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"Procedure to compose the information about regional economic situation: empirical illustration for a small regional economy"

Abstract

The methodologies for the construction of business cycle indicators when modeling regional economies, are not exactly the same as the ones used at national level. The available information is more limited at regional level, and the basic methodology at national level must be supplemented taking into account the characteristics of each particular region. In this work, we expose the main steps in the methodology to build regional economic indicators. In particular, we are specially focused on a specific step which combines the information about the regional economic situation into a composite coincident indicator. Finally, an empirical illustration in a small regional economy allows us to obtain several conclusions.

1. INTRODUCTION.

The level II of the nomenclature of territorial units for statistics (NUTS) divides the territory of the European Union in 206 regions. At the level II of the NUTS, there are regional account updates which are excessively behind, and it is necessary to obtain predictions about the evolution of the regional activity. Also, there aren't quarterly regional accounts and the evolution of the growth of the regional economic activity is unknown. Thus, this work deals with the quarterly forecasting in this type of regions, which are facing similar problems to the ones this work is approaching: difficulties to unify the published data into a consistent data base which makes the data base quality rather poor in some cases (collecting data from some regions is not an easy matter: it includes problems like discontinuities, base changes, changes in definitions and the lack of both deflactors and demand series of the regional data). This positioning is important in order to explain the orientation of this work, since mainly due to statistical reasons, the methodologies for the construction of business cycle indicators, when modeling regional economies, are not exactly the same as the ones used at national level. So, it is not possible, nowadays, to face the construction of regional business cycle indicators succesfully by following the procedures established by the National Bureau of Economic Research (NBER). Besides, in the case of regional economies, there are different perspectives because the problem of instability becomes even more acute than in the case of a national economy. In fact, the impact of external or internal shocks is much greater than for the country as a whole, and it is more difficult to explain the visual patterns which are referred to as "cycles". The small size of these economies causes that the impact of suprarregional or regional shocks are greater. Therefore, in this context, the empirical aim should consist of trying to show the expansions and constractions in the growth cycle (because the regional account updates are excessively behind, and it is important to know in the short term the evolution of the regional economy). Thus, we want to investigate the growth cycle for a regional economy in the SW of Spain, Extremadura, with the goal of describing its recent quarterly evolution (we didn't focus upon the "classical cycle" in the levels of regional economic activity).

The regional economy of Extremadura is of a less magnitude than the overall national economy (Spain), around 1,8%. During the analysis period (1986-1995), Extremadura had a population of approximately 1 million (about 2,7% of the Spanish population, whereas this region occupies an 8,2% of the Spanish territory). It produces 1,8% of the gross added value (which we will represent as *GAV*) of the Spanish economy: Extremadura is definitely a small regional economy. Graph 1 shows the growth rates of the gross added value in constant pesetas for both Spain (*RGAVES*) and Extremadura (*RGAVEX*). This rate in the economy of Extremadura during this analysis period presented more instability for Extremadura than for Spain itself. So, the yearly reference series that we selected to represent the economic activity in Extremadura (see Márquez (1998)) was the gross added value (excluded agriculture and energy branches) at market prices in 1986 constant pesetas (*GNAEEX*).

Graph 1: Growth rate of the gross added value in constant pesetas for Spain (RGAVES) and Extremadura (RGAVEX) and growth rate of the gross added value (excluding agriculture and energy branches) in constant pesetas for Extremadura (RGNAEEX).

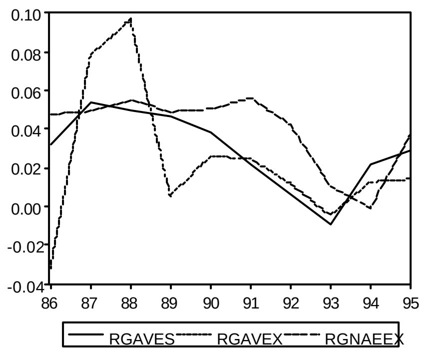


Table 1 provides detailed data about the internal percentage structure for both Spain and Extremadura (1986-1995); it showed a supply-side sectoral disaggregation, specifically, the regional production gets divided into six economic sectors: agriculture, energy, manufacturing industries, construction, sale-oriented services and non-sale-oriented services. These structures are very different, and we want to emphasize the structural differences between Spain and Extremadura as the lack of deflactors for the regional GAV in Extremadura compels us to use "proxies" coming from the national branches, and the different structures are causing important bias.

TABLE 1. Mean internal percentage structure in Spain and Extremadura: results by branches.

