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"A COMPARATIVE STUDY ON SPANISH REGIONS' INVESTMENT CAPACITY IN A BUDGETARY DISCIPLINE ANTICIPATED SCENARIO, BY MEANS OF MULTICRITERIA PROMETHEE METHOD".

Authors:

ARÉVALO QUIJADA, M. T.: University of Seville and Fundación centrA:. Spain.
CASTRO NUÑO, M. M.: University of Seville and Fundación centrA:. Spain.
YÑIGUEZ OVANDO R.: University of Seville. Spain.

ABSTRACT

The principle of the budgetary discipline, compulsory for the Spanish regions by the Law 18/2001, December 12th [General Law of Budgetary Stability] and the Organic Law 5/2001, December 13th, complementary to the former one, established in the frame of the European Agreement for Stability and Growth, can generate conflicting situations with those Spanish regions which investment capacity depends on external borrowing.

This paper deals with the corresponding relative position of the different regions, according to its investment capacity, using for that purpose a simulation exercise, in which we advance the budgetary stability constraint for the period 1997-2000.

In this paper, the public financial activity is treated, for each region, through different public revenue and expenditure ratios per capita. This situation leads to consider a multicriteria Promethee method as the apropriate one to obtain a global ranking for all of them.

In the opinion of Al-Shemmeri, Al-Kloub and Rearman (1997), this method is the most adequate one because of the following advantages: public authorities, as decision takers, can understand easily the results, regardless the knowledge they may have about it; the method uses understandable economic parameters; the method avoids distorting scale effects among different alternatives and, as well, makes possible the deviation evaluation between alternatives and, finally, allows for sensibility analysis.

1. INTRODUCTION

The Stability and Growth Pact which was approved at the meeting of the European Union Council held in Amsterdam in June 1997, indicates fighting public deficit as the primordial economic policy objective of the states signing the pact.

This commitment forms part of the Spanish internal legal system, through the enactment of Law 18/2001, dated 12th December 2001, on General Budgetary Stability and its complementary Organic Law, extending the scope of the stability objective to the Territorial Administration sector.

Due to the fact that the Public Sector cannot incur public deficit, it must perform budgetary adjustments by either increasing taxes (which is not a particularly feasible option given the considerable existing tax pressure and the unpopular nature of this measure), or by reducing expenses, preferably capital expenses, since these are more flexible to reduce than current expenses[1].

As a result of the above, it seems likely there will be a conflict between the budgetary stability objective imposed by financial orthodoxy and investment potential in Public Administration, represented by capital expenses.

The present study has been conducted on the budgetary stability – investment capacity binomial of the 17 Autonomous Communities (CCAA) and the Autonomous Cities of Ceuta and Melilla (CDAA), based on the assumption of preparing for the zero deficit condition during a 4-year period (1997-2000), using the multi-criteria Promethee method in order to provide information on the relative situation of each of these regions within the scenario described.

To achieve the purpose indicated above, the study has been divided into the following sections: introduction, methodology, empirical analysis, conclusions, appendix including a net flows diagram and sensitivity analysis and references.

2. METHODOLOGY

2.1. Description of variables[2].

- PERSONNEL EXPENSES (PEX): Salaries paid by the Public Sector to civil servants and personnel recruited.
- CURRENT EXPENSES IN GOODS AND SERVICES (CEX): Expenses arising from exercising current activities in the Public Sector.

[1] De Haan et al (1996).
[2] Aggregate values: 1997-2000.

- FINANCIAL EXPENSES (FEX): Credits which are necessary to satisfy the financial burden of public liabilities.
- CURRENT TRANSFERS MADE (CTM): Non-compensated payments made for the purpose of financing current transactions.
- REAL INVESTMENT (RINV): Expenses used to create or acquire capital assets.
- CAPITAL TRANSFERS MADE (KTM): Non-compensated payments made for the purpose of financing capital transactions.
- DIRECT TAXATION (DITAX): Basically income and capital gains tax.
- INDIRECT TAXATION (INTAX): Basically sales tax.
- FEES, PUBLIC PRICES AND OTHER INCOME (FPP): Monetary compensation and income arising basically from the sale of public goods and services.
- CURRENT TRANSFERS RECEIVED (CTR): Non-compensated resources received by the Public Sector for financing current transactions.
- CAPITAL INCOME (KI): Income arising from public estate or capital income.
-DIVESTING OF EFFEECTIVE INVESTMENTS (DEINV): Income arising from the sale of public capital assets.
- CAPITAL TRANSFERS RECEIVED (KTR): Non-compensated resources received by the Public Sector for financing capital transactions.
-GROSS SAVINGS (GS): Current (Income – Expenses).
- CAPITAL BALANCE (KS): Capital (Income – Expenses).
- NON-FINANCIAL DEFICIT OR SURPLUS (DEF/SURP): GS + KS.
- CAPITAL EXPENSES FINANCED BY NET INDEBTEDNESS (KEfind): Capital transactions financed through the reduction of assets or the increase of financial liabilities.
- FINANCIAL SAVINGS (FS): Less financial expenses arising from budgetary balancing restrictions.
-REDUCTION IN CAPITAL EXPENSES UNDER BUDGETARY STABILITY (∇ KEbst): Reduction in capital transactions resulting from non-incurrence of debt.

