Source of data as a determinant of the assessment of agricultural producers' financial situation

Tomasz Kuszewski[1], Agata Sielska[2]

Abstract

The aim of the paper is to examine whether the analysis of agricultural producer's income in 2004-2013 based on the different sources of data leads to noncontradictory conclusions concerning the changes of economic situation in agriculture. Data from the Central Statistical Office of Poland, Farm Accountancy Data Network (FADN), Research Institute for Economic Development of Warsaw School of Economics (IRG SGH) and results reported in the Social Diagnosis have been used. The changes in variables reflecting the agricultural producers' financial situation have been compared on the basis of the interpretation of graphs, correlation coefficients and distance measured in the Clark's metrics. The study shows that the inference about farmers' financial situation based on data from different sources can lead to different conclusions. Results from FADN may be considered the most consistent with other databases whereas results obtained by IRG SGH may be considered the most disparate.

Key words: *value added, farms' income, agricultural indicators*

JEL Classification: Q19

1 Introduction

Until recently, lack or scarcity of the quantitative data was one of analysts' main problems. The research presented in the papers (Bailey et al., 2004; Alvarez and Arias, 2004; Charnes et al., 1973) is a good illustration of the compromises related to the scarcity of relevant data. This situation has changed and the period of rapidly developing both the data collection techniques and the methods of forecasting and classification lead to problems related to the excess of information. Nowadays, the analyst has to choose from many existing data sources, evaluate datasets' adequacy for a given problem and to ensure substantive and statistical comparability.

The aim of this paper is to illustrate and solve that dilemma. We use an example of changes in economic situation of Polish agriculture in period 2004-2013 and the influence of this changes on economic producers' opinion on their own financial situation. Polish agriculture has

[1] Corresponding author: Warsaw School of Economics, Institute of Econometrics, Al. Niepodległości 162, 02-554 Warsaw, e-mail: tomasz.kuszewski@sgh.waw.pl.

[2] Warsaw School of Economics, Department of Applied Economics, Al. Niepodległości 162, 02-554 Warsaw, e-mail: asiels@sgh.waw.pl.

undergone a substantial change since country accessed the European Union and is still an important sector of Polish economics (Piecuch, 2013; Wicka, 2012).

The following sources of data are used: official national and EU statistics i.e. Central Statistical Office of Poland (GUS) and Farm Accountancy Data Network (FADN) database respectively, data gathered by the Research Institute for Economic Development of Warsaw School of Economics (IRG SGH) and survey results reported periodically in the Social Diagnosis (DS).

We propose a set of data illustrating the changes in financial situation of Polish agricultural producers. Due to the different data sources, variables cannot be compared in a straightforward way. It is difficult to compare time series data on agricultural production based on value added created in agriculture published by GUS in current or fixed prices to the qualitative results from IRG SGH or DS surveys or to variables published by FADN. Another aspect of comparability concerns the scope of the survey. Data published by GUS concerns the whole population and result from the full statistical survey, whereas FADN data concerns whole population but results from the research conducted among the representative sample of Polish agricultural households. This representativeness concerns chosen criteria such as economic size of the farm, type of farming and location (Floriańczyk et al., 2014). Both GUS and FADN data have well defined economic categories and will be referred to as objective. FADN data and methodology is frequently used to evaluate the situation in agricultural sector in the EU countries (Galluzzo, 2015; Serences et al., 2016). IRG SGH and DS data come from survey and – in contrast to those previously mentioned – will be referred to as subjective.

We propose a method of data transformation, which ensure its comparability. In the next step of the analysis we examine the dynamics of changes in agricultural producers' financial situation on the basis of selected data sources and discuss results. We calculate distances between time series in order to evaluate the similarities in the pictures of the financial situation of Polish agricultural producers in 2004-2013.

2 Data sources and methodology

We use Central Statistical Office of Poland (GUS)[3] data for 2004-2013 on:

[3] http://stat.gov.pl; page Roczne wskaźniki makroekonomiczne, accesed in April 2016.

- gross value added in „Agriculture, forestry, hunting and fishing" section of Polish economy (in m zł, current prices; in the next sections of the article we refer to this variable as the value of gross production in agriculture);
- gross value added in „Agriculture, forestry, hunting and fishing" section of Polish economy (in fixed prices, expressed as "previous year =100"; in the next sections of the article we refer to this variable as the value of gross production in agriculture);
- real gross disposable income in households that simultaneously run business as individual farms in agriculture (expressed as "previous year =100");
- the number of working in „Agriculture, forestry, hunting and fishing" (thousands); in the next part of the paper this value is treated as the number of working in agriculture.

We also collected data on net disposable income of individual households in agriculture in 2004 (in current prices) (GUS, 2005).

The following time series were prepared for the analysis after proper conversions:

- gross value added, in current prices per working in agriculture - GUS_WD;
- real net disposable income of households per working in individual agricultural household - GUS_DD.

The following data for 2004-2013 was collected from Farm Accountancy Data Network[4]:

- farm net value added expressed per agricultural work unit, in current prices (variable coded as SE425 in the FADN database) - FADN_WD;
- farm net income per family labour unit i.e. unpaid full time family labour, expressed in current prices (variable coded as SE430 in FADN database) - FADN_D.

