

# The Economic Sentiment Index as a Tool of Estimation of the Growth Rate of GDP in Regions. An Example of the Lubelskie Voivodship

**Mieczysław Kowerski**

University of Management and Administration in Zamość, Poland

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## Abstract

*GDP per capita is one of the basic criteria for granting European funding to particular regions. However, in Poland the Central Statistical Office calculates the GDP value in regions with a two-year delay. Therefore, it is important to create tools which, with greater accuracy, would make it possible to estimate the growth rate of GDP in regions much earlier than the publications of the Central Statistical Office. In the article, in order to estimate the growth rate of GDP in regions, the autoregressive model is put forward, in which the voivodship<sup>1</sup> entrepreneur's economic sentiment index is used as one independent variable. The sentiment index is calculated on the basis of a survey, and its value is already known a month after the end of the year, which makes it possible to bring forward the estimation of the growth rate of GDP. Using the proposed model, the growth rate of GDP in the Lubelskie Voivodship in the years 2011–2012 was estimated.*

## Introduction

Despite much justified criticism (Stiglitz, Sen, and Fitoussi 2010), Gross Domestic Product (GDP) still remains one of the main measures of the level and rate of economic growth, not only at country level, but also at the level of regions distinguished within a country. In Poland the significance of GDP as a measure of regional development has increased substantially with accession to the European Union, when GDP per person became one of the main criteria for granting European funds to particular regions. However, in Poland the Central Statistical Office calculates the value of GDP at regional level with a two-year delay. Therefore, at the time of writing this article (January 2013) the values and the rate of change of GDP in regions (voivodships) in 2011 are still not known, not to mention the data for the year 2012.<sup>2</sup> Even though there are high correlations between the growth rate of GDP in Poland and the growth rate of GDP in particular voivodships,<sup>3</sup> still they are not strong enough to unambiguously determine GDP changes in a particular voivodship on the basis of the national data published much earlier. That is why it is important to create tools which would make it possible to estimate the growth rate of GDP in regions with high precision and much earlier than the publications of the Central Statistical Office.

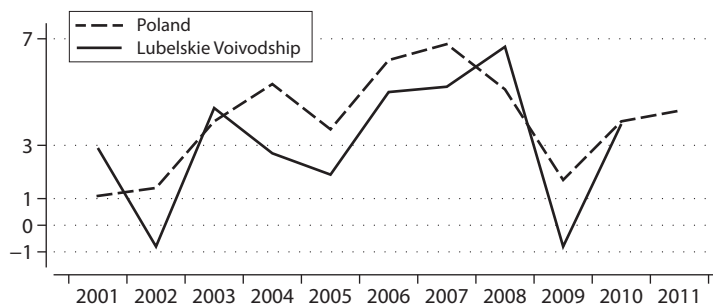
In the article the autoregressive model to estimate the growth rate of GDP in regions is put forward, in which the entrepreneurs' diagnostic economic sentiment index is one of the independent variables. The sentiment index is calculated on the basis of surveys and its value is already known a month after the end of the year, which provides a way to bring forward the estimation of the growth rate of GDP.

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1. Voivodship—Polish administration region on the NUTS 2 level. Poland is divided into 16 voivodships.

2. Information about GDP in voivodships in 2011 will most probably be published in November 2013, and the information about GDP in voivodships in 2012 in November 2014.

3. For example the linear correlation coefficient between the growth rate of GDP in the Lubelskie Voivodship and in Poland in the years 2001–2010 was 0,749.



**Fig. 1.** Rate of growth of GDP in the Lubelskie Voivodship and in Poland in the years 2001–2011 (%).

Source: Own calculations with the data from: [http://www.stat.gov.pl/gus/5840\\_13605\\_PLK\\_HTML.htm](http://www.stat.gov.pl/gus/5840_13605_PLK_HTML.htm)

The suggestion has been verified against the example of the Lubelskie Voivodship. It must be emphasized that the distinguished model was used to estimate the growth rate of GDP in the Lubelskie Voivodship in previous years and proved to be very effective. The estimates made at the end of 2010 on the basis of the model indicated that the rate of GDP in the voivodship in 2009 was  $-0,2\%$ , and in 2010  $3,7\%$  (Kowerski 2011, 29–32).<sup>4</sup> The Central Statistical Office data published at the end of 2011 showed that in 2009 the growth rate was  $-0,8\%$ . On the other hand, the Central Statistical Office data published at the end of 2012 proved that in 2010 the growth rate of GDP in the Lubelskie Voivodship was  $3,8\%$ . At the same time, having actual data for the year 2009, at the end of 2011 the estimation of the GDP growth rate in 2010 was made again on the basis of the model of the same specification and on the basis of the time series extended by a year – this time the estimation was  $3,9\%$  (Kowerski 2012a, 64–67).<sup>5</sup>

In this study the time series was extended by the next year (2010), and the estimates of the GDP growth rate in the Lubelskie Voivodship in the years 2011–2012 were presented.

