AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2016. **12**: 128-145 DOI:10.5605/IEB.12.7

A tsunami in the Spanish economy. Epicentre: The public pension system

Córdoba-Bueno, Miguel
Fernández-Avilés, Gema
García-Centeno, María del Carmen

▸ RECEIVED: 19 DECEMBER 2015
▸ ACCEPTED: 22 APRIL 2016

Abstract

A large number of research articles as well as debates in economic forums address the unsustainability of the public pension system in Spain in the medium and long term. This paper therefore has the following objectives: (i) to forecast trends in population ageing in order to estimate future retirement benefits; (ii) to study the dynamics of participation in the Social Security system as well as the amount that contributors pay; (iii) to determine whether the current pension system will be sustainable in the future, and if not, to estimate when the system would become bankrupt; (iv) to propose suitable measures in order to build a sustainable system in the future.

Keywords:

Pension, Sustainability, Allowances, Contributors, Social Security.

JEL classification:

H55, J11, C10, C22, J39.

Córdoba Bueno,, M. ✉ School of Business and Economics, Department of Mathematics and Statistics, University CEU San Pablo, Julián Romea 23, 28003-Madrid (Spain). Email: corbue@ceu.es.

Fernández-Avilés Calderón, G. Faculty of Law and Social Sciences, Department of Statistics, University of Castilla-La Mancha, Cobertizo de San Pedro Mártir s/n, 45071-Toledo (Spain). Email: gema.faviles@uclm.es.

García-Centeno, M.C. School of Business and Economics, Department of Mathematics and Statistics / University CEU San Pablo, Julián Romea 23, 28003-Madrid (Spain). Email: garcen@ceu.es

AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2016. **12**: 128-145

Tsunami en la economía española. **Epicentro: el sistema público de pensiones**

Córdoba-Bueno, Miguel
Fernández-Avilés, Gema
García-Centeno, María del Carmen

Resumen

Numerosos trabajos y foros económicos indican la existencia de problemas en la sostenibilidad del sistema público de pensiones en España en el medio y largo plazo. En esta línea, los objetivos que se plantean en este trabajo son varios: (i) analizar la evolución del envejecimiento de la población española, con el fin de estimar cuáles serían las futuras prestaciones de los pensionistas; (ii) estudiar la dinámica de los afiliados a la Seguridad Social y la cuantía de sus contribuciones; (iii) determinar si en el futuro será sostenible el sistema actual y si no fuera así, estimar en qué momento se produciría su ruptura; (iv) proponer medidas adecuadas para que en el futuro dicho sistema sea sostenible.

Palabras clave:

Pensiones, sostenibilidad, prestaciones, afiliados, seguridad social.

1. Introduction

The sustainability of pension systems is increasingly becoming a matter of vital and wide-ranging discussion in developing countries. In addition, according to Jimeno (2000), pensions are retirees' most important source of income (receiving a retirement pension is usually incompatible with having a job[1]). Moreover, pensions are the largest public spending item and are basically funded by companies and workers. Part of the cost (12.2% in 2014), however, is paid for through taxes (unemployed contributions). But why is the pension system at risk of possible bankruptcy? A possible explanation can be found in Boldrin *et al.* (1999a, 1999b). They claim that an ageing population results in an increase in the pensioners-workers ratio. This unstoppable demographic change is the cause of the current problems in the public pension system (Doménech and Melguizo, 2009). Ayuso *et al.* (2015) argue that in order to understand the changes in population structure, it is necessary to bear in mind some key aspects: (i) fertility rates by age; (ii) mortality rates by age; and (iii) level and composition of net emigration by age. In Spain, the National Statistics Institute (INE) is responsible for official forecasting, though there are also other supranational institutions which provide forecasting for all countries (the Census Bureau in the United States, Eurostat for the European Union (EU), the United Nations Organization (UNO) and the World Bank (WB)).

When the main public pension systems were designed (at the end of 19th century and the beginning of 20th century), most people were poor, life expectancy was very low and family structure was characterized by having a head of the household who was the only person with a job. Today however, as Jimeno explains (2000), the situation is completely different. We are witnessing important and socioeconomic changes which are calling into question the sustainability of pension systems (Galasso, 1999). Since the beginning of the 1980s, there has been an ongoing debate about the need to adjust the contributory pension systems to the new economic and social reality (see, De la Fuente and Doménech, 2009; Ministerio de Trabajo e Inmigración, 2008; Gil *et al.*, 2008; Mingorance and García, 2007; and Holzmann, 1998).

The Spanish pension system had its origins in the law of 27th February 1908, which created the National Welfare Institute, with a capitalization system for retired workers. In 1919, this system became obligatory (although the political upheaval delayed the effective application date to 1921), and 1939 saw the introduction of the distribution system in place to this day. As in other countries, since its introduction, pension expenditure has grown continuously to the point where it makes up the greatest share of social welfare in the Government budget. Nevertheless, despite

[1] *Retirees can be self-employed if their income does not exceed the legal minimum wage (€648.60 per month).*

the fact that Spanish pension expenses are lower than the EU average, there is growing debate about Spanish pensions. Moreover, we need to bear in mind that according to a WB report (1994), there is extensive social debate about the necessity of reforming pension systems in order to make them financially and efficiently sustainable (Roseveare *et al.*, 1996; Jimeno *et al.*, 2008; and Rosado and Domínguez, 2014). This debate has resulted in a generalized consensus about introducing structural reforms to the social welfare systems, specifically with respect to mixed systems (Balmaseda *et al.*, 2006; Miles and Ibern, 1998; Miles and Timmermann, 1999; and Mulligan and Sala-i-Martín, 1999a, 1999b).

With respect to Spain, there was intense debate in the second half of the 1990s, as we can see in Herce and Pérez-Díaz (1995), Ministerio de Trabajo y Seguridad Social (1995), Herce *et al.* (1996), Piñera and Weinstein (1996), Barea *et al.* (1997) and Moral-Arce *et al.* (2008). This helped generate political interest in this problem; eventually, in April 1995, Parliament approved the *"Pacto de Toledo"* (Balmaseda *et al.*, 2006).

