



Facultad de Ciencias Económicas y Empresariales

**TRABAJO FIN DE GRADO
DOBLE GRADO INTERNACIONAL EN ADMINISTRACIÓN Y DIRECCIÓN
DE EMPRESAS Y ECONOMÍA**

**MEASURING THE IMPACT OF AN EMERGENCY FINANCIAL
ASSISTANCE PROGRAM.**

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Abstract

One of the clearest facts regarding the actual economic crisis is the increase in social inequalities and its resulting risk for families in social exclusion. In this type of situations, the need for accessing to social protection systems deepens. In Navarre, the principal exclusion coverage system is the *Renta de Inclusión Social (RIS)*.

The *RIS* is a benefit of subjective right and key element for the containment of socioeconomic deterioration processes. Due to the multiple situations of long term unemployment and precarious job contracts, people without coverage present a real social need which is attended in Navarre through the *RIS*.

The main objective of this work is to accurately predict the number of *RIS* Applications entering the Social Rights Department of the Government of Navarre, given its main determinant, which is Uncovered Unemployed.

This prediction will serve as an extremely valuable budgetary instrument for this Department.

Key words

Navarra, *Renta de Inclusión Social (RIS)*, Uncovered Unemployed, Vector Error Correction Model (VECM).

Index

1. INTRODUCTION	9
2. PROGRAM DESCRIPTION.....	10
3. SOCIAL CONTEXT AND RELEVANCE OF THE RIS PROGRAM.....	12
4. RIS BENEFICIARIES	18
4.1 HU Receiving RIS	18
4.2 People receiving RIS	19
4.3 Beneficiaries' sources of income.....	21
5. PREDICTIVE MODEL	25
5.1 Introduction to the model	25
5.2 Data description: series used for the empirical analysis.....	25
5.3 Methodology and analytical framework.....	27
5.3.1 Stationarity test.....	28
5.3.2 Cointegration analysis	30
5.3.3 Lag selection.....	31
5.4 Vector Error Correction Model (VECM)	32
5.5. Forecast.....	35
6. CONCLUSION	37

Index of Graphs and Tables

Graph 1: People registered as unemployed in the Servicio Navarro de Empleo (SNE) (2007-2016 1Q).	13
Graph 2: Unemployed people classified by typology of unemployment coverage (2007-2016 1Q).....	15
Graph 3: Monthly evolution of unemployment and Uncovered unemployed (2007-2016 1Q).	16
Graph 4: Monthly evolution of unemployment coverage rates in Navarre (2007-2016 1Q).	17
Graph 5: Monthly evolution of Household Units (HU) Receiving RIS in Navarre (2007-2016 1Q).....	19
Graph 6: Monthly evolution of People Receiving RIS in Navarre (2007-2016 1Q).....	19
Graph 7: Monthly evolution of Adults receiving RIS and Uncovered unemployed in Navarre (2007-2016 1Q).....	20
Graph 8: Monthly evolution of People Receiving RIS and those beneficiaries WITH Previous income in Navarre (2007-2016 1Q).....	22
Graph 9: Percentage of People receiving unemployment subsidy or benefit and RIS (at the same time) over Adults receiving RIS (2007-2016 1Q).....	23
Graph 10: Typology of income source from RIS beneficiaries WITH previous income in Navarre (2007-2015).....	24
Graph 11: Monthly evolution of Applications (2007-2016 1Q)	26
Graph 12: Monthly evolution of Uncovered unemployed (2007-2016 1Q)	27
Graph 13: Uncovered unemployed, Applications and their respective fist differences. (2007-2016 1Q)	28
Graph 14: One year forecast for the variable Applications with a 95% confidence interval.	36
Table 1: Applicable requirements in 2015.....	11
Table 2: 12 months Applications (At) forecast for 95% confidence intervals (2016:03-2017:03)	35

1. INTRODUCTION

Nowadays, even after a lustrum since the arrival of the last international financial crisis, the effects on the Spanish economy are still present. Among the multiple problems derived from that recession, perhaps the most worrisome is the high unemployment rate. In Spain, the rate was around 8% before the crisis, reached its peak at the beginning of 2013 at almost 27% and took up a value of 20.9% in the last quarter of 2015. In the Autonomous Community of Navarre the 2013 peak reached a 19% while the last available rate in March 2016 is 14.25%. (Spanish Statistics Institute, (Instituto Nacional de Estadística, INE))¹.

While it is true that since the middle of 2014 these unemployment rates seem to keep decreasing due to a good development of job creation rates, the pace is too slow. The effect of the crisis on employment has been somewhat asymmetric, i.e., not the whole Spanish economy has been hit equally by the recession. In fact, some Communities have been damaged in a more severe way than others. Given these facts, one may wonder how Navarre was affected, whether programs to avoid social exclusion situations of the people from Navarre need to be implemented and the effectiveness of those already launched.

People from Navarre access to social services through the Social Inclusion Income benefit, which is referred in Spanish as *Renta de Inclusión Social (RIS)*. Throughout this paper, we will just refer to it as RIS. This guaranteed economic benefit has the fundamental objectives of obtaining the well-being of the people from the Autonomous Community of Navarre and guaranteeing them the universal right of accessing to social services.

The RIS has been a key program to prevent from processes of socioeconomic deterioration in our Community. Its regulation is a major issue of concern for both citizens and politicians operating in several departments of the Government of Navarre. Specifically, The Department of Social Rights manages the program while the Economy Department is in charge of the budgetary allocation.

This paper main interest is to accurately predict the number Applications for RIS therefore being this prediction an extremely valuable budgetary instrument. In order to attain this objective, we prepare a joint modeling of the variable RIS and its main determinant that is Uncovered Unemployed.

¹ Spanish Statistics Institute. Labor Force Survey, several years.

2. PROGRAM DESCRIPTION

The RIS is regulated through the Regional Law 1/2012, 23th January². It is defined as a periodic economic benefit which is supplementary, subsidiary, guaranteed and non-transferrable. It is aimed to prevent and modify possible social exclusion situations and to foment social inclusion and labor incorporation. In Navarre, it is the principal social benefit.

The RIS is a benefit of subjective right; household units in situation of social exclusion have the right of benefitting from this aid as long as they comply with the regulated requirements. In the following paragraphs we are going to define the concepts of household units, social exclusion situation and general requirements.

A **Household Unit (HU)** or Unidad Familiar (UF) consists on the solicitant, spouse or partner, consanguinity familiars up to second grade and familiars by affinity up to first grade living together in the same place of residence. Communal living among them must be continuous for at least two years without breakdowns longer than 6 months. As a general rule, each household unit could be beneficiary of just one RIS. There would be some differences between the number of solicitants and the people beneficiaries of the aid as household units can be composed by one or more than one members.

A **social exclusion** situation is defined as the one resulting from a combination of factors that lead to disassociation of social life. Those factors can be poverty, with income level below 50% of Minimum Inter-professional Salary (MIS); lack of own, rented or familiar dwelling; shortage of employment; illiteracy; health problems impeding access to work and loss or lack of familiar support.

The **requirements** make reference to age, legal residence, economic resources, other aids, benefits or compensation. Most of them are provided with several exceptions depending on particular cases and have been modified subsequently in different laws. A general overview of the requirements is presented in table 1. Additionally, household units must accomplish all the obligations and responsibilities.

² Navarra. Gobierno de Navarra (2012). Ley Foral por la que se regula la Renta de Inclusión Social (Ley Foral 1/2012, de 23 de enero, Art.2.2). Pamplona: BON.

Table 1: Applicable requirements in 2015.

Age	
Ass 1: General Case	Between 18 and 65
Ass2: Elderly people with dependents	≥65 with dependent familiars
Ass3: Emancipated minors	18 years emancipated with children in their care
Legal residence	
Ass 1: General Case	Legal residence in Spanish territory
Ass 2: Past legal residences	Household Units deprived of residence as a result of employment loss
Continuous and permanent residence in Navarre	
Ass 1: General Case	At least 24 months before the solicitation's date
Ass2: Longer than 10 years	At least 10 years in Navarre before 4 th Feb 2012
Economic resources	
Ass 1: General Case	Income resources of the last 6 months below the receivable RIS amount.
Other aids, benefits or compensations	
Ass 1: General Case	Having asked for all the plausible aids, benefits or compensations offered by other public administrations.

Note: Assumption (Ass)

Source : Own elaboration based on information from *Manual de Gestión de Inclusión Social, Version 3.3* (Nov 2015). Social Rights Department, Government of Navarre.

Socially excluded household units aiming for the RIS will present their candidatures in their corresponding social services or “Servicios Social de Base” as called in Navarre. The application procedure is divided in three main phases; Phase 1: written application, Phase 2: assessment and Phase 3: post assessment resolution. The process normally takes from five to six months.

Once the household unit applies for the aid and meets all the previous criteria, it will receive a specific amount depending on its particular situation. The maximum perceptible amount is the maximum established RIS amount minus previous household unit (HU) income.

$$\text{Perceptible RIS} = \text{max RIS} - \text{HU income}$$

Previously to a change in the regulation in 2015, the aid was given for renewable periods of 6 months. However, today those effectively benefitting from this program will receive it during a 12 months period extendable up to 36 months. The maximum monthly amounts established in 2015 (max RIS) were the following:

- ✓ 1 person: 100% MIS (648.60€)
- ✓ 2 people 120% MIS (778.32€)
- ✓ 3 people 130% MIS (843.18€)
- ✓ 4 people 140% MIS (908.04€)
- ✓ ≥5 people 150% MIS (972.90€)

The aid is given to those household units that comply with the applicable requirements.

3. SOCIAL CONTEXT AND RELEVANCE OF THE RIS PROGRAM

It is important to know the circumstances that Navarre citizens face after the 2008 deep recession in order to understand the social importance that the RIS aid got during the last years. Being unemployed and not having access to social programs or unemployment benefits is an important factor leading to social exclusion situations. The number of citizens facing this situation continuously increases.

