MODEL FOR SIMULATING EXPENDITURE SCENARIOS FOR CONTRIBUTORY SOCIAL SECURITY RETIREMENT PENSIONS

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Introduction

This study attempts to establish an instrument which, with the available information published by the Ministry of Labour and Social Affairs, would enable scenarios to be simulated for changes in expenditure on Social Security contributory pensions, as well as measuring the impact on such expenditure attributable to specific policies which may be adopted in the future.

While not forgetting that instruments are not an end in themselves and that the ultimate aim is to provide results for analysis which could serve as a support in decision-taking, we wish to stress that one of the specific aims of this study is to put forward an analytical method which would make it possible to have available results which would be as up-to-date as the information sources on which it is based.

The development of the retirement pension system has to be placed within the demographic, economic and legal framework of Spain. On the legal side, this model incorporates the reform of the system established in 1997, as a consequence of the application of the Toledo Pact Agreements, in the " Law for the Consolidation and Rationalisation of the Social Security System". The measures envisaged in this law will be fully applied in 2002, from which time we assume no further changes in the legislation.

The demographic scenario, which will later be analysed in detail, has been carried out by the National Statistical Institute[1].The macroeconomic model, also described below, was devised by the General Undersecretariat for Economic Analysis and Planning[2] based on the demographic scenario itself[3].

Having established the general framework within which we estimate the future pension system will develop, behaviour of retirement pension expenditure are calculated from a

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[1] Acknowledgements to the National Statistical Institute and to Margarita Cantalapiedra for all their co-operation.
[2] Acknowledgements to its Deputy Director, Juan Varela Donoso and Angel Sánchez Avila for all their co-operation.
[3] It should be pointed out that both scenarios logically influence the results of the model, but they do not affect the methodology of the same.

collection of identities and functional relationships which reflect in analytical form the rules which govern this Social Security benefit.

Regulatory framework

As is known, the Social Security (Spanish Public Pension) system is a complex web of benefits and groups of people each of which deserves separate analysis. Practical considerations have led us to work with the system as a whole, only treating separately the group of pensioners of the former Compulsory Old-Age and Disability Insurance (SOVI) whose pensions do not follow the general rules.

In accordance with those general rules, the access to a Social Security retirement pension involves the following general requirements:

* To be a registered contributor to the system or be in a similar situation at the time of eligibility. Although this is a legal requirement, Law 26/1985, of 31st July, established that one could be eligible for retirement pensions even if in a situation of non-registration so long as the remaining requirements were met, although in this case early retirement would not be an option.

* To have satisfied a minimum contribution period of fifteen years of which at least two should be included in that fifteen year period immediately preceding the moment of eligibility.

* To be 65 years of age and no longer working.

There can be exceptions to this last requirement and therefore there are people going onto the system before the age of 65: these are early retirements. There are various situations governing different types of early retirements:

A) The voluntary right to retire early over the age of 60 of those workers who were part of the Labour Mutualism before 1st January 1967, with a reduction

coefficient applied to the amount of pension of 8% for each year below age 65. This percentage is 7% when the worker has 40 or more years' contributions.

B) Those dangerous, toxic, etc. working conditions involved in some Special Regimes (Coal Mining or the Merchant Navy) or in activities which were included as from 1987 in the General Regime and preserved the pension right. In all these cases there is no reduction coefficient.

C) Those cases related to job creation policy: partial retirement three years prior to the legal retirement age so long as there is a replacement contract for the period not worked; and retirement at 64, provided that a previously unemployed worker is hired and that it is included in the Collective Bargaining Agreement.

The initial amount of retirement pension is determined, for each worker, by applying a percentage to the regulatory base which depends on the number of years of contributions. In the case that the result is an amount lower than the established legal minimum, a supplement is applied to bring it up to this level. Each year, pensions are adjusted in accordance with the established rules, indexing a great many pensions with the consumer price index (CPI). For others, like "SOVI" pensions, the adjustment is discretionary, although these are currently being adjusted in the same way according to changes in the consumer price index.

The regulatory base is calculated from monthly contribution bases during the years prior to retirement and duly updated by the general consumer price index. With the passing of Law no. 24/97, of 1st July, the number of years considered for the calculation of the regulatory base will vary annually until the year 2002, from which time 15 years will be considered, thus establishing the following equation:

$$BR_t = \frac{\sum_{i=1}^{24} BC_i + \sum_{i=25}^{180} \frac{I_{25}}{I_i} BC_i}{210}$$

where:

$\mathbf{BR_t}$ = Regulatory base in the eligibility year t

$\mathbf{BC_i}$ = Contribution base of the "i-th" year before eligibility.

$\mathbf{I_i}$ = General consumer price index of the "i-th" month prior to eligibility

Table 1 shows the number of years considered for the calculation of the regulatory base as well as the associated months and the corresponding denominator in the previous formula:

Table 1. Breakdown of the number of years used to calculate the regulatory base.

Year	Number of years in the regulatory base
1996	8 years-96 months/112
1997	9 years-108 months/126
1998	10 years-120 months/140
1999	11 years –132 months /154
2000	12 years – 144 months /168
2001	13 years –156 months /182
2002	15 years –180 months /210

The **percentage** applicable to the regulatory base is established in the following way[4]:

For the first 15 years of contributions, 50%.

For each additional year up to the 25th year, 3% more.

For each additional year as from the 26th year, 2% more.

Under no circumstances can this exceed 100%.

In the case of the "SOVI" pension scheme, the pension, which is single, for life, permanent and of a fixed amount, is recognised for a transitional period of time by the application of the rules of the former Compulsory Old-Age and Disability Insurance (SOVI). The requirements are:

[4] Prior to the reform of 1997, to be eligible for the full pension, 35 years of contributions were necessary but for each year less of contributions the percentage applicable to the regulatory base was reduced by 2 points until it reached 60% with 15years of contributions.

* Not to have the right to another pension under the Social Security System Regime.

* To be 65 years of age, or 60 in the case of "Old-age through Disability"

* To have a contribution period of 1,800 days in the former Old-Age Regimes from 1940-1966 or, alternatively, to be registered in the former Compulsory Retired Workers' Regime (1919-1938).

Make-up of pension expenditure

The bulk of pension expenditure is determined by the number of pensioners at the end of each year. Another part of the expenditure derives from the net increase in the number of pensioners, resulting from the number of people joining and leaving the system during the year.

Also, in the calculation of the expenditure needed to deal with pensions, it must be borne in mind that pensions are adjusted annually and that the average pension for people joining the system is higher than for those leaving because of the so-called substitution effect. The amount for new pensions carries increments above the level of the C.P.I. because the regulatory bases are related to the worker's pay while the pensions, once started, rise in line with the indicator[5].

Finally, effects such as the change in the level of minimum pensions over 65, the first pension payments, the recovery of payments made by error, discretionary increases, etc. must also be considered. However, the level of expenditure they cause is residual, as can be seen in the following table referring to all pensions within the system from 1991 to 1999:

Table 2. Breakdown of pension expenditure (in percent)

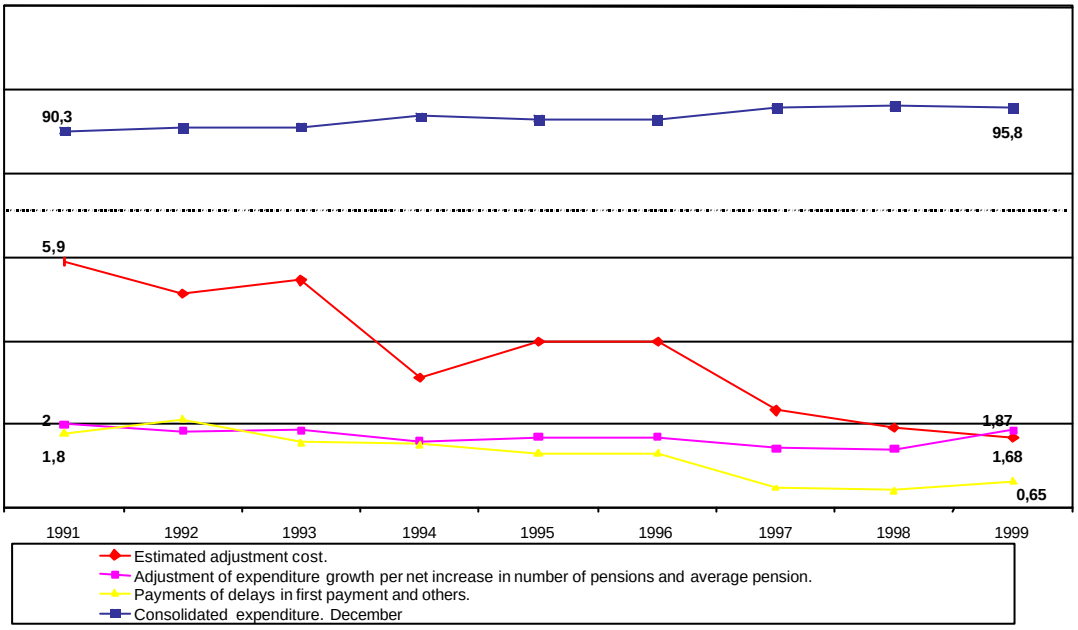
Item	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. *Consolidated value of pension expenditure in December*	90,30	90,90	91,10	93,74	93,00	93,00	95,75	96,26	95,80
2. *Estimated adjustment cost (*)*									

[5] As well as the difference in average pensions of people joining and leaving the system, the substitution effect also includes the effect of the difference between the number of people joining and leaving the system, and the effect of the variation in the level of pension during a person's period in the system (through change in family situation, age, etc.)

	5.90	5.12	5.45	3.11	4.00	4.00	2.32	1.91	1.68
3. *Estimate of expenditure growth per net increase in number of pensioners and average pension*	2.00	1.84	1.87	1.61	1.70	1.70	1.44	1.41	1.87
4. *Payment of delays in first payment and others*	1.8	2.14	1.58	1.53	1.30	1.30	0.49	0.42	0.65
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: MTAS. Social Security Budget Plan. Year 1999. Financial and Economic Report. Over various years.
(*) For 1999, it includes an increase in the minimum widow(er)'s pension.

Graph 1. Breakdown of Pension Expenditure: Share in percentage



Source: generated by the authors of this study from Table 2.

From another viewpoint, pension expenditure is calculated by considering that the pension received is the result of applying to the initial pension on joining the system the corresponding annual adjustments and adding to the result the so-called minimum supplement, as can be seen in the following table:

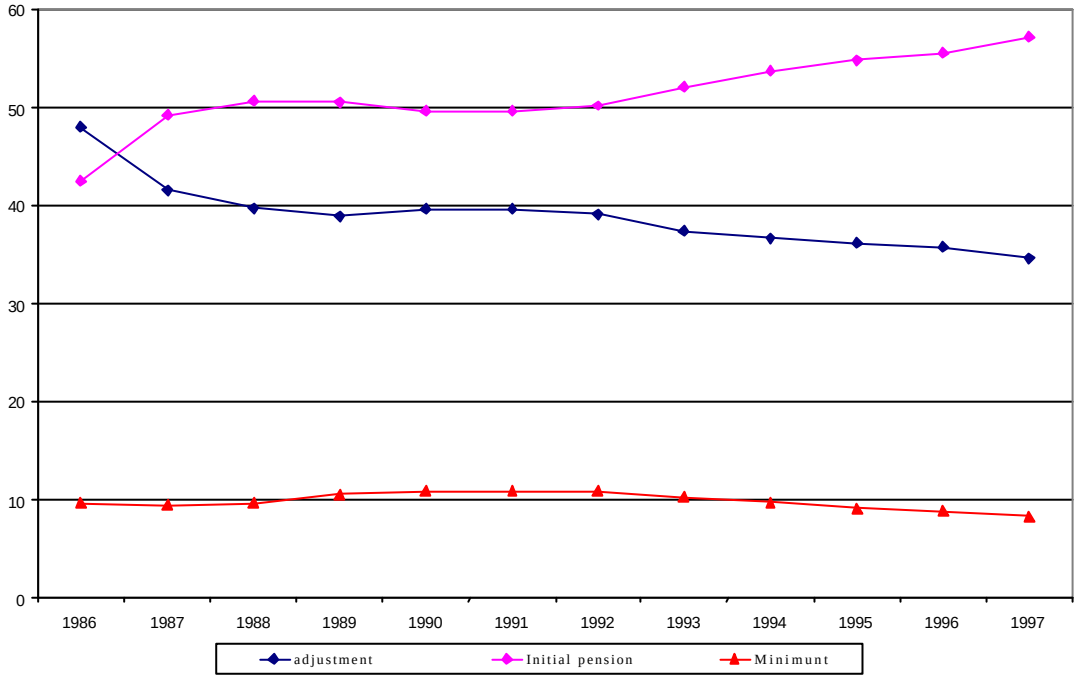
Table 3. Percentage Distribution of the amount of pensions existing according to items at 31st December of year

Year	Total	*Adjustment*	*Initial pension*	*Minimums*
1986	**100**	48.00	42,37	9,63
1987	**100**	41,,49	49,14	9,38
1988	**100**	39,69	50,66	9,64
1989	**100**	38,93	50,49	10,58
1990	**100**	39,57	49,57	10,86

1991	**100**	39,60	49,58	10,81
1992	**100**	39,09	50,10	10,81
1993	**100**	37,37	52,04	10,23
1994	**100**	36,62	53,63	9,75
1995	**100**	36,07	54,76	9,17
1996	**100**	35,67	55,54	8,79
1997	**100**	34,58	57,20	8,22

Source: generated by the authors from MTAS (1998). Social Security Budget Plan. 1999. Economic and Financial Report.

Graph 2. Distribution of the amount of pensions according to item. Figures at 31st December.



Source: generated by the authors from Table 3.

The basic Model[6]

The strategy for estimating future retirement pension expenditure is centred on a basic model which consists of a breakdown of expenditure into factors which determine changes in such expenditure. In this way, once the development of such factors is established, the future expenditure are projected through the relative functional relationships.

[6] The detail of the drawing up of the model's equations can be consulted in the document " Simulation model of expenditure scenarios for contributory retirement pensions of the Spanish Social Security" applied to the period

The breakdown of expenditure which we propose separates the demographic and economic factors. Regarding the demographic side, pensioners are regarded as a population group within the over-60's [7] (**P 60+ t** where t indicates the reference year) where the greater the pension coverage level, the larger the group. Also, the number of pensioners who receive a pension throughout one year is made up of three groups: those who receive a pension throughout the whole year (common pensioners, Ct), people joining the system (At), and those leaving the system (Bt).

In the economic field, account is taken that the average pension of the system is determined by average pensions of the three above groups and their respective minimum supplements. And also that the pension received is the result of applying to the initial entry pension the corresponding annual adjustments and adding the so-called minimum supplement to the result.

These considerations, together with the analysis carried out in the previous section, are the basis for the breakdown of retirement pension expenditure (**GPJt**) which will be developed later, as well as for the functional relationships which back the projection for such expenditure.

The initial identity breaks down the growth of retirement pension expenditure into the product of the growth rates of the following variables:

1. **Total population (Pt).**

2. **Ageing rate (Et)** measured as the proportion of people over 60 of the total population **(P60+/ Pt)**

1998-2050. Methodology and Results, available in the General Undersecretariat for Regional and Sector Analysis and Planning.

[7] The analysis of the figures for the distribution of pensioners by age shows that at the present time, 60 is the age when retirement begins, because the number of people joining the system before this age is small: on 31st December 1996, the number of pensioners under 60 came to 1,745 in the age group 50-59, out of a total of 3,398,186 pensioners (see Social Security Bulletin. Economic Management). These people under 60 retire early because they have worked in specific activities (i.e. dangerous, toxic, etc activities)

3. The retirement pension **coverage rate (TCJt)** measured as the proportion of people receiving a retirement pension throughout the year **(PJAt = Ct + Bt + At)** in the total population over age 60 **(PJAt /P60+t)**

4. The average expenditure per person, which is related to the average pension **(pmt_t)** through the coefficient $\mathbf{w_t}$, which remains constant in the time:

$$w_t = \frac{C_t + 0{,}5B_t + 0{,}5A_t}{C_t + B_t + A_t} = \frac{PJA^*}{PJA}$$

PJA* = C_t+0,5B_t+0,5A_t *Number of pensioners equivalent to PJA receiving pensions throughout the year.*

The analytical expression is as follows:

$$:\mathbf{D_t\,GPJ \approx D_t\,P \times D_t\,E \times D_t\,TCJ \times D_t\,w \times D_t\,pmt}$$

$$\mathbf{D_t\,GPJ \approx D_t\,P \times D_t\,E \times D_t\,TCJ \times D_t\,pmt}$$

Where:

$$\mathbf{D_t X = X_t / X_{t-1}} = (1+r_{x_t})$$

is the year-on-year variation of each of the variables in year t, which as a decimal is r_{x_t}.

The following step is to break down the average total pension as a weighted sum of the following average pensions:

1. average pension of the common pensioners before applying the minimum supplement (**pmc_t**).
2. average pension of those leaving the system before applying the minimum supplement (**pmb_t**).

3. average pension of those joining the system before applying the minimum supplement (**pma_t**).
4. average minimum supplement for common pensioners (**cmc_t**).
5. average minimum supplement for people joining the system (**cmb_t**).
6. average minimum supplement for those leaving the system (**cma_t**).

That is:

$$pmt_t \approx a_t pmc_t + b_t pmb_t + g_t pma_t + a_t hc_t cmc_t + b_t hb_t cmb_t + g_t ha_t cma_t$$

$$a_t = \frac{C_t}{C_t + 0{,}5B_t + 0{,}5A_t}$$

$$b_t = \frac{0.5B_t}{C_t + 0{,}5B_t + 0{,}5A_t}$$

$$g_t = \frac{0.5A_t}{C_t + 0{,}5B_t + 0{,}5A_t}$$

$$hc_t = \frac{CC_t}{C_t}$$

$$hb_t = \frac{BC_t}{B_t}$$

$$ha_t = \frac{AC_t}{A_t}$$

Where **CC_t**, **BC_t** y **AC_t** represent the pensioners with minimum supplement among common pensioners, people leaving and people joining the system respectively.

