190.3	316.4	- 8.6
2	2011	1'002.8	3'392.9	186.6	4'582.3	40.43	422.9	3'890.9	84.9%	301.0	20.1	3.4	324.5	130.6	190.0	320.5	- 3.9
3	2012	1'008.9	3'397.9	203.9	4'610.6	28.38	427.7	3'882.9	84.2%	308.9	17.4	3.4	329.8	132.1	189.7	321.7	- 8.0
4	2013	1'018.0	3'397.6	220.8	4'636.5	25.81	434.9	3'872.8	83.5%	314.2	15.9	3.5	333.5	134.3	189.2	323.5	- 10.0
5	2014	1'034.7	3'376.6	236.4	4'647.7	11.21	435.7	3'854.4	82.9%	318.9	19.1	3.5	341.5	134.5	188.5	323.1	- 18.4
6	2015	1'055.9	3'351.3	251.4	4'658.6	10.94	445.7	3'836.5	82.4%	322.6	17.0	3.6	343.2	137.6	187.6	325.3	- 17.9
7	2016	1'077.6	3'325.2	266.0	4'668.8	10.24	453.9	3'818.1	81.8%	325.6	16.1	3.6	345.3	140.2	186.8	326.9	- 18.4
8	2017	1'111.8	3'280.6	278.8	4'671.2	2.39	461.7	3'799.4	81.3%	327.9	15.5	3.7	347.1	142.6	185.9	328.4	- 18.7
9	2018	1'132.2	3'251.1	292.6	4'675.9	4.66	467.3	3'777.6	80.8%	329.8	17.5	3.7	351.1	144.3	184.9	329.2	- 21.9
10	2019	1'150.7	3'222.1	306.1	4'678.9	2.98	476.0	3'756.0	80.3%	331.6	17.0	3.8	352.4	147.0	183.8	330.8	- 21.6
11	2020	1'173.0	3'186.0	318.6	4'677.7	-1.20	483.5	3'734.7	79.8%	333.0	16.4	3.9	353.3	149.3	182.8	332.1	- 21.3
12	2021	1'199.8	3'140.7	329.8	4'670.3	-7.39	490.8	3'713.9	79.5%	333.9	16.3	3.9	354.2	151.6	181.7	333.3	- 20.9
13	2022	1'222.0	3'101.1	341.1	4'664.2	-6.06	497.2	3'692.4	79.2%	334.1	17.6	4.0	355.7	153.5	180.7	334.2	- 21.4
14	2023	1'240.8	3'064.7	352.4	4'657.9	-6.32	504.8	3'671.7	78.8%	334.2	18.0	4.0	356.3	155.9	179.7	335.6	- 20.7
15	2024	1'250.5	3'042.5	365.1	4'658.1	0.25	512.5	3'652.2	78.4%	334.3	18.1	4.1	356.5	158.2	178.7	336.9	- 19.6
16	2025	1'262.4	3'016.5	377.1	4'655.9	-2.21	519.4	3'632.9	78.0%	334.8	18.5	4.2	357.4	160.4	177.7	338.1	- 19.3
17	2026	1'259.5	3'012.9	391.7	4'664.1	8.19	525.0	3'613.6	77.5%	335.4	18.6	4.2	358.1	162.1	176.8	338.9	- 19.2
18	2027	1'259.5	3'007.7	406.0	4'673.2	9.11	531.8	3'594.6	76.9%	335.8	19.1	4.3	359.2	164.2	175.9	340.1	- 19.1
19	2028	1'259.3	2'998.0	419.7	4'677.0	3.80	538.5	3'576.0	76.5%	336.0	19.5	4.3	359.8	166.3	174.9	341.2	- 18.6
20	2029	1'217.0	3'054.8	443.0	4'714.8	37.77	544.8	3'556.5	75.4%	337.3	20.1	4.4	361.7	168.2	174.0	342.3	- 19.5
21	2030	1'187.4	3'089.5	463.4	4'740.3	25.46	549.4	3'533.9	74.6%	340.3	20.6	4.4	365.3	169.6	173.0	342.6	- 22.7
22	2031	1'168.1	3'106.4	481.5	4'756.1	15.78	555.1	3'509.9	73.8%	341.8	21.1	4.4	367.3	171.4	171.9	343.3	- 24.0
23	2032	1'137.9	3'141.9	502.7	4'782.5	26.47	562.1	3'485.5	72.9%	342.2	21.9	4.5	368.6	173.6	170.7	344.3	- 24.4
24	2033	1'099.9	3'190.2	526.4	4'816.5	33.96	566.7	3'458.3	71.8%	344.3	22.8	4.5	371.6	175.0	169.4	344.4	- 27.2
25	2034	1'081.1	3'208.4	545.4	4'834.9	18.43	573.7	3'430.4	71.0%	345.1	23.5	4.6	373.1	177.2	168.1	345.2	- 27.9
26	2035	1'052.8	3'246.5	568.1	4'867.5	32.58	581.7	3'403.0	69.9%	345.3	23.8	4.7	373.8	179.6	166.7	346.4	- 27.5
27	2036	1'050.3	3'247.1	584.5	4'881.9	14.39	588.0	3'374.3	69.1%	346.1	24.7	4.7	375.6	181.6	165.4	346.9	- 28.6
28	2037	1'043.6	3'257.8	602.7	4'904.1	22.25	596.3	3'347.2	68.3%	345.4	25.1	4.8	375.2	184.1	164.0	348.1	- 27.1
29	2038	1'044.6	3'259.9	619.4	4'923.9	19.77	605.1	3'321.3	67.5%	344.8	25.9	4.8	375.5	186.9	162.7	349.6	- 25.9
30	2039	1'052.4	3'253.5	634.4	4'940.3	16.34	614.3	3'297.3	66.7%	343.7	26.6	4.9	375.2	189.7	161.5	351.2	- 24.0

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C6

Model M06

i = 4.50 % Technical interest rate in %
i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'026.7	3'390.3	169.5	4'586.5	81.90	408.5	3'894.8	84.9%	288.9	32.9	3.3	325.0	126.1	190.3	316.4	- 8.6
2	2011	1'022.3	3'458.7	190.2	4'671.3	84.76	427.1	3'889.2	83.3%	304.0	20.0	3.4	327.5	131.9	189.9	321.8	- 5.7
3	2012	1'040.3	3'493.5	209.6	4'743.4	72.15	436.3	3'877.1	81.7%	314.9	18.0	3.5	336.3	134.7	189.5	324.2	- 12.1
4	2013	1'059.9	3'526.2	229.2	4'815.3	71.85	448.0	3'861.1	80.2%	323.2	16.4	3.6	343.1	138.4	188.8	327.2	- 15.9
5	2014	1'088.3	3'536.9	247.6	4'872.8	57.55	453.3	3'833.9	78.7%	331.1	20.2	3.6	354.9	140.0	187.7	327.7	- 27.2
6	2015	1'121.4	3'544.6	265.8	4'931.8	59.02	468.3	3'805.4	77.2%	338.2	17.6	3.7	359.6	144.6	186.4	331.0	- 28.5
7	2016	1'155.8	3'549.6	284.0	4'989.5	57.63	481.5	3'773.6	75.6%	344.6	16.9	3.9	365.4	148.7	184.9	333.6	- 31.8
8	2017	1'203.4	3'535.6	300.5	5'039.5	50.00	494.6	3'738.8	74.2%	350.4	16.4	4.0	370.8	152.7	183.3	336.0	- 34.8
9	2018	1'237.9	3'536.3	318.3	5'092.5	53.02	505.6	3'698.0	72.6%	355.6	18.7	4.0	378.4	156.1	181.5	337.6	- 40.8
10	2019	1'271.7	3'537.2	336.0	5'144.9	52.41	520.2	3'654.3	71.0%	361.0	18.6	4.2	383.7	160.6	179.4	340.0	- 43.7
11	2020	1'308.2	3'530.5	353.1	5'191.7	46.85	533.3	3'607.4	69.5%	366.1	18.4	4.3	388.8	164.7	177.2	341.9	- 46.9
12	2021	1'348.8	3'517.5	369.3	5'235.6	43.83	546.7	3'557.6	68.0%	370.7	18.3	4.4	393.4	168.8	174.8	343.6	- 49.8
13	2022	1'388.9	3'505.0	385.6	5'279.5	43.89	559.4	3'504.1	66.4%	374.5	19.6	4.5	398.6	172.7	172.3	345.0	- 53.5
14	2023	1'425.5	3'496.8	402.1	5'324.4	44.95	573.6	3'447.8	64.8%	378.3	20.2	4.6	403.0	177.1	169.6	346.7	- 56.3
15	2024	1'450.1	3'504.5	420.5	5'375.1	50.65	588.1	3'388.7	63.0%	382.0	20.7	4.7	407.4	181.6	166.8	348.4	- 59.0
16	2025	1'478.2	3'506.0	438.2	5'422.4	47.36	601.8	3'326.5	61.3%	386.0	21.1	4.8	412.0	185.8	163.9	349.7	- 62.3
17	2026	1'490.3	3'534.1	459.4	5'483.9	61.43	614.4	3'260.0	59.4%	390.3	21.7	4.9	416.9	189.7	160.7	350.4	- 66.5
18	2027	1'504.2	3'563.3	481.1	5'548.6	64.78	628.4	3'189.3	57.5%	394.6	22.5	5.0	422.1	194.0	157.4	351.4	- 70.7
19	2028	1'520.3	3'584.1	501.8	5'606.2	57.55	642.5	3'114.8	55.6%	398.6	23.1	5.1	426.8	198.4	153.8	352.2	- 74.5
20	2029	1'484.3	3'686.0	534.5	5'704.8	98.60	656.8	3'034.6	53.2%	403.7	24.1	5.3	433.1	202.8	150.1	352.9	- 80.2
21	2030	1'462.6	3'763.7	564.6	5'790.9	86.15	668.8	2'945.3	50.9%	411.1	25.2	5.4	441.7	206.5	145.9	352.5	- 89.2
22	2031	1'456.4	3'818.5	591.9	5'866.8	75.87	682.3	2'849.4	48.6%	416.7	25.9	5.5	448.0	210.7	141.4	352.1	- 95.9
23	2032	1'431.3	3'904.3	624.7	5'960.3	93.50	697.9	2'747.6	46.1%	421.6	26.8	5.6	453.9	215.5	136.6	352.1	-101.8
24	2033	1'397.3	4'002.1	660.4	6'059.8	99.50	710.5	2'636.0	43.5%	428.4	28.4	5.7	462.4	219.4	131.4	350.8	-111.6
25	2034	1'386.4	4'064.0	690.9	6'141.2	81.43	726.3	2'517.7	41.0%	433.3	29.2	5.8	468.3	224.3	125.8	350.0	-118.3
26	2035	1'362.2	4'153.1	726.8	6'242.1	100.83	743.4	2'393.0	38.3%	437.8	30.4	5.9	474.1	229.6	119.8	349.4	-124.7
27	2036	1'371.5	4'195.3	755.2	6'321.9	79.88	759.0	2'260.2	35.8%	443.1	31.6	6.1	480.7	234.4	113.6	348.0	-132.8
28	2037	1'375.0	4'251.4	786.5	6'413.0	91.03	776.9	2'121.1	33.1%	446.6	33.1	6.2	485.9	239.9	106.9	346.8	-139.1
29	2038	1'391.0	4'294.7	816.0	6'501.8	88.79	796.6	1'976.9	30.4%	450.1	33.8	6.4	490.2	246.0	100.0	346.0	-144.2
30	2039	1'414.3	4'329.6	844.3	6'588.3	86.49	816.3	1'827.5	27.7%	453.0	34.7	6.5	494.3	252.1	92.9	344.9	-149.4