BRANCHES	**SPAIN**	**EXTREMADURA**
AGRICULTURE	5,39%	12,65%
ENERGY	5,98%	11,66%
CONSTRUCTION	7,82%	11,07%
MANUFACTURING INDUSTRY	23,93%	7,86%
SALE-ORIENTED SERVICES	43,09%	35,83%
NON-SALE-ORIENTED SERVICES	13,81%	20,98%

Consequently, the endogenous variables to be explained (and forecasted) are given by the production of manufacturing industries, construction, sale-oriented services and non-sale-oriented services sectors, measured by the gross value added at market prices in 1986 constant pesetas (excluding agriculture and energy branches) for Extremadura (*GNAEEX*). The variable used in this work consists of official data from the National Statistics Institute (INE); but as we are aware of the importance of using both correct deflactors and variables, we worked with three data bases to compare the obtained results: Hispalink (1999), Hispalink (2000) and Cordero y Gayoso (1997) data bases. In particular, all variables referring to gross added value at market prices in 1986 constant pesetas by regional sectors were obtained from the mentioned data bases. In general, the data that are to be used cover 1986 to 1996 (except in the case of Cordero and Gayoso (1997), where we used 1986 to 1995 (as the last year which is available). The difference between these data bases are: a) Cordero and Gayoso (1997) data base consists of official data from the National Statistics Institute (INE, base 1986), and the use of their own deflactors: the main contribution of this data base is the development of sectoral GAV series in constant pesetas for Extremadura. b) Hispalink (1999) and Hispalink (2000) data bases consist of official data from the National Statistics Institute but the former is base 1986 and the latter is base 1995. These bases use the sectoral national deflactors with 17 branches as the sectoral regional deflactors, which could cause bias in the case of Extremadura because it has a different economic structure.

The rest was constructed from different sources of regional or national statistical information[1], although the length of the series is reduced in some sectors due to the nonexistence of observations for several quarters at the beginning of the period under consideration.

The work is organized as follows. Section 2 gives details of the basic methodology concerning the construction of business cycle indicators at national level that serves as the basis for an empirical work in Extremadura, and it shows some difficulties to apply it: this empirical work is conditioned by the limitations of the statistical information available in Extremadura.

In Section 3 we expose the main steps in the methodology to build regional economic situation growth indicators, and we apply it. Certain conclusions that can be drawn from the empirical illustration carried out in Section 3 are gathered in Section 4.

2. METHODOLOGY USED AT NATIONAL LEVEL.

The main steps in the methodologies for the construction of business cycle indicators when modeling regional economies are (see Jacobs (1998, p. 56)):

1.”selecting a reference series that represents the business cycle: usually gross domestic production or a variety thereof;

2.selecting macroeconomic variables that might contain information on business cycles and gather time series for these basic series

3.smoothing and filtering all time series to derive cyclical patterns, (…);

4.comparing the cyclical patterns in the basic series to the cyclical pattern in the reference series, (…);

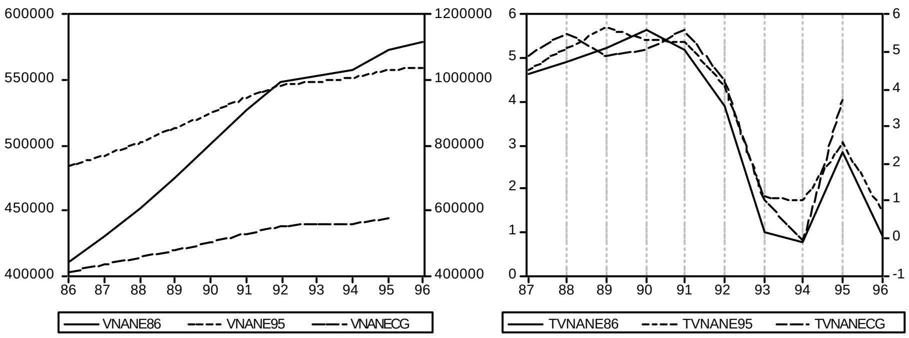
5.grouping the basic series into three classes: leading, coincident and lagging series;

6.equalizing phase differences in leading series by taking lags; and

7.constructing one composite leading indicator as a weighted average of the selected leading series”.

The first problem is that we don’t have of a quaterly GNAEEX; so we must estimate regional gross added values quaterly (excluding agriculture and energy branches) at market prices in 1986 constant pesetas for Extremadura (which are obtained from the mentioned data bases and represented in Graph 2).

Graph 2: Gross added values (excluded agriculture and energy branches) at market prices in 1986 constant pesetas for Extremadura: VNANE86 (Hispalink (1999)), VNANE95 (Hispalink (2000)) and VNANECG (Cordero and Gayoso(1997)). Growth rate of the gross added values: TVNANE86 (Hispalink (1999)), TVNANE95 (Hispalink (2000)), and TVNANECG (Cordero and Gayoso(1997)).



The method of estimation of quaterly regional account series was Chow-Lin (1971), which incorporate indicators in the context of regression analysis: the unknown quaterly observations of the series of interest are linearly related to the indicators (with a quaterly frequency). We part from the econometric estimation of a relation between the yearly GAV series and the yearly indicators (these have previously been selected and they originally have a quarterly or a monthly periodicity). This estimation makes possible to obtain the quarterly values of the GAV, using the quarterly indicators as “input”. Here is briefly exposed the above mentioned method.

