The ESA 2010 pension table: An integrated view on the functioning of pension systems in Spain

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Abstract

The inexorable impact of the population ageing, the peculiarities of pay-as-you-go pension schemes of public systems and the increasing role played by private systems in developed societies emphasize the need of a harmonized measure of accrued –to date pension rights and obligations in them as one the main priorities for the statistical systems. Current national accounts standards (SNA 2008 and ESA 2010) already include guidelines for the registration in their systems of all employment related private pension obligations/rights regardless of whether they are systems with or without constitution of reserves. In addition, they propose the recording of all pension schemes, including contingent obligations/rights accrued in public systems in a supplementary table. The supplementary table on accrued-to-date pension entitlements in social insurance will allow us to see the evolution of all pension rights stocks and the flows that motivate their variations, regardless the fact they are non-contingent financial assets/liabilities for the households/pension managers or not. Both the objectives and data compiled in the table present obvious conceptual difficulties and require a high level of expert knowledge in the financial, insurance and actuarial fields. Thus, in the Spanish case, the close collaboration with external agencies from various areas has been a basic component of the project, as a clear example of inter-institutional cooperation towards the highest standards of quality in official statistics. In addition, a highly flexible and adaptable SAS® software (PensINE) has been developed by INE for the actuarial estimation of accrued to date pension obligations/rights in public defined benefit schemes, which brings together a large part of the fruits of this collaboration. Finally, a didactic dissemination of the pension tables results as a tool for analysing the functioning of national pensions systems but not as a measure of their future sustainability is a challenging issue that the European Statistical System and other international organizations face nowadays.

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"The ESA 2010 Pension Table: an integrated view on the functioning of pension systems in Spain[*]

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Abstract

The inexorable impact of the population ageing, the peculiarities of pay-as-you-go pension schemes of public systems and the increasing role played by private systems in developed societies emphasize the need of a harmonized measure of accrued –to date pension rights and obligations in them as one the main priorities for the statistical systems. Current national accounts standards (SNA 2008 and ESA 2010) already include guidelines for the registration in their systems of all employment related private pension obligations/rights regardless of whether they are systems with or without constitution of reserves. In addition, they propose the recording of all pension schemes, including contingent obligations/rights accrued in public systems in a supplementary table. The supplementary table on accrued-to-date pension entitlements in social insurance will allow us to see the evolution of all pension rights stocks and the flows that motivate their variations, regardless the fact they are non-contingent financial assets/liabilities for the households/pension managers or not. Both the objectives and data compiled in the table present obvious conceptual difficulties and require a high level of expert knowledge in the financial, insurance and actuarial fields. Thus, in the Spanish case, the close collaboration with external agencies from various areas has been a basic component of the project, as

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Keywords: pensions, national accounts, ageing.

1 Introduction

INE-Spain has disseminated for the first time the results of the ***supplementary table for accrued-to-date pension entitlements in social insurance*** or, simply, **Pension Table** the last June 30th. This table is mandatory for all countries according to the *Regulation (EU) No 549/2013 of 21 May, relative to European system of National and Regional Accounts of EU (ESA 2010)* since 2018, with reference year 2015[1]. The data has been published as part of the *Spanish Annual National Accounts* (CNA), annexed to the annual non-financial accounts of the institutional sector.

The Pension Table allows us to see the evolution of all pension rights stocks and the flows that motivate their variations. Both the objectives and data compiled in the table present obvious conceptual difficulties and require a high level of expert knowledge in the financial, insurance and actuarial fields. Thus, in Spain the project has been carried out in close collaboration with the General Directorate of Insurance and Pension Funds of the Ministry of Economy and Business, the Ministry of Labor, Migrations and Social Security and the Bank of Spain. They have provided their expert advice on the operation of the different pension systems and on the actuarial calculations, besides of having facilitated access to the necessary base information.

The table is recognized as a tool for analysing the functioning of national pensions systems in the general context of the measurement and analysis of the national economy provided by the system of national accounts. However, it is a complex instrument indeed: the dissemination of the Pension Table is a high challenging issue that the European Statistical System and other international organizations face nowadays.

This document comes to light on this new accounting tool for the economic analysis, providing a brief description of the background and contents of the Pension Table in the framework of the national accounts, a summary of the inventory of sources and methods used in its compilation and a short view on the results obtained for Spain, as a relevant example of interinstitutional cooperation and use of data of very different nature in building up new statistics. In addition, a presentation of the own-developed software used in the actuarial estimates of accrued-to-date pension entitlements in the public schemes is included in the annex. It is a SAS® software which is highly flexible and easily adaptable to the specificities of other national defined benefit public pension system.

2 Pension systems in the National Accounts

The current international standards - System of National Accounts 2008 (SCN 2008) and System of National and Regional Accounts of EU (ESA 2010) - define the rules for the recording in the National Accounts of all pension obligations/ entitlements in the financial balance of the institutional sectors of the economy, regardless of whether they are systems with or without constitution of reserves. However, **the systems that are in the scope of General Government are excluded.**

In fact, in social security schemes (under the scope of General Government) they do not have a defined obligation (neither households a consolidated right) on such

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[1] The results published in other EU Member States can be consulted in
http://ec.europa.eu/eurostat/web/pensions/other-information.

pensions to be paid, to the extent that the system can undergo legal reforms that modify such obligations. The fact that it is a **contingent** right/obligation justifies that these rights are not registered in the financial balance of the *Households/ General Government* institutional sectors: they do not constitute a financial liability of the General Government or an asset of the corresponding household indeed.