Following this important milestone, any reforms were merely parametric[2] (as we can see in Law 24/1997 of 15th July, and Law 35/2002 of 12th June) and did not entail a complete assessment of costs and profits required for more ambitious reforms to the Social Security System (Balmaseda *et al.*, 2006; Conde-Ruiz and Alonso, 2006; and Diamond, 1996).

It was in this context that the Spanish Government approved Law 27/2011 of 1st August, which establishes parametric measures to strengthen the future financial sustainability of retirement pension system. This Law introduced the Sustainability Factor, whose objective is to guarantee the future financial solvency of the Spanish pension system and which is due to come into force in 2027. Two years later, the Government tasked an Expert Committee with designing the Sustainability Model. The result was a proposal with two main components: (i) Intergenerational Equity Factor (IEF) for new pensions, and (ii) Annual Revaluation Factor (ARF) for all pensions (see Herce, 2014). Finally, Parliament approved Law 23/2013 of 23rd December, which incorporated the Expert Committee's recommendations.

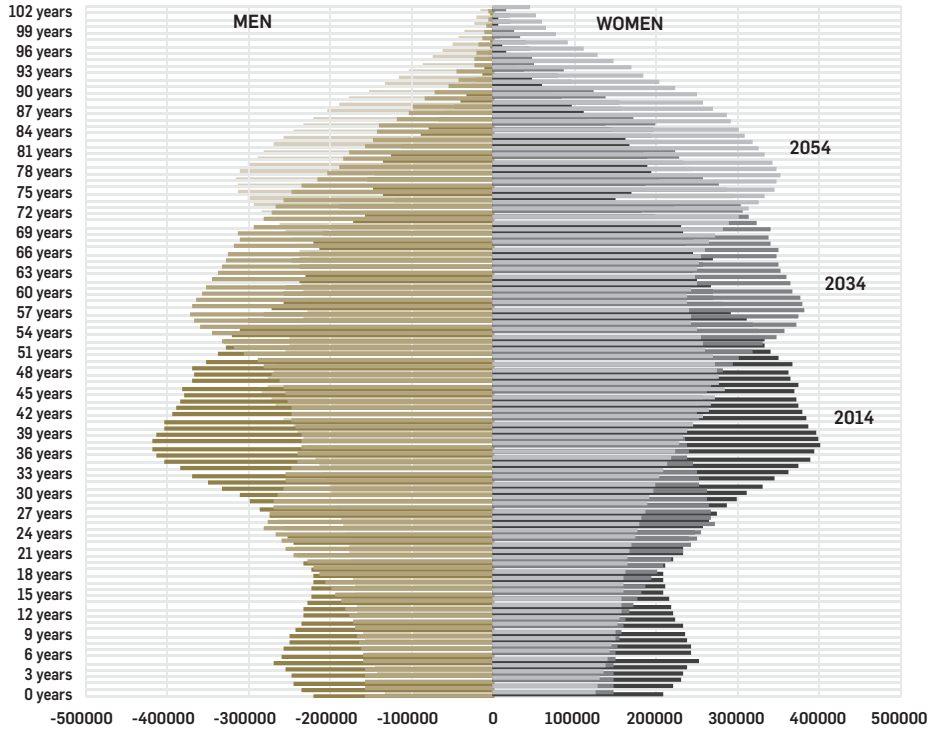
The remainder of the paper is structured as follows: Following this introduction, section 2 introduces the demographic evolution of the Spanish population according to INE forecasting (2014-2064). Section 3 briefly explains the methodology used to analyse the results shown in section 4. In section 5, we propose some measures to address the problem and, finally, we present the main conclusions of this paper.

[2] *Parametric reforms are those related to pension payment calculations, specifically: delayed retirement age, increased working life, changes in periods for pension payment calculation, and changes to pension indexation to increase payments.*

2. Foreseeable demographic evolution of the Spanish population

According to the INE's current forecast (2014-2064), the ageing of the Spanish population is gradually becoming more acute. The question is whether this fact should worry politicians; if we add the effects of the economic crisis (declining tax income and National Insurance contributions) to the increasingly ageing population, maintaining the public pension system becomes a pressing problem. The situation worsens over time as the newly retired generations join the system and the contribution amounts taper off, as we can see in Figure 1.

Figure 1. **Population by sex and age. Spain 2014 – 2054**



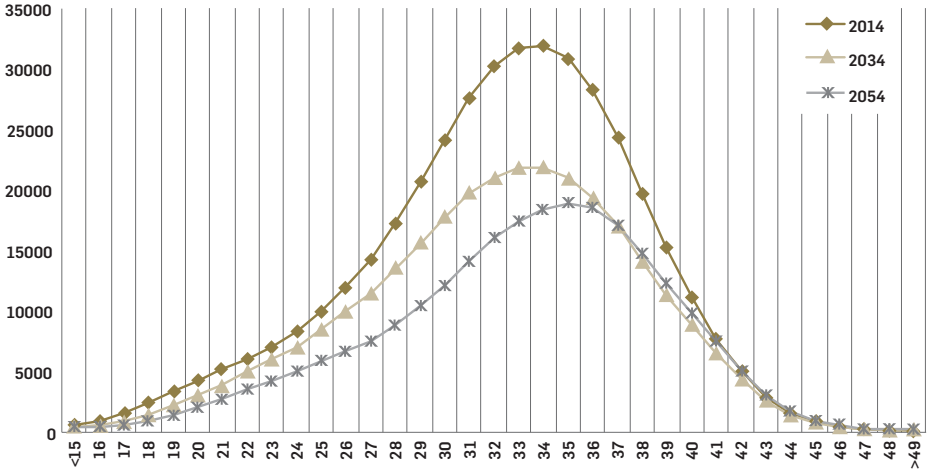
SOURCE: INE, SPANISH POPULATION FORECAST 2014-2054.