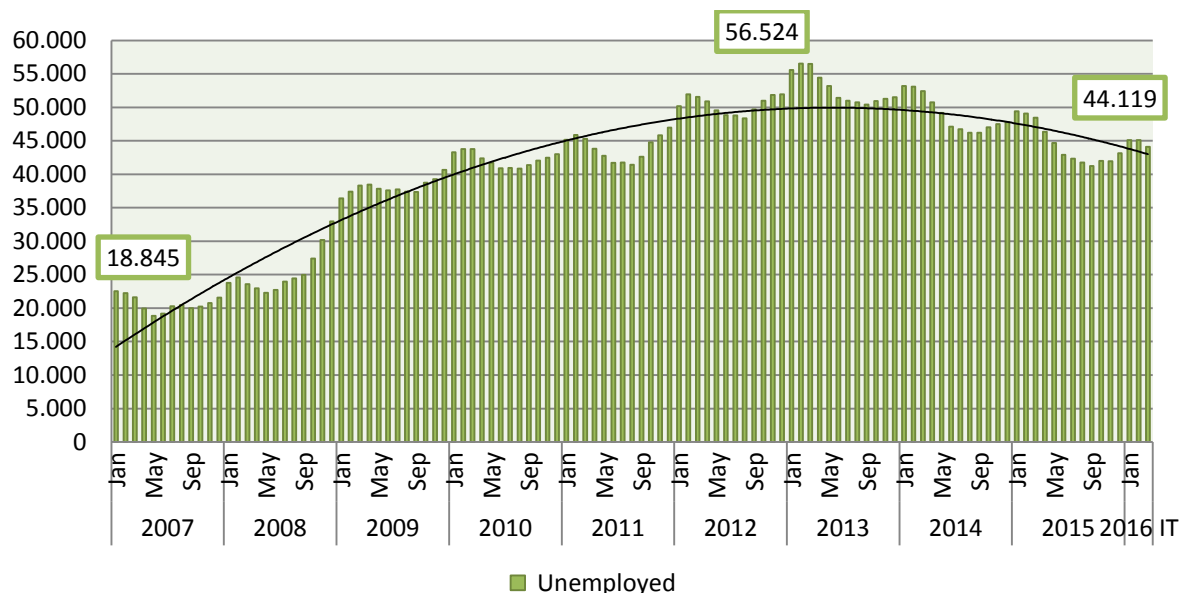
Among the multiple sides of the actual socioeconomic crisis, unemployment is probably its maximum indicator and the origin of the multiple exclusions situations observed in our community. Since the last months of 2009, Navarre maintains its unemployment figures above the forty thousand people unemployed.

Graph 1 illustrates the total number of unemployed people in Navarre for the last ten years. Unemployment has a seasonal behavior: maximums during the first quarter of the year followed by a decrease in the second and reaching its lowest values in the summer quarter.

The minimum level of unemployment registered was 18845 people in May 2007. The highest peak was reached in February 2013 at 56254, and the last available data at the time of elaboration of this project in March 2016 was 44119 people unemployed. These figures will probably decrease in the coming months due to the seasonal component.

However, the evolution of unemployment is improving. For example, the number of workers registered in the Servicio Navarro de Empleo has decreased in 4308 people from the 48.427 registered in March of the last year.

Graph 1: People registered as unemployed in the Servicio Navarro de Empleo (SNE) (2007-2016 1Q).



Source: Own elaboration based on data from the Servicio Navarro de Empleo (SNE).³

In a socioeconomic context as the drawn in the previous paragraphs in which unemployment has reached its highest values for the last decade and poverty and vulnerability situations are common, a system for social protection correctly organized turns indispensable.

The social protection system for unemployment situations is regulated by the General Administration of Spain throughout several benefits; Unemployment benefit, Unemployment subsidy, RAI and PAE. The first two refer to contributory benefits while the others are welfare aids.

- **Unemployment benefit:** this benefit is perceived after an involuntary employment loss as long as the worker had previously pay contributions to the Social Security system. The quantity to be perceived is calculated depending on the contributions paid during periods of work. In Spanish it is commonly referred as “el paro”.

³ The sources that provide unemployment data are two: Encuesta de Población Activa (EPA) from the Instituto Nacional de Estadística and the registered unemployment at the Servicio Público de Empleo Estatal (SEPE). Both sources are equally valid though they have different methodologies and concept definitions leading to divergent results. In any case, the differences within the levels exposed and those of the EPA for the first quarter of 2016 amount approximately to 1000 people.

- **Unemployment subsidy:** destined to unemployed people in the Navarre Employment Service whose monthly income is below 75% of the MIS. Even unemployed that have not paid any contribution to the social security system could receive it.
- **Renta Activa de Inserción (RAI):** designed for collectives with income below 75% of MIS facing special difficulties to find employment and in situation of economical need, not having access to other benefits. The program includes measures to enhance incorporation to labor market.
- **Programa de Activación para el Empleo (PAE):** In force since February 2015 it has a temporal character and is addressed to long term unemployed. The program consists on active employment and labor intermediation policies aimed to increase labor opportunities. It is as well accompanied with an economic aid.

The number of benefits and aids for unemployment coverage is directly related to unemployment rates registered. People receiving any kind of unemployment benefit are classified as **Covered unemployed**. In the same way, those not receiving these aids are referred as **Uncovered unemployed**.

In relation to the type of benefits that unemployed people in Navarra receive, we observe that during the last years unemployment benefit is decreasing. Unemployed people do not contribute to the Social Security System and many people have already lost the right to receive it. The current crisis effects can be seen in Graph 2: while higher quality programs are exhausting, welfare aids come to the fore.

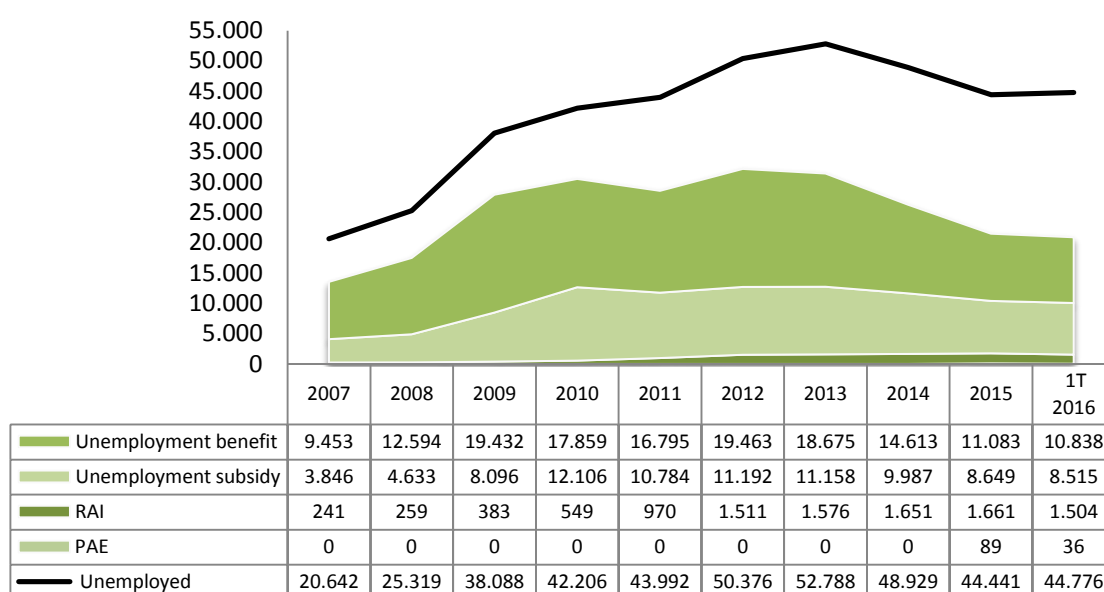
In Navarre, during the first period of the crisis, the increase in number of Covered Unemployed increased at a similar rate of unemployment. Beneficiaries of unemployment benefit reached its peaks in 2009 and 2012. However, for the last 3 years and the first quarter of 2016 the number of unemployed receiving this benefit continuously decreased. Subsidies and welfare aids are gaining its importance. From 2007 to 2016 1Q, unemployment subsidy has more than doubled.

In absolute figures, the highest peak of benefit beneficiaries was reached in January 2013 with 34995 people. The last available figure at the elaboration of this paper, corresponding to February 2016, is 21026 unemployed beneficiaries.

The distribution of benefits and subsidies for unemployment in Navarra follows the following ranking with data corresponding to February 2016; 51.9% unemployment

benefit, 40.8% unemployment subsidy, 7.2% RAI and 0.2% PAE. If we compare this distribution with the one in the first years of the crisis, it is relevant to mention the increase in importance of unemployment subsidy. As time passes, many unemployed have exhausted their possibilities of benefitting from unemployment benefit as they do not contribute to the social security system. In fact, in 2008, unemployment benefit represented a 70.9% and subsidies a 27.6%. This evidence is also supported by the recent increase of the RAI which in 2008 accounted for a 1.6%, whereas now accounts for 7.2%. (Observatorio de la Realidad Social, 2015).

Graph 2: Unemployed people classified by typology of unemployment coverage (2007-2016 1Q).