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 make necessary to have a more detailed register and a complete overview of pension obligations and rights deriving from them. Given the relevance of the topic, the Committee on Monetary, Financial and Balance of Payments Statistics[2] (CMFB) already agreed in 2006 on the implementation of a joint Eurostat/ECB working group with the collaboration of several countries (including Spain) for the development of a methodology for estimation of assets and liabilities of pension systems linked to public administrations. This working group made then a key contribution from the European side to the process of updating the accounts systems. This update crystalized in the design of a supplementary table for pension rights acquired on a given date in social insurance, which was included in both the SNA 2008 and the SEC 2010.

Thus, both the 2008 SNA and ESA 2010 do provide for the registration of such rights a new instrument, annexed to the account system: the ***supplementary table for accrued-to-date pension entitlements in social insurance*** in (ESA 2010, 17.121 -17,183) [3], known as the Pension Table. The **Pension Table** shows a complete perspective of pension rights in social insurance, including those generated in the scope of public pensions systems. In terms of national accounts, **social insurances** are understood as that in which participants are obliged or encouraged to participate by third parties in order to be assured against specific social risks or circumstances that can harm their own welfare or that of person in their charge, and where the employees or others, or employers on behalf of the employees, pay social contributions to guarantee the right for them, the dependents and the surviving relatives to receive benefits in the current or future exercise.

There are two major types of social insurance:

-**Social security schemes**, imposed, controlled and financed by the General Government (in the Spanish case, we would talk about the **Social Security System**, in its various regimes, and the **"Clases Pasivas" system** for Central Government employees).

-**Other employment-related schemes**, derived from the contractual relationship between employer and employee, but where the responsibility for the payment of the pension does not fall on the General Government.

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[2] The European Statistical System and European System of Central Banks are represented in the CMFB. It assists both in the design and implementation of the work programs related to monetary and financial statistics.
[3] In the SNA 2008 (Chapter 17.k), supplementary table that shows the pension schemes included and excluded from the account system.

3 Pension Table: contents

The table registers the **pension entitlements for retirement, permanent disability, widowhood, in favor of family members and orphanhood** accrued at the beginning and the end of the reference year, and the flows that explain the variation of such rights throughout of the year (payment of contributions and social benefits, revaluations, other changes in volume, transfers between schemes, approved regulatory reforms, etc.).

Therefore, the abovementioned table **excludes:**

- Social assistance, as it is not a social insurance[4].

- Individual pension plans and funds are not included either in this concept of social insurance.

- Health and dependency insurance, as well as sick leaves benefits, as these are not pensions.

All rights and obligations are registered accrued-to-date (beginning and end of the reference year) and valued in actuarial terms. In addition, 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* (that is *other employment-related schemes*) and schemes whose guarantors are units belonging to the *General Government* (social security schemes: in the Spanish case, the Social Security System and the Clases Pasivas system).

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

In the Spanish Pension Table, ***defined contribution*** schemes cover all *defined contribution* employment pension plans, as well as those with mixed characteristics.[5]

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[4] Social assistance and, therefore, the so-called non-contributory pensions in the Spanish case, are not social insurance, since social assistance benefits are paid without having paid the necessary contributions for this purpose in a social insurance system.

[5] 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.

Code	Row No.	Item	Social security schemes			Other employment related schemes			Total
			Social Security	General Government employees scheme "Clases Pasivas"	Total	Defined contribution	Defined benefit	Total	
F.63	1	Pension entitlements							
D.61	2 (2.1+2.2+2.3+2.4-2.5)	Increase in pension entitlements due to social contributions							
D.6111	2.1	Employer actual social contributions							
D.6121	2.2	Employer imputed social contributions							
D.6131	2.3	Household actual social contributions							
D.6141	2.4	Household social contribution supplements							
D.61SC	2.5	Less: Pension scheme service charges							
D.619	3	Other (actuarial) change of pension entitlements in social security pension schemes							
D.62	4	Reduction in pension entitlements due to payment of pension benefits							
D.8	5 (2+3-4)	Changes in pension entitlements due to social contributions and pension benefits							
D.81	6	Transfers of pension entitlements between schemes							
D.82	7	Change in entitlements due to negotiated changes in scheme structure							
K.7+K.5	8+9	Changes in entitlements due to revaluations and other changes in volume							
K.7	8	Changes in entitlements due to revaluations							
K.5	9	Changes in entitlements due to other changes in volume							
F.63	10 (1+5+6+7+8+9)	Pension entitlements							

In summary, the Pension Table has the objective of offering a complete and comparable picture of the total pension entitlements in social insurance accrued at a specific date (beginning and end of the reference year) and valued in actuarial terms. The table **is not, therefore, a valid instrument to assess the viability of the system,** since it does not show the future evolution of those rights and obligations. Even though, it is a tool for monitoring them as well as understanding and assessing its functioning. In consequent, it is a first attempt for a harmonized registration that allows a comparative vision on an international level.

4 Institutional arrengements: interinstitutional cooperation towards the highest standards of quality

Both the objectives and the information that is intended to be compiled in the Pension Table present obvious conceptual difficulties and require a high level of expert knowledge in the financial, insurance and actuarial fields that goes beyond, even, the system of national accounts. On the other hand, as described above, the contents of the table are already partially included in the national accounts system, both in the non-financial accounts of the institutional sectors and in their financial accounts and balances.

