INSTITUTO NACIONAL DE ESTADÍSTICA

Pension Table

Inventory of Methods and Sources

June 2018

Index

General description....3

1 Organisational aspects....4

1.1 Description of the organisation and responsibilities in the compilation of the annual non-financial accounts of the institutional sectors and results attached thereto....4

1.2 OrganiSational scheme of the National Accounts Department of the INE....5

2 Information sources....6

2.1 Pension schemes in which the guarantor is an institutional unit that does not belong to the general government....6

2.2 Pension schemes guaranteed by the General Government....6

3 Methods....7

3.1 Pension schemes in which the guarantor is an institutional unit that does not belong to the General Government....7

3.1.1 Pension schemes in which the guarantor is an institutional unit that does not belong to the General Government and considered as defined contribution scheme....7

3.1.2 Pension schemes in which the guarantor is an institutional unit that does not belong to the General Government and considered as defined benefit scheme....9

3.2 Pension schemes guaranteed by the General Government....12

3.2.1 Accrued-to-date pension entitlements....13

3.2.1.1Pensioners....14

3.2.1.2Employed contributors....15

3.2.1.3Reversible life annuities....18

3.2.2 Annual change in accrued pension entitlements....22

3.2.2.1 Pension schemes guaranteed by the General Government in the scope of the different Social Security systems....22

3.2.2.2 State Civil Service System....23

General description

The aim of National Accounting is to carry out a systematic and detailed representation of the national economy as a whole, its components and its relations with other economies, addressing the description and measurement of the totality of the economic relations of the different economic agents beyond their participation in the production process. The system of accounts is designed, indeed, in order to describe all the economic relations between the institutional units which form the national economy (households and non-profit institutions serving households, non-financial corporations, financial corporations and general government), and between those and the rest of the world, in an ordered sequence of accounts that covers every phase of the economic process.

Nevertheless, even though the current national accounts systems, SNA 2008 and ESA 2010, determine the registration in the national accounts of all pension obligations/entitlements linked to employment, they make an exception in the case of the systems that are in the scope of general government. This is because in the social security schemes dependent on the General Government they do not have a defined obligation (nor households a consolidated right) on pensions to be paid (to receive) in the future, as long as the system can undergo regulatory reforms that modulate its amount. That is to say, we are dealing with rights and debt of a "contingent" nature, and this justifies the absence of registration in the central framework of the national accounts system.

However, the increasing social and political interest on the present and future evolution of the pension schemes and the better comprehension of how it works makes necessary to have a more detailed register of pension obligations and rights deriving from them. This is why a supplementary table for accrued-to-date pension entitlements in social insurance is included in the current national accounts systems (Supplementary table for accrued-to-date pension entitlements in social insurance in ESA 2010).

The statistical operation Table of Pensions responds to the design and completion of that table, as a complement to the central framework of national accounts, with the aim of offering a complete and comparable image of the total of pension entitlements of social insurance existing in the national economy.

The operation covers all the current social insurance pension systems (with a collective nature) in force, including the so-called social security systems, containing retirement pensions, widowhood and orphanhood pensions, pensions for family members and pensions for permanent disability. Social assistance, health and dependency insurance, and insurance other than social insurance pensions, such as sick leaves benefits, are not included in the table. Individual pension funds are not included either.

In any case, such rights and obligations are registered accrued-to-date (beginning and end of the reference year) and valued in actuarial terms.

The different flows and stocks resulting from the diverse pension schemes considered are provided according to:

1 Type of **guarantor of the fund**: the schemes are classified in pension schemes whose guarantors are units that do not belong to the institutional sector of General Government and schemes whose guarantors are units belonging to the General Government, including Social Security.

2 Type of pension **scheme**: it is distinguished between **defined contribution schemes and defined benefit schemes.**

1 Organisational aspects

1.1 DESCRIPTION OF THE ORGANISATION AND RESPONSIBILITIES IN THE COMPILATION OF THE ANNUAL NON-FINANCIAL ACCOUNTS OF THE INSTITUTIONAL SECTORS AND RESULTS ATTACHED THERETO

The National Statistics Institute (INE) is an autonomous administrative institution, with legal personality and its own budget, attached to the Ministry of Economy and Business via the State Secretary for Economy and Business Support. It is basically governed by *Law 12/1989 on the Public Statistical Function (LFEP) of 9 May* that regulates statistical activity for state purposes which is the exclusive competence of the State and by the Statute approved by Royal Decree 508/2001 of 11 May[1].

The Law assigns the National Statistics Institute an important role in public statistic activity by expressly entrusting it with the performance of large-scale statistical operations, including the national accounts.

The law also gives the INE the competence to formulate the draft National Statistical Plan and the Annual Programmes that develop it. The National Statistical Plan is the main instrument to order the statistical activity of the General State Administration and is valid for four years. It contains the statistics to be compiled during the four-year period by the services of the General State Administration or any other entities dependent on it and those that must be completed totally or partially with the participation of the Autonomous Communities and Local Corporations in virtue of cooperation agreements with the state statistical services or, when appropriate, in execution of the provisions of the laws. All statistics included in the National Statistical Plan are considered statistics for state purposes and are mandatory.

The National Statistical Plan is approved by royal decree and, once approved, it is updated through the annual programmes that develop it, which are also approved by royal decree. The Annual Programme contains the actions to be carried out during the year in execution of the National Statistical Plan and the forecasts that, for this purpose, must be incorporated into the State General Budget.

In accordance with the INE Statute, the National Accounts Department, which depends on the Presidency of the National Statistics Institute and with the rank of

[1] Consolidated text (last modification in March 26 of 2015).

Sub-Directorate General, is in charge of the preparation and execution of the statistical operations of the national and regional accounts which are the responsibility of the National Statistics Institute and, also, of the representation of the INE in the fields of national and international discussion and decision-making related to the tasks of its competence.

In addition, in accordance with the current National Statistical Plan, the INE is responsible for the preparation and dissemination of all statistical operations that constitute the system of national and regional accounts, both annual and quarterly, with the exception of the *General Government Accounts*, which are the responsibility of the General Intervention of the State Audit Office (Intervención General de la Administración del Estado, IGAE), and of the financial accounts of the institutional sectors of the national economy, which correspond to the Bank of Spain.