The arrival of immigrants covered up the situation because the birth rate increased. Nevertheless, most of the new births were to immigrants, whose birth rate was higher than that of native-born Spaniards.

The issue of the ageing Spanish population can be read two ways. On the one hand, Spaniards have one of the longest life expectancies in the world (according to 2012 data, Spanish females are the longest-lived Europeans with a life expectancy of 85

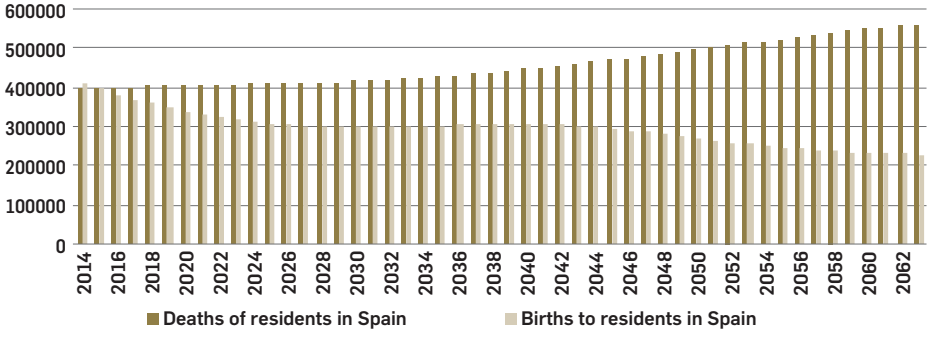
years). On the other hand, the birth rate is decreasing due to women's increasing participation in the job market. In Figures 2 and 3 we can see the INE forecasting related to births and deaths for the next fifty years.

Figure 2. **Births to mothers resident in Spain by maternal age and year**



SOURCE: INE, POPULATION FORECAST 2014-2054.

Figure 3. **Forecast of births to mothers resident in Spain versus deaths of residents in Spain**



SOURCE: INE, POPULATION FORECAST 2014-2054.

In spite of the information above, the worst (in terms of demographic structure) is still to come. This stage will appear after the 2030s, and above all, after the 2040s and 2050s, when the "the late baby boomers", born in the 1960s" will begin to retire. At that point, the larger generations will leave the labour market, while the smaller, younger generations will be obliged to shoulder the increasing costs of pensions and the National Health Service.

3. Methods

To achieve our objective, we will estimate a dynamic model (see equation 1) using generalized[3] least squares (GLS). This model will estimate the evolution of Social Security income and pensions-related expenses and will allow us to predict the moment at which the system will become bankrupt due to the difference between income and expenses. In order to obtain the income, we estimate two models, one for Social Security members, and the other for social contributions collected. In the same way, in order to obtain the expenses, the estimation is done separately for each category of pensioner (the model being the same), as well as the average monthly pension, taking into account the fact that the evolution of each type differs over time.

The estimated model[4] is expected to obtain the inertia of the variable Y_t, which will change according to the variables analysed to obtain income and expenses. In every model, we have included this lagged dependent variable as an explanatory variable. On the other hand, and depending on the type of variable and its evolution, we have included in the model either a trend variable (*Trend*) or centred seasonal variables (*C_Seasonal*). In general, the trend variable has been included when we have estimated the number of people (pensioners or contributors, depending on the income or expenses model); the seasonal variables have been incorporated into the analysis when we have estimated the average pension paid to each type of pensioner or the amounts contributed to the pension system by contributors. The complete dynamic model estimated is the following:

$$Y_t = \beta_1 + \beta_2 Y_{t-1} + \beta_3 Trend + \alpha_1 C\_Seasonal + \alpha_2 C\_Seasonal_{t-1} + \ldots + \alpha_{11} C\_Seasonal_{t-10} + u_t \quad (1)$$

where:

- Y_t is the Social Security expense for the models created to estimate the number of people who have the right to receive a contributory pension (retirement, widow's/widower's pension, permanent disability, orphan's pension and family member's pension) as well as the average pension for each of these groups. In the same way, we estimate the non-contributory pensions (NCP) and the associated average amount. For Social Security income, Y_t represents, for some models the total number of members and the number of unemployed members, while for other models it is the collected income.
- *Trend* is used to estimate the upward or downward trend of the studied variable.
- *C_Seasonal* is employed to determine the seasonal behaviour of the analysed variable.
- u_t, is the disturbance term in the model, which is assumed to be uncorrelated and homoscedastic.
- β_j, j=1, 2, 3 and α_i, i=1,…,11, are the estimated parameters of the model, which allow us to quantify the influence of each regressor on the dependent variable.

[3] *For more information about generalized least squares, see Greene (2012).*

[4] *To calculate the different estimations we have used Oxmetrics 6, see Doornik and Hendry (2009).*

4. Empirical analysis and results

In order to study the equilibrium of a public pension system, we should analyse, on the one hand, the contributors and the contributions that finance the current pensions and, on the other hand, the pensioners (or preferably the number of pensions since there are pensioners who receive more than one pension) and the benefits they receive. Our forecast will extend to 2050, because the current contributors will in turn become pensioners and will receive their corresponding pensions according to the amounts paid by the contributors who were working at that time.

4.1. Expenses. Evolution of pensioners and their average pension

There are two types of pensions: *contributory* (CP) and *non-contributory* (NCP). There are five categories of CP: permanent disability, retirement, widow's/widower's pension, orphan's pension and family member's pension. *Permanent disability* pensions refer to those received by the worker after being declared unfit for work by a medical tribunal. The *retirement* pensions are the pensions for life given to workers at a specific age at the end of their working life. The *widow's/widower's pension, orphan's pension,* and temporary pensions awarded to family members are those given to third parties in the event of a worker's death. On the other hand, the NCP are the benefits paid out to people who do not have enough income to survive, despite not having contributed in the past to Social Security (they may have contributed nothing at all or an insufficient amount to receive their CP), Peláez (2008).

