

**THE INFLUENCE OF LOANS FOR AGRICULTURE  
ON NET PROFIT OF COOPERATIVE BANKS  
IN POLAND**

SŁAWOMIR JUSZCZYK

**Abstract**

*The aim of the research was to determine whether and to what extent loans for agriculture, i.e. loans for farms and preferential loans affected the level of net profit of cooperative banks in Poland in 2015-2017. The research determined, e.g. that loans for farms are important for generating net profit for small, medium and large cooperative banks. However, the values of the regression coefficient for this variable were relatively low with a slight increasing tendency. The variable defining preferential loans for agriculture appeared only in two models out of nine constructed and with a negative sign. This concerned small and medium-sized cooperative banks. For large cooperative banks, preferential loans for agriculture were not of key importance in generating net profit. Therefore, it can be indicated that preferential loans do not bring financial benefits for cooperative banks. However, cooperative banks support these loans due to their mission towards their members and the environment, related to the development of agriculture as well as rural areas. Regardless of this, it will be necessary to reconstruct the financial revenues of servicing preferential loans.*

**Keywords:** preferential loans for agriculture, loans granted to individual farmers, net profit, cooperative banks.

**JEL codes:** G17, G19, G20.

## **Introduction**

The development of a large part of agriculture and food economy, as well as of small and medium-sized enterprises, especially in rural areas, is affected by cooperative banks. In Poland, at the end of 2017, there were 553 cooperative banks, which in terms of capital and ownership are wholly Polish, and 35 commercial banks, operating mainly in cities, in most of them foreign capital dominates. Cooperative banks are distributed evenly throughout the country and specialise in the services for agriculture, small and medium-sized enterprises, local authorities and rural and urban populations. There are also cooperative banks in the voivodeship cities and even in the capital city, but these banks are clearly larger than other cooperative banks and usually serve suburban producers of fruit and vegetables as well as handicraft facilities. It is worth adding that cooperative banks in Poland have been operating for more than 150 years and are mainly associated with rural areas and small towns. When compared to commercial banks, they are smaller, but generally more deeply rooted in the local environment which they support in various ways.

It should be stressed that a cooperative bank is both a bank and a cooperative. The purpose of the bank is generally to actually increase profit over a continuous long-term period, at planned and accepted risk level. The objective of the cooperative is, then, to satisfy the needs of its members – co-owners, to a maximum extent. The cooperative banking sector in Poland employs about 32 thousand employees at about 4 thousand establishments, whose services are used by more than 10 million Polish customers, constituting a major share in relation to all customers.

In the next few years, the cooperative banking sector is to face many challenges related to social, market and legal transformations, which will also affect the market position of these banks (Różyński, 2014). Due to the very good knowledge of the local market and its customers, cooperative banks should primarily see their chances of further development in these attributes. The changes are possible, for instance, by introducing individualised approach to the customer, better and better organisation of the functioning of facilities in terms of service and modernising changes allowing to fully use the economic potential of both banks and served corporate and customers. Despite the important attributes of cooperative banks, commercial banks generate higher level of net profit for a number of reasons. According to data from the Polish Financial Supervision Authority, over the last decade the annual net profit of commercial banks was between PLN 8.6 billion and PLN 14.3 billion. In the case of cooperative banks, the net profit varied between the PLN 0.5 billion and 0.98 billion. It should be added that in the literature there are no studies related to the impact of loans for agriculture on the net profit level of cooperative banks in Poland. Therefore, an attempt was made to bridge the gap, which could be important for managers of cooperative banks and for government institutions shaping the economic reality in the field of agricultural policy in Poland.

## Major issues regarding loans for agriculture

Agricultural loans can be divided into two main groups, i.e. loans granted to individual farmers and preferential loans, i.e. with subsidies to the interest rate of these loans provided by the Agency for Restructuring and Modernisation of Agriculture (*Agencja Restrukturyzacji i Modernizacji Rolnictwa*, ARMiR). The first group of loans refers to the situation where the farmer submits an application to the bank for obtaining a loan for the agricultural activity-related purpose. Importantly, the conditions of such a loan are often negotiated by both parties. The other group of loans has the extensive legal and economic legitimacy, as it is linked to public subsidies, most often resulting from the mechanisms of the Common Agricultural Policy of the European Union. The funds for subsidies under preferential loans are the responsibility of the Agency for Restructuring and Modernisation of Agriculture which applies aid e.g. in a form subsidies to the interest rate of loans for: purchase of UAA (Z line), resumption of production on farms and of special agricultural production sections, purchase of shares or stocks of companies processing agricultural products or fish, as well as purchase of shares of companies involved in artificial insemination – PR line (ARiMR, 2018b).