Therefore, a basic component of this project is the close collaboration with external agencies from various areas such as the Ministry of Labor, Migrations and Social Security (MEMSS), the Ministry of Economy and Business, the Central Bank (BdE) or the Ministry of Finance and Public Administrations, either in the provision of expert advice on the operation of the different pension systems and their accounting record and actuarial calculation, in the mutual consideration of the coherence of the contents of the table with the current record in the system of national accounts or in the provision of the necessary information.

During 2016, the Department of National Accounts at INE was working in the clarification of the concepts handled in it and its contents. In this first stage, the project counted on the advice of the Unit C.1 Methodology of National Accounts and Indicators of Eurostat in the resolution of doubts about the contents of the table; as well as with the collaboration, although not formalized, of the General Directorate of Insurance and Pension Funds (DGSFP) of the Ministry of Economy, Industry and Competitiveness, both in terms of advising on private accounting of insurance and pension funds and in the provision of necessary accounting information for employment-related pensions funds.

As a continuation of such work and with the first objective of fulfilling the regulatory obligation of transmission to Eurostat of the 2015 table before December 31, 2017, two national working groups were formalized:

1. ***INE-DGSFP-BdE Working Group on the ESA 2010 Pension Table,*** for the methodological design and provision of the required information on *other employment-related* pension systems.

2. ***INE-MEMSS-BdE Working Group on the ESA 2010 Pension Table***, for the methodological design and provision of the required information on *social security* systems.

These groups have develop their mandate throughout 2017, with the aim of having the table referred to the year 2015 before the end of the year. Both group will continue working in the coming future in order to:

- Extend the series of the Pension Table, at least at internal level for analytical purposes.

- Guarantee the right incorporation of all regulatory changes and other newness of the different pension schemes.

- Keep a continuous monitoring of the results of the table and, therefore, of the functioning of the pension systems in Spain.

- In particular, INE and BdE will work together on the consistency between the Pension Table data with the general framework of the sector accounts, both non-financial and financial accounts. In fact, the compilation of the Pension Table has suggested several points where the recording of flows and stocks related to pension should be improved in the next benchmark revision (in 2019).

5 Sources and methods for the compilation of the Pension Table in Spain

5.1 Employment-related pension schemes

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

1. *Employment pension plans,* promoted by the companies in favour of their workers and managed and deposited in the entities registered for this purpose.

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

3. *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 and 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.

The data compiled in the table come from 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.

The translation of these financial statements of the pension plans and funds into the framework of the pension table is direct in the case *defined contribution* schemes.

However, in the case of *defined benefit* schemes, the entitlements of the participants do not correspond to the level of the fund built up from their contributions and the increases in value that result from the investment of such fund. They need to be estimated through actuarial calculations.

In this second case, the results of the table are based on identifying the stock of pension entitlements accrued at the beginning and end of the reference year with 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[6].

In addition, within the increases registered in the accrued pension entitlements throughout the reference year the **employer's imputed social contributions** need

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[6] Such 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.

to be considered: they correspond to the aggregate of *deficits/surplus*[7] (adjusted by the solvency margin) in the *defined benefit* employment plans,[8] while the collective insurances and PPSE are estimated with a null value.

In addition, 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 publishes to make in this year the calculation of the technical provisions of these products.

Finally, 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.

5.1   Social security schemes

The estimation is carried out separately for the **Social Security** pension system and the **Clases Pasivas** system, as well as for each of the existing schemes in each of them, namely **disability, retirement, orphanhood, widowhood, in favour of family members, extraordinary** and **other** (n.i.e).

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:

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

Where:

D_n are the pension entitlements accrued as at 31 December of year n, in a given scheme.

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

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

$\lambda_{n,s,x}$ 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).

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[7] Adjusted by the solvency margin.
[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.

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**[9] 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%[10] is used (base scenario), in accordance with the recommendations of Eurostat for all EU Member States.

Besides, the projected mortality tables for the population resident in Spain in the baseline scenario of the *Population Projections[11] of Eurostat* for the period 2015-2080[12] are used. Both in the disability scheme and in the scheme for retired persons coming from the disability scheme, mortality tables estimated by the Ministry of Labour, Migrations and Social Security for the pensioner population due to disability over 16 years for the reference year are considered (they are 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)[13].

Finally, the projected average pension of the new pensioners in each year is based on 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[14]. The future evolution of those average pensions take into account their revaluation using the so-called Pension Revaluation Index (IRP), according to current regulations[15], and 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 in the *Ageing Working Group*.

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[9] 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).

[10] 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%).

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

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

[13] 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.

[14] 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.

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

5.2   Stock of pension entitlements of 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).

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:

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

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 orphanhood pension schemes and pensions in favour of family members, some other adjustment are needed, given that the termination of the entitlement occurs in certain cases once a certain age has been reached.

5.3   Stock of pension entitlements of 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:

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

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 before, 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** and a **disability rate** of the population of sex s and age x estimated for every year t.

The **accrual factor** is estimated in each scheme and for each sex and age using the results of the *Continuous Survey of Working Lives[16]* developed by the Ministry Labour, Migrations and Social Security. In **Clases Pasivas** scheme, the estimated accrual factor is approximated with the one obtained for the Social Security scheme for this scheme, sex and age.