We have used monthly data from 2008 to analyse the evolution of pensions[5]. This information[6] has been provided by the Statistics Section of Social Security in the Ministry of Employment and Social Security. The estimated results adjusted for autocorrelation and heteroscedasticity in relation to the number of pensions and the average pension for each category, according to the model indicated in equation (1), can be seen in the Tables 1 and 2, respectively.

From Table 1, we can infer that there is a high inertia between the number of pensions in a period and in the immediately preceding period, independently of the category of pension analysed. Moreover, the estimated models are reliable and we can therefore use them to predict the number of pensions that will have to be paid in the coming decades, bearing in mind that there are pensioners who receive more than one pension (typically the widow's/widower's pension in addition to their retirement pension), and the current ratio is 1.1 pensions per pensioner.

[5] *We have not used a long sample period because we do not have itemised monthly data for each category of contributory pensions.*

[6] *The information related to the different types of pensions can be checked at: http://www.seg-social.es/Internet_1/Estadistica/Est/Pensiones_y_pensionistas/HistoricoEstadisticas/index.htm*

A tsunami in the Spanish economy. Epicentre: The public pension system. *Córdoba-Bueno, M., Fernández-Avilés, G. and García-Centeno, M.C.* AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2016. 12: 128-145

Table 1. Estimated models using GLS for the different categories of pensions (Contributory and non-contributory)

Variable	Retirement	Permanent Disability	Widow's/ widower's pension	Orphan's pension	Family members	NCP
Constant	775972** (2.7e+05)	30313 (2.5e+04)	154375 (1.2e+05)	-745.8** (200)	3367** (1292)	11206** (434.4)
Y_{t-1}	0.8422** (0.05646)	0.8684** (0.0279)	0.8321** (0.05232)	0.831** (0.0081)	0.810** (0.044)	0.880** (0.001)
Trend	1364.8** (485.4)	15.341** (1.339)	76.169** (7.20)	18.21** (7.81)	1.116** (0.550)	-10.3** (0.66)
Adjusted R^2	0.99	0.95	0.99	0.99	0.99	0.99

** *Statistically significant at a 5% type I error rate.The standard deviations are indicated in parentheses.*

Once we have estimated the models for each category, we then estimate the models related to average pensions for each category in Table 2.

Table 2. Estimated models using GLS for the different categories of average pensions (Contributory and non-contributory)

Variable	Retirement	Permanent Disability	Widow's/ widower's pension	Orphan's pension	Family members	NCP
Constant	8.376** (3.15)	12.73** (4.27)	9.341** (3.42)	9.482** (2.58)	5.535** (2.11)	44.682* (11.99)
Y_{t-1}	0.893** (0.003)	0.8870** (0.004)	0.8860** (0.005)	0.874** (0.007)	0.890** (0.004)	0.872** (0.034)
C_seasonal	10.879** (0.064)	9.206** (0.935)	9.014** (0.925)	5.92** (0.57)	6.710** (0.59)	1.591 (10.79)
C_seasonal_1	0.986 (0.31)	-0.253** (0.90)	0.450** (0.89)	-0.0476 (0.055)	0.472 (0.579)	3.102 (10.13)
C_seasonal_2	0.152 (0.65)	0.0510 (0.93)	0.029 (0.92)	0.048 (0.057)	-0.045 (0.098)	-0.102 (10.13)
C_seasonal_3	0.0233 (0.65)	0.0335 (0.93)	-0.007 (0.92)	0.114 (0.057)	0.015 (0.059)	0.291 (10.13)
C_seasonal_4	0.648 (0.65)	0.296 (0.93)	0.338 (0.92)	0.378 (0.057)	0.127 (0.059)	281.9** (10.13)
C_seasonal_5	-0.187 (0.65)	-0.048 (0.93)	-0.030 (0.92)	0.083 (0.057)	-0.013 (0.059)	-2.421 (13.69)
C_seasonal_6	-0.288 (0.65)	-0.078 (0.93)	-0.094 (0.92)	-0.047 (0.057)	0.029 (0.059)	-0.178 (10.13)
C_seasonal_7	-0.024 (0.65)	-0.212 (0.93)	-0.0003 (0.92)	-0.010 (0.057)	0.128 (0.059)	-1.887 (10.13)
C_seasonal_8	-0.250 (0.65)	-0.572 (0.93)	-0.042 (0.92)	-0.034 (0.057)	0.227 (0.059)	3.808 (10.14)
C_seasonal_9	0.150 (0.64)	-0.161 (0.93)	0.011 (0.92)	-0.084 (0.057)	-0.021 (0.059)	2.849 (10.13)
C_seasonal_10	0.135 (0.64)	-0.149 (0.93)	0.008 (0.92)	-0.256 (0.057)	-0.040 (0.059)	-2.354 (10.77)
Adjusted R^2	0.98	0.98	0.98	0.98	0.98	0.94

** *Statistically significant at a 5% type I error rate.The standard deviations are indicated in parentheses.*

The above results indicate that, in the sample period analysed, there is a notable and logical relationship between the average pension amounts paid in consecutive periods, independently of the category used in the analysis. On the other hand, in each type