Farmers can apply for support from other institutions e.g. in a form of: seed material subsidies (Agricultural Market Agency), reduced social security contributions (Farmers' Social Security Fund), reduced lease rent (Agricultural Property Agency) and tax reliefs (tax authorities, local government units). Moreover, loans with the Agency's subsidies to the interest rates may be intended for e.g. purchase and installation of machinery, devices and equipment for the agricultural production, storage and preparation of agricultural products for sale. The purchase may include both new and used machinery and devices, provided that used machinery and devices are not older than 5 years as of the day of sale and have not been previously purchased with the use of public funds. Essentially, in 2018 financial support of the Ministry of Agriculture, also through ARMiR, in the area of the so-called biosecurity is gaining ground. In fact, it is about financial aid to prevent the spread of African swine fever (ASF) (ARiMR, 2018a).

As regards granting of preferential loans, ARMiR cooperates with the following banks:

- Bank Polskiej Spółdzielczości S.A. and associated cooperative banks,
- SGB Bank S.A. and associated cooperative banks,
- BGŻ BNP Paribas S.A.,
- Bank Pekao S.A.,
- Raiffeisen Bank Polska S.A.,
- Bank Zachodni WBK S.A.

### **Methodological issues of the studies**

The objective of the studies was to establish whether and to what extent agricultural loans, i.e. loans for farms and preferential loans for these farms affect the net profit level of cooperative banks in Poland and to answer the question whether the importance of these loans in 2015, 2016 and 2017 increased or decreased. The objective of the study required literature and empirical studies.

One of the more important problems in economic studies is the selection of a sample. It is possible to cover all the objects with the studies, i.e. comprehensive studies, but we may also select only certain population units (Klepacki, 1984). In Poland, as of 31 December 2017, there were 553 banks. In the period of the study, 91 banks were subject to merger processes or significant organisational changes and therefore were omitted in this study. To select a representative sample, the remaining 462 banks, i.e. 83.5% of the overall population were ranked in ascending order by total value of assets, and every fourth bank was drawn starting from the bank ranked second. Therefore, the studies covered 115 banks, i.e. nearly 20.8% of the overall population, as of the end of 2017. The source materials were:

- Statistical data of the Polish Financial Supervision Authority,
- Statistical data of the Bank Guarantee Fund,
- Statistical data of the associating banks,
- Publications of the National Bank of Poland,
- Mass statistical data on the European Union and Poland,
- Statistical data of the individual cooperative banks.

A key measure of the growth and evaluation of the financial efficiency of the entity is the net profit value. It can even be considered that this is the most important measure. Szustak believes that the profit achieved enables the increase on the market value, payment of a dividend to its owners, increase in the bank's credibility in the market and determines the degree of self-financing of the bank's development. The net profit is also an important source of feeding own funds (Szustak, 2009). At the next stage of the study, the author makes an estimation of the regression exogenous models for the net profit level in the three groups of cooperative banks, separately for 2015, 2016 and 2017. In total, 9 econometric models were developed, the studies in this field were conducted according to the following scheme (Nowak, 1998; Welfe, 2003; Gruszczyński, Kluza and Winek, 2003):

1. Preparing the model specification:
  - Determining the objective and scope of the study of the dependent variable,
  - Identifying potential independent variables,
  - Initial reduction of potential independent variables,
  - Selecting the analytical form of the model.
2. Estimation of the structural parameters of the model.
3. Statistical verification of the constructed model, i.e. assessment of:
  - Degree of adjusting the model to empirical data using the determination coefficient,
  - Normal distribution of the residual component, using the Jarque–Bera test,

- Uniformity of the residual component's variance (assessment of heteroscedasticity), using the White test,
- Co-linearity of exogenous variables, using the variance inflation factor.

According to the above procedure, at the first stage, based on an overview of the literature and collected data, economic and financial indices were selected, which were potential exogenous variables. The selection of exogenous variables has been dictated by their prevalence in the literature. The endogenous variable was the net profit, the following potential exogenous variables were selected:

$X_1$  = total own funds (PLN thousand),

$X_2$  = basic fund (PLN thousand),

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_8$  = result on banking activity (PLN thousand),

$X_9$  = costs of the bank's operation (PLN thousand),

$X_{10}$  = total bank loan exposure (PLN thousand),

$X_{11}$  = capital adequacy ratio,

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{13}$  = loans granted to individual operators (PLN thousand),

$X_{14}$  = loans granted to private individuals (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit),

$X_{19}$  = net assets (PLN thousand).