5.4   Stock of pension entitlements of 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 these type of pensions.

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.

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 already described.

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.

5.5   Annual change in accrued pension entitlements

The increases registered in the accrued pension entitlement in the **Social Security system** throughout the reference year correspond to:

- *Employers' actual social contributions* and *households' actual social contributions*: data are based on the results of the *General Government Accounts,* combined with budgetary information of the Entities that make up the Social Security system.

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[16] The continuous sample of working lives (CSWL), developed by the Ministry of Labor, Migrations and Social Security is a set of anonymized microdata from various administrative records: Social Security, Municipal Register of inhabitants and the Tax Agency. The CSWL constitutes a representative sample of all the persons who during the reference year (calendar year) had a relationship with the Social Security, either because they were affiliated in a situation of labor registration, either because they received a contributory benefit or unemployment subsidy, or because they received some type of contributory pension from the Social Security.

-   ***Households' social contribution supplements***: product of the discount interest rate considered and the stock of initial entitlements.

In addition, **costs for providing pension services** are not registered.[17]

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.

Similar flows explain the yearly evolution of the accrued-to-date pension rights in the **Clases Pasivas** system. However, there **are no *employers' actual social contributions*** (in this case the employer is the General Government itself) and the *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, as the increase in pension rights accrued by the employees of the General Government workers during the reference year which is not explained by the rest of the flows recorded in the table.

6   The Spanish Pension Table for 2015: results

6.1   Accrued rights for pensions at December 31, 2015

The actuarial estimate of the total accrued rights in the social security systems at a date has been carried out under the hypothesis of a nominal discount rate of 5% for the **base scenario**, and of 4% and 6% in **alternative scenarios 1 and 2**,

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[17]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.

respectively [18], all in accordance with the recommendations of Eurostat[19] and the own sensitivity analysis required by ESA 2010.

Pension entitlements accrued in social insurance system at 31st December
Unit: Eur million

Guarantor and type of system	2014	2015
General Government	2.957.480	3.102.318
- Social Security	2.661.993	2.792.227
- General Government employees scheme "Clases Pasivas"	295.487	310.091
Out of General Government	62.868	62.886
- Defined contribution	34.818	35.245
- Defined benefit	28.050	27.641

Source: Annual Spanish National Accounts

The estimated total of social insurance´s pension entitlements accrued in Spain at 31st December 2015 is 3.165.204 million euros (2,9 times GDP) in the baseline scenario[20].

From the abovementioned amount for the baseline scenario, 3.102.318 million euros (2,9 times GDP) correspond to **social security schemes** (understood as all imposed, controlled and financed by the General Government). The rest, 62.886 million euros (0,1 times GDP), are accrued in **other employment related schemes.**

From the pension rights accrued in the social security systems, 2.792.227 million euros correspond to the **Social Security System**, in its different schemes (88,2% of total rights accrued in social insurance) and 310.091 million euros (9,8%) to the **General Government employees scheme "Clases Pasivas".**

With regard to those entitlements accrued in other employment related schemes, 56,1% corresponds to **defined contribution** systems[21] (they represent 1,1% of the total rights accrued in social insurances) and 44,0% to systems of **defined benefit**[22] (0,9% of the total rights accrued in social insurances).

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[18] The results related to such alternative scenarios can be consulted among the set of results disseminated for this operation in IneBase.
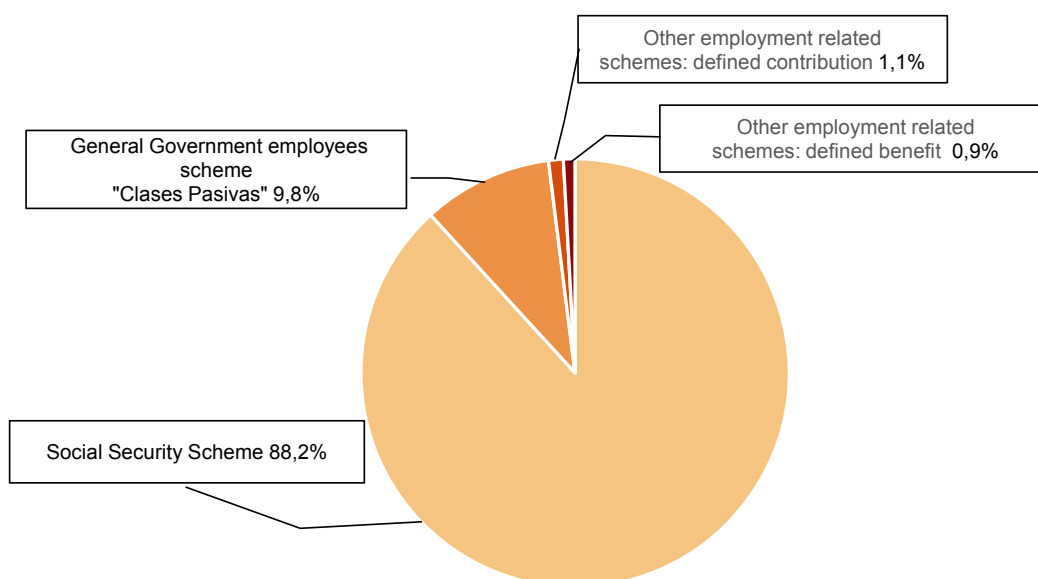[19] Nominal discount rates recommended in the Technical Guide for the Compilation of Pensions Data in the National Accounts (Eurostat, 2011) and agreed within the Eurostat Group of Experts on Pensions for all Member States, in order to guarantee the comparability of the national results obtained.
[20] This estimate amounts to 3.741.362 million euros (3.5 times GDP) in alternative scenario 1 and is 2.728.114 million euros (2.5 times GDP) in alternative scenario 2.
[21] The amount of the pension to be received by the employee corresponds exclusively to the accumulated funds derived from the contributions made throughout the employee's working life and the increase in value resulting from the investment of the funds.
[22] The amount of the pension to be received by the employee when he retires is determined by a formula, sometimes combined with a guaranteed minimum amount.

