

Józef Garczarczyk, Robert Skikiewicz

Poznań University of Economics

THE USE OF BAROMETERS IN FORECASTING CHANGES IN THE BANKING MARKET SITUATION

Abstract: Barometers, constructed for almost a century as composite indicators on the basis of variables which exhibit leading features, are commonly used to determine the direction of the future changes in the whole economy or its sectors. In relation to the immense importance of the banking sector for the functioning of the whole economy, the forecasting of the changes in the banking market assumes a particular importance.

The barometers presented in the article – constructed for two most important elements from the banking market, namely PLN deposits and PLN loans – allow for accurate forecasting of the occurrence of the turning points in the business cycle. Composite leading indicators constructed for both referential variables maintained, in a majority of cases, good forecasting characteristics and signalled almost all turning points in the cycle of PLN loans and PLN deposits. This confirms the usefulness of the method applied for forecasting the development of the market of banking services.

Key words: barometers, composite leading indicators, forecasting, banking market.

1. Introduction

The processes which take place within an economy are of mutual influence which has been analysed and confirmed in numerous publications. It is especially important in economics to identify variables, the changes of which are regularly preceding the changes in the whole economy, or the most significant economic or sectoral indicators. On the basis of such variables, it is possible to construct composite leading indicators (barometers).

Barometers, calculated for almost a century, were initially created only for the U.S. economy, but already in the mid-1980s they started being implemented in large numbers in other countries, mainly highly-developed ones [Drozdowicz-Bieć 2001]. One should note, however, that composite leading indicators do not inform directly about the changes in the phenomenon in a quantitative aspect but serve to anticipate the occurrence of the turning points which are followed by the change in the direction of the economy's development. As a result, the main criterion taken into consideration when assessing their usefulness is their early regular signalling of the turning points in the development of the economy [Drozdowicz-Bieć (ed.) 2007].

Together with the development of the economy, composite leading indicators, which were initially used to forecast the future changes in the whole economy, started to be applied in relation to the most significant macroeconomic indicators and to numerous different sectors. They are being created at present in many countries, inter alia for inflation or employment (or unemployment rate) indicators. Composite leading indicators have also been constructed for the agricultural and food sector [Idzik 2006], the market of commercial real estate [Matysiak, Tsolacos 2003], exports [Dua, Banerji 2001], as well as the demand for commodity transport shipping [Mikkelsen, Tronstad 2006].

The barometers for Polish economy have been created since 1993; initially by Kudrycka and Nilsson (1993-1996), and later by Matkowski (1995-1999) [Kudrycka, Nilsson 1993; Matkowski (ed.) 1999]. Since 1998, the Business Cycle Leading Indicator has been regularly calculated at monthly intervals by Drozdowicz-Bieć, as it serves the aim of forecasting the future situation in the Polish economy¹. This barometer, constructed out of eight variables, consists in half of qualitative variables, which result from the research conducted with the use of business tendency tests, while the remaining half contains quantitative variables. The composite leading indicator for Polish economy was also constructed by OECD and is also determined on a monthly basis. Among the five variables which are included in this barometer, there is only one qualitative indicator and four quantitative ones [*Composite Leading Indicators...* 2006]. Since 2002, the barometer for the whole economy has been also calculated by the Gdańsk Institute for Market Economics. This indicator differs from the previously described ones because of its weekly approach. The barometer is published in *Rzeczpospolita* daily quality paper [Fundowicz, Wyżnikiewicz 2008].

Among the leading indicators which signal changes in the whole economy, there is a large number of financial indicators, including variables directly related to the banking market [Garczarczyk, Skikiewicz 2009b; Garczarczyk et al. 2006]. This situation gives even more importance, apart from the sectoral one, to the forecasting of the future changes in the most significant indicators from the banking market.

The aim of the article is the assessment of the possibility of forecasting the future development of the two most important categories when it comes to the share in banks' assets and liabilities, i.e. PLN loans (KRZL) and PLN deposits (DPZL), with the use of composite leading indicators (barometers). Barometers constructed on the basis of a set of statistical (quantitative) data and business tendency balances, which result from business tendency tests in the banking sector (qualitative data), will be characterized here. The analysis of cyclical fluctuations within this article covers the period from the first quarter 1997 until the first quarter 2009 in the case of PLN loans and until the second quarter 2009 in the case of PLN deposits.