The budgetary stability alternatives are:

- Increasing taxes, and/or,

- Reducing public expense, as defended by González-Páramo[3]. Basically, capital expenses are those most affected by cuts, due to reasons of political visibility[4] and because they are more flexible[5], compromising the productive capacity of the economic system.

In comparing the situation in which Spanish regions would find themselves within this hypothetical scenario, we are raising the issue of putting into some kind of order a series of alternatives (CCAA, CDAA) in the face of multiple criteria (Public Accounting ratios as defined in paragraph 2.3).

2.2. The Promethee method: a multicriteria decision system.

As we have said, in this work the public financial activity is treated, for each region, through different public revenue and expenditure ratios. This situation leads to consider a multicriteria Promethee method as the appropriated one to obtain a global ranking for all of them. In the opinion of Al-Shemmeri, Al-Kloub and Pearman[6], this method is the most adequate one because of the following advantages: public authorities, as decision takers, can understand easily the results, regardless the knowledge they may have about it; the method uses understandable economic parameters; the method avoids distorting scale effects among different alternatives and, as well, makes possible the deviation evaluation between alternatives and, finally, allows for sensibility analysis.

Actually, to decide in a multicriteria environment is difficult, because indeed most decision problems that arise in our daily life involve different often conflicting objectives that we try to satisfy simultaneously. In practice, this attempt is illusory and we have to consider best compromise solutions.

So in general, we consider multicriteria decision problems of the following type:

$$OPTIMIZAT \ \{g_1(a), g_2(a),..., g_j(a),..., g_k(a) / a \in M\}$$

A is a set of *n* possible decisions or alternatives (finite set: Autonomous Communities and the Autonomous Cities of Ceuta and Melilla) which are evaluated

[3] González-Páramo J. M. (2001).
[4] Oxley, H. and Martín, M. (1991)
[5] De Haan et al (1996).
[6] Al-Shemmeri, T., Al-Kloub, B. and Pearman, A., (1997).

through *k* criteria g_1, $g_{2..}$, g_k. The basic data for such a problem can be presented in a *evaluation matrix* that it gives the dominance relation, based on a unanimity principle, can be defined as follows:

$(a,b) \in A$ *a dominates b iff* $g_h(a) \geq g_h(b), \forall h = 1,2,...k.$ *(with at least one >).*

The non-dominated alternatives are called efficient (or Pareto optimal) solutions. In practice, the dominance relation is often very poor and the number of efficient solutions can be rather large. Indeed, it is clear that such data do not generally induce a complete ranking on the set A of alternatives. The problem is not mathematically well stated and the notion of optimal solution does not exist. However the problem is most often economically well stated as it expresses the different and possibly conflicting objectives of the decision maker. In order to provide the decision maker with a good assistance a particular multicriteria methodology must be considerate, called PROMETHEE (means: *Preference Ranking Organization Method for Enrichement Evaluations*).

The Promethee method (and its visual associated visual modelling: The GAIA plane), take into account all the necessary requisites for the most multicriteria models:

- The amplitude of the deviations between the evaluations of the alternatives are taken into account: $d_j(a,b) = g_j(a) - g_j(b)$.
- As the criteria are generally expressed in different units, the scaling effects are completely eliminated.
- When comparing a couple of alternatives *(a,b),* the multicriteria decision aid method, come to one of this conclusions:
  - *a* is preferred to *b* or *b* is preferred to *a*.
  - *a* and *b* are indifferent.
  - *a* and *b* are incomparable (this circumstance, allows the method to avoid to decide when insufficient information is available)[7].
- All the parameters have economical significance.
- We can obtain different results depending on the additional information by the decision maker.
- This method analyzes the conflicting aspects between the criteria. It is very important to have the opportunity to speak to the decision maker, to appreciate

[7] Incomparability between two alternatives appears when one alternative is good on some criteria and bad on others, while the opposite holds for the other alternative.

his/her preferences, and to have a clear interpretation of the weights of the criteria.

Then this requisite set, the Promethee method, in order to consider the deviations and the scales or the criteria, associates a *generalized criterion* to each criterion *g(.)*. For this objective, we define a preference function, which is obtained giving the degree or preference between alternatives for the decision maker. The generalized criterion associated, is defined by the following pair:

$\{g_j(.), P_j(.,.)\}$, where $P_j(a,b) = P_j\{d_j(a,b)\} \quad \forall a,b \in M$

$$0 \le P_j(a,b) \le 1$$

To facilitate the association the generalized criterion to each criterion, in the classic literature[8], there are six typical generalized criteria that are proposed to the decision maker. The choice is made interactively by the decision maker and the analyst according to their preference degrees.