Let $y = X\beta + u$ be a multiple regression model, where the unknown quaterly GAV (y) are linearly related to the quaterly indicators (a k vector X), β is a vector of unknown parameters, and u is the vector of disturbances of the model, which is normally distributed with mean zero and a covariance matrix V.

As the addition of the four quarters for every year must be equal to the yearly quantity y_a (constraint of annual consistency), this implies the use of a aggregation matrix B, which allows to obtain the yearly model: $y_a = B'y = B'X\beta + B'u$. In this model, the perturbance term $B'u$ is a vector with mean zero (null vector) and covariance matrix $V_a = B'VB$. With respect to the B matrix, it is defined as:

$$B^{/} = \begin{bmatrix} f & 0 & \dots & 0 \\ 0 & f & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & f \end{bmatrix};$$ where $f = \left(\frac{1}{4} \quad \frac{1}{4} \quad \frac{1}{4} \quad \frac{1}{4} \right)$, as the goal is to estimate unknown quarterly observations of a type "*stock*" series.

The best linear unbiased estimator of y (which we denote as $\hat{y}$) is given by: $\hat{y} = X\,\hat{b} + VBV_a^{-1}B^{/}\,\hat{u}$; where , $\hat{b}$ is the generalized least squares (GLS) estimator of de b in the yearly model, and its expression is: $\hat{b} = \left(X^{/}BV_a^{-1}B^{/}X \right)^{-1} X^{/}BV_a^{-1}Y$. On the other hand, $B^{/}\,\hat{u}$ denotes the residual vector which is obtained from $B^{/}\,\hat{u} = Y - \hat{Y} = Y - B^{/}X\,\hat{b}$. Consequently, the estimator of the quarterly gross added value is given by:

$$\hat{y} = X\,\hat{b} + VBV_a^{-1}B^{/}\,\hat{u} = X\,\left(X^{/}BV_a^{-1}B^{/}X \right)^{-1} X^{/}BV_a^{-1}Y$$
$$+VBV_a^{-1}\left(Y - B^{/}X\,\left(X^{/}BV_a^{-1}B^{/}X \right)^{-1} X^{/}BV_a^{-1}Y \right)$$

In this work the estimation of quarterly sectoral gross added value uses the information which provides, in each sector, only one trend-cycle synthetic indicator (sectoral synthetic indicators for the economic activity level, seasonally adjusted and removed of irregular components). Also, we have assume that the covariance matrix of dsturbances of the quarterly model behaves as an AR(1) process.

Next we are relating in detail the selected economic indicators in order to compose each sectoral synthetic indicator. Respect to the manufacturing industry sector, the selected partial indicators are: the number of employees in the manufacturing industry, the industrial production indices for that industry in Extremadura, and the amount of registration numbers of goods vehicles.

For the construction sector, the selected partial indicators were: number of employees in this sector, total endorsed projects and cement consumption.

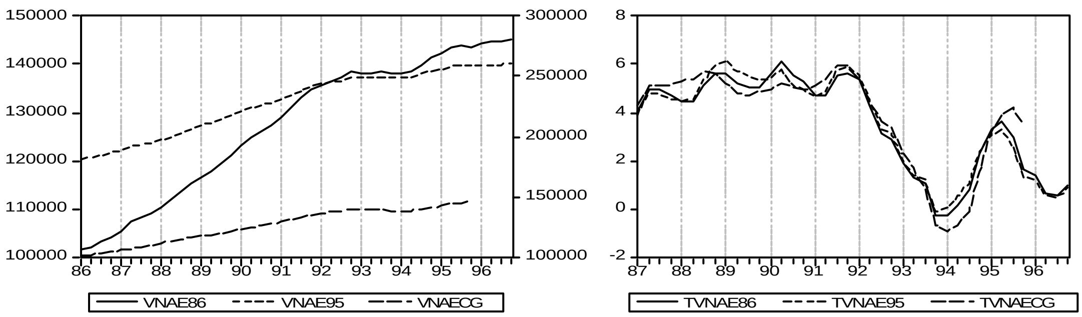
Regarding the sale services, here are the indicators of the synthetic index: number of employees in sale services, consumption of electricity in industry and services in Extremadura, consumption of electricity for household purposes, number of credits granted to the private sector (in constant pesetas) and the amount of registration numbers of cars.

Lastly, the synthetic indicator for the non-sale service sector in Extremadura consists of: number of employees for the non-sale service sector, credits granted to the public sector (in constant pesetas) and amount of registration number of cars.

Once selected the indicators to be part of the sectoral synthetic indicators, the trend-cycle "signal" has been obtained for each indicator. Signal is defined as the stochastic trend-cycle component of each partial indicator. In order to estimate the signals of each series, a procedure based on models was followed; particulary, the model ARIMA of each series (reduced method). The estimates have been made using the program SEATS, developed by Gómez and Maravall (1997). Once that procedure was applied in each one of the selected partial indicators, an estimation of the trend-cycle series for each partial indicator was obtained. Thus, we already have the signals of the different partial indicators, where these are the elements added, in a sectoral way, using the procedure based on the distance DP2 (which we are going to expose later).