Data on the economic situation in agriculture in 2004-2013 was collected from IRG SGH[5]. In this research respondents are asked about their cash income. They can choose one of the following answers: income is higher than previously, as high as previously, lower than previously, no income at wall was obtained, with weights 1; 0; -1; 0 respectively. When preparing the data for further analysis a standard procedure for calculating the balance of responses to the question in the form of a weighted average of the percentage of positive answers is applied. Therefore, quarterly data refer to the structure of responses to the questions

[4] European Commission - EU FADN, http://ec.europa.eu/agriculture/rica/database/database.cfm, accessed in April 2016.
[5] Data compiled by K. Walczyk from IRG SGH.

characterizing the financial situation. In the second step the arithmetic average of the quarterly balances is calculated and the IRG_P time series is obtained.

A survey of conditions and quality of life called Social Diagnosis is carried out since 2000. Since 2003 it is carried out in two-year intervals. Since that year the survey includes a question on the individual assessment of the quality of life. Different aspects and spheres of life are specified and the respondents are asked to evaluate their satisfaction on a scale of 1 (very satisfied) to 6 (very dissatisfied). Financial situation of the family is one of the aspects mentioned. In the research reports (Czapiński and Panek, 2009; 2011; 2013) the average of the responses to this question of all respondents can be found. On the basis of survey data[6] the average level of satisfaction from the family financial situation can be assessed for each year for respondents classified as "farmers"[7].

Average degree of satisfaction with the financial situation of the family for the families of farmers surveyed was indicated as DS_R. Because the DS research is conducted in two-year intervals, the time series of DS_R has a lower number of observations than the others. We assumed the values from 2003 survey as the value for 2004, which is the first year for other time series. In order to improve the comparability and readability of results missing values of DS_R were filled with averages of neighbouring values in figures and tables.

As previously mentioned, the nature of the collected time-series value of these indicators is not uniform. To ensure comparability and enable the combined analysis the time series of all indicators were transformed in such a way that the values of each indicator for 2004 was arbitrary set on 100 and values for 2005-2013 were calculated in proportion. Therefore we interpret only the relative changes of each indicator.

We calculated the distance, i.e. similarity, between the time series using the Clark's metrics[8]. We also study the correlation between indicators.

[6] Social Diagnosis. Integrated database. www.diagnoza.com, accessed 16 April 2016.
[7] Respondents indicating to usage of farm as the main source of income.
[8] Distance measured in J.P. Clark's metrics, also known as the divergence coefficient, between points x_i, x_k from R^n space is defined as: $d(x_i, x_k) = \sqrt{\frac{1}{n}\sum_{j=1}^{n}\left(\frac{x_{ij}-x_{kj}}{x_{ij}+x_{kj}}\right)^2}$. It is normalized on the [0, 1] interval and easy to interpret (Młodak, 2006). In our interpretation, the point from R^n space is the time series of a given indicator for the period 2004-2013. An alternative approach to the comparison of time series which develop according to the clear trend is to use the function

3 Results

Values of the objective indicators from GUS and FADN lead to the most optimistic assessment of the agricultural producers' situation. DS results indicate smaller improvement, whereas IRG SGH results suggest relative deterioration of the financial situation in the analysed period as compared to 2004. It can be said, that this data source seems to be burdened with the highest risk of committing an error in interpretation.

Discrepancies in the assessment of the farms situation on the basis of all indicators are presented in figure 1. If we ignore the IRG_P indicator, it can be seen that GUS_WD, FADN_D and FADN_WD achieved their final high values in 2013 by different paths. On the basis of the GUS_DD and DS_R indicators the growth can be assessed as slow.

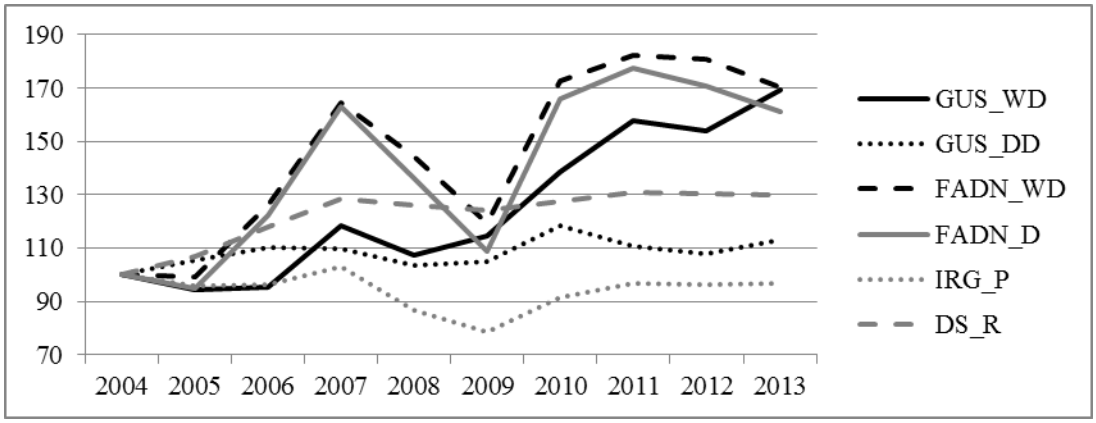

Fig. 1. Changes in values of indexes describing economic situation in 2004-2013 (2004=100).