When a generalized criterion has been associated to each criterion, we define, with all the criteria, a *multicriteria preference index* of *a* over *b*, like this[9]:

$$\pi(a,b) = \sum_{i=1}^{n} w_j P_j(a,b), \text{ with } \left(\sum_{i=1}^{n} w_j = 1\right),$$

Where: $w_j > 0$ $(j = 1,2,...,k)$, are weights associated to each criterion, according to its relative importance.

If we consider how each alternative *a*, is facing the *n-1* other ones, we can define the two following outranking flows:

1. *The positive outranking flow*: expresses how much each one is outranking all the others. The best alternative has the higher positive flow, because it represents its dominance power.

$$\phi^{+}(a) = \frac{1}{n-1}\sum_{b \in A}\pi(a,b)$$

2. *The negative outranking flow*: expresses how much each alternative is outranked by all the others. The best alternative has the smaller negative flow, so represents its weakness.

[8] Brans, J. P., (1984) (1986), Brans, J. P., and Vincke, P. H. (1985).

[9] $\pi(a,b)$ expresses how and which degree *a* is preferred to *b*, and $\pi(b,a)$ how *b* is preferred to *a*, over all the criteria.

$$\phi^{-}(a) = \frac{1}{n-1}\sum_{b \in A} \pi(b,a)$$

From the information about these positive and negative flows, we can deduce two natural rankings of the alternatives:

1. The PROMETHEE I PARTIAL RANKING:

   It is obtained from the pairwise comparisons and intersections:

   a is preferred to b $\Leftrightarrow$ $\begin{cases} \phi^{+}(a) > \phi^{+}(b) \text{ and } \phi^{-}(a) < \phi^{-}(b) \\ \phi^{+}(a) = \phi^{+}(b) \text{ and } \phi^{-}(a) < \phi^{-}(b) \\ \phi^{+}(a) > \phi^{+}(b) \text{ and } \phi^{-}(a) = \phi^{-}(b) \end{cases}$

   a and b are indifferent $\Leftrightarrow$ $\phi^{+}(a) = \phi^{+}(b) \text{ and } \phi^{-}(a) = \phi^{-}(b)$

   a and b are incomparable $\Leftrightarrow$ otherwise

2. The PROMETHEE II COMPLETE RANKING:

   It is the balance between the positive and negative outranking flows. The higher net flow is the better alternative.

   $$\phi(a) = \phi^{+}(a) - \phi^{-}(a)$$

   The complete ranking is defined by:

   a is preferred to b $\Leftrightarrow$ $\phi(a) > \phi(b)$

   a and b are indifferent $\Leftrightarrow$ $\phi(a) = \phi(b)$

   Let us notice there remain no incomparability but the resulting information is more disputable, because, a considerable part of the information is lost by considering the difference.

As we have said, the Promethee method allows obtaining an important part with graphical information about the conflicting character of the criteria and the impact of the weights of the criteria on the final results. This is called GAIA visual modelling method (*Geometrical Analysis for Interactive Assistance*), and provides such information. It complements the rather approach of the Promethee procedure with a descriptive and graphically oriented analysis.

The set of alternatives should be represented by n points in the k-dimensional space, but as the number of criteria is usually greater than two, it is impossible to have a

clear vision of these points. So, it is possible to define a plane in order to obtain a two dimensional representation of the alternatives. The GAIA plane is defined by vectors which represent the criteria in according by weights.

As few information as possible get lost by projection, so a measure of the quantity of information being preserved, is given by δ parameter (it represents a percentage of the total information about the problem).

About the GAIA plane interpretation, let us consider the projections of the unit vectors (of all the criteria) on the plane. These axes have different lengths and positions that mean a differentiation power of the criteria. The length of this vectors, is a measure of how much the criterion g_j differentiates the alternatives (the longer vector belongs to the more criterion differentiates the alternatives). When two criteria expressing the same preferences, their vectors are oriented approximately in the same direction; while conflicting criteria are represented by axes having opposite directions.

The projection on the plane of the different criteria in according to the assessed weights, allows a clear visualisation of the solution with the unit vector called *The Promethee decision axis:* π.If π is short, the Promethee decision axis has no strong decision power, so the unit vector is nearly orthogonal to the GAIA plane[10]. When this vector is long, the decision maker is invited to select the alternatives that are as far as possible in its direction.

Moreover, each alternative has a projection in the GAIA plane, too. It is represented by a point that if it is located in the direction of a particular criterion axis, is generally a good alternative on this criterion. When the distance between two projected alternatives is small, is because they both are similar alternatives for the decision maker. The best alternatives are located in the direction of the Promethee decision axis π.

The Promethee and GAIA methods have been implemented on personal computers, with several decision support systems. In this paper, we use the DECISION LAB 2000 program. This software allows obtaining a sensibility analysis about the results. A sensibility analysis is quite recommended before finalising the decision, because a modification or the assessed weights to the criteria can modify seriously the conclusions.