Further on, bearing in mind the selection of potential exogenous variables, the Nowak method was used (Nowak, 1984). As a result, those variables were selected, which are strongly correlated with the endogenous variable and also poorly intercorrelated with each other. What was also used was the analysis of correlation coefficients (Grabiński, Wydymus and Zeliaś, 1982). As a result, the exogenous models for the net profit level of cooperative banks along with factors determining that level were constructed.

### Factors determining the net profit of cooperative banks – results of the studies

The analysed cooperative banks were divided into 3 groups, small, medium-sized and large. These groups were internally homoscedastic. Small cooperative banks were those with own funds up to PLN 5 million. Medium-sized banks are those whose own funds are from PLN 5 million to PLN 15 million, while large are those whose own funds are more than PLN 15 million.

#### *Small cooperative banks (1<sup>st</sup> group)*

The system of selecting indices for the model was used to determine the potential variables likely to affect the net profit generated by cooperative banks in 2015. In the first step, a correlation matrix was set between the endogenous variable and the nineteen potential exogenous variables analysed in the studies and between all exogenous variables.

Having regard to the adopted critical value of the correlation coefficient, the strongly intercorrelated exogenous variables were eliminated until obtaining a set of exogenous variables highly correlated with the endogenous variable and poorly intercorrelated between each other (Dziechciarz, 2003). The analysis of the correlation coefficients among the analysed variables, taking into account the above assumptions, showed that the relevant variables meeting the above conditions were as follows:

$$X_3, X_4, X_6, X_7, X_{12}, X_{16}, X_{17}, X_{18}$$

where:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit).

After determining the variables of key importance for explaining the net profit of cooperative banks with own funds lower than PLN 5 million, in 2015, the regression function parameters have been estimated. The final form of the model net profit for small banks in 2015 is shown below:

$$ZN_{I2015} = 273.694 + 0.15446X_4 - 0.00346682X_{17}$$

where:

$ZN_{I2015}$  – net profit of the bank from the 1<sup>st</sup> group in 2015 (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand).

Among the variables relevant to the net profit level obtained in 2015 by banks with funds lower than PLN 5 million, there are two exogenous variables, with one variable affecting positively the net profit of cooperative banks. This variable was the resource fund, whose increase by PLN 100 thousand resulted in the increase in the net profit by PLN 15.44 thousand. Interestingly, preferential loans for agriculture had a negative influence on the net profit level as their increase by PLN 100 thousand decreased the net profit, on average, by PLN 350.

On the basis of the analysis of the correlation coefficients for 2016, 11 variables were selected that could be considered crucial in estimating the net profit in the analysed group of banks. The variables of this group in 2016 are:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{13}$  = loans granted to individual operators (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand),

$X_{19}$  = net assets (PLN thousand).

In view of the designated exogenous variables, the net profit regression function for banks with own funds of up to PLN 5 million was estimated for 2016. The estimated form of the net profit regression function for these banks is as follows:

$$ZN_{12016} = 233.51 + 0.187878X_4 + 0.00214498X_{15} + 0.009559886X_{19}$$

where:

$ZN_{12016}$  – net profit of the bank from the 1<sup>st</sup> group in 2016 (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{19}$  = net assets (PLN thousand).

For the  $ZN_1 2016$  model, crucial were three variables whose increase had a positive impact on the net profit level. The first variable was the resource fund level, whose increase by PLN 100 thousand increased the net profit by PLN 18.8 thousand. The second variable was the value of loans granted to individual farmers, whose increase by PLN 100 thousand increased the net profit by PLN 0.21 thousand. The third variable was the value of net assets, whose increase by PLN 100 thousand increased the net profit of a cooperative bank from that group in 2016 by PLN 0.95 thousand.



Analysing the data for 2017 for small cooperative banks, 10 variables were selected that could be considered crucial in estimating the net profit in the analysed group of banks. The variables of this group in 2017 are:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{10}$  = total bank loan exposure (PLN thousand),

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit).

According to the studies carried out, four variables concerned own funds of cooperative banks, five variables were related to loans granted and the number of employees also proved important among the variables crucial for clarification of the net profit of cooperative banks from the 1<sup>st</sup> group, in 2017. In the next step, the regression function parameters were estimated. Below, there is the final form of the regression function:

$$ZN_{I2017} = 2363.556 + 0.188221X_4 + 0.0112136X_{10} + 0.0953343X_{16}$$

where:

$ZN_{I2017}$  – net profit of the bank from the 1<sup>st</sup> group in 2017 (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_{10}$  = total bank loan exposure (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand).