¹ <http://www.biec.org>.

2. Selecting the components of a barometer – basic principles

The barometers are usually constructed from the set of at least 4-10 variables. In 19 out of 34 composite leading indicators created by OECD, the number of their components did not exceed 6 while only in the case of 6 indicators it amounted to 8 or more².

A set of potential variables, among which the components of a barometer are selected on the basis of statistical properties, should be prepared while observing certain rules, developed as a result of almost a century's work on barometers. These rules and principles are listed in numerous publications. They are comparatively presented and discussed in a most comprehensive way in OECD materials which refer to the barometers created by this organization. Therefore, relatively often they are adopted as the guidelines when creating new barometers also by other institutions.

In accordance with the OECD criteria, while selecting the components of a barometer, one should take into consideration the **content-related significance** of the indicators, as well as their **cyclical properties**. The components of a constructed barometer should also be **varied** as well as **easily accessible** and **published regularly**. The components of a barometer should be characterized by a relation to a referential value which is possible to explain on the basis of the law of economics (the so-called economic significance). The indicators should cover various spheres of economic processes and cannot relate to one sector only. The cyclical properties of these indicators are immensely important. They should be characterized by a stability of leads in their turning points in relation to the turning points of the referential variable. It is also important that the lead length is significant enough for the possibility of a timely presentation of a barometer value to exist, taking into consideration the delay in the publication of statistical data. The components of a barometer should not have additional cycles nor should they omit the existing cycles of a referential variable. The 'cyclical compliance' of each potential element, in order for it to be included to the barometer under construction, should be confirmed by a high correlation with its referential variable. Also these variables should be rejected in the case of which one can determine a significant difference in the scope of indications of the lead length on the basis of the median of the turning points and correlation analysis. In order for the barometer indications to be more reliable, one should select these variables the values of which are not adjusted too much. The variables which constitute a barometer should be published regularly and on time and they should be easily accessible. The time series of these variables must be characterized by a sufficient length in relation to the aims of the analysis. In the case of creating a barometer for a referential variable on a monthly basis, it is most advisable to select the components with the same frequency as the referential variable, in order to avoid the necessity of

² A description of components used in composite leading indicators of OECD and TCB can be found in: [Garczarczyk, Skikiewicz 2009b, s. 15].

supplementing the lacking data by estimation [Nilsson, Gyomai 2007; *Composite Leading Indicators...* 2006].

When selecting the best variant of the barometer (CLI), the indicators which allow for the assessment of similarity in the development of the cycle and the stability of leads are taken into consideration. One should analyse the behaviour of the constructed composite leading indicator in particular turning points of the referential variable. For a certain form of a synthesis, the mean, median and standard deviation for leads in turning points in relation to the turning points of the referential variable are then determined. The relation between the referential variable and the leading indicator should be statistically significant and, moreover, it should maintain stability in time [Fritsche, Stephan 2000]. Correlation analysis complements the analysis of the turning points and allows for the assessment of the general adjustment of a particular variable to its referential variable. The lead of the variable in relation to the referential variable obtained on the basis of correlation analysis should not differ substantially from the lead signalled by the median. In such case, the accuracy of signalling the turning points of the referential variable by the barometer is at risk [*Composite Leading Indicators...* 2006].

The barometer should not possess additional cycles nor should it omit the cycles which occur for the referential variable. In case of constructing several composite indicators, the best indicator will be the one which has the same number of cycles as the referential variable, is characterized by a low value of standard deviation from the lead and, moreover, has relatively longest lead in relation to the referential value and the highest values of correlation coefficients with the referential variable [Atabek, Coşar, Şahinöz 2005].

3. Source basis for the selection of the components for the banking market barometers

The search for leading indicators covered a wide set of quantitative financial variables, mainly those relating to the banking sector (33 variables concerning assets and liabilities and 1997 various indicators of banks' commitments and receivables) but also 6 stock exchange indicators, 7 interest rates (of the central bank as well as short-term interest rates for Poland, Switzerland, the U.S.A. and the Eurozone), 26 rates and spreads for inter-banking deposits or 63 money-creation indicators and the elements of money supply indicators as well as 4 indicators of the exchange rates for most important foreign currencies. Also available macroeconomic variables were covered: GDP and its component parts (82), inflation (30), indicators relating to industrial production with regard to particular sectors (73), as well as the variables which describe the situation in construction industry (3), transport (10), agriculture (14), labour market (40) and demographic variables (10).