In the case of the SOVI, the pension is not calculated according to the general rules described above as it is a fixed-amount pension, established and adjusted in a discretionary way as regulated and, therefore, no breakdown is made. Its future levels

have been estimated by means of a variation equal to the general consumer price index, which has determined its adjustment in the last few years.

The expression used as a basis for the projection of the SOVI is as follows:

$$\mathbf{D_t\ GPJS \approx D_t\ P \times D_t\ E \times D_t\ TCJS \times D_t\ pms}$$

where the total expenditure (**$GPJS_t$**), the coverage rate (**$TCJS_t$**) and the average pension (**pms_t**) are specific for the group of SOVI pensioners.

Projection of variables: Scenario 1998-2050

Projection of demographic variables

The demographic variables supporting the model are [8]:

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1. Pensioners existing on 31st December of each year ($\mathbf{PJ^e_t}$)
2. People joining the system during the year ($\mathbf{A^e_t}$)
3. People leaving the system during the year ($\mathbf{B^e_t}$)
4. Pensioners staying in the system during the whole year ($\mathbf{C^e_t}$)
5. The probability of death according to age ($\mathbf{q^e_t}$), inferred from the demographic scenario drawn by the National Statistical Institute (INE).

In the following sections is indicated how each one of these variables has been projected based on observed or estimated values during the period 1987 to 1997.

Demographic scenario

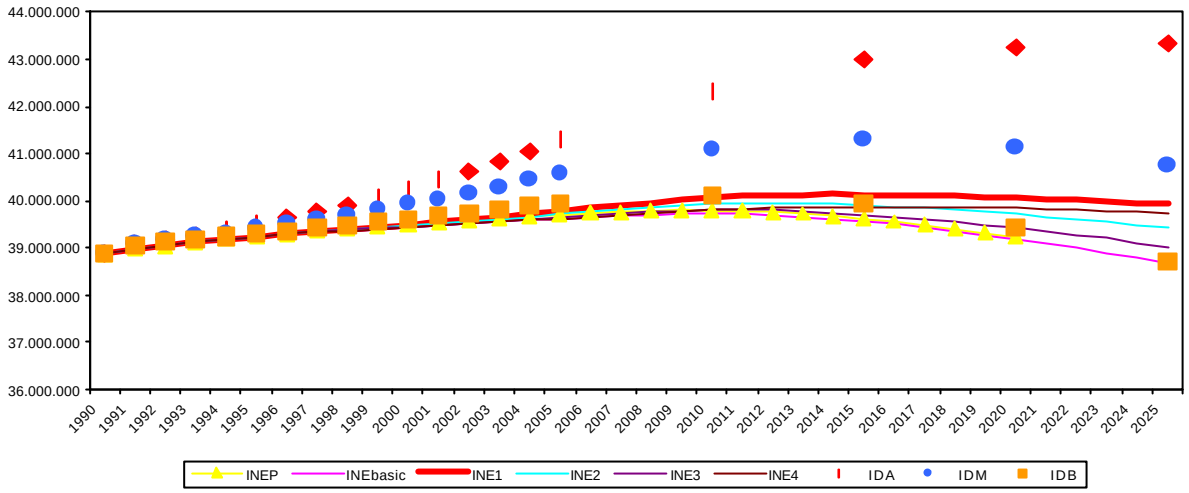
As a reference to carry out the projection of the above-mentioned demographic variables it is necessary to consider the whole population and its age structure.

Several demographic projections show the possible situation of the Spanish population in the future. In each of the projections considered, the Spanish population trend bears one unquestionable feature: the population is ageing.

[8] PJ^e_t, A^e_t, B^e_t and C^e_t denote, respectively, the total number of pensioners on 31st December, new registrations, people leaving the system and the common pensioners for age e in year t, and they may refer both to the whole system and to the SOVI, and to the whole system without the SOVI. In each case, it is applied accordingly to the appropriate group.

Indeed, the following graphs pick up the Spanish population trend and the dependency rates of older people which the demographic projections available from the National Statistical Institute and the Institute of Demography outlined.

Graph 3. Spanish population trend according to different demographic projections



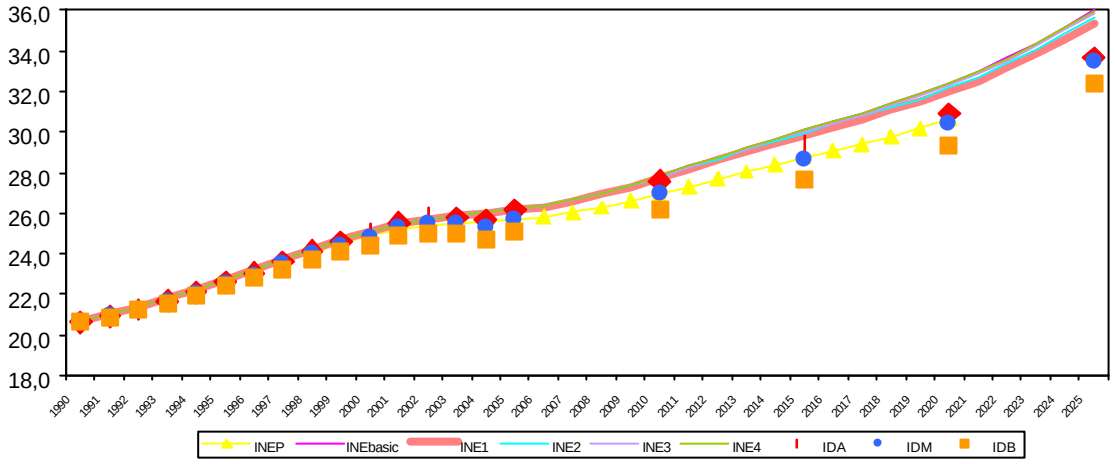
Source: generated by the authors from 1) National Statistical Institute (INE) (1996). Projections for Spanish Population calculated from Population Census 1991; 2) INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Basic scenario. Working Document. Mimeograph.; 3) INE (1999). Future scenarios for the Spanish population. Period 1990-2050. Scenarios 1-4. Working Document . Mimeograph; Institute of Demography (1994). Projections for Spanish population.

Note: The populations calculated refer to the legal population on 31st December of each year. The following table shows the characteristics and hypotheses developed referring to different demographic elements which determine the projections:

	Starting Population	Mortality	Fertility	Immigration.
INEP	I991 Population Census	On the basis of the mortality tables on December 1990, mortality has been projected so life expectancy at birth rises from 73.37 in 1990 to 76.01 (83.74 for women) in 2050. .	Falling trend from 1.329 children per woman in 1991 to 1.222 in 1998. Rising trend from 1998 reaching 1.703 in 2020	Immigration quota of 35,000 persons annually during the whole period of the projection.
INE basic	1991 Population Census.	On the basis of the mortality tables for 1980, 1985, 1990 and 1995 mortality has been projected so life expectancy at birth rises from 74.47 in 1996 to 77.23 (85.27 for women) in 2025.	Falling trend from 1.329 children per woman in 1991 to 1.159 in 1998. Rising trend from 1998 reaching 1.702 in 2020 and from then on constant rate.	Immigration quota of 35,000 persons annually during the whole period of the projection. .
INE1	As INE basic	As INE basic	As INE basic	Immigration quota rises from 35,000 in 1995 to 288,813 in 2050.
INE2	As INE basic	As INE basic	As INE basic	Immigration quota rises from 35,000 in 1995 to 167,069 in 2050.
INE3	As INE basic	As INE basic	As INE basic	Immigration quota rises from 35,000 in 1995 to 101,454 in 2050.
INE4	As INE basic	As INE basic	Falling trend from 1.329 children per woman in 1991 to 1.159 in 1998. Rising trend from 1998 reaching 2.014 in 2020 and from then on constant rate. .	As INE basic
IDA	1991 population census (advance sample)	On the basis of the mortality tables for 1985-86 and the Princeton-standard tables, mortality has been determined from an estimated series for life expectancy at birth ,with asymptote at 87.5 for women.	Rising rate from 1.326 children per woman in 1991 to 2.100 in 2025..	Immigration quota of 20,000 from 1992 to 2025.
IDM		On the basis of the mortality tables for 1985-86 and the Princeton-standard tables, mortality has been determined from an estimated series for life expectancy at birth, with asymptote at 85 for women..	Rising trend from 1.326 children per woman in 1991 to 1.800 in 2025	Immigration quota of 20,000 from 1992 to 2025.

IDB		On the basis of the mortality tables for 1985-86 and the Princeton-standard tables, mortality has been determined from an estimated series for life expectancy at birth, with asymptote of 82.5 for women.	Rising trend from 1.326 children per woman in 1991 to 1.600 in 2025.	Immigration quota of 20,000 from 1992 to 2025.

Graph 4:
Trend in the dependency rate of older people according to different demographic projections.



Source: generated by the authors from 1) INE (1996). Projections for the Spanish population calculated from the 1991 Population Census. 2) INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Basic scenario. Working document, Mimeograph; 3) INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Scenarios 1 to 4. Working Document. Mimeograph; Institute of Demography (1994). Projection for the Spanish population.

Note: see the note attached to the previous graph.

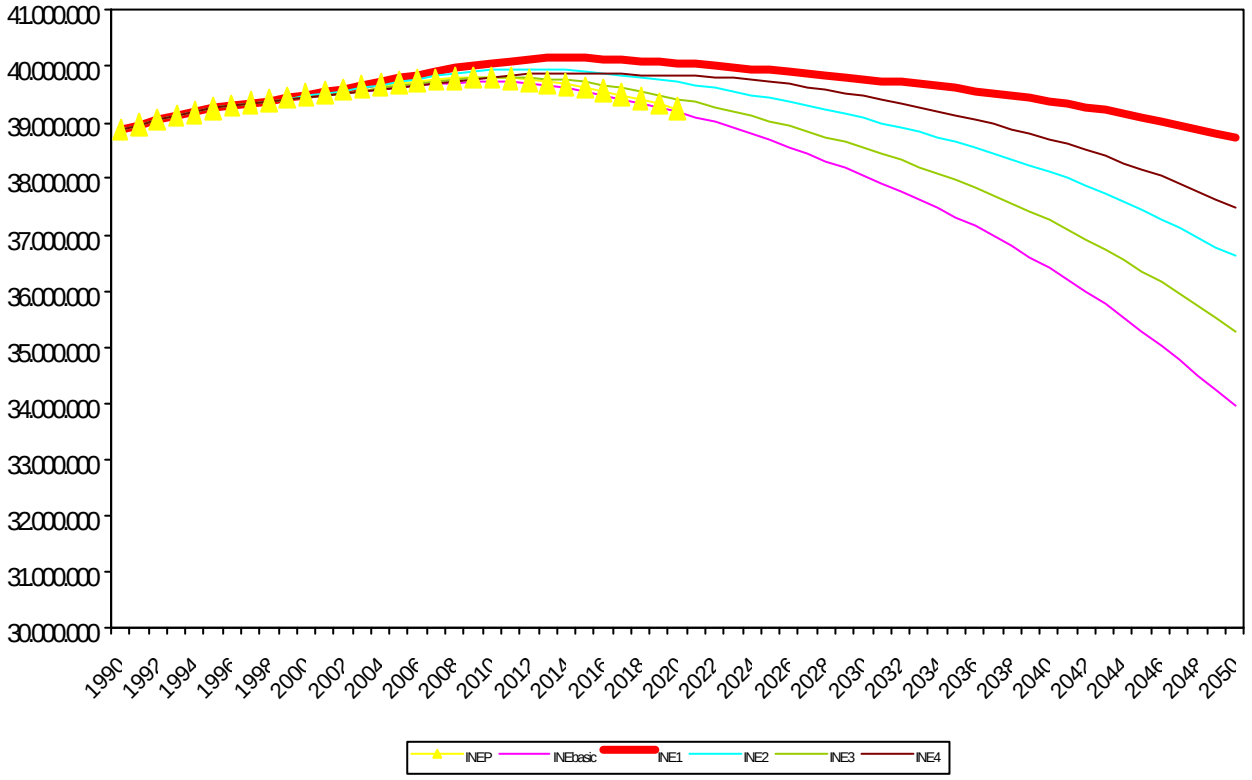
The future relationship between older people (65 years of age and over) and the potentially active population (between 15 and 64 years) shows, as noted before, a key fact for public pension policy: the dependency rate for older people increases from 1990 to 2025 between 73% and 75%. The increase up to 2050 varies according to different available projections up to that year, between 165% and 191%.

Moreover, simulations carried out with various levels for the immigration quota make it clear that, although these immigrants are on average younger than the Spanish population, their integration into Spain would not, in the medium term, cause any rejuvenation of the Spanish population. Such integration only influences in the medium term the size of the total population. Only in the long term can any appreciable change be detected in the dependency rate of older people as a result of immigration.

In this study, we have opted for the demographic scenario carried out by the National Statistical Institute [9] which sees the total population during the period covered remaining steady at between 39 and 40 million (near to the present population) thanks to immigration[10]

The following graph reflects the trend, up to the year 2050, of the Spanish population according to the National Statistical Institute's forecasts.

Graph 5. Trend of the Spanish population for the period 1990-2050 according to different scenarios developed by the National Statistical Institute. (INE)

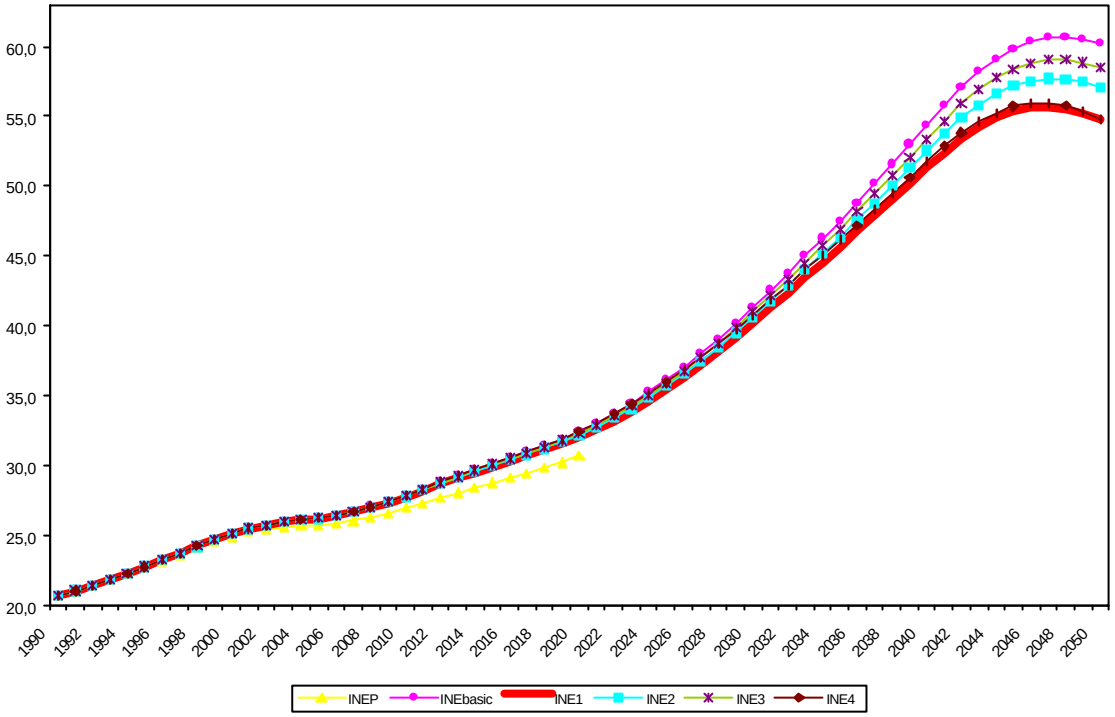


Source: generated by the authors from 1) INE (1996). Projections for the population of Spain calculated from the 1991 Population Census; 2) INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Basic scenario. Working Document. Mimeograph; 3) INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Scenarios 1 to 4. Working Document. Mimeograph.

The dependency rates for older people related to these projections are included in Graph 6.

[9] Described in the footnote of the graph as INE1
[10] This scenario has been carried out by the INE as a specific requerement

Graph 6. Trend in the dependency rates of older people in the period 1990-2050 according to different demographic scenarios developed by the INE



Source: generated by the authors from 1) INE (1996). Projections for the population of Spain calculated from the 1991 Population census. 2) INE (19999) Future scenarios for the population of Spain. Period 1990-2050. Basic scenario. Working Document. Mimeograph; 3) INE (1999) Future scenarios for the population of Spain. Period 1990-2050. Scenarios 1-4. Working Document. Mimeograph**.**

Projection for retirement pensioners

The starting point is the breakdown by age, year by year, of the retirement pensioner population, in total and within the SOVI system, at 31st December 1996. This initial breakdown has been estimated from the information provided by the Social Security in its Information Bulletin, and the National Institute for Social Security (INSS) in its Annual reports, relating to pensions, according to age groups, and attributing the population structure by single ages, in accordance with the following criteria common to both groups (total and SOVI) [11]:

[11] It is assumed that the Ae t+ reach the age e+1 in the period t+1 at a rate of 50%. Also, the period of exposure to the risk of death before the following age during t+1 is assumed at 0.5 (uniform distribution of the phenomena)

i) $PJ^{60}{}_{96} \approx 0{,}5 \times A^{60}{}_{96} \times (1\text{-}0{,}5 \times q_{96}{}^{60})$

ii) For the ages 61 to 69, in accordance with the age structure year-by-year estimated for the pensioners at 31st December 1996 from the data on new registrations form 1987 to 1996, considering that [12]:

For $60 \leq e \leq 69$

$$PJ_{96}^{60} \approx 0{,}5A_{96}^{60}(1-0{,}5q_{96}^{60})$$

$$PJ_{96}^{61} \approx PJ_{95}^{60}(1-q_{96}^{60}) + 0{,}5A_{96}^{60}(1-0{,}5q_{96}^{60}) + 0{,}5A_{96}^{61}(1-0{,}5q_{96}^{61}) =$$

$$= 0{,}5A_{95}^{60}(1-0{,}5q_{95}^{60})(1-q_{96}^{60}) + 0{,}5A_{96}^{60}(1-0{,}5q_{96}^{60}) + 0{,}5A_{96}^{61}(1-0{,}5q_{96}^{61})$$

$$PJ_{96}^{62} \approx PJ_{95}^{61}(1-q_{96}^{61}) + 0{,}5A_{96}^{61}(1-0{,}5q_{96}^{61}) + 0{,}5A_{96}^{62}(1-0{,}5q_{96}^{62}) =$$

$$= \left[0{,}5A_{94}^{60}(1-0{,}5q_{94}^{60})(1-q_{95}^{60}) + 0{,}5A_{95}^{60}(1-0{,}5q_{95}^{60}) + 0{,}5A_{95}^{61}(1-0{,}5q_{95}^{61})\right](1-q_{96}^{61}) +$$

$$. + 0{,}5A_{96}^{61}(1-0{,}5q_{96}^{61}) + 0{,}5A_{96}^{62}(1-0{,}5q_{96}^{62})$$

.....

iii) For the ages of 70 and over in accordance with the general population structure according to the data in the INE's population projections:

$$PJ_{96}^{e} = PJ_{96} \times \frac{P_{96}^{e}}{P_{96}}$$

Assuming that as from age 76 there are no people joining the retirement pension system, the pensioner population by age in future years is calculated in the following way:

[12] Rates q_{e87} to q_{e94} have been taken from the mortality tables for the Spanish population from 1990-1991 and the rates q_{e95} and q_{e96} from the mortality rates of 1994-1995.