As is apparent from the estimated regression function  $ZN_{I2017}$ , the increased resource fund had a positive impact on the net profit of banks with own funds lower than PLN 5 million in 2017. The increase in the resource fund by 10 thousand increased the net profit by more than PLN 1.88 thousand. The increase in the loan exposure of a cooperative bank and loans granted to institutions and households had a positive impact on the net financial result in 2017 obtained by cooperative banks with own funds lower than PLN 5 million. As evident from the model, the increased bank loan exposure in total by PLN 100 thousand increased the net profit by PLN 1.12 thousand, while the increase in loans granted to institutions involved in the activity for households by PLN 100 thousand increased the net profit, on average, by PLN 9.53 thousand.



Table 1

*Net profit regression models (PLN thousand) for cooperative banks  
with own funds lower than PLN 5 millio*

Specification	Years		
	2015	2016	2017
Constant	273.694	233.51	2363.556
----- Regression coefficient with the given variable -----			
X <sub>4</sub> – resource fund (PLN thousand)	0.15446	0.187878	0.188221
X <sub>10</sub> – total bank loan exposure (PLN thousand)	-	-	0.0112136
X <sub>15</sub> – loans granted to individual farmers (PLN thousand)	-	0.00214498	-
X <sub>16</sub> – loans granted to institutions involved in the activity for households (PLN thousand)	-	-	0.0953343
X <sub>17</sub> – preferential loans for agriculture (PLN thousand)	-0.00346682	-	-
X <sub>19</sub> – net assets (PLN thousand)	-	0.009559886	-
R <sup>2</sup>	0.76020	0.82257	0.82164
F	46.5641	35.26447	101.0398
F*	3.03163	2.64998	2.64411
Verification of the hypothesis about the significance and non-randomness of the variables in the model	accepted	accepted	accepted
JB	2.512	4.195	3.420
χ <sup>2</sup> for the JB test	5.99146	5.99146	5.99146
Verification of the hypothesis about the normal distribution of residues	accepted	accepted	accepted
White test	27.071288	29.165720	29.486394
χ <sup>2</sup> for the White test	23.6848	23.6848	23.6848
Verification of the hypothesis about the homoscedasticity of the model residues	accepted	accepted	accepted
Verification of the hypothesis about the absence of co-linearity of the exogenous variables	VIF <sub>X<sub>4</sub></sub> =1.032 VIF <sub>X<sub>17</sub></sub> =1.28 accepted	VIF <sub>X<sub>4</sub></sub> =1.16 VIF <sub>X<sub>15</sub></sub> =1.19 VIF <sub>X<sub>19</sub></sub> =1.19 accepted	VFI <sub>X<sub>4</sub></sub> =1.050 VFI <sub>X<sub>10</sub></sub> =1.15V FI <sub>X<sub>16</sub></sub> =1.08 accepted

Source: own studies.

During the studies on the net profit increase factors in cooperative banks with the lowest level of own funds, i.e. below PLN 5 million, three net profit regression functions were estimated, i.e. for each year covered by the study. All constructed net profit regression models met the requirements imposed by the least-squares method. Namely, they were characterised by the normal distribution of residues, the absence of heteroscedasticity and the absence of co-linearity among the exog-

enous variables. The Fisher–Snedecor test indicated the significance and non-randomness of the exogenous variables in the estimated net profit models. In addition, it should be stressed that the coefficient of determination of the individual models was between 0.76020 for the 2015 model and 0.82257 for the 2016 model. This means that models constructed for the group of cooperative banks with own funds lower than PLN 5 million, explained the variability of the net profit in more than 76%, which was considered satisfactory.

### ***Medium-sized cooperative banks (2<sup>nd</sup> group)***

Using the adopted procedure, in order to determine the exogenous function for the net profit of cooperative banks with own funds of PLN 5-15 million for 2015, seven variables were designated which met the assumptions about the value of the correlation coefficients. These variables are:

$$X_3, X_4, X_5, X_7, X_{15}, X_{16}, X_{18}$$

where:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit).

These variables were used to estimate the regression exogenous model for the net profit level for entities in the analysed group. The regression function for 2015 is as follows:

$$ZN_{II\ 2015} = 97.8303 + 0.14332X_4 + 0.00659062X_{15}$$

where:

$ZN_{II\ 2015}$  – net profit of the bank in the 2<sup>nd</sup> group in 2015 (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand).