In particular, the INE elaborates the non-financial national accounts for the institutional sectors, which are published as a part of the results of the *Annual Spanish National Accounts* (Base 2010)[2]. As attached information are included the Pension Table and detailed results for the General Government sector, elaborated by the IGAE and published adopting the formats for the presentation of government finance statistics recommended by the ESA 2010.

1.2 ORGANISATIONAL SCHEME OF THE NATIONAL ACCOUNTS DEPARTMENT OF THE INE

There are 35 people[3] assigned to the National Accounts Department, of which 4 are auxiliary and 31 perform specialized technical work (of these, 28 are career officials). The department is organised in the following units:

- Deputy Sub-Directorate General of quarterly accounts and institutional sectors, responsible for the preparation of the main aggregates of quarterly accounts, quarterly non-financial accounts of institutional sectors and estimations of operations and aggregates related to them involved in the general equilibrium of the input-output framework and the series of main aggregates of the national economy.
- Deputy Sub-Directorate General of accounts by branch of activity and input-output framework, responsible for technical coordination and work related to the development of the input-output framework of the Spanish economy (Supply and Use Tables and Input-Output Tables) and of the estimations of supply aggregates and gross fixed capital formation by branch of activity.
- Head of Area of regional accounts, responsible for the preparation of regional accounts and other operations closely related to them.

[2] Reference 30023 of the Statistical Operations Inventory.

[3] As at June 2018.

2 Information sources

2.1 PENSION SCHEMES IN WHICH THE GUARANTOR IS AN INSTITUTIONAL UNIT THAT DOES NOT BELONG TO THE GENERAL GOVERNMENT

The main source is the financial and accounting statements sent by the pension funds management entities and insurance companies to the Directorate General for Insurance and Pension Funds (DGSFP) belonging to the Ministry of Economy and Business, in the exercise of its functions as supervisor. In particular:

- Annual accounting statistical documentation of pension plans and funds.
- Annual accounting statistical documentation of collective insurance.
- Annual accounting statistical documentation of insurance entities[4].

2.2 PENSION SCHEMES GUARANTEED BY THE GENERAL GOVERNMENT

The main sources used are as follows:

- Information about pensioners, pensions and contributors in the various Social Security schemes of the Directorate General of Social Security Planning of the Ministry of Labour, Migrations and Social Security.
- Information about pensioners and pensions in the civil service system of the Ministry of Finance and Public Function.
- Information about contributors to the civil service system of the mutual benefit societies of civil servants of the State (MUFACE, ISFAS, MUGEJU).
- Projection of the future evolution of the amounts of average pensions of new pensioners, both in the Social Security system and in the civil service system, carried out by the Ministry of Economy and Business in the scope of the works of the Ageing Working Group, which operates under the mandate granted by the Economic and Financial Affairs Council (ECOFIN) to the Economic Policy Committee (EPC) in 2015 to update and deepen its exercise of age-related expenditure projections, on the basis of Population projections prepared by Eurostat.[5]
- Mortality tables projected for Spain in the *Population Projections 2015-2080* of Eurostat.
- *General Government Accounts*, of the Audit Office (IGAE), dependent on the Ministry of Finance and Public Function.

[4] Since 2016, documentation for the purposes of supervision and statistical accounting and complementary documentation of insurance and re-insurance companies and its groups.

[5] The main hypothesis and methodology can be consulted in: https://ec.europa.eu/info/publications/economic-and-financial-affairs-publications_en.

– *Continuous Sample of Working Lives* (CSWL), prepared by the Ministry of Labour, Migrations and Social Security.

3 Methods

3.1 PENSION SCHEMES IN WHICH THE GUARANTOR IS AN INSTITUTIONAL UNIT THAT DOES NOT BELONG TO THE GENERAL GOVERNMENT

These systems group together the schemes that make up what can be called complementary social provision of a business nature, instrumented in Spain through:

– *Employment pension plans,* promoted by the companies in favour of their workers and managed and deposited in the entities registered for this purpose. They can be *defined contribution* systems, *defined benefit* systems or *mixed* systems. In particular, among the latter are those plans in which the amount of the contributions is defined and in which a minimum interest rate in the capitalisation or minimum benefit is guaranteed, and those plans that combine the defined contribution for some contingency, group or sub-plans with the defined benefit for other contingency, group or sub-plans.

– *Collective insurance,* which implements pension commitments from the company to its workers.

– *Corporate Benefit Plans (PPSE,* for its acronym in Spanish*):* collective insurance contracted by the company for its workers with a legal and tax regime that is similar to that of pension plans in the employment system, covering the same contingencies as pension plans, having retirement as its main coverage. This type of insurance is characterized because it will have to offer a guarantee of interest and use actuarial techniques.

3.1.1 Pension schemes in which the guarantor is an institutional unit that does not belong to the General Government and considered as defined contribution scheme

These systems cover all *defined contribution* employment pension plans, as well as those with mixed characteristics.[6]

In general, the determination of the initial and final stocks of entitlements as well as the corresponding flows that explain the variation between both is done through a translation of the accounting information contained in their financial statements.

[6] In its majority correspond, in the Spanish case, to defined contribution plans for the contingency of retirement and to defined benefit for the contingency of death and disability, reason why they have been classified as defined contribution plans.

The stock of pension entitlements accrued at the beginning and end of the reference year corresponds to the aggregate of the balances at such dates of the *position accounts* of the corresponding pension plans.

The increases registered in the accrued pension entitlements during the reference year correspond to:

- The *employers' actual social contributions*, which are obtained as the aggregate, for all the plans included, of the contributions of promoters registered in their position accounts.
- The *households' actual social contributions*, as the aggregate of contributions of participants, other contributions and returned contributions recorded in the position accounts of the respective plans.
- The *households' social contribution supplements*, estimated from the sum of the aggregate for said plans of own income of the plans included in their position accounts and the proportional part of the *own income* (after deducting operating costs) of the fund, registered in its profit and loss account (the proportional distribution is made on the amount of the position account of the integrated plans).