2.3. Criteria.

We have established three different economic groups in per capita terms:

[10] In this case, the criteria are conflicting and a good compromise should be selected near the origin.

a) Group I: Per capita Public Expense.

R1= PEX / Nº INHABITANTS

R2 = CEX / Nº INHABITANTS

R3 = FEX / Nº INHABITANTS

R4= CTM / Nº INHABITANTS

R5 = RINV / Nº INHABITANTS

R6 = KTM / Nº INHABITANTS

These ratios have a direct effect on budgetary stability, due to their direct relationship with the public deficit. In addition, R_5 and R_6 have a positive effect on the investment capacity.

b) Group II: Per capita Public Income

R7= DITAX / Nº INHABITANTS

R8 = INTAX / Nº INHABITANTS

R9 = FPP / Nº INHABITANTS

R10= CTR / Nº INHABITANTS

R11 = KI / Nº INHABITANTS

R12 = DEINV / Nº INHABITANTS

R13 = KTR / Nº INHABITANTS

These ratios have an inverse relationship to the deficit. R13 also has a direct relationship with the investment capacity.

c) Group III: Per capita stability

R14= GS / Nº INHABITANTS

R15 = DEF SURP / Nº INHABITANTS

R16 = KS / Nº INHABITANTS

R17= KEfind / Nº INHABITANTS

R18 = FS / Nº INHABITANTS

R19 = ∇ KEbst / Nº INHABITANTS

These ratios (and in particular R19), synthesise the effect of budgetary stability on investment capacity.

3. EMPIRICAL ANALYSIS.

3.1 Multicriteria analysis of public expense.

Table 1 shows the public expense data matrix. The Spanish regions are shown in rows and the public expense ratios in columns.

The most relevant ratios with higher weightings are indicated by means of an asterisk (*).

RATIOS	**R1**	**R2**	**R3**	**R4**	**R5 ***	**R6 ***
CRITERIA	min	min	min	min	max	max
ANDALUCÍA	3,51	0,92	1,16	3,7	32,48	1,18
ARAGÓN	1,54	0,32	0,2	2,26	5,11	0,92
ASTURIAS	0,88	0,29	0,14	0,88	3,79	1,25
BALEARES	1,24	0,7	0,13	0,58	3,5	0,61
CANARIAS	4,15	1,41	0,15	2,58	9,46	1,1
CANTABRIA	1,4	0,45	0,23	1,09	4,96	1,11
CAST-MANCHA	1,21	0,3	0,11	3,91	6,52	0,91
CAST-LEÓN	1,29	0,29	0,12	2,1	43,07	0,86
CATALUÑA	2,34	1,58	0,44	4,22	9,29	0,69
COM. VALENCIANA	2,96	0,61	0,26	2,57	7,19	0,7
EXTREMADURA	0,99	0,29	0,19	2,76	5,95	1,76
GALICIA	3,36	1,2	0,32	2,76	8,95	1,3
MADRID	1,15	0,43	0,22	1,21	3,64	0,52
MURCIA	1,19	0,21	0,18	1,13	3,39	0,83
NAVARRA	4,74	1,44	0,76	6,55	15,43	2
PAÍS VASCO	2,81	2,54	0,29	2,55	8,71	0,96
LA RIOJA	1,14	0,65	0,14	1,38	4,54	1,58
CEUTA	2,21	2,01	0,18	0,9	5,62	0,21
MELILLA	2,52	3,48	0,17	0,66	8,92	0,32

€ (1997). Prepared by the authors.

TABLE 1

R1 to R4 have been minimised, as they have a negative effect on gross savings and on the investment potential; R5 to R6 have been maximised due to their direct link with the investment capacity.

Table 2 shows the partial order based on incoming and outgoing preferential flows and the total resulting order of the net flow.

	$\phi+$	Ranking	$\phi-$	Ranking	ϕ	Ranking
ANDALUCÍA	0,5556	6	0,4444	6	0,1111	6
ARAGÓN	0,4762	11	0,5238	12	-0,0476	12
ASTURIAS	0,6349	4	0,3373	4	0,2976	4
BALEARES	0,3730	15	0,6270	16	-0,2540	16
CANARIAS	0,5476	7	0,4524	7	0,0952	7
CANTABRIA	0,5278	8	0,4722	8	0,0556	8
CAST-MANCHA	0,5119	10	0,4881	11	0,0238	11
CAST-LEÓN	0,6984	1	0,2778	1	0,4206	1

CATALUÑA	0,3373	16	0,6548	17	-0,3175	17
COM. VALENCIANA	0,3968	13	0,5952	14	-0,1984	14
EXTREMADURA	0,6468	3	0,3214	2	0,3254	3
GALICIA	0,5119	10	0,4722	9	0,0397	10
MADRID	0,3135	1 8	0,6786	19	-0,3651	19
MURCIA	0,4087	12	0,5635	13	-0,1548	13
NAVARRA	0,5833	5	0,4167	5	0,1667	5
PAÍS VASCO	0,5238	9	0,4762	1 0	0,0476	9
LA RIOJA	0,6667	2	0,3294	3	0,3373	2
CEUTA	0,3294	17	0,6670	18	-0,3373	18
MELILLA	0,3770	14	0,6230	15	-0,2460	15

Prepared by the authors.