In the regression model of the net profit for cooperative banks with own funds of PLN 5-15 million, there are two variables for 2015, i.e. the variables applying to the resource fund and loans granted to individual farmers. They were stimulants as their increase by PLN 100 thousand increased the net profit by 14.33 thousand and nearly PLN 0.66 thousand, respectively. As it results from the estimated regression function, the largest impact on the net profit level among banks in the group analysed in 2015 was that of the resource fund variable, indicating its crucial financial importance.

The data analysis carried out for 2016, for cooperative banks with own funds PLN 5-15 million showed that the following variables were statistically significant:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand).

The stepwise regression method allowed to estimate the following regression function:

$$ZN_{II\ 2016} = 43.3678 + 0.14966X_4 + 0.144729X_6 + 0.0289991X_{15}$$

where:

$ZN_{II\ 2016}$  – net profit of the bank in the 2<sup>nd</sup> group in 2016 (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand).

The analysis shows that in cooperative banks with funds of PLN 5-15 million in 2016, there were three exogenous variables whose increase resulted in the increased net profit. The greatest impact on the financial result, according to the estimated model, was that of the increase in the resource fund, whose increase by PLN 100 thousand increased the net profit by more than PLN 14.96 thousand, while the increase of the general risk fund by PLN 100 thousand increased the net profit by less than PLN 14.5 thousand. The lowest increase in the net profit was generated by a change in the level of loans granted to individual farmers, whose increase by PLN 100 thousand allowed to increase the net profit by nearly PLN 2.9 thousand.

With the aim of determining the exogenous function for the net profit of a medium-sized cooperative bank for 2017, nine variables were determined, namely:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{14}$  = loans granted to private individuals (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit).

At the further stage of the study on the regression models for the net profit in the analysed group for 2017, the variables were eliminated and the following model was established:

$$ZN_{II\ 2017} = 69.1455 + 0,015924X_3 + 0.118814X_4 + 0.153184X_6 + 0.017412X_{14} - 0.00806114X_{17}$$

where:

$ZN_{II\ 2017}$  – net profit of the bank in the 2<sup>nd</sup> group in 2017 (PLN thousand),

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_{14}$  = loans granted to private individuals (PLN thousand),

$X_{17}$  = preferential loans for agriculture (PLN thousand).

In the  $ZN_{II\ 2017}$  model, there were five exogenous variables. Three of them concerned the level of own funds of cooperative banks and another two – loans. In the case of the variable  $X_3$  determining the level of the equity fund, it was found that its level had a positive impact on the net profit level, as the increase of that fund by PLN 100 thousand increased the net financial result by PLN 1.59 thousand. But the increase in the resource fund by PLN 100 thousand increased the net profit in the analysed banks by, on average, PLN 11.88 thousand, while the increase in the general risk fund by PLN 100 thousand generated the average increase in the net profit by PLN 15.32 thousand. In the case of loans granted to private individuals their increase by PLN 100 thousand, resulted in the increase in the net profit by more than PLN 1.74 thousand, whereas the increase in preferential loans for agriculture by PLN 100 thousand decreased the net profit by, on average, PLN 806.

The resource fund that is indivisible was important during all years of the studies for medium-sized banks. Also vital, especially in 2016 and 2017 was the general risk fund and in 2017 the equity fund proved to be crucial for the net profit. This could be due to the fact that in December 2016, the European Banking Authority (EBA) included the equity fund on the list of recognised instruments – common equity tier 1 (CET1).

Between 2015 and 2016 the net profit level of medium-sized cooperative banks was significantly and positively affected by loans granted to individual farmers. Moreover, in 2016 the significance of these loans was higher than in 2015. In contrast, preferential loans for agriculture decreased the profit of this group of banks in 2017, nevertheless they were still extended for social reasons, which should be rated positively, but requires changes and realignment of the costs of service of these loans.

Table 2

*Net profit regression models (PLN thousand) for cooperative banks with own funds of PLN 5-15 million*

