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THE USE OF BANKING BTS DATA IN DIAGNOSING AND FORECASTING SITUATION OF POLISH ECONOMY

Introduction

With the strengthening of the market economy in Poland – after the change of the economic system in 1989 – the increase in demand for information concerning the assessment of the economic situation both on the national scale and with respect to particular branches, the estimation of their attractiveness level and their development abilities, has been noticed. Simultaneously, the increase in the interest in short-term forecasts of the basic economic categories, which are the basis of the decision-making for the participants of economic processes, is clearly visible. Stabilisation of the market economy in Poland, its opening as a result of joining the EU structures and the liberalisation of economic activities contribute to the fact that in the managers' decision-making process the importance of macroeconomic analyses and the forecasts of those numbers, achieved also by unconventional means, is growing.

One of the sources providing the abovementioned information, apart from the data from market statistics, are the results of the business tendency surveys. Such research has a long tradition in fully-grown, mature market economies and the results are commonly used by the participants of the economic life for the assessment and forecasting of the directions of changes in economic activities on a national or regional scale or with respect to particular branches. In Poland, the interest in the business tendency surveys on a wider scale has appeared only after the change of the economic system.

One of the most popular methods of examining the changes in economic activities is the business tendency survey. This method has many advantages[1], and the

[1] A more extensive characteristics of the advantages and efficiency of the business test survey can be found, among others, in: E. Adamowicz, *Badania koniunktury gospodarczej i ich skuteczność*, [in:] J. Garczarczyk (ed.), *Rynek usług finansowych w Polsce w latach 1990-2001.*

most important of these include its speed and relative ease of achieving information and the possibility of achieving not only the assessment of the accomplished economic processes (ex post), but also their forecast for the coming period (ex ante). An indisputable advantage of this method is its universality, enabling the researchers to diagnose and forecast the business tendencies both on the level of the whole economy as well as in particular branches and sectors. Despite the widespread use of the business tendency surveys to study the situation in industry, construction and foreign trade, this method has been relatively rarely used by research institutes to assess and forecast business performance tendencies in the service sector, and especially in the financial service sector.

One of the first centres in Europe to use the business tendency survey for the assessment of the situation on the financial service market was the Department of Marketing Research of the University of Economics in Poznań (DMRP)[2]. Such research has been conducted in the banking (since 1992) and insurance (since 1993) sectors, in a quarterly cycle on a Polish, nation-wide constant sample consisting of 500 units in both cases. The panel comprises of both the head-offices and branches of banks and insurance companies. Information from the units participating in the survey is received by a mail survey and the achieved return is on the level of 40-50%.

The need of research, diagnose and forecasting of the business tendency fluctuations in the financial sector stems from the fact that this sector is the "pacemaker of the economy's bloodstream", which makes the information about the business performance tendencies indispensable for the state's decision-making centre and for the all economic subjects. Moreover, in Poland, as a result of the systemic transformation, the rank of the financial sector has risen decisively and banks have found a proper place for their function.

Considering the abovementioned premises, the authors have tried to answer the following questions:

- Do the results of the business tendency survey in the banking sector (banking BTS) reflect the dynamics of changes in other sectors of Polish economy?
- Can the qualitative data from the surveys in the banking sector (banking BTS) be used in econometric models describing the activity changes in the whole economy and in its particular sectors?
- Can such models serve as the basis of creating the economic development forecasts, what is the accuracy of such forecasts and the reasons of their errors?

Diagnozowanie i prognozowanie koniunktury, Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań 2003; M. Bieć, *Test koniunktury. Metody, techniki, doświadczenia*, SGH, Warszawa 1996.

[2] A detailed description of the methodology and research organisation can be found in: J. Garczarczyk, R. Matusewicz, M. Mocek, *Koniunktura na rynku bankowym i ubezpieczeniowym w Polsce*, Akademia Ekonomiczna, Poznań 2001.

However, in this report the issue of evaluating the applicability of the banking BTS data for diagnosing and forecasting the situation in the banking sector has been omitted, as this problem was the subject of analyses in previous publications[3].

1. Research methodology

The basis for the analyses and comparison with qualitative data from the banking BTS (DMRP) comprised of the quantitative (statistical) data collected and published by the Central Statistical Office (CSO). For the analyses the following variables characterising the dynamics of the quarterly changes in Poland in 1995-2003 were used:

PKB – Gross Domestic Product (GDP),
PPI – the sold industry production value,
PBI – the construction and assembly production value,
IMI – the import value,
EKI – the export value.

These variables are the basic indicators characterising the economic growth rate. Statistical data were present in the analyses as referential variables. In order to provide the comparison with the qualitative data, the quantitative data have been transformed into indexes, with the use of two formulas:

Y – analogical quarter of the previous year = 100,
Q – the previous quarter = 100

(the symbols Y, Q are present as the last letter in the variable description).

Among many qualitative variables achieved during the survey (BTS) characterising the changes in the banking sector, the following were subject to comparative studies[4]:

OSF – general assessment of the banks' financial situation,
OPS – obtained means value,
OWK – given loans value,

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[3] The description of the results of this research is to be found in: J. Garczarczyk, R. Matusewicz, *Economic Performance in the Polish Banking Sector – Accuracy Evaluation of the Results Obtained from the Business Tendency Survey*, Selected Papers submitted to the 26th Ciret Conference, Taipei 2002, pp. 20-24; R. Matusewicz, *Zastosowanie testu koniunktury w ilościowych prognozach na rynku usług bankowych w Polsce*, [in:] *Badanie gospodarki polskiej – stan bieżący i perspektywy*, Instytut Rozwoju Gospodarczego SGH, Warszawa 2002, pp. 199-208.

[4] A more extensive description of the banking tendency surveys can be found, in: J. Garczarczyk, *Analiza wahań koniunktury na rynku usług bankowych w latach 1992-2002*, [in:] *Badanie gospodarki polskiej – stan bieżący i perspektywy*, Instytut Rozwoju Gospodarczego SGH, Warszawa 2002, pp. 17-32.