TABLE 2

Extremadura and La Rioja are not comparable, since their partial orders alternate with each other, something which also occurs with Galicia and the Basque Country.

The total order puts Castilla-León first, followed by La Rioja, with Madrid last in the classification. Most of the regions with high levels of powers already transferred are among the first ten.

3.2. Public income.

The following chart shows the income ratios (R7-R13) by columns.

The most relevant ratios with higher weightings are indicated by means of an asterisk (*).

RATIOS	**R7**	**R8**	**R9**	**R10**	**R11**	**R12***	**R13***
CRITERIA	max	max	max	max	max	min	max
ANDALUCÍA	117,92	399,32	260,52	8.015,01	34,13	9,52	1.146,15
ARAGÓN	804,03	421,41	335,77	3.169,62	60,59	20,01	527,14
ASTURIAS	704,33	372,03	287,99	1.589,20	24,44	125,66	1.130,37
BALEARES	922,32	1.086,86	250,00	1.597,52	11,17	0,33	375,13
CANARIAS	525,91	1.887,36	565,29	5.821,20	33,18	43,24	809,55
CANTABRIA	753,88	647,32	192,13	2.321,57	17,54	12,93	1.077,17
CAST- MANCHA	96,50	333,79	228,36	5.126,94	36,55	65,33	976,05
CAST- LEÓN	574,36	337,77	280,39	3.264,20	23,30	69,91	904,61
CATALUÑA	1.017,73	743,61	379,65	6.977,08	44,15	88,12	240,92
COM. VALENCIANA	661,89	694,22	505,26	5.146,02	46,28	36,16	425,94
EXTREMADURA	131,38	220,65	234,88	4.529,04	55,20	91,81	1.559,23
GALICIA	522,63	337,06	259,37	7.069,53	17,44	77,81	899,04
MADRID	1.134,60	942,32	261,58	1.145,12	52,97	120,73	250,42
MURCIA	480,40	506,60	288,11	2.097,90	20,00	17,72	631,24
NAVARRA	6.899,89	7.953,95	436,44	419,96	182,89	73,41	298,28
PAÍS VASCO	0,00	16,14	121,84	9.571,24	64,76	22,16	181,72
LA RIOJA	811,45	561,25	409,06	2.952,96	25,37	138,99	525,50
CEUTA	222,83	3.604,46	195,50	1.921,66	39,48	1,43	15,33
MELILLA	233,81	5.635,10	254,86	1.350,80	21,25	106,18	268,06

€ (1997). Prepared by the authors.

TABLE 3

All the ratios are maximised due to their positive relationship with the two objectives, except for R12, which shows a reduction in the investment capacity.

Table 4 shows the partial and total orders obtained.

	$\phi+$	Ranking	$\phi-$	Ranking	ϕ	Ranking
ANDALUCÍA	0,6917	1	0,3083	1	0,3833	1
ARAGÓN	0,6278	3	0,3722	3	0,2556	3
ASTURIAS	0,4361	14	0,5639	15	-0,1278	14
BALEARES	0,5444	7	0,4556	7	0,0889	7
CANARIAS	0,6417	2	0,3583	2	0,2833	2
CANTABRIA	0,5944	5	0,4056	5	0,1889	5
CAST- MANCHA	0,4750	12	0,5250	12	-0,0500	12
CAST- LEÓN	0,5028	9	0,4972	9	0,0056	9
CATALUÑA	0,4806	11	0,5194	11	-0,0389	11
COM. VALENCIANA	0,6056	4	0,3944	4	0,2111	4
EXTREMADURA	0,4944	10	0,5056	10	-0,0111	10
GALICIA	0,4389	13	0,5611	14	-0,1222	13
MADRID	0,3694	18	0,6306	18	-0,2611	18
MURCIA	0,5278	8	0,4722	8	0,0556	8
NAVARRA	0,5556	6	0,4444	6	0,1111	6
PAÍS VASCO	0,3750	17	0,6250	17	-0,2500	17
LA RIOJA	0,4056	16	0,5944	16	-0,1889	16
CEUTA	0,4472	15	0,5528	13	-0,1056	15
MELILLA	0,2861	19	0,7139	19	-0,4278	19

Prepared by the authors.

TABLE 4

Andalucia occupies the first position and Melilla the last. Despite the fact that it is fully autonomous in financial terms, the Basque Country is last but one, with a negative net flow due to its weakness as compared to the other regions.

3.3. Budgetary stability.

Table 5 shows the variables most directly linked to budgetary stability.

The most relevant ratios with higher weightings are indicated by means of an asterisk (*).