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C7

Model M07

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'026.7	3'374.6	168.7	4'570.0	65.40	408.5	3'894.8	85.2%	288.9	32.9	3.3	325.0	126.1	190.3	316.4	- 8.6
2	2011	1'022.3	3'427.5	188.5	4'638.3	68.24	427.1	3'890.6	83.9%	302.6	20.0	3.4	326.1	131.9	189.9	321.8	- 4.2
3	2012	1'040.2	3'447.0	206.8	4'693.9	55.67	436.3	3'881.5	82.7%	312.0	18.0	3.5	333.5	134.7	189.6	324.4	- 9.1
4	2013	1'059.7	3'464.6	225.2	4'749.6	55.65	448.0	3'870.2	81.5%	318.8	16.4	3.6	338.8	138.4	189.1	327.5	- 11.3
5	2014	1'088.2	3'460.8	242.3	4'791.3	41.69	453.3	3'849.4	80.3%	325.2	20.2	3.6	349.1	140.0	188.3	328.3	- 20.8
6	2015	1'121.2	3'454.6	259.1	4'834.9	43.67	468.3	3'829.2	79.2%	330.8	17.6	3.7	352.2	144.6	187.3	332.0	- 20.2
7	2016	1'155.6	3'446.5	275.7	4'877.8	42.86	481.5	3'807.8	78.1%	335.7	16.9	3.9	356.5	148.7	186.3	335.0	- 21.5
8	2017	1'203.1	3'419.9	290.7	4'913.7	35.92	494.6	3'785.4	77.0%	340.0	16.4	4.0	360.4	152.7	185.3	338.0	- 22.4
9	2018	1'237.6	3'408.9	306.8	4'953.4	39.65	505.6	3'759.1	75.9%	343.7	18.7	4.0	366.5	156.1	184.1	340.2	- 26.3
10	2019	1'271.3	3'398.9	322.9	4'993.1	39.74	520.2	3'732.3	74.7%	347.5	18.6	4.2	370.3	160.6	182.8	343.4	- 26.9
11	2020	1'307.8	3'382.1	338.2	5'028.0	34.94	533.3	3'704.5	73.7%	351.2	18.4	4.3	373.9	164.7	181.4	346.1	- 27.7
12	2021	1'348.3	3'359.8	352.8	5'060.9	32.81	546.7	3'676.4	72.6%	354.3	18.3	4.4	377.0	168.8	180.1	348.9	- 28.1
13	2022	1'388.4	3'338.9	367.3	5'094.5	33.69	559.4	3'647.0	71.6%	356.8	19.6	4.5	380.8	172.7	178.7	351.4	- 29.4
14	2023	1'424.9	3'323.0	382.2	5'130.1	35.58	573.6	3'617.4	70.5%	359.2	20.2	4.6	384.0	177.1	177.2	354.4	- 29.6
15	2024	1'449.5	3'323.8	398.9	5'172.1	42.01	588.1	3'587.7	69.4%	361.7	20.7	4.7	387.1	181.6	175.8	357.4	- 29.7
16	2025	1'477.5	3'319.2	414.9	5'211.6	39.49	601.8	3'557.5	68.3%	364.5	21.1	4.8	390.4	185.8	174.3	360.2	- 30.2
17	2026	1'489.6	3'341.7	434.4	5'265.7	54.05	614.4	3'525.7	67.0%	367.7	21.7	4.9	394.3	189.7	172.8	362.5	- 31.7
18	2027	1'503.5	3'365.6	454.4	5'323.5	57.82	628.4	3'492.6	65.6%	370.9	22.5	5.0	398.4	194.0	171.2	365.3	- 33.1
19	2028	1'519.5	3'381.7	473.4	5'374.7	51.21	642.5	3'458.5	64.3%	373.9	23.1	5.1	402.1	198.4	169.6	368.0	- 34.1
20	2029	1'483.5	3'478.8	504.4	5'466.7	91.99	656.8	3'421.7	62.6%	378.2	24.1	5.3	407.5	202.8	167.9	370.7	- 36.8
21	2030	1'461.8	3'551.7	532.8	5'546.2	79.53	668.8	3'378.8	60.9%	384.8	25.2	5.4	415.3	206.5	165.9	372.5	- 42.9
22	2031	1'455.5	3'602.0	558.3	5'615.8	69.61	682.3	3'332.4	59.3%	389.6	25.9	5.5	420.9	210.7	163.8	374.5	- 46.5
23	2032	1'430.5	3'682.8	589.3	5'702.6	86.72	697.9	3'283.1	57.6%	393.8	26.8	5.6	426.1	215.5	161.4	376.9	- 49.2
24	2033	1'396.4	3'775.7	623.0	5'795.1	92.58	710.5	3'227.4	55.7%	400.0	28.4	5.7	434.0	219.4	158.9	378.2	- 55.8
25	2034	1'385.5	3'832.6	651.5	5'869.6	74.48	726.3	3'168.3	54.0%	404.4	29.2	5.8	439.4	224.3	156.1	380.3	- 59.1
26	2035	1'361.3	3'916.1	685.3	5'962.8	93.14	743.4	3'106.3	52.1%	408.4	30.4	5.9	444.7	229.6	153.1	382.7	- 62.0
27	2036	1'370.6	3'953.0	711.5	6'035.0	72.29	759.0	3'039.8	50.4%	413.2	31.6	6.1	450.8	234.4	150.0	384.4	- 66.4
28	2037	1'374.1	4'003.3	740.6	6'118.0	82.93	776.9	2'970.9	48.6%	416.1	33.1	6.2	455.5	239.9	146.7	386.6	- 68.9
29	2038	1'390.0	4'040.8	767.7	6'198.5	80.55	796.6	2'900.8	46.8%	419.2	33.8	6.4	459.3	246.0	143.3	389.3	- 70.1
30	2039	1'413.3	4'069.8	793.6	6'276.7	78.17	816.3	2'829.8	45.1%	421.7	34.7	6.5	463.0	252.1	139.8	391.9	- 71.0

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C8

Model M08

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'021.6	3'389.5	169.5	4'580.6	76.01	408.4	3'894.6	85.0%	288.9	33.1	3.3	325.2	126.1	190.3	316.4	- 8.8
2	2011	1'011.4	3'458.7	190.2	4'660.3	79.68	424.9	3'888.3	83.4%	304.0	20.0	3.4	327.4	131.2	189.9	321.1	- 6.3
3	2012	1'023.7	3'493.3	209.6	4'726.6	66.34	431.9	3'875.1	82.0%	314.9	17.6	3.5	335.9	133.4	189.4	322.8	- 13.2
4	2013	1'039.4	3'521.4	228.9	4'789.7	63.07	441.4	3'857.4	80.5%	323.0	16.2	3.5	342.7	136.3	188.7	325.0	- 17.8
5	2014	1'061.7	3'529.8	247.1	4'838.6	48.91	444.3	3'828.2	79.1%	330.7	19.7	3.6	353.9	137.2	187.5	324.7	- 29.2
6	2015	1'088.5	3'535.0	265.1	4'888.6	50.02	456.9	3'796.8	77.7%	337.6	17.2	3.7	358.5	141.1	186.0	327.1	- 31.4
7	2016	1'117.3	3'536.9	283.0	4'937.2	48.51	467.5	3'761.6	76.2%	343.8	16.5	3.7	364.0	144.4	184.4	328.8	- 35.2
8	2017	1'156.7	3'521.2	299.3	4'977.3	40.13	478.0	3'722.5	74.8%	349.4	16.1	3.8	369.3	147.6	182.6	330.2	- 39.1
9	2018	1'184.1	3'518.0	316.6	5'018.8	41.49	486.2	3'676.9	73.3%	354.5	17.9	3.9	376.3	150.1	180.5	330.7	- 45.6
10	2019	1'211.1	3'512.7	333.7	5'057.6	38.81	497.8	3'627.7	71.7%	359.4	17.8	4.0	381.2	153.7	178.2	332.0	- 49.2
11	2020	1'241.5	3'498.8	349.9	5'090.2	32.60	508.0	3'574.9	70.2%	364.0	17.3	4.1	385.3	156.9	175.7	332.6	- 52.7
12	2021	1'274.8	3'479.1	365.3	5'119.2	29.02	518.2	3'518.6	68.7%	368.0	17.3	4.1	389.4	160.0	173.1	333.1	- 56.3
13	2022	1'305.4	3'460.1	380.6	5'146.2	26.96	527.6	3'457.7	67.2%	371.3	18.5	4.2	394.0	162.9	170.2	333.1	- 60.9
14	2023	1'332.7	3'445.4	396.2	5'174.3	28.12	538.2	3'393.4	65.6%	374.5	18.9	4.3	397.7	166.2	167.2	333.4	- 64.3
15	2024	1'348.2	3'445.4	413.4	5'207.0	32.72	549.2	3'325.6	63.9%	377.6	19.4	4.4	401.3	169.6	163.9	333.5	- 67.8
16	2025	1'367.1	3'438.8	429.8	5'235.7	28.74	559.3	3'253.7	62.1%	380.9	19.8	4.5	405.1	172.7	160.5	333.2	- 71.9
17	2026	1'371.1	3'454.4	449.1	5'274.6	38.85	568.2	3'177.3	60.2%	384.2	20.1	4.5	408.8	175.5	156.9	332.4	- 76.4
18	2027	1'378.6	3'470.3	468.5	5'317.4	42.84	578.3	3'096.3	58.2%	387.4	20.6	4.6	412.6	178.6	153.1	331.7	- 81.0
19	2028	1'383.9	3'480.7	487.3	5'351.9	34.46	588.4	3'010.5	56.3%	390.5	21.4	4.7	416.5	181.7	149.0	330.7	- 85.8
20	2029	1'346.4	3'559.3	516.1	5'421.7	69.83	598.3	2'918.8	53.8%	394.4	21.9	4.8	421.1	184.8	144.7	329.4	- 91.7
21	2030	1'321.6	3'616.3	542.4	5'480.3	58.59	606.6	2'818.6	51.4%	399.9	22.8	4.9	427.6	187.3	140.0	327.3	-100.2
22	2031	1'308.1	3'654.8	566.5	5'529.4	49.04	615.8	2'711.3	49.0%	404.1	23.4	4.9	432.4	190.2	134.9	325.1	-107.3
23	2032	1'277.7	3'721.0	595.4	5'594.0	64.68	626.5	2'598.0	46.4%	407.3	24.1	5.0	436.4	193.5	129.6	323.0	-113.3
24	2033	1'241.9	3'795.2	626.2	5'663.3	69.29	634.7	2'475.2	43.7%	412.2	25.3	5.1	442.6	196.0	123.8	319.8	-122.8
25	2034	1'226.2	3'836.9	652.3	5'715.3	51.99	645.6	2'345.4	41.0%	415.2	26.4	5.2	446.8	199.3	117.6	317.0	-129.8
26	2035	1'199.5	3'902.1	682.9	5'784.4	69.10	657.7	2'209.9	38.2%	417.8	26.7	5.3	449.7	203.1	111.2	314.3	-135.5
27	2036	1'200.7	3'925.9	706.7	5'833.3	48.88	668.0	2'066.3	35.4%	420.9	28.0	5.3	454.3	206.3	104.4	310.6	-143.6
28	2037	1'198.2	3'960.2	732.6	5'891.0	57.68	680.7	1'916.8	32.5%	422.3	29.1	5.4	456.9	210.2	97.2	307.4	-149.5
29	2038	1'205.5	3'984.1	757.0	5'946.6	55.63	694.2	1'762.0	29.6%	423.8	29.7	5.6	459.0	214.4	89.8	304.2	-154.9
30	2039	1'220.3	4'002.6	780.5	6'003.3	56.75	708.4	1'601.9	26.7%	424.9	30.4	5.7	460.9	218.8	82.1	300.9	-160.1