PIK – the composite indicator (DMRP banking indicator) – Poznań Index of Banking Economic Performance – PIKBANK, characterising the economic situation in the banking sector[5].

The qualitative variables used in the analyses are balances of the assessment of the studied phenomena, formulated ex post. They were analysed as modified BTS balances.

While comparing the adjustment of qualitative and quantitative variables, the leads and lags of the qualitative variables from one to eight quarters has been studied. In the analyses presented in the text the following methods have been employed in consecutive steps:

- cross-correlation analysis,
- Granger causality test,
- econometric modelling.

In the correlation analysis, studying the interdependence between the quantitative (CSO) and qualitative variables (DMRP), Pearson's coefficient of correlation has been used. It allowed for establishing the strength of the interdependence relations between these variables depending on the lead or lag period. Employing Granger causality test aimed at preliminary verification of whether there exist causal relationships between the variables from the banking BTS and statistical data and what their direction is. On the basis of the abovementioned analyses, an attempt has been made to construct econometric models aiming at describing the quantitative changes of referential variables (GDP, sold industry production, construction and assembly production, import, export) with the use of qualitative variables (banking BTS).

2. Correlation Analysis

The aim of this part of analyses is a diagnosis of the existence of a relation between the business fluctuations on the banking market and fluctuations in chosen economy sectors. Consequently, an analysis of the interdependence between banking BTS and statistical data indexes, characterising the changes in sold industry production, construction and assembly production, GDP, import and export, has been conducted. Eight lead and lag periods have been used.

The yearly construction and assembly production index (PBIY) shows even a slightly stronger than PKB relation to banking BTS balances. It is also symptomatic that the highest correlation coefficient values have been observed this time for the banking BTS balances from the periods earlier than t, which shows that the

[5] J. Garczarczyk, R. Matusewicz, op.cit., pp. 4-5, and J. Garczarczyk, M. Mocek, R. Matusewicz, op.cit., p. 68.

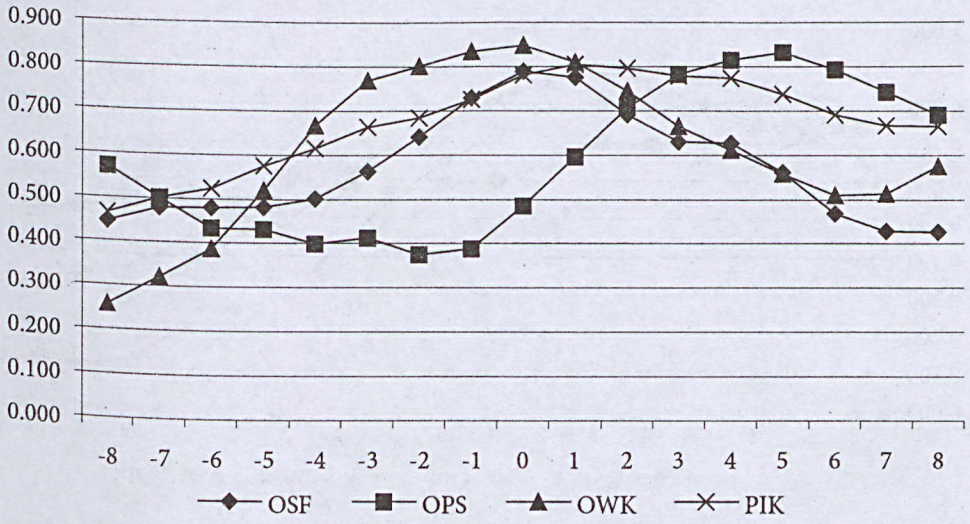


Figure 1. Correlation coefficients between the GDP index and banking BTS balances

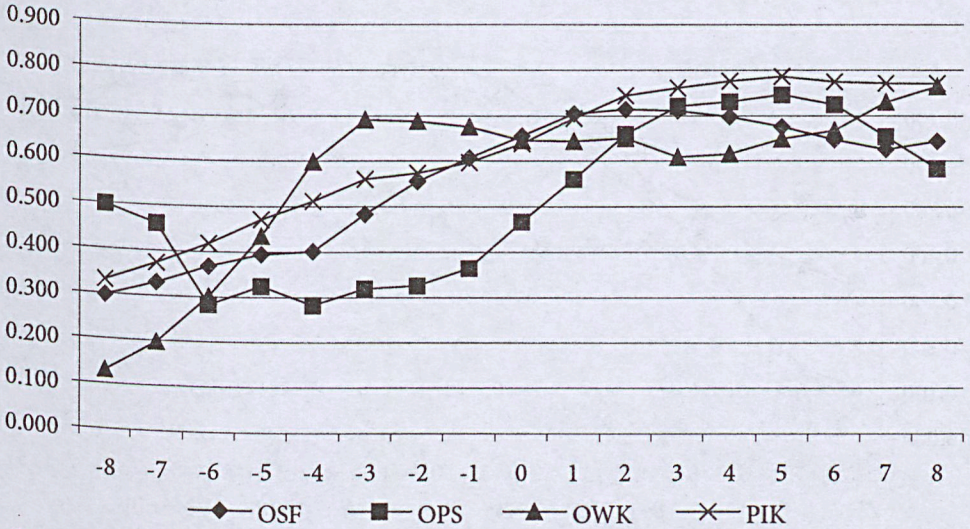


Figure 2. Correlation coefficients between the sold industry production index (PPIY) and banking BTS balances

changes in the construction operate as a consequence of the banking sector changes. The strongest correlation has appeared between PBIY and the OWK (0.889) and PIK (0.897) variables from the t-3 period. It means that the changes in banking BTS balances show the strongest relation to the construction economic situation changes operating 3 quarters later. In the case of construction and assembly