## 1 Lubelskie Voivodship

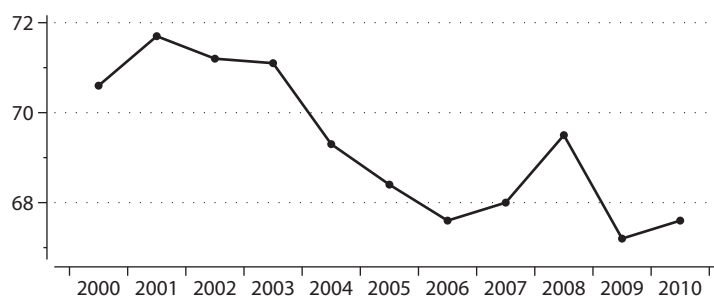
Lubelskie Voivodship is situated in the south-eastern part of Poland in the interfluvial zone of the Vistula and Bug Rivers. In the west and north it borders on Mazowieckie Voivodship, in the south on Podkarpackie, and in the south-west on Świętokrzyskie Voivodship. In the east the Lublin region borders on Belorussia and Ukraine, creating at the same time the external border of Poland and the European Union. The location of Lubelskie Voivodship assures convenient room for economic growth on the capacious eastern markets. The region is located along the major transport routes linking the eastern and western parts of the European continent. Across the area of the voivodship run the shortest roads and railways through Berlin and Warsaw up to Minsk in Belorussia, Moscow in Russia, Luck, Kiev, Lviv and Odessa in Ukraine. Apart from that, the voivodship is regarded as a peripheral region with a low level of economic development and capital expenditure attractiveness.

Lubelskie Voivodship's area is 25,1 thousand km<sup>2</sup>, which makes up 8% of the country's territory and places it in the third position among the Polish voivodships. At the end of 2011 Lubelskie Voivodship was inhabited by 2171,9 thousand people (5,6% of the citizens of Poland).

The region is characterized by a very low level of economic development. The expression of this is lower GDP per person compared with the country's average; in 2010 it was 67,6% the country's average and was one of the lowest in Poland (only Podkarpackie Voivodship had lower GDP per person). At the same time the GDP per person created in Lubelskie Voivodship was only 41% of the EU average. The problem is that the distance to the country's average for Lubelskie Voivodship has been increasing for the last decade.

4. [In the journal (in both Polish and English texts) European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style). Furthermore in the International System of Units (SI units), fixed spaces rather than commas are used to mark off groups of three digits, both to the left and to the right of the decimal point.—Ed.]

5. The estimate made according to this model for year 2011 was 1,4%.



**Fig. 2.** Changes of the GDP per person in Lubelskie Voivodship in the years 2000–2010. Poland = 100

*Source:* Own calculations with the data from: [http://www.stat.gov.pl/gus/5840\\_13605\\_PLK\\_HTML.htm](http://www.stat.gov.pl/gus/5840_13605_PLK_HTML.htm)

The structure of GDP in Lubelskie Voivodship is slightly different than in the rest of the country. First of all there is a great contribution of agriculture, hunting, fishing and forestry to the creating of value added of production. On the other hand the contribution of the industrial and commercial services related to finance, real estate and company's services in creating GDP is much lower than the country's average. The labour efficiency per worker measured by value added of production is considerably lower in general as well as in individual industries. In 2010 the value added of production per worker was only 68,8% of the country's average, and from this point of view the voivodship ranked in the last position in the country.

In the end of the year 2011 in Lubelskie there were registered 162,1 thousand enterprises of which 95,2% employed up to 9 persons and only 0,1% employed above 250 persons. The number of households is estimated at about 792 600.

## 2 Methodology of examining economic sentiment in the Lubelskie Voievodship

The methodology of examining economic sentiment in the Lubelskie Voivodship is similar, though by no means identical, to that recommended by the European Commission for examining economic sentiment on the national level (Kowerski 2009).