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C9

Model M09

i = 4.50 % Technical interest rate in %
i' = 4.50 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.6	3'373.3	168.7	4'564.6	59.98	408.4	3'875.8	84.9%	288.8	32.9	3.3	325.0	126.1	171.2	297.3	- 27.7
2	2011	1'012.5	3'425.6	188.4	4'626.5	61.95	424.9	3'851.1	83.2%	302.5	20.1	3.4	326.0	131.2	170.1	301.3	- 24.7
3	2012	1'024.8	3'445.9	206.8	4'677.4	50.90	431.9	3'820.5	81.7%	311.9	17.4	3.5	332.8	133.4	168.9	302.2	- 30.6
4	2013	1'038.5	3'462.6	225.1	4'726.2	48.78	441.3	3'785.8	80.1%	318.7	16.1	3.5	338.4	136.3	167.4	303.7	- 34.7
5	2014	1'061.6	3'456.3	241.9	4'759.8	33.57	444.3	3'740.5	78.6%	325.0	19.6	3.6	348.2	137.2	165.7	302.9	- 45.3
6	2015	1'088.5	3'447.0	258.5	4'794.0	34.19	456.8	3'693.9	77.1%	330.4	17.3	3.7	351.3	141.1	163.6	304.7	- 46.6
7	2016	1'116.9	3'435.8	274.9	4'827.6	33.61	467.6	3'644.6	75.5%	335.0	16.5	3.7	355.2	144.4	161.5	305.9	- 49.3
8	2017	1'157.2	3'407.0	289.6	4'853.8	26.19	477.8	3'592.7	74.0%	339.1	15.9	3.8	358.8	147.6	159.3	306.9	- 51.9
9	2018	1'185.4	3'391.4	305.2	4'882.0	28.25	486.1	3'535.1	72.4%	342.7	18.0	3.9	364.6	150.1	156.9	307.0	- 57.6
10	2019	1'212.7	3'373.9	320.5	4'907.2	25.13	497.8	3'475.4	70.8%	346.1	17.7	4.0	367.8	153.7	154.3	308.0	- 59.7
11	2020	1'242.3	3'350.9	335.1	4'928.3	21.14	508.0	3'413.1	69.3%	349.2	17.5	4.1	370.8	156.9	151.6	308.5	- 62.3
12	2021	1'274.8	3'322.2	348.8	4'945.9	17.56	518.3	3'348.7	67.7%	351.7	17.4	4.1	373.3	160.0	148.8	308.9	- 64.4
13	2022	1'305.0	3'296.4	362.6	4'964.0	18.11	527.6	3'281.2	66.1%	353.7	18.5	4.2	376.4	162.9	145.9	308.9	- 67.6
14	2023	1'332.6	3'274.4	376.6	4'983.6	19.60	538.4	3'211.6	64.4%	355.7	18.8	4.3	378.7	166.3	142.9	309.2	- 69.5
15	2024	1'348.7	3'266.0	391.9	5'006.6	22.97	549.2	3'139.8	62.7%	357.5	19.3	4.4	381.2	169.6	139.8	309.4	- 71.8
16	2025	1'367.9	3'252.7	406.6	5'027.1	20.58	559.2	3'065.1	61.0%	359.7	19.8	4.5	384.0	172.7	136.6	309.3	- 74.7
17	2026	1'372.2	3'262.7	424.1	5'059.0	31.91	568.1	2'987.2	59.0%	361.9	20.1	4.5	386.6	175.4	133.2	308.7	- 77.9
18	2027	1'378.6	3'274.8	442.1	5'095.5	36.46	578.2	2'906.1	57.0%	364.2	20.6	4.6	389.4	178.6	129.7	308.3	- 81.1
19	2028	1'384.6	3'281.4	459.4	5'125.5	29.96	588.4	2'821.5	55.0%	366.3	21.3	4.7	392.3	181.7	126.1	307.8	- 84.6
20	2029	1'345.2	3'358.4	487.0	5'190.6	65.17	598.3	2'732.3	52.6%	369.4	22.0	4.8	396.2	184.8	122.3	307.0	- 89.2
21	2030	1'318.5	3'414.0	512.1	5'244.6	53.96	606.3	2'636.1	50.3%	374.3	22.5	4.9	401.7	187.2	118.2	305.4	- 96.3
22	2031	1'305.5	3'446.9	534.3	5'286.7	42.13	615.5	2'534.0	47.9%	377.7	23.3	4.9	406.0	190.1	113.8	303.9	-102.1
23	2032	1'276.1	3'507.8	561.2	5'345.1	58.39	626.4	2'427.3	45.4%	380.2	24.0	5.0	409.3	193.4	109.2	302.7	-106.6
24	2033	1'241.0	3'577.8	590.3	5'409.1	63.93	634.7	2'312.7	42.8%	384.6	25.3	5.1	415.0	196.0	104.4	300.4	-114.7
25	2034	1'224.4	3'616.6	614.8	5'455.8	46.79	645.6	2'192.3	40.2%	387.3	26.4	5.2	418.9	199.4	99.2	298.5	-120.4
26	2035	1'197.7	3'677.2	643.5	5'518.5	62.63	657.7	2'067.6	37.5%	389.5	26.8	5.3	421.6	203.1	93.8	296.9	-124.7
27	2036	1'201.0	3'695.6	665.2	5'561.8	43.29	668.1	1'936.7	34.8%	392.2	27.9	5.3	425.4	206.3	88.2	294.5	-130.9
28	2037	1'197.2	3'727.3	689.6	5'614.1	52.31	680.7	1'801.4	32.1%	393.1	29.2	5.4	427.8	210.2	82.3	292.5	-135.3
29	2038	1'205.2	3'747.4	712.0	5'664.6	50.52	694.2	1'662.6	29.4%	394.3	29.6	5.6	429.5	214.4	76.3	290.6	-138.8
30	2039	1'219.1	3'760.8	733.3	5'713.2	48.59	708.2	1'520.3	26.6%	395.1	30.2	5.7	431.0	218.7	70.1	288.8	-142.2

Contribution rate:

30.88 %

Rate of return:

4.50 %

CPCERN

Appendix C10

Model M11

i = 4.50 % Technical interest rate in %
i' = 5.50 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.6	3'373.3	168.7	4'564.6	59.98	408.4	3'913.9	85.7%	288.8	32.9	3.3	325.0	126.1	209.3	335.4	10.4
2	2011	1'012.5	3'425.6	188.4	4'626.5	61.95	424.9	3'929.0	84.9%	302.5	20.1	3.4	326.0	131.2	210.0	341.2	15.2
3	2012	1'024.8	3'445.9	206.8	4'677.4	50.90	431.9	3'940.3	84.2%	311.9	17.4	3.5	332.8	133.4	210.7	344.1	11.2
4	2013	1'038.5	3'462.6	225.1	4'726.2	48.78	441.3	3'949.4	83.6%	318.7	16.1	3.5	338.4	136.3	211.2	347.5	9.1
5	2014	1'061.6	3'456.3	241.9	4'759.8	33.57	444.3	3'949.9	83.0%	325.0	19.6	3.6	348.2	137.2	211.5	348.7	0.5
6	2015	1'088.5	3'447.0	258.5	4'794.0	34.19	456.8	3'951.3	82.4%	330.4	17.3	3.7	351.3	141.1	211.5	352.6	1.3
7	2016	1'116.9	3'435.8	274.9	4'827.6	33.61	467.6	3'952.0	81.9%	335.0	16.5	3.7	355.2	144.4	211.6	356.0	0.7
8	2017	1'157.2	3'407.0	289.6	4'853.8	26.19	477.8	3'952.4	81.4%	339.1	15.9	3.8	358.8	147.6	211.6	359.2	0.4
9	2018	1'185.4	3'391.4	305.2	4'882.0	28.25	486.1	3'949.5	80.9%	342.7	18.0	3.9	364.6	150.1	211.6	361.7	- 2.9
10	2019	1'212.7	3'373.9	320.5	4'907.2	25.13	497.8	3'946.9	80.4%	346.1	17.7	4.0	367.8	153.7	211.4	365.1	- 2.6
11	2020	1'242.3	3'350.9	335.1	4'928.3	21.14	508.0	3'944.2	80.0%	349.2	17.5	4.1	370.8	156.9	211.3	368.1	- 2.6
12	2021	1'274.8	3'322.2	348.8	4'945.9	17.56	518.3	3'942.1	79.7%	351.7	17.4	4.1	373.3	160.0	211.1	371.2	- 2.1
13	2022	1'305.0	3'296.4	362.6	4'964.0	18.11	527.6	3'939.7	79.4%	353.7	18.5	4.2	376.4	162.9	211.0	373.9	- 2.5
14	2023	1'332.6	3'274.4	376.6	4'983.6	19.60	538.4	3'938.1	79.0%	355.7	18.8	4.3	378.7	166.3	210.9	377.2	- 1.5
15	2024	1'348.7	3'266.0	391.9	5'006.6	22.97	549.2	3'937.3	78.6%	357.5	19.3	4.4	381.2	169.6	210.9	380.4	- 0.8
16	2025	1'367.9	3'252.7	406.6	5'027.1	20.58	559.2	3'936.9	78.3%	359.7	19.8	4.5	384.0	172.7	210.8	383.5	- 0.5
17	2026	1'372.2	3'262.7	424.1	5'059.0	31.91	568.1	3'936.5	77.8%	361.9	20.1	4.5	386.6	175.4	210.8	386.2	- 0.4
18	2027	1'378.6	3'274.8	442.1	5'095.5	36.46	578.2	3'936.5	77.3%	364.2	20.6	4.6	389.4	178.6	210.8	389.4	- 0.1
19	2028	1'384.6	3'281.4	459.4	5'125.5	29.96	588.4	3'936.6	76.8%	366.3	21.3	4.7	392.3	181.7	210.8	392.5	0.1
20	2029	1'345.2	3'358.4	487.0	5'190.6	65.17	598.3	3'935.9	75.8%	369.4	22.0	4.8	396.2	184.8	210.8	395.5	- 0.7
21	2030	1'318.5	3'414.0	512.1	5'244.6	53.96	606.3	3'932.1	75.0%	374.3	22.5	4.9	401.7	187.2	210.7	397.9	- 3.8
22	2031	1'305.5	3'446.9	534.3	5'286.7	42.13	615.5	3'926.6	74.3%	377.7	23.3	4.9	406.0	190.1	210.4	400.5	- 5.5
23	2032	1'276.1	3'507.8	561.2	5'345.1	58.39	626.4	3'920.9	73.4%	380.2	24.0	5.0	409.3	193.4	210.1	403.5	- 5.7
24	2033	1'241.0	3'577.8	590.3	5'409.1	63.93	634.7	3'911.6	72.3%	384.6	25.3	5.1	415.0	196.0	209.7	405.7	- 9.3
25	2034	1'224.4	3'616.6	614.8	5'455.8	46.79	645.6	3'901.2	71.5%	387.3	26.4	5.2	418.9	199.4	209.2	408.5	- 10.4
26	2035	1'197.7	3'677.2	643.5	5'518.5	62.63	657.7	3'891.3	70.5%	389.5	26.8	5.3	421.6	203.1	208.6	411.7	- 9.9
27	2036	1'201.0	3'695.6	665.2	5'561.8	43.29	668.1	3'880.3	69.8%	392.2	27.9	5.3	425.4	206.3	208.1	414.4	- 11.0
28	2037	1'197.2	3'727.3	689.6	5'614.1	52.31	680.7	3'870.3	68.9%	393.1	29.2	5.4	427.8	210.2	207.5	417.7	- 10.1
29	2038	1'205.2	3'747.4	712.0	5'664.6	50.52	694.2	3'862.2	68.2%	394.3	29.6	5.6	429.5	214.4	207.0	421.4	- 8.1
30	2039	1'219.1	3'760.8	733.3	5'713.2	48.59	708.2	3'856.5	67.5%	395.1	30.2	5.7	431.0	218.7	206.7	425.3	- 5.7

Contribution rate:

30.88 %

Rate of return:

5.50 %

CPCERN

Appendix C11

Model M12

i = 4.00 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'050.9	3'459.0	155.7	4'665.5			3'903.5	83.7%								
1	2010	1'032.9	3'520.0	176.0	4'728.8	63.28	408.4	3'894.8	82.4%	288.8	32.9	3.3	325.0	126.1	190.3	316.4	- 8.7
2	2011	1'022.6	3'572.7	196.5	4'791.8	62.96	424.9	3'890.0	81.2%	302.5	20.1	3.4	326.0	131.2	189.9	321.1	- 4.9
3	2012	1'034.9	3'591.7	215.5	4'842.1	50.33	431.9	3'880.1	80.1%	311.9	17.4	3.5	332.8	133.4	189.6	323.0	- 9.9
4	2013	1'048.6	3'607.2	234.5	4'890.3	48.23	441.3	3'867.0	79.1%	318.7	16.1	3.5	338.4	136.3	189.0	325.3	- 13.1
5	2014	1'071.9	3'598.7	251.9	4'922.5	32.12	444.3	3'844.2	78.1%	325.0	19.6	3.6	348.2	137.2	188.1	325.4	- 22.8
6	2015	1'099.0	3'587.2	269.0	4'955.3	32.83	456.8	3'821.0	77.1%	330.4	17.3	3.7	351.3	141.1	187.0	328.1	- 23.2
7	2016	1'127.6	3'574.0	285.9	4'987.5	32.22	467.6	3'796.0	76.1%	335.0	16.5	3.7	355.2	144.4	185.8	330.2	- 25.0
8	2017	1'168.2	3'542.4	301.1	5'011.7	24.21	477.8	3'769.3	75.2%	339.1	15.9	3.8	358.8	147.6	184.6	332.1	- 26.7
9	2018	1'196.5	3'525.1	317.3	5'038.9	27.17	486.1	3'738.0	74.2%	342.7	18.0	3.9	364.6	150.1	183.2	333.3	- 31.3
10	2019	1'224.1	3'505.9	333.1	5'063.1	24.18	497.8	3'705.6	73.2%	346.1	17.7	4.0	367.8	153.7	181.6	335.3	- 32.4
11	2020	1'253.9	3'481.1	348.1	5'083.1	20.07	508.0	3'671.7	72.2%	349.2	17.5	4.1	370.8	156.9	180.0	336.9	- 33.9
12	2021	1'286.6	3'450.8	362.3	5'099.7	16.60	518.3	3'636.8	71.3%	351.7	17.4	4.1	373.3	160.0	178.3	338.4	- 34.9
13	2022	1'317.0	3'423.5	376.6	5'117.0	17.27	527.6	3'599.8	70.4%	353.7	18.5	4.2	376.4	162.9	176.6	339.5	- 36.9
14	2023	1'344.8	3'400.3	391.0	5'136.1	19.13	538.4	3'562.1	69.4%	355.7	18.8	4.3	378.7	166.3	174.7	341.0	- 37.7
15	2024	1'360.9	3'391.6	407.0	5'159.5	23.40	549.2	3'523.3	68.3%	357.5	19.3	4.4	381.2	169.6	172.9	342.5	- 38.8
16	2025	1'380.2	3'378.0	422.2	5'180.4	20.84	559.2	3'483.0	67.2%	359.7	19.8	4.5	384.0	172.7	170.9	343.6	- 40.3
17	2026	1'384.5	3'388.9	440.6	5'213.9	33.56	568.1	3'440.8	66.0%	361.9	20.1	4.5	386.6	175.4	168.9	344.4	- 42.2
18	2027	1'390.8	3'402.1	459.3	5'252.2	38.27	578.2	3'396.8	64.7%	364.2	20.6	4.6	389.4	178.6	166.8	345.4	- 44.0
19	2028	1'396.8	3'409.6	477.3	5'283.8	31.60	588.4	3'350.8	63.4%	366.3	21.3	4.7	392.3	181.7	164.6	346.3	- 46.0
20	2029	1'357.1	3'491.1	506.2	5'354.3	70.54	598.3	3'301.6	61.7%	369.4	22.0	4.8	396.2	184.8	162.3	347.1	- 49.2
21	2030	1'330.1	3'549.9	532.5	5'412.5	58.19	606.3	3'247.0	60.0%	374.3	22.5	4.9	401.7	187.2	159.8	347.0	- 54.7
22	2031	1'316.9	3'585.0	555.7	5'457.6	45.04	615.5	3'188.0	58.4%	377.7	23.3	4.9	406.0	190.1	157.0	347.1	- 58.9
23	2032	1'287.2	3'649.2	583.9	5'520.3	62.69	626.4	3'126.3	56.6%	380.2	24.0	5.0	409.3	193.4	154.1	347.5	- 61.8
24	2033	1'251.8	3'722.8	614.3	5'588.8	68.56	634.7	3'058.2	54.7%	384.6	25.3	5.1	415.0	196.0	150.9	346.9	- 68.1
25	2034	1'235.1	3'763.5	639.8	5'638.4	49.60	645.6	2'986.1	53.0%	387.3	26.4	5.2	418.9	199.4	147.5	346.8	- 72.1
26	2035	1'208.3	3'827.0	669.7	5'704.9	66.52	657.7	2'911.5	51.0%	389.5	26.8	5.3	421.6	203.1	143.9	347.0	- 74.6
27	2036	1'211.6	3'846.1	692.3	5'749.9	44.98	668.1	2'832.6	49.3%	392.2	27.9	5.3	425.4	206.3	140.2	346.5	- 78.9
28	2037	1'207.8	3'879.0	717.6	5'804.5	54.54	680.7	2'751.2	47.4%	393.1	29.2	5.4	427.8	210.2	136.3	346.5	- 81.3
29	2038	1'215.9	3'899.7	740.9	5'856.5	52.06	694.2	2'668.4	45.6%	394.3	29.6	5.6	429.5	214.4	132.2	346.6	- 82.9
30	2039	1'230.0	3'913.1	763.1	5'906.2	49.68	708.2	2'584.2	43.8%	395.1	30.2	5.7	431.0	218.7	128.2	346.9	- 84.1

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C12

Model M15

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	0.0	4'355.9			3'903.5	89.6%								
1	2010	1'022.6	3'373.3	0.0	4'395.9	39.99	408.4	3'894.8	88.6%	288.8	32.9	3.3	325.0	126.1	190.3	316.4	- 8.7
2	2011	1'012.5	3'425.6	0.0	4'438.1	42.20	424.9	3'890.0	87.6%	302.5	20.1	3.4	326.0	131.2	189.9	321.1	- 4.9
3	2012	1'024.8	3'445.9	0.0	4'470.7	32.56	431.9	3'880.1	86.8%	311.9	17.4	3.5	332.8	133.4	189.6	323.0	- 9.9
4	2013	1'038.5	3'462.6	0.0	4'501.2	30.47	441.3	3'867.0	85.9%	318.7	16.1	3.5	338.4	136.3	189.0	325.3	- 13.1
5	2014	1'061.6	3'456.3	0.0	4'517.9	16.70	444.3	3'844.2	85.1%	325.0	19.6	3.6	348.2	137.2	188.1	325.4	- 22.8
6	2015	1'088.5	3'447.0	0.0	4'535.5	17.61	456.8	3'821.0	84.2%	330.4	17.3	3.7	351.3	141.1	187.0	328.1	- 23.2
7	2016	1'116.9	3'435.8	0.0	4'552.7	17.27	467.6	3'796.0	83.4%	335.0	16.5	3.7	355.2	144.4	185.8	330.2	- 25.0
8	2017	1'157.2	3'407.0	0.0	4'564.2	11.46	477.8	3'769.3	82.6%	339.1	15.9	3.8	358.8	147.6	184.6	332.1	- 26.7
9	2018	1'185.4	3'391.4	0.0	4'576.8	12.61	486.1	3'738.0	81.7%	342.7	18.0	3.9	364.6	150.1	183.2	333.3	- 31.3
10	2019	1'212.7	3'373.9	0.0	4'586.6	9.84	497.8	3'705.6	80.8%	346.1	17.7	4.0	367.8	153.7	181.6	335.3	- 32.4
11	2020	1'242.3	3'350.9	0.0	4'593.2	6.58	508.0	3'671.7	79.9%	349.2	17.5	4.1	370.8	156.9	180.0	336.9	- 33.9
12	2021	1'274.8	3'322.2	0.0	4'597.0	3.82	518.3	3'636.8	79.1%	351.7	17.4	4.1	373.3	160.0	178.3	338.4	- 34.9
13	2022	1'305.0	3'296.4	0.0	4'601.4	4.34	527.6	3'599.8	78.2%	353.7	18.5	4.2	376.4	162.9	176.6	339.5	- 36.9
14	2023	1'332.6	3'274.4	0.0	4'607.0	5.65	538.4	3'562.1	77.3%	355.7	18.8	4.3	378.7	166.3	174.7	341.0	- 37.7
15	2024	1'348.7	3'266.0	0.0	4'614.6	7.61	549.2	3'523.3	76.4%	357.5	19.3	4.4	381.2	169.6	172.9	342.5	- 38.8
16	2025	1'367.9	3'252.7	0.0	4'620.6	5.91	559.2	3'483.0	75.4%	359.7	19.8	4.5	384.0	172.7	170.9	343.6	- 40.3
17	2026	1'372.2	3'262.7	0.0	4'634.9	14.34	568.1	3'440.8	74.2%	361.9	20.1	4.5	386.6	175.4	168.9	344.4	- 42.2
18	2027	1'378.6	3'274.8	0.0	4'653.4	18.51	578.2	3'396.8	73.0%	364.2	20.6	4.6	389.4	178.6	166.8	345.4	- 44.0
19	2028	1'384.6	3'281.4	0.0	4'666.1	12.66	588.4	3'350.8	71.8%	366.3	21.3	4.7	392.3	181.7	164.6	346.3	- 46.0
20	2029	1'345.2	3'358.4	0.0	4'703.7	37.60	598.3	3'301.6	70.2%	369.4	22.0	4.8	396.2	184.8	162.3	347.1	- 49.2
21	2030	1'318.5	3'414.0	0.0	4'732.5	28.84	606.3	3'247.0	68.6%	374.3	22.5	4.9	401.7	187.2	159.8	347.0	- 54.7
22	2031	1'305.5	3'446.9	0.0	4'752.5	19.95	615.5	3'188.0	67.1%	377.7	23.3	4.9	406.0	190.1	157.0	347.1	- 58.9
23	2032	1'276.1	3'507.8	0.0	4'783.9	31.42	626.4	3'126.3	65.4%	380.2	24.0	5.0	409.3	193.4	154.1	347.5	- 61.8
24	2033	1'241.0	3'577.8	0.0	4'818.7	34.84	634.7	3'058.2	63.5%	384.6	25.3	5.1	415.0	196.0	150.9	346.9	- 68.1
25	2034	1'224.4	3'616.6	0.0	4'841.0	22.30	645.6	2'986.1	61.7%	387.3	26.4	5.2	418.9	199.4	147.5	346.8	- 72.1
26	2035	1'197.7	3'677.2	0.0	4'875.0	33.94	657.7	2'911.5	59.7%	389.5	26.8	5.3	421.6	203.1	143.9	347.0	- 74.6
27	2036	1'201.0	3'695.6	0.0	4'896.6	21.60	668.1	2'832.6	57.8%	392.2	27.9	5.3	425.4	206.3	140.2	346.5	- 78.9
28	2037	1'197.2	3'727.3	0.0	4'924.5	27.96	680.7	2'751.2	55.9%	393.1	29.2	5.4	427.8	210.2	136.3	346.5	- 81.3
29	2038	1'205.2	3'747.4	0.0	4'952.6	28.07	694.2	2'668.4	53.9%	394.3	29.6	5.6	429.5	214.4	132.2	346.6	- 82.9
30	2039	1'219.1	3'760.8	0.0	4'979.8	27.25	708.2	2'584.2	51.9%	395.1	30.2	5.7	431.0	218.7	128.2	346.9	- 84.1