The decreases of the accrued pension entitlements during the reference year correspond to:

- The *costs of providing the service*, estimated as the sum of the aggregate of:
  - The *expenses* of the plan contained in the position account of the corresponding plans.
  - The proportional part corresponding to those pension plans of the "other operating costs" of the profit and loss accounts of the pension funds into which they are integrated.
  - The expenditure for insurance services, estimated as the average weight the cost of the insurance service represents over the premium to be paid for it in the group of resident insurance companies, applied on the aggregate of the insurance premiums to be paid by the respective plan according to its position account.
  - The proportional part corresponding to those pension plans of the *excess provisions of the profit and loss accounts* of these pension funds.
- The *benefits to be paid,* obtained from the *aggregate of benefits and liquidity of the consolidated entitlements* included in the position accounts of the considered plans.

The *transfers of pension entitlements between schemes* are estimated as the sum of the following three types of mobilisations:

- Mobilisations from *defined benefit* pension plans: the aggregate of *mobilisations from other pension plans* minus *mobilisations to other pension plans* declared in the *position account* of the respective plans. To this, it must

be added the effect of the reallocation between plans in the mathematical provision which is estimated as the aggregate of reallocations between plans that appear in the *position account* of the considered plans multiplied by the change of the mathematical provision of the plan that corresponds to the mobilised plan.

- Mobilisations from collective insurances: the aggregate of the item *mobilisations from other social prevision instruments* minus the aggregate of the item *mobilisations to other social prevision instruments* of the considered plans.
- Mobilisations from PPSE: the item *mobilisations from Corporate Benefit Plans* minus the *mobilisations to Corporate Benefit Plans* of the *position account* of the corresponding pension plans.

On the other hand, changes in entitlements due to revaluations correspond to the proportional part of the plans considered of the sum of the aggregate of results of disposal of the investments, change of the fair value of financial instruments and exchange differences, accounted in the profit and loss accounts of the pension funds in which the corresponding plans are registered (the proportion is estimated with the amount of the position account of the plans considered on the total amount of the position account of the group of employment plans).

Finally, *changes in entitlements due to other changes in volume* are estimated as the difference between the change in the stock of pension entitlements accrued throughout the year minus the part of it explained by the flows estimated as previously described.

3.1.2 Pension schemes in which the guarantor is an institutional unit that does not belong to the General Government and considered as defined benefit scheme

These systems include all *defined benefit* employment plans and collective insurance and PPSE.

Again, the determination of the initial and final stock of entitlements as well as the estimation of the corresponding flows that explain the variation between both is made from the information contained in the accounting statistical documentation of such plans and social security instruments.

The stock of pension entitlements accrued at the beginning and end of the reference year corresponds to the aggregate of *mathematical provisions* (in the case of defined benefit employment plans) and *life provisions* (in collective insurance and PPSE) in each of those dates, which are declared by the entities in the corresponding accounting statistical documentation.

Said provisions are calculated in accordance with life or impairment tables and with the interest rates specified in the technical base of the plan or insurance and adjusted to the criteria set by the Ministry of Economy, and Business. That is, within the framework provided by the regulations of pension plans and funds, specifically the Regulation of plans and pension funds approved by Royal Decree

304/2004, as well as Order EHA/ 407/2008 of 7 February that develops the regulations of pension plans and funds in financial-actuarial matters, of the investment regime and of registration procedures[7].

The increases registered in the accrued pension entitlements throughout the reference year correspond to:

- The *employers' actual social contributions*: in the case of *defined benefit* employment plans, it corresponds to the aggregate of *contributions of the employer* registered in the *position accounts* of the corresponding plans and, in the case of *collective insurances* and PPSE, with the aggregate of the *premiums paid by the employer* and declared by him in the accounting statistical documentation of collective insurances.
- The *households' actual social contributions* correspond, in the case of *defined benefit* employment plans, to the aggregate of the *contributions of the participant* registered in their *position account* and, in the case of collective insurances and PPSE, to the aggregate declared by the company of *premiums paid on behalf of the worker*.
- The *employer's imputed social contributions* correspond to the aggregate of *deficits/surplus* (adjusted by the solvency margin) in the *defined benefit* employment plans,[8] while the collective insurances and PPSE are estimated with a null value.
- The *households' social contribution supplements* are estimated applying to the stock of accrued pension entitlements at the beginning of the period the discount rate that the regulator published to make in this year the calculation of the technical provisions of these products.

The decreases in the accrued pension entitlements in the reference year correspond to:

- The *cost of providing the service*:
  - In the case of pension plans, estimated as the sum of the aggregate of:

[7] The actuarial valuation methods applicable to determine the annual cost of the plan may be based on the allocation of benefits or cost. Regarding the interest rate that will be used in discounting flows, it will be fixed in the technical basis of the plan, although it cannot be higher than 100 percent of the average interest rates of loans in the form of government bonds and debentures corresponding to the last quarter of the previous year to which it applies. The Directorate General for Insurance and Pension Funds will publish annually the interest rate resulting from the application of the previous criteria.

However, if the interest rate published by the Directorate General for Insurance and Pension Funds for each fiscal year is lower than that used by the plan in the previous fiscal year, it may be used, without exceeding the latter, the net return obtained by the plan.

In turn, if the interest rate published by the Directorate General for Insurance and Pension Funds for each fiscal year is higher than the used by the plan in the previous year, it only will be able to use it if the net return of the plan in the previous year is higher than the published one. Otherwise, it should be maintained the one used by the plan the previous year or the net return obtained by the plan if this would be higher.

[8] It has been estimated a null value in the collective insurances and PPSE, due to the impossibility of doing other type of estimation and the fact that could be considered as irrelevant: surpluses are obtained from the analysis of the life insurance coverage status of those insurance companies that offer collective insurances, that is, they have assets assigned to technical provisions with bigger amounts than their obligations. However, these assets are associated to their consideration as companies with a necessity of social capital.

- *Own expenditures of the plan* contained in the *position account* of the corresponding employment pension plans.
- The proportional part corresponding to these pension plans of *other operating costs* accounted in the profit and loss accounts of the pension funds in which these plans are integrated.
- *Insurance services expenses*, estimated as the average weight that the cost of the service represents on the premium to pay for it in the set of resident insurance companies, applied on the aggregate of *insurance premiums to pay* for the respective plans according to its *position account*.
- The proportional part corresponding to these pension plans of the *excess provisions* of the profit and loss accounts of the pension funds where they are integrated.

o In the case of collective insurance and PPSE, estimated as the proportional part of the *total administration and acquisition expenditure* of the insurance companies that offer these products that would correspond to them based on the amount of benefits paid.