For $t \geq 1997$

$$PJ_{t+1}^{60} \approx 0{,}5A_{t+1}^{60}(1-0{,}5q_{t+1}^{60})$$

$$PJ_{t+1}^{61} \approx PJ_{t}^{60}(1-q_{t+1}^{60}) + 0{,}5A_{t+1}^{60}(1-0{,}5q_{t+1}^{60}) + 0{,}5A_{t+1}^{61}(1-0{,}5q_{t+1}^{61})$$

.....

$$PJ_{t+1}^{75} \approx PJ_{t}^{74}(1-q_{t+1}^{74}) + 0{,}5A_{t+1}^{74}(1-0{,}5q_{t+1}^{74}) + 0{,}5A_{t+1}^{75}(1-0{,}5q_{t+1}^{75})$$

$$PJ_{t+1}^{76} \approx PJ_{t}^{75}(1-q_{t+1}^{75}) + 0{,}5A_{t+1}^{75}(1-0{,}5q_{t+1}^{75})$$

$$PJ_{t+1}^{77} \approx PJ_{t}^{76}(1-q_{t+1}^{76})$$

.....

$$PJ_{t+1}^{100+} \approx PJ_{t}^{99}(1-q_{t+1}^{99})$$

Where the rates q^{e}_{t} are the ones deduced from the demographic scenario, as we do not have the specific mortality rates for the group of retirement pensioners of the Social Security.

Projection for people joining the scheme

The projection for new registrations in the period covered is made using as a basis the estimated probability of access to retirement of cohorts of people reaching age 60 in the years 1998 to 2050. The pattern followed by these cohorts is established from the one observed for the population groups which reach age 60 in each of the years 1987 to 1997, maintaining the same trend up to year 2000.

As from year 2000, it is assumed on the one hand, that people retiring without a reduction coefficient stabilise their access probability and, on the other, that the mutualists cease retiring early progressively until, in the year 2018, early retirement disappears for this group. That is, the proportion of people coming to retire with a reduction coefficient among those reaching 60 in any given year moves lineally from the trend value in the year 2000 to zero in the year 2014. These new registrants who no longer retire early occur at the age of 65 (therefore not carrying a reduction coefficient).

In table 4 it can be seen that the proportion of people who come to retire among those who reach the age of 60 in any given year, during the period 1987 to 1997, show a rising trend with an accumulative annual rate of 3.65%, in the case of new registrants with a reduction coefficient , and 0.67% without the coefficient.

This table also shows the distribution of new registrations of the cohort according to the age when they take place, as well as the said distribution in average terms during the period 1987 to 1997[13].

[13] This distribution is maintained throughout the period 1998 to 2050.

Table 4. Pattern in the 60-year-old cohorts in their access to retirement between 1987 and 1997[14]

1. Probability of access to retirement within the cohort reaching 60 years of age between 1987 and 1996

Years	Population reaching 60 years of age	With reduction coefficient		Without reduction coefficient	
		Total registrations 60 year-old cohort. (ACh^{60}_t)	Probability of retirement for the 60-year-old cohort (κ^{ccr}_{t+1})	Total registrations 60- year-old cohort (ACh^{60}_t	Probability of retirement for the 60-year-old-cohort (κ^{scr}_{t+1})
1987	423.303	64.440	0,1522	130.885	0,3092
1988	431,804	70,224	0.1626	135,225	0.3132
1989	435,087	72,354	0.1663	132,233	0.3039
1990	443,256	75,609	0.1706	131,797	0.2973
1991	446,851	80,889	0.1810	131,210	0.2936
1992	446,923	85,927	0.1923	129,449	0.2896
1993	442,545	87,577	0.1979	138,613	0.3132
1994	443,602	85,079	0.1918	145,140	0.3272
1995	430,981	86,940	0.2017	138,760	0.3220
1996	408,683	86,236	0.2110	133,340	0.3263
1997	381,516	83,105	0.2178	126,097	0.3305
Cumulative Annual Rate (%)			**3.65**		**0.67**

Source: generated by the authors from **1)** MTAS (1998). Social Security Budget Plan. Year 1999, Financial and Economic Report and Appendix I to the Financial and Economic Report; **2)** MTAS. Labour and Social Affairs Statistical Yearbook. Various years.

Note 1:

$$ACh60t \approx A60t+A61t+1+\ldots+A69t+9+A70+t+10$$

And for $t \neq 1987 \ldots 1997$:

$$Aet = Pet \times Praltae \mid Pe)$$

Pr(altae | Pe) = average probability during the period 1987 to 1997 that a person of age e registers as a retirement pensioner

Where the registrations and registration probabilities refer both to those with and without reduction coefficient, in each case it is indicated which type corresponds.

Note 2: note that, relating registrations at a certain age e with the population of that age instead of with the active population implies that keeping the probabilities of registration for retirement constant, the proportion of workers with a full history of contributions will decrease in the future, given that the macroeconomic scenario indicates a rising trend in employment rates.

[14] This data refers to the whole system without SOVI

2, Distribution of the retiring population within the 60-year -old cohort with reduction coefficient (S^e_{ccr})

Years	Total	60	61	62	63	64
1987	1	0.4750	0.1685	0.1408	0.1195	0,0961
1988	1	0.5140	0.1486	0.1307	0.1070	0,0997
1989	1	0.5183	0.1351	0.1216	0.1186	0,1065
1990	1	0.5078	0.1225	0.1271	0.1241	0,1185
1991	1	0.4855	0.1245	0.1363	0.1395	0,1142
1992	1	0.4979	0.1230	0.1528	0.1312	0,0951
1993	1	0.4955	0.1496	0.1556	0.1153	0,0840
1994	1	0.5413	0.1529	0.1256	0.0914	0,0888
1995	1	0.5769	0.1255	0.1066	0.1050	0,0859
1996	1	0.5923	0.1059	0.1168	0.1018	0,0832
1997	1	0.5862	0.1187	0.1142	0.0995	0,0814
AVERAGES						
1987	1	0.48	0.17	0.14	0.12	0.10
1987-88	1	0.49	0.16	0.14	0.11	0.10
1987-89	1	0.50	0.15	0.13	0.12	0.10
1987-90	1	0.50	0.14	0.13	0.12	0.11
1987-91	1	0.50	0.14	0.13	0.12	0.11
1987-92	1	0.50	0.14	0.13	0.12	0.11
1987-93	1	0.50	0.14	0.14	0.12	0.10
1987-94	1	0.50	0.14	0.14	0.12	0.10
1987-95	1	0.51	0.14	0.13	0.12	0.10
1987-96	1	0.52	0.14	0.13	0.12	0.10
1987-97	1	0.53	0.13	0.13	0.11	0.10

3, Distribution of the retiring population within the 60-year-old cohort without reduction coefficient (S^e_{scr})

Years	Total	60	61	62	63	64	65	66	67	68	69	70 +
1987	1	0,0330	0,0085	0,0016	0,0092	0,0219	0,8139	0,0408	0,0223	0.0134	0.0110	0.0244
1988	1	0,0505	0,0022	0,0021	0,0088	0,0247	0,8015	0,0364	0,0197	0.0136	0.0093	0.0312
1989	1	0,0401	0,0016	0,0055	0,0081	0,0281	0,8055	0,0336	0,0211	0.0121	0.0114	0.0328
1990	1	0,0414	0,0066	0,0054	0,0071	0,0305	0,7939	0,0356	0,0188	0.0151	0.0116	0.0339
1991	1	0,0511	0,0059	0,0060	0,0073	0,0330	0,7775	0,0327	0,0242	0.0155	0.0119	0.0349
1992	1	0,0495	0,0072	0,0070	0,0065	0,0327	0,7663	0,0419	0,0247	0.0158	0.0121	0.0363
1993	1	0.0569	0.0068	0.0076	0.0090	0.0010	0.7959	0.0390	0.0230	0.0147	0.0113	0.0347
1994	1	0.0527	0.0111	0.0047	0.0348	0.0205	0.7583	0.0371	0.0219	0.0140	0.0108	0.0339
1995	1	0.0529	0.0063	0.0028	0.0098	0.0212	0.7841	0.0384	0.0227	0.0145	0.0111	0.0362
1996	1	0.0500	0.0047	0.0045	0.0098	0.0212	0.7847	0.0385	0.0227	0.0145	0.0112	0.0382
1997	1	0.0490	0.0057	0.0045	0.0098	0.0211	0.7823	0.0384	0.0227	0.0145	0.0111	0.0409
AVERAGES												
1987	1	0.03	0.01	0.00	0.01	0.02	0.81	0.04	0.02	0.01	0.01	0.02
1987-88	1	0,04	0,01	0.00	0.01	0.02	0.81	0.04	0.02	0.01	0.01	0.03
1987-89	1	0,04	0,00	0.00	0.01	0.02	0.81	0.04	0.02	0.01	0.01	0.03
1987-90	1	0,04	0,00	0.00	0.01	0.03	0.80	0.04	0.02	0.01	0.01	0.03
1987-91	1	0,04	0,00	0.00	0.01	0.03	0.80	0.04	0.02	0.01	0.01	0.03
1987-92	1	0,04	0,01	0.00	0.01	0.03	0.79	0.04	0.02	0.01	0.01	0.03
1987-93	1	0,05	0,01	0.01	0.01	0.02	0.79	0.04	0.02	0.01	0.01	0.03
1987-94	1	0,05	0,01	0.00	0.01	0.02	0.79	0.04	0.02	0.01	0.01	0.03
1987-95	1	0,05	0,01	0.00	0.01	0.02	0.79	0.04	0.02	0.01	0.01	0.03
1987-96	1	0,05	0,01	0.00	0.01	0.02	0.79	0.04	0.02	0.01	0.01	0.03
1987-97	1	0,0500	0,0100	0.0000	0.0100	0.0200	0.7900	0.0400	0.0200	0.0100	0.0100	0.0300

Source: generated by the authors from the same sources as table 4,1 considering that

$$ACh^{60}_{t} \approx A^{60}_{t}+A^{61}_{t+1}+\ldots+A^{69}_{t+9}+A^{70+}_{t+10}$$

And for $t \neq 1987 \ldots 1997$:

$$A^{e}_{t} = P^{e}_{t} \times Pr(alta^{e} \mid P^{e})$$

$Pr(alta^{e} \mid P^{e})$ = average probability during the period 1987 to 1997 that a person of age e registers as a retirement pensioner,

Where the registrations and the probabilities of registration refer both to those with reduction coefficient and without reduction coefficient, in each case it is indicated which one applies,

New Registrations without reduction coefficient

$$A^{60}_{t+1} = P^{59}_{t} \times \kappa^{scr}_{t+1} \times S^{60}_{scr}$$

……

$$A^{70+}_{t+1} = P^{59}_{t-10} \times \kappa^{scr}_{t-9} \times S^{70+}_{scr}$$

$$A^{e}_{t+1} = A^{70+}_{t+1} \times P^{e}_{t+1}/P^{70-76}_{t+1} \qquad e \geq 70$$

κ^{scr}_{t} = estimated probability that a person reaching the age of 60 in t retires without reduction coefficient

S^{e}_{scr} = proportion of people among those who retire without reduction coefficient from a cohort of 60-year-olds who retire at age e.

As it has been assumed that as from the year 2000 the mutualists progressively cease retiring early, to these new registrations must be added, as from year 2005, all those that would have occurred during the previous five years with reduction coefficient[15].

New registrations with reduction coefficient

$$A^{60}_{t+1} = P^{59}_{t} \times \kappa^{ccr}_{t+1} \times S^{60}_{ccr}$$

……

$$A^{64}_{t+1} = P^{59}_{t-4} \times \kappa^{ccr}_{t-3} \times S^{64}_{ccr}$$

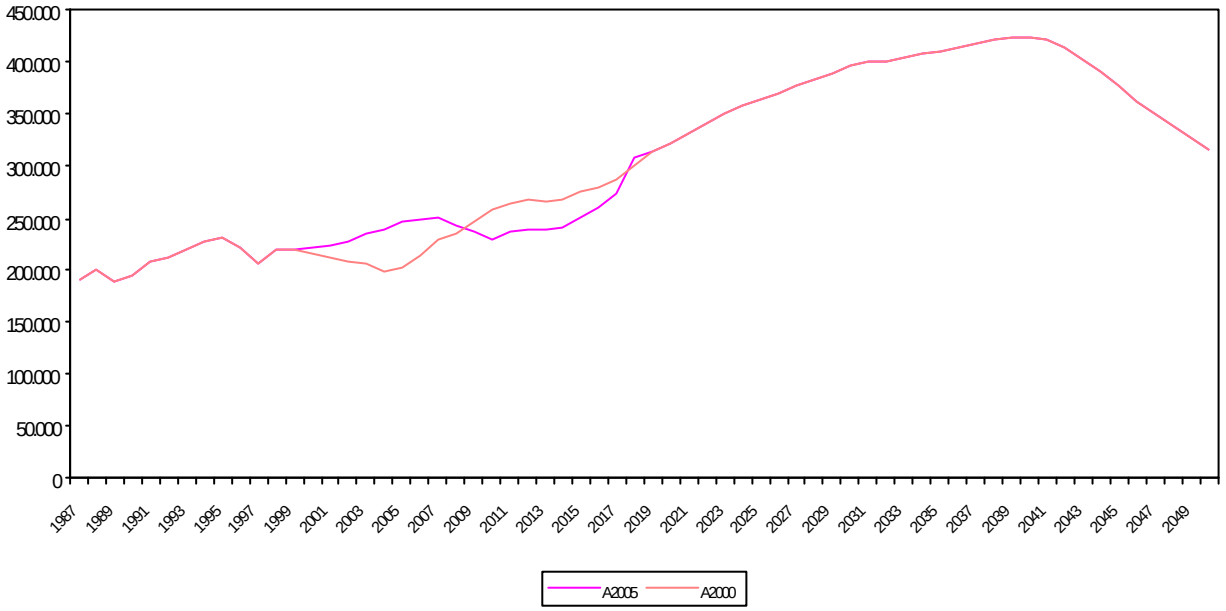
κ^{ccr}_{t} = estimated probability that a person reaching 60 in t retires with the reduction coefficient

[15] Note that the trend for new registrations up to the year 2017 will be influenced by the situation of the mutualists in their access to early retirement which, in its turn, will depend on multiple factors among which should be stressed the labour market situation and the financial incentives to retire (for example, the reduction coefficient and the average number of years of contribution awarded, which can be seen in table 7). In any case, as from 2017, and given no changes in the legislation, this type of early retirement will cease to occur.

S^{e}_{ccr} = proportion of people among those who retire with reduction coefficient from a cohort of 60-year-olds going into retirement at age e.

The following graph shows the future development of new retirement registrations in accordance with the mentioned hypothesis (A 2000), Also an alternative scenario is outlined similar to the one described except in the behaviour of mutualists in their access to early retirement: in this case it is assumed that they will follow the same trend observed in the past up to the year 2005 and as from then they will progressively cease to retire early (A 2005)[16].

Graph 7. Trend of new registrations for contributory retirement pensions. 1987-2050.



Source: generated by the authors from **1)** MTAS (1998), Appendix I to the Economic/Financial Report of the Social Security Budget Plan 1999.Page 131, 164 and 165; **2)** MTAS (1997). Labour and Social Affairs Statistical Yearbook. 1996. Page 820; **3)** MTAS (1998). Labour and Social Affairs Statistical Yearbook,. 1997. Page 833 and 834; **4)** INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Mimeograph.

Note 1: as can be observed, the trend for new registrations up to the year 2017 will be influenced by the situation of the mutualists in their access to early retirement which in its turn will depend on multiple factors among which should be stressed the labour market situation and financial incentives to retire (for example, the reduction coefficient and the average number of years of contribution awarded , which can be seen in table 7). In any case, as from the year 2017 this type of early retirement will cease to occur. With the aim of stating the level of error associated with the uncertainty about the situation of the mutualists two extreme scenarios have been simulated. On the one hand, it has been assumed that the mutualists cease to retire early as from year 2000 and on the other, they will only cease to retire early when the legal possibility to do so disappears. The estimated expenditure on retirement pensions thrown up by these scenarios, as from year 2017, scarcely differs from that of the scenario which has been chosen (with some differences in absolute values that are below 1%). The biggest differences occur between 2005 and 2017, The biggest of them all, in absolute value, is around 9,5%. For more details on the simulation see reference to note 5.

Note 2: the new SOVI registrations are not included, These registrations involve 18,000 people in 1987 and they have a decreasing tendency until they disappear in year 2018.

[16] Other simulations on the behaviour of the mutualists' access to early retirement can be seen in the document mentioned in footnote 6.