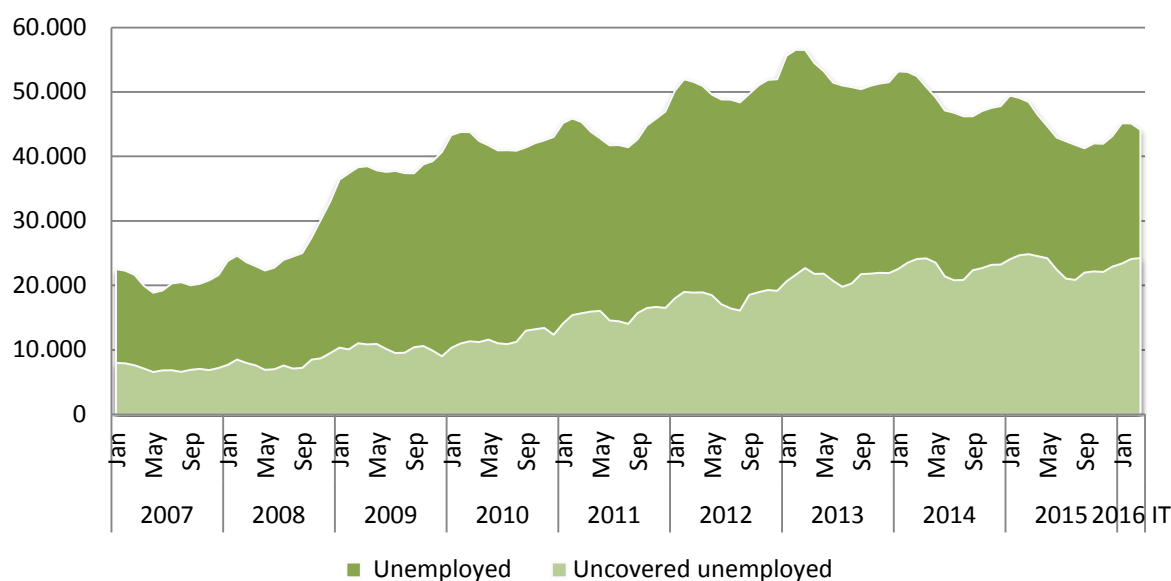
Note: Year averages

Source: Own elaboration based on data facilitated by Observatorio de la Realidad Social and Servicio de Garantía de Ingresos y Cooperación al Desarrollo of the Social Politics Department, Government of Navarre.

The previous graph leads to further interpretations. From 2007 on, the number of uncovered unemployed people (or non-receiving any kind of benefit) continuously increases while unemployment in the last years has remained constant or decreased. Uncovered unemployed are an important collective to quantify as they are the most likely profile to meet the RIS requirements. Quantifying this collective could help in the task of predicting the number of household units perceiving the RIS.

Graph 3 shows the evolution of unemployment and Uncovered unemployed. While in average in 2007, 34% (7103 out of 20642) of unemployed people were uncovered, in 2015, 52% (22966 out of 44441 in average) of total unemployed were uncovered.

Graph 3: Monthly evolution of unemployment and Uncovered unemployed (2007-2016 1Q).



Source: Own elaboration based on data facilitated by Observatorio de la Realidad Social and Servicio de Garantía de Ingresos y Cooperación al Desarrollo of the Social Politics Department, Government of Navarre.

One of the most accused problems of the actual socioeconomic crisis is long-term unemployment, that is unemployed people for longer than one year. Depending on the information source, it is estimated that among 40% and 65% of unemployed people in Navarra have been more than one year in this critical situation .(Observatorio de la Realidad Social, 2016).

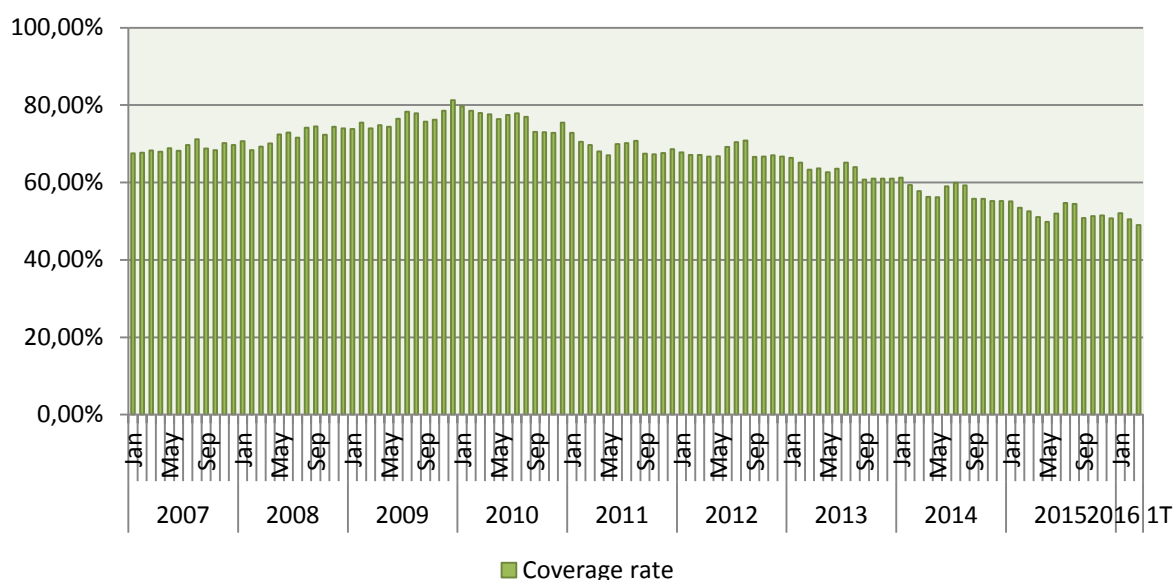
Long-term unemployed face harsh difficulties: frustration, depression, low self-esteem, scarce expertise and unfair stereotypes that influence employers. Their probabilities of finding a job are limited and especially for some profiles. It is also known that being in this situation leads to further problems such as accumulated loss of human capital (knowledge, skills) or health problems. All these definitively results in exclusion and vulnerability situations.

The well-being of this profile of people greatly depend on public coverage. Coverage rates can be calculated throughout two different formulas. One the one hand, over the total number of unemployed people in Navarra and on the other, over the total number of unemployed people in Navarra with right to receive one of these benefits (Experienced Unemployed). It is important to remark that not everyone being unemployed has the right to receive a benefit. Unemployed people without working experience do not have access to these benefits. These two different formulas lead to divergent rates. In this paper coverage rates have been calculated over Experienced Unemployed; unemployed people with right to receive coverage.

Coverage rates of the Unemployment Protection System have decreased since 2009. The highest rate was reached in December 2009 (81.25%). According to the last available data, in March 2016, the coverage rate was 49.00%. This month's coverage does not reach half of total unemployed people in Navarra with right to receive a benefit. It could be said during the last 5 years the coverage fall amounts to around 30% of total unemployed people.

Ultimately, while coverage rate has decreased in 30 points with respect to the maximum levels dated from December 2009, unemployment has increased since that moment almost 11% in spite of the important decrease of this last year. These comparative results are revealing.

Graph 4: Monthly evolution of unemployment coverage rates in Navarra (2007-2016 1Q).



Note: Covered unemployed / Experienced unemployed.

Source: Own elaboration based on data facilitated by Observatorio de la Realidad Social and Servicio de Garantía de Ingresos y Cooperación al Desarrollo of the Social Politics Department, Government of Navarra.

The previous paragraphs, highlight the evident limit of the public protection system for unemployment which is a phenomenon clearly linked to the increase in poverty and vulnerability levels.

Among the most important consequences of the crisis, social inequalities and social exclusion risks have increased. Being in a situation of uncovered unemployment could be greatly related to social exclusion situations. This profile of people get access to social protection systems in Navarra throughout the aid RIS.

4. RIS BENEFICIARIES

Uncovered unemployed people may receive or not RIS, given that they could have income from other sources; savings or earnings from other members in the household unit. In any case, this group of people are potential beneficiaries and the most likely to receive RIS.

4.1 HU Receiving RIS

The following lines explain the monthly evolution of Household Units (HU) receiving RIS. In order to interpret its evolution, both the political and background effects need to be taken into consideration. Within the series one can appreciate the impact that different regulatory changes have had over familiar units with right to receive this aid.

As can be seen in Graph 5 the increasing trend breaks at the end of 2011. This has to do with the introduction of the Regional Law 1/2012 of 23th January in February 2012. This law introduced new aspects such as; age exceptions, required period of residence in Navarre, new exceptions to familiar income above RIS quantities during the 6 months previous to the concession of the aid, exceptions to renewal situations and special situations for accessing to the program and finally, the amount of the benefit was also modified.

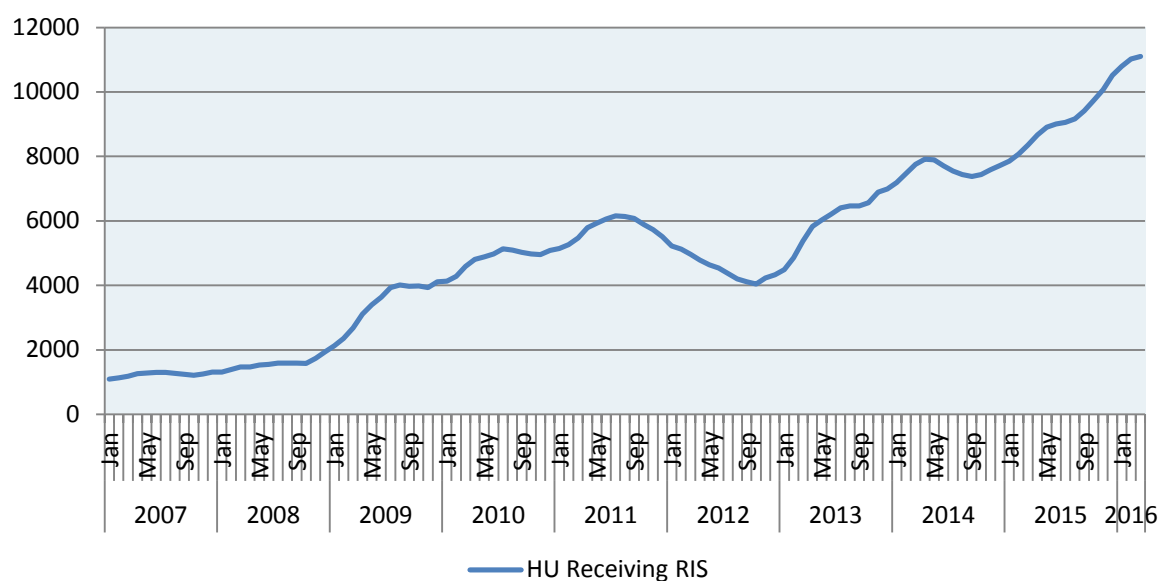
At the same time, during the second quarter of 2013 there was a modification in the Regional Order 58/2012 of 9th February introducing the extraordinary renewal for household units with minors below the age of 12. This produces a progressive increase in the familiar units benefitting from the aid from March to August 2013.