RATIOS	**R14**	**R15**	**R16**	**R17 ***	**R18**	**R19 ***
CRITERIA	max	max	max	min	max	min
ANDALUCÍA	433,55	-6,59	-440,14	36,03	3,64	32,40
ARAGÓN	661,15	-68,19	-729,12	104,52	9,21	95,31
ASTURIAS	763,94	-179,08	-943,02	179,08	23,39	155,68
BALEARES	1.047,38	61,66	-985,72	13,40	3,41	10,00
CANARIAS	839,69	44,39	-795,30	7,22	1,83	5,39
CANTABRIA	980,95	-61,18	-1.042,13	103,47	6,31	97,15
CAST-MANCHA	635,02	-44,67	-679,68	44,67	5,59	39,07
CAST-LEÓN	636,27	24,49	-611,78	15,82	2,26	13,56
CATALUÑA	404,97	-47,00	-451,97	17,30	12,16	5,14
COM. VALENCIANA	245,73	-528,86	-774,58	528,86	54,27	474,58

EXTREMADURA	757,81	12,65	-745,16	58,20	0,00	58,20
GALICIA	708,34	-81,16	-789,50	81,16	16,76	64,39
MADRID	518,69	-14,31	-533,00	24,29	5,62	18,67
MURCIA	626,24	3,48	-622,77	8,50	2,04	6,46
NAVARRA	3.004,73	475,17	-2.529,56	0,00	0,00	0,00
PAÍS VASCO	1.655,82	529,18	-1.126,65	21,65	5,70	15,94
LA RIOJA	935,72	-230,18	-1.165,90	242,71	6,86	235,86
CEUTA	1.030,25	680,02	-350,17	0,00	0,00	0,00
MELILLA	1.141,60	-119,19	-1.260,87	392,59	17,61	374,98

€ (1997). Prepared by the authors.

TABLE 5

The variables directly related to the objectives pursued are maximised (R14, R15, R16 and R18) and R17 and R19 are minimised as a result of their inverse relationship.

Table 6 shows the partial and total orders.

	$\phi+$	Ranking	$\phi-$	Ranking	ϕ	Ranking
ANDALUCÍA	0,5000	10	0,5000	10	0,0000	10
ARAGÓN	0,3750	13	0,6250	14	-0,2500	14
ASTURIAS	0,3264	15	0,6736	16	-0,3472	16
BALEARES	0,6597	4	0,3403	4	0,3194	4
CANARIAS	0,6736	3	0,3264	3	0,3472	3
CANTABRIA	0,3611	14	0,6389	15	-0,2778	15
CAST-MANCHA	0,4514	11	0,5486	11	-0,0972	11
CAST-LEÓN	0,6111	8	0,3889	8	0,2222	8
CATALUÑA	0,6528	5	0,3472	5	0,3056	5
COM. VALENCIANA	0,1875	18	0,8125	19	-0,6250	19
EXTREMADURA	0,4097	12	0,5764	12	-0,1667	12
GALICIA	0,4097	12	0,5903	13	-0,1806	13
MADRID	0,5278	9	0,4722	9	0,0556	9
MURCIA	0,6250	7	0,3750	7	0,2500	7
NAVARRA	0,7083	2	0,2500	2	0,4583	2
PAÍS VASCO	0,6319	6	0,3681	6	0,2639	6
LA RIOJA	0,2431	17	0,7569	18	-0,5139	18
CEUTA	0,8194	1	0,1389	1	0,6806	1
MELILLA	0,2778	16	0,7222	17	-0,4444	17

Prepared by the authors.

TABLE 6

Ceuta is in first position, followed by Navarre and the Canary Islands, and Melilla, La Rioja and the Community of Valencia are among the last.

3.4. Ratio samples.

The most relevant ratios for the study objectives have been selected: R5, R6, R12, R13, R15, R17 and R19.

The most relevant ratios with higher weightings are indicated by means of an asterisk (*).

RATIOS	**R5***	**R6***	**R12***	**R13***	**R15**	**R17***	**R19***
CRITERIA	max	max	min	max	max	min	max
ANDALUCÍA	32,48	1,18	9,52	1.146,15	-6,59	36,03	32,40
ARAGÓN	5,11	0,92	20,01	527,14	-68,19	104,52	95,31
ASTURIAS	3,79	1,25	125,66	1.130,37	-179,08	179,08	155,68
BALEARES	3,50	0,61	0,33	375,13	61,66	13,40	10,00
CANARIAS	9,46	1,10	43,24	809,55	44,39	7,22	5,39
CANTABRIA	4,96	1,11	12,93	1.077,17	-61,18	103,47	97,15
CAST- MANCHA	6,52	0,91	65,33	976,05	-44,67	44,67	39,07
CAST- LEÓN	43,07	0,86	69,91	904,61	24,49	15,82	13,56
CATALUÑA	9,29	0,69	88,12	240,92	-47,00	17,30	5,14
COM. VALENCIANA	7,19	0,70	36,16	425,94	-528,86	528,86	474,58
EXTREMADURA	5,95	1,76	91,81	1.559,23	12,65	58,20	58,20
GALICIA	8,95	1,30	77,81	899,04	-81,16	81,16	64,39
MADRID	3,64	0,52	120,73	250,42	-14,31	24,29	18,67
MURCIA	3,39	0,83	17,72	631,24	3,48	8,50	6,46
NAVARRA	15,43	2,00	73,41	298,28	475,17	0,00	0,00
PAÍS VASCO	8,71	0,96	22,16	181,72	529,18	21,65	15,94
LA RIOJA	4,54	1,58	138,99	525,50	-230,18	242,71	235,86
CEUTA	5,62	0,21	1,43	15,33	680,02	0,00	0,00
MELILLA	8,92	0,32	106,18	268,06	-119,19	392,59	374,98