Projection for people leaving the system

The figures for the people leaving the system in year t+1 at age e, B^{e}_{t+1}, are obtained by applying the probabilities of death to the groups of pensioners existing at 31st December of year t as well as to the half of the new registrations at ages e and e+1 occurring through out year t+1:

$$B_{t+1}^{60} \approx PJ_t^{60} q^{60} + 0{,}5 A_{t+1}^{60} 0{,}5 q^{60}$$
$$B_{t+1}^{61} \approx PJ_t^{61} q^{61} + 0{,}5 A_{t+1}^{60} 0{,}5 q^{60} + 0{,}5 A_{t+1}^{61} 0{,}5 q^{61}$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$B_{t+1}^{75} \approx PJ_t^{75} q^{75} + 0{,}5 A_{t+1}^{74} 0{,}5 q^{74} + 0{,}5 A_{t+1}^{75} 0{,}5 q^{75}$$
$$B_{t+1}^{76} \approx PJ_t^{76} q^{76} + 0{,}5 A_{t+1}^{75} 0{,}5 q^{75}$$
$$B_{t+1}^{77} \approx PJ_t^{77} q^{77}$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$B_{t+1}^{100+} \approx PJ_t^{100} q^{100}$$

Projections for common pensioners for the whole year

Finally the figures for common pensioners are obtained by considering the following equation:

$$\mathbf{C^{e}_{t+1} = PJ^{e}_{t} - B^{e}_{t+1}}$$

Projection for pensioners with minimum supplement

The pensioners with minimum supplement of each type (new registrations, people leaving the system and common pensioners) are a the proportion which varies according to the annual cumulative rate in the period 1986-1996, up to the year 2005, as from when it remains constant:

$$CC_{1998} = C_{1997} \times (CC_{1997}/C_{1997}) \times \Delta_{86\text{-}96}\ (CC/C)$$

$$CC_{1999} = C_{1998} \times (CC_{1997}/C_{1997}) \times \Delta_{86\text{-}96}\ (CC/C)^2$$

……

$$CC_{2005} = C_{2004} \times (CC_{1997}/C_{1997}) \times \Delta_{86\text{-}96}\ (CC/C)^7$$

$$CC_{t+1} = C_t \times (CC_{2005}/C_{2005}) \qquad 2005 \leq t$$

$$BC_{1998} = B_{1997} \times (BC_{1997}/B_{1997}) \times \Delta_{86\text{-}96}\ (BC/B)$$

$$BC_{1999} = B_{1998} \times (BC_{1997}/B_{1997}) \times \Delta_{86\text{-}96}\ (BC/B)^2$$

……

$$BC_{2005} = B_{2004} \times (BC_{1997}/B_{1997}) \times \Delta_{86\text{-}96}\ (BC/B)^7$$

$$BC_{t+1} = B_t \times (BC_{2005}/B_{2005}) \qquad 2005 \leq t$$

$$AC_{1998} = A_{1997} \times (AC_{1997}/A_{1997}) \times \Delta_{86\text{-}96}\ (AC/A)$$

$$AC_{1999} = A_{1998} \times (AC_{1997}/A_{1997}) \times \Delta_{86\text{-}96}\ (AC/A)^2$$

……

$$AC_{2005} = A_{2004} \times (AC_{1997}/A_{1997}) \times \Delta_{86\text{-}96}\ (AC/A)^7$$

$$AC_{t+1} = A_t \times (AC_{2005}/A_{2005}) \qquad 2005 \leq t$$

For the SOVI pensioners, the method of projecting the demographic variables is the same. However, a correction has been introduced into the death rates of this group in the light of the situation observed from people leaving the system, because the figures show that the process of disappearance of these people responds to a higher *"exit"* rate than that obtained from the general mortality figures. It is estimated that this is perhaps due to the existence of other causes than death for leaving the system.

In the following tables can be seen the demographic scenarios corresponding to retirement pensioners which have been estimated:

Table 5. Demographic scenario Without SOVI. *(Continued on next page)*

Year	Retirement Pensioners at 31/12/t PJSS	Common pensioners CSS	People leaving system BSS	New registrations ASS	Pensioners with minimum supplement	Common pensioners with minimum supplement CC	People leaving system with minimum supplement BC	New registrations with minimum supplement AC
1986	2,171,468	1,978,284	114,279	186,944	1,020,032	1,042,581	62,912	54,857
1987	2,265,031	2,065,021	106,447	226,513	1,017,294	962,194	57,838	57,374
1988	2,357,245	2,153,364	111,667	199,963	1,052,894	956,028	61,266	66,376
1989	2,438,325	2,249,065	108,180	190,402	1,088,743	990,674	62,220	67,754
1990	2,519,350	2,324,918	113,407	194,670	1,132,542	1,027,168	61,575	79,509
1991	2,609,547	2,401,624	117,726	207,884	1,157,752	1,068,663	63,879	87,095
1992	2,700,699	2,488,692	120,855	210,199	1,164,845	1,094,339	63,413	83,070
1993	2,840,801	2,571,887	128,812	219,811	1,181,362	1,101,352	63,493	87,862
1994	2,932,889	2,705,455	135,346	227,180	1,181,158	1,117,097	64,265	79,821
1995	3,027,152	2,797,005	135,884	230,549	1,157,256	1,118,960	62,198	75,133
1996	3,115,892	2,894,757	132,395	221,617	1,157,983	1,098,504	58,752	72,144
1997	3,197,383	2,977,038	138,854	206,660	1,160,754	1,100,150	57,833	63,363
1998	3,290,689	3,069,788	127,595	220,901	1,166,967	1,108,942	51,813	65,011
1999	3,381,562	3,160,697	129,992	220,865	1,171,426	1,115,502	51,464	62,391
2000	3,465,962	3,249,219	132,342	216,742	1,172,863	1,120,343	51,083	58,769
2001	3,543,005	3,330,609	135,353	212,396	1,171,174	1,121,927	50,936	55,279
2002	3,612,078	3,404,734	138,272	207,344	1,166,360	1,120,442	50,732	51,798
2003	3,676,400	3,470,890	141,188	205,510	1,159,643	1,115,855	50,505	49,279
2004	3,730,610	3,532,349	144,051	198,261	1,149,495	1,109,404	50,239	45,633
2005	3,787,188	3,583,669	146,941	203,519	1,139,909	1,099,532	49,963	44,963
2006	3,851,904	3,637,232	149,956	214,672	1,159,388	1,088,920	50,988	47,427
2007	3,928,217	3,698,744	153,160	229,473	1,182,357	1,107,310	52,078	50,697
2008	4,007,264	3,771,669	156,548	235,595	1,206,150	1,129,127	53,230	52,049
2009	4,094,202	3,847,156	160,108	247,046	1,232,317	1,151,709	54,440	54,579
2010	4,189,294	3,930,338	163,864	258,957	1,260,939	1,176,600	55,717	57,211
2011	4,285,093	4,020,777	168,517	264,316	1,289,774	1,203,640	57,300	58,395
2012	4,379,422	4,111,865	173,228	267,557	1,318,166	1,230,873	58,901	59,111
2013	4,467,981	4,201,527	177,896	266,454	1,344,821	1,257,678	60,488	58,867
2014	4,554,114	4,285,407	182,574	268,707	1,370,747	1,282,742	62,079	59,365
2015	4,643,027	4,366,893	187,221	276,134	1,397,509	1,307,087	63,659	61,005
2016	4,731,662	4,451,244	191,783	280,418	1,424,187	1,332,298	65,210	61,952
2017	4,823,119	4,535,370	196,292	287,749	1,451,715	1,357,443	66,744	63,572
2018	4,922,530	4,622,334	200,785	300,196	1,481,636	1,383,443	68,271	66,322
2019	5,031,717	4,717,133	205,397	314,584	1,514,501	1,411,797	69,839	69,500
2020	5,143,735	4,821,671	210,046	322,063	1,548,217	1,443,081	71,420	71,153

Source : generated by the authors from figures published by the Ministry of Labour and Social Affairs in the Economic/Financial Report of the Social Security Budgets and Appendix 1 in the Social Security Information Bulletin, in the Labour Statistics Yearbook and the statistical reports of the INSS; also the INE (1998) Death tables for the Spanish population 1994-1995 and INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Mimeograph.

Table 5. Demographic scenario, without SOVI. *(ends here)*

Year	Retirement Pensioners at 31/12/t PJSS	Common pensioners CSS	People leaving system BSS	New registrations ASS	Pensioners with minimum supplement	Common pensioners with minimum supplement CC	People leaving system with minimum supplement BC	New registrations with minimum supplement AC
2021	5,260,127	4,929,009	214,725	331,117	1,583,250	1,475,206	73,011	73,153
2022	5,382,124	5,040,725	219,402	341,399	1,619,970	1,508,649	74,601	75,424
2023	5,509,446	5,158,089	224,035	351,357	1,658,293	1,543,793	76,177	77,624
2024	5,639,873	5,280,904	228,542	358,970	1,697,550	1,580,583	77,709	79,306
2025	5,770,696	5,406,879	232,994	363,817	1,736,927	1,618,327	79,223	80,377
2026	5,901,808	5,532,300	238,396	369,508	1,776,390	1,655,867	81,060	81,634
2027	6,035,283	5,657,830	243,978	377,453	1,816,565	1,693,432	82,958	83,390
2028	6,168,496	5,785,452	249,831	383,044	1,856,661	1,731,617	84,948	84,625
2029	6,302,103	5,912,539	255,957	389,565	1,896,875	1,769,630	87,031	86,065
2030	6,435,952	6,039,726	262,377	396,225	1,937,162	1,807,661	89,214	87,537
2031	6,566,720	6,166,836	269,116	399,884	1,976,523	1,845,657	91,505	88,345
2032	6,691,907	6,290,655	276,065	401,252	2,014,203	1,882,655	93,868	88,647
2033	6,813,068	6,408,798	283,109	404,270	2,050,671	1,917,939	96,263	89,314
2034	6,930,847	6,523,039	290,029	407,807	2,086,121	1,952,055	98,616	90,096
2035	7,045,276	6,634,079	296,767	411,197	2,120,564	1,985,214	100,907	90,845
2036	7,157,005	6,741,967	303,310	415,038	2,154,193	2,017,432	103,132	91,693
2037	7,266,337	6,847,371	309,634	418,966	2,187,101	2,048,911	105,282	92,561
2038	7,372,921	6,950,543	315,794	422,378	2,219,182	2,079,724	107,377	93,315
2039	7,475,822	7,051,136	321,785	424,687	2,250,154	2,109,768	109,414	93,825
2040	7,571,377	7,148,218	327,604	423,158	2,278,915	2,138,762	111,392	93,487
2041	7,658,855	7,238,004	333,372	420,850	2,305,245	2,165,561	113,354	92,977
2042	7,733,790	7,319,769	339,086	414,021	2,327,800	2,189,948	115,297	91,469
2043	7,792,828	7,389,146	344,644	403,682	2,345,570	2,210,613	117,186	89,184
2044	7,833,425	7,442,772	350,056	390,653	2,357,789	2,226,543	119,027	86,306
2045	7,856,159	7,478,083	355,342	378,076	2,364,632	2,236,965	120,824	83,527
2046	7,858,835	7,495,790	360,369	363,045	2,365,437	2,242,098	122,533	80,207
2047	7,844,467	7,493,753	365,082	350,714	2,361,113	2,241,301	124,136	77,482

2048	7,813,343	7,475,012	369,454	338,330	2,351,744	2,235,490	125,623	74,746
2049	7,766,925	7,439,872	373,470	327,053	2,337,773	2,224,756	126,988	72,255
2050	7,706,717	7,389,818	377,107	316,899	2,319,651	2,209,549	128,225	70,012

Source : generated by the authors from figures published by the Ministry of Labour and Social Affairs in the Economic/Financial Report of the Social Security Budgets and Appendix 1 in the Social Security Information Bulletin, in the Labour Statistics Yearbook and the statistical reports of the INSS; also the INE (1998) Death tables for the Spanish population 1994-1995 and INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Mimeograph.

Table 6. Projection for retirement pensioners from SOVI *(Continued on next page)*

Year	Retirement pensioners from SOVI 31/XII/t PJS	Common pensioners from SOVI CS	People leaving SOVI BS	New registrations SOVI AS
1986	364,158	346,692	30,867	17,955
1987	353,864	335,909	28,249	17,683
1988	343,994	326,311	27,553	18,433
1989	333,824	315,391	28,603	18,131
1990	325,233	307,102	26,722	18,730
1991	316,762	298,761	26,472	18,456
1992	308,351	290,801	25,961	19,716
1993	300,872	282,541	25,810	19,117
1994	292,740	274,834	26,038	19,118
1995	286,450	267,768	24,972	18,956
1996	282,294	263,836	22,614	18,310
1997	279,824	260,167	22,127	19,640
1998	278,844	260,015	19,808	18,821
1999	279,582	260,826	18,019	18,752
2000	281,546	262,991	16,591	18,553
2001	284,152	266,125	15,421	18,025
2002	286,716	269,414	14,737	17,301
2003	288,071	271,939	14,777	16,133
2004	289,596	273,258	14,813	16,337
2005	291,043	274,747	14,849	16,296
2006	293,080	276,160	14,884	16,920
2007	296,051	278,147	14,933	17,904
2008	297,922	281,051	14,999	16,871
2009	299,634	282,829	15,093	16,805
2010	301,353	284,419	15,215	16,934
2011	303,059	285,989	15,365	17,070
2012	304,614	287,520	15,539	17,094
2013	291,967	288,984	15,629	2,982
2014	277,782	276,320	15,646	1,461
2015	263,189	262,145	15,637	1,044
2016	248,370	247,588	15,601	782
2017	233,418	232,839	15,531	579
2018	218,009	218,009	15,409	0
2019	202,771	202,771	15,239	0
2020	187,759	187,759	15,012	0

Source: generated by the authors from figures published by the Ministry of Labour and Social Affairs in the Economic/Financial Report of the Social Security Budgets and Appendix I and in the statistical reports of the INSS. Also INE (1998) Death tables for the Spanish population 1994-1995 and INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Mimeograph.

Note: the number of people leaving the SOVI for the period 1986-1990 has been estimated from $B_{t+1} = PJ_t + A_t - Pj_{t+1}$. New registrations have been estimated using the method of cohorts.

Table 6. Projection for retirement pensioners from SOVI *(ends here)*

Year	Retirement pensioners from SOVI 31/XII/t PJS	Common pensioners from SOVI CS	People leaving SOVI BS	New registrations SOVI AS
2021	173,028	173,028	14,730	0
2022	158,629	158,629	14,399	0
2023	144,610	144,610	14,019	0
2024	131,017	131,017	13,593	0
2025	117,909	117,909	13,108	0
2026	105,344	105,344	12,565	0
2027	93,376	93,376	11,968	0
2028	82,055	82,055	11,321	0
2029	71,432	71,432	10,622	0
2030	61,543	61,543	9,889	0
2031	52,420	52,420	9,122	0
2032	44,098	44,098	8,322	0
2033	36,601	36,601	7,497	0
2034	29,933	29,933	6,668	0
2035	24,079	24,079	5,855	0
2036	19,012	19,012	5,067	0
2037	14,700	14,700	4,312	0
2038	11,098	11,098	3,602	0
2039	8,136	8,136	2,961	0
2040	5,743	5,743	2,394	0
2041	3,865	3,865	1,878	0
2042	2,454	2,454	1,411	0
2043	1,452	1,452	1,003	0
2044	786	786	665	0
2045	378	378	408	0
2046	150	150	228	0
2047	36	36	114	0
2048	0	0	36	0
2049	0	0	0	0
2050	0	0	0	0

Source: generated by the authors from figures published by the Ministry of Labour and Social Affairs in the Economic/Financial Report of the Social Security Budgets and Appendix I and in the statistical reports of the INSS. Also INE (1998) Death tables for the Spanish population 1994-1995 and INE (1999). Future scenarios for the population of Spain. Period 1990-2050. Mimeograph.

Note: the number of people leaving the SOVI for the period 1986-1990 has been estimated from $B_{t+1} = PJ_t + A_t - Pj_{t+1}$. New registrations have been estimated using the method of cohorts.

Projection of the economic variables

Macroeconomic scenario[17]

The macroeconomic scenario which is used as a framework for this study has been developed by the General Undersecretariat for Economic Analysis and Planning on the basis of the same demographic scenario described before and, at the same time, preserving coherence between the various economic aggregates.

This scenario is based on the established fluctuations in the economic variables contained in the Stability Programme for Spain, which takes in the period 1999 to 2003, with one important exception: the latest figures from the Working Population Survey (EPA) made it necessary to revise the growth rates for participating and working population, though the unemployment rates envisaged in the above-mentioned Stability Programme have been maintained.

The projection for participation rates throughout the period covered by this scenario, and in particular during those years when the Stability Programme is in force, is developed according to the criteria established by the OECD in the document "Public finance implications of ageing: background and issues", in the framework of the working group on the implications of ageing for the financing of Public Expenditure. In line with these criteria, the participation rates by age are kept at the levels forecast for the year 2000, both for men and women, with the exception participation rate of the female in the 25-54 age-group which moves towards a rate ten points below the rate for males in this age-group, in the year 2050.

In the period 2003 to 2006 the GDP growth rate remains at the level for the year 2003 and accelerates at the same rate of growth as the productivity growth rate, allowing the unemployment rate to continue falling, albeit at a more gradual pace.

Finally, for the period 2007 to 2050, based on the projected economic activity rates with the indicated criteria, the employed population, real GDP and per capita GDP are

inferred from a falling unemployment rate stabilising at 3.8 during the last decade and growing productivity from 2.2 to 2.6.

At all times, the trend for number of wage and salary earners is linked to the trend for employment, setting a maximum rate of paid employment of 91%. The real increase in average wage is linked to the productivity growth trend.

Regarding prices, it is forecast that the present low levels of inflation will be consolidated throughout the period, so average growth for the GDP and private consumption deflators has been established at 1.75% and 1.75% respectively.