Apart from statistical data, also qualitative data (business tendency balances) which result from business tendency tests in the banking sector carried out by the

Department of Marketing Research of the Poznań University of Economics were taken into consideration (31 indicators)³.

All quantitative data were transformed into indexes of year-to-year changes. Such transformation removes the long-term trend which is present in the variable series and, to a large extent, eliminates seasonality. The initial selection of the variable set was made on the basis of an analysis of the similarity in the shaping of these variables and the referential value. On the basis of the graphs, a preliminary selection of the best potential banking components was made from among 2429 variables – separately for PLN loans and PLN deposits. The variables selected were cleared of irregular fluctuations and seasonal component with the use of the Census X11/Y2K method, available in Statistica 8.0 package, in order to be able to identify their turning points correctly.

4. Characteristics of the barometer for PLN deposits

4.1. Selecting the components of a barometer

From among 2429 variables, 115 variables were initially selected on the basis of the analysis of similarity in the shaping of variables in the graphs. These variables, after removing random fluctuations and seasonality, were analysed further – the lead period was determined on the basis of correlation analysis and the leads in particular turning points, their medians, means and standard deviations were calculated. 23 indicators were selected for the construction of barometers, as these were characterized by leading features, with correlation coefficients exceeding 0.7. The indicators which relatively best reflected the course of the cycle of the referential value were selected, i.e. those variables which had lagging turning points and which omitted more than one cycle of PLN deposits were left aside.

Among the variables selected, there were 19 quantitative indicators and 4 qualitative ones from the business tendency test in the banking sector. Among the quantitative variables there were as many as 11 different loans and other claims and 2 deposits and other liabilities of monetary institutions, two rates for inter-banking deposits, three GDP components and WIG20 indicator.

Relatively longest leads of at least 5 quarters, confirmed both by correlation analysis and medians, are exhibited by one of the component parts – overnight deposits of MFIs to other domestic residents (ZSK9), as well as three indicators from business tendency tests – balance of general assessment of loans (BOWK) and PLN loans (BOKZ) as well as the climate indicator for PLN loans (BKBKZ). In turn, the

³ The research has been conducted on a quarterly basis, starting from the second quarter of 1992 among the central offices and bank outlets. 400 outlets participate in the study, which covers the whole geographical area of Poland. For more on research methodology, see: [Garczarczyk, Matusewicz, Mocek 2001, pp. 62-66].

Table 1. Lead of potential components of a barometer in relation to DPZL referential variable

Indicator code	Partial indicators	Peaks and troughs in total			Correlation in relation to referential indicator	
		mean	median	standard deviation	lead (-)	correlation coefficients
NSK2	MFIs loans and other claims on other domestic residents (PLN)	-3.3	-3.5	1.37	-3	0.86
NSK228	MFIs loans and other claims on non-monetary financial institutions (PLN)	-3.2	-4.0	1.83	-4	0.79
NSK234	MFIs loans and other claims on other financial intermediaries (PLN)	-3.7	-4.0	0.76	-4	0.80
NSN5	MFIs loans on non-financial sector (PLN)	-3.3	-3.5	1.63	-3	0.91
N2GD4	MFIs loans and other claims on households (PLN)	-4.0	-4.0	1.41	-3	0.88
N2GD13	Other MFIs loans and other claims (excluding interest) on households over 2 up to 3 years (PLN)	-3.8	-4.5	1.94	-4	0.80
KGD19	Other MFIs loans to households for the purchase of real property (PLN)	-3.7	-4.0	0.82	-4	0.84
KGD31	Other MFIs loans to households (PLN)	-4.0	-4.0	1.41	-3	0.89
N2OP25	Other MFIs loans and other claims (excluding interest) on individuals (PLN)	-3.3	-4.0	1.51	-4	0.90
NP5	Other MFIs loans on non-financial corporations (PLN)	-3.3	-3.5	2.07	-3	0.85
KPPRY31	Loans to non-financial private corporations (PLN)	-3.3	-3.5	1.63	-3	0.85
ZSK9	Overnight deposits of MFIs to other domestic residents (PLN)	-7.2	-7.0	1.30	-8	0.80
ZMIF230	Other MFIs deposits and other liabilities to other MFIs with agreed maturity (total)	-2.3	-2.0	1.80	-3	0.86
WIBOR3M	WIBOR3M rate	-2.3	-2.0	1.03	-1	0.75
WIBOR6M	WIBOR6M rate	-2.5	-2.5	1.05	-2	0.73
GDP6	Gross fixed capital formation	-3.8	-4.0	1.50	-4	0.94
GDP10	Domestic demand	-4.5	-5.0	1.22	-4	0.86
GDP11	Gross value added	-3.6	-4.0	2.07	-3	0.90
WIG20	WIG20 stock exchange index	-3.7	-4.5	1.97	-4	0.59
BOWK	Total loans value (balance)	-3.7	-4.5	2.58	-5	0.93
BOKZ	PLN loans value (balance)	-3.7	-4.5	2.16	-5	0.92
BKDZ	Climate for PLN deposits (balance)	-2.8	-3.0	1.72	0	0.94
BKBKZ	Climate for PLN loans (balance)	-3.7	-5.0	2.50	-5	0.89