The examination of economic sentiment in the Lubelskie Voivodship is performed in the following stages:

- sampling
- questionnaire surveys
- balances calculation
- balanced seasonal adjustment
- calculation of sector confidence indices
- calculation of the economic sentiment index (the barometer)

The survey is the fundamental tool used in examining economic sentiment. The questions contained in it are answered by both company managers and consumers. The number of questions for entrepreneurs does not exceed 10, while households are asked to answer 11 questions. The entrepreneurs and consumers (households) from the Lubelskie Voievodship are asked diagnostic questions referring to the situation in the last quarter and prognostic questions concerning predictions for the next quarter.

Industrial entrepreneurs are asked questions about the financial situation of their companies, its production volume, levels of orders, inventories and employment. Building and construction sector entrepreneurs are asked about the financial situation of their companies, volume of construction and assembly production, size of orders and employment. Traders are asked about the financial situation of their companies, their turnover, merchandise stocks and employment. Service providers are asked about the financial situation of their companies, their turnover and employment. Consumers (household members) give information on the financial situation of their households, their expenses, savings and their evaluation of the economic situation and job market in the Lubelskie Voievodship. The obtained answers are then processed using the net balance method.

The respondents have three answers to a question: the situation improved (positive answer), remained unchanged, or worsened (negative answer). Net balance is calculated as the difference between the percentage of positive and negative answers, in line with the formula below:

$$B = P - N,$$

where:

$B$ —net balance,

$P$ —percentage of positive answers (claiming there has been an improvement),

$N$ —percentage of negative answers (claiming that the situation has worsened).

The balances may have the values from  $-100$  to  $100$ , the  $-100$  value would be reached if all respondents unanimously claimed that the situation had deteriorated, while the  $100$  value would be achieved if all respondents claimed that the situation had improved. If the balance equals  $0$ , this indicates that half of the respondents are pessimists (they answer that the situation has declined) while the other half are optimists (believing that the situation has improved). The balances of answers then serve as a foundation for the creation of a time series. However, prior to this, the balance values are subject to seasonal adjustment using the Census II method from Statistica 7.0 software.

Diagnostic and prognostic confidence indices in particular business sectors of the Lubelskie Voivodship (industry, building and construction, trade, services, households) are calculated on the basis of selected diagnostic and prognostic questions. Sector confidence indices are arithmetic means of seasonally adjusted balances of answers to selected questions, their values ranging from  $-100$  to  $100$ . Indices of economic sentiment (barometers) are synthetic measures of sentiment among businesspeople representing all sectors and consumers. The general economic sentiment index (barometer) in the Lubelskie Voivodship is a weighted arithmetic mean of sector confidence indices and ranges from  $-100$  to  $100$ , while the share of the weights of particular indices in the total value of the index are established taking into account the share of particular sectors in total gross added value generated in the Lubelskie Voivodship. The entrepreneurs' economic sentiment index is also calculated.

Quarterly surveys of economic sentiment in the Lubelskie Voivodship have been conducted since the 2nd quarter of 2001. So far 46 surveys have been carried out and 17 600 questionnaires collected from entrepreneurs and around 18 700 questionnaires from households.<sup>6</sup> The analysis of the trends of economic sentiment indices permit one to reach the conclusion that in the investigated period the economy of Lubelskie Voivodship has gone through the full medium term business cycle, which began with the 2001 recession and through the recovering phase of 2004–2006 entered the boom phase of 2007—the first half of 2008 with the peak in the 4th quarter of 2007 and then the slowdown in the economy which ended in the 2009–2010 recession with the “doldrums” registered in 2nd quarter of 2009. These conclusions can be confirmed by econometric smoothing with the Hodrick-Prescott filter for long-term trends of general and entrepreneurs' economic sentiment indices and sector confidence indices. Whereas, the way and pace in which the 2009–2010 recession receded constitutes a problem. The results in the second half of 2011 may show that this will be represented by a **W**-shape whereas in the 3rd quarter 2011 the economy and economic sentiment reached “the second doldrums” (Kowerski 2012a).

### 3 Model estimation results

The observation of time changes of various variables describing the economy of Poland and the Lubelskie Voivodship lead us to accept the following potential independent variables, which describe the changes of rate of growth of the GDP in the Lubelskie Voivodship ( $GDPL_t$ ) in the years 2001–2010:

$GDPP_t$ —rate of growth of GDP in Poland in the year  $t$

6. Quarterly reports of the results of economic sentiment surveys in the Lubelskie Voivodship are presented in the succeeding issues of *Regional Barometer. Analyses & Prognoses*.