– The *benefits to be paid*, which are obtained from the aggregate of benefits included in the *position accounts* of the plans considered and in the accounting statistical documentation for the case of collective insurance and PPSE.

Transfers of pension entitlements between schemes are estimated as the sum of the following three types of mobilisations:

– Mobilisation from *defined contribution* pension plans, as the aggregation of *mobilisations from other pension plans* minus the *mobilisations to other pension plans* that are declared in the *position accounts* of the respective plans. To this must be added the effect of the reallocation between plans in the *mathematical provision* that is estimated as the aggregate of reallocations between *sub-plans* that appears in the *position account* of the plans considered multiplied by the variation of the *mathematical provision* of the plan corresponding to the mobilised plan.

– Mobilisation to collective insurances, as the aggregate of *mobilisations to other social prevision instruments* minus the aggregate of *mobilisations from other social welfare instruments* of *position accounts* of the *defined contribution* and *mixed* employment pension plans.

– Mobilisation to PPSE, as the aggregate of *mobilisations to corporate benefit* plans minus the *mobilisations from corporate benefit plans* of position accounts of the defined and mixed contribution employment pension plans.

On the other hand, changes in the entitlements due to revaluations or other changes in volume are estimated as the difference between the variation in the stock of pension entitlements accrued throughout the year and the part of the same explained by the estimated flows as described previously.

3.2 PENSION SCHEMES GUARANTEED BY THE GENERAL GOVERNMENT

The estimation is carried out separately for the **Social Security pension system** (in its different schemes) and the **State civil service system**, as well as for each of the existing schemes in each of them, namely:

1. **Disability**: it is the pension received by the worker or assimilated that presents serious dysfunctions that diminish or cancel their work capacity. The disability pension depends on the degree of disability recognized to the pensioner (total, absolute and great disability).
2. **Retirement**: it is the lifetime pension granted to workers when they reach the established age and cease working, either totally or partially.
3. **Orphanhood**: it is the pension granted to the children of disabled and retired workers and pensioners on their death. Generally, the pension is terminated when the orphan turns 18 (or 24, in some cases) and can be lifelong in the case of disabled orphans.
4. **Widowhood**: it is the pension granted to the spouses of disabled and retired workers and pensioners on their death. In general, the widowhood pension is compatible with the retirement pension (or permanent disability) to which one was entitled provided that a maximum amount is not exceeded.
5. **In favour of family members**: it is the pension granted to parents, grandparents, siblings and grandchildren of disabled and retired workers and pensioners on their death, provided they are not entitled to another public pension.
6. **Extraordinary**: exclusive pensions of the civil service system whose causal event has occurred due to injury, death or disappearance produced in the act of service or as a consequence of it and in accordance with the provisions of Royal Legislative Decree 670/1987 of 30 April, which approves the consolidated text of the Law on State Pensioners.
7. **Miscellaneous**: those other pensions, exclusive of the civil service system, which are not included in the previous typologies (crosses and medals pensions, exceptional pensions and others).

In addition, in estimating these pensions, a separate calculation has been carried out in each type, for the Compulsory Old Age and Disability Insurance[9] (SOVI, for its acronym in Spanish).

[9] Residual scheme to the system that applies to those workers and their entitled persons who, meeting the requirements of the legislation of the former scheme, are not entitled to a pension under the current Social Security System, with exception of widowhood pensions for which they may be beneficiaries.

3.2.1 Accrued-to-date pension entitlements

The accrued-to-date pension entitlements in each of the previous schemes represent the sum of the present value of all future pension payments to be received by the beneficiaries of such schemes that are accrued to that date.

The estimate of the total of the accrued pension entitlements in each scheme as at 31 December of the year n is obtained as:

$$\boldsymbol{D_n} = \sum_{\boldsymbol{s,x,t}} \boldsymbol{\lambda_{n,s,x}} \times \boldsymbol{N_{s,x,t}} \times \boldsymbol{P_{s,x,t}} \times (\mathbf{1} + \boldsymbol{r})^{\boldsymbol{n-t}}$$

Where:

$\boldsymbol{D_n}$ are the pension entitlements accrued as at 31 December of year n, in a given scheme.

$\boldsymbol{N_{s,x,t}}$ is the number of pensions with beneficiary of sex s and age x in the year t.

$\boldsymbol{P_{s,x,t}}$ is the average amount of the pension with beneficiary of sex s and age x in the year t.

$\boldsymbol{\lambda_{n,s,x}}$ is the **accrual** factor, defined as the accrued fraction of the entitlement to receive the totality of a pension with beneficiary of sex s and age x at the end of year n. It is the quotient between the number of years contributing to the pension until the reference year and the expected total number of years contributing until the acquisition of the condition of pensioner (or disabled person, in the case of disability scheme).

$\boldsymbol{r}$ is the annual discount rate.

The following population groups are also distinguished in the calculation according to the situation at the reference date: **pensioners**, **employed contributors**[10] and **reversible life annuities** (the latter being understood as those in which, after the death of the insured person, a previously fixed beneficiary enjoys a benefit or "reversible life annuity").

In all cases, an annual **nominal discount rate** of 5%[11] is used (base scenario), in accordance with the recommendations of Eurostat for all EU Member States.

Within the Social Security system, only flows and positions relating to **contributory pensions** are considered. The flows and positions of **non-contributory pensions** are not registered in the Pension Table.

[10] It has to be taken into account that the contributors as at 31 December of the starting reference year includes: contributors who are registered as working (affiliated workers); unemployed contributors (their contributions are paid by the State Public Employment Service); contributors with special agreement (unemployed persons who continue to contribute voluntarily); and contributors who have ceased their activity (self-employed persons that earns a benefit due to "cessation of activity", while they are affiliated to the State Public Employment Service who contributes on their behalf).

[11] A sensitivity analysis of the estimates is carried out on a margin of plus/minus one percentage point over the discount rate used (**alternative scenario 1**, with a nominal rate of 4%, and **alternative scenario 2**, with a nominal rate of 6%).

In the Spanish Social Security system, the pension systems considered here fall into two major regimes: the **General Regime** (RG) for employed workers and the **Special Regime for Self-Employed Workers** (RETA, for its acronym in Spanish)[12].