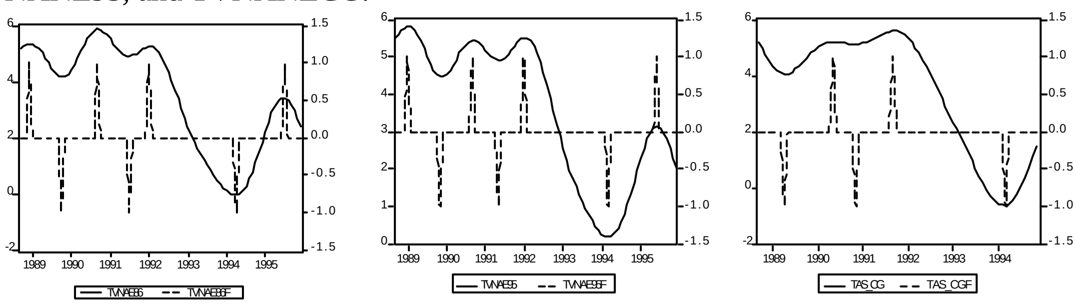
The application of such methodology provides the quarterly sectoral values; and the addition of the quarterly sectoral estimates allows us to obtain the quaterly gross added value (excluding agriculture and energy branches) for each of the three data bases used (see Graph 3).

Graph 3: Quaterly gross added values (excluding agriculture and energy branches) at market prices in 1986 constant pesetas for Extremadura: VNANE86 (Hispalink(1999)), VNANE95 (Hispalink(2000)) and VNANECG (Cordero and Gayoso(1997)). Growth rate of the quaterly gross added values: TVNANE86 (Hispalink (1999)), TVNANE95 (Hispalink (2000)), and TVNANECG (Cordero and Gayoso(1997)).



Once the quaterly accounts are obtained, the next step is the detection of the turning points (transition from a expansion phase to a constraction phase or viceversa). In order to proceed to the dating, the <F> program of detection of turning points, more detailed in Abad and Quilis (1994,1996), has been used. It is only applicable to monthly data, though. So, prior to the dating, it was necessary to interpolate the quarterly cyclic signals from the GAV figures and from the sectoral cyclic indicators. The interpolation program that was used, was created by Qulis and Abad, from the Statistic National Institute (INE) in 1997, taking as basic theory the works by Melis (1992) and Abad and Quilis (1996). Once that method of interpolation was applied, the cyclic dating was performed by using the <F> program, in which the turning points (max and min) are defined as *"those values of null tangent in the series of smoothed rates which are at least fifteen months away among them (if they are of the same signal), and which phases (number of months between two opposite-signal turning points) aren't under five months"* (Abad and Quilis (1996, p.72)). The results of the dated of the <F> program are shown in Graph 4.

Graph 4: Dated of the growth rate of the quaterly gross added values: TVNANE86, TVNANE95, and TVNANECG.



Although the three series in Graph 4 seems coincident, we used the technic of cyclical classification which accomplishes the <G> program (defined in Abad and Quilis(1994, 1996)), which allows to group the series into three categories: leading, coincident and lagging series. Table 2 shows these results.

Table 2. Results obtained from <G> program.

SERIE	Classification with respect to TVNANE86	Ry	Rx	DMG	IC	Sign
TVNANE95	Coincident	1	1	0.0	0.8554	+
TVNANECG	Coincident	1	1	-0.5	0.7831	+
	Classification with respect to TVNANE95	**Ry**	**Rx**	**DMG**	**IC**	**Sign**
TVNANECG	Coincident	1	1	-0.5	0.7349	+

Note: *nd* = the number of turning points with double relations (which is the same for both series); C_{TVNANE} = the whole of turning points of the reference series; C_{REX} = the whole of turning points in the series to be classified; n_i = the cardinal number of C_i , where *i* = *TVNANE, REX*.

Ry = nd/ n_{TVNANE} is the percentege of turning points classified of each reference series (interpolated data TVNANE); **Rx = nd/ n_{REX}** is the percentage of turning points which are classified for each series to be categorized (REX); if **Ry** and **Rx** are > 0.7, then REX and TVNANE are strongly related, if **Ry** or **Rx** are < 0,5, there is no cyclic relationship between REX and TVNANE; for the rest of possible cases, we can say that they are weakly related.

DMG is the median of the phase shifts of all the turning points. If DMG is in the range (-1 , 1), the indicator cycle is in phase with the Regional one; if DMG ≥ 1, the regional cycle is ahead of the indicator cycle (the indicator is behind), if DMG ≤ 1, the series of indicator is ahead of the regional one.