Social insurances' pension entitlements by type of guarantor
Percentage. 31st December 2015

Other employment related
schemes: defined contribution 1,1%

Other employment related
schemes: defined benefit 0,9%

General Government employees
scheme
"Clases Pasivas" 9,8%

Social Security Scheme 88,2%

6.2   Evolution of pension entitlements at 2015

Throughout 2015, **the total of pension entitlements accrued in social insurance** increased by 144.856 million euros (4,8%) in the baseline scenario.

Accrued entitlements in the **Social Security System** increased by 130.234 million euros (4,9%). This increase is explained, in part, by:

- Income accrued by the system during the year as effective social contributions of employers and employees of 94.746 million euros.

- The estimated amount of supplementary contributions of households to the system; 133.100 million euros in 2015 (theoretical return on accumulated entitlements).

On the other hand, the reduction of entitlements arising from pension benefits to be paid during 2015 by the system, amounted to 116.006 million euros.

With all this, it is necessary to register as **other variations (actuarial)** of such entitlements, an amount of 18.394 million euros throughout the year to be able to explain the total variation in them.

Variation in the pension entitlements accrued in the Social Security System

Unit: Eur million

	2015
Accrued entitlements at 31st December 2014 (A)	2.661.993
Social contributions (B)	227.846
- Employers' actual social contributions	67.592
- Households' actual social contributions	27.154
- Households' social contribution supplements[1]	133.100
Benefits (C)	116.006
Other actuarial variations (D)	18.394
Accrued entitlements at 31st December 2015 (E= A+B-C+D)	2.792.227

Source: Annual Spanish National Accounts

[1]They represent the theoretical profitability of the accumulated entitlements in the system at the applied discount rate

Accrued rights in the **General Government employees scheme "Clases Pasivas"** is increased by 14.604 million euros (4,9%). In this case:

- The income accrued by the system as actual social contributions (of employees) during the year, which is 1.120 million euros.

- The amount estimated for 2015 of households' social contribution supplements to the system (theoretical return on accumulated rights), which is 14.774 million euros.

On the other hand, the reduction of rights that is produced by pension benefits, to be paid during 2015 by the General Government employees scheme "Clases Pasivas", amounted to 12.825 million euros.

With this, it would be necessary to impute 11.535 million euros of contributions to the system (**employers' imputed social contributions**) to cover the total increase in accrued entitlements throughout 2015.

Variation in the pension entitlements accrued in the General Government employees scheme "Clases Pasivas"

Unit: Eur million

	2015
Accrued entitlements at 31st December 2014 (A)	295.487
Social contributions (B)	27.429
- Employers' actual social contributions	0
- Employer's imputed social contributions [1]	11.535
- Households' actual social contributions	1.120
- Households' social contribution supplements[2]	14.774
Benefits (C)	12.825
Accrued entitlements at 31st December 2015 (E= A+B-C)	310.091

Source: Annual Spanish National Accounts

[1]Accounting counterpart to the increase accrued in the exercise of the right to receive a future pension of the system

[2]They represent the theoretical profitability of the accumulated entitlements in the system at the applied discount rate

Out of the scope of General Government, pension entitlements accumulated in **other employment related schemes**, increased by 18 million euros during 2015. From this increase, 427 million euros correspond to defined contribution schemes and the rest (-409) to defined benefit systems.

Accrued entitlements in defined contribution schemes increased by 427 million euros (1,2%). Such increase is explained by:

- An amount of 1.319 million euros to be received during the year by such schemes as **social contributions**, either by the employer or employee, or **social contribution supplements** (return on accumulated funds), and once the managing costs of such funds have been deducted.

- An amount of 1.597 million euros that detracts from the accumulated entitlements at the beginning of the year for **pension benefits** to be paid during the mentioned year.

- 126 million euros added to the accumulated stock of pension entitlements in these systems due to **transfers of rights** from defined benefit schemes.

- 493 million euros of the **revaluation** of the investments in which the accumulated entitlements are materialized.

- 86 million euros for **other changes in volume**.