3.2.1.1 Pensioners

The group of pensioners as at the reference date has already accrued the totality of the their pension entitlements ($\lambda_{n,s,x}$ is equal to 1 in all cases), so the present value of the accrued-to-date pension entitlements is equal to the present value of all the pension payments that they would receive until the termination of their pension entitlements, generally when the individual dies.

The estimation of the number of pensions as at 31 December of each year is carried out as follows:

- In the retirement and disability schemes, based on mortality tables projected for each collective, so:

$$N_{s,x,t} = N_{s,x-1,t-1} \times \left(\frac{L_{s,x,t}}{L_{s,x-1,t-1}}\right)$$

For x=0, 1, 2, .,.100 and more years.

Where:

$N_{s,x,t}$ is the number of pensions with beneficiary of sex s and age x as at 31 December of year t.

$L_{s,x,t}$ is the population of sex s and age x as at 31 December of year t (*stationary population* of the projected mortality table).

In the case of the retirement scheme, the projected mortality tables for the population resident in Spain in the baseline scenario of the *Population Projections[13] of Eurostat* for the period 2015-2080[14] have been used. Both in the disability scheme and in the scheme for retired persons coming from the disability schema, the mortality tables that have been used, are those estimated by the Ministry of Labour, Migrations and Social Security for the pensioner population due to disability over 16 years for the year n and projected in future years, according to the projected evolution of the mortality of the total population resident in Spain by Eurostat in its base scenario[15].

[12] Historically, there have also been numerous special regimes (Sea workers, Mining, Book writers, Bullfighters, etc.) that have gradually been assimilated to the RG. Some of them still exists with specific characteristics due the nature of the work that defines them.

[13] http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-/database.

[14] For the periods after 2080, the hypotheses projected for that year remain constant.

[15] At ages below 16 years it is used the biometrical functions used for the case of retirement, corrected with a factor determined as the ratio of the mortality rate at 16 years old for the disability pensioner population to that projected for the total population.

– In the case of orphanhood pension schemes and pensions in favour of family members, the termination of the entitlement occurs in certain cases once a certain age has been reached. Therefore, it is necessary to separate in the group of pensions in force at the reference date, those pensions that are of a lifelong nature from the rest. For this purpose, in the case of orphanhood pensions, the number of lifetime pensions is estimated as the sum of all those in force as at 31 December of the reference year in which the beneficiary is over 25 years plus a fraction of the rest, this being estimated for each year, sex and age, as the percentage of such pensions that have the qualification of lifetime pensions for the orphanhood scheme in the reference year. In the case of pensions in favour of family members, the fraction of lifetime pensions is estimated, for each year, sex and age, as the percentage of such pensions that have the qualification of lifetime pensions in said scheme in the reference year.

  The estimation of the number of pensioners as at 31 December of each future year is made in a similar way to that of retirement pensions, making use, in the case of lifetime pensions, of the mortality hypothesis used in the case of disability pensions, and in the case of non-lifetime pensions, to that of the general population. However, in the case of non-lifetime orphanhood pensions, the estimation is made taking into account a maximum period of validity of the pension until the age of 25 and under the hypothesis of an average remaining duration of the pension of 15 years in the case of pensions in favour of family members.

The estimation of the average amount of the pension in each year t, sex s and age x ($\boldsymbol{P_{s,x,t}}$) is carried out taking into account its revaluation, which, according to current regulations,[16] is determined as of 1 January 2014, by the so-called Pension Revaluation Index (IRP). It has been carried out under the assumption of an IRP of 0.25% throughout the projected period, in accordance with the hypotheses established for Spain by the Ministry of Economy and Business in the context of the work of the Ageing Working Group, which operates under the mandate given by the Economic and Financial Affairs Council (ECOFIN) to the Economic Policy Committee (EPC) in 2015, to update and deepen its projection of age-related expenditure, based on the population projections prepared by Eurostat[17].

3.2.1.2 Employed contributors

The number of affiliation relationships registered as working as at 31 December of each year is estimated based on the projection of mortality used and subtracting the number of affiliation losses due to disability and retirement during that year. That is to say:

[16] Law 23/2013 of 23 December, which regulates the Sustainability Factor and the Revaluation Index of the Social Security Pension System).

[17] The main hypothesis and methodology can be consulted in: https://ec.europa.eu/info/publications/economic-and-financial-affairs-publications_en

$$A_{s,x,t} = (A_{s,x-1,t-1} \times \frac{L_{s,x,t}}{L_{s,x-1,t-1}}) - J^{t}_{s,x-1,t-1} - I^{t}_{s,x-1,t-1}$$

Where:

$A_{s,x,t}$ is the number of affiliation relationships registered as working of individuals of sex s and age x as at 31 December of year t.

$L_{s,x,t}$ is the population of sex s and age x as at 31 of December of year t (stationary population of the table of projected mortality).

$J^{t}_{s,x-1,t-1}$ is the number of affiliation losses throughout year t due to retirements by age of contributors of sex s and age x-1 as at 31 of December of year t-1.

$I^{t}_{s,x-1,t-1}$ is the number of affiliation losses throughout year t due to retirements by disability of contributors of sex s and age x-1 as at 31 of December of year t-1.

The calculation of accrued pension entitlements in the retirement and disability schemes corresponds to the general formula described in section 3.2.1, applied to cases in which N = J and N = I, respectively, and in each group of new pensioners that take place in a future determined year.

The number of contributors that retires throughout each year for each sex and age is estimated based on a **retirement rate** of the population of sex s and age x in year t ($AJ_{s,x,t}$), estimated as the number of new pensioners due to retirement of sex s and age x in the year after the reference year divided by the total number of contributors of sex s and age x-1 registered as working as at 31 December of the reference year, and of a **disability rate** of the population of sex s and age x in the year t ($AI_{s,x,t}$), estimated also as the number of new pensioners due to disability of sex s and age x in the year after the reference year divided by the total number of contributors of sex s and age x-1 registered as working as at 31 December of the reference year.