The following table is a summary of the growth rates for economic aggregates assumed in the scenario:

Table 7. Macroeconomic scenario (1)

	1997	1998	Average 1997-2000	Average 2001-2020	Average 2020-2050	Average 2001-2050	2050
Population	0,1	0,1	0,1	0,1	-0,1	-0,04	-0,2
Real GDP	3,5	3,8	3,7	2,7	2,1	2,33	2,9
Nominal GDP	5,6	6,1	6,1	4,5	3,9	4,12	4,7
PIB per capita	3,4	3,7	3,6	2,4	2,2	2,28	3,0
GDP deflator	2,0	2,3	2,4	1,8	1,7	1,75	1,7
Private consumption deflator	2,5	2,0	2,3	1,8	1,7	1,74	1,7
Dec/Dec CPI	2,0	1,4	2,1	1,8	1,7	1,74	1,7
Working population.	1,1	0,9	1,2	0,2	-0,4	-0,18	0,3
Employment	2,9	3,4	3,6	0,6	-0,3	0,05	0,3
Wage and salary earners	3,9	4,2	4,0	0,7	-0,2	0,14	0,2
Average pay per wage or salary earner	2,3	3,0	2,6	3,7	4,2	3,99	4,3
Productivity per person employed	0,6	0,5	0,2	2,0	2,4	2,28	2,6
Unemployment rate	20,8	18,7	17,4	7,82	4,79	5,97	3,8
Share compensation of employees	46,6	50,1	49,2	49,84	50,17	50,05	50,4
Participation rate	62,3	64,0	64,2	68,89	71,45	70,46	73,9
Rate of paid employment	78,9	87,6	85,0	87,61	89,70	88,90	91,0

Source: MEH (1999). General Undersecretariat for Economic Analysis and Planning. Mimeograph. Updated in July 1999..
(1) Variation rates except for the last four variables.

[17] The macroeconomic scenario is kept constantly up-to-date. This study is based on the one developed by the Undersecretariat for Economic Analysis and Planning in March 2000.

Average pension for new registrations

The central variable round which the projection for average retirement pension is built is the average monthly pension of those joining the system without the part corresponding to the minimum supplement, that is, the initial pension on joining the system, which depends, as has been seen, on the regulatory base, on the percentage that is applied to the regulatory base according to years of contributions and on the reduction coefficient in force in the case of early retirements. In its turn the regulatory base depends on the monthly contribution bases and the CPI in the years prior to retirement.

Initial entry pension

The average monthly pension (**pma_t**) will be obtained , as from year 2002, from the following equation:

$$pma_t = r_t \times p_t \times BR_t$$

$$BR_t = \frac{BC_{t-1} + BC_{t-2} + \sum_{i=3}^{15} \frac{I_{t-3}}{I_{t-i}} BC_{t-i}}{a_t}$$

$$p_t = p_t(n_t)$$

$$n_t = h_t + b_t$$

derived from the one set out in the Law 24/1997,of 15th July, concerning the Consolidation and Rationalisation of Social Security, but expressed in terms of monthly average contribution bases for each year.

Where:

$\mathbf{pma_t}$	average initial pension in year t (monthly)
$\mathbf{r_t}$	reduction coefficient for early retirement.
$\mathbf{p_t}$	average percentage applied to the regulatory base of the pension which is a function of the number of years of contributions (actual plus those years awarded for belonging to the Labour Mutual System) and of the reduction due to early retirement, in year t.
$\mathbf{n_t}$	average number of contribution years.
$\mathbf{B_t}$	average number of years awarded for belonging to the Labour Mutual System.
$\mathbf{BR_t}$	Regulatory base in year t (monthly)
$\mathbf{BC_t}$	Average monthly contribution Base in year t.
$\mathbf{I_t}$	Consumer price index (CPI) in year t .
$\mathbf{a_t}$	number of years included in the regulatory base corrected as per legislative norm.[18]

Up to year 2002, we are in a transition period in which years will be progressively incorporated into the calculation of the regulatory base in line with the progression shown in Table 1. The equation for calculating $\mathbf{pma_t}$ is adapted in each case correspondingly.

The estimate for this variable $\mathbf{pma_t}$ in future years will be therefore based on the projections, referring to the whole System, for the average **contribution bases**, for the number of **years awarded** as if contributions had been paid, for the average **working life record** and the average **reduction coefficient**. The forecast movements of these variables is given in detail in the following sections.

Average contribution bases.

Contributing to the Social Security is an obligation for all workers within the system, as well as for the employers for whom they work.

[18] For 15 years incorporated in the calculation of the regulatory base a_t=210/12.

All contributory benefits are the compensation for such contributions and are set according to the contributions, specifically in accordance with the **contribution bases** used to fix the level of contribution[19].

The contribution bases are determined by the worker's total wage. However, there are minimum and maximum bases as well as ceilings in each professional category.

For the period covered in the scenario (1998-2050), a trend is considered for the average contribution bases equal to the trend for average wage per worker forecast in the macroeconomic scenario:

$$BC_t = BC_{t-1} \times \Delta_t w_t$$

w_t average wage per employee in year t.

Average allowance for years of contribution.

This variable is determined by the scale of allowances for years and days of contribution according to age established by legislation[20] as well as by the distribution of mutualists' joining the system by ages and its weighting in the total new registrations. In tables 8 to 10 the detail is shown of the average number of years of benefit for the whole of the system during the period 1987 to 2017.

[19] The level of contribution payable by a worker to the Social Security is the result of applying the legally established contribution rate to the contribution base.
[20] See MTAS (1998) Labour and Social Affair Guide.1998. Page 132

Table 8. Age on 1st January 1967 of people who become old age pensioners between 1987 and 2017

Retirement Age	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
60	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
61	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
62	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11
63	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12
64	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13
65	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14
66	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15
67	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
68	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
69	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18
70	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19

Table 9. Years awarded for the calculation of labour mutualists' retirement pension

Retirement Age	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
60	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68												
61	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68											
62	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68										
63	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68									
64	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68								
65	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68							
66	17,15	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68						
67	17,84	17,15	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68					
68	18,52	17,84	17,15	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68				
69	19,21	18,52	17,84	17,15	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68			
70	19,89	19,21	18,52	17,84	17,15	16,46	15,78	15,09	14,41	13,72	13,03	12,35	11,66	10,98	10,29	9,60	8,92	8,23	7,55	6,86	6,18	5,49	4,80	4,12	3,43	2,75	2,06	1,37	0,68		

With less than 21 years in the system at 1/1/67 no Award is made.

Source: generated by the authors from current legislation.

(*) As from year 2013 early retirement at 60 of mutualists starts disappearing.

Table 10. Average allowance (in years) implicit in the percentage applied to the regulatory base for estimating the pension

Hypothesis	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Average allowance for the System.	6,89	6,20	5,67	5,10	4,50	3,91	3,29	3,52	2,46	2,08	1,79	1,37	1,08	0,96	0,66	0,38	0,06	0,04	0,03	0,01	0,01	0,00

Source: generated by the authors from current legislation, from the same sources as for table 4.1 and table 6 weighting up every age group according to the number of new labour mutualists' registrations and estimating that the number of new registrations occurring outside labour mutualism do not have any allowance.

Note 1: the number of labour mutualists within the new registrations is estimated by considering that all the new registrations with reduction coefficient are mutualists, for the rest of new registrations the proportion of mutualists is assumed to be the same as for the whole population. This proportion has been estimated from the number of employed people on 1st of January 1967, which has been taken from the Working Population Survey (EPA) carried out by the INE. To these people, mortality rates available for the period 1970-1995 have been applied. This estimation is shown in the following table:

Proportion of mutualists in the population according to age group.

Age group	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
60	55	54	55	54	51	51	50	47	43	38	60	38	40	47	46	46	57	57	61	57	53	53	56	56	55	57	27	0	0	0	0
61	60	59	54	55	54	51	51	50	47	43	38	60	38	40	47	46	46	57	57	61	57	53	53	56	56	55	57	27	0	0	0
62	59	58	59	54	55	54	51	51	50	47	43	37	60	38	40	47	46	45	57	57	61	57	53	53	56	55	55	57	27	0	0
63	61	59	58	58	54	55	54	51	51	49	46	43	37	60	38	40	47	46	45	57	57	61	56	53	52	56	55	54	57	27	0
64	58	56	59	58	58	54	55	54	51	51	49	46	43	37	60	37	40	47	46	45	56	56	61	56	53	52	55	55	54	56	27
65	62	59	56	59	58	58	54	55	54	51	51	49	46	43	37	60	37	40	47	46	45	56	56	60	56	53	52	55	55	54	56
66	57	53	59	56	59	58	58	53	55	54	51	51	49	46	43	37	59	37	39	46	45	45	56	56	60	56	52	52	55	55	54
67	60	56	53	59	56	59	58	58	53	55	54	51	51	49	46	42	37	59	37	39	46	45	45	56	56	60	56	52	52	55	54
68	63	59	56	53	59	56	59	58	58	53	55	54	51	50	49	46	42	37	59	37	39	46	45	45	56	56	60	55	52	51	54
69	64	60	58	55	53	59	56	59	58	58	53	55	54	51	50	49	46	42	37	59	37	39	46	45	44	55	55	60	55	52	51
70+	60	56	56	56	57	57	57	58	58	58	58	58	58	57	57	56	55	54	53	52	52	50	49	48	48	47	47	47	47	48	47

Note 2: the number of labour mutualists within the new registrations creates a degree of additional uncertainty in the projection for retirement pension expenditure. In order to limit the degree of error associated with this calculation, different scenarios have been simulated assuming, on the one hand, that none of the new registrations taking place is a mutualist and, on the other, that all new registrations are mutualists. The difference, in absolute value, between the expenditure estimated for these two scenarios and the one presented in this study -based on the hypothesis suggested on note 1- progressively increases in time remaining below 1% up to year 2005; in 2050 it reaches 10%. See note 6 for further details on this simulation.

Average working life record.

Between 1995 and 1997, this variable is obtained as the difference between the number of contribution years considered to calculate the percentage to be applied to the regulatory base and the average allowance due to the Labour Mutual System. During the period of the scenario it is kept constant and equal to the level registered in 1997.

The Social Security Budgets provide the distribution of years of contributions for the period 1995-1998, from which the average and finally the working life record have been calculated. The results are shown in tables 11 and 12.

Table 11. Average number of contribution years (actual plus awarded). 1995-1996.

Contribution years	Contribution years, class record and average 95	Percentage of new registrations occurring in 1995	New Registrations 1995	Contribution years, class record and average 96	Percentage of New Registrations occurring in 1996	New Registrations 1996
Less than 15	15	7,19	17.939	15	8,07	19.362
16-20	18	8,23	20.534	18	8,12	19.482
21-25	23	7,79	19.436	23	8,59	20.610
26-30	28	7,88	19.661	28	8,85	21.234
31-34	33	6,83	17.041	33	6,71	16.099
More than 35	35	62,08	154.893	35	59,66	143.140
Average (n_t)/ Total	**30,54**	**100**	**249.505**	**30,22**	**100**	**239.927**

Contribution years	Contribution years, class record and average 97	Percentage of new registrations occurring in 1997	New Registrations 1997	Contribution years, class record and average 98	Percentage of New Registrations occurring in 1998	New Registrations1998
Less than 15	15	6,37	14.415	15	10,34	21.854
16-20	18	9,03	20.435	18	7,31	15.450
21-25	23	8,85	20.028	23	6,22	13.146
26-30	28	9,41	21.295	28	6,94	14.668
31-34	33	7,22	16.339	33	6,91	14.604
More than 35	35	59,12	133.789	35	62,28	131.629
Average (n_t)/ Total	**30,33**	**100**	**226.300**	**30,32**	**100**	**211.350**

Source: MTAS (1997). Economic/financial report from the budgetary plan for the Social Security in 1998. Page 202. Same for 1997. Page 200; MTAS (1997) Appendix 1 to the economic/financial report on the Social Security Budget Plans 1998. Page 127.

Table 12. Estimate of the average working life record

Variables	1995	1996	1997	Cumulative Annual rate (%)
$n_{t\ (years)}$	30,54	30,22	30,33	-0,34
$h_{t\ ((years)}$	23,65	24,02	24,66	2,11
$b_{t\ (years)}$	6,89	6,20	5,67	-9,28
$P_{t\ (percentage)}$	91,08	90,44	90,65	-0,24

Source: generated by the authors from tables 7 and 8 with $p_t = 60+(n_t-15)\times 2$, following Social legislation prior to the 1997 reform.

Average reduction coefficient in the whole system

The reduction coefficient is estimated for the years 1995 to 1997 by means of the equation:

$$r_t = \frac{\frac{pma_t}{BR_t}}{p_t}$$

It remains constant until the year 2005, a year when all those mutualists who as from year 2000 have not retired early begin to retire at the age of 65. From this year on it grows lineally until it reaches 1 in the year 2017, a year from which reduction coefficients are not applied because early retirements by mutualists cease.

Table 13 is a breakdown of both components of the quotient and the estimated reduction coefficient which results.

Table 13. Estimated average percentage applicable to the regulatory base between 1995 and 1997.

Years	$\frac{pma_t}{BR_t}$	r_t
1995	83.46	91.63
1996	81.29	89.88
1997	80.95	89.29

Source: generated by the authors from data published by the Social Security in its annual budgets and the INSS reports.

Average pension for people leaving the system

The projection for the average pension of people leaving the system without the part corresponding to the minimum supplement is made by considering that people leaving the system throughout the year t+1 come from the group of common pensioners in year t plus new registrations in year t. Hence their average pension should be set in relation to the average pension of the two groups mentioned. The relationship which is estimated with the available historical series is maintained throughout all the scenario. It is calculated with the following equation:

$$pmb_{t+1} = d_0 + d_1\, pmca_t$$

$$pmca_t = \frac{C_t^{\otimes}\, pmc_t + 0{,}5\, A_t^{\otimes}\, pma_t}{C_t^{\otimes} + 0{,}5\, A_t^{\otimes}}$$

$$C_t^{\otimes} = C - CC$$

$$A_t^{\otimes} = A - AC$$

The coefficients δ_0 and δ_1 have been estimated by means of regression on the basis of the data corresponding to the period 1986 to 1996, with the following results:

Result of the Estimation

Variable	δ	SE δ	t	Sig t
Pmca	**0.85**	0.0140	60.5180	0.0000
(Constant)	**3,244**	793.1360	4.0900	0.0027

R^2 = 0.9978

R^2 adjusted = 0.9972

F = 3662.395 Significant F = 0.0000

Average pension for common pensioners

The **average pension of those pensioners who remain throughout each year without** the part corresponding to the **minimum supplement** will be calculated from the following equation:

$$pmc_{t+1} = \frac{C_t^{\otimes} pmc_t (1 + r_{t+1}) + A_t^{\otimes} pma_t (1 + r_{t+1}) - B_{t+1}^{\otimes} pmb_{t+1}}{C_{t+1}^{\otimes}}$$

where r_t is the adjustment rate for pensions in year t.

Average minimum supplement

Will be calculated as follows:

$$cmc_{t+1} = p_{c\,t+1}\, pmc_{t+1}$$

$$cmb_{t+1} = p_{b\,t+1}\, pmb_{t+1}$$

$$cma_{t+1} = p_{a\,t+1}\, pma_{t+1}$$

Where the proportions π_{lt}, l = c, b, a, the trend from 1997 up to 2005 is in accordance with the accumulative annual rate registered in the period 1986-1996. As from the year 2005 these proportions remain constant.

Finally, given that the SOVI pension has a fixed amount determined each year by legislation, and given that in the last few years it has been fixed by adjusting the existing one by means of the variation in the general consumer price index, the average SOVI pension has been projected by means of the forecast scenario for the CPI.

Tables 14 and 15 give the trend up to year 2050 for the average pension of the System together with the trend for the components it has been broken down into, as well as the average SOVI pension.

In table 14 an appreciation is given of the growth rate, in nominal terms, of the said average pension, excluding the SOVI pensions, which at a cumulative annual rate is growing at 3,65% during the period 1997 to 2050, reaching annual growth rates approaching 4% as from year 2010. In real terms the cumulative annual growth rate of the average pension is 1.68%, rising to slightly under 2% towards the year 2010.