Variation in the pension entitlements accrued in other employment related schemes of defined contribution
Unit: Eur million

	2015
Accrued entitlements at 31st December 2014 (A)	34.818
Social contributions (B)	1.319
- Employers' actual social contributions	915
- Households' actual social contributions	207
- Households' social contribution supplements¹	364
Benefits (C)	1.597
Transferencias de derechos procedentes de sistemas de prestación definida (D)	126
Revaluations (E)	493
Other changes in volume (F)	86
Accrued entitlements at 31st December 2015 (G= A+B-C+D+E+F)	35.245

Source: Annual Spanish National Accounts
¹They represent the profitability of the accumulated entitlements in the system

Accrued entitlements in defined **benefit schemes** have suffered a variation of -409 million euros (-1,5%). Such variation is explained by:

- An amount of 2.323 million euros to be received by such schemes in 2015 as **social contributions**, either by the employer or employee, or **social contribution supplements** (theoretical return on accumulated entitlements), and once the management costs of such schemes have been deducted.

- An amount of 2.811 million euros that detracts from the accumulated entitlements at the beginning of the year, for **pension benefits** to be paid during the mentioned year.

- 126 million euros that are deducted from the accumulated stock of pension entitlements in these systems, by **transfer of entitlements** to defined contribution schemes.

- 205 million euros due to variations in entitlements due to **revaluations and other volume variations**.

Variation in the pension entitlements accrued in other employment related schemes of defined benefit
Unit: Eur million

	2015
Accrued entitlements at 31st December 2014 (A)	28.050
Social contributions (B)	2.323
- Employers' actual social contributions	1.830
- Employer's imputed social contributions [1]	-26
- Households' actual social contributions	144
- Households' social contribution supplements[2]	536
Benefits (C)	2.811
Transfers of entitlements coming from contribution systems schemes (D)	-126
Revaluations and other changes in volume (E)	205
Accrued entitlements at 31st December 2015 (F= A+B-C+D+E)	27.641

Source: Annual Spanish National Accounts

[1] Accounting counterpart to the increase accrued in the exercise of the entitlement to receive a future pension of the system

[2] They represent the theoretical profitability of the accumulated entitlements in the system at the applied discount rate (maximun type of interest is published by the Directorate of Insurance and Pension Funds for the calculation of the mathematical provision in defined benefit systems).

Pension entitlements of social insurances
Variation rate 2014-2015. Percentage
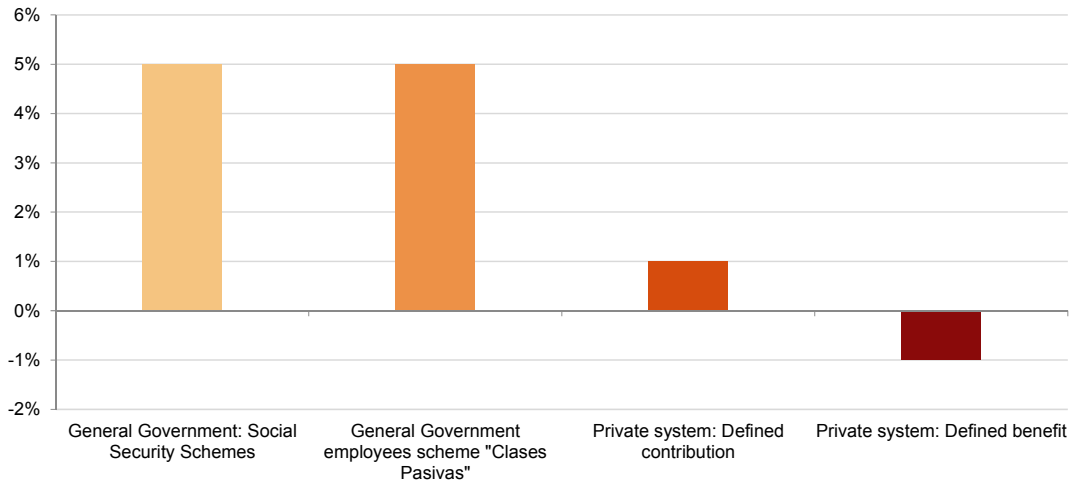
7   Annex

PensINE: a software to estimate the stock of accrued-to-date pension entitlements in social security systems

1. Introduction

The complexity of the calculations needed for the estimation of the stock of accrued-to-date pension entitlements in social security systems, as described in the document, imposed the need for a specific software that implemented this methodology in very short time and low cost of development and maintenance.

The development of such software has been based on a triple dimension:

a) **Operational characteristics**: these are functionality-based factors and related to 'exterior quality' of software (usability/learnability, reliability and efficiency).

b) **Revision characteristics**: these engineering based factors relate to 'interior quality' of the software like documentation and structure (maintainability, flexibility, extensibility, scalability, testability and modularity).

c) **Transition characteristics**: we refer here, fundamentally, to how the software interacts with its environment (interoperability, reusability and portability).

2. The project

PensINE is a software, developed by the National Accounts Department and the IT Department of INE-Spain to estimate the stock of accrued-to-date pension entitlements in social security systems.

It has been developed in SAS®9.4 and it is compatible with Windows Operating Systems (Windows 7 Professional and higher) and Linux (Red Hat 6.9). It makes use of the SAS®/ STAT, SAS®/ IML and SAS®/ ACCESS Interface to PC Files modules and has a graphical user interface for Windows developed in SAS®/AF and compiled in SAS®9.4 for Windows of 64 bits.