- DBO<sub>*t*</sub>—yearly average value of general diagnostic economic sentiment index in the Lubelskie Voivodship in the year *t*
- DBP<sub>*t*</sub>—yearly average value of entrepreneurs' diagnostic economic sentiment index in the Lubelskie Voivodship in the year *t*
- DGD<sub>*t*</sub>—yearly average value of households' diagnostic confidence index in the Lubelskie Voivodship in the year *t*
- PDO<sub>*t*</sub>—yearly average value of general prognostic economic sentiment index in the Lubelskie Voivodship in the year *t*
- PBP<sub>*t*</sub>—yearly average value of entrepreneurs' prognostic economic sentiment index in the Lubelskie Voivodship in the year *t*
- PGD<sub>*t*</sub>—yearly average value of households' prognostic confidence index in the Lubelskie Voivodship in the year *t*

The analysis of the correlation matrix of specified variables in the years 2001–2010 shows that the growth rate of GDP in the Lubelskie Voivodship (DDPL) was significantly at the level of 0,05 correlated with the growth rate of GDP in Poland and yearly average value of general diagnostic economic sentiment index and yearly average value of entrepreneurs' diagnostic economic

**Tab. 1.** Results of the estimation of the model of GDP rate of growth in Lubelskie Voivodship. Two stage least squares method

Specyfication	Coefficient/ Statistic	<i>p</i> -value
Constant . . . . .	3,7704	< 0,00001
BP <sub><i>t</i></sub> (points) . . . . .	0,3065	< 0,00001
GDPL <sub><i>t-1</i></sub> (%) . . . . .	-0,5435	0,00010
<i>R</i> -squared . . . . .	0,8938	
Adjusted <i>R</i> -squared . . . . .	0,8584	
F test		
Null hypothesis: Multiple correlation coefficient is not significant		
Statistic $F_{(2,6)}$ . . . . .	41,95	0,0003
Hausman test		
Null hypothesis: OLS estimates are consistent		
Asymptotic statistic $\chi^2_{(2)}$ . . . . .	0,45	0,8005
Sargan over-identification test		
Null hypothesis: all instruments are valid		
Statistic <i>LM</i> . . . . .	6,86	0,0764
Test for normality of residual		
Null hypothesis: Disturbance term is normally distributed		
Statistic $\chi^2_{(2)}$ . . . . .	0,82	0,6636
Pesaran-Taylor test for heteroskedasticity		
Null hypothesis: Heteroskedasticity not present		
Asymptotic statistic <i>z</i> . . . . .	3,20	0,0014
LM test for autocorrelation up to order 1		
Null hypothesis: no autocorrelation		
Statistic <i>LMF</i> . . . . .	1,53	0,2839
Test for ARCH of order 1		
Null hypothesis: No ARCH effect is present		
Statistic <i>LM</i> . . . . .	0,92	0,3400
<b>Estimated value of GDP rate of growth</b>		
2011	1,29	
2012	2,84	

Note: Instruments: const, DBO, DGD, PBO, PBP, PGD; HAC standard errors, bandwidth 1 (Bartlett kernel)

Source: Own calculations in GRETL (see Kufel 2004; Maddala 2006)

sentiment index in the region.<sup>7</sup> From among the many analysed models, the model with two independent variables which describes the growth rate of GDP in the Lubelskie Voivodship ( $GDPL_t$ ) in the years 2001–2010:  $DBP_t$ —yearly average value of entrepreneurs diagnostic economic sentiment index in the Lubelskie Voivodship in the year  $t$  and the autoregressive variable—the growth rate of GDP in the Lubelskie Voivodship in the previous year ( $GDPL_{t-1}$ ) is the best one. Since this is an autoregressive model and there is a correlation between the lagged dependent variable and the disturbance term, using the least squares method may lead to obtaining biased estimators of structural coefficients, the two stage least squares method was used for estimation (Gruszczyński, Kuszewski, and Podgórska 2009, 227). Yearly average values of diagnostic and prognostic economic sentiment indices ( $DBO_t$ ,  $DGD_t$ ,  $PBO_t$ ,  $PBP_t$ ,  $PGD_t$ ) were adopted as instrumental variables.

The estimated model explains the variability of the dependent variable in 89,38%. The used estimator is consistent (the Hausman test). All the instruments are valid (the Sargan test). The disturbance term is normally distributed (test  $\chi^2_{(2)}$ ) and there is no autocorrelation of the disturbance term of first order (LMF test) or no ARCH effect (LM test). A certain drawback of the model is the heteroskedasticity of the disturbance term (the Pesaran-Taylor test). Still, the proposed model seems to be a good tool for estimating<sup>8</sup> the growth rate of GDP in the Lubelskie Voivodship in the years 2011–2012.