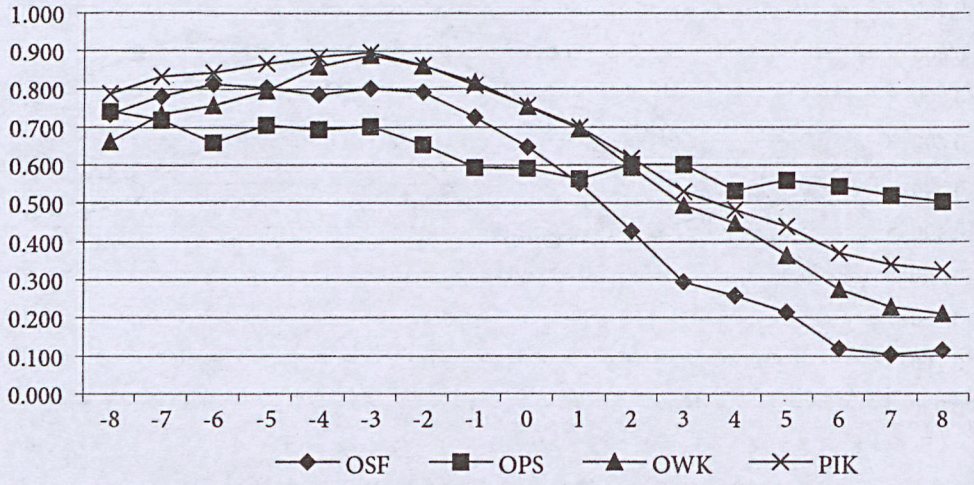


Figure 3. Correlation coefficients between the construction and assembly production index (PBIY) and banking BTS balances

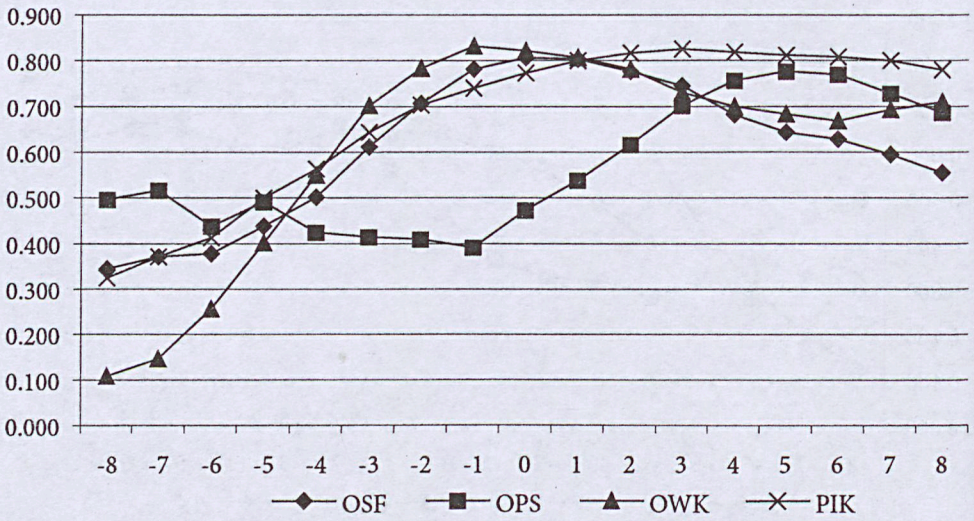


Figure 4. Correlation coefficients between the import index (IMIY) and banking BTS balances

production, similarly to the case of industry production, the relations between the quarterly index (PBIQ) and banking BTS balances are noticeably weaker, which is confirmed by the maximum value of Pearson's correlation coefficient of only 0.196.

The situation in import also seems to show a considerable similarity with the banking BTS balances. Pearson's correlation coefficient reaches the maximum values of about 0.800. It may be noticed that the changes in import operate with a certain lag in relation to the changes of given loans value and parallel to the changes in the banks' financial situation. The import, in turn, anticipates the changes of the PIKBANK synthetic indicator with 3 quarters. The biggest lag in reaction to the importchanges (5 quarters) is shown by the value of the means obtained. The relations between the banking performance balances and the import quarterly index (IMIQ) are noticeably weaker, and the maximum value of Pearson's correlation coefficient is 0.388.

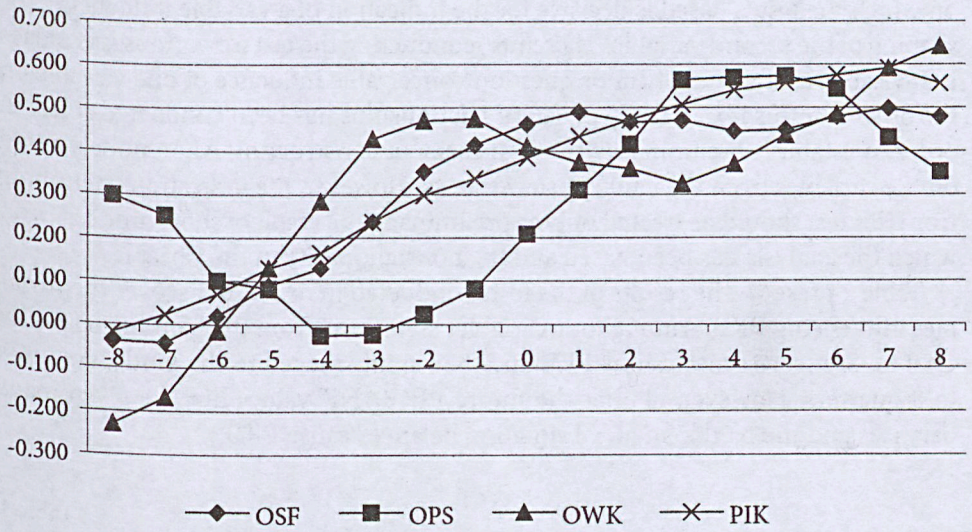


Figure 5. Correlation coefficients between the export index (EKIY) and banking BTS balances

The correlation between the export and loans or banking deposits, as well as the banks' financial situation and PIKBANK is slightly weaker than in the case of import. Apart from the strength of relation, the character of interdependencies of the values studied differs also in the mutual leads and lags question. Pearson's correlation coefficients betwee the yearly export index and the banking performance balances assume the highest values for the future period balances from t+5 to t+8. It means earlier situation changes within export in relation to the banking BTS balances changes. Export anticipates bank loans in a highest degree, equaling as much as 8 periods. A slightly lesser lead, equaling 7 periods, is shown in the case of PIKBANK and the banks' financial situation assessment. The slightest lead, 5 quarters only, is shown in relation to the value of the means obtained. Similarly as in the case

of the phenomena analysed earlier, also in the case of export the quarterly indexes show much lesser correlation with banking BTS balances than the yearly ones.