Source: own calculations.

shortest lead periods, of 1 to 2 quarters, are revealed in the case of inter-banking market rates WIBOR3M and WIBOR6M. The remaining indicators lead the turning points of the referential value by 3-4 quarters.

4.2. Evaluation of constructed barometers

In relation to the occurrence of many categories of loans and other claims, which are partly mutually-contained, among the 23 selected variables, various barometer variants have been tested, which included, among their components, either bigger aggregates or their component parts. Moreover, barometers which include differentiated sets of variables or those created exclusively on the basis of qualitative variables or various categories of loans and other claims have been tested.

Table 2. Barometer lead in relation to DPZL referential variable

Indicator code	Components	Peaks and troughs in total			Correlation in relation to referential indicator	
		mean	median	standard deviation	lead (-)	correlation coefficients
WWKZD1	NSN5, ZMIF230, WIBOR6M, GDP10, WIG20, BKDZ	-2.8	-3.0	0.98	-4	0.91
WWKZD2	NSN5, ZMIF230, WIBOR6M, GDP10, WIG20	-3.4	-3.0	0.74	-4	0.89
WWKZD3	NSN5, ZMIF230, GDP10, WIG20	-3.4	-4.0	1.13	-5	0.96
WWKZD4	KGD31, NP5	-3.2	-3.5	1.47	-4	0.90
WWKZD5	KGD19, N2OP25, NP5	-4.0	-4.0	1.38	-5	0.89
WWKZD6	BOWK, BOKZ, BKDZ, BKBKZ	-2.7	-3.0	2.58	-5	0.93
WWKZD7	BOWK, BOKZ, BKBKZ,	-3.8	-5.0	2.64	-6	0.92
WWKZD8	NSN5, WIBOR6M, GDP10, WIG20	-3.3	-3.0	1.03	-4	0.75
WWKZD9	NSK2, WIBOR6M, GDP10, WIG20	-3.5	-3.5	1.05	-4	0.74
WWKZD10	NSN5, WIBOR6M, GDP10	-2.5	-2.5	1.05	-3	0.80
WWKZD11	NSK2, WIBOR6M, GDP10	-2.5	-2.5	1.05	-3	0.78
WWKZD12	KGD31, NP5, WIBOR6M, GDP10	-2.7	-3.0	1.03	-3	0.83
WWKZD13	KGD31, KPPRY31, WIBOR6M, GDP6	-2.8	-3.0	1.17	-3	0.85
WWKZD14	KGD31, KPPRY31, ZMIF230, WIBOR6M	-2.3	-3.0	1.21	-4	0.92

Source: own calculations.