€ (1997). Prepared by the authors.

TABLE 7

All the ratios proposed are maximised due to their positive effect on the investment capacity and on budgetary discipline, with the exception of R12 and R17, since they show a reduction in the investment capacity and an increase in budgetary imbalance, respectively.

The orders obtained are shown below.

	$\phi+$	Ranking	$\phi-$	Ranking	ϕ	Ranking
ANDALUCÍA	0,7422	2	0,2578	2	0,4844	2
ARAGÓN	0,4111	14	0,5889	14	-0,1778	15
ASTURIAS	0,3600	15	0,6400	15	-0,2800	16
BALEARES	0,5133	10	0,4867	10	0,0267	11
CANARIAS	0,7156	3	0,2844	3	0,4311	3
CANTABRIA	0,5111	11	0,4889	11	0,0222	12
CAST- MANCHA	0,5067	12	0,4933	12	0,0133	13
CAST- LEÓN	0,6511	4	0,3489	4	0,3022	5
CATALUÑA	0,4689	13	0,5311	13	-0,0622	14
COM. VALENCIANA	0,2844	18	0,7156	19	-0,4311	18
EXTREMADURA	0,5689	5	0,4311	6	0,1378	6
GALICIA	0,5156	9	0,4844	9	0,0311	10
MADRID	0,2689	19	0,7311	18	-0,4622	19
MURCIA	0,5400	7	0,4600	7	0,0800	8
NAVARRA	0,7467	1	0,2356	1	0,5111	1
PAÍS VASCO	0,5356	8	0,4644	8	0,0711	9
LA RIOJA	0,2867	17	0,7133	17	-0,4267	17
CEUTA	0,5556	6	0,4267	5	0,1289	7

MELILLA	0,3000	16	0,7000	16	0,4000	4

Prepared by the authors.

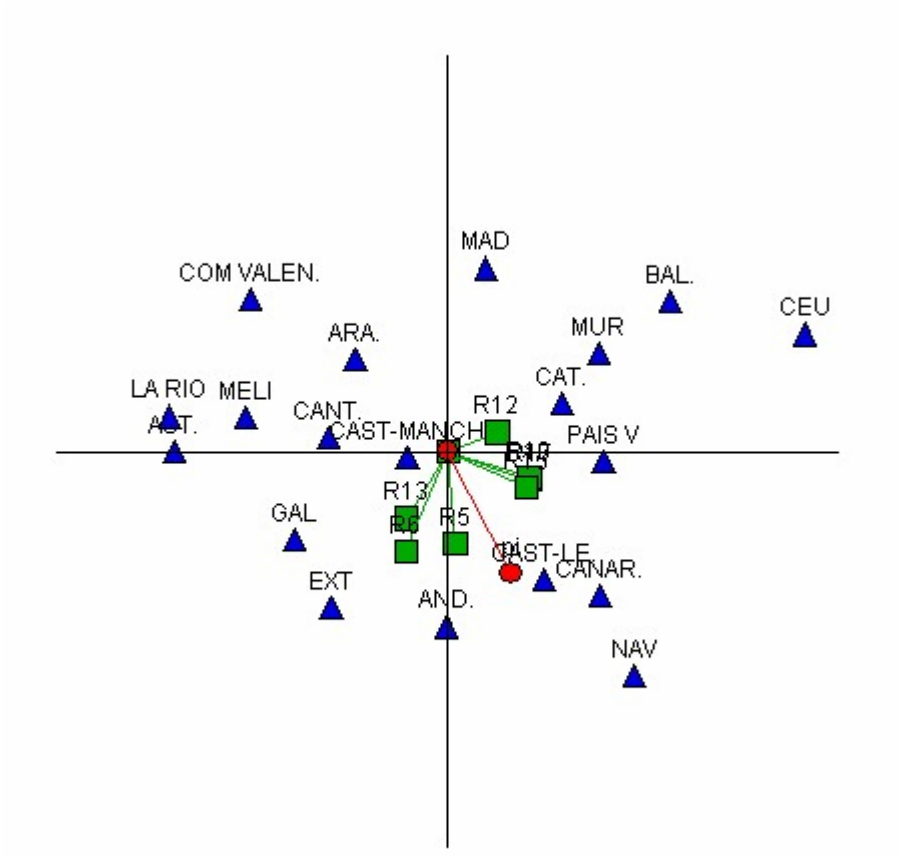
TABLE 8

Extremadura and Ceuta are not comparable, since their partial orders alternate with each other. Madrid and the Community of Valencia are the worst-positioned, due to the considerable effort made by both regions in investment and their greater sacrifice in achieving budgetary stability

Navarra is in first place (due to the fact that it is fully autonomous in financial terms), together with Andalucia.