Specification	Years		
	2015	2016	2017
Constant	97.8303	43.3678	69.1555
----- Regression coefficient with the given variable -----			
X <sub>3</sub> – equity fund (PLN thousand)	-	-	0.015924
X <sub>4</sub> – resource fund (PLN thousand)	0.14332	0.14966	0.118814
X <sub>6</sub> – general risk fund (PLN thousand)	-	0.154728	0.153184
X <sub>14</sub> – loans granted to private individuals (PLN thousand)	-	-	0.017412
X <sub>15</sub> – loans granted to individual farmers (PLN thousand)	0.00659062	0.0289991	-
X <sub>17</sub> – preferential loans for agriculture (PLN thousand)	-	-	-0.00806114
R <sup>2</sup>	0.842636	0.926977	0.789015
F	99.70403	98.25217	32.75574
F*	3.03867	2.64145	2.27176
Verification of the hypothesis about the significance and non-randomness of the variables in the model	accepted	accepted	accepted
JB	2.730	0.338	3.253
χ <sup>2</sup> for the JB test	5.99146	5.99146	5.99146
Verification of the hypothesis about the normal distribution of residues	accepted	accepted	accepted
White test	22.139641	36.317012	24.888770
χ <sup>2</sup> for the White test	23.6848	23.6848	23.6848
Verification of the hypothesis about the homoscedasticity of the model residues	accepted	accepted	accepted
Verification of the hypothesis about the absence of co-linearity of the exogenous variables	VIF <sub>X<sub>4</sub></sub> =1.196	VIF <sub>X<sub>4</sub></sub> =1.492	VIF <sub>X<sub>3</sub></sub> =1.026
	VIF <sub>X<sub>15</sub></sub> =1.191	VIF <sub>X<sub>6</sub></sub> =1.177	VIF <sub>X<sub>4</sub></sub> =1.525
		VIF <sub>X<sub>15</sub></sub> =1.302	VIF <sub>X<sub>6</sub></sub> =1.300
	accepted	accepted	VIF <sub>X<sub>14</sub></sub> =1.207 VIF <sub>X<sub>17</sub></sub> =1.108 accepted

Source: own study.

### ***Large cooperative banks (3<sup>rd</sup> group)***

In the course of the studies, a correlation matrix was established between the analysed variables for banks with own funds of more than PLN 15 million for 2015. This was done with the use of analogous procedure as before and an analysis the group was carried out to determine variables to best describe the variability in the net profit. These variables are:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_{11}$  = capital adequacy ratio,

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{14}$  = loans granted to private individuals (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{18}$  = number of people employed in the bank (unit).

The final form of the estimated model using the stepwise regression method for 2015 is as follows:

$$ZN_{III\ 2015} = 1745.26 + 0.001234X_3 + 0.146833X_4 + 0.0280734X_{14} + 0.0116223X_{15}$$

where:

$ZN_{III\ 2015}$  – net profit of the bank in the 3<sup>rd</sup> group in 2015 (PLN thousand),

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_{14}$  = loans granted to private individuals (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand).

Four variables were vital in the estimated net profit model of banks with own funds of more than PLN 15 million in 2015. The first variable concerned the resource fund, whose increase by PLN 100 thousand increased the net profit by PLN 14.68 thousand. The next variable applied to the equity fund, which according to the designated regression function had a positive, yet poor, impact on the financial result of a large cooperative bank, since its increase by PLN 100 thousand increased the net profit by more than PLN 123. The other two variables referred to loans granted to private individuals and to individual farmers. As apparent from the model, the increase in these variables by PLN 100 thousand increased, on average, the net profit of a cooperative bank in this group in 2015 by nearly PLN 2.8 thousand for the  $X_{14}$  variable and nearly PLN 1.16 thousand for the variable concerning loans granted to individual farmers. This indicates that in 2015, the importance of loans to private individuals was more than twice higher for increasing the net profit in large banks than that of loans granted to individual farmers.

On that basis of the designated correlation coefficients for the analysed variables for 2016, six variables have been designated which met the conditions for being recognised as potentially significant. These variables were as follows:

$$X_3, X_4, X_5, X_{11}, X_{15}, X_{16}$$

where:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand),

$X_{16}$  = loans granted to institutions involved in the activity for households (PLN thousand).

These variables were used to estimate the regression function for the net profit for large cooperative banks in 2016. The form of the model is as follows:

$$ZN_{III\ 2016} = 46.2223 + 0.0097695X_3 + 0.150422X_4 + 0.304948X_6$$

where:

$ZN_{III\ 2016}$  – net profit of the bank in the 3<sup>rd</sup> group in 2016 (PLN thousand),

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand).

The regression function of the net profit for banks with the highest level of own funds, i.e. of more than PLN 15 million in 2016, contained three variables which determined the amount of the collected equity fund, resource fund and general risk fund. According to the  $ZN_{III\ 2016}$  model, the increase in the equity fund by PLN 1 thousand contributed to the increase in the net profit by nearly PLN 9.8. The other two variables were also characterised by positive regression factors, indicating their positive and strong impact on the financial result of a cooperative bank from the 3<sup>rd</sup> group in 2016.