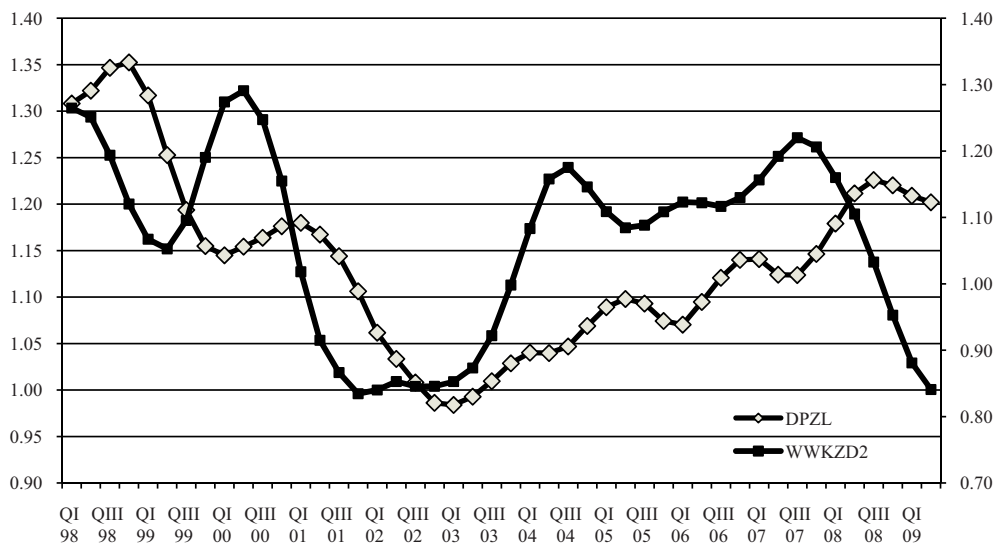


Figure 1. PLN deposits (DPZL) and WWKZD2 barometer

Source: own calculations.

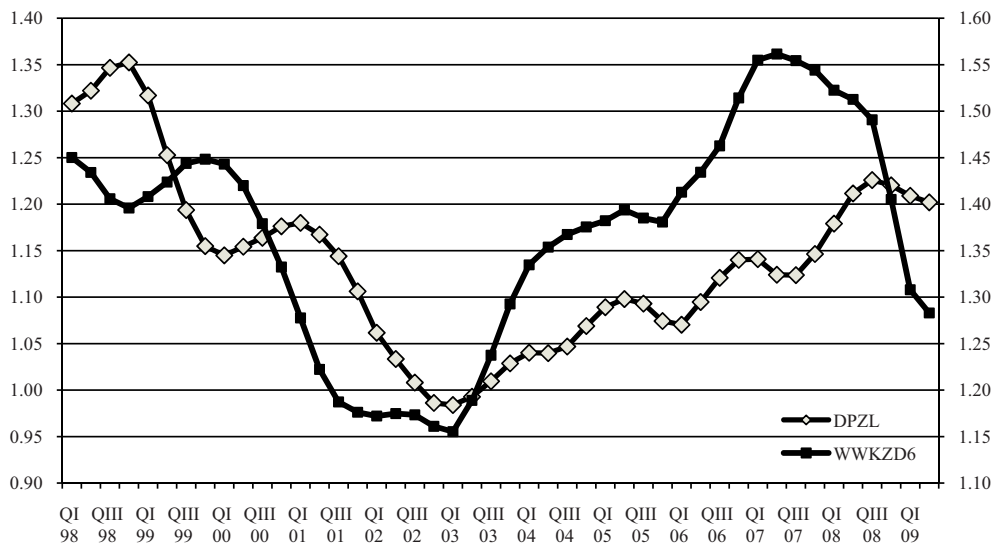


Figure 2. PLN deposits (DPZL) and WWKZD6 barometer

Source: own calculations.