There have been several reasons to choose SAS®as a tool for the development of the project, but we could highlight that it is the standard software use at INE-Spain and it is a programming language widely spread and known in the field of official statistics. It is also stable, with a great capacity of data management and very flexible, with the possibility of using different modules according to the particular programming needs (IML, SQL, Macros, etc.).
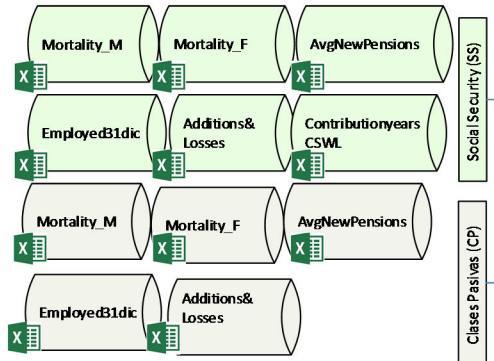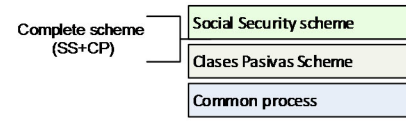
PensINE has been programmed in a modular way, so that it is composed of around 40 main programs that make use of around 144 macros or secondary programs. These secondary programs are reused several times throughout the system. This modular design makes it easier to maintain the program, tests and has also facilitated the debugging of errors throughout the development process. In addition, the theoretical approach to the estimation combined with this modular

design means that the software can be adapted for use in other social insurance schemes other than Spanish with relative ease.

The following diagram shows a very simplified flow diagram of the program, only the programs corresponding to the outermost layer of execution.
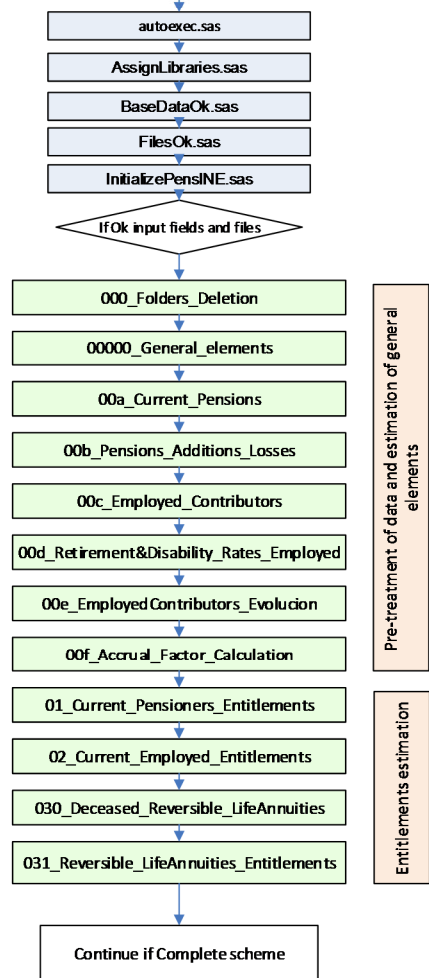
PensINE

General flowchart of the process
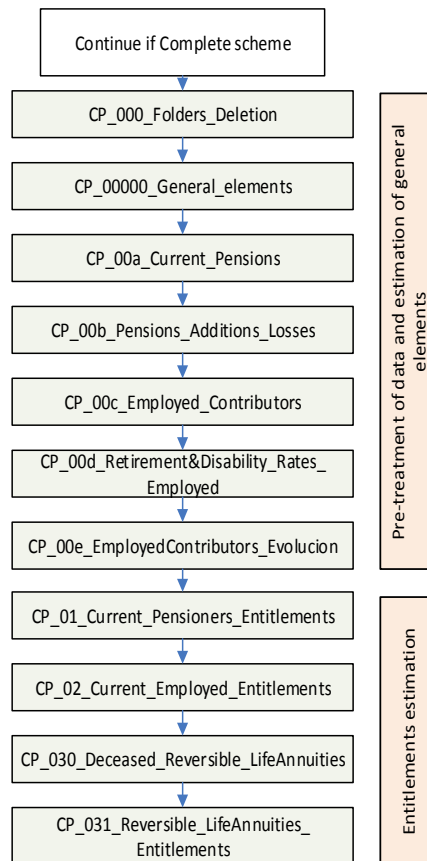### Version: 12/09/2018

Complete scheme (SS+CP)	Social Security scheme
	Clases Pasivas Scheme
	Common process

Social Security (SS)
- Mortality_M
- Mortality_F
- AvgNewPensions
- Employed31dic
- Additions&Losses
- Contributionyears CSWL

Clases Pasivas (CP)
- Mortality_M
- Mortality_F
- AvgNewPensions
- Employed31dic
- Additions&Losses

Input fields (graphical user interface):

* Language <ES/EN>
* User (xxxxxxx):
* Reference year (aaaa):
* Maximum life expectancy (nn nnn):
* Nominal discount rate (0.nn 0.n):
* Life expectancy at birth <total/males/females>:
* Age difference between spouses (n nn):
* Average age of motherhood (nn):
* Duration of temporary pension on favor of relatives (nn):
* Pension revaluation index (PRI) <Constant/Variable>:
  = Constant => PRI value (0.nn 0.n 0):
  = Variable => Existing file path of extension .xls or .xlsx
* Scheme <Complet/Social Security>:

INe PensINE

- autoexec.sas
- AssignLibraries.sas
- BaseDataOk.sas
- FilesOk.sas
- InitializePensINE.sas