3. Granger causality analysis

In order to verify the conclusions introduced earlier and based on the correlation analysis regarding the relation between banking BTS balances and statistical data, a causal relationships analysis has been conducted, based on Granger causality test. In the case of this test, the number of lags introduced into the econometric models on which the test is based is decisive for the indication of a variable influencing the shaping of the second variable. Therefore, conducting the test for various sets of lags is advisable, as it can confirm or question conceivable influence of one variable on the other[6]. In this text, a study of causal relationships has been conducted solely in order to establish preliminarily the legitimacy of constructing ADL models based on the variables from the banking survey tests. However, the indications stemming from this test should be treated only as preliminary as a result of short time series on which the analysis has been based and the nonstationarity of the variables[7].

Table 2 presents the results of the tests conducted in order to discover the variables influencing PKB. Among four variables stemming from the banking BTS only OSP in Granger's sense causes PKB and the lag introduced to the model amounts to 8 quarters. However, neither the future PIKBANK values nor the given loans balances and the bank's financial situation balances cause PKB.

Table 1

Causal relationships between the index of GDP (PKB) and the banking BTS balances in the light of Granger causality test

PKB	BTS	PKB ↔ BTS	PKB → BTS	BTS → PKB
PKBY	OSF	–	–	–
PKBY	OPS	–	–	+
PKBY	OWK	–	–	–
PKBY	PIK	–	+	–

+ means there is a relationship between variables
– means there is no relationship between variables

[6] J. Shan, F. Sun, *Domestic Saving and Foreign Investment in Australia: a Granger Causality Test*, International Economic Journal, vol. 12, 1998, no. 4, pp. 83-84.

[7] For more see: W. Charemza, D.F. Deadman, *Nowa ekonometria*, PWE, Warszawa 1997, pp. 161-162.

In the case of the sold industry production a greater number causal relationships with the values characterising the banking sector situation has been discovered. From the set of variables coming from the banking BTS only the balance of the bank's financial situation does not influence the sold industry production. In turn, the given loans balance cause the yearly sold industry production index for the lag set of 2, 3 and 8 periods and for the lags from 4 to 7 a mutual causal relationships can be found between the variables. It is interesting that there appear similar in character causal relationships for particular lags between the quarterly sold industry production index and the given loans balance. This time, however, the mutual causality of the aforementioned variables has been observed for the lags of 3 to 7 periods. For the lags amounting to 8 periods, a one-sided causality of the change of the values of given loans on the quarterly sold industry production has been noted. It seems, therefore, justified to draw a conclusion about the influence of the value of given loans on the level of industry production.

Table 2

Causal relationships between the indexes of the changes in the sold industry production (PPI) and the banking BTS balances in the light of Granger causality test

PPI	BTS	PPI ↔ BTS	PPI → BTS	BTS → PPI
PPIY	OSF	–	–	–
PPIY	OPS	–	–	–
PPIY	OWK	+	–	+
PPIY	PIK	–	–	+
PPIQ	OSF	–	–	–
PPIQ	OPS	–	–	+
PPIQ	OWK	+	–	+
PPIQ	PIK	–	+	–

+ means there is a relationship between variables
– means there is no relationship between variables

In turn, the PIKBANK indicator in Granger's sense cause the sold industry production (PPIY) for the lag of 4. For the same lag, the quarterly sold industry production index causes in Granger's sense PIKBANK, so there exists a causal relationship between the variables in opposite direction. The value of the means obtained, in turn, causes in Granger's sense the quarterly index of sold industry production for the lag of 7 periods.

Even a greater number of causal relationships can be found while analysing the results of the Granger causality test between construction and assembly production

Table 3

Causal relationships between the indexes of construction and assembly production changes (PBI) and the banking BTS balances in the light of Granger causality test

PBI	BTS	PBI ↔ BTS	PBI → BTS	BTS → PBI
PBIY	OSF	–	–	+
PBIY	OPS	+	+	+
PBIY	OWK	–	–	+
PBIY	PIK	–	–	+
PBIQ	OSF	+	–	–
PBIQ	OPS	–	–	+
PBIQ	OWK	+	+	–
PBIQ	PIK	+	+	–

+ means there is a relationship between variables
– means there is no relationship between variables

and banking BTS balances. In this case a decisive majority of causal relationships appears for slight lags, usually not exceeding three periods. Each variable coming from the banking BTS causes the yearly construction and assembly production index. Additionally, the value of the means obtained both causes and is caused by construction and assembly production for the lags of 3 to 7 periods. Moreover, for the lag of 8 periods, construction and assembly production in Granger's sense causes the obtained means value.

A slightly different character of causal relationships has been observed between the quarterly construction and assembly production index and banking BTS bal-

Table 4

Causal relationships between export change indexes (EKI) and banking BTS balances in the light of Granger causality test

EKI	BTS	EKI ↔ BTS	EKI → BTS	BTS → EKI
EKIY	OSF	–	–	–
EKIY	OPS	–	–	–
EKIY	OWK	+	+	–
EKIY	PIK	–	–	+
EKIQ	OSF	–	–	–
EKIQ	OPS	–	–	–
EKIQ	OWK	–	+	–
EKIQ	PIK	–	–	–

+ means there is a relationship between variables
– means there is no relationship between variables

ances. Only the value of the means obtained caused in Granger's sense construction and assembly production. The bank's financial situation simultaneously both caused and was caused by construction and assembly production for the lag of 3 periods. Two others categories coming from the banking BTS, i.e. the value of the loans given and the synthetic PIKBANK indicator for the number of lags of 3 periods showed mutual causal relationships with construction and assembly production and for a higher number of lags they were caused by construction and assembly production.