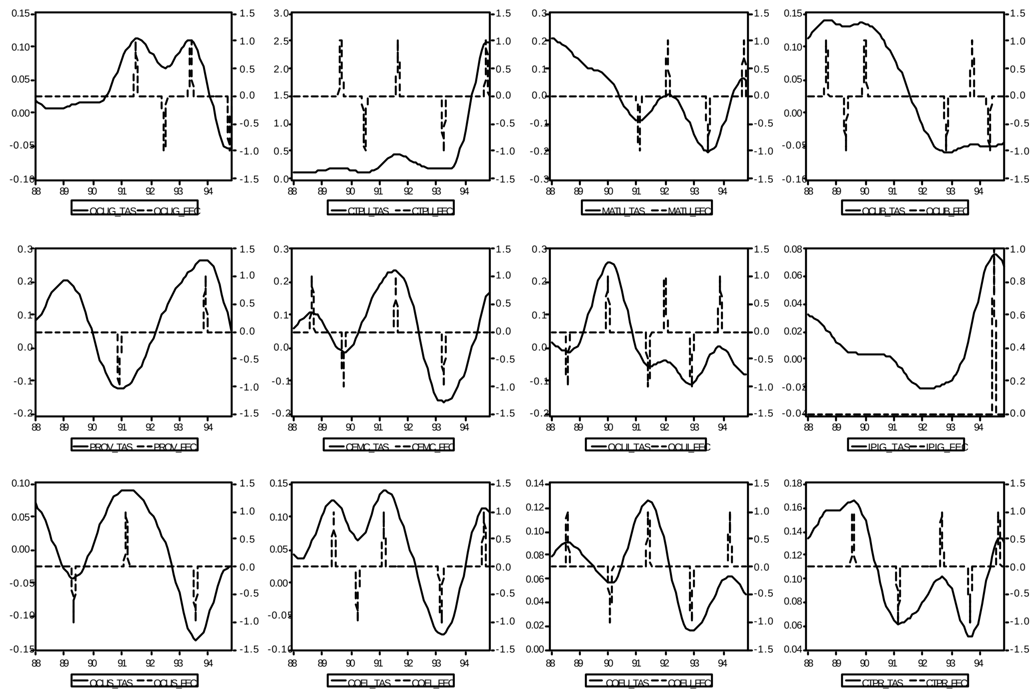
Sign indicates the pro cyclical (+) or counter cyclical (-) of each synthetic indicator with respect to the cycle defined by the regional series.

$IC_{TVNANE,REX}$ = $n^{-1}\sum_{t=1,\ldots T}(Dated_{TVNANE}\times Dated_{REX})$, where $Dated_i = 1$ in the acceleration stages, and $Dated_i = -1$ in the deceleration stages for $i = TVNANE, REX$. Thus, IC is an index (between -1 and 1) of global coincidence-conformity, in such a way that if IC is close to 1, the aceleration-deceleration phases of the series to be analysed, have a synchronic evolution with the reference series; if IC is close to –1, the existent synchronicity is an inverse type, and if IC is close to 0, there is little coincidence among both series phases.

Considering the results shown in Table 2, the three series are coincident, so this result allows us to work with certain confidence when classifying the indicators.

As we had the quaterly accounts, we tried to classify the indicators growth rates with respect to the quaterly gross added values. Thus, we used the <F> (see Graph 5) and <G> programs. From <G> program classification we might say that all the indicators are unclassifiable (except for the indicator “employees in manufacturing industry in Extremadura”, which is classified as a leading indicator).

Graph 5: Dated of the indicators growth rate.



3. ALTERNATIVE METHODOLOGY AND THE EMPIRICAL RESULTS

3.1. Methodology at regional level.

Since we can’t classify the basic indicators into leading, coincident and lagging (probably because the length of the series is limited), we tried to construct a regional economic growth indicator. So, we wanted to represent the growth cycle of a regional economy. First, it is necessary to define cycle. In this work the approximation to the economic cycle is performed from the perspective of the rates of growth in the level of the economic activity (measured by the gross added value excluding agriculture and energy sectors). In the context of a regional economy where there aren’t quaterly regional accounts and the growth of the regional economic activity is unknown, it is very useful to obtain a synthetic indicator which allows us to measure the trend-cycle growth of the economic activity.

As the goal is to obtain the growth cycle of the *GNAEEX*, it is more adecuate to use the growth rates than to use the levels of series in the process of the economic selection indicators (principally when, as it generally happens, most of the indicators used in this work show a trend). Consecuently, the selection of the component indicators is carried out from the growth approach, and it is aimed to obtain a growth and decrease synthetic indicator in the regional economic activity. Here is the methodology used to build such synthetic indicator. The time period is dependent upon the availability of the indicators. In our case, it was impossible to obtain data for all the indicators before 1986. The indicators have been selected based on two fundamental criteria: economic and statistical. The first criterium implies that the economic sectors as part of the GAV must be represented. The second criterium selects those signals for which the yearly growths show the highest correlations with respect to the GAV yearly growths.