For 2017, just like before, at the first stage the potential exogenous variables for the net profit level of large cooperative banks in Poland were determined and they were:

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_5$  = reserve fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_7$  = complementary fund (PLN thousand),

$X_{11}$  = capital adequacy ratio,

$X_{12}$  = loans granted to enterprises and private companies (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand).



The final form of the model is as follows:

$$ZN_{III\ 2017} = 1540.15 + 0.0732446X_3 + 0.1714456X_4 + 0.0776673X_6 + 0.0144878X_{15}$$

where:

$ZN_{III\ 2017}$  – net profit of the bank in the 3<sup>rd</sup> group in 2017 (PLN thousand),

$X_3$  = equity fund (PLN thousand),

$X_4$  = resource fund (PLN thousand),

$X_6$  = general risk fund (PLN thousand),

$X_{15}$  = loans granted to individual farmers (PLN thousand).

In the model, there are four variables being stimulants, as their increase resulted in the increase in the net profit proportionally to the regression coefficient estimated for the given variable. According to the  $ZN_{III\ 2017}$  model, the increase in the equity fund by PLN 1 thousand involved the increase in the net profit in large cooperative banks in 2017 by more than PLN 73, on average. Further on, the increase in the resource fund by PLN 100 thousand increased the net profit by more than PLN 17.14 thousand, while the increase in the general risk fund by PLN 100 thousand generated the increase in the net profit by nearly PLN 7.77 thousand. The lowest value of the regression coefficient has the variable referring to loans granted to individual farmers, which amounted to 0.0144878. This means that the increase in the value of loans granted to individual farmers by PLN 100 thousand, generated, at that time, an increase in the net profit by less than PLN 1,450 PLN in the analysed group of banks.

The variable determining the level of the resource fund was crucial in that group of banks in all years of the study period. This attests to the fundamental impact of this variable on the net profit level of large cooperative banks. It is also important that each year the amount of the regression coefficient of this variable was growing. This may indicate the increase in the significance of this fund to the net profit level in the analysed group of cooperative banks in relation to other coefficients.

Importantly, for large cooperative banks, the importance of preferential loans for agriculture in 2015-2017 was not a decisive factor in shaping the net profit. In 2015 and 2017, loans granted to individual farmers were important for large cooperative banks. It should be also emphasised that the importance of these loans in 2017 was higher than in 2015. Statistical calculations indicate that loans granted to individual farmers even for large cooperative banks, often established in urban areas, are still an important factor that positively affects the increase in the net profit.

Table 3

*Net profit regression models for cooperative banks with own funds  
of more than PLN 15 million*

Specification	Years		
	2015	2016	2017
Constant	1745.26	46.2223	1540.15
----- Regression coefficient with the given variable -----			
X <sub>3</sub> – equity fund (PLN thousand)	0.001234	0.0097695	0.0732446
X <sub>4</sub> – resource fund (PLN thousand)	0.146833	0.150422	0.1714456
X <sub>6</sub> – general risk fund (PLN thousand)	-	0.304948	0.0776673
X <sub>14</sub> – loans granted to private individuals (PLN thousand)	0.0280734	-	-
X <sub>15</sub> – loans granted to individual farmers (PLN thousand)	0.0116223	-	0.0144878
R <sup>2</sup>	0.763288	0.874564	0.823630
F	6.459620	12.01378	12.33337
F*	3.00692	2.8826	3.34389
Verification of the hypothesis about the significance and non-randomness of the variables in the model	accepted	accepted	accepted
JB	3.336	1.505	1.962
χ <sup>2</sup> for the JB test	5.99146	5.99146	5.99146
Verification of the hypothesis about the normal distribution of residues	accepted	accepted	accepted
White test	24.058041	29.384545	34.116941
χ <sup>2</sup> for the White test	23.6848	23.6848	23.6848
Verification of the hypothesis about the homoscedasticity of the model residues	accepted	accepted	accepted
Verification of the hypothesis about the absence of co-linearity of the exogenous variables	VIF <sub>X<sub>3</sub></sub> =1.093	VIF <sub>X<sub>3</sub></sub> =1.067	VIF <sub>X<sub>4</sub></sub> =1.235
	VIF <sub>X<sub>14</sub></sub> =1.203	VIF <sub>X<sub>4</sub></sub> =1.030	VIF <sub>X<sub>6</sub></sub> =1.085
	VIF <sub>X<sub>15</sub></sub> =1.333	VIF <sub>X<sub>6</sub></sub> =1.015	VIF <sub>X<sub>15</sub></sub> =1.04
	accepted	accepted	accepted

Source: own study.