The **accrual factor** is estimated in each scheme and for each sex and age based on the following expression and based on the data of CSWL of the Ministry Labour, Migrations and Social Security corresponding to the reference year and the previous three:

$$\lambda_{s,x} = \frac{C_{s,x}}{l_s - e_s}$$

Where:

$C_{s,x}$ is the sample average of the contributed years by the contributors in the Social Security system of sex s and age x as at 31 December of each observed year of the CSWL.

e_s is, for each sex, the average age of registration of the first affiliation relationship in which the participant enters in the corresponding Social Security pension scheme. It is estimated as the weighted average by the number of cases observed,

of the difference between the age as at 31 December in each year observed in the CSWL and the number of contribution years of the affiliates of that age and sex s as at 31 December of each year, assuming a continuous contribution history.

l_s is, for each sex, the expected retirement age of the participant (expected age of the acquisition of disability status in the case of disability pensions). It is estimated, for each sex, as the weighted average, by the observed number of new pensioners, of the age at which the participant becomes pensioner or disabled, of the pensioners of that sex that have become pensioners in the year following the reference year.

In the civil service scheme, the estimated accrual factor is approximated with the one obtained for the Social Security scheme for this scheme, sex and age.

The estimation of the average amount of the pension in each year t, sex s and age x ($P_{s,x,t}$) is carried out, for each scheme, considering that:

- In one hand, for the projection of the average pension of the new pensioners in each year, data corresponding to the estimations carried out for Spain by the Ministry of Economy and Business in the scope of the works of the Ageing Working Group of the Economic Policy Committee (AWG) for the period 2016-2070[18] has been taken as initial data in the first year (the following year to the reference year). From the second year after the reference year until 2070, it is projected according to the inter-annual variation observed in those estimates for each sex and age. From 2071 onwards, it is projected according to the average inter-annual variation observed for each sex and age in the period 2061-2070.
- In the case of retirement pensions of the Social Security scheme, it has been considered, until 2070, the projection of the average pension of the new pensioners in each sex, corresponding to the estimations carried out for Spain by the Ministry of Economy and Business in the scope of the works of the Ageing Working Group of the Economic Policy Committee (AWG) for the period 2016-2070.[19] From 2071 onwards, it is projected according to the average inter-annual variation observed for each sex and age in the period 2061-2070 in those hypothesis.
- On the other hand, the revaluation of this average pension of the new pensioners that, according to the current regulations[20].

[18] Such estimations have been adapted to the estimation model here described imputing, for the ages between 20 and 80 years, the ages for which no estimate of the average pension at the time of registration is available for the year in question by the average pension at the time of registration estimated for that year, sex and scheme, and afterwards making in that range of ages a smoothing of the estimated average pensions through moving averages of order 5.Out of this range of ages, it is imputed in each year and sex, to all ages, the estimated average pension of the ten closest ages inside that range and it is made a second smoothing to all ages through the application of moving averages of order 5.

[19] Idem 17.

[20] Law 23/2013 of 23 December, which regulates the Sustainability Factor and the Revaluation Index of the Social Security Pension System.

3.2.1.3 Reversible life annuities

The estimation is carried out in a separate way for the following types of pensions that can be applied: orphanhood pensions, widowhood pensions and pensions in favour of family members.

A separate estimation is also carried out for reversible life annuities generated by the death of those individuals with the condition of pensioner in the reference date and those with the condition of contributor, since the accrual factor is different in both cases.

This is done sequentially:

1 It is estimated the annual number of deaths that potentially cause this type of pensions, for each of the following groups:

- Pensioners as at 31 December of the reference year whose death could generate a reversible life annuity, what means, retirement and disability pensioners[21], as:

$$\boldsymbol{DP_{s,x-1,t} = N_{s,x-1,t-1} \times (1 - \frac{L_{s,x,t}}{L_{s,x-1,t-1}})}$$

For x=0, 1, 2, .,.100 and over.

Where:

$\boldsymbol{DP_{s,x-1,t}}$ is the number of pension cancellations due to death throughout year t of pensioners of sex s and age x-1 as at 31 December of year t-1.

$\boldsymbol{N_{s,x-1,t-1}}$ is the number of pensions with beneficiary of sex s and age x-1 as at 31 December of year t-1.

$\boldsymbol{L_{s,x,t}}$ is the population of sex s and age x as at 31 December of year t (*stationary population* of the projected mortality table).

- Contributors as at 31 December of the reference year who enter the retirement or disability scheme at a given time or who die before entering one of those schemes:

$$\boldsymbol{DJ_{s,x-1,t} = \sum_{t'<t} N(J^{t'})_{s,x-1,t-1} \times (1 - \frac{L_{s,x,t}}{L_{s,x-1,t-1}})}$$

$$\boldsymbol{DI_{s,x-1,t} = \sum_{t'<t} N(I^{t'})_{s,x-1,t-1} \times (1 - \frac{L_{s,x,t}}{L_{s,x-1,t-1}})}$$

[21] The death of beneficiaries of widowhood and orphanhood pensions and pensions in favour of family members does not generate reversible life annuities.

$$DA_{s,x-1,t} = A_{s,x-1,t-1} \times (1 - \frac{L_{s,x,t}}{L_{s,x-1,t-1}})$$

$DJ_{s,x-1,t}$ is the number of retirement pensions of pensioners of sex s and age x-1 as at 31 December of year t-1 that dies throughout year t.

$N(J^{t'})_{s,x-1,t-1}$ is the number of retirement pensions of pensioners of sex s and age x-1 as at 31 December of year t-1 that are registered in the retirement scheme in the year t'.

$DI_{s,x-1,t}$ is the number of disability pensions of pensioners of sex s and age x-1 as at 31 December of year t-1 that dies throughout year t.

$N(I^{t'})_{s,x-1,t-1}$ is the number of disability pensions of pensioners of sex s and age x-1 as at 31 December of year t-1 that are registered in the disability scheme in the year t'.

$DA_{s,x-1,t}$ is the number of affiliation relations with contributors of sex s and age x-1 as at 31 December of year t-1 which are terminated due to the death of the contributor throughout year t without having acquired the condition of pensioner.

$L_{s,x,t}$ is the population of sex s and age x as at 31 December of year t (*stationary population* of the projected mortality table).