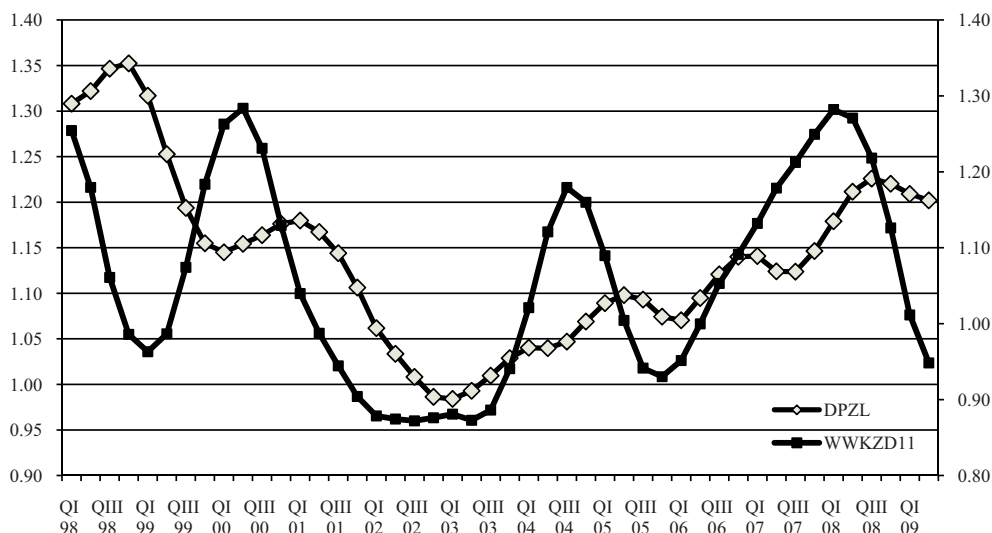


Figure 3. PLN deposits (DPZL) and WWKZD11 barometer

Source: own calculations.

Among the 14 barometers constructed, the highest regularity in signalling the turning points, confirmed by the value of standard deviation (0.74), was exhibited by WWKZD2 barometer, constructed on the basis of a differentiated set of 5 variables – MFIs loans on non-financial sector (NSN5), other MFIs deposits and other liabilities to other MFIs with agreed maturity (ZMIF230), WIBOR6M rate, domestic demand (GDP10) and WIG20 index. The barometer also exhibits quite a high value of correlation coefficient and the lead of 4 quarters. Another advantage of the composite indicator thus constructed is also signalling all turning points of a referential indicator.

Also the barometers constructed on the basis of a set of components reduced in relation to the abovementioned one (WWKZD11, WWKZD12) maintained quite low values of a standard deviation in turning points leads. These indicators exhibited slightly shorter leads, amounting to 3 quarters, and slightly lower values of correlation coefficients. Moreover, similarly to the majority of the remaining barometers, they did not signal one of the cycles of a referential variable.

Among the three barometers created exclusively on the basis of various categories of loans and other claims of monetary institutions, WWKZD5 presents itself more advantageously when it comes to the regularity of signalling turning points. This barometer also exhibits quite a long lead in relation to referential indicator, amounting to 5 quarters, as well as a relatively high value of correlation coefficient.

In turn, the barometers created on the basis of the data from business tendency tests maintained, just like their component parts, quite long lead periods (5-6 quarters) in relation to PLN deposits. WWKZD6 barometer should be assessed as the

one which offers the most advantages when it comes to the value of correlation coefficient and the regularity of signalling turning points.

5. Characteristics of the barometer for PLN loans

5.1. Selecting the components a the barometer

As a result of applying an analogous procedure to the one used for a barometer for PLN deposits, final selection of variables was made, as a result of which the number of potential components of a barometer decreased from 99 to 22 (Table 3). These are variables with relatively regular changes and cycle development which, as a rule, is compliant with the cycle course for a referential variable – PLN credits (KRZL).

Within the set obtained, almost all potential components of a composite leading indicator concern the financial sector, there is, however, a lack of variables which characterize the situation in the remaining sectors of economy (industry, agriculture, construction, etc.) as well as demographic variables. Moreover, the components of money supply (4 variables), two macroeconomic variables (GDP components) as well as two qualitative variables resulting from business tendency tests in the banking sector conducted by the Department of Marketing Research of the Poznań University of Economics were included in the set under analysis. Among the variables from the financial sector, four concern MFIs loans and other claims, seven – deposits and other liabilities of MFIs, two – securities owned by banks and one – the stock exchange index. In the above set, some variables do not fully reflect the course of the cycle of a referential variable (KRZL), namely: components of money supply (M4, M1, M2), gross fixed capital formation (GDP6), the assessment of PLN loans (BOKZ) as well as overnight deposits of the other domestic sectors (P5).

At the same time, M2 variable (money supply M2) exhibits, in some cases, a lag in the occurrence of turning points in relation to a referential variable. Numerous variables do not reflect the first through (QIV/98) of the KRZL variable; however, this results from the limited temporal scope of the empirical analysis (from QI/1998) of the components of a barometer.

Relatively longest lead in relation to the turning points of the referential variable, amounting to 4 quarters, characterizes current deposits of households (ZGD8, ZGD10), deposits of individual entrepreneurs, cash in circulation (PM1) and M1 money supply. Even bigger lead appears in the case of two variables which characterize securities owned by banks (6 quarters).