In December 2013 there was a new legislative change that introduces in one of its articles the positive administrative silence⁴ and it is applied to all the dossiers with pending assessment. This carries a positive movement in the coverage that affects all the dossiers from November 2013 to April 2014.

In March 2015 occurs the last modification which implies the extension of the aid concession period from 6 to 12 months.

⁴ When a citizen requests something to a Public Administration and does not receive any response, positive administrative silence means that the request is granted.

Graph 5: Monthly evolution of Household Units (HU) Receiving RIS in Navarre (2007-2016 1Q).

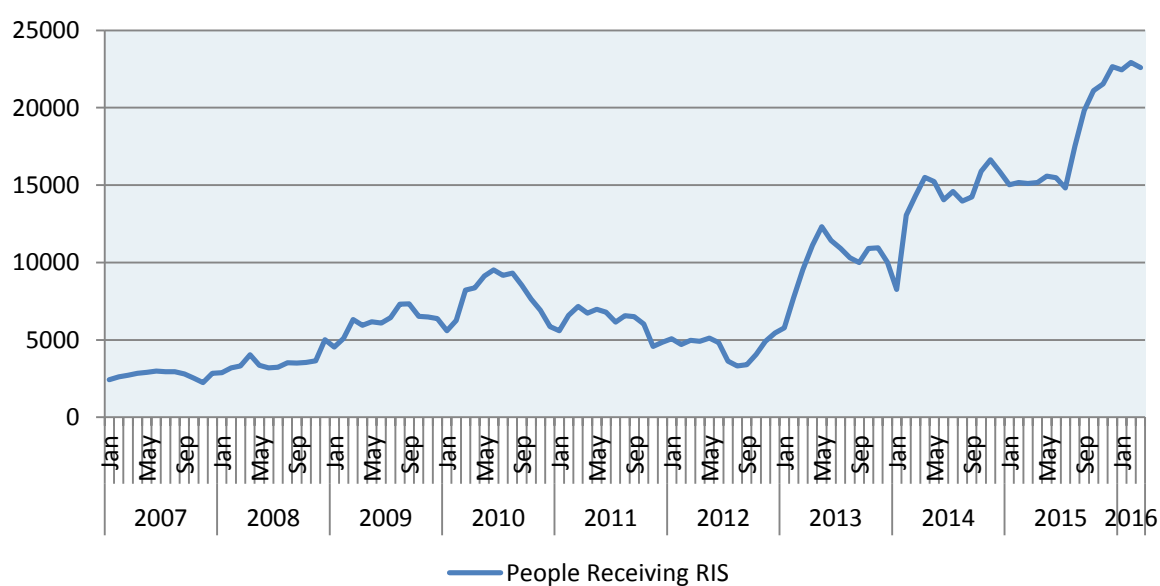


Source: Own elaboration based on data taken from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre.

4.2 People receiving RIS

Within each household unit receiving the RIS there can be one or more than one people beneficiaries as represented in Graph 6. This implies that the variables HU receiving RIS and people receiving RIS differ. As a general rule, 40% of the people benefitting from the aid are minors.

Graph 6: Monthly evolution of People Receiving RIS in Navarre (2007-2016 1Q).



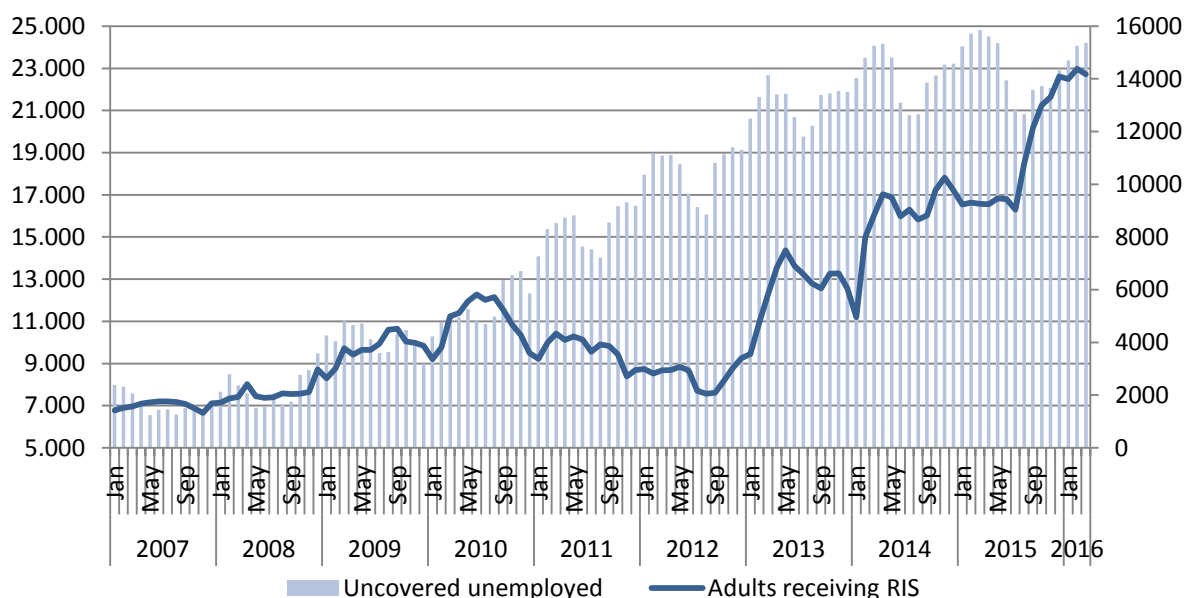
Source: Own elaboration based on data taken from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre.

Graph 7 displays how the series Uncovered unemployed and Adults Receiving RIS relate. We exclude minors and just focus on adults beneficiaries of RIS, given that just people over eighteen can be registered in the unemployment service.

During the first years of the actual socioeconomic crisis, it can be observed that the *Renta Básica* (name of the actual RIS at that time) covered in a great percentage the needs of those unemployed without benefits. Especially remarkable is the 2010 peak. However, in 2012 there was a turning point in the coverage previously observed. As already said, the Regional Law 1/2012 of 23th January restricted this aid's access requirements. Its effect was visible for at least two years in which the coverage in percentage terms decreases breaking its natural trend. Posterior law modifications attenuated this sudden decrease.

These days the gap within these variables has decreased notably. In a context in which the number of Uncovered unemployed is kept constant, since 2015's spring there is an increasing number of people benefitting from the aid. It seems evident that the RIS is a key shock-absorbing element in Navarre, especially for the uncovered collective, given that the unemployment protection system is incapable of reducing vulnerability levels.

Graph 7: Monthly evolution of Adults receiving RIS and Uncovered unemployed in Navarre (2007-2016 1Q).



Source: Own elaboration taking data from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre and Servicio Público de Empleo Estatal (SEPE).

4.3 Beneficiaries' sources of income

Another plausible categorization of the people beneficiaries is whether they had previous sources of income.

WITHOUT previous income means that people receiving RIS do not have other previous sources of income.

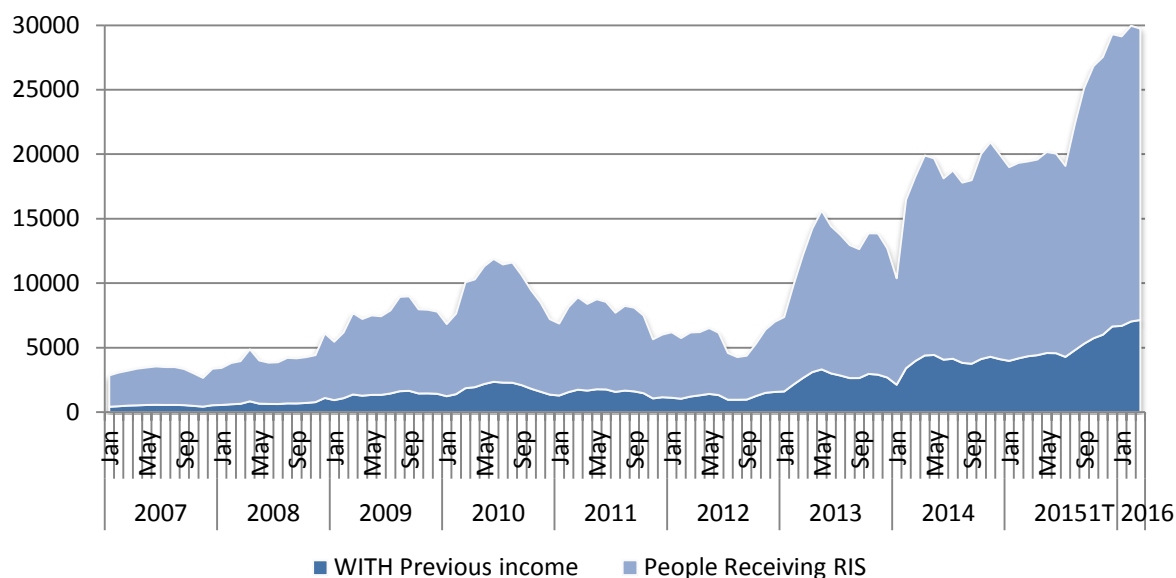
WITH previous income means that people receiving RIS had previous sources of income such as:

- Labor income
- Pensions
- Unemployment benefit
- Unemployment subsidy
- Other benefits
- Other

In this second case the RIS is given a complementary character. Each time there are more people needing to receive the RIS as a complementary income because their savings exhausted, they are working below the minimum inter-professional salary, their partners lost their jobs, their grandparents pensions were reduced or due to other reasons that should be studied in detail and for each particular case. The actual panorama is that families' income does not cover the minimum living standards.