We modeled the selected quaterly indicators using the TRAMO program. Then, using the SEATS program, we estimated the "signal" of trend-cycle for every indicator. We understand by signal the stochastic trend-cycle component of each indicator. So, we obtain a estimation of the total trend-cycle series adding to the deterministic components found when we modeled the indicator with TRAMO to the estimated estochastic part (so, we followed a so called ARIMA-model-based method to estimate the unobserved components).

Thus, now we have the signals of the different partial indicators. The next step is to compute the growth rates: $T_1^4 = \frac{x_t - x_{t-4}}{x_{t-4}}$, where x_t is the signal of a quaterly indicator; so, the turning points (*peaks and troughs*) are placed on the local masima and minima of the quarterly indicators T_1^4 rates. These rates are the elements to be aggregated. The procedures to compose the cyclical "signals" are very wide, and it is possible to use a lot of methods to construct a synthetic indicator. This work proposes the use of a procedure based on the DP2 Distance.

Procedure based on the Distance P_2.

The original application of the indicator based on the Distance P2 is directed towards measuring the social well-being. Here is briefly presented that indicator[2]. Let X_t be the state vector of the trend-cycle signals obtained from the partial indicators, (*t=1,...T*): $X_t = \left(x_{t1}\ x_{t2}\ \ldots x_{tn}\right)$; so x_{ti} (*i=1,...,n*) is the value taken by trend-cycle signal of the partial indicators i , at t (from now on denoted as signal *i*). This state vector is compared to a reference vector. Let $X_{\bullet}$ be the "reference base" vector, where $X_{\bullet} = \left(x_{\bullet 1}\ x_{\bullet 2}\ \ldots x_{\bullet T}\right)'$. So, $x_{\bullet t}$ is the "reference base" state at *t*, an "ideal" state for the extracted signals for each one of the partial indicators from which the comparison is made. In this case, the reference base consists of the vector which takes the minimum value, *t=1,...T*, for each of the signals.

So, the synthetic indicator of Distance-P$_2$ (DP_2) is defined, *t=1,...T*, as[3]: $DP_2(t) = \sum_{i=1}^{n} \frac{d_i}{s_i}(1 - R^2_{i\bullet i-1,i-2,\ldots,1})$ where $R_1^2 = 0$, and where $d_i = d_i(t,\bullet) = \left|x_{ti} - x_{\bullet t}\right|$ is the difference to the minimum vector, s_i the standard deviation of the values that signal i takes, and $R^2_{i\bullet i-1,i-2,\ldots 1}$ is the coefficient of determination obtained from the regression between the signal x_{ti} and the signals $x_{t,i-1}, x_{t,i-2}, \ldots, x_{t,1}$. This last term gathers the part of the variance of x_{ti} explained by the linear combination of the already added to the synthetic indicator signals. In short, it measures the common information between the to-be-introduced tren-cycle and the already incorporated to the composite indicator signals.

In the above DP_2 expression, two components for each addend can be distinguished:

1°) $\frac{d_i}{s_i}$ This component is the defined distance for the signal i divided by the standard deviation of that signal, and it has two functions:

a) To state the signal in abstract units, making the additive possible (there is to mention that the numerator and denominator are measured in the same units) , and

b) to weight in a lesser degree those distances which have a higher standard deviation (the dispersion increases respect to the mean and it is convenient to play down those signals which present a higher standard deviation).

2°) $(1 - R^2_{i\bullet i-1,i-2,\ldots,1})$ This second component prevents the repetition of the information contained in a signal, which is common to other signals (gathered by $R^2_{i\bullet i-1,i-2,\ldots,1}$) . At once we observe that if we substract the common information ($R^2_{i\bullet i-1,i-2,\ldots,1}$) from value 1, only the nonrepeated information is added to the synthetic indicator. The indicator have been worked out with the program FELIZ.FOR, presented in Zarzosa (1992).

3.2. Empirical results.

In this Section we use the methodology illustrated in Section 3.1. As an experiment, we formed two different groups of selected indicators:

1) This first group is composed of the indicators used to estimate the quarterly GAV series (13 indicators): number of employees in the manufacturing industry, industrial production indices for that industry in Extremadura, amount of registration numbers of goods vehicles, number of employees in the construction sector, total endorsed projects, cement consumption, number of employees in sale services, consumption of electricity in industry and services in Extremadura, consumption of electricity for household purposes, number of credits granted towards the private sector (in constant pesetas), number of employees for the non-sale service sector, credits granted to the public sector (in constant pesetas) and amount of registration number of cars. We call the synthetic indicator which composed the T_1^4 of the trend-cycle estimated from these indicators as INDIDP2.

2) The indicators in the second group are selected taking into account the economic and estatistical criteria (14 indicators): cement consumption, unemployment registered in the construction, total official bidding, registration number of cars, amount of registration numbers of goods vehicles, consumption of electricity in industry and services in Extremadura, consumption of electricity for household purposes, number of Spanish travellers, employees in industrial capital goods, employees in industrial intermediate goods, employees in sale services, employees in non-sale services, employment rate and credit granted to the private sector. The synthetic indicator obtained for these indicators was named ISDP2.