◇ If Ok input fields and files

Pre-treatment of data and estimation of general elements
- 000_Folders_Deletion
- 00000_General_elements
- 00a_Current_Pensions
- 00b_Pensions_Additions_Losses
- 00c_Employed_Contributors
- 00d_Retirement&Disability_Rates_Employed
- 00e_EmployedContributors_Evolucion
- 00f_Accrual_Factor_Calculation

Entitlements estimation
- 01_Current_Pensioners_Entitlements
- 02_Current_Employed_Entitlements
- 030_Deceased_Reversible_LifeAnnuities
- 031_Reversible_LifeAnnuities_Entitlements

Continue if Complete scheme

```
Continue if Complete scheme
    │
    ▼
CP_000_Folders_Deletion
    │
    ▼
CP_00000_General_elements
    │
    ▼
CP_00a_Current_Pensions
    │
    ▼
CP_00b_Pensions_Additions_Losses
    │
    ▼
CP_00c_Employed_Contributors
    │
    ▼
CP_00d_Retirement&Disability_Rates_
Employed
    │
    ▼
CP_00e_EmployedContributors_Evolucion
```

Pre-treatment of data and estimation of general elements

```
CP_01_Current_Pensioners_Entitlements
    │
    ▼
CP_02_Current_Employed_Entitlements
    │
    ▼
CP_030_Deceased_Reversible_LifeAnnuities
    │
    ▼
CP_031_Reversible_LifeAnnuities_
Entitlements
```

Entitlements estimation

An example of the modular design is the program used to calculate the current value of the accrued-to-date pension entitlements for the population that had the status of pensioner at the reference date (Example 1).

```
%macro CalcDerechJubilados (clase= , sexo= , norma=);

%let clase=&clase.;
%let sexo=&sexo.;
%let norma=&norma.;

%NumeroDePensiones (clase=&clase. , sexo=&sexo. , norma=&norma.);

%PensionMedia (clase=&clase. , sexo=&sexo. , norma=&norma.);

%GastoAnualPensionistas (clase=&clase. , sexo=&sexo. ,
norma=&norma.);

%VAGastAnualPens (clase=&clase. , sexo=&sexo. , norma=&norma.);

%mend CalcDerechJubilados;
```

Example 1:
The program consists of four subroutines that determine respectively:

- the number of surviving pensioners in each scheme and sex for each of the years of the projection (% NumeroDePensiones);

- the average pension of each of these groups in each of the years of the projection determined by its initial pension revalued with the corresponding factor *(% PensionMedia);*

- the expense in each of the groups and for each of the years of the projection as a product of the surviving pensioners and the projected average pension *(% GastoAnualPensionistas);*

- the current value of said expense *(% VAGastAnualPens).*

Likewise, each of these programs has the same modular design.

As far as the experience for the end user is concerned, the handling is extremely easy in terms of both installation and the input of parameters and execution. Once the folder containing the application is pasted in the corresponding path, we just need to indicate the path where the folder has been pasted and the path where the SAS® executable is. Then the program automatically calculates the internal routes of the folders that contain both the programs and the intermediate and final results.

The following image shows the graphical interface for a windows environment. Here the user can define the different parameters.

The pension revaluation index can be defined as constant throughout the projection period or as a variable. In the latter case, an example file is offered to show the data entry format and the possibility of importing our own file.

It can be executed only for the social security scheme or completely. In the latter case, making the estimation for the social security scheme first and then for the public employees scheme. The execution time for a complete estimate is around 1 hour and 40 minutes if it runs on Windows-based PC SAS® and around 40 minutes on Linux-based SAS® GRID[23].

Once the parameters have been entered, the program asks for their confirmation before starting the execution.

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[23] The running time of a program depends, among other things, on the power of the computer, the inputs and the operating system.

After these parameters are confirmed, the execution of the different programs begins.

Once the execution is finished, an email is sent with the log of the same, indicating the path where the different results are found to the people authorized as users.

The software stores almost all the intermediate calculation files, just over 11,000 for a complete execution, in order to explore in the future the various analysis that could be carried out with this available information. The results are presented disaggregated by sex, age and scheme, as well as by the life or non-lifetime nature of the income in case this distinction exists.

In the case of reversible income, it offers separate results according to the origin of the same given the different value of the accrual factor. The following are some internal tables of results.

Reference year: 2015		Total accrued-to-date pension entitlements in social insurance 31/12/2015
Total Social Security	Employed Contributors	
	Pensioners	
	Reversible Life Annuities	
	TOTAL	

MODULE=COTI

Reference year: 2015	Total accrued-to-date pension entitlements in social insurance 31/12/2015			
	EUR	Percentage (%)	Sex	
			Male	Female
SCHEME				
Disability				
Retirement				
Total				

MODULE=PENS

Reference year: 2015	Total accrued-to-date pension entitlements in social insurance 31/12/2015			
	EUR	Percentage (%)	Sex	
			Male	Female
SCHEME				
In favour of family members				
*Lifelong				
*Non-Lifelong				
Orphanhood				
*Lifelong				
*Non-Lifelong				
Widowhood:				
Retirement from Disability				
Disability				
Retirement				
Total				

MODULO=RERE

Reference year: 2015	Total accrued-to-date pension entitlements in social insurance 31/12/2015			
	EUR	Percentage (%)	Sex	
			Male	Female
SCHEME				
In favour of family members				
*Lifelong				
*Non-Lifelong				
Orphanhood				
*Lifelong				
*Non-Lifelong				
Widowhood:				
Total				

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