In the case of export the appearance of causal relationships has been observed only with the value of the loans given balance and with PIKBANK. PIKBANK

Table 5

Causal relationships between the import changes indexes (IMI) and banking BTS balances in the light of Granger causality test

IMI	BTS	IMI ↔ BTS	IMI → BTS	BTS → IMI
IMIY	OSF	–	–	–
IMIY	OPS	–	–	+
IMIY	OWK	–	+	+
IMIY	PIK	–	–	–
IMIQ	OSF	–	–	+
IMIQ	OPS	–	–	–
IMIQ	OWK	+		+
IMIQ	PIK	–	–	+

+ means there is a relationship between variables
– means there is no relationship between variables

cause in Granger's sense the yearly export index for the lags of 4, 7 and 8 periods. The loans given were caused by both the quarterly and the yearly export index for the lags of 5, 6 and 7 periods (for EKIQ also for the lags of 3 and 4 periods). Mutual causal relationships appeared between the value of the loans given and the yearly export index for the lag of 4 periods.

A higher number of causal relationships than in the case of export has been observed between import and banking BTS balance. However, it turned out that neither the bank's financial situation nor PIKBANK cause in Granger's sense or is caused by the yearly import index. The value of obtained means is, however, the cause of the yearly import index for the lags of 2 and 3 periods and the loans given cause the yearly import index for the lags of 1 and 4 periods and for the lag of 7 periods they are caused by the yearly import index.

4. Econometric models

In order to construct econometric models it has been decided to use autoregressive models with distributed lags (ADL), in which the delayed quantitative variables (statistical data) and delayed qualitative changes from the banking BTS have been used as explanatory variables. Moreover, an attempt to construct models with distributed lags (DL)[8] has been made, in which as the explanatory variables only the variables from the banking BTS have been used. For both groups of models the approach from the general to the particular has been employed, assuming 8 periods as the primary number of lags[9] and a lower number of lags if the earlier Granger causality test indicated for such a number of lags the existence of causal relationships between the variables considered in the model. For the estimated models a Breusch-Godfrey serial correlation LM test has been conducted in order to verify whether there exists a first order serial correlation of the residuals. On the basis of the models, characterised with the adjustment of empirical data to theoretical data surpassing 50% and without serial correlation in the residuals, the forecasts for the 4 following quarters of the year 2003 have been made. Later, the accuracy of the forecasts has been verified[10]. In further stages of the procedure only those models have been taken into consideration for which the mean absolute percentage error of the forecast was not higher that 5%[11]. For the models chosen on the basis of the aforementioned criteria, the causes of their errors have been established with the use of Theil's coefficient components[12]. Additionally, the Janus quotient has been established in order to state whether the model can be used for making the forecast for another period.

Various forms of econometric models have been tested, in which as the explanatory variables the indexes of referential variables (PKB, PPI, PBI, IMI, EKI) were

[8] D.N. Gujarati, *Basic Econometrics*, McGraw Hill, New York 1995, pp. 612-619.

[9] W. Charemza, D.F. Deadman, op. cit., pp. 75-77.

[10] In the forecasts verification the following measures have been employed: root mean square error (RMSE), mean absolute error (MAE) and mean absolute percentage error (MAPE).

[11] Forecasts for which the MAPE is between 3% and 5% are regarded as good and those for which the MAPE is lower than 3% are regarded as very good. For more, see: A. Zeliaś, B. Pawełek, S. Wanat, *Prognozowanie ekonomiczne*, Wydawnictwo Naukowe PWN, Warszawa 2003, pp. 49-50.

[12] Three Theil's coefficient components may be distinguished. The first of these, I_1 informs us about the extent in which the forecast error was caused by the improper anticipation of the phenomenon's average level. The second coefficient, I_2 states how much the predictions elasticity was adjusted to the actual fluctuations of the prognosed variable. The third Theil's I_3 coefficient allows us to state to which extent the forecast error was influenced by the lack of agreement of the prognosis change direction with the actual direction changes of the prognosed variable. For more, see: A. Zeliaś, *Teoria prognozy*, PWE, Warszawa 1997, pp. 230-233.

employed and as the explanatory variables the qualitative variables groups and delayed explained variables.

In table 7, the characteristics of the models with the best adjustment to empirical data have been shown, one in each of the categories of statistical data, i.e. for the sold industry production, construction and assembly production, export and import. Simultaneously, they also meet the demands in the range of the mean ab-

Table 6

Chosen models for the sold industry production (PPI), construction and assembly production (PBI), export (EKI) and import (IMI)

Model A	Variables	Coefficient	Std. Error	t-Statistic	Prob.
PPIY	C	96.992	6.450	15.038	0.000
	PPIY(-4)	-0.371	0.079	-4.711	0.000
	OWK(-2)	0.243	0.063	3.862	0.001
	OWK(-3)	0.251	0.072	3.491	0.002
	OWK(-6)	-0.113	0.048	-2.368	0.028
	R-squared	Adjusted R-squared	S.E. of regression	Breusch-Godfrey Serial Correlation LM Test (Probability)	
	0.913	0.897	2.583	0.526	
Model I	Variables	Coefficient	Std. Error	t-Statistic	Prob.
PBIY	OWK(-1)	0.299	0.141	2.121	0.043
	OWK(-3)	0.455	0.139	3.277	0.003
	R-squared	Adjusted R-squared	S.E. of regression	Breusch-Godfrey Serial Correlation LM Test (Probability)	
	0.789	0.781	8.482	0.101	
Model J	Variables	Coefficient	Std. Error	t-Statistic	Prob.
EKIY	C	117.632	13.975	8.417	0.000
	OWK(-3)	0.568	0.085	6.650	0.000
	OWK(-7)	-0.541	0.116	-4.651	0.000
	R-squared	Adjusted R-squared	S.E. of regression	Breusch-Godfrey Serial Correlation LM Test (Probability)	
	0.669	0.639	6.735	0.189	
Model K	Variables	Coefficient	Std. Error	t-Statistic	Prob.
IMIY	C	23.327	8.077	2.888	0.008
	IMIY(-1)	0.745	0.139	5.345	0.000
	OWK(-1)	0.396	0.109	3.628	0.001
	OWK(-4)	-0.342	0.088	-3.879	0.001
	R-squared	Adjusted R-squared	S.E. of regression	Breusch-Godfrey Serial Correlation LM Test (Probability)	
	0.911	0.900	5.294	0.207	