Source: own calculations.

The indicators obtained from the FADN data show that both the value added and income developed according to the same regularities, which to some extent may result from the algorithm used to calculate the values of these variables. When FADN data are considered, it can be seen that the difference between the value added and farm income is smaller than in the case when GUS data are used (figure 2). FADN_(WD-D) is the difference between FADN_WD and FADN_D; GUS_(WD-DD) is the difference between GUS_WD and GUS_DD.

similarity measure (Dorosiewicz, Michalski, 1998). We didn't use this approach due to the small number of observations.

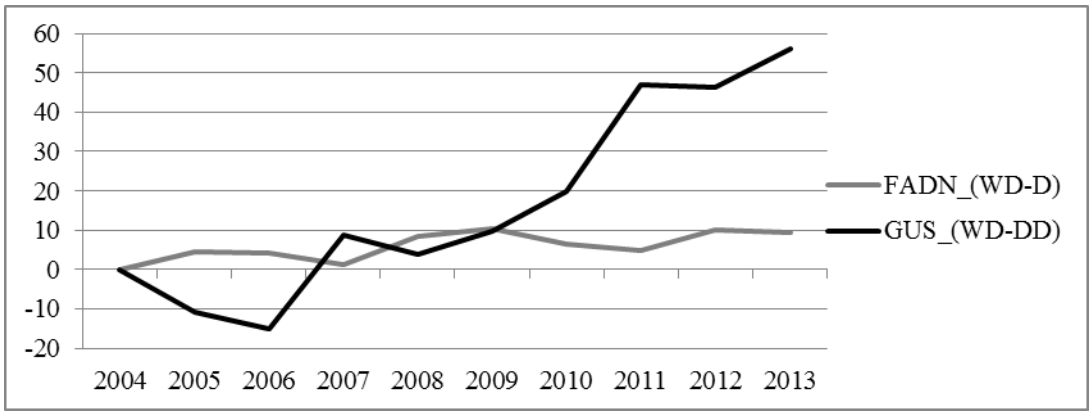

Fig. 2. Difference between the indexes of value added and income on the basis of FADN and GUS data.

Source: own calculations.

Indicator	GUS_WD	GUS_DD	FADN_D	IRG_P	DS_R	FADN_WD
GUS_WD	1.0000					
	[0.00]					
GUS_DD	0.5828	1.0000				
	[0.35]	[0.00]				
FADN_D	0.8291	0.6828	1.0000			
	[0.26]	[0.47]	[0.00]			
IRG_P	0.1228	0.1266	0.2682	1.0000		
	[0.49]	[0.19]	[0.67]	[0.00]		
DS_R	0.7285	0.6083	0.8526	-0.1803	1.0000	
	[0.24]	[0.22]	[0.31]	[0.45]	[0.00]	
FADN_WD	0.8543	0.6827	0.9942	0.1837	0.8905	1.0000
	[0.30]	[0.52]	[0.08]	[0.73]	[0.34]	[0.00]

Table 1. Correlation coefficients and Clark's distances for pairs of indexes.

Source: own calculations.

Pearson correlation coefficient was used as the first method of analysis of the time series' similarity[9] (table 1). Results of IRG research are still not similar to any of the objective variables. Results of the DS research are similar to both FADN and GUS. In brackets in table 1 we present the values of Clark's distance. Both measures are symmetrical, so part of the table is unfilled.

The evaluation of interdependence between the pairs of indicators would be fully consistent if high values of Clark's measure were accompanied by small absolute values of the correlation coefficient. As we can see, this is not the case, for example for (IRG_P, GUS_DD) pair. On the other hand, the compatibility of measures is confirmed by both interdependence measures for pair (FADN_WD, FADN_D).

Conclusions

Using only one source of quantitative data or one indicator in the economic analysis may lead to the risk of error in interpretation. Especially when analyzing changes over time we should refer to the values of several indicators, preferably those whose values derive from surveys conducted by various institutions. The fact that the original data, which is the basis for determining the values of the indicators are measured by different methods and in different units does not constitute an obstacle to a proper transformation of the indicators in order to ensure their comparability.

Comparing the indicators can help identify the study, the results of which are consistent with other sources. In our case data on the situation in agriculture collected by FADN seem to be most trustworthy, whereas the IRG SGH data can be seen as most controversial and difficult to compare with other time series.

Another issue unresolved in this study, is the choice of indicators for comparisons, in order to illustrate the state or dynamics of change. We use indicators on financial situation of the farm same as (Augustyńska-Grzymek et al., 2013), but we could as well choose the amount of free time which a family have as a prosperity measure (Bazyl, 2010).

[9] The changes are nonlinear but the Pearson correlation coefficient was used in order to show the interdependence of directions of changes.

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