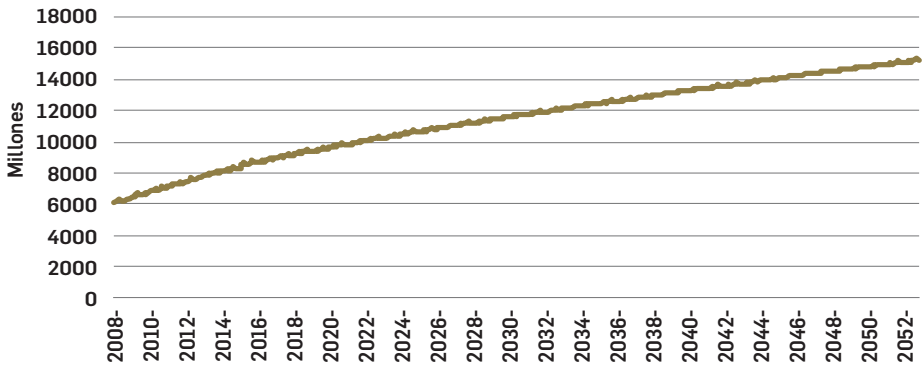
of contributory pension, we can identify significant seasonality in the first month of the year, which is when the benefit payments are updated according to the model implemented by the Government (see Figure 5). In the non-contributory pensions, the significant seasonality corresponds to the months which include an extra payment. Moreover, the estimated models are reliable, and we can therefore use them to predict the average pension for the different types of pensions to be paid in the coming decades, with respect the hypotheses which we state below.

Once we have estimated the models for pensioners in the different categories, and the corresponding average pensions, we then forecast future evolution, with respect to the following hypotheses: (i) *Regarding pensioners:* the increase in the number of people who receive permanent disability, orphan or family member pensions will not show a very different evolution to that which we have observed to date, and the retirement and widow's/widower's pension will taper off in line with the population pyramid; (ii) *Regarding the average pension:* contributory pensions will follow the same evolution as they currently do, with an 1.0022% annual increase (bearing in mind that the current generation's salaries are low and so they will logically receive smaller benefit payments when they retire, which will partially offset the increase in retired people); (iii) *Regarding the total cost of non-contributory pensions:* we assume that there will be a reduction in these pensions (the estimated value of the trend is negative, Table 1) in the next ten years, at which point this cost will remain stable. According to the estimated models and these hypotheses, we have estimated the total pensions (contributory and non-contributory) costs for Social Security. Table 3 shows these values for December once every five years, and Figure 4 shows forecasts to 2050.

● Table 3. **Forecast of total monthly pension expenses for Social Security (million euros)**

Dec-2020	Dec-2025	Dec-2030	Dec-2035	Dec-2040	Dec-2045	Dec-2050
9,808.862	10,818.522	11,739.532	12,599.740	13,416.981	14,203.411	14,966.989

■ Figure 4. **Evolution of total pension expenses for Social Security (2008 – 2052)**



As we can see, there is a clear growing trend in total pension expenses. In order to determine whether there is an imbalance between expenses and income, and if so when this imbalance would occur, in the following subsection we estimate the future evolution of contributors and the contributions they make to Social Security.

4.2. Income. Evolution of contributors and contributions

The money needed to pay the CP comes from salaried employees, self-employed workers and companies. In recent years, the economic crisis affecting Spain has led to a growth in unemployment and a resulting decrease in the contributions to Social Security as well as an increase in the payments to unemployed people. Consequently, there have been fewer people contributing and more people receiving benefits.

In order to determine the amount in contributions it is necessary to know the number of social security contributors that are employed and so we divide total contributors into two categories: employed and unemployed. We also need to know the income they provide.

We have used monthly data[7] from 2005 to analyse the income provided by contributors. This information has been obtained from the monthly income summaries provided by the Ministry of Labour and Social Security. Table 4 shows the estimated results adjusted for autocorrelation and heteroscedasticity related to total income from contributors broken down into employed and unemployed[8], according to the model indicated in equation (1).

The results from the above estimated models reveal an important relationship between the income in one period and the income in the preceding period. On the other hand, there are no changes in variance, so, variance remains constant. Moreover, we have included two atypical values from 2006 and 2007. Since the estimated error is small, the estimated models can be considered reliable and appropriate for predicting the revenues collected in the coming decades.

We have used these models to estimate Social Security income corresponding to total contributions. Table 5 shows these values for December every five years until 2050 (these values are not accumulated).

[7] *This sample period is not very long, but it was not possible to obtain a longer monthly sample period from the Secretaría de Estado del Ministerio de Trabajo y Seguridad Social. The data is obtained from http://www.seg-social.es/Internet_1/InformacionEconomicof/InformacionContableFinancieraPruebas/ResumenEjecucionPresupuesto/index.htm*

[8] *Income related to employed contributors has been obtained by subtracting unemployed contributors from total contributors.*

Table 4. Estimated models using GLS for contributions

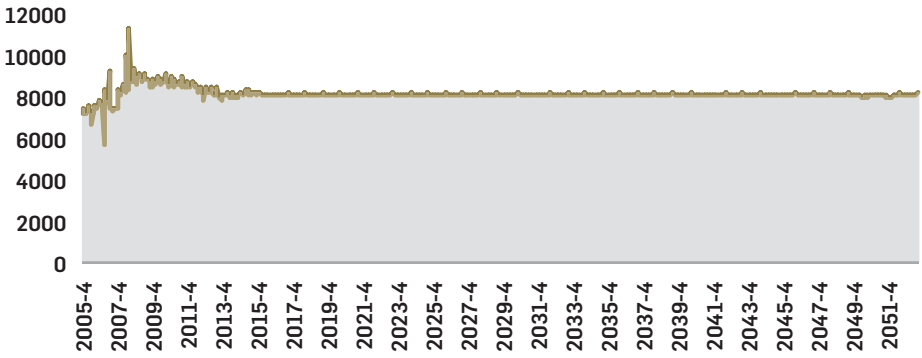
Variable	Contributors	Unemployed Contributors
Constant	3776.68** (402.5)	24.601** (11.92)
Y_{t-1}	0.4976** (0.053)	0.867** (0.023)
C_seasonal	-399.03** (150.7)	15.992 (16.49)
C_seasonal_1	-311.39** (148.2)	14.616 (16.53)
C_seasonal_2	-164.76 (152.1)	-14.385 (17.08)
C_seasonal_3	91.84 (152.0)	-44.009** (17.08)
C_seasonal_4	-230.28 (148.6)	-26.636 (16.51)
C_seasonal_5	-111.82 (152.1)	-31.184 (16.50)
C_seasonal_6	241.02 (148.3)	-15.811 (16.49)
C_seasonal_7	-260.73 (149.6)	-4.897 (16.49)
C_seasonal_8	-212.69 (148.3)	-13.011 (16.49)
C_seasonal_9	22.34 (152.0)	-21.340 (16.50)
C_seasonal_10	-372.47** (149.8)	-28.077 (16.49)
2006(6)	-2265.02 (340.3)	-
2007(12)	2928.77 (340.4)	-
Adjusted R^2	0.74	0.98