Graph 8 shows how the RIS turns out as a key compensating element for these families. Over the years, there are a great percentage of people who receive the RIS as complement of other sources of income. The last information available in March 2016 stands that out of 22587 people receiving RIS, those with previous income amounted 7156 people, which is a 31.68%.

Graph 8: Monthly evolution of People Receiving RIS and those beneficiaries WITH Previous income in Navarre (2007-2016 1Q).

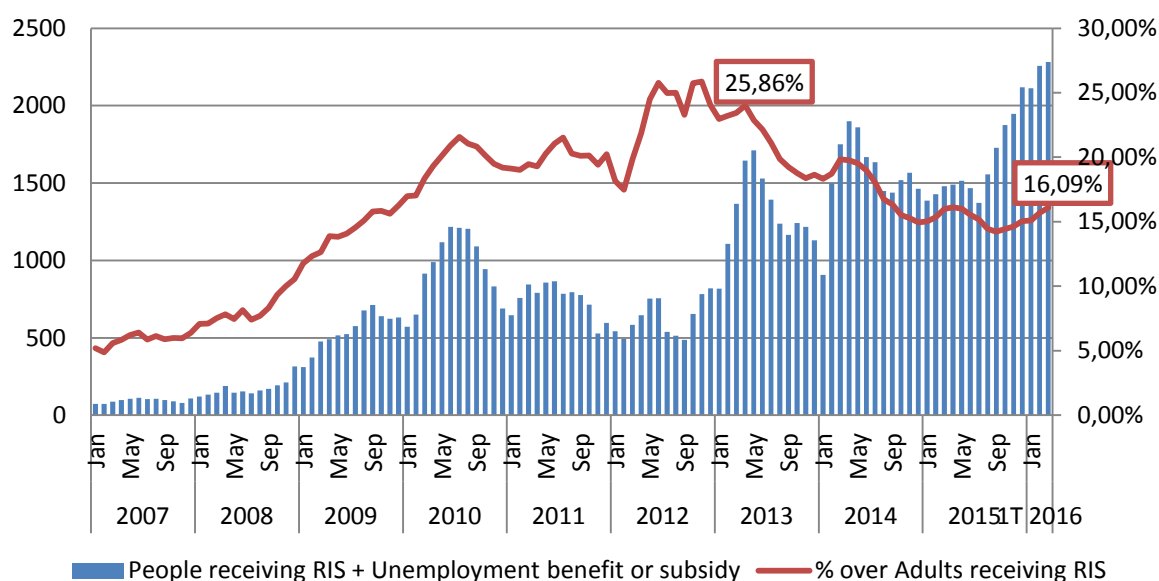


Source: Own elaboration taking data from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre and Servicio Público de Empleo Estatal (SEPE).

It is also important to consider that someone could receive income from two different sources, e.g., a disabled person that used to work could receive unemployment benefit and disability pension at the same time. Yet if this person does not reach the MIS and accomplishes with the RIS program prerequisites, could receive the corresponding complementary amount. In other words, the aids are not exclusive.

In fact, Graph 9 shows the percentage of adults receiving RIS who at the same time are beneficiaries of unemployment coverage. In November 2012 a 25.86% of adult beneficiaries of RIS were receiving simultaneously unemployment benefit or subsidy. The last available percentage for March 2016 is 16.09%

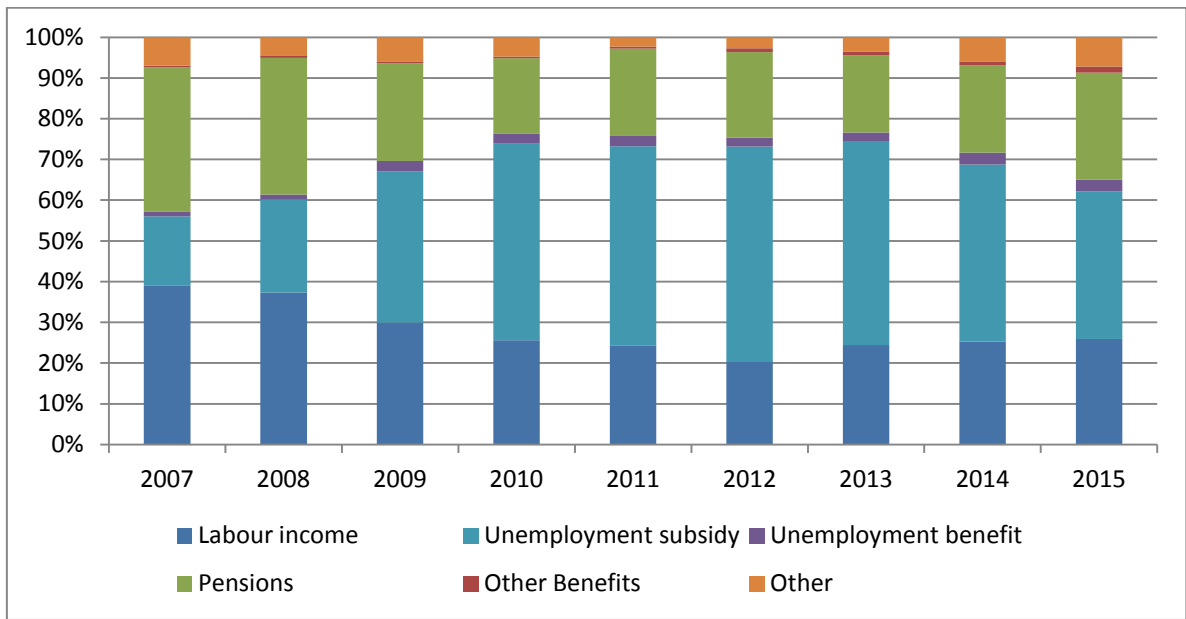
Graph 9: Percentage of People receiving unemployment subsidy or benefit and RIS (at the same time) over Adults receiving RIS (2007-2016 1Q).



Source: Own elaboration taking data from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre and Servicio Público de Empleo Estatal (SEPE).

Finally, graph 10 shows the distribution by income source typology among beneficiaries of RIS from 2007 to 2015. This graphs leads to multiple interpretations. First, related to Unemployment benefit, it can be observed its small representativeness. Most people receiving the RIS are Uncovered unemployed and long-term ones. Second, labor income especially decreased in 2011. In Navarre unemployment boomed with a little retard in comparison to other Spanish communities. Third, as people could not work and did not have enough working experience to receive unemployment benefit, unemployment subsidies got notable significance. Unemployment subsidy and labor income have logically behave in opposite directions. Finally, for the last two to three years, labor income has increased. This slight increase could be explained by the massive spread of precarious job positions.

Graph 10: Typology of income source from RIS beneficiaries WITH previous income in Navarre (2007-2015).



Source: Own elaboration taking data from Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre and Servicio Público de Empleo Estatal (SEPE).

5. PREDICTIVE MODEL

5.1 Introduction to the model

Sims (1980) first introduced vector autoregressive (VAR) models as an alternative for analyzing temporal series rather than the large scale previous macro econometric models. With the intention of improving the empirical analysis of economic relations, this methodology has gained widespread use in applied macroeconomic research and has been commonly practiced during the last decade of XX century. Similar ideas had already been introduced by Liu (1960), but the one proposed by Sims suggested something new: empirical research should use small-scale models identified via a small number of constraints.

As signaled by Ballabriga (1991), the VAR model adds two innovative applications to the traditional applied by other econometric models. The first one consists on the simulation of shocks effects throughout impulse responses functions. This function gives the response of one variable to an impulse in another variable in a system that may involve a number of other variables as well. The second one, decomposition of the error variance of the prediction in order to detect which factors are associated with each of the disturbances.

Most macro econometric studies share this methodology which use is extended to other aspects of economic activity as well. As an example, Sims (1992) proposed this method to show how monetary policy consequences diverge among different economies. In Spain the model has been used to determine the causes of the economic recession (Dolado and Sicilia, 1995) or causes of unemployment (Dolado and Jimeno, 1997) as examples.

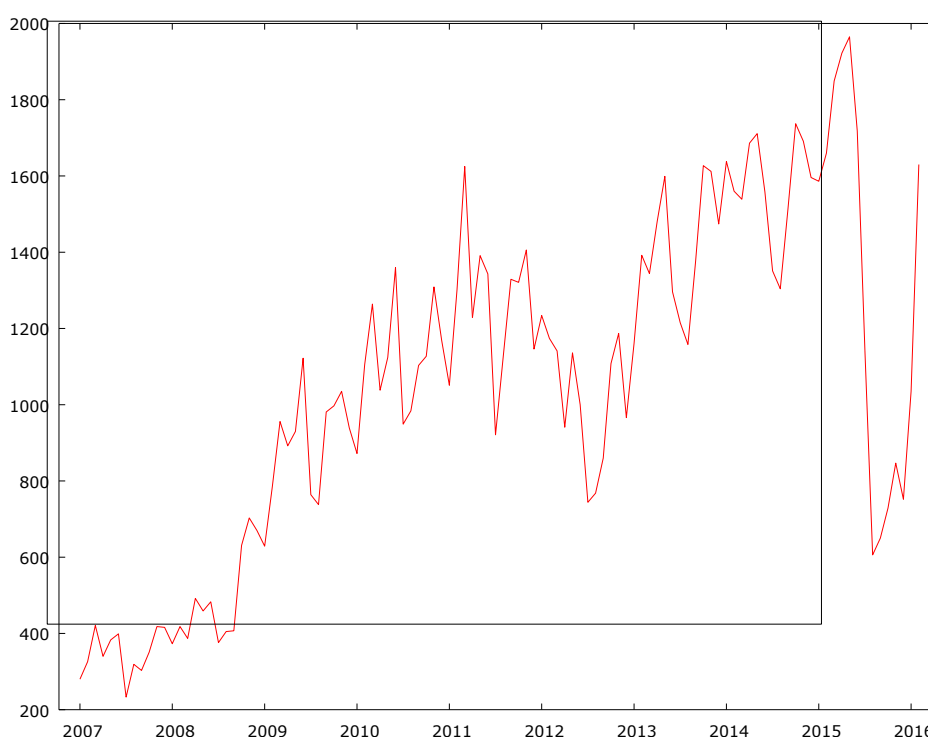
5.2 Data description: series used for the empirical analysis

The period object to study in this report goes from January 2007 to February 2016 (both inclusive). The series used for the analysis contain monthly data. The sources of procedure and characteristics of the series are the following:

- Applications (**applic**): the series has been provided by the Income Guarantee and Development Service of the Social Politics Department, Government of Navarre. It corresponds to the number of applications for RIS by month that entered the department in charge of the corresponding evaluation.
It is important to note that not all the applications are approved. However, the denial percentage is really small and most times applications and HU receiving RIS coincide.