solute percentage error. Among the models presented, the A model is the best adjusted to the actual data for the sold industry production and the worst adjusted is the J model for export. The fact that in every model only one variable from the banking BTS appears – the given loans balance – is worth emphasising. It also seems important that in the case of export and construction and assembly production the only explanatory variables in the model are the qualitative data from the banking BTS, which turned out to be sufficient for the explanation of the shaping of these economic phenomena.

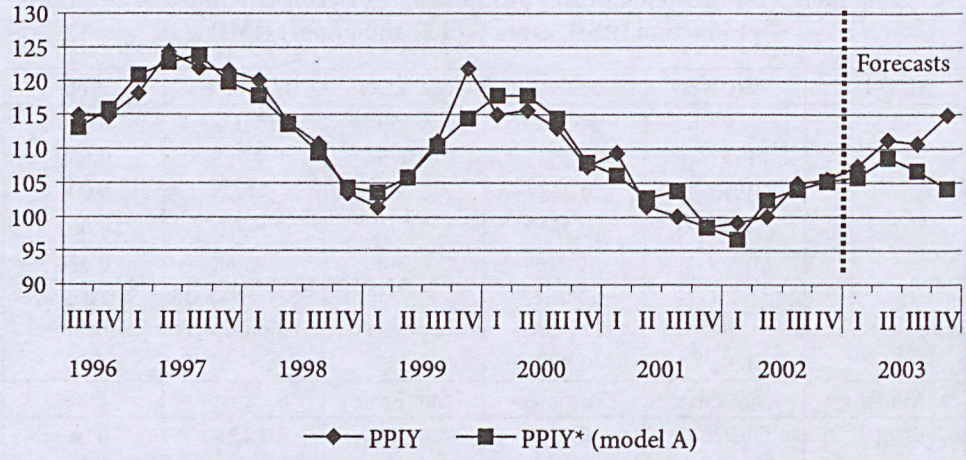


Figure 6. Sold industry production - statistical data and model A data

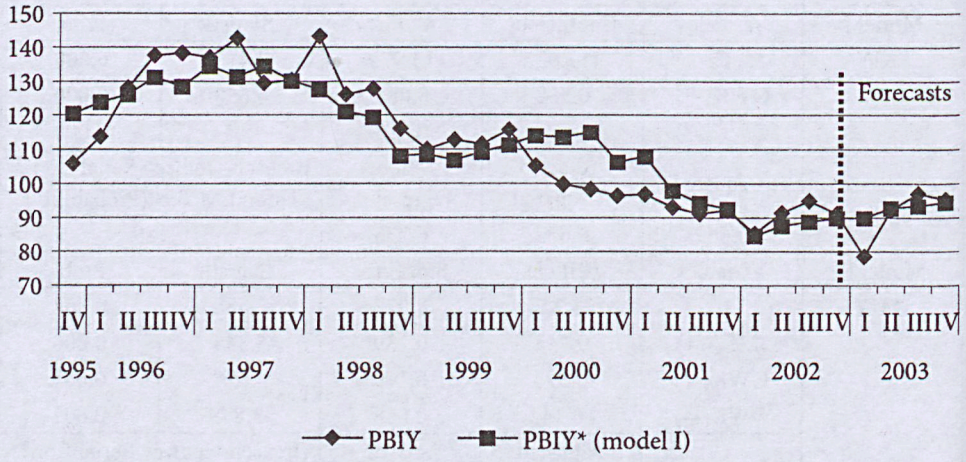


Figure 7. Construction and assembly production (PBIY) – statistical data and model I data

Figure 6 presents the actual values of the sold industry production and the model ones (III 1996-IV 2002) and the forecasts and their realisation (I 2003-IV 2003). Unfortunately, despite the small differences between the theoretical and empirical values in the period for which the model's parameters have been estimated, the forecast for the fourth quarter of 2003 is significantly different from the actual value of the phenomenon. Consequently, good adjustment of the presented model A, expressed by the R squared of 0. 913 allowed for accurate forecasts only 3 quarters in advance. It means that the relations between the variables considered in the model have not remained up-to-date as early as in the next, fourth quarter.

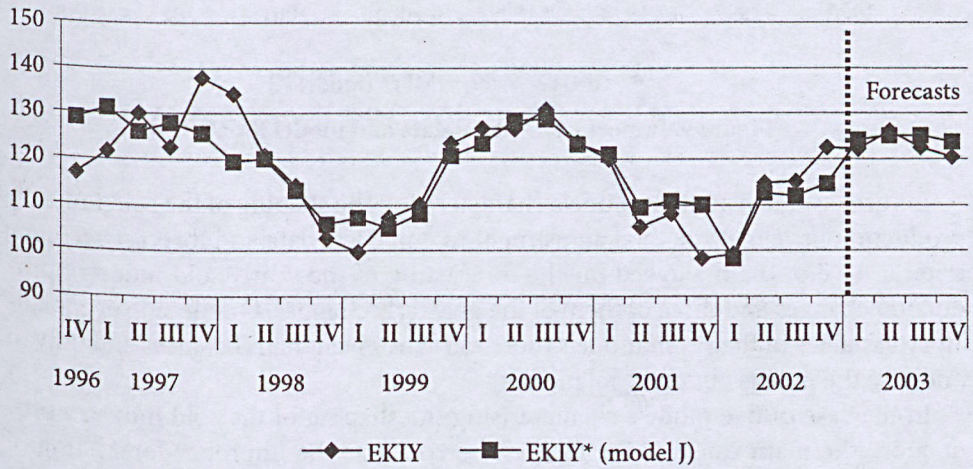


Figure 8. Export – statistical data and model J data

The J model presented in figure 8, characterising the export shaping, is adjusted to empirical data to a slightly lesser degree, because only in 67%. Therefore, in some periods, relatively big differences between theoretical and actual export values are visible (IV 1996-IV 2002). However, each of the forecasts for the four consecutive quarters may be regarded as good. These forecasts, in contrast to those shown in figure 6, are not characterised by an increasing ex post error size.