The total number of affiliation relations with contributor of sex s and age x-1 that dies throughout year t will be:

$$DC_{s,x-1,t} = DA_{s,x-1,t} + DJ_{s,x-1,t} + DI_{s,x-1,t}$$

2 It is applied to the deaths thus obtained of in each sex and age in the previous point, a rate of new pensions in each type of scheme by sex and age:

- **Rate of registrations of widowhood pensions** of pensioners with sex s and age x in the year t ($AV_{s,x,t}$), estimated as the number of new pensions during the year following the reference year of widowhood pensions of pensioners with sex s and age x as at 31 December of the previous year divided by the total number of deregistrations due to death of pensions or affiliation relations throughout that year of individuals of opposite sex and age x-3 (in the case of men) and x+3 (in the case of women)[22] as at 31 December of the previous year for the groups of causal individuals considered.
- **Rate of registrations of orphanhood pensions** of pensioners with sex s and age x in the year t ($AO_{s,x,t}$), estimated as the number of new pensions during the year following the reference year of orphanhood pensions of pensioners with sex s and age x as at 31 December of the previous year divided by the total number

[22] The average difference of the Average Age of Marriage of each sex in Spain in the period 1980-2015 is 2, 83 years according to the *Basic Demographic Indicators* published by the INE.

of deregistrations due to death of pensions or affiliation relations throughout the year, of people of age x+AMA (in the case of female causal individuals) or x+APA (in the case of male causal individuals) as at 31 December of the previous year, being AMA the Average Maternity Age in Spain in the reference year and APA an approximation of the Average Paternity Age.[23]

– **Rate of registrations of pensions in favour of family members** in year t ($AF_{s,x,t}$), estimated as the number of new pensions during the year following the reference year of pensions in favour of family members of pensioners of sex s and age x as at 31 December of the previous year divided by the number of deregistrations due to death of pensions or affiliation relations throughout the year.

In this way, the estimated number of new pensioners of reversible life annuities in each year t and in every scheme with pensioner of sex s and age x as at 31 December of year t, from pension deregistrations due to death of the pensioner, results from:

$$\boldsymbol{V_{s,x,t}} = \boldsymbol{DP_{s',x+j,t}} \times \boldsymbol{AV_{s,x,t}}$$
$$\boldsymbol{O_{s,x,t}} = (\boldsymbol{DP_{s,x+j,t}} + \boldsymbol{DP_{s',x+j,t}}) \times \boldsymbol{AO_{s,x,t}}$$
$$\boldsymbol{F_{s,x,t}} = (\boldsymbol{DP_{s,t}} + \boldsymbol{DP_{s',t}}) \times \boldsymbol{AF_{s,x,t}}$$

Where:

$\boldsymbol{V_{s,x,t}}$ is the number of registrations in the year t of widowhood pensions for reversible life annuities with pensioner of sex s and age x as at 31 December of year t.

$\boldsymbol{O_{s,x,t}}$ is the number of registrations in the year t of orphanhood pensions for reversible life annuities with pensioner of sex s and age x as at 31 December of year t.

$\boldsymbol{F}$ is the number of registrations in the year t of pensions in favour of family members for reversible life annuities with pensioner of sex s and age x as at 31 December of year t.

s' is the complementary sex of s.

j=3 in the case of the estimation of registration of widowhood pensions for women and -3 in the case of the estimation of registration of widowhood pensions for men. In the case of the estimation of registration of orphanhood pensions, j=AMA for deaths of potential causal individuals of the female sex and j=APA for deaths of potential causal individuals of the male sex.

The calculation of accrued pension entitlements for reversible life annuity in the schemes of widowhood, orphanhood and in favour of family members responds to the general formula described in section 3.2.1, applied in the cases in which N=V and N=O and N=F, respectively, and to each group of new pensioners in each future year.

[23] It is taken into account again that the average difference of the Average Age of Marriage for each sex in Spain in the period 1980-2015 is 2, 83 years.

The same procedure is followed in the case that the reversible life annuity comes from the death of contributors by simply replacing $\boldsymbol{DP_{s,x+j,t}}$ by $\boldsymbol{DC_{s,x+j,t}}$ and analogously for s'.

As in the case of accrued entitlements by the group of pensioners as at the reference date, in the case of orphanhood schemes and pensions in favour of family members, the termination of the entitlement occurs in certain cases once a certain age has been reached. It is therefore necessary to separate the number of initial pensions in those of a lifetime nature from the rest. The separation in lifetime and non-lifetime pensions is done analogously to how it is done for the pensioners' group. The same hypothesis of mortality and validity and duration of the pension are also used.

In addition, the accrual factor in the case of reversible life annuities from the death of pensioners is 1. In all other cases, the accrual factor is estimated, based on the results of the CSWL for the reference year and for the three years previous, such as:

$$\boldsymbol{\lambda_{s,x}} = \frac{\boldsymbol{C_{b_{s,x}}}}{\boldsymbol{C_{r_{s,x}}}}$$

Where:

$\boldsymbol{C_{b_{s,x}}}$ represents the average sample contribution of the deaths of sex s and age x as at 31 December of each observed year that are potentially causal individuals of the corresponding reversible life annuity in the terms defined in the previous sections. So, in the case of widowhood pensions it will be the average of the contribution of individuals of the opposite sex with a difference of age of ±3 year according to the application of the accrual factor to pensions of women or men, respectively. In the case of orphanhood pensions, the average of the contribution of women aged x+AMA and men aged x+APA. In the case of annuities in favour of family members the average weighted by the number of deaths of the contributions of both sexes.

$\boldsymbol{C_{r_{s,x}}}$ are the expected years of contribution until the death of the causal individual of sex s and age x as at 31 December of each year observed in the case of reversible life annuity for widowhood, orphanhood and in favour of family members. Thus, in the case of registrations of widowhood pensions of each sex and age x as at 31 December of each year, it will be the expected contribution of the subjects of the opposite sex with an age difference of ± 3 years according to the application of the accrual factor to pensions of women or men respectively. In the case of orphanhood pensions of each sex and age x as at 31 December of each year, the average of the expected contribution with age x+AMA, in the case of women, and with age x+APA, in the case of men. In the case of annuities in favour of family members of each sex and age x as at 31 December of each year, the average of the expected contributions of both sexes. In all cases, the expected contributions are estimated as the difference between the life expectancy at birth in the reference year according to the Mortality Tables of the population resident in Spain published by the INE and the average age of the first relation of affiliation in each sex and age with which the deceased (potential cause of the reversible life

annuity) enters the corresponding Social Security pension scheme. This entry age is estimated as the weighted average by the observed number of cases, of the difference between the age as at 31 December in each observed year of the CSWL and the number of years of contributions of affiliates of that age and sex s, to as at 31 December of each year, assuming a continuous contribution history.