** *Statistically significant at a 5% type I error rate. .The standard deviations are indicated in parentheses.*

Table 5. Forecast of total monthly income from contributions to Social Security (million euros)

Dec-2020	Dec-2025	Dec-2030	Dec-2035	Dec-2040	Dec-2045	Dec-2050
8,145.69	8,118.99	8,103.32	8,100.32	8,095.46	8,079.02	8,045.69

Figure 5. Evolution of total monthly Social Security income from contributors (2008 – 2052)



It was to be expected that there would be no increase in contributions since the ageing population leads to a decrease in the number of contributors. The income falls slightly, stabilizing at around €8 billion per month. In the following section we will establish whether this forecast represents enough income to cover Social Security expenditure.

4.3. Does social security expenditure exceed income from contributions?

Bearing in mind the fact that the population changes in such a way that the number of pensioners increases and the number of contributors decreases (as in the above estimated results, which show a clear growing trend in total pension expenses and a smaller increase in income) we can see that the Social Security pension system may well become bankrupt in the not-too-distant future. To identify the timeframe in which the system will become unsustainable, we represent in Figure 6 the difference between income and expenses. The continuous line indicates that income from contributors is not enough to cover benefits paid out. Use of the Reserve Fund allows these imbalances to be temporarily covered, until such time as the fund is depleted (discontinuous line).

Figure 6. **Difference between Social Security income from contributors and expenses paid out to pensioners (millions euros)**

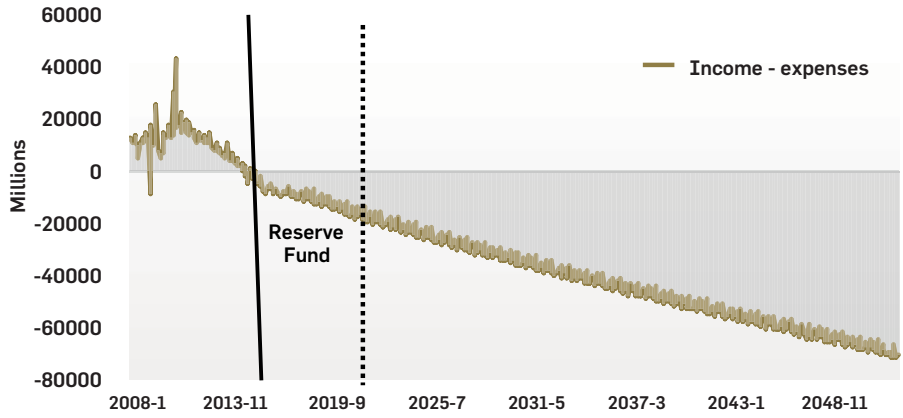


Figure 6 shows how in the last three years (2012-2014), Social Security expenses exceeded income and the Government was obliged to turn to the Reserve Fund[9] in order to balance the budget; specifically, €15.3 billion was required in 2014, as we can see in Table 6.

This implies that the Social Security pension system, in the absence of other funding, will become bankrupt when the Reserve Fund dries up. Therefore, from that point on, if benefits were to exceed income, the money needed to cover the difference would have to come from the National Budget.

[9] *The Reserve Fund, created in 2000, will be funded in the surplus years in order to compensate for deficit years without increasing the amounts to be paid in or reducing the benefits paid out.*

Table 6. **Reserve Fund (millions of euros)**

Year	Contributions	Withdrawals	Yields	Total
2000	601		3	604
2001	1,803		26	2,433
2002	3,575		161	6,169
2003	5,494		362	12,025
2004	6,720		585	19,330
2005	7,005		850	27,185
2006	7,542		1,152	35,879
2007	8,410		1,427	45,716
2008	9,520		1,987	57,223
2009	80		2,719	60,022
2010	1,809		2,544	64,375
2011	223		2,217	66,815
2012	226	-7,003	2,970	63,008
2013	197	-11,648	2,187	53,744
2014	279	-15,300	2,911	41,634

SOURCE: MINISTERIO DE TRABAJO Y SEGURIDAD SOCIAL (HTTP://WWW.EMPLEO.GOB.ES)

So although the Social Security deficit could be managed in the coming years by using the Reserve Fund, this fund would only cover the deficit until 2019 and after that the public pension system would become bankrupt. The only option would then be to increase the public deficit by a specific percentage of GNP (see Table 6).

Nevertheless, turning to public deficit also has its limits due to commitments with the EU and because increasing the public deficit is not a welcome solution. Table 7 shows the impact of the Social Security deficit (if the situation continues) on our economy. As we can see, the deficit will continue to grow requiring 1.4% of GNP the following year to cover the Reserve Fund depletion. Fifteen years later, in 2035, this deficit will take up 3% of GNP (in addition to the public deficit typically generated yearly by our economy); this situation is clearly unsustainable and can only lead to bankruptcy.