In the following part of the article, for all models meeting the adjustment and the mean absolute error percentage criteria, the causes of errors in forecasts created on their basis will be presented, together with the verification of their usefulness in forecasting for the consecutive period.

The attempts to create an ADL model (with the number of 8 lags introduced) in order to forecast PKB have not succeeded. The models obtained were usually characterised with too small an adjustment to empirical data in order to be able to be used for forecasting the future PKB values.

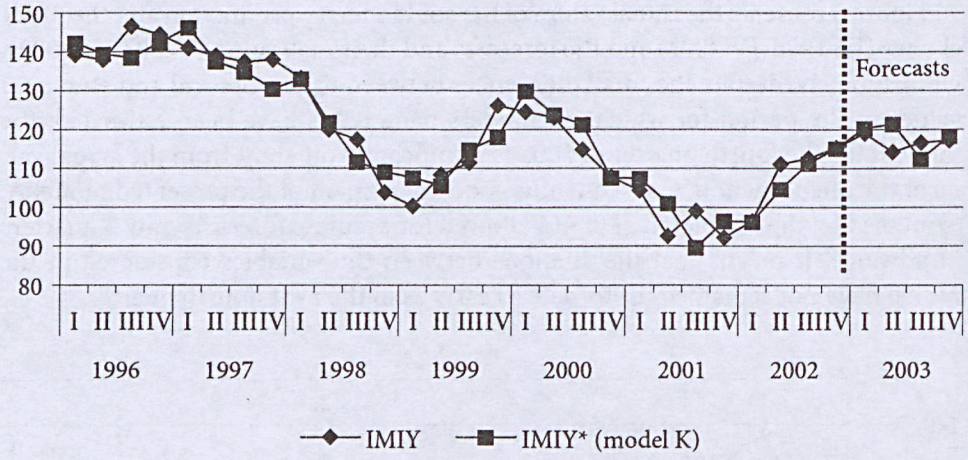


Figure 9. Import – statistical data and model K data

In turn, as much as eight models characterising the shaping of the sold industry production have met the total adjustment to empirical data and forecast accuracy criteria. Five of them allowed for the forecasting of the yearly sold industry production changes and three of them of the quarterly changes. On the side of explanatory variables in the seven models there were the given loans balances and only in one case the means obtained balances.

In the case of five models characterising the shaping of the sold industry production, the main cause of the forecasts' errors was the improper forecasting of the phenomenon' average level. At the same time, what is indicated by the I_2 coefficient, it stemmed only in a slight degree from the differences in the scope of changeability of the forecasts created on the basis of the model and changeability of the phenomenon in the period for which the forecast were created. Only in the case of the B model, did the error stem from the improper anticipation of the phenomenon's direction change, and to an insignificant degree. However, in the case of two models (G and H), the insufficient congruity of the direction of actual changes with the anticipated values constituted the fundamental reason of the presented forecast errors.

Unfortunately, despite low values of the mean absolute percentage error of the ex post forecast, the Janus quotient indicates that the models shown in Table 8 cannot be used for forecasts for the consecutive quarter. It results from the fact that the forecasts created for four quarters in advance were characterised with various accuracy for particular quarters. Usually, for the first and second quarter of 2003, the mean absolute percentage error of the forecasts obtained did not exceed 2% but for the third and fourth quarter the errors were, unfortunately, higher. Therefore, the more distant the forecast period was, the higher the error during the forecasting of the phenomenon on the basis of the model presented. It may, therefore, be

Table 7

The ex post errors of forecasts and the reasons of their appearance for the ADL models – the sold industry production (PPI)

Model	R-squared	RMSE	MAE	MAPE	I (in %)	I_1 (in %)	I_2 (in %)	I_3 (in %)	Janus quotient
A	0.91	5.95	4.73	4.19	0.03	63	3	34	6.58
B	0.91	6.12	5.58	4.97	0.03	83	11	6	7.37
C	0.90	6.81	5.38	4.77	0.03	62	0	38	7.46
D	0.88	6.21	5.24	4.65	0.03	71	5	25	2.90
E	0.91	5.36	4.1	3.62	0.02	47	6	47	3.39
F	0.83	3.58	2.79	2.63	0.02	42	23	35	3.62
G	0.87	3.58	2.86	2.7	0.02	34	17	49	3.19
H	0.54	4.01	3.15	3	0.02	44	5	51	2.85

A: PPIY= C+PPIY(-4)+OWK(-2)+OWK(-3)+OWK(-6)
B: PPIY= C+PPIY(-3)+PPIY(-6)+OWK(-1)+OWK(-3)
C: PPIY= C+PPIY(-4)+OWK(-2)+OWK(-3)+OWK(-5)
D: PPIY= C+PPIY(-1)+PPIY(-4)+OWK(-1)
E: PPIY= C+PPIY(-1)+PPIY(-4)+PPIY(-6)+OPS(-6)+OPS(-7)
F: PPIQ= C+PPIQ(-1)+PPIQ(-2)+PPIQ(-3)+OWK(-2)+OWK(-3)+OWK(-5)
G: PPIQ= C+PPIQ(-1)+PPIQ(-2)+PPIQ(-3)+PPIQ(-6)+OWK(-1)+OWK(-3)+OWK(-5)
H: PPIQ= C+PPIQ(-1)+PPIQ(-2)+PPIQ(-3)+OWK(-1)

stated that the relations between variables in ADL models characterising the shaping of the sold industry production do not retain stability for too long in the future periods and, in consequence, allow for the forecasts to be created only for one or two periods in advance.