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C13

Model M17

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 34.00%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.6	3'373.3	168.7	4'564.6	59.98	408.4	3'907.9	85.6%	288.8	32.9	3.3	325.0	138.9	190.6	329.4	4.4
2	2011	1'012.5	3'425.6	188.4	4'626.5	61.95	424.9	3'917.3	84.7%	302.5	20.1	3.4	326.0	144.5	190.9	335.4	9.4
3	2012	1'024.8	3'445.9	206.8	4'677.4	50.90	431.9	3'922.5	83.9%	311.9	17.4	3.5	332.8	146.9	191.3	338.1	5.3
4	2013	1'038.5	3'462.6	225.1	4'726.2	48.78	441.3	3'925.7	83.1%	318.7	16.1	3.5	338.4	150.0	191.5	341.5	3.1
5	2014	1'061.6	3'456.3	241.9	4'759.8	33.57	444.3	3'920.0	82.4%	325.0	19.6	3.6	348.2	151.1	191.4	342.5	- 5.7
6	2015	1'088.5	3'447.0	258.5	4'794.0	34.19	456.8	3'915.2	81.7%	330.4	17.3	3.7	351.3	155.3	191.2	346.5	- 4.8
7	2016	1'116.9	3'435.8	274.9	4'827.6	33.61	467.6	3'909.9	81.0%	335.0	16.5	3.7	355.2	159.0	190.9	349.9	- 5.3
8	2017	1'157.2	3'407.0	289.6	4'853.8	26.19	477.8	3'904.2	80.4%	339.1	15.9	3.8	358.8	162.5	190.6	353.1	- 5.7
9	2018	1'185.4	3'391.4	305.2	4'882.0	28.25	486.1	3'895.2	79.8%	342.7	18.0	3.9	364.6	165.3	190.3	355.6	- 9.0
10	2019	1'212.7	3'373.9	320.5	4'907.2	25.13	497.8	3'886.5	79.2%	346.1	17.7	4.0	367.8	169.2	189.9	359.1	- 8.7
11	2020	1'242.3	3'350.9	335.1	4'928.3	21.14	508.0	3'877.9	78.7%	349.2	17.5	4.1	370.8	172.7	189.4	362.1	- 8.6
12	2021	1'274.8	3'322.2	348.8	4'945.9	17.56	518.3	3'869.8	78.2%	351.7	17.4	4.1	373.3	176.2	189.0	365.2	- 8.0
13	2022	1'305.0	3'296.4	362.6	4'964.0	18.11	527.6	3'861.4	77.8%	353.7	18.5	4.2	376.4	179.4	188.6	368.0	- 8.4
14	2023	1'332.6	3'274.4	376.6	4'983.6	19.60	538.4	3'854.0	77.3%	355.7	18.8	4.3	378.7	183.1	188.2	371.3	- 7.4
15	2024	1'348.7	3'266.0	391.9	5'006.6	22.97	549.2	3'847.4	76.8%	357.5	19.3	4.4	381.2	186.7	187.9	374.6	- 6.6
16	2025	1'367.9	3'252.7	406.6	5'027.1	20.58	559.2	3'841.2	76.4%	359.7	19.8	4.5	384.0	190.1	187.6	377.7	- 6.2
17	2026	1'372.2	3'262.7	424.1	5'059.0	31.91	568.1	3'835.0	75.8%	361.9	20.1	4.5	386.6	193.1	187.3	380.4	- 6.1
18	2027	1'378.6	3'274.8	442.1	5'095.5	36.46	578.2	3'829.2	75.1%	364.2	20.6	4.6	389.4	196.6	187.0	383.6	- 5.8
19	2028	1'384.6	3'281.4	459.4	5'125.5	29.96	588.4	3'823.6	74.6%	366.3	21.3	4.7	392.3	200.0	186.7	386.8	- 5.6
20	2029	1'345.2	3'358.4	487.0	5'190.6	65.17	598.3	3'817.2	73.5%	369.4	22.0	4.8	396.2	203.4	186.4	389.8	- 6.4
21	2030	1'318.5	3'414.0	512.1	5'244.6	53.96	606.3	3'807.7	72.6%	374.3	22.5	4.9	401.7	206.2	186.0	392.2	- 9.5
22	2031	1'305.5	3'446.9	534.3	5'286.7	42.13	615.5	3'796.5	71.8%	377.7	23.3	4.9	406.0	209.3	185.5	394.8	- 11.2
23	2032	1'276.1	3'507.8	561.2	5'345.1	58.39	626.4	3'785.2	70.8%	380.2	24.0	5.0	409.3	213.0	185.0	398.0	- 11.3
24	2033	1'241.0	3'577.8	590.3	5'409.1	63.93	634.7	3'770.4	69.7%	384.6	25.3	5.1	415.0	215.8	184.3	400.2	- 14.9
25	2034	1'224.4	3'616.6	614.8	5'455.8	46.79	645.6	3'754.6	68.8%	387.3	26.4	5.2	418.9	219.5	183.6	403.1	- 15.8
26	2035	1'197.7	3'677.2	643.5	5'518.5	62.63	657.7	3'739.4	67.8%	389.5	26.8	5.3	421.6	223.6	182.8	406.4	- 15.2
27	2036	1'201.0	3'695.6	665.2	5'561.8	43.29	668.1	3'723.2	66.9%	392.2	27.9	5.3	425.4	227.1	182.1	409.2	- 16.2
28	2037	1'197.2	3'727.3	689.6	5'614.1	52.31	680.7	3'708.2	66.1%	393.1	29.2	5.4	427.8	231.5	181.3	412.8	- 15.0
29	2038	1'205.2	3'747.4	712.0	5'664.6	50.52	694.2	3'695.4	65.2%	394.3	29.6	5.6	429.5	236.0	180.6	416.6	- 12.8
30	2039	1'219.1	3'760.8	733.3	5'713.2	48.59	708.2	3'685.2	64.5%	395.1	30.2	5.7	431.0	240.8	180.1	420.9	- 10.2

Contribution rate:

34.00 %

Rate of return:

5.00 %

CPCERN

Appendix C14

Model M19

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'022.4	3'310.7	165.5	4'498.7	-5.97	408.4	3'894.8	86.6%	288.8	32.9	3.3	325.1	126.1	190.3	316.4	- 8.7
2	2011	1'012.3	3'302.2	181.6	4'496.1	-2.51	424.9	3'895.6	86.6%	296.9	20.1	3.4	320.4	131.2	190.1	321.3	0.8
3	2012	1'024.6	3'263.8	195.8	4'484.2	-11.98	431.9	3'897.6	86.9%	300.7	17.4	3.5	321.6	133.4	190.1	323.5	1.9
4	2013	1'038.2	3'258.1	211.8	4'508.1	23.95	441.3	3'902.7	86.6%	301.8	16.1	3.5	321.4	136.3	190.3	326.6	5.1
5	2014	1'061.2	3'257.8	228.0	4'547.1	38.97	444.4	3'901.3	85.8%	306.0	19.5	3.6	329.1	137.2	190.4	327.6	- 1.5
6	2015	1'088.0	3'254.6	244.1	4'586.7	39.65	456.9	3'900.3	85.0%	311.4	17.3	3.7	332.4	141.1	190.3	331.4	- 0.9
7	2016	1'116.3	3'249.4	259.9	4'625.6	38.89	467.6	3'898.7	84.3%	316.2	16.5	3.7	336.4	144.4	190.3	334.7	- 1.7
8	2017	1'156.6	3'226.4	274.2	4'657.2	31.62	477.9	3'896.4	83.7%	320.4	15.8	3.8	340.0	147.6	190.2	337.8	- 2.2
9	2018	1'184.3	3'217.2	289.5	4'691.0	33.79	486.2	3'890.7	82.9%	324.0	18.0	3.9	345.9	150.1	190.0	340.1	- 5.8
10	2019	1'211.3	3'205.7	304.5	4'721.5	30.53	497.8	3'884.8	82.3%	327.6	17.7	4.0	349.3	153.7	189.7	343.4	- 5.8
11	2020	1'240.8	3'188.6	318.9	4'748.2	26.66	508.0	3'878.7	81.7%	330.8	17.5	4.1	352.4	156.9	189.4	346.3	- 6.1
12	2021	1'273.1	3'166.1	332.4	4'771.6	23.37	518.3	3'872.9	81.2%	333.6	17.3	4.1	355.0	160.0	189.1	349.2	- 5.8
13	2022	1'303.2	3'145.8	346.0	4'795.1	23.56	527.6	3'866.2	80.6%	335.7	18.5	4.2	358.4	162.9	188.8	351.7	- 6.7
14	2023	1'331.0	3'128.9	359.8	4'819.7	24.56	538.5	3'860.0	80.1%	337.9	18.8	4.3	360.9	166.3	188.5	354.8	- 6.2
15	2024	1'346.9	3'125.6	375.1	4'847.6	27.91	549.2	3'854.3	79.5%	339.9	19.3	4.4	363.6	169.6	188.2	357.8	- 5.7
16	2025	1'365.8	3'116.9	389.6	4'872.3	24.70	559.2	3'848.4	79.0%	342.3	19.8	4.5	366.6	172.7	187.9	360.6	- 5.9
17	2026	1'370.2	3'130.7	407.0	4'907.9	35.65	568.1	3'842.0	78.3%	344.8	20.1	4.5	369.4	175.4	187.6	363.0	- 6.4
18	2027	1'376.8	3'146.5	424.8	4'948.0	40.05	578.3	3'835.4	77.5%	347.2	20.6	4.6	372.5	178.6	187.3	365.9	- 6.6
19	2028	1'383.1	3'155.9	441.8	4'980.8	32.85	588.4	3'828.4	76.9%	349.6	21.3	4.7	375.6	181.7	187.0	368.7	- 6.9
20	2029	1'343.7	3'235.0	469.1	5'047.8	67.00	598.4	3'820.1	75.7%	352.9	22.0	4.8	379.7	184.8	186.6	371.4	- 8.4
21	2030	1'317.1	3'292.5	493.9	5'103.5	55.70	606.4	3'807.9	74.6%	358.1	22.5	4.9	385.5	187.2	186.1	373.4	- 12.1
22	2031	1'304.2	3'327.9	515.8	5'147.9	44.36	615.6	3'793.4	73.7%	361.8	23.3	4.9	390.0	190.1	185.5	375.6	- 14.5
23	2032	1'274.4	3'390.3	542.4	5'207.2	59.29	626.5	3'778.0	72.6%	364.7	24.0	5.0	393.6	193.5	184.7	378.2	- 15.5
24	2033	1'239.4	3'460.6	571.0	5'271.1	63.88	634.8	3'758.2	71.3%	369.3	25.3	5.1	399.7	196.0	183.9	379.9	- 19.8
25	2034	1'222.7	3'500.2	595.0	5'318.0	46.95	645.7	3'736.6	70.3%	372.3	26.4	5.2	403.8	199.4	182.9	382.2	- 21.6
26	2035	1'195.8	3'561.2	623.2	5'380.2	62.15	657.8	3'714.7	69.0%	374.8	26.8	5.3	406.8	203.1	181.8	384.9	- 21.9
27	2036	1'198.8	3'580.5	644.5	5'423.7	43.57	668.1	3'690.8	68.0%	377.8	27.8	5.3	410.9	206.3	180.7	387.0	- 23.9
28	2037	1'195.0	3'611.6	668.1	5'474.7	50.98	680.8	3'666.9	67.0%	379.0	29.2	5.4	413.7	210.2	179.5	389.7	- 23.9
29	2038	1'202.6	3'631.7	690.0	5'524.3	49.59	694.2	3'644.1	66.0%	380.4	29.6	5.6	415.5	214.4	178.4	392.7	- 22.8
30	2039	1'216.5	3'644.2	710.6	5'571.2	46.94	708.3	3'622.8	65.0%	381.4	30.2	5.7	417.3	218.7	177.3	396.0	- 21.3

Contribution rate:

30.88 %

indexation des pensions : 0 %

Rate of return:

5.00 %

avec limite de sous-indexation de 8 %

CPCERN

Appendix C15

Model M21

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'052.0	3'303.9	148.7	4'504.6			3'903.5	86.7%								
1	2010	1'023.3	3'375.0	168.7	4'567.1	62.44	408.4	3'895.9	85.3%	288.9	31.8	3.3	324.0	126.1	190.3	316.4	- 7.6
2	2011	1'016.5	3'426.3	188.4	4'631.2	64.19	425.1	3'893.0	84.1%	302.6	18.2	3.4	324.2	131.3	190.0	321.3	- 2.9
3	2012	1'028.9	3'446.9	206.8	4'682.6	51.35	432.1	3'884.2	82.9%	312.0	16.5	3.5	332.0	133.4	189.7	323.2	- 8.8
4	2013	1'044.5	3'463.0	225.1	4'732.6	50.00	441.3	3'872.3	81.8%	318.8	15.2	3.5	337.5	136.3	189.2	325.5	- 11.9
5	2014	1'068.7	3'455.8	241.9	4'766.4	33.76	444.7	3'850.4	80.8%	325.0	19.0	3.6	347.6	137.3	188.4	325.7	- 21.9
6	2015	1'098.7	3'447.1	258.5	4'804.4	38.07	457.2	3'829.7	79.7%	330.4	15.2	3.7	349.3	141.2	187.4	328.6	- 20.7
7	2016	1'126.4	3'438.8	275.1	4'840.4	35.94	467.6	3'805.5	78.6%	335.2	15.9	3.7	354.8	144.4	186.3	330.7	- 24.1
8	2017	1'168.6	3'408.5	289.7	4'866.8	26.49	477.8	3'779.6	77.7%	339.3	15.4	3.8	358.6	147.5	185.1	332.6	- 25.9
9	2018	1'197.2	3'393.4	305.4	4'896.0	29.19	486.1	3'749.1	76.6%	342.8	17.6	3.9	364.3	150.1	183.7	333.8	- 30.5
10	2019	1'226.3	3'377.2	320.8	4'924.4	28.39	498.3	3'718.6	75.5%	346.2	16.5	4.0	366.6	153.9	182.2	336.1	- 30.6
11	2020	1'257.4	3'354.8	335.5	4'947.7	23.26	507.8	3'685.9	74.5%	349.3	16.8	4.1	370.2	156.8	180.7	337.5	- 32.7
12	2021	1'292.5	3'325.6	349.2	4'967.4	19.69	518.2	3'652.3	73.5%	351.9	16.6	4.1	372.6	160.0	179.0	339.1	- 33.5
13	2022	1'325.3	3'298.3	362.8	4'986.4	19.07	527.6	3'616.6	72.5%	353.8	18.0	4.2	376.0	162.9	177.4	340.3	- 35.7
14	2023	1'354.8	3'275.1	376.6	5'006.6	20.11	538.8	3'580.6	71.5%	355.6	18.1	4.3	378.1	166.4	175.6	342.0	- 36.1
15	2024	1'374.3	3'267.9	392.1	5'034.3	27.78	549.5	3'543.8	70.4%	357.4	18.5	4.4	380.3	169.7	173.8	343.5	- 36.8
16	2025	1'397.3	3'253.2	406.7	5'057.2	22.90	559.6	3'506.1	69.3%	359.5	18.6	4.5	382.6	172.8	172.0	344.8	- 37.7
17	2026	1'404.8	3'264.1	424.3	5'093.2	35.97	568.6	3'466.5	68.1%	361.8	18.9	4.5	385.2	175.6	170.1	345.7	- 39.5
18	2027	1'413.9	3'275.8	442.2	5'131.9	38.74	578.9	3'425.6	66.8%	364.0	19.2	4.6	387.8	178.8	168.2	346.9	- 40.9
19	2028	1'424.5	3'279.7	459.2	5'163.3	31.40	589.1	3'383.1	65.5%	366.0	19.9	4.7	390.6	181.9	166.1	348.0	- 42.6
20	2029	1'389.1	3'356.8	486.7	5'232.6	69.31	599.1	3'337.8	63.8%	369.0	20.5	4.8	394.3	185.0	164.0	349.0	- 45.3
21	2030	1'365.4	3'414.5	512.2	5'292.1	59.47	607.4	3'287.0	62.1%	374.0	21.2	4.9	400.0	187.6	161.6	349.2	- 50.8
22	2031	1'357.4	3'449.1	534.6	5'341.1	49.01	617.0	3'232.5	60.5%	377.5	21.6	4.9	404.1	190.5	159.1	349.6	- 54.5
23	2032	1'331.4	3'510.9	561.7	5'404.0	62.92	628.0	3'175.2	58.8%	380.0	22.5	5.0	407.6	193.9	156.4	350.3	- 57.3
24	2033	1'299.6	3'581.2	590.9	5'471.7	67.64	636.3	3'111.9	56.9%	384.4	23.7	5.1	413.3	196.5	153.4	349.9	- 63.3
25	2034	1'288.1	3'621.0	615.6	5'524.7	53.01	647.3	3'045.3	55.1%	387.2	24.4	5.2	416.7	199.9	150.2	350.1	- 66.6
26	2035	1'266.1	3'684.3	644.8	5'595.1	70.45	659.7	2'976.4	53.2%	389.5	24.7	5.3	419.6	203.7	146.9	350.6	- 68.9
27	2036	1'274.2	3'704.2	666.7	5'645.1	49.99	670.3	2'903.1	51.4%	392.4	25.9	5.4	423.7	207.0	143.5	350.5	- 73.3
28	2037	1'274.1	3'738.5	691.6	5'704.2	59.08	683.2	2'827.8	49.6%	393.7	27.0	5.5	426.1	211.0	139.8	350.8	- 75.3
29	2038	1'281.6	3'764.5	715.3	5'761.4	57.16	696.7	2'750.7	47.7%	395.3	27.5	5.6	428.4	215.1	136.1	351.3	- 77.1
30	2039	1'299.3	3'778.2	736.7	5'814.2	52.85	711.0	2'672.4	46.0%	396.1	28.4	5.7	430.2	219.6	132.3	351.9	- 78.3

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C16

Model MM03 a

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'620.1	3'950.5	177.8	5'748.4			3'903.5	67.9%								
1	2010	1'487.6	4'042.1	202.1	5'731.8	-16.68	408.4	3'898.8	68.0%	288.8	29.2	3.3	321.2	126.1	190.4	316.5	- 4.7
2	2011	1'445.0	4'097.4	225.4	5'767.8	36.02	424.9	3'898.4	67.6%	302.3	16.1	3.4	321.8	131.2	190.2	321.4	- 0.4
3	2012	1'439.0	4'113.2	246.8	5'799.0	31.24	432.1	3'892.6	67.1%	311.7	14.1	3.5	329.3	133.4	190.1	323.5	- 5.8
4	2013	1'435.8	4'127.0	268.3	5'831.0	32.01	441.4	3'883.6	66.6%	318.5	12.9	3.5	335.0	136.3	189.7	326.0	- 9.0
5	2014	1'455.6	4'113.3	287.9	5'856.8	25.79	444.4	3'864.7	66.0%	325.0	16.6	3.6	345.2	137.2	189.0	326.3	- 18.9
6	2015	1'481.1	4'098.0	307.3	5'886.4	29.62	456.9	3'844.9	65.3%	330.7	14.6	3.7	349.0	141.1	188.1	329.2	- 19.8
7	2016	1'506.0	4'084.7	326.8	5'917.4	30.97	467.7	3'823.9	64.6%	335.8	13.0	3.7	352.6	144.4	187.1	331.5	- 21.1
8	2017	1'553.7	4'051.8	344.4	5'949.9	32.46	478.1	3'801.0	63.9%	340.5	12.2	3.8	356.6	147.6	186.0	333.7	- 22.9
9	2018	1'576.9	4'041.4	363.7	5'982.0	32.17	486.6	3'773.2	63.1%	344.9	14.0	3.9	362.8	150.3	184.8	335.1	- 27.8
10	2019	1'603.0	4'027.8	382.6	6'013.4	31.31	498.1	3'743.7	62.3%	349.3	13.5	4.0	366.8	153.8	183.4	337.2	- 29.5
11	2020	1'634.2	4'011.3	401.1	6'046.6	33.28	508.3	3'711.9	61.4%	353.5	13.1	4.1	370.7	157.0	181.9	338.9	- 31.8
12	2021	1'674.6	3'985.5	418.5	6'078.6	31.95	518.7	3'678.1	60.5%	357.4	12.7	4.1	374.2	160.2	180.3	340.5	- 33.7
13	2022	1'717.1	3'965.5	436.2	6'118.8	40.24	528.1	3'641.1	59.5%	360.6	13.8	4.2	378.7	163.1	178.6	341.7	- 37.0
14	2023	1'752.2	3'953.6	454.7	6'160.5	41.68	538.9	3'601.9	58.5%	364.0	14.0	4.3	382.3	166.4	176.7	343.1	- 39.2
15	2024	1'776.2	3'962.0	475.4	6'213.6	53.09	550.0	3'560.5	57.3%	367.4	14.2	4.4	386.0	169.8	174.8	344.6	- 41.4
16	2025	1'810.6	3'964.5	495.6	6'270.8	57.17	560.2	3'516.1	56.1%	371.3	14.4	4.5	390.1	173.0	172.7	345.7	- 44.5
17	2026	1'821.9	3'999.0	519.9	6'340.8	70.07	569.4	3'467.5	54.7%	375.5	14.7	4.6	394.8	175.8	170.4	346.2	- 48.6
18	2027	1'837.5	4'036.2	544.9	6'418.5	77.70	579.6	3'415.0	53.2%	379.7	15.0	4.6	399.3	179.0	167.9	346.9	- 52.4
19	2028	1'854.9	4'065.7	569.2	6'489.8	71.29	589.6	3'358.0	51.7%	383.9	15.8	4.7	404.4	182.1	165.3	347.3	- 57.0
20	2029	1'795.4	4'188.5	607.3	6'591.3	101.48	599.9	3'295.6	50.0%	389.3	15.9	4.8	410.0	185.2	162.4	347.6	- 62.4
21	2030	1'762.4	4'278.4	641.8	6'682.5	91.21	607.9	3'224.4	48.3%	396.6	16.6	4.9	418.1	187.7	159.1	346.8	- 71.3
22	2031	1'747.5	4'343.0	673.2	6'763.7	81.19	617.6	3'146.4	46.5%	402.2	17.0	4.9	424.2	190.7	155.5	346.2	- 78.0
23	2032	1'707.8	4'438.2	710.1	6'856.1	92.41	628.4	3'062.1	44.7%	407.1	17.7	5.0	429.8	194.0	151.5	345.5	- 84.3
24	2033	1'647.8	4'549.6	750.7	6'948.1	91.94	636.9	2'968.2	42.7%	413.8	18.8	5.1	437.7	196.7	147.2	343.8	- 93.9
25	2034	1'623.2	4'622.5	785.8	7'031.5	83.44	648.3	2'867.5	40.8%	419.0	19.1	5.2	443.3	200.2	142.4	342.6	-100.7
26	2035	1'573.7	4'725.1	826.9	7'125.6	94.13	660.5	2'760.6	38.7%	423.7	19.3	5.3	448.2	204.0	137.3	341.3	-106.9
27	2036	1'571.7	4'773.0	859.1	7'203.8	78.17	670.9	2'645.1	36.7%	428.9	20.4	5.4	454.6	207.2	131.9	339.1	-115.5
28	2037	1'559.7	4'835.7	894.6	7'290.0	86.25	683.8	2'523.7	34.6%	432.1	21.1	5.5	458.6	211.2	126.1	337.3	-121.3
29	2038	1'559.5	4'889.2	929.0	7'377.7	87.64	697.6	2'396.5	32.5%	435.5	21.7	5.6	462.7	215.4	120.1	335.5	-127.2
30	2039	1'575.4	4'929.6	961.3	7'466.2	88.49	711.9	2'264.2	30.3%	438.4	21.9	5.7	465.9	219.8	113.7	333.6	-132.4