In turn, relatively short lead of 1-2 quarters occurs in the case of domestic demand (GDP10), PLN loans and other claims on individual entrepreneurs (NSK210 and N2PI10) and households (N2GD18), the assessment of the number of customers served (BOLP), WIG20 stock exchange index and housing loans (KOP10).

Table 3. Lead of potential components of a barometer in relation to KRZL referential variable

Indicator code	Partial indicators	Peaks and troughs in total			Correlation in relation to referential indicator	
		mean	median	standard deviation	lead (-)	correlation coefficients
GDP10	Domestic demand	-1.3	-1.5	0.93	-1	0.80
BOLP	Assessment of a number of clients served – legal persons (balance)	-0.8	-1	0.99	-1	0.92
NSK210	MFIs loans and other claims on individual entrepreneurs (PLN)	-1.8	-1.5	1.64	-2	0.90
N2GD18	Other MFIs loans and other claims (excluding interest) on households over 3 up to 5 years (PLN + foreign currency)	-2.8	-2.5	2	-1	0.85
N2PI10	Other MFIs loans and other claims (excluding interest) on individual entrepreneurs over 3 up to 5 years (PLN)	-1.3	-0.5	1.69	-1	0.80
ZGD8	Overnight deposits of MFIs to households (PLN)	-5.5	-5.5	1.94	-4	0.84
ZGD10	Overnight deposits of MFIs to households (PLN + foreign currency)	-3	-2.5	1.73	-4	0.81
ZSK210	Deposits and other liabilities of MFIs to individual entrepreneurs (PLN)	-3.3	-2	1.62	-4	0.76
ZPI3	Deposits and other liabilities of MFIs to individual entrepreneurs (PLN + foreign currency)	-2.8	-2	1.58	-4	0.71
P5	Overnight deposits of the other domestic residents	-3.7	-5	2.34	-4	0.67
ZPPRY3	Deposits and other liabilities of MFIs to private corporations (PLN + foreign currency)	-2	-3	1.98	-4	0.69
ZSK11	Overnight deposits of MFIs to other domestic residents (PLN + foreign currency)	-3.7	-5	2.34	-4	0.67
PAPW9	Other MFIs securities (foreign currency)	-3.3	-4	1.63	-6	0.77
DP122	Other MFIs holdings of debt securities issued by central government (foreign currency)	-3.3	-4	1.63	-6	0.78
PM1	Currency in circulation (excluding vault cash)	-4.3	-4	1.11	-4	0.57
PM4	Overnight deposits and other liabilities	-3.7	-5	2.34	-3	0.66
GDP6	Gross fixed capital formation	-2	-2	2.61	-2	0.83
BOKZ	PLN loans value (balance)	-1	0	1.37	-3	0.80
M1	M1 money supply	-4.5	-4.5	2.07	-4	0.66
M2	M2 money supply	-0.8	-2.0	2.68	0	0.86
WIG20	WIG20 stock exchange index	-2.5	-3	2.26	-2	0.72
KOP10	Other MFIs housing loans to individuals for the purchase of real property (PLN)	-0.5	-0.3	1.21	-1	0.83

Source: own calculations.

5.2. The evaluation of constructed barometers

On the basis of selected variables, nine composite leading indicators with different combinations of their component parts were created (Table 4). The barometers obtained were composed of from 2 (WWKZK1) to as many as 8 (WWKZK3) elements, while the majority had 3 component elements. Some of the aggregates obtained (WWKZK7, WWKZK8, WWKZK9) did not fully reflect the course of the referential value, omitting one of the cycles. These barometers were at the same time characterized by relatively small lead of both troughs (median – 1 quarter) and peaks (median – 1 quarter) in the cycle, which, with a relatively large standard deviation of the lead length, makes them insufficiently useful for forecasting business cycles in the scope of the changes in PLN credits.

Among the remaining indicators, all signalled the changes in the business tendency on the credit market with a lead. The average lead amounted to, depending on a barometer, from 1 to 3.5 quarter in the case of troughs and from 1.3 to 3 quarters in the case of peaks. The leads were similar in the case of using a median.

Table 4. Barometer lead in relation to KRZL referential variable

Indicator code	Components	Peaks