Table 7. **Impact of the pensions deficit on the public deficit (millions euros)**

	2020	2025	2030	2035	2040	2045	2050
GNP Evolution	1,160,987	1,250,712	1,347,372	1,451,503	1,563,681	1,684,529	1,814,716
Social Security deficit	16,232	26,328	35,538	44,140	52,312	60,177	67,813
% public deficit	1.40	2.11	2.64	3.04	3.35	3.57	3.74

5. Discussion

The situation described in section 4 demonstrates the unsustainability of the current pension system; moreover, we have to bear in mind that 12% of current contributions are paid out of the National Budget (PGE), which takes responsibility for the unemployed contributions. By 2050, the PGE contribution is expected to have reached 30% of total contributions, generating a structural public deficit (3.74% of GNP and growing). If we bear in mind the foreseeable evolution of Spanish GNP with a 1.5% annual average increase, we can conclude that the pension expenses paid by PGE will be nearly 5% of GNP in 2050, which is incompatible with the Spain-European Union agreements signed in the 2001 constitutional amendment. We therefore propose the following measures to address the problem:

Increasing the retirement age is almost unavoidable. The Social Security model was designed for people up to 65 years old but the average life expectancy at that time was around 70 years, thus requiring only five years' worth of benefits to be paid out. Currently, however, the average life expectancy is 82/83 years making it necessary to finance more than three times the original coverage. Consequently, the retirement age must be raised to at least 70 years old. This would then entail 12 years' coverage but will not completely solve the problem.

Encouragement of "active retirement" for contributors who want to continue working after they reach 70 years old. We could introduce a pension increase for every additional year of work or offer exemption from paying taxes.

Benefits freeze is political anathema but offers a reasonable solution in times of crisis. In fact, the annual increase in recent years in Spain has been 0.25%.

Increasing contributions paid by workers is an unavoidable measure to balance the Social Security accounts. On the one hand, we must increase the contribution rate, and on the other hand, we must raise the limit (€42,000 salary) over which people do not contribute. Increasing the limit to €50,000 or €60,000 would mean higher costs for workers and companies, but it is a necessary measure if we wish to balance the Social Security accounts.

In spite of all these measures, the gap will not be totally covered, and the introduction of specific tax paid by citizens would be necessary to finance pension coverage. This tax could apply to people of independent means who do not contribute to Social Security as they do not work but who have a high level of income from bonds, shares and rents.

Apart from these four measures, we can also examine a possible change to the Social Security model consisting of the introduction of a mixed pension system by levels for the new generations. Under such a model, people contribute in order to receive a minimum subsistence pension payment (for instance, €1,000), with any extra amount invested in private pension funds. The objective would be for everyone to have a basic income after retirement, while those who were able to earn surplus income during their working lives invest it in pension funds in order to have a better retirement. A transitional period of 40 years would obviously be necessary in order to adapt the current situation to the new situation, establishing different benefit levels according to each person's pension calculation period.

6. Conclusions

The current state of the Social Security system, despite best efforts relating to the *"Pacto de Toledo"*, is not sustainable over time. In 2014, the Government was obliged to withdraw €15.3 billion from the Reserve Fund and the remaining balance in December of that year was €41.634 billion—only enough to cover the gap for the following three years. After that, the only other options will be the PGE and an increase in the public deficit financed by issuing new public debt. Moreover, it must be borne in mind that in recent years several million foreigners have been contributing to Social Security, a significant proportion of whom have since gone back to their home countries but retain the right to receive a Spanish pension when they retire. As far as we know, these payments have not been quantified in the national accounts but represent an additional future cost for the Social Security System.

According to the proposed model, in 2019 the current system will collapse and Social Security will hand over responsibility for such payments to the Government. Between 2019 and 2050 the gap will widen and the effect on the public deficit will become overwhelming for the Spanish Economy unless we are able to take measures such as the ones proposed in the above sections.

A combination of raising the retirement age, a benefits freeze, tax hikes and increased contributions, will provide the system with the necessary sustainability. In addition, we should not rule out the possibility of a mixed public-private model, which represents a different option for experts to explore in order to ascertain its social and economic viability.

Finally, in future research we would like to examine the impact of two important measures: gradually raising the retirement age to 67 years old and extending the pension calculation period to 25 years. Both of these will have a crucial effect on the evolution of the social security deficit.

A tsunami in the Spanish economy. Epicentre: The public pension system. *Córdoba-Bueno, M., Fernández-Avilés, G. and García-Centeno, M.C.* AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2016. **12**: 128-145

References

- Ayuso, M., Bravo, J.M. and Holzmann, R. (2015). Revisión de las proyecciones de población: Más allá de los convenientes supuestos sobre fertilidad, mortalidad y migración. Documento de Trabajo Instituto BBVA de Pensiones, Nº 10/2015, BBVA, Madrid. https://www.jubilaciondefuturo.es/recursos/doc/pensiones/20131003/posts/paper-foro-de-expertos-revision-de-las-proyecciones-de-poblacion.pdf

- Balmaseda, M., Melguizo, A. and Taguas, D. (2006). Las reformas necesarias en el sistema de pensiones contributivas en España, *Moneda y Crédito*, **222**, pp. 313-340.

- Barea, J., González-Páramo, J.M. and Velarde, J. (1997). *Pensiones y prestaciones por desempleo*, 2ª ed., Fundación BBV, Bilbao.

- Boldrin, M., Dolado, J.J., Jimeno, J.F. and Peracchi, F. (1999a): The future of pension systems in Europe, *Economic Policy*, **29**, pp. 286-323.

- Boldrin, M., Jimenez-Martin, S. and Peracchi, F. (1999b). *Sistema de Pensiones y Mercado de Trabajo en España,* Fundación BBVA, BBVA, Madrid. https://w3.grupobbva.com/TLFU/dat/sistema_pensiones_indice.pdf

- Conde-Ruiz, J.I. and Alonso, J. (2006). El Sistema de Pensiones en España ante el Reto del Envejecimiento, *Presupuesto y Gasto Público*, **44**, pp. 51-73.