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C17

Model MM03 b

i = 4.50 % Technical interest rate in %
i' = 5.00 % Actual rate of return in %

FS(0) = 5748.4 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'620.1	3'950.5	177.8	5'748.4			5'748.4	100.0%								
1	2010	1'487.6	4'042.1	202.1	5'731.8	-16.68	408.4	5'836.0	101.8%	288.8	29.2	3.3	321.2	126.1	282.6	408.7	87.5
2	2011	1'445.0	4'097.4	225.4	5'767.8	36.02	424.9	5'932.4	102.9%	302.3	16.1	3.4	321.8	131.2	287.1	418.3	96.5
3	2012	1'439.0	4'113.2	246.8	5'799.0	31.24	432.1	6'028.4	104.0%	311.7	14.1	3.5	329.3	133.4	291.8	425.2	95.9
4	2013	1'435.8	4'127.0	268.3	5'831.0	32.01	441.4	6'126.2	105.1%	318.5	12.9	3.5	335.0	136.3	296.5	432.8	97.8
5	2014	1'455.6	4'113.3	287.9	5'856.8	25.79	444.4	6'219.4	106.2%	325.0	16.6	3.6	345.2	137.2	301.2	438.4	93.2
6	2015	1'481.1	4'098.0	307.3	5'886.4	29.62	456.9	6'317.3	107.3%	330.7	14.6	3.7	349.0	141.1	305.8	446.9	97.9
7	2016	1'506.0	4'084.7	326.8	5'917.4	30.97	467.7	6'419.9	108.5%	335.8	13.0	3.7	352.6	144.4	310.7	455.2	102.6
8	2017	1'553.7	4'051.8	344.4	5'949.9	32.46	478.1	6'526.8	109.7%	340.5	12.2	3.8	356.6	147.6	315.8	463.5	106.9
9	2018	1'576.9	4'041.4	363.7	5'982.0	32.17	486.6	6'635.3	110.9%	344.9	14.0	3.9	362.8	150.3	321.1	471.4	108.5
10	2019	1'603.0	4'027.8	382.6	6'013.4	31.31	498.1	6'748.9	112.2%	349.3	13.5	4.0	366.8	153.8	326.5	480.3	113.6
11	2020	1'634.2	4'011.3	401.1	6'046.6	33.28	508.3	6'867.4	113.6%	353.5	13.1	4.1	370.7	157.0	332.2	489.1	118.5
12	2021	1'674.6	3'985.5	418.5	6'078.6	31.95	518.7	6'991.4	115.0%	357.4	12.7	4.1	374.2	160.2	338.1	498.3	124.0
13	2022	1'717.1	3'965.5	436.2	6'118.8	40.24	528.1	7'120.1	116.4%	360.6	13.8	4.2	378.7	163.1	344.2	507.3	128.7
14	2023	1'752.2	3'953.6	454.7	6'160.5	41.68	538.9	7'254.8	117.8%	364.0	14.0	4.3	382.3	166.4	350.7	517.1	134.7
15	2024	1'776.2	3'962.0	475.4	6'213.6	53.09	550.0	7'396.1	119.0%	367.4	14.2	4.4	386.0	169.8	357.4	527.2	141.2
16	2025	1'810.6	3'964.5	495.6	6'270.8	57.17	560.2	7'543.4	120.3%	371.3	14.4	4.5	390.1	173.0	364.4	537.4	147.3
17	2026	1'821.9	3'999.0	519.9	6'340.8	70.07	569.4	7'696.2	121.4%	375.5	14.7	4.6	394.8	175.8	371.8	547.6	152.8
18	2027	1'837.5	4'036.2	544.9	6'418.5	77.70	579.6	7'855.2	122.4%	379.7	15.0	4.6	399.3	179.0	379.4	558.3	159.0
19	2028	1'854.9	4'065.7	569.2	6'489.8	71.29	589.6	8'020.1	123.6%	383.9	15.8	4.7	404.4	182.1	387.3	569.4	165.0
20	2029	1'795.4	4'188.5	607.3	6'591.3	101.48	599.9	8'190.9	124.3%	389.3	15.9	4.8	410.0	185.2	395.5	580.7	170.7
21	2030	1'762.4	4'278.4	641.8	6'682.5	91.21	607.9	8'364.4	125.2%	396.6	16.6	4.9	418.1	187.7	403.9	591.6	173.5
22	2031	1'747.5	4'343.0	673.2	6'763.7	81.19	617.6	8'543.4	126.3%	402.2	17.0	4.9	424.2	190.7	412.5	603.2	179.0
23	2032	1'707.8	4'438.2	710.1	6'856.1	92.41	628.4	8'729.0	127.3%	407.1	17.7	5.0	429.8	194.0	421.3	615.4	185.6
24	2033	1'647.8	4'549.6	750.7	6'948.1	91.94	636.9	8'918.4	128.4%	413.8	18.8	5.1	437.7	196.7	430.5	627.2	189.4
25	2034	1'623.2	4'622.5	785.8	7'031.5	83.44	648.3	9'115.2	129.6%	419.0	19.1	5.2	443.3	200.2	439.9	640.1	196.8
26	2035	1'573.7	4'725.1	826.9	7'125.6	94.13	660.5	9'320.7	130.8%	423.7	19.3	5.3	448.2	204.0	449.7	653.7	205.4
27	2036	1'571.7	4'773.0	859.1	7'203.8	78.17	670.9	9'533.1	132.3%	428.9	20.4	5.4	454.6	207.2	459.9	667.1	212.5
28	2037	1'559.7	4'835.7	894.6	7'290.0	86.25	683.8	9'756.2	133.8%	432.1	21.1	5.5	458.6	211.2	470.5	681.7	223.1
29	2038	1'559.5	4'889.2	929.0	7'377.7	87.64	697.6	9'990.6	135.4%	435.5	21.7	5.6	462.7	215.4	481.7	697.1	234.4
30	2039	1'575.4	4'929.6	961.3	7'466.2	88.49	711.9	10'238.0	137.1%	438.4	21.9	5.7	465.9	219.8	493.5	713.3	247.3

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C18

Model MM01 a

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'074.7	3'950.5	177.8	5'203.0			3'903.5	75.0%								
1	2010	1'054.9	4'039.2	202.0	5'296.1	93.09	408.4	3'894.6	73.5%	288.8	33.2	3.3	325.2	126.1	190.3	316.4	- 8.9
2	2011	1'044.5	4'089.1	224.9	5'358.6	62.47	425.0	3'890.0	72.6%	302.4	20.0	3.4	325.8	131.2	189.9	321.2	- 4.6
3	2012	1'055.4	4'101.5	246.1	5'403.0	44.43	432.0	3'880.3	71.8%	311.8	17.5	3.5	332.7	133.4	189.6	323.0	- 9.7
4	2013	1'068.8	4'112.0	267.3	5'448.1	45.05	441.4	3'867.3	71.0%	318.7	16.1	3.5	338.3	136.3	189.0	325.3	- 13.0
5	2014	1'092.2	4'093.9	286.6	5'472.7	24.60	444.3	3'843.8	70.2%	325.2	20.0	3.6	348.8	137.2	188.1	325.3	- 23.4
6	2015	1'120.9	4'073.9	305.5	5'500.3	27.63	456.8	3'820.0	69.5%	330.9	17.4	3.7	351.9	141.1	187.0	328.1	- 23.8
7	2016	1'149.4	4'055.0	324.4	5'528.8	28.48	467.5	3'793.8	68.6%	336.0	16.5	3.7	356.3	144.4	185.8	330.1	- 26.2
8	2017	1'190.2	4'016.1	341.4	5'547.6	18.84	477.9	3'765.0	67.9%	340.6	16.4	3.8	360.8	147.6	184.4	332.0	- 28.8
9	2018	1'219.0	3'993.6	359.4	5'572.1	24.48	486.2	3'731.4	67.0%	344.8	18.0	3.9	366.7	150.1	182.9	333.1	- 33.7
10	2019	1'246.7	3'973.4	377.5	5'597.6	25.49	497.9	3'695.5	66.0%	349.1	17.7	4.0	370.8	153.7	181.2	335.0	- 35.8
11	2020	1'277.5	3'945.1	394.5	5'617.1	19.56	508.1	3'657.3	65.1%	353.1	17.3	4.1	374.5	156.9	179.4	336.3	- 38.2
12	2021	1'310.8	3'914.3	411.0	5'636.1	18.93	518.2	3'616.5	64.2%	356.8	17.3	4.1	378.3	160.0	177.5	337.5	- 40.8
13	2022	1'344.2	3'885.1	427.4	5'656.7	20.61	527.8	3'572.3	63.2%	360.0	18.5	4.2	382.7	163.0	175.4	338.4	- 44.3
14	2023	1'372.0	3'863.1	444.3	5'679.4	22.77	538.7	3'525.3	62.1%	363.1	19.1	4.3	386.5	166.3	173.2	339.5	- 47.0
15	2024	1'388.4	3'861.8	463.4	5'713.6	34.12	549.6	3'475.8	60.8%	366.3	19.4	4.4	390.0	169.7	170.8	340.5	- 49.5
16	2025	1'408.6	3'854.8	481.8	5'745.2	31.70	559.5	3'422.6	59.6%	370.0	19.8	4.5	394.2	172.8	168.3	341.1	- 53.1
17	2026	1'412.7	3'878.8	504.2	5'795.8	50.58	568.6	3'365.1	58.1%	374.0	20.2	4.5	398.7	175.6	165.6	341.2	- 57.5
18	2027	1'422.0	3'898.3	526.3	5'846.6	50.75	578.5	3'303.0	56.5%	378.0	20.9	4.6	403.5	178.7	162.7	341.4	- 62.2
19	2028	1'429.9	3'913.7	547.9	5'891.5	44.96	588.9	3'236.3	54.9%	381.8	21.5	4.7	408.0	181.8	159.6	341.4	- 66.6
20	2029	1'389.8	4'020.9	583.0	5'993.8	102.21	598.9	3'164.0	52.8%	386.8	21.8	4.8	413.4	184.9	156.2	341.1	- 72.3
21	2030	1'365.2	4'096.4	614.5	6'076.0	82.28	606.9	3'082.5	50.7%	393.8	22.7	4.9	421.4	187.4	152.4	339.8	- 81.5
22	2031	1'352.6	4'150.2	643.3	6'146.0	70.01	616.3	2'993.9	48.7%	399.0	23.2	4.9	427.1	190.3	148.3	338.6	- 88.5
23	2032	1'322.3	4'234.0	677.4	6'233.8	87.75	627.0	2'898.5	46.5%	403.6	24.2	5.0	432.8	193.6	143.8	337.4	- 95.4
24	2033	1'285.6	4'332.1	714.8	6'332.5	98.74	635.3	2'793.1	44.1%	409.8	25.6	5.1	440.5	196.2	138.9	335.1	-105.4
25	2034	1'267.7	4'390.5	746.4	6'404.6	72.07	646.0	2'680.2	41.8%	414.6	26.2	5.2	446.0	199.5	133.6	333.1	-112.9
26	2035	1'237.6	4'478.4	783.7	6'499.7	95.11	658.1	2'560.9	39.4%	418.7	26.5	5.3	450.4	203.2	127.9	331.1	-119.3
27	2036	1'238.8	4'514.0	812.5	6'565.3	65.58	668.3	2'432.3	37.0%	423.5	28.0	5.3	456.8	206.4	121.9	328.2	-128.6
28	2037	1'236.9	4'556.4	842.9	6'636.3	71.00	680.9	2'297.3	34.6%	426.3	28.9	5.4	460.7	210.3	115.4	325.7	-135.0
29	2038	1'243.1	4'590.8	872.3	6'706.2	69.88	694.3	2'156.2	32.2%	429.1	29.5	5.6	464.1	214.4	108.7	323.1	-141.0
30	2039	1'257.3	4'614.2	899.8	6'771.3	65.09	708.2	2'009.3	29.7%	431.3	30.3	5.7	467.3	218.7	101.7	320.4	-147.0