4. CONCLUSIONS

The GAIA figure shows the results of the analysis made in the previous paragraph.



The vectors of criteria R15, R17 and R19 are overlapping, and thus have the same discriminatory effect on the alternatives. R6, R12 and R13 are more conflictive, since the angle formed by their vectors is the widest.

Axis π confirms the fact that the Community of Valencia is the worst-positioned (furthest away in the opposite direction) and Navarra is the best (as it is furthest away but in the same direction).

APPENDIX

The flow figures showing the analyses made and the sensitivity tests for each one are shown below, for the purpose of checking the reliability and stability of the solutions.

SENSIVITY TEST FOR EXPENSE RATIOS

RATIOS	STABILITY INTERVAL		
	Max. (%)	Weight (%)	Min.(%)
R1	8,24	7,14	5,80
R2	15,15	14,29	13,64
R3	7,65	7,14	4,88
R4	15,37	14,29	13,25
R5	29,41	28,57	28,10
R6	29,58	28,57	27,08

SENSIVITY TEST FOR INCOME RATIOS

RATIOS	STABILITY INTERVAL		
	Max. (%)	Weight (%)	Min.(%)
R7	10,53	10,00	9,40
R8	10,69	10,00	9,09
R9	10,99	10,00	9,17
R10	11,21	10,00	9,65
R11	10,89	10,00	8,99
R12	26,34	25,00	24,24
R13	25,62	25,00	23,81

SENSIVITY TEST FOR BUDGETARY STABILITY RATIOS

RATIOS	STABILITY INTERVAL		
	Max. (%)	Weight (%)	Min.(%)
R14	14,50	12,50	11,71
R15	15,66	12,50	11,11
R16	13,48	12,50	9,90
R17	27,27	25,00	20,00
R18	13,27	12,50	10,64
R19	28,00	25,00	18,92

SENSIVITY TEST FOR RATIO SAMPLES

RATIOS	STABILITY INTERVAL		
	Max. (%)	Weight (%)	Min.(%)
R5	16,56	16,00	15,69
R6	16,33	16,00	15,74

R12	16,28	16,00	14,86
R13	16,37	16,00	15,63
R15	4,35	4,00	3,57
R17	16,42	16,00	15,63
R19	16,48	16,00	15,63

The solutions presented are stable, since the weightings assigned are at the intermediate point of the stability interval.

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FIGURE OF EXPENSES OUTRANKING FLOWS

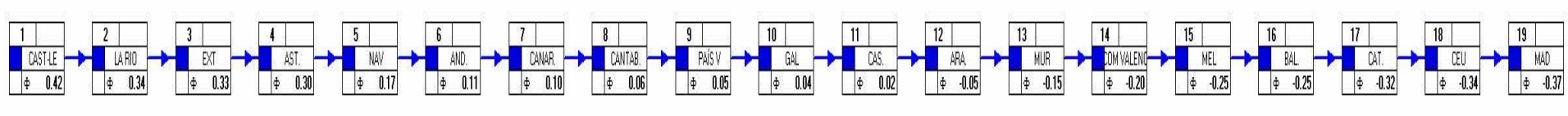

FIGURE OF INCOME OUTRANKING FLOWS

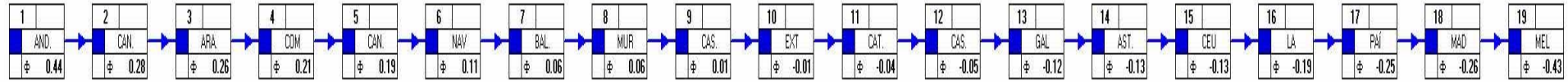

FIGURE OF BUDGETARY STABILITY OUTRANKING FLOWS

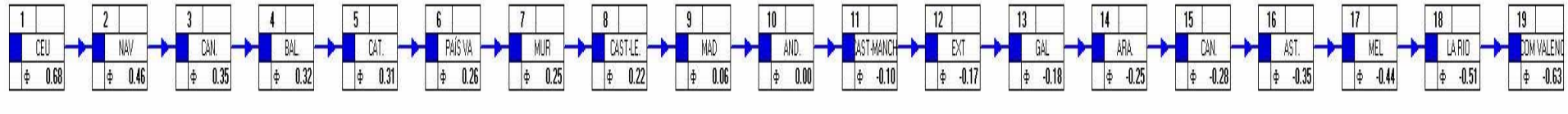

FIGURE OF A RATIO SAMPLES OTURANKING FLOWS