Table 14. Trend of the average pension in the whole System without SOVI. *(Continued on the next page)*

Year	Average pension in the system **Pmtss**	Annual variation of the average pension in the System	Average pension of new registrations **Pmtass**	Average pension of people leaving the system **Pmtbss**	Average for common pensioners. **pmtcss**	Average minimum supplement in the system. **Cm**	Average minimum supplement of new registrations. **cma**	Average minimum supplement of people leaving the system. **cmb**	Average minimum supplement for common pensioners **Cmc**	Average pension without ms in the system **Pmss**	Average pension without ms for new registrations **pmass**	Average pension without ms for people leaving the system **pmbss**	Average pension without ms for common pensioners **pmcss**
1986	39.480		47.710	35.686	39.201	9.351	8.924	9.385	9.361	31.114	45.091	30.519	34.268
1987	42.568	7,82	49.921	38.413	42.272	9.957	9.824	10.115	9.956	37.118	47.432	32.917	37.633
1988	45.744	7,46	55.704	41.353	45.396	10.651	8.896	11.011	10.700	40.694	52.751	35.312	40.645
1989	49.702	8,65	58.617	44.982	49.439	11.535	8.924	12.001	11.610	44.497	55.442	38.080	44.325
1990	54.893	10,44	61.646	48.439	54.768	12.599	9.515	12.823	12.712	49.169	57.760	41.476	49.152
1991	59.587	8,55	68.107	52.956	59.381	13.143	10.718	14.089	13.214	52.608	63.617	45.312	53.501
1992	64.135	7,63	74.441	56.768	63.879	13.705	10.797	14.677	13.787	56.312	70.174	49.067	57.816
1993	69.444	8,28	79.611	62.045	69.195	14.140	11.272	15.323	14.220	59.980	75.106	54.493	63.105
1994	73.352	5,63	87.433	64.638	72.979	14.369	10.894	15.684	14.455	65.438	83.605	57.191	67.011
1995	78.002	6,34	93.509	68.123	77.603	14.594	11.293	16.002	14.666	69.307	89.829	60.799	71.736
1996	82.847	6,21	96.869	72.106	82.556	15.045	11.883	16.128	15.120	75.247	93.000	64.949	76.819
1997	86.439	4,34	100.838	75.153	86.203	15.275	12.329	16.384	15.331	79.108	97.058	68.329	80.537
1998	**88.985**	**2,94**	102.805	79.103	88.693	15.265	12.068	16.951	15.319	81.712	99.254	72.219	83.159
1999	**92.594**	**4,06**	103.730	81.226	92.439	15.438	11.688	17.105	15.504	85.400	100.428	74.454	86.967
2000	**95.300**	**2,92**	104.093	84.331	95.230	15.443	11.256	17.450	15.507	88.301	101.041	77.595	89.883
2001	**97.914**	**2,74**	105.699	86.613	97.895	15.415	10.967	17.607	15.474	91.137	102.845	79.987	92.683
2002	**100.509**	**2,65**	107.578	88.832	100.531	15.369	10.707	17.738	15.423	93.964	104.903	82.323	95.456
2003	**102.818**	**2,30**	108.127	91.035	102.900	15.269	10.322	17.853	15.320	96.484	105.652	84.648	97.975
2004	**105.113**	**2,23**	110.181	92.980	105.218	15.158	10.086	17.906	15.200	99.055	107.859	86.735	100.445
2005	**107.484**	**2,26**	113.867	94.920	107.560	15.037	9.995	17.948	15.074	101.562	111.659	88.817	102.935
2006	**110.145**	**2,48**	115.978	97.222	110.239	15.421	10.180	18.384	15.466	105.157	113.729	90.971	105.609
2007	**114.122**	**3,61**	118.916	99.640	114.273	15.973	10.438	18.841	16.032	108.829	116.610	93.234	109.474
2008	**118.254**	**3,62**	122.475	103.133	118.436	16.552	10.750	19.501	16.616	112.753	120.100	96.502	113.462
2009	**122.490**	**3,58**	125.766	106.742	122.712	17.143	11.039	20.184	17.216	116.712	123.327	99.879	117.558
2010	**126.850**	**3,56**	129.524	110.442	127.104	17.751	11.369	20.883	17.832	120.788	127.013	103.341	121.766
2011	**131.360**	**3,56**	133.750	114.251	131.640	18.384	11.740	21.604	18.468	125.103	131.156	106.906	126.112
2012	**136.044**	**3,57**	139.202	118.193	136.317	19.040	12.218	22.349	19.124	129.615	136.502	110.594	130.592
2013	**140.942**	**3,60**	144.989	122.289	141.208	19.728	12.726	23.124	19.811	134.387	142.177	114.427	135.278
2014	**146.051**	**3,62**	151.093	126.572	146.308	20.444	13.262	23.934	20.526	139.321	148.163	118.434	140.164
2015	**151.412**	**3,67**	157.751	131.041	151.649	21.191	13.847	24.779	21.275	144.428	154.692	122.616	145.280
2016	**157.076**	**3,74**	164.873	135.735	157.290	21.982	14.472	25.666	22.067	149.866	161.676	127.008	150.685
2017	**163.052**	**3,80**	172.527	140.692	163.235	22.814	15.144	26.604	22.901	155.560	169.181	131.647	156.381
2018	**169.340**	**3,86**	179.179	145.925	169.529	23.689	15.728	27.593	23.784	161.477	175.705	136.542	162.411
2019	**175.933**	**3,89**	186.214	151.427	176.123	24.606	16.345	28.633	24.709	167.656	182.603	141.691	168.728
2020	**182.846**	**3,93**	193.633	157.196	183.044	25.571	16.996	29.724	25.680	174.239	189.878	147.089	175.358

Source: generated by the authors from data published by the Ministry of Labour and Social Affairs in the Economic/Financial Bulletin of the Social Security Budgets and its Appendix I and in the INSS statistical reports, together with the Table and the macroeconomic scenario.

Table 14. Trend of the average pension in the whole System without SOVI. *(Ends here)*

Year	Average pension in the system **Pmtss**	Annual variation of the average pension in the System	Average pension of new registrations **Pmtass**	Average pension of people leaving the system **pmtbss**	Average for common pensioners. **Pmtcss**	Average minimum supplement in the system. **Cm**	Average minimum supplement of new registrations. **cma**	Average minimum supplement of people leaving the system. **cmb**	Average minimum supplement for common pensioners **Cmc**	Average pension without ms in the system **Pmss**	Average pension without ms for new registrations **pmass**	Average pension without ms for people leaving the system **Pmbss**	Average pension without ms for common pensioners **pmcss**
2021	**190.052**	**3,94**	201.432	163.241	190.253	26.577	17.681	30.867	26.692	181.080	197.526	152.745	182.265
2022	**197.575**	**3,96**	209.609	169.542	197.778	27.626	18.398	32.059	27.747	188.205	205.544	158.641	189.473
2023	**205.434**	**3,98**	218.125	176.121	205.639	28.722	19.146	33.303	28.850	195.653	213.895	164.797	197.004
2024	**213.631**	**3,99**	226.954	182.992	213.841	29.868	19.921	34.602	30.001	203.455	222.553	171.227	204.861
2025	**222.151**	**3,99**	236.098	190.155	222.371	31.061	20.724	35.957	31.197	211.609	231.519	177.929	213.034
2026	**230.992**	**3,98**	245.620	197.600	231.223	32.299	21.559	37.364	32.439	220.074	240.857	184.895	221.514
2027	**240.181**	**3,98**	255.533	205.327	240.420	33.583	22.429	38.825	33.730	228.840	250.578	192.125	230.325
2028	**249.746**	**3,98**	265.848	213.360	249.999	34.923	23.335	40.344	35.073	238.009	260.693	199.642	239.501
2029	**259.689**	**3,98**	276.574	221.721	259.955	36.315	24.276	41.925	36.470	247.530	271.211	207.466	249.039
2030	**270.033**	**3,98**	287.714	230.414	270.314	37.764	25.254	43.569	37.924	257.439	282.134	215.600	258.964
2031	**280.795**	**3,99**	299.331	239.459	281.096	39.274	26.274	45.279	39.436	267.806	293.526	224.063	269.293
2032	**291.971**	**3,98**	311.446	248.868	292.296	40.845	27.337	47.059	41.008	278.618	305.407	232.867	280.023
2033	**303.572**	**3,97**	324.083	258.639	303.917	42.473	28.446	48.906	42.638	289.812	317.799	242.010	291.157
2034	**315.635**	**3,97**	337.265	268.784	316.001	44.166	29.604	50.824	44.333	301.441	330.725	251.503	302.734
2035	**328.189**	**3,98**	351.017	279.335	328.574	45.927	30.811	52.819	46.098	313.541	344.210	261.375	314.780
2036	**341.256**	**3,98**	365.364	290.314	341.660	47.759	32.070	54.896	47.933	326.123	358.279	271.649	327.317
2037	**354.864**	**3,99**	380.334	301.743	355.286	49.667	33.384	57.057	49.845	339.219	372.958	282.343	340.371
2038	**369.038**	**3,99**	395.955	313.646	369.479	51.655	34.755	59.307	51.836	352.866	388.277	293.480	353.968
2039	**383.797**	**4,00**	412.257	326.042	384.258	53.725	36.186	61.651	53.910	367.097	404.262	305.079	368.127
2040	**399.151**	**4,00**	429.271	338.950	399.639	55.884	37.679	64.092	56.068	381.979	420.947	317.157	382.863
2041	**415.093**	**3,99**	447.030	352.375	415.609	58.126	39.238	66.631	58.309	397.451	438.361	329.719	398.164
2042	**431.641**	**3,99**	465.568	366.316	432.194	60.458	40.865	69.267	60.636	413.616	456.540	342.764	414.053
2043	**448.778**	**3,97**	484.921	380.784	449.376	62.878	42.564	72.002	63.046	430.442	475.518	356.301	430.514
2044	**466.500**	**3,95**	505.127	395.766	467.149	65.385	44.338	74.835	65.540	447.919	495.332	370.320	447.543
2045	**484.821**	**3,93**	526.225	411.261	485.522	67.975	46.190	77.765	68.118	465.991	516.021	384.819	465.145
2046	**503.783**	**3,91**	548.257	427.284	504.545	70.661	48.123	80.795	70.787	484.774	537.625	399.812	483.371
2047	**523.407**	**3,90**	571.265	443.870	524.225	73.436	50.143	83.931	73.548	504.160	560.187	415.331	502.227
2048	**543.770**	**3,89**	595.296	461.042	544.649	76.317	52.252	87.179	76.414	524.296	583.752	431.400	521.796
2049	**564.921**	**3,89**	620.396	478.866	565.862	79.308	54.455	90.549	79.390	545.196	608.366	448.077	542.122
2050	**586.926**	**3,90**	646.617	497.384	587.931	82.418	56.757	94.050	82.487	566.925	634.078	465.405	563.267

Source: generated by the authors from data published by the Ministry of Labour and Social Affairs in the Economic/Financial Bulletin of the Social Security Budgets and its Appendix I and in the INSS statistical reports, together with the Table and the macroeconomic scenario.

Table 15, Projection for the average pension of SOVI, 1997-2050,

Year	Average pension of SOVI	Year-on-year variation
1986	18.655	
1987	19.584	4,98
1988	20.558	4,97
1989	21.702	5,56
1990	23.945	10,34
1991	25.497	6,48
1992	27.010	5,93
1993	28.579	5,81
1994	29.763	4,14
1995	31.356	5,35
1996	33.051	5,41
1997	34.289	3,75
1998	35.009	2,10
1999	35.639	1,80
2000	36.352	2,00
2001	36.970	1,70
2002	37.562	1,60
2003	38.125	1,50
2004	38.697	1,50
2005	39.277	1,50
2006	39.866	1,50
2007	40.664	2,00
2008	41.477	2,00
2009	42.307	2,00
2010	43.153	2,00
2011	44.016	2,00
2012	44.896	2,00
2013	45.794	2,00
2014	46.710	2,00
2015	47.644	2,00
2016	48.597	2,00
2017	49.569	2,00
2018	50.560	2,00
2019	51.571	2,00
2020	52.603	2,00
2021	53.655	2,00
2022	54.728	2,00
2023	55.823	2,00
2024	56.939	2,00
2025	58.078	2,00
2026	59.239	2,00
2027	60.424	2,00
2028	61.633	2,00
2029	62.865	2,00
2030	64.123	2,00
2031	65.405	2,00
2032	66.713	2,00
2033	68.047	2,00
2034	69.408	2,00
2035	70.797	2,00
2036	72.213	2,00
2037	73.657	2,00
2038	75.130	2,00
2039	76.633	2,00
2040	78.165	2,00
2041	79.728	2,00
2042	81.323	2,00
2043	82.949	2,00
2044	84.608	2,00
2045	86.301	2,00
2046	88.027	2,00
2047	89.787	2,00
2048	91.583	2,00
2049	93.415	2,00
2050	95.283	2,00

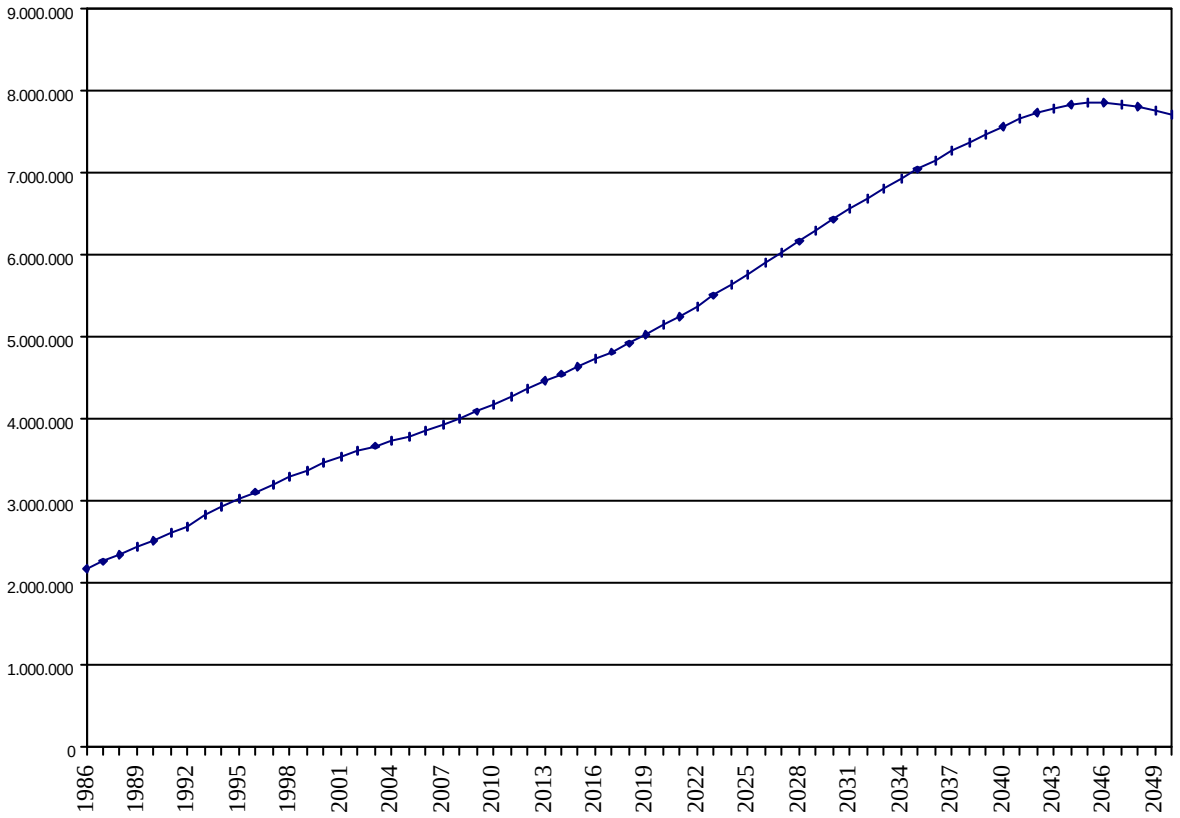
Source: generated by the authors from data published by the Ministry of Labour and Social Affairs in the Economic/Financial Bulletin of the Social Security Budgets and its Appendix I and in the INSS statistical reports; together with Table and the macroeconomic scenario.

Results

The future indicated in the scenario just described shows that the number of retirement pensioners, which at the moment makes up 9% of the population, shows an upward trend, except at the end of the period covered by the scenario, when a change of trend is perceived, The annual cumulative growth rate during this period of time is 1,69%, which implies the said pensioners will make up 20% of the population in the year 2050 (See graph 8)

Graph 8

Trend of all the pensioners 1996-2050

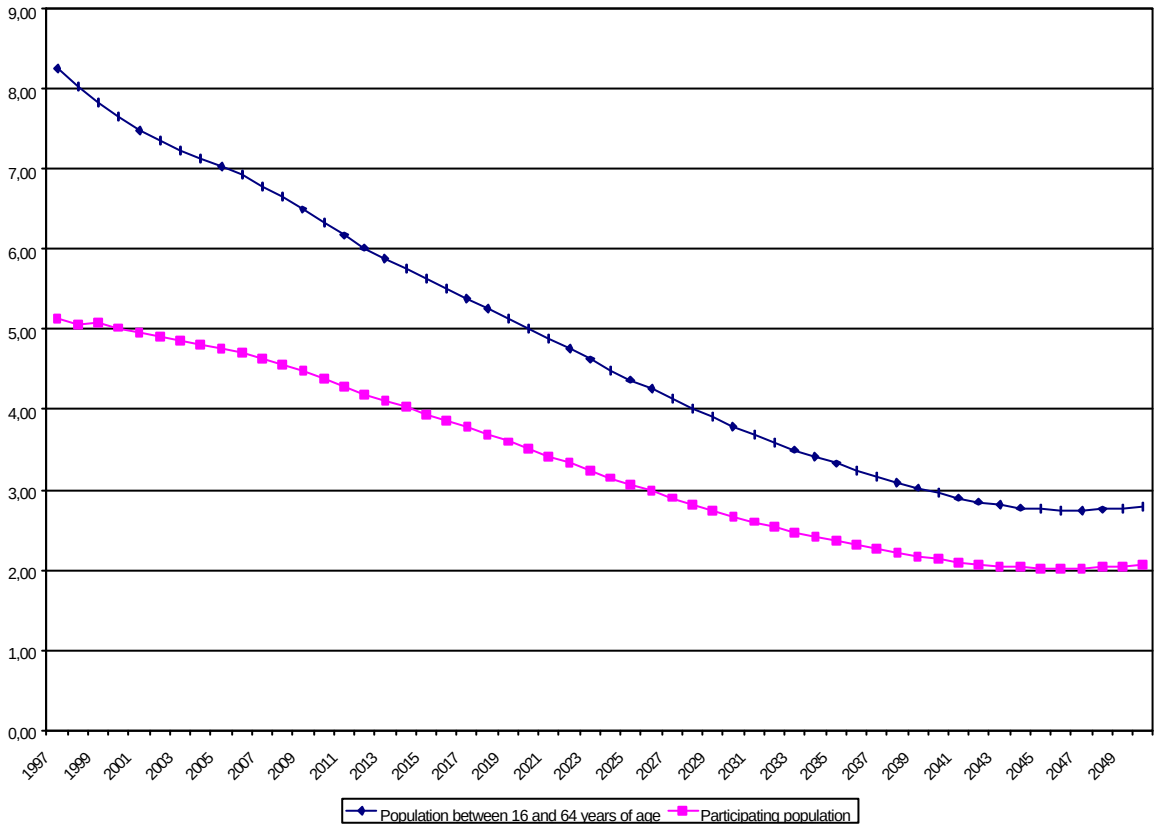


Source: generated by the authors from **1)** MTAS (1998). Social Security Budget Plan. Year 1999. Economic/Financial Report and Appendix I to the Economic/Financial Report; **2)** INSS. Statistical Report. Several years,; **3)** MTAS. Social Security News Report. Several years; **4)** MTAS. Labour statistics and Social Affairs Yearbook. Several years; **5)** INE (1999). Future scenarios for the Spanish population. Period 1990-2050. Mimeograph; **6)** INE (1998). Mortality tables for the Spanish population.

Concerning the population which can make contributions, we can see in Graph 9 how the number of participating people and people of working age per retired person moves downward: it moves down from 5 active people per retired person to a little over two.