#### 4. Estimation of the growth rate of GDP in the Lubelskie Voivodship in the years 2011–2012

The growth rate of GDP in the Lubelskie Voivodship estimated on the basis of the model is 1,3%, so it is by 3 points lower than the average in Poland. Also the growth rate of GDP in 2012 (2,8) is below the average in Poland (3,4%), even though it is twice as high as in the year 2011.

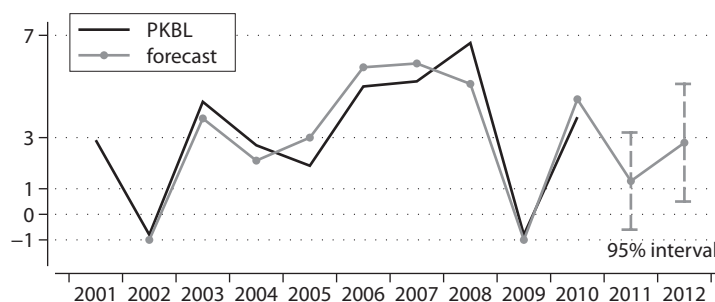


Fig. 3. Estimation of the GDP rate growth in Lubelskie Voivodship in the years 2011–2012

Source: Own calculations in GRETL (see Kufel 2004; Maddala 2006)

## Conclusions

Economic sentiment indices reflect real processes taking place in the economy of the region and their values can be obtained just after the end of the year. Thus, they can be good tools to estimate the growth rate of GDP in a situation where the Central Statistical Office publishes the data concerning the growth rate of GDP in regions with an almost two-year delay.

7. It should be noted that the economic sentiment indices in the Lubelskie Voivodship are much more correlated to the growth rate of GDP in Poland than in the region. It may mean that while formulating their answers to the questions in the survey, both entrepreneurs and consumers are more influenced by widespread information concerning the entire economy than by information about the economy of the region.

8. To estimate the growth rate of GDP, the econometric model of prognosis is used. However, “prognosis” is usually considered as making statements about the future, while we, using the methods, attempt to define GDP changes in the past (years 2011–2012). Thus, we do not use the term “prognosis” but we talk about estimating the value of the growth rate of GDP.

## References

- BIELAK, J., D. DŁUGOSZ, and A. SALEJ. 2011. "Zmiany nastrojów gospodarczych w województwie lubelskim w IV kwartale 2010 roku." *Lubelski Barometr Gospodarczy. Raporty* no. 7:27–52.
- GRUSZCZYŃSKI, M., T. KUSZEWSKI, and M. PODGÓRSKA. 2009. *Ekonometria i badania operacyjne. Podręcznik dla studiów licencjackich*. Warszawa: Wydawnictwo Naukowe PWN.
- "The Joint Harmonised EU Programme of Business and Consumer Surveys. User Guide." 2007. Brussels: European Commission. Directorate General Economic and Financial Affairs. [http://ec.europa.eu/economy\\_finance/db\\_indicators/surveys/documents/userguide\\_en.pdf](http://ec.europa.eu/economy_finance/db_indicators/surveys/documents/userguide_en.pdf) (accessed 2013.02.20).
- KOWERSKI, M. 2009. "Metodyka badania nastrojów gospodarczych w województwie lubelskim na tle badań Komisji Europejskiej." *Barometr Regionalny. Analizy i prognozy* no. 3 (17): 15–28.
- . 2011. "10 lat badań nastrojów gospodarczych przedsiębiorców i konsumentów województwa lubelskiego." *Barometr Regionalny. Analizy i prognozy* no. 2 (24): 15–34.
- KOWERSKI, M. 2012a. "Barometr nastrojów gospodarczych jako narzędzie diagnozowania i prognozowania rozwoju regionu transgranicznego." In *Kadry dla gospodarki transgranicznej*, edited by M. Kowerski and I. Pieczykolan, 51–72. Zamość: Wyższa Szkoła Zarządzania i Administracji w Zamościu.
- . 2012b. "Jedenaście lat badań nastrojów gospodarczych w województwie lubelskim." *Prace i Materiały Instytutu Rozwoju Gospodarczego SGH* (forthcoming).
- KUFEL, T. 2011. *Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu GRETL*. Wyd. 3. zm. ed. Warszawa: Wydawnictwo Naukowe PWN.
- MADDALA, G.S. 2006. *Ekonometria*. Translated by M. Gruszczyński, E. Tomczyk and B. Witkowski. Warszawa: Wydawnictwo Naukowe PWN.
- STIGLITZ, J.E., A. SEN, and J.-P. FITOUSSI. 2010. *Mismeasuring Our Lives. Why GDP Doesn't Add Up*. New York: New Press.