The estimation of the average amount of the pension in each year t, sex s and age x ($\boldsymbol{P_{s,x,t}}$) is carried out for each scheme taking into account:

– On the one hand, for the projection of the average pension of the new pensioners in each year and scheme it has been taken as initial data in the first year (the following year to the reference year) the corresponding to the estimations carried out for Spain by the Ministry of Economy and Business in the scope of the works of the Ageing Working Group of the Economic Policy Committee (AWG) for the period 2016-2070[24]. From the second year after the reference year until 2070, it is projected according to the inter-annual variation observed in those estimates for each sex and age. From 2071 onwards, it is projected according to the average inter-annual variation observed for each sex and age in the period 2061-2070.

– On the other hand, the revaluation of this average pension of the new pensioners that, according to the current regulations[25], comes determined, as from 1 January 2014, by the denominated *Pension Revaluation Index* (IRP).

3.2.2 Annual change in accrued pension entitlements

3.2.2.1 Pension schemes guaranteed by the General Government in the scope of the different Social Security systems

The increases registered in the accrued pension entitlement throughout the reference year correspond to:

– Employers' actual social contributions and households' actual social contributions:

The estimation is based on the results of the General Government Accounts on contributions and benefits, specifically on the resources of the sector in D.611 Employers' actual social contributions and in D.613 Households' actual social contributions. To each of these amounts is subtracted the part that finances the expenditures not associated to contributory pensions, according to the Aggregate

[24] Such estimations have been adapted to the estimation model here described by imputing, for the ages between 20 and 80 years (between 0 and 80 years in the orphanhood scheme and between 20 and 100 years in the widowhood scheme), the ages for which no estimate of the average new pension is available in the year in question by the average new pension estimated for said year, sex and scheme, and afterwards making in that range of ages a smoothing through moving averages of order 5 of the estimated average pensions. Out of this range of ages, the estimated average pension of the ten closest ages inside that range is imputed in each year and sex, to all ages, and a second smoothing is carried out for all ages through the application of moving averages of order 5.

[25] Law 23/2013, of December 23, which regulates the Sustainability Factor and the Revaluation Index of the Social Security Pension System.

Account of the Entities that make up the Social Security system (the percentage of the total social contributions that are not used for the payment of pensions is estimated as the proportion of the total contributions which are used to finance expenditure other than the payment of contributory pensions, according to the Aggregate Account of the Entities that make up the Social Security system[26]).

– Households' social contribution supplements: they are estimated as the product of the discount interest rate considered and the stock of initial entitlements.

In addition, *costs for providing pension services* are not registered.[27]

The decreases in the accrued pension entitlements in the year of reference correspond to the payment of pension benefits, that is, the uses in D.6211 *Social Security Benefits in Cash* of the sub-sector *Social Security Funds* in the *General Government Accounts*.

On the other hand, *transfers of pension entitlements between schemes* are not registered since they are considered as irrelevant significance in the Spanish case.

For its part, the impact in the accrued stock of entitlements at the end of the year of a change in its calculation assumptions due to a negotiated legislative change over the system would be registered as *negotiated changes in the structure of the system*.

Also, changes in entitlements due to *revaluations* would register the impact on the estimated stock of entitlements of changes in the actuarial assumptions used on the discount rate, the wage growth rate or the inflation rate; and *changes in entitlements due to other changes in volume* quantify the impact of changes in the demographic assumptions used in actuarial calculations, changes in pension entitlements that are imposed, without negotiation, changes in retirement patterns that are not due to legislative reforms and any other change in the hypotheses not included in the previous items.

Finally, *the other (actuarial) changes in pension entitlements in the Social Security pension system* are obtained residually, as the difference between the annual variation of accrued entitlements throughout the year and the difference resulting from the increases and decreases in such entitlements registered in the previous items.

3.2.2.2 State Civil Service System

In the schemes grouped in the Civil Service system, there are no *Employers' actual social contributions*. In this way, the increases registered in accrued pension entitlements throughout the reference year correspond to:

– *Households' actual social contributions*, which correspond to the resources of the subsector Central Government in D.613 *Households' actual social contributions* according to General Government Accounts.

[26] http://www.seg-social.es/Internet_1/InformacionEconomicof/InformacionContableFinancieraPruebas/cuentassegsocial/Ejerc16/cuengral15/con15/index.htm

[27] It is not legally assigned a part of the social contributions to cover the costs but these costs are covered in a generic way through budgetary assignments included in the State General Budget.

– *Households' social contribution supplements*, calculated as the product of the discount interest rate and the stock of accrued entitlements in the scheme considered at the beginning of the accounting period.

In addition, *costs for providing pension services* are not registered.[28]

The decreases in the accrued pension entitlements throughout the year of reference correspond to the payment of pension benefits, that is, the uses in *D.622 Other social insurance benefits* of the subsector *Central Government in the General Government Accounts*.

On the other hand, *transfers of pension entitlements between schemes* are not registered since they are considered as irrelevant significance in the Spanish case.

Also, similarly to the Social Security schemes, the impact in the stock of accrued entitlements at the end of year of a modification in its calculation assumptions due to a negotiated legislative change in the system would be registered as *negotiated changes in scheme structure*; *changes in entitlements due to revaluations* would record the impact of changes in the actuarial assumptions used on the discount rate on the estimated stock of entitlements, the wage growth rate or the inflation rate; and *changes in entitlements due to other changes* in volume quantify the impact of changes in the demographic assumptions used in actuarial calculations, changes in taxable, non-negotiable pension entitlements, changes in retirement patterns not due to legislative reforms, and any other change in the assumptions not included in the previous items.

Finally, in this case the *employers' imputed social contributions* are obtained residually, as the difference between the annual variation of accrued entitlements throughout the year and the difference resulting from the increases and decreases in such entitlements registered in the previous items.

[28] As in the case of the Social Security, a part of the social contributions is not legally allocated to cover these costs but they are covered in a generic way through budgetary allocations included in the State General Budget.