Among the estimated models describing the shaping of construction and assembly production, only the model considering on the side of delayed variables the given loans balances lagged by one and three periods, was at the same time characterised by the adjustment exceeding 50% and allowed for achieving for the four 2003 quarters forecasts with the mean absolute percentage error of less than 5%. The divergence between the actual phenomenon level and the forecasts created resulted primarily (in as much as 87%) from different change ability of the forecasts and the phenomenon's actual values. This model allowed for the creation of forecasts for four quarters in advance, in the case of which only in 3% did the errors result from the divergence between the forecast values change direction and the actual values. It is also immensely important that this model furtherly retains its up-to-dateness and allows for the forecast for the following, fifth quarter.

In the case of models estimated for the forecasting of the shaping of export, only one model possessed simultaneously the adjustment of over 50% and allowed for making forecasts characterised with the mean absolute percentage error lower

Table 8

The ex post errors of forecasts and the reasons of their appearance for ADL and DL models – construction and assembly production (PBI), export (EKI), import (IMI)

Model	R-squared	RMSE	MAE	MAPE	I (in %)	I_1 (in %)	I_2 (in %)	I_3 (in %)	Janus quotient
I	0.79	6.01	4.14	4.96	0.03	10	87	3	0.54
J	0.67	3.44	2.29	1.87	0.01	52	39	9	0.15
K	0.91	4.33	3.38	2.93	0.02	61	0	39	0.73
L	0.87	6.04	5.00	4.29	0.03	5	44	51	0.89
M	0.69	4.27	3.94	3.76	0.02	37	28	35	0.81
N	0.67	5.97	4.79	4.62	0.03	58	2	40	1.45

I: PBIY= OWK(-1)+OWK(-3)
J: EKIY= C+ OWK(-3)+OWK(-7)
K: IMIY= C+ IMIY(-1)+OWK(-1)+OWK(-4)
L: IMIY=IMIY(-1)+IMIY(-4)+OSF(-5)
M: IMIQ= C+ IMIQ(-4)+OWK(-2)+OWK(-5)+OWK(-8)
N: IMIQ= C+ IMIQ(-4)+OWK(-1)+OWK(-4)

than 5%. Moreover, the Janus quotient indicates that this model may be used to create forecast also for the consecutive period, which is the first quarter of 2004, and hence this model retains its up-to-dateness. The forecasts obtained for the four quarters of 2003 were different from the actual level of the phenomenon mostly because of the incorrect attributing of its average level.

In the case of import, in turn, four econometric models meeting the criteria established earlier have been obtained. In the estimated ADL models, on the side of the explanatory variables, apart from the delayed import index, there were loans given balances and banks' financial situation balances. The remaining two categories from the banking BTS, namely the obtained means balance and PIKBANK balance proved insignificant in the models estimated. Relatively best forecasts (from the value of the mean absolute percentage error point of view) were obtained on the basis of the K model, which explained in 91% the yearly import index changeability. The errors of forecasts created with the use of this model, as Theil's coefficient components show, result mostly, because in as much as 61%, from the improper anticipation of the average phenomenon level in the four 2003 quarters and in 39% from the divergence of the change direction of the anticipated and actual values of the phenomenon.

In the case of the three of the models presented (K, M, N), the forecast error was influenced most strongly by improper anticipation of the average phenomenon level, which, taking into account the character of the business tendency survey, seems justified. In one of the models (L), in turn, the forecast errors were most strongly influenced by the wrong anticipation of the turning points. Moreover, tak-

ing into consideration the values of the Janus quotient, it may be stated that only the N model is not up-to-date and cannot be used for the further forecasts, while the others retain their up-to-dateness and may be used for the import forecast in the first quarter 2004.

Conclusions

The analyses conducted with the use of various methods proved that the qualitative data from the banking BTS describe well the changeability of the activity process in other sectors of economy and allow for the formulation of short-term quantitative forecasts of their further course. This general statement allows for drawing subsequent, more detailed conclusions:

1) The qualitative data collected in the banking BTS are a valuable source of information not only about the performance in the banking sector but also in other sectors, as well as about the whole economy. They allow for establishing trends and directions of changes in the economic activity in the most important economy sectors.
2) Correlation analysis proved that the qualitative data concerning banking economic situation (banking BTS) reflect well the dynamics of quantitative changes in the selected economy sectors (industry, construction, foreign trade). A significantly higher convergence of the qualitative data changes (banking BTS) was obtained with the yearly rather than the quarterly quantitative data index.
3) From the analyses conducted it ensues that in the majority of cases the fluctuations in the banking sector (in the light of the data from the business tendency survey) are delayed in relation to the fluctuations in the sectors being analysed (industry, import, export). Only in the case of the construction they are anticipatory and in the case of the relation to the GDP change they are usually parallel fluctuations.
4) The turning points. They may, therefore, be useful for diagnosing and forecasting economic situation and, at the same time, for conducting current economic policy.
5) Among the four qualitative variables describing situation in the banking sector, the highest usefulness in econometric modelling is shown by the given loans balances. The dim prognostic value of the PIKBANK index, characterising the general situation in the banking sector, is surprising.
6) The achieved ADL and DL models allow for making accurate short-term forecasts only for 2-3 quarters in advance and only some of them for 5 quarters in advance. The main reason for the forecasts errors was incorrect anticipation of the average level of a phenomenon, while the prediction's flexibility was usually adjusted to actual fluctuations of the variable being forecasted.

The results obtained are of diagnostic character so they require further improvement and testing. It is, therefore, necessary to continue the presented research direction, to collect even longer qualitative and quantitative data series, to test other variants of regression models and to expand the research into other economy sectors. However, it may be already stated that the qualitative data on the banking situation (banking BTS) may be a source of information about the changes in the whole economy and constitute a premise for the decision-making processes in other sectors of economy.

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