Two dummy variables have been considered to absorb the effect of the changes in regulation, introduction of the Regional Law 1/2012 of 23th January and the extension of the concession period in March 2015 that affected the evolution of this series. These variables are qualitative and only take the values 0 and 1 indicating respectively the absence or presence of a given quality or attribute. In this case, the dummy variables *change 1* is set to absorb the 2015 modification by taking the value 0 up to February 2015 and 1 from March 2015 till the February 2016. The dummy variable *change 2* encloses the 2012 effect taking the value 1 from February 2012 on.

Graph 11: Monthly evolution of Applications (2007-2016 1Q)

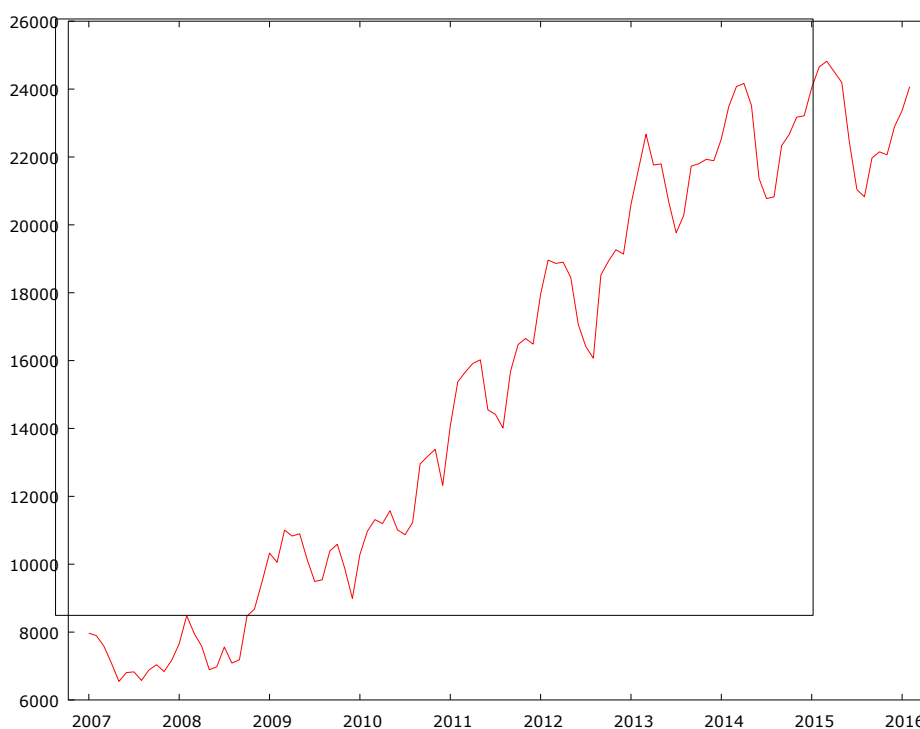


Source: Data facilitated by Servicio de Garantía de Ingresos y Cooperación al Desarrollo, Government of Navarre.

- Uncovered unemployed (**unemp**): the series has been provided by the Observatorio de la Realidad Social of the Social Politics Department, Government of Navarre. It corresponds to unemployed people not receiving any kind of unemployment coverage in the Navarre Employment Service. This group of unemployed may receive or not the aid RIS as they could have savings or other sources of income in their household units. In any case, those are the ones with greater possibilities of benefitting from RIS and are considered as potential beneficiaries. The number of

household receiving RIS is expected to increase notably being Uncovered unemployed its main determinant.

Graph 12: Monthly evolution of Uncovered unemployed (2007-2016 1Q)



Source : Data facilitated by the Observatorio de la Realidad Social of the Social Politics Department, Government of Navarre.

Seasonal dummies have been added to the model. Those predictors add to the model a seasonal indicator or “dummy” variables to serve as regresors for seasonal effects. Since the data that we are using is monthly, there are 11 seasonal dummy variables added. This include a dummy regressor variable that takes the value 1 in January while 0 for the other months, another one that takes the value 1 in February and 0 for the rest, and so on. No dummy variable is added for December to avoid co-linearity issues.

5.3 Methodology and analytical framework

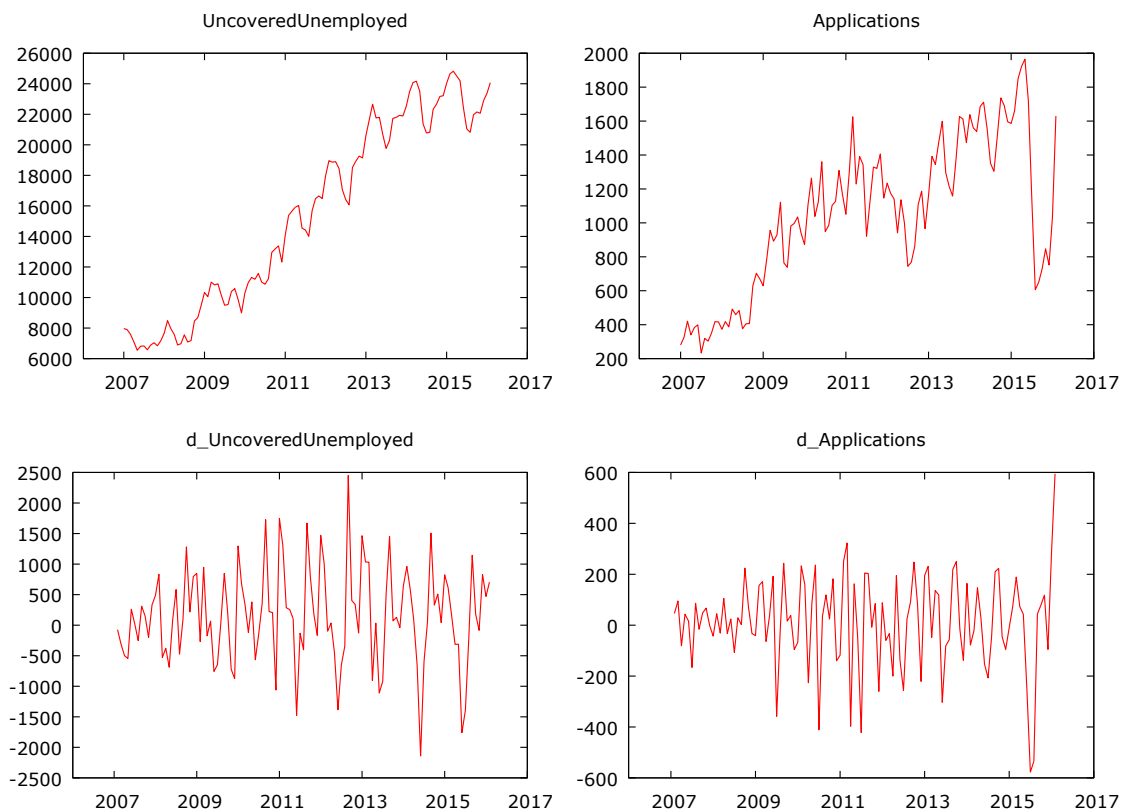
This paper uses the econometric package Gretl to explore the time series properties of the data. The first thing to do when working with time series is to look at the data graphically. The series plots will help us identifying characteristics of the data and suggest the plausible ways to proceed and create an accurate model.

The first differences have been added to the graphs view. By looking at the plots, both series have a trending behavior with a seasonal pattern. In Figure 3, it can be seen how

Uncovered Unemployed has an upward seasonal trending and its difference version appears to wonder around some constant amount.

Regarding the series Applications, the trending is upward and presents a strong seasonality. Two diminishing effects are observed in this series. The first one in 2012 due to the change in regulation already explained in the previous paragraphs, which responds to the introduction of the Regional Law 1/2012 of 23th January. The second one in March 2015 corresponds to the extension of the aid concession period from 6 to 12 months.

Graph 13: Uncovered unemployed, Applications and their respective fist differences. (2007-2016 1Q)



Source: Data facilitated by Observatorio de la Realidad Social and Servicio de Garantía de Ingresos y Cooperación al Desarrollo of the Social Politics Department, Government of Navarre.

5.3.1 Stationarity test

Once the data has been observed, the augmented Dickey-Fuller test (ADF) can be used to test for the stationarity of the series. Whether the variables are stationary or not needs to be used with care in regression analysis. Stationary implies that the means, variances and covariances of the series do not depend on the time in which they are observed. When a series is stationary observations in different moments in time can be correlated and its correlation does not change over time. Nonstationary series grow over time, may have volatile behavior and the persistence of its shocks varies over time.

To perform the ADF test regressions for each of the series we have decided to include a constant, a time trend and seasonal dummies. The number of lagged terms to include in the test is a maximum of 12 and according to the AIC criteria. Gretl automatically determine the number of lags included.

The test results are quite informative. It provides an estimate which is referred to as $a-1$, the t-ratio and the correct p-value for the statistic as computed by Davidson and Mackinnon. It reports an autocorrelation coefficient for the errors which should be relatively small. The null hypothesis is not stationary (a unit root).