## **Conclusions**

The studies showed that the number of the variables that, from the statistical point of view, had a key impact on the net profit level of cooperative banks in Poland changed in 2015-2017. The number of the variables was the lowest in the net profit models for the largest cooperative banks in individual years of the studies.

The  $X_{15}$  variable, determining the level of loans granted to individual farmers, was included in 5 of 9 constructed models. Moreover, this variable was important for generating the net profit for small, medium-sized and large cooperative banks. However, it should be stressed that the regression coefficient values for this variable had a relatively low level, but with a small upward trend.

Preferential loans for agriculture are a separate issue. In 9 models explaining the net profit level of cooperative banks, the  $X_{17}$  variable applying to these loans appeared only twice and in addition with a negative sign. Therefore, these loans do not bring financial benefits to small and medium-sized cooperative banks, although they are granted due to the mission of those banks towards their members. For large cooperative banks, preferential loans for agriculture are not of key importance in generating the net profit.

**References**

- Agencja Restrukturyzacji i Modernizacji Rolnictwa (2018a). *Bioasekuracja*. Retrieved from: <http://www.arimr.gov.pl/>.
- Agencja Restrukturyzacji i Modernizacji Rolnictwa (2018b). *Kredyty preferencyjne*. Retrieved from: <http://www.arimr.gov.pl/>.
- Dziechciarz, J. (2003). *Ekonometria. Metody, przykłady, zadania*. Wrocław: Wydawnictwo Akademii Ekonomicznej.
- Grabiński, T., Wydymus, S., Zeliaś, A. (1982). *Metody doboru zmiennych w modelach ekonometrycznych*. Warszawa: Wydawnictwo PWN.
- Gruszczyński, M., Kluza, S., Winek, D. (2003). *Ekonometria*. Warszawa: Wydawnictwo WSHiFM.
- Klepacki, B. (1984). *Wybór próby w badaniach ekonomiczno-rolniczych*. Warszawa: Wydawnictwo SGGW.
- Nowak, E. (1984). *Problemy doboru zmiennych do modelu ekonometrycznego*. Warszawa: PWN.
- Nowak, E. (1998). *Zarys metod ekonometrii – zbiór zadań*. Warszawa: PWN.
- Różyński, J. (2014). *Oddziaływanie wielkości i struktury funduszy własnych na efektywność banków spółdzielczych*. Szczecin: Uniwersytet Szczeciński.
- Szustak, G. (2009). *Kapitał własny a bezpieczeństwo, efektywność i konkurencyjność banku*. Wydawnictwo Akademii Ekonomicznej w Katowicach.
- Welfe, A. (2003). *Ekonometria*. Ed. III. Warszawa: Wydawnictwo PWN.

## ODDZIAŁYWANIE KREDYTÓW DLA ROLNICTWA NA ZYSK NETTO BANKÓW SPÓŁDZIELCZYCH W POLSCE

### Abstrakt

*Niniejsze badanie ma na celu ustalenie, czy i w jakim stopniu kredyty dla rolnictwa, tzn. kredyty dla gospodarstw rolnych i kredyty preferencyjne, wpływały na poziom zysku netto banków spółdzielczych w Polsce w latach 2015-2017. Badanie pozwoliło stwierdzić między innymi, że kredyty dla gospodarstw rolnych odgrywają istotną rolę w generowaniu zysku netto dla małych, średnich i dużych banków spółdzielczych. Jednak wartości współczynnika regresji dla tej zmiennej były stosunkowo niskie z niewielką tendencją zwyżkową. Zmienna definiująca kredyty preferencyjne dla rolnictwa pojawiła się tylko w dwóch z dziewięciu zbudowanych modeli i to ze znakiem negatywnym. Dotyczyło to małych i średnich banków spółdzielczych. W przypadku dużych banków spółdzielczych kredyty preferencyjne dla rolnictwa nie miały decydującego znaczenia w generowaniu zysku netto. Można zatem stwierdzić, że kredyty preferencyjne nie przynoszą korzyści finansowych dla banków spółdzielczych. Banki spółdzielcze wspierają jednak takie kredyty, ponieważ są zobowiązane wypełnianiem swojej misji wobec swoich członków i środowiska, związanej z rozwojem rolnictwa i obszarów wiejskich. Bez względu na powyższe konieczna będzie przebudowa dochodów finansowych obsługi kredytów preferencyjnych.*

**Słowa kluczowe:** kredyty preferencyjne dla rolnictwa, kredyty udzielone rolnikom indywidualnym, zysk netto, banki spółdzielcze.

Accepted for print: 18.12.2018.