- De la Fuente, A. and Doménech, R. (2009). *Convergencia real y envejecimiento: retos y propuestas*, Colección Estudios Económicos 03-09, FEDEA, Madrid. http://digital.csic.es/bitstream/10261/11983/1/76409.pdf

- Diamond, P. (1996): Proposals to Restructure Social Security, *Journal of Economic Perspectives*, **10**(3), pp. 67-88.

- Doornik, J.A. and Hendry, D.F. (2009). *Modelling Dynamic Systems*, Oxmetrics 6, Timberlake Consultants Ltd, London.

- Doménech, R. and Melguizo, A. (2009). *Projecting Pension Expenditures in Spain: On Uncertainty, Communication and Transparency*. In Franco, D. (ed.), Fiscal Sustainability: Analytical Developments and Emerging Policy Issues, Banca d'Italia, Roma.

- Expert Committee (2013). Informe sobre el factor de sostenibilidad en el sistema público de pensiones. Ministerio de Empleo y Seguridad Social. Madrid, 7 de junio de 2013. http://www1.seg-social.es/ActivaInternet/groups/public/documents/rev_anexo/rev_032187.pdf

- Galasso, V. (1999). The U.S. Social Security System: What Does Political Sustainability Imply?, *Review of Economic Dynamics*, **2**(3), pp. 698-730.

- Greene, W.H. (2012). *Econometric Analysis*, Seventh ed., Macmillan, New York.

- Gil, J., López García, M., Onrubia, J., Patxot, C. and Souto, G. (2008). *SIPES, un modelo de simulación del sistema de pensiones contributivas en España: proyecciones de gasto a largo plazo.* Instituto de Estudios Fiscales, Madrid.

- Herce, J.A. and Pérez-Díaz, V. (1995). *La reforma del sistema público de pensiones en España*, Colección Estudios Económicos, No. 4, Servicio de Estudios de La Caixa, Barcelona. https://www.bbvaresearch.com/KETD/fbin/mult/WP_0505_tcm346-233544.pdf?ts=2242013

- Herce, J.A., Sosvilla, S., Castillo, S. and Duce, R. (1996). *El futuro de las pensiones en España: hacia un sistema mixto,* Colección Estudios Económicos, No. 8, Servicio de Estudios de La Caixa, Barcelona.

- Herce, J.A. (2014). *Pensiones, una reforma medular*, Fundación de Estudios Financieros, Madrid. http://circulodeempresarios. zorg/sites/default/files/noticias/2014/01/pensiones-web.pdf
- Holzmann, R. (1998). On economic benefits and fiscal requirements of moving from unfunded to funded pensions, *European Economy*, **4**, pp. 32-49.
- Jimeno, J. (2000). *El sistema de pensiones contributivas en España: Cuestiones básicas y perspectivas en el medio plazo*. FEDEA, Madrid. http://crei.cat/activities/other/jornadas/jimeno.pdf
- Jimeno, J. F., Rojas, J.A. and Puente, S. (2008). Modelling the impact of aging on social security expenditures, *Economic Modelling*, **25**(2), pp. 201-224.
- Miles, D. and Ibern, A. (1998). The Reform of Pension Systems: Winners and Losers Across Generations in the UK and Germany, CEPR Working Paper No. 1943. http://econpapers.repec.org/paper/cprceprdp/1943.htm
- Miles, D. and Timmermann, A. (1999). Risk Sharing and Transition Costs in the Reform of Pension Systems in Europe, *Economic Policy*, **14**(29), pp. 251-286.
- Mingorance Arnáiz, A.C. and García Serrador, A. (2007), Análisis empírico del efecto que la jubilación anticipada tiene sobre el gasto en pensiones, *Presupuesto y Gasto Público*, **48**, pp. 59-84.
- Ministerio de Trabajo e Inmigración (2008). *Estrategia nacional de pensiones*. http://envejecimiento.csic.es/documentacion/biblioteca/registro.htm?id=52858
- Ministerio de Trabajo y Seguridad Social (1995). *La Seguridad Social en el umbral del siglo XXI*, Estudio económico actuarial, Madrid. http://www.revecap.com/revista/numeros/09/pdf/bandres.pdf
- Ministerio de Trabajo y Seguridad Social (2015). http://www.empleo.gob.es. 10 mayo 2015
- Mulligan, C.B. and Sala-I-Martín, X. (1999a): *Social Security in Theory and in Practice (I): Facts and Political Theories*, NBER, Working Paper No. 7118.
- Mulligan, C.B. and Sala-I-Martín, X. (1999b): *Social Security in Theory and in Practice (II): Efficiency Theories, Narrative Theories, and Implications for Reform*, NBER, Working Paper No. 7119.
- Moral-Arce, I., Patxot, C. and Souto, G. (2008). La sostenibilidad del sistema de pensiones: una aproximación a partir de la MCVL, *Revista de Economía Aplicada*, **16**(E-1), pp. 29-66.
- Peláez Herreros, C. (2008). Evolución del gasto en pensiones contributivas en España bajo distintos escenarios demográficos (2007-2050), *Principios*, **12**, pp. 45-60.
- Piñera, J. and Weinstein, A. (1996). *Una propuesta de reforma del sistema de pensiones*, Círculo de Empresarios, Madrid. http://www.josepinera.org/zrespaldo/PensionesEspana.pdf
- Rosado, B. and Domínguez, I. (2014). Solvencia Financiera y Equidad en el Sistema de Pensiones Español tras las Reformas de 2011 y 2013, *Anales del Instituto de Actuarios Españoles*, **20**, pp. 117-164.
- Roseveare, D., Leibfritz, W., Fore, D. and Wurzel, E. (1996). *Ageing Populations, Pensions Systems and Government Budgets: Simulations for 20 OECD Countries*, OECD Economics Department, Working Paper No. 168. http://econpapers.repec.org/paper/oececoaaa/168-en.htm
- World Bank (1994). *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*. http://documents.worldbank.org/curated/en/1994/09/698030/averting-old-age-crisis-policies-protect-old-promote-growth