The test statistic for the stationarity of UncoveredUnemployed is -2.28971 which has a p-value of 0.6753. Nonstationarity of UncoveredUnemployed cannot be rejected at the usual 5% level of significance. The same for Applications with test statistic is -2.41342 and has a p-value of 0.6174. Thus according to the ADF test results, we cannot reject the null of nonstationarity; so we can say that both series are I (1), that is, stationary in first differences.

ADF test results for UncoveredUnemployed and Applications:

Augmented Dickey-Fuller test for UncoveredUnempl
including 0 lags of (1-L)UncoveredUnempl
(max was 12, criterion AIC)
sample size 109
unit-root null hypothesis: $a = 1$

with constant and quadratic trend plus seasonal dummies
model: $(1-L)y = b_0 + b_1*t + b_2*t^2 + (a-1)*y(-1) + e$
estimated value of $(a - 1)$: -0.0947306
test statistic: $\tau_{ctt}(1) = -2.28971$
p-value 0.6753
1st-order autocorrelation coeff. for e: 0.050

Augmented Dickey-Fuller test for Applications
including 7 lags of (1-L)Applications
(max was 12, criterion AIC)
sample size 102
unit-root null hypothesis: $a = 1$

with constant and quadratic trend plus seasonal dummies
model: $(1-L)y = b_0 + b_1*t + b_2*t^2 + (a-1)*y(-1) + \dots + e$
estimated value of $(a - 1)$: -0.24943
test statistic: $\tau_{ctt}(1) = -2.41342$
asymptotic p-value 0.6174
1st-order autocorrelation coeff. for e: 0.037
lagged differences: $F(7, 80) = 3.413 [0.0031]$

5.3.2 Cointegration analysis

Two I(1) series are cointegrated if they tend to move together through time. Now, if both series move together through time we could say they are “cointegrated”. Cointegration requires both series to be I (1) and a linear combination of them to be stationary.

The Johansen (1988) cointegration test has been performed to contrast plausible cointegration relationships within Applications and UncoveredUnemployed. The two Johansen tests for cointegration used to establish the rank are the “L-max” and the “trace” test. Those tests establish the cointegration rank or in other words the number of cointegrating vectors.

In this case, both the trace and L-max tests reject the null hypothesis that the rank of cointegration is zero. The tests do not reject that the rank is smaller or equal than one then consequently there is cointegration evidence and common stochastic trend.

Johansen test results:

Johansen test:

Number of equations = 2

Lag order = 4

Estimation period: 2007:05 - 2016:02 (T = 106)

Case 3: Unrestricted constant

Exogenous regressor(s): change1 change2

Log-likelihood = -1147.57 (including constant term: -1448.39)

Cointegration tests, ignoring exogenous variables

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.24135	29.497	[0.0001]	29.278	[0.0001]
1	0.0020550	0.21806	[0.6405]	0.21806	[0.6405]

Corrected for sample size (df = 84)

Rank	Trace test	p-value
0	29.497	[0.0002]
1	0.21806	[0.6461]

Note: in general, the test statistics above are valid only in the absence of additional regressors.

eigenvalue 0.24135 0.0020550

beta (cointegrating vectors)

UncoveredUnempl	-0.00076961	0.00046222
Applications	0.0067809	-0.00041675

alpha (adjustment vectors)

UncoveredUnempl	-32.498	21.456
Applications	-60.170	0.094628

renormalized beta

UncoveredUnempl	1.0000	-1.1091
Applications	-8.8109	1.0000

renormalized alpha

```

UncoveredUnempl    0.025011  -0.0089420
Applications        0.046307  -3.9437e-005

long-run matrix (alpha * beta')
                UncoveredUnempl  Applications
UncoveredUnempl    0.034928      -0.22931
Applications        0.046351      -0.40804

```

5.3.3 Lag selection

In order to perform the Johansen test and construct the model, it is important first to specify the lag order of the VAR. There are several ways to select lags but Gretl provides the following possibility. You can choose the maximum lag to consider, the variables to include and whether the model should contain constant, trend, or seasonal dummies. The output is given making use of three different criteria. The AIC or Akaike criteria, the BIC or Bayesian Information Criteria and the HQC or Hannan-Quinn (1979) criteria. The asterisks below mark the best, meaning the lag values for each information criteria.

The AIC select a VAR with 11 lags, the BIC with 1 and the HQC with 4. After validating the model for each one of the 3 options selected, the model was better and clearer specified by using 4 lags. A model with 4 lags appeared to be acceptable.

Lag selection results:

VAR system, maximum lag order 12

The asterisks below indicate the best (that is, minimized) values of the respective information criteria, AIC = Akaike criterion, BIC = Schwarz Bayesian criterion and HQC = Hannan-Quinn criterion.

lags	loglik	p(LR)	AIC	BIC	HQC
1	-1357.44667		28.356055	29.200126*	28.697464
2	-1355.41286	0.39693	28.396181	29.345761	28.780266
3	-1354.00338	0.58856	28.449049	29.504137	28.875810
4	-1338.95249	0.00000	28.223520	29.384118	28.692958*
5	-1338.18603	0.82080	28.289511	29.555617	28.801625
6	-1336.85533	0.61598	28.343986	29.715602	28.898776
7	-1335.27461	0.53118	28.393359	29.870484	28.990826
8	-1329.63319	0.02356	28.359861	29.942494	29.000004
9	-1328.03393	0.52517	28.408856	30.096998	29.091674
10	-1309.35259	0.00000	28.109236	29.902887	28.834731
11	-1302.16952	0.00621	28.044276*	29.943436	28.812447
12	-1299.43825	0.24304	28.070168	30.074837	28.881015

5.4 Vector Error Correction Model (VECM)

A Vector Error Correction Model (VECM) is a form of Vector Auto Regression or VAR applicable when the variables in the model are individually integrated of order 1 and present cointegration. The lag order selected is that of the VAR system and the dependent variable here is given as a first difference. The cointegration rank, already established with the Johansen test, represents the number of cointegrating vectors. Gretl includes an “unrestricted constant” by default which allows for the presence of a non-zero intercept in the cointegrating relations as well as a trend in the levels of endogenous variables.

There are two endogenous variables which are Applications (At) and UncoveredUnemployed (Ut), change 1 and change 2 have been added as exogenous variables in their unrestricted form and, as the data present a seasonal behavior, seasonal dummy variables have been included as well.

The model interpretation is very interesting.

The cointegration relation between Applications and UncoveredUnemployed can be written as:

$$(A_t - 0.11350U_t)$$

At: Applications in t.

Ut: UncoveredUnemployed in t.

This equation is called the Error Correction term and represents the long run relationship of the variables. This lineal combination of the variables is stable in time and corrects possible deviations within At and Ut.

Equation 1 for Applications (At) takes the following form:

$$\Delta A_t = C_1 + \alpha_1(A_{t-1} + \beta_1 U_{t-1}) + \delta_1^{(1)} C_{1t} + \delta_2^{(1)} C_{2t} + \gamma_1^{(1)} \Delta A_{t-1} + \gamma_2^{(1)} \Delta A_{t-2} + \gamma_3^{(1)} \Delta A_{t-3} + \theta_1^{(1)} \Delta U_{t-1} + \theta_2^{(1)} \Delta U_{t-2} + \theta_3^{(1)} \Delta U_{t-3} + \text{seasonal dummies} + U_{1t}$$

$\Delta = 1-L$, where L is the usual lag operator, that is $L_{xt} = x_{t-1}$

C₁: change 1 and C₂ change 2.

U_t: white noise

α_1 : Adjustment coefficient for At.

This equation is estimated by the Maximum Likelihood (ML) method of Johansen (1988) and we obtain:

Equation 1: d_Applications

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	-130.354	32.0708	-4.0646	0.0001	***
d_Applications_1	0.21014	0.110784	1.8968	0.0612	*
d_Applications_2	0.1737	0.107958	1.6090	0.1113	
d_Applications_3	0.456496	0.100742	4.5313	<0.0001	***
d_UncoveredUne mpl_1	0.0230215	0.0253572	0.9079	0.3665	
d_UncoveredUne mpl_2	-0.00145466	0.0260221	-0.0559	0.9556	
d_UncoveredUne mpl_3	-0.089276	0.0253663	-3.5195	0.0007	***
change1	-104.094	47.4541	-2.1936	0.0310	**
change2	-276.226	57.6846	-4.7886	<0.0001	***
S1	98.4993	61.8664	1.5921	0.1151	
S2	180.783	68.9453	2.6221	0.0104	**
S3	181.087	74.7631	2.4221	0.0176	**
S4	102.41	60.5764	1.6906	0.0946	*
S5	184.267	59.147	3.1154	0.0025	***
S6	69.0746	63.9157	1.0807	0.2829	
S7	-102.381	74.421	-1.3757	0.1725	
S8	53.0582	77.5992	0.6837	0.4960	
S9	168.765	83.7781	2.0144	0.0471	**
S10	212.422	81.3182	2.6122	0.0106	**
S11	94.9077	68.7999	1.3795	0.1714	
EC1	-0.408004	0.0784761	-5.1991	<0.0001	***
Mean dependent var	12.16981	S.D. dependent var	185.9776		
Sum squared resid	1206769	S.E. of regression	119.1523		
R-squared	0.667713	Adjusted R-squared	0.589528		
rho	0.046797	Durbin-Watson	1.847097		

$\hat{\alpha}_1 = -0.408004$ and it is statistically significant at 1%. It seems to be reacting to departures from equilibrium in period t-1. This coefficient expresses how the variable responds to disequilibrium in year t-1. It means that if the error correction term is high, being applications in t-1 too large in relation with the equilibrium number of uncovered unemployed, a negative adjustment coefficient will correct the previous year deviation in year t.

$\hat{\delta}_1^{(1)} = -104.094$, significant at 5% and $\hat{\delta}_2^{(1)} = -276.226$, significant at 1%, which indicates that the regulation changes, as explained before, had a negative impact on Δt .