The INDIDP2 and ISDP2 indicators are shown in Graph 6 and they seem to have a similar general evolution, although the first one is more irregular. These synthetic indicators are composed of seven common economic indicators. However, Table 3 shows that INDIDP2 is leading with respect to ISDP2.

Graph 6: INDIDP2 and ISDP2 indicators

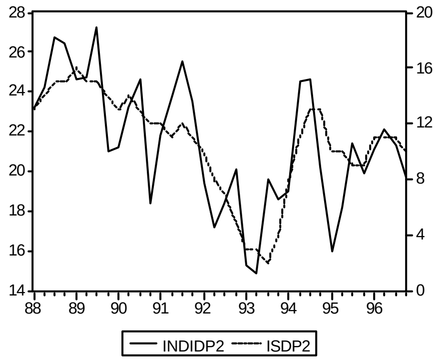
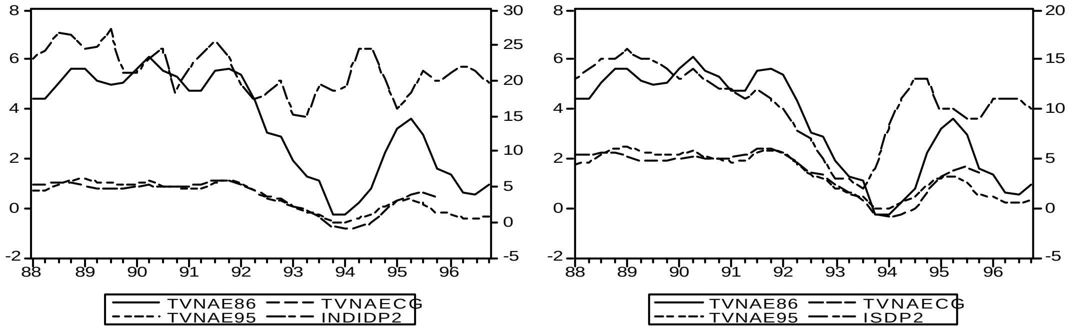


Table 3. Cross-correlogram of INDIDP2 and ISDP2: *Corr[INDIDP2(t),ISDP2(t+i)] and Corr[INDIDP2(t),ISDP2 (t-i)]*.

i	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
(-i)	0.753	0.604	0.398	0.274	0.231	0.203	0.187	0.153	0.151	0.118	0.062
(+i)	0.753	**0.758**	0.681	0.510	0.344	0.180	0.087	0.023	-0.027	-0.056	-0.034

In Graphs 7 and 8 we can see that the synthetic indixes are leading indicators with respect to the quaterly gross added values, and this result is confirmed in Tables 4 and 5, where the cross correlation coefficients gives information on the phase shift of the synthetic indicators relative to the growth of the quarterly gross added values. The absolute value of these coefficients are maximal for a possitive *i*; so, we can say that the synthetic indicators are leading the cycle by 3 quarters.

Graph 7: INDIDP2 and ISDP2 indicators vs growth rate of the quaterly gross added values (TVNANE86, TVNANE95, TVNANECG)



Graph 8: Growth rate of the quaterly gross added values (TVNANE86, TVNANE95, TVNANECG) and synthetic indicators (filtered).

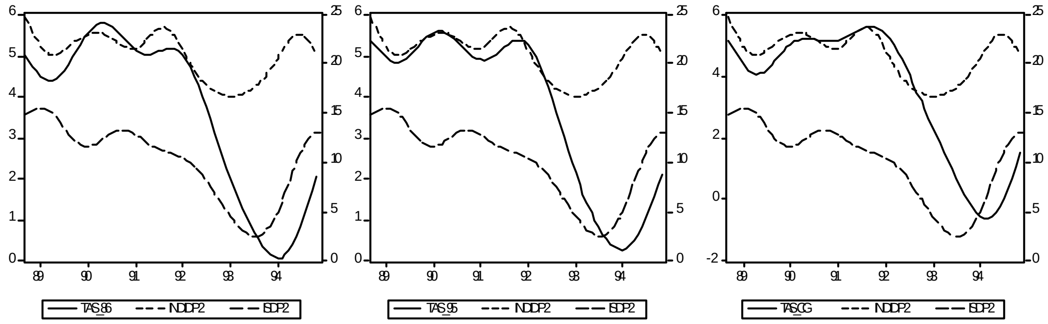


Table 4. Cross-correlogram of INDIDP2 vs growth rate of the quaterly gross added values: *Corr[INDIDP2(t),TVNANE(t+i)] and Corr[INDIDP2(t),TVNANE (t-i)].*

	i	0	1	2	3	4	5	6	7	8
INDIDP2, TVNAE86	**(-i)**	0.42	0.30	0.21	0.18	0.14	0.08	0.01	-0.06	-0.07
	(+i)	0.42	0.51	0.63	**0.70**	0.67	0.60	0.52	0.39	0.24
INDIDP2, TVNAE95	**(-i)**	0.45	0.32	0.21	0.16	0.11	0.06	0.01	-0.04	-0.04
	(+i)	0.45	0.55	0.66	**0.70**	0.65	0.57	0.49	0.37	0.23
INDIDP2, TVNAECG	**(-i)**	0.38	0.29	0.24	0.20	0.16	0.11	0.04	-0.03	-0.05
	(+i)	0.38	0.45	0.56	**0.63**	0.61	0.57	0.49	0.39	0.27