Graph 9

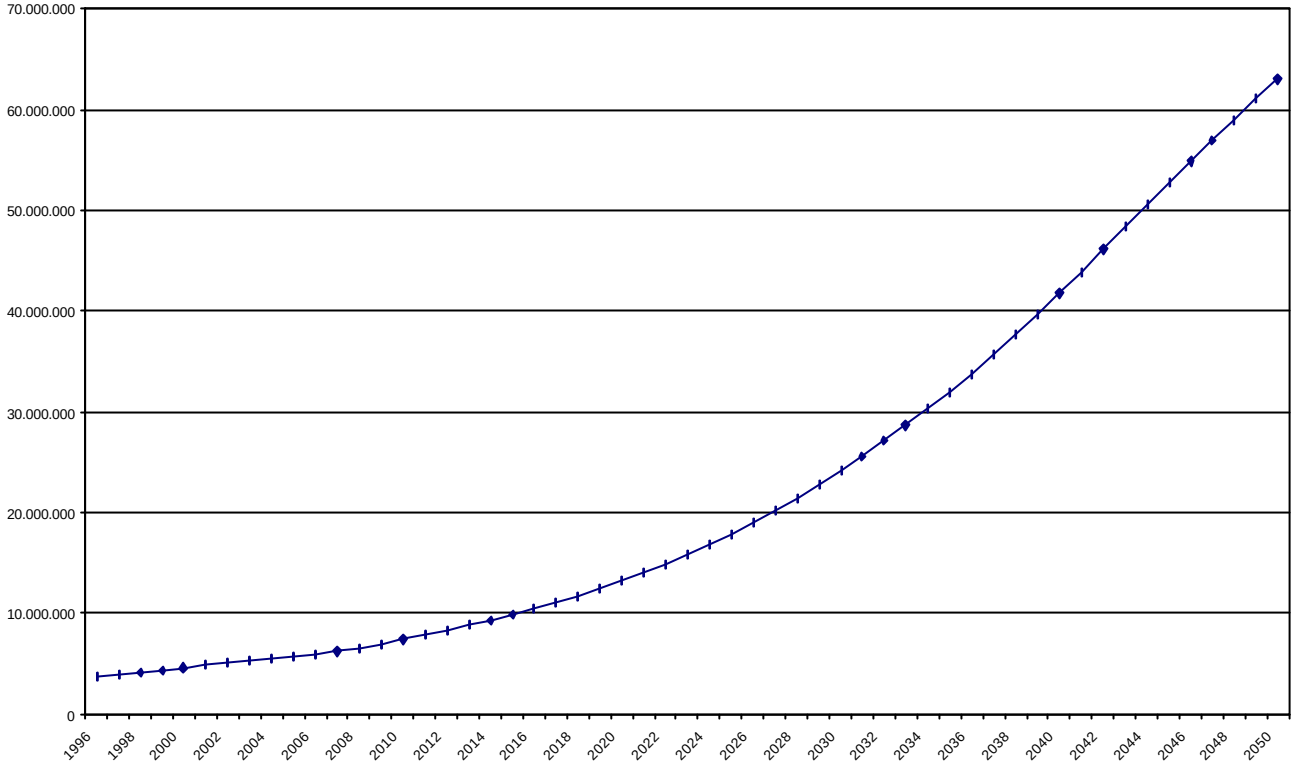
Trend of number of people who may contribute to the system, per retired person.



Source: generated by the authors from **1)** MTAS (1998). Social Security Budget Plan. Year 1999. Economic/Financial Report and Appendix I to the Economic/Financial Report; **2)** INSS. Statistical Report. Several years; **3)** MTAS. Social Security News Report. Several years; **4)** MTAS, Labour statistics and Social Affairs Yearbook. Several years; **5)** INE (1999) Future scenarios for the Spanish population. Period 1990-2050. Mimeograph; **6)** INE (1998). Mortality tables for the Spanish population; **7)** MEH. Macroeconomic scenario. Mimeograph.

For its part, expenditure, the trend of which can be seen in Graph 10, grows at an average annual rate of 5.45% between 1996 and 2050, During the first few years of the new century, roughly up to year 2005, the growth in expenditure will show a downward trend, with an average growth of 4.27%, during the rest of the period, the average annual growth rate registered will be 5.51%.

Graph 10
Scenario for retirement pension expenditure

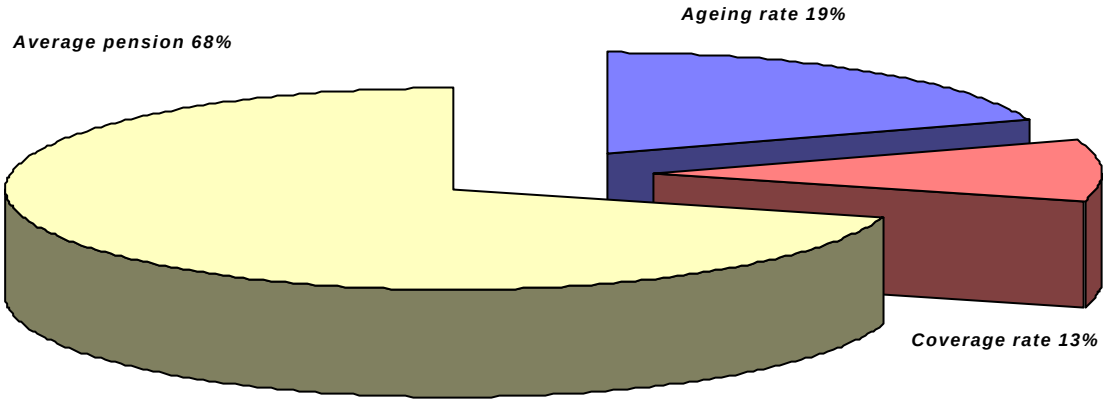


Source: generated by the authors from **1)** MTAS (1998). Social Security Budget Plan. Year 1999. Economic/Financial Report and Appendix I to the Economic/Financial Report; **2)** INSS. Statistical Report. Several years; **3)** MTAS. Social Security News Report. Several years; **4)** MTAS. Labour statistics and Social Affairs Yearbook. Several years; **5)** INE (1999). Future scenarios for the Spanish population. Period 1990-2050. Mimeograph; **6)** INE (1998). Mortality tables for the Spanish population; **7)** MEH, Macroeconomic scenario. Mimeograph.

Among the factors determining expenditure growth, the growth trend for average pension will account for 68%, the ageing rate for 19% while the pension coverage accounts for the remaining 13%. The effect of population growth on expenditure changes is minimal. Graph 11 shows the share of the different factors in expenditure growth for the period 1997-2050. In the following graph can be seen how these factors have moved in recent years.

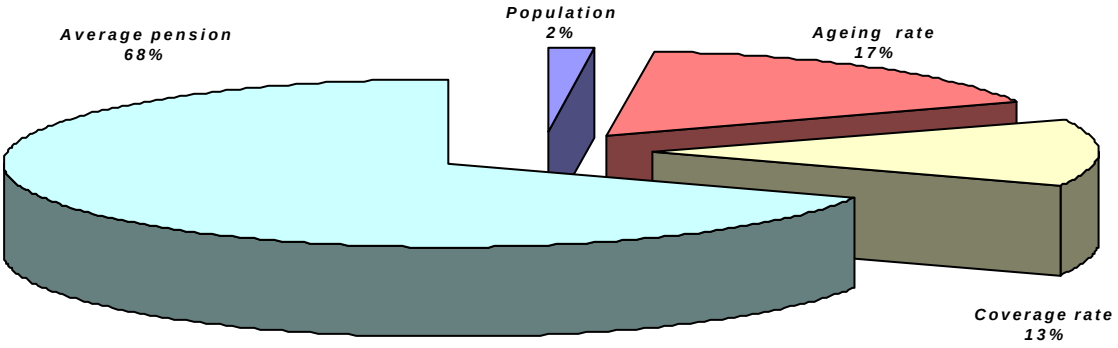
Graph 11

Share of the different components of retirement pension expenditure in their growth 1997-2050.



Graph 12

Share of the different components of retirement pension expenditure in their growth 1987-1996.



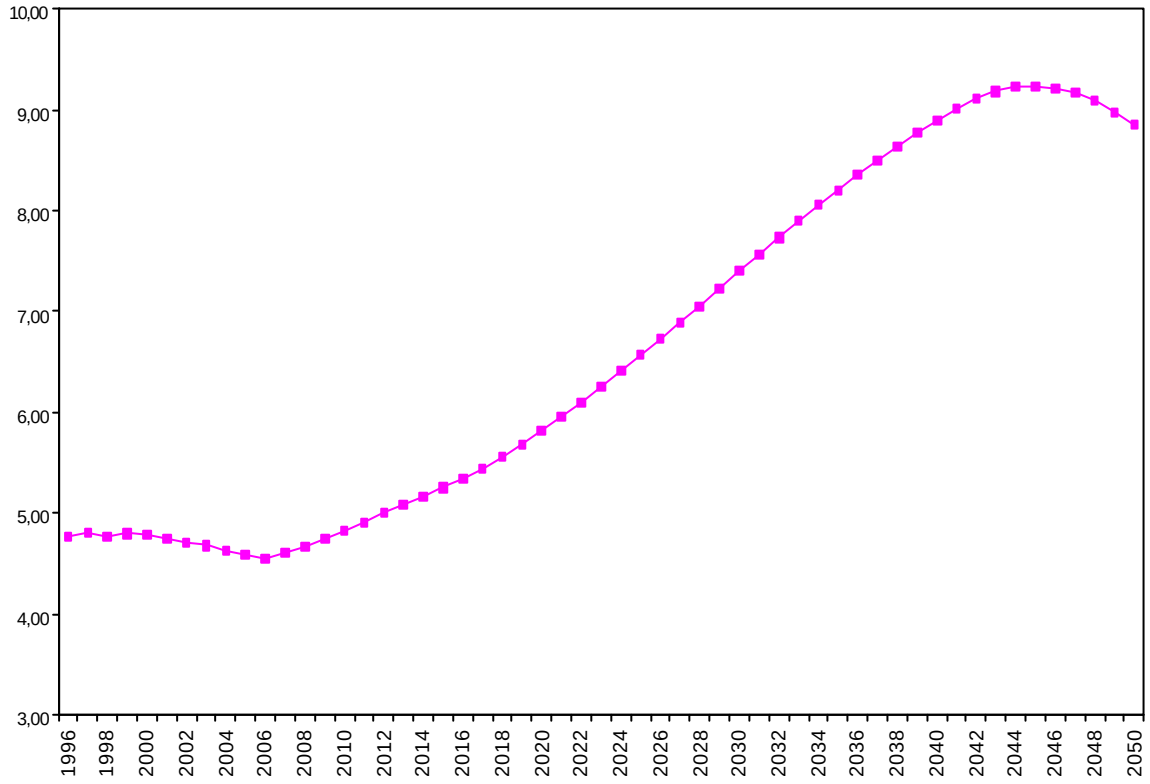
Source: generated by the authors from **1)** MTAS (1998). Social Security Budget Plan. Year 1999. Economic/Financial Report and Appendix I to the Economic/Financial Report; **2)** INSS. Statistical Report. Several years; **3)** MTAS. Social Security News Report. Several years; **4)** MTAS. Labour statistics and Social Affairs Yearbook. Several years; **5)** INE (1999). Future scenarios for the Spanish population. Period 1990-2050. Mimeograph; **6)** INE (1998). Mortality tables for the Spanish population; **7)** MEH, Macroeconomic scenario. Mimeograph.

Discounting the effect of inflation, during the period 1997 to 2050, the growth of the real average pension makes up 52% of the growth in pension expenditure, ageing of the population 28% and the coverage rate 20%.

In terms of GDP expenditure it remains stable (around 5% of GDP) up to year 2010 approximately, As from this year, it begins to have a more important weighting in the GDP making the relationship between the two increase from 5% to around 10% (Graph 13)

Graph 13

Retirement pension expenditure as a share of GDP. 1996-2050.



Source: generated by the authors from **1**) MTAS (1998). Social Security Budget Plan. Year 1999. Economic/Financial Report and Appendix I to the Economic/Financial Report; **2**) INSS. Statistical Report. Several years; **3**) MTAS. Social Security News Report. Several years; **4**) MTAS. Labour statistics and Social Affairs Yearbook. Several years; **5**) INE(1999). Future scenarios for the Spanish population. Period 1990-2050. Mimeograph; **6)** INE (1998). Mortality tables for the Spanish population; **7)** MEH. Macroeconomic scenario. Mimeograph.

.It should also be noted that, between the years 2000 and 2005 there is a downward trend in its weighting in GDP in the forecasts. We understand that this is the result of two effects: on the one hand, the smaller size of the cohorts reaching 60 years of age during the said period and on the other, the fall in the occurrence of early retirement, according to what we have assumed from the year 2000 on, which reduces the incorporation of pensioners into the system during those years. This figure will begin to rise again as from year 2005 when the people who ceased retiring early will retire on attaining the normal retirement age.

To sum up, we observe that with unchanging legislation, retired people make up a group which will have a higher weighting in the population as a whole, doubling in the next 50 years. The public expenditure necessary to finance the corresponding pensions will involve a proportion of GDP which can be considered as stable up to year 2010, when it will begin to increase to the point of making up, as has been indicated, around 9% of GDP. This growth is accounted for by a 68% growth in the average pension, 19% growth in ageing of the population and 13% pension coverage.

The following tables show the trend for retirement pension expenditure and its share in GDP.

Table 16. Scenario for pension expenditure. 1997-2050. *(Continued on next page)*

Years	Year-on-year variation rates								Expenditure in million pesetas		
			System without SOVI			SOVI					
	Population	Ageing rate	Coverage rate	Average pension	Expenditure for retirement pensions	Coverage rate	Average pension	Expenditure for retirement pensions	Expenditure for the System without SOVI	SOVI expenditure	Total expenditure
1997	0,12	0,86	1,28	4,34	6,71	-1,89	1,04	0,10	3.909.318	9.595	3.918.912
1998	0,12	0,86	1,88	2,94	5,91	-2,05	1,02	-0,08	4.140.378	9.587	4.149.965
1999	0,13	0,62	1,97	4,06	6,90	-1,09	1,02	0,66	4.425.896	9.651	4.435.547
2000	0,13	0,55	1,77	2,92	5,46	-0,50	1,02	1,20	4.667.760	9.767	4.677.527
2001	0,14	0,73	1,35	2,74	5,03	-0,38	1,02	1,50	4.902.470	9.914	4.912.384
2002	0,14	0,99	0,81	2,65	4,66	-0,50	1,02	1,65	5.130.921	10.077	5.140.999
2003	0,15	0,97	0,67	2,30	4,13	-0,65	1,02	1,48	5.342.880	10.227	5.353.107
2004	0,16	1,07	0,27	2,23	3,76	-0,70	1,02	1,54	5.543.809	10.384	5.554.193
2005	0,16	1,15	0,22	2,26	3,82	-0,81	1,02	1,51	5.755.856	10.540	5.766.396
2006	0,16	1,20	0,36	2,48	4,24	-0,67	1,02	1,70	5.999.907	10.719	6.010.626
2007	0,15	1,19	0,63	3,61	5,67	-0,36	1,02	2,01	6.340.077	10.935	6.351.012
2008	0,14	1,10	0,77	3,62	5,71	-0,61	1,02	1,65	6.702.302	11.115	6.713.417
2009	0,13	1,08	0,95	3,58	5,83	-0,63	1,02	1,60	7.093.252	11.294	7.104.546
2010	0,11	1,10	1,10	3,56	5,97	-0,62	1,02	1,61	7.516.436	11.475	7.527.911
2011	0,09	1,04	1,16	3,56	5,95	-0,54	1,02	1,61	7.963.319	11.660	7.974.979
2012	0,06	1,01	1,13	3,57	5,87	-0,53	1,02	1,57	8.430.652	11.843	8.442.495
2013	0,04	1,07	0,93	3,60	5,72	-4,97	1,02	-2,94	8.913.027	11.495	8.924.522
2014	0,01	1,14	0,80	3,62	5,65	-5,69	1,02	-3,63	9.416.657	11.077	9.427.734
2015	-0,01	1,22	0,76	3,67	5,72	-6,11	1,02	-4,01	9.955.154	10.633	9.965.788
2016	-0,03	1,32	0,63	3,74	5,74	-6,53	1,02	-4,36	10.526.795	10.170	10.536.965
2017	-0,04	1,43	0,55	3,80	5,83	-6,99	1,02	-4,73	11.140.255	9.689	11.149.944
2018	-0,04	1,53	0,57	3,86	6,01	-7,62	1,02	-5,28	11.809.407	9.177	11.818.584
2019	-0,04	1,59	0,67	3,89	6,20	-8,02	1,02	-5,65	12.541.694	8.659	12.550.352
2020	-0,04	1,59	0,66	3,93	6,24	-8,41	1,02	-6,04	13.324.856	8.135	13.332.991