The signs of the estimates corresponding to the seasonal dummies, which have been introduced to capture seasonal effects, are consistent with the seasonal patterns observed in the data.

Equation 2 for UncoveredUnemployed (U_t) takes the following form:

$$\Delta U_t = C_2 + \alpha_2(A_{t-1} + \beta_1 U_{t-1}) + \delta_1^{(2)} C_{1t} + \delta_2^{(2)} C_{2t} + \gamma_1^{(2)} \Delta A_{t-1} + \gamma_2^{(2)} \Delta A_{t-2} + \gamma_3^{(2)} \Delta A_{t-3} + \theta_1^{(2)} \Delta U_{t-1} + \theta_2^{(2)} \Delta U_{t-2} + \theta_3^{(2)} \Delta U_{t-3} + \text{seasonal dummies} + U_{2t}$$

$\Delta = 1-L$, where L is the usual lag operator, that is $L_{xt} = x_{t-1}$

C_1 : change 1 and C_2 change 2.

U_t : white noise

α_2 : Adjustment coefficient for U_t .

This equation is estimated by the Maximum Likelihood (ML) method of Johansen (1988) and we obtain:

Equation 2: d_UncoveredUnempl

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	174.342	143.314	1.2165	0.2272	
d_Applications_1	0.431372	0.495061	0.8714	0.3860	
d_Applications_2	0.37728	0.482432	0.7820	0.4364	
d_Applications_3	-0.18238	0.450186	-0.4051	0.6864	
d_UncoveredUne	-0.0564673	0.113313	-0.4983	0.6195	
mpl_1					
d_UncoveredUne	-0.134685	0.116285	-1.1582	0.2500	
mpl_2					
d_UncoveredUne	-0.190877	0.113354	-1.6839	0.0959	*
mpl_3					
change1	-341.047	212.058	-1.6083	0.1115	
change2	-172.613	257.774	-0.6696	0.5049	
S1	922.161	276.462	3.3356	0.0013	***
S2	629.611	308.095	2.0436	0.0441	**
S3	215.495	334.093	0.6450	0.5207	
S4	-133.886	270.697	-0.4946	0.6222	
S5	-286.658	264.309	-1.0846	0.2812	
S6	-1166.43	285.619	-4.0839	<0.0001	***
S7	-760.858	332.564	-2.2879	0.0246	**
S8	-359.412	346.767	-1.0365	0.3029	
S9	869.038	374.378	2.3213	0.0227	**
S10	42.9927	363.386	0.1183	0.9061	
S11	-92.7899	307.445	-0.3018	0.7635	
EC1	-0.220364	0.350685	-0.6284	0.5314	

Mean dependent var	160.1887	S.D. dependent var	791.9503
Sum squared resid	24098175	S.E. of regression	532.4546
R-squared	0.634069	Adjusted R-squared	0.547968
rho	-0.028818	Durbin-Watson	2.041182

As expected, ΔU_t does not react to the error correction term, which along with the results corresponding to the first equation, seems to indicate that, even if U_t and A_t are cointegrated, it is A_t the variable which adjusts to the disequilibrium. This makes perfect sense: U_t moves freely while A_t adjusts to the behavior of U_t .

Also, $\hat{\delta}_1^{(2)}$ and $\hat{\delta}_1^{(2)}$ are not statistically significant. Obviously, changes of the RIS regulation did not affect U_t .

Otherwise, the signs of the estimates corresponding to the seasonal dummies, which have been introduced to capture seasonal effects, are consistent with the seasonal patterns observed in the data.

Once this model was estimated, we checked for further correlation in the residuals of the two equations. We found that the residuals are basically white noises. Therefore, the model prepared seems adequate.

5.5. Forecast

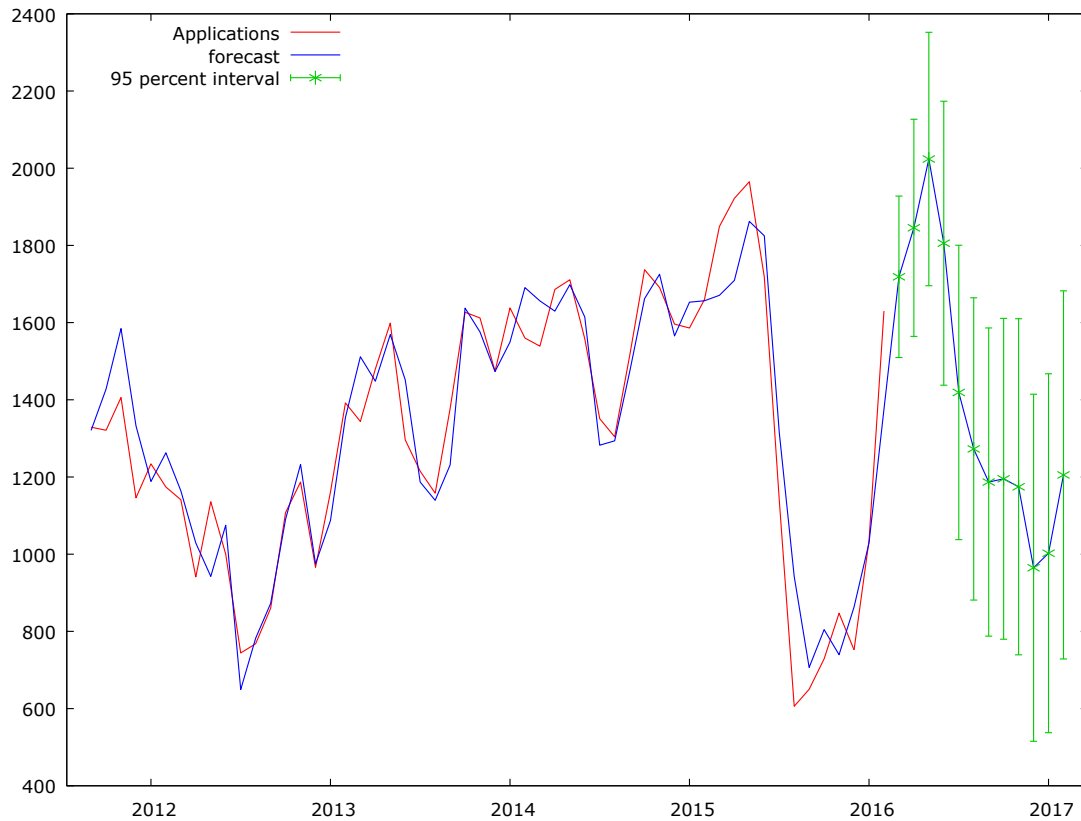
Finally, we use the model for forecasting RIS. The model we have prepared allows for a prediction of the number of Applications of RIS being modeled with its main determinant which is UncoveredUnemployed. The forecast is for period 2016:03 to 2017:03. The values are given in table 2 along with 95% confidence intervals.

Table 2: 12 months Applications (At) forecast for 95% confidence intervals (2016:03-2017:03)

Obs	prediction	std. error	95% interval
2016:03	1718.65	106.699	(1509.52, 1927.77)
2016:04	1845.60	143.513	(1564.32, 2126.88)
2016:05	2023.87	167.519	(1695.54, 2352.20)
2016:06	1805.66	187.680	(1437.81, 2173.50)
2016:07	1419.05	194.606	(1037.63, 1800.47)
2016:08	1272.73	199.783	(881.160, 1664.30)
2016:09	1186.92	203.693	(787.687, 1586.15)
2016:10	1195.30	212.053	(779.685, 1610.92)
2016:11	1174.59	222.158	(739.167, 1610.01)
2016:12	964.824	229.385	(515.238, 1414.41)
2017:01	1002.50	237.223	(537.548, 1467.44)
2017:02	1205.30	243.298	(728.447, 1682.16)
2017:03	undefined	undefined	

Graph 14 draws both, the observed and predicted values for Applications, with 95% error bars.

Graph 14: One year forecast for the variable Applications with a 95% confidence interval.



Only recently, and after this model had been estimated, the Social Services Department of the Government of Navarre, released the values of RIS Applications corresponding to periods 2016:03 and 2016:04. The corresponding value for March was 1741 which approximates our prediction (1719 units) considerably. The value for April was 1760.

The real values fall within our confidence interval reinforcing the usefulness of our model for forecast purposes.

Needless to say, the arrival of new data should have led to a reestimation of the model (incorporating that data) in a continuous fashion. Obviously, that is out of the scope of the present work.

6. CONCLUSION

One of the clearest facts regarding the actual economic crisis is the increase in social inequalities and its resulting risk for families in social exclusion. In this type of situations, the need for accessing to social protection systems deepens. In Navarre, the principal exclusion coverage system is the *Renta Inclusion Social (RIS)*.

At the beginning of the current socioeconomic crisis, most Uncovered Unemployed did not access to the *RIS* program as they still had other income sources i.e., savings, unemployment benefit, couple's income. However, due to the multiple situations of long term unemployment and precarious job contracts, today these people have exhausted their savings and present a real social need which is attended in Navarre through the *RIS*.

The *RIS* is the principal benefit of subjective right in Navarre and key element for the containment of socioeconomic deterioration processes. Apparently, the observed 2015 and first quarter of 2016 evolution of Household Units receiving *RIS* in Navarre, indicates that there has been an improvement in its coverage. Besides, the *RIS* is expected to keep on increasing in the coming months.

The main objective of this research was to accurately predict the number of Applications for *RIS* entering the Social Rights Department of the Government of Navarre, given its main determinant, which is Uncovered Unemployed. This prediction will serve as an extremely valuable budgetary instrument for this Department.

This task has been attained making use of a Vector Error Correction Model (VECM) modeling both series (Applications and UncoveredUnemployed) together. It allowed for a twelve months Applications forecast from March 2016 onwards.

Only recently, and after this model had been estimated, *RIS* Applications for March and April have been released by the Department. The real values fall within our confidence interval reinforcing the usefulness of our model for forecast purposes.

It is the first time that an econometric tool has been elaborated for the task of predicting and managing social aids in this public institution.

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Reference law

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