Table 5. Cross-correlogram of ISDP2 vs Growth rate of the quaterly gross added values: *Corr[INDIDP2(t),TVNANE(t+i)] and Corr[INDIDP2(t),TVNANE (t-i)].*

	i	0	1	2	3	4	5	6	7	8
ISDP2, TVNAE86	**(-i)**	0.59	0.42	0.27	0.13	0.03	-0.05	-0.13	-0.19	-0.22
	(+i)	0.59	0.72	0.82	**0.84**	0.78	0.66	0.52	0.42	0.35
ISDP2, TVNAE95	**(-i)**	0.60	0.43	0.27	0.13	0.02	-0.06	-0.13	-0.17	-0.19
	(+i)	0.60	0.72	0.80	**0.81**	0.74	0.62	0.50	0.41	0.37
ISDP2, TVNAECG	**(-i)**	0.55	0.37	0.23	0.10	0.02	-0.04	-0.10	-0.14	-0.16
	(+i)	0.55	0.71	0.83	**0.88**	0.85	0.76	0.62	0.48	0.34

Finally we show in Table 6 the regressions between the synthetic indicators and the growth rate of the quaterly gross added values.

Table 6. Results of the estimations: synthetic indicators and the growth rate of the quaterly gross added values.

DEPENDENT VARIABLE	REGRESSOR	SAMPLE	A	B	*t* statistic (Coefficient b)	R^2
TVNAE86	INDIDP2(-3)	1988:1-1995:4	-5,40	0,416	5,189	0,473
TVNAE95	INDIDP2(-3)	1988:1-1996:4	-6,40	0,449	6,283	0,537
TVNAECG	INDIDP2(-3)	1988:1-1996:4	-6,52	0,457	6,339	0,541
TVNAE86	ISDP2(-3)	1988:4-1996:4	-1,77	0,473	9,474	0,743
TVNAE95	ISDP2(-3)	1988:4-1996:4	-1,58	0,460	8,246	0,686
TVNAECG	ISDP2(-3)	1988:4-1995:4	-1,68	0,488	13,266	0,866

Nota: The adjusted relation is $GRGAV_t = a + bI_{t-3} + e_t$; where $GRGAV_t$ is the dependent variable and I_t is the synthetic indicator.

4. SUMMARY AND CONCLUSIONS

In this work we tried to apply a methodology, widely used at national level, in the construction of business cycle indicators to a regional economy: Extremadura. So we estimated quarterly gross added values (excluding agriculture and energy branches) for four regional sectors from three data bases: manufacturing industry, construction, sale oriented services and non-sale oriented services.

As the estimation of the quarterly regional GAV used synthetic indicators as “input” -in the Chow-Lin (1971) method-, which collect the trend-cycle of the sectoral economic activity, the obtained quarterly sectoral estimates collect the trend-cycle signal (in levels) of the sectoral economic activity, and also meet the requisite that the addition of the estimated figures for every year’s four quarters is coincident with the yearly GAV datum.

Once the quarterly figures are obtained, the short lenght of the series didn’t permit us to obtain a classification of the series. Therefore, we proposes, in the context of a regional economy where there aren’t any quaterly regional accounts and the growth of the regional economic activity is unknown, that it would be very useful to obtain a synthetic indicator which allows us to measure the growth in the trend-cycle of the economic activity. So, we exposed the main steps to obtain this indicator, and we suggested the use of the DP2 distance to compose the information about the regional economic situation.

Thus, we constructed two leading synthetic indicators, and we prefer the one that gathers the information of fourteen economic indicators selected according to economic and statistical criteria: ISDP2. This indicator allows us to describe the growth of the quarterly GAV in Extremadura and to obtain an estimation about it (using the results of Table 6).

This work also tried to show the importance in the selection of the series to represent the growth activity, and also the important role that the DP2 can play in the context of the procedures in irder to compose the economic activity.

Footnotes

[1] In Ramajo and M<rquez (1996), a detailed analysis is given of the different sources of information used to a greater or lesser degree in our work.

[2] In order to look deeply into this synthetic indicator, key references are Pena (1977) and Zarzosa (1992).

[3] DP_2 definition is taken from Zarzosa (1992, pp. 188-191). The original definition is found in Pena (1977, p. 114).

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