Table 16. Scenario for pension expenditure. 1997-2050 *(Ends here)*

Years	Year-on-year variation rates								Expenditure in million pesetas		
			System without SOVI			SOVI					
	Population	Ageing rate	Coverage rate	Average pension	Expenditure for retirement pensions	Coverage rate	Average pension	Expenditure for retirement pensions	Expenditure for the system without SOVI	SOVI expenditure	Total expenditure
2021	-0,05	1,63	0,67	3,94	6,29	-8,85	1,02	-6,46	14.163.204	7.610	14.170.814
2022	-0,06	1,71	0,65	3,96	6,36	-9,34	1,02	-6,91	15.064.555	7.084	15.071.640
2023	-0,07	1,75	0,67	3,98	6,43	-9,83	1,02	-7,39	16.032.775	6.561	16.039.336
2024	-0,07	1,79	0,62	3,99	6,44	-10,38	1,02	-7,91	17.064.821	6.042	17.070.864
2025	-0,08	1,84	0,53	3,99	6,39	-10,97	1,02	-8,48	18.154.514	5.530	18.160.044
2026	-0,07	1,84	0,50	3,98	6,34	-11,56	1,02	-9,09	19.306.214	5.028	19.311.242
2027	-0,08	1,79	0,54	3,98	6,33	-12,16	1,02	-9,75	20.528.843	4.538	20.533.380
2028	-0,08	1,77	0,52	3,98	6,29	-12,83	1,02	-10,46	21.819.156	4.063	21.823.219
2029	-0,08	1,74	0,51	3,98	6,24	-13,56	1,02	-11,23	23.181.758	3.607	23.185.365
2030	-0,08	1,72	0,50	3,98	6,21	-14,34	1,02	-12,06	24.620.756	3.172	24.623.928
2031	-0,08	1,69	0,44	3,99	6,12	-15,21	1,02	-12,97	26.127.541	2.761	26.130.302
2032	-0,08	1,67	0,35	3,98	5,99	-16,15	1,02	-13,95	27.692.610	2.376	27.694.985
2033	-0,09	1,63	0,29	3,97	5,89	-17,16	1,02	-15,02	29.322.668	2.019	29.324.687
2034	-0,09	1,59	0,26	3,97	5,80	-18,23	1,02	-16,15	31.023.658	1.693	31.025.351
2035	-0,09	1,50	0,27	3,98	5,72	-19,35	1,02	-17,38	32.798.841	1.398	32.800.240
2036	-0,10	1,40	0,30	3,98	5,66	-20,59	1,02	-18,74	34.654.123	1.136	34.655.259
2037	-0,10	1,26	0,39	3,99	5,60	-21,94	1,02	-20,24	36.594.673	906	36.595.579
2038	-0,11	1,08	0,51	3,99	5,54	-23,42	1,02	-21,89	38.622.668	708	38.623.376
2039	-0,12	0,88	0,65	4,00	5,47	-25,08	1,02	-23,73	40.736.183	540	40.736.723
2040	-0,13	0,70	0,73	4,00	5,35	-27,10	1,02	-25,94	42.916.635	400	42.917.035
2041	-0,14	0,49	0,83	3,99	5,22	-29,67	1,02	-28,70	45.157.614	285	45.157.899
2042	-0,14	0,32	0,84	3,99	5,04	-32,81	1,02	-32,01	47.431.658	194	47.431.851
2043	-0,15	0,15	0,81	3,97	4,80	-36,50	1,02	-35,86	49.709.352	124	49.709.476
2044	-0,16	-0,01	0,74	3,95	4,54	-40,75	1,02	-40,25	51.964.504	74	51.964.578
2045	-0,17	-0,16	0,67	3,93	4,28	-45,66	1,02	-45,29	54.190.267	41	54.190.307
2046	-0,17	-0,30	0,57	3,91	4,01	-51,67	1,02	-51,41	56.362.518	20	56.362.538
2047	-0,18	-0,41	0,47	3,90	3,77	-60,05	1,02	-59,87	58.489.274	8	58.489.282
2048	-0,18	-0,51	0,37	3,89	3,55	-75,91	1,02	-75,83	60.566.821	2	60.566.823
2049	-0,18	-0,54	0,20	3,89	3,35	-100,00	1,02	-100,00	62.596.627	0	62.596.627
2050	-0,18	-0,60	0,08	3,90	3,17		1,02		64.582.905	0	64.582.905

Source: generated by the authors from **1)** INE (1999). Future scenarios for the Spanish population. Period 1990-2050. Mimeograph ; **2)** MEH (1999). Macroeconomic scenario. Mimeograph; and **3)** tables 5, 6, 14, 15.

Note: the variation in annual expenditure has been calculated from all the other variables by means of the following equation:

$$\mathbf{D_t\ GPJSS = D_t\ P \times D_t\ E \times D_t\ TCJSS \times D_t\ pmtss}$$ for the system without SOVI

$$\mathbf{D_t\ GPJS = D_t\ P \times D_t\ E \times D_t\ TCJS \times D_t\ pmts}$$ for SOVI

Projection for expenditure comes from the estimated expenditure for 1996 which, for the whole system without SOVI, is ***3,663,657*** and for SOVI is ***9,330*** million pesetas.

Table 17. Trend on retirement pension expenditure in terms of GDP. 1997-2050

Years	Share of retirement pension expenditure in GDP
1997	4,8
1998	4,8
1999	4,8
2000	4,7
2001	4,7
2002	4,7
2003	4,6
2004	4,6
2005	4,5
2006	4,5
2007	4,6
2008	4,6
2009	4,6
2010	4,7
2011	4,8
2012	4,9
2013	4,9
2014	5,0
2015	5,1
2016	5,2
2017	5,3
2018	5,4
2019	5,5
2020	5,6
2021	5,8
2022	5,9
2023	6,1
2024	6,2
2025	6,4
2026	6,5
2027	6,7
2028	6,9
2029	7,0
2030	7,2
2031	7,4
2032	7,5
2033	7,7
2034	7,9
2035	8,0
2036	8,2
2037	8,3
2038	8,4
2039	8,6
2040	8,7
2041	8,8
2042	8,9
2043	9,0
2044	9,0
2045	9,1
2046	9,0
2047	9,0
2048	8,9
2049	8,8
2050	8,7

Source: generated by the authors from **1)** MEH (1999). Macroeconomic scenario. Mimeograph; and **2)** Table 16.

Simulation of the effects on the retirement pension system of changes in the institutional, demographic and economic framework: some examples.

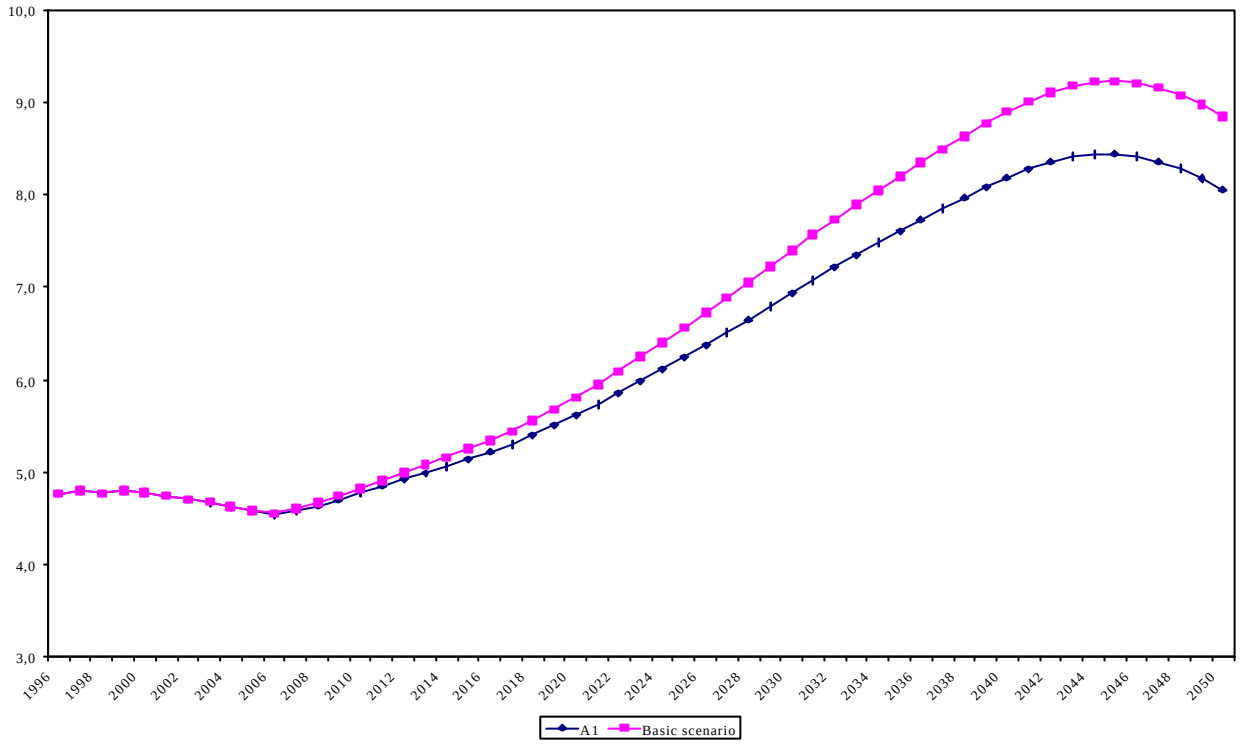
The changes on the basic scenario described above whose effects on the retirement pension system have been taken into account imply:

1) Progressive introduction of up to 25 years in the estimate of the regulatory base (A1 Scenario)
2) Adjusting pensions half a point below the CPI (A2 Scenario)
3) Progressively introducing a requirement of up to 25 years' contributions in the regulatory base and adjusting pensions half a point below the CPI (A3 Scenario)

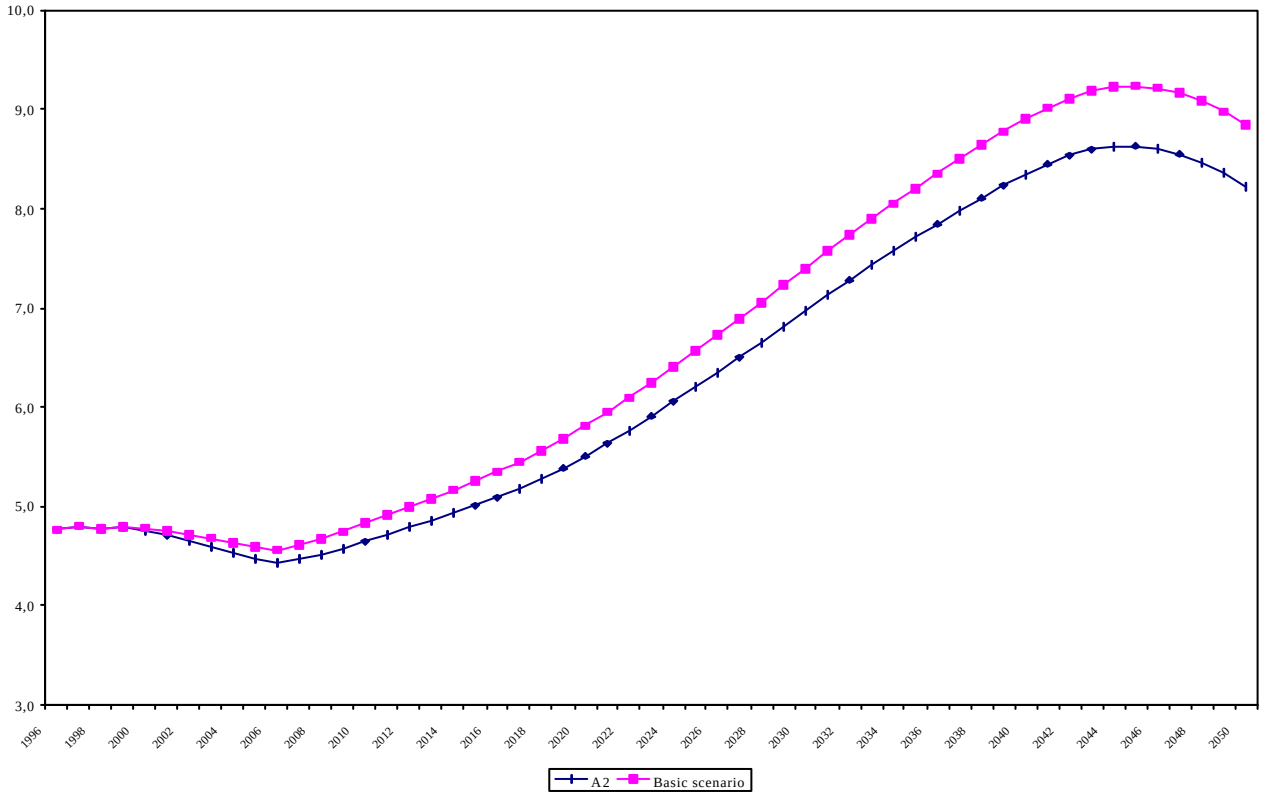
We have also considered a scenario (A4 Scenario) based on de demographic scenario named "*INEbasic*" which can be considered as the extension to 2050 of the officially published by the INE, that only reach 2020. In accordance with this scenario the Spanish population fall approximately five million people from now till 2050 and would have a higher ageing (this "*INEbasic*" scenario records a dependency rate of 60.2% in 2050 against 54.8% recorded by INE1 scenario). The macroeconomic scenario related to the "*INEbasic*" scenario keeps on trends in labour market as well as in productivity and prices; growth in GDP is calculated so that the coherence in the relationships between those economic variables is held up.

The trend on the resulting expenditure for the scenarios A1 to A3 in terms of GDP is reflected in the following graphs:

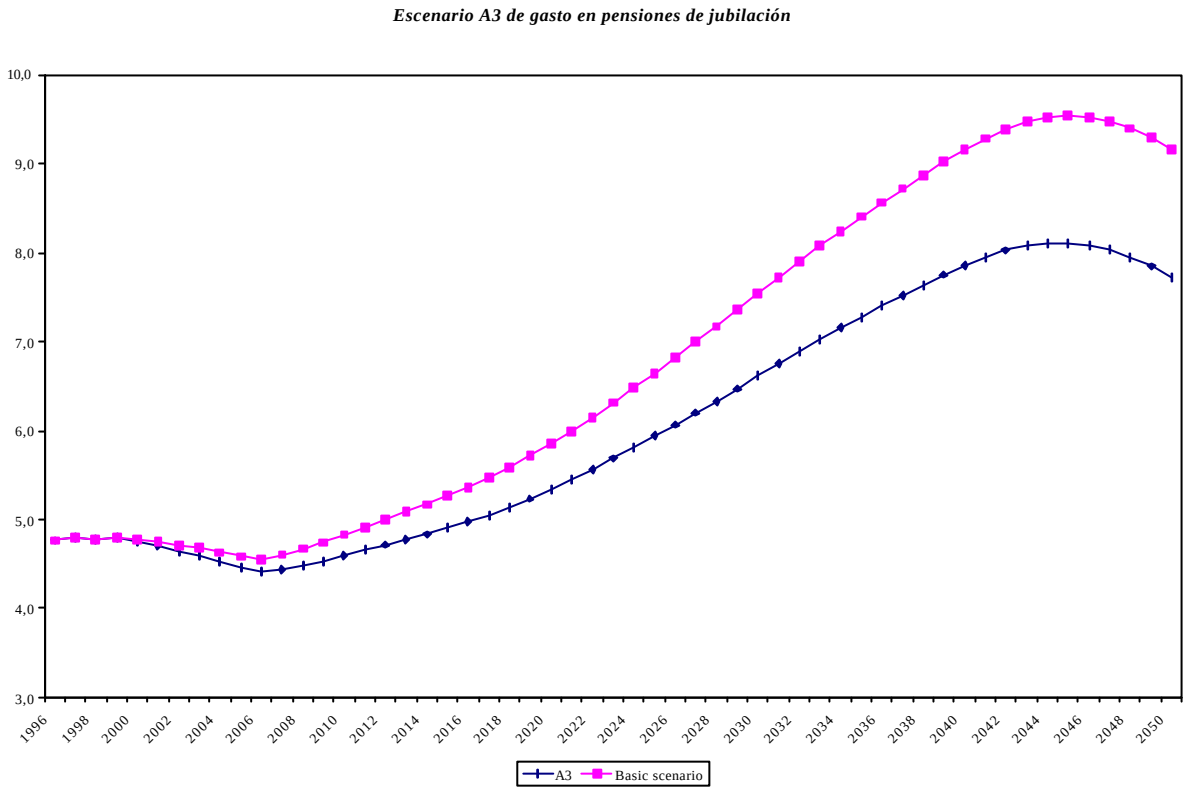
Graph 14
A1 scenario for retirement pension expenditure



Graph 15
A2 scenario for retirement pension expenditure



Graph 16

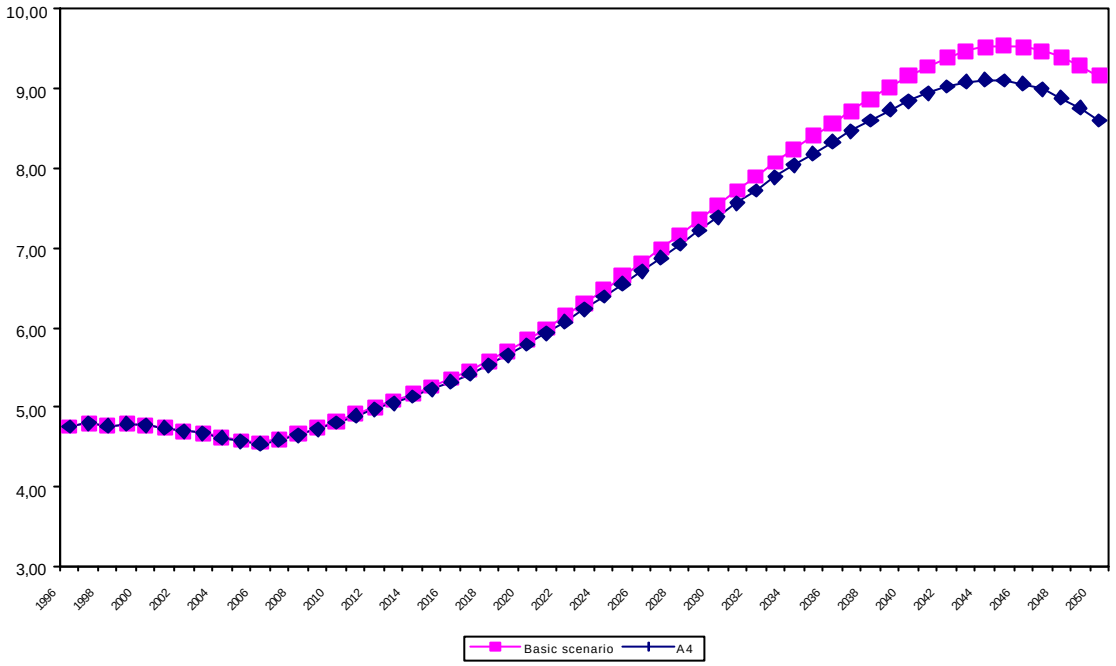


We can see that the measures reducing that share of the GDP which must be assigned to the liabilities derived from retirement pensions do not prevent, around year 2010, expenditure for contributory retirement pensions from gaining weight in the GDP and will continue thus, without interruptions, until about year 2045.

If the demographic scenario, which would result in the future, is “INEbasic” trend in expenditure is reflected in the following graph:

Graph 17

A4 scenario for retirement pension expenditure



It should be noticed that the retirement pension expenditure estimated by the A4 scenario in 2050 is a 6% lower than that estimated by the basic scenario. Nevertheless, the value for GDP estimated by the macroeconomic scenario in which the A4 is based on is a 16% lower. This will have, certainly, implications on the balance of the system, which will be the subject for a future analysis.