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C19

Model MM01 b

i = 4.50 % Technical interest rate in %
 i' = 5.00 % Actual rate of return in %

FS(0) = 5203.0 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'074.7	3'950.5	177.8	5'203.0			5'203.0	100.0%								
1	2010	1'054.9	4'039.2	202.0	5'296.1	93.09	408.4	5'259.1	99.3%	288.8	33.2	3.3	325.2	126.1	255.2	381.3	56.1
2	2011	1'044.5	4'089.1	224.9	5'358.6	62.47	425.0	5'322.7	99.3%	302.4	20.0	3.4	325.8	131.2	258.2	389.4	63.6
3	2012	1'055.4	4'101.5	246.1	5'403.0	44.43	432.0	5'384.6	99.7%	311.8	17.5	3.5	332.7	133.4	261.2	394.6	61.9
4	2013	1'068.8	4'112.0	267.3	5'448.1	45.05	441.4	5'446.9	100.0%	318.7	16.1	3.5	338.3	136.3	264.2	400.5	62.2
5	2014	1'092.2	4'093.9	286.6	5'472.7	24.60	444.3	5'502.4	100.5%	325.2	20.0	3.6	348.8	137.2	267.1	404.3	55.5
6	2015	1'120.9	4'073.9	305.5	5'500.3	27.63	456.8	5'561.5	101.1%	330.9	17.4	3.7	351.9	141.1	269.9	411.0	59.1
7	2016	1'149.4	4'055.0	324.4	5'528.8	28.48	467.5	5'622.4	101.7%	336.0	16.5	3.7	356.3	144.4	272.8	417.2	60.9
8	2017	1'190.2	4'016.1	341.4	5'547.6	18.84	477.9	5'685.0	102.5%	340.6	16.4	3.8	360.8	147.6	275.9	423.4	62.6
9	2018	1'219.0	3'993.6	359.4	5'572.1	24.48	486.2	5'747.3	103.1%	344.8	18.0	3.9	366.7	150.1	278.9	429.0	62.3
10	2019	1'246.7	3'973.4	377.5	5'597.6	25.49	497.9	5'812.3	103.8%	349.1	17.7	4.0	370.8	153.7	282.0	435.8	65.0
11	2020	1'277.5	3'945.1	394.5	5'617.1	19.56	508.1	5'880.0	104.7%	353.1	17.3	4.1	374.5	156.9	285.2	442.1	67.7
12	2021	1'310.8	3'914.3	411.0	5'636.1	18.93	518.2	5'950.3	105.6%	356.8	17.3	4.1	378.3	160.0	288.6	448.6	70.3
13	2022	1'344.2	3'885.1	427.4	5'656.7	20.61	527.8	6'022.7	106.5%	360.0	18.5	4.2	382.7	163.0	292.1	455.1	72.4
14	2023	1'372.0	3'863.1	444.3	5'679.4	22.77	538.7	6'098.2	107.4%	363.1	19.1	4.3	386.5	166.3	295.7	462.0	75.5
15	2024	1'388.4	3'861.8	463.4	5'713.6	34.12	549.6	6'177.4	108.1%	366.3	19.4	4.4	390.0	169.7	299.5	469.2	79.1
16	2025	1'408.6	3'854.8	481.8	5'745.2	31.70	559.5	6'259.3	108.9%	370.0	19.8	4.5	394.2	172.8	303.4	476.2	82.0
17	2026	1'412.7	3'878.8	504.2	5'795.8	50.58	568.6	6'343.7	109.5%	374.0	20.2	4.5	398.7	175.6	307.5	483.1	84.3
18	2027	1'422.0	3'898.3	526.3	5'846.6	50.75	578.5	6'430.4	110.0%	378.0	20.9	4.6	403.5	178.7	311.6	490.3	86.8
19	2028	1'429.9	3'913.7	547.9	5'891.5	44.96	588.9	6'520.2	110.7%	381.8	21.5	4.7	408.0	181.8	315.9	497.8	89.7
20	2029	1'389.8	4'020.9	583.0	5'993.8	102.21	598.9	6'612.0	110.3%	386.8	21.8	4.8	413.4	184.9	320.4	505.3	91.9
21	2030	1'365.2	4'096.4	614.5	6'076.0	82.28	606.9	6'702.9	110.3%	393.8	22.7	4.9	421.4	187.4	324.8	512.2	90.9
22	2031	1'352.6	4'150.2	643.3	6'146.0	70.01	616.3	6'795.4	110.6%	399.0	23.2	4.9	427.1	190.3	329.3	519.6	92.5
23	2032	1'322.3	4'234.0	677.4	6'233.8	87.75	627.0	6'890.0	110.5%	403.6	24.2	5.0	432.8	193.6	333.9	527.5	94.7
24	2033	1'285.6	4'332.1	714.8	6'332.5	98.74	635.3	6'984.2	110.3%	409.8	25.6	5.1	440.5	196.2	338.5	534.6	94.2
25	2034	1'267.7	4'390.5	746.4	6'404.6	72.07	646.0	7'080.9	110.6%	414.6	26.2	5.2	446.0	199.5	343.1	542.6	96.7
26	2035	1'237.6	4'478.4	783.7	6'499.7	95.11	658.1	7'181.6	110.5%	418.7	26.5	5.3	450.4	203.2	347.9	551.1	100.7
27	2036	1'238.8	4'514.0	812.5	6'565.3	65.58	668.3	7'284.0	110.9%	423.5	28.0	5.3	456.8	206.4	352.9	559.3	102.4
28	2037	1'236.9	4'556.4	842.9	6'636.3	71.00	680.9	7'391.6	111.4%	426.3	28.9	5.4	460.7	210.3	358.0	568.3	107.6
29	2038	1'243.1	4'590.8	872.3	6'706.2	69.88	694.3	7'505.3	111.9%	429.1	29.5	5.6	464.1	214.4	363.4	577.8	113.7
30	2039	1'257.3	4'614.2	899.8	6'771.3	65.09	708.2	7'625.8	112.6%	431.3	30.3	5.7	467.3	218.7	369.1	587.8	120.5

Contribution rate:

30.88 %

Rate of return:

5.00 %

CPCERN

Appendix C20

Model MM08

i = 4.00 % Technical interest rate in %
 i' = 4.50 % Actual rate of return in %

FS(0) = 3903.5 millions of CHF

in millions of CHF

t	Year	CPA(t)	RMP(t)	PL(t)	ENG(t)	VE(t)	TR(t)	FS(t)	DC(t)	PV(t)	VV(t)	FR(t) 0.80%	DEP(t)	COT(t) 30.88%	REV(t)	REC(t)	EXC(t)
0	2009	1'668.5	4'174.2	187.8	6'030.5			3'903.5	64.7%								
1	2010	1'620.6	4'241.7	212.1	6'074.3	43.76	408.3	3'883.6	63.9%	288.8	25.4	3.3	317.4	126.1	171.4	297.5	- 19.9
2	2011	1'573.8	4'300.5	236.5	6'110.9	36.61	425.0	3'867.2	63.3%	302.2	12.6	3.4	318.2	131.2	170.6	301.8	- 16.4
3	2012	1'567.3	4'317.9	259.1	6'144.3	33.35	432.1	3'844.5	62.6%	311.6	10.9	3.5	325.9	133.4	169.7	303.2	- 22.7
4	2013	1'563.8	4'332.8	281.6	6'178.2	33.94	441.5	3'816.9	61.8%	318.4	10.6	3.5	332.5	136.3	168.6	305.0	- 27.6
5	2014	1'582.6	4'319.8	302.4	6'204.8	26.64	444.4	3'777.4	60.9%	324.9	15.4	3.6	343.9	137.2	167.2	304.4	- 39.5
6	2015	1'610.1	4'304.5	322.8	6'237.5	32.63	456.9	3'736.4	59.9%	330.7	13.2	3.7	347.5	141.1	165.4	306.5	- 41.0
7	2016	1'637.8	4'289.3	343.1	6'270.2	32.73	467.7	3'692.7	58.9%	335.7	12.2	3.7	351.7	144.4	163.5	308.0	- 43.7
8	2017	1'689.9	4'252.2	361.4	6'303.5	33.29	478.3	3'646.4	57.8%	340.2	11.5	3.8	355.6	147.7	161.5	309.2	- 46.3
9	2018	1'714.8	4'240.5	381.6	6'336.9	33.39	486.4	3'594.0	56.7%	344.5	13.5	3.9	362.0	150.2	159.4	309.6	- 52.4
10	2019	1'741.7	4'228.7	401.7	6'372.2	35.35	498.1	3'538.9	55.5%	348.8	13.1	4.0	365.9	153.8	157.0	310.8	- 55.1
11	2020	1'774.5	4'211.0	421.1	6'406.6	34.38	508.3	3'480.9	54.3%	353.0	12.5	4.1	369.6	157.0	154.5	311.5	- 58.1
12	2021	1'816.5	4'187.5	439.7	6'443.8	37.15	518.6	3'419.8	53.1%	356.8	12.1	4.1	373.1	160.2	151.9	312.1	- 61.0
13	2022	1'860.3	4'168.9	458.6	6'487.8	44.00	528.0	3'354.4	51.7%	360.1	13.3	4.2	377.6	163.0	149.1	312.2	- 65.4
14	2023	1'897.9	4'161.0	478.5	6'537.3	49.58	538.9	3'285.8	50.3%	363.5	13.4	4.3	381.2	166.4	146.2	312.6	- 68.6
15	2024	1'923.9	4'173.8	500.9	6'598.5	61.13	550.1	3'214.1	48.7%	366.9	13.4	4.4	384.6	169.9	143.1	313.0	- 71.7
16	2025	1'957.2	4'180.4	522.6	6'660.2	61.68	560.2	3'138.2	47.1%	370.9	13.4	4.5	388.8	173.0	139.8	312.8	- 75.9
17	2026	1'966.5	4'223.0	549.0	6'738.5	78.32	569.2	3'056.7	45.4%	375.1	14.0	4.6	393.6	175.8	136.4	312.1	- 81.5
18	2027	1'984.7	4'265.1	575.8	6'825.6	87.15	579.4	2'969.9	43.5%	379.3	14.5	4.6	398.4	178.9	132.7	311.6	- 86.9
19	2028	2'006.4	4'298.0	601.7	6'906.1	80.46	590.0	2'877.8	41.7%	383.4	14.8	4.7	403.0	182.2	128.7	310.9	- 92.0
20	2029	1'946.6	4'423.6	641.4	7'011.6	105.55	600.1	2'779.2	39.6%	388.7	15.1	4.8	408.5	185.3	124.5	309.9	- 98.7
21	2030	1'907.8	4'527.0	679.1	7'113.8	102.20	608.5	2'670.6	37.5%	395.9	15.7	4.9	416.5	187.9	120.0	307.9	-108.6
22	2031	1'887.9	4'604.7	713.7	7'206.3	92.44	617.9	2'553.4	35.4%	402.0	16.1	4.9	423.0	190.8	115.0	305.8	-117.2
23	2032	1'842.2	4'712.6	754.0	7'308.8	102.57	629.1	2'428.7	33.2%	407.0	16.6	5.0	428.6	194.3	109.7	304.0	-124.7
24	2033	1'779.7	4'834.3	797.7	7'411.7	102.82	637.4	2'292.8	30.9%	414.0	17.6	5.1	436.7	196.8	104.0	300.8	-135.9
25	2034	1'752.4	4'915.6	835.6	7'503.6	91.98	648.9	2'148.1	28.6%	419.2	18.4	5.2	442.8	200.4	97.8	298.2	-144.7
26	2035	1'697.4	5'029.3	880.1	7'606.8	103.15	661.1	1'995.2	26.2%	424.3	18.7	5.3	448.2	204.1	91.2	295.4	-152.9
27	2036	1'700.0	5'080.3	914.5	7'694.8	87.98	671.6	1'832.4	23.8%	429.9	19.2	5.4	454.5	207.4	84.3	291.7	-162.9
28	2037	1'686.9	5'153.8	953.5	7'794.1	99.36	684.7	1'661.7	21.3%	433.5	20.0	5.5	459.0	211.4	76.9	288.4	-170.6
29	2038	1'688.5	5'214.1	990.7	7'893.3	99.15	698.2	1'483.1	18.8%	437.6	20.3	5.6	463.6	215.6	69.3	284.9	-178.7
30	2039	1'704.9	5'261.0	1025.9	7'991.8	98.49	712.7	1'296.8	16.2%	441.0	20.8	5.7	467.6	220.1	61.2	281.3	-186.2

Contribution rate:

30.88 %

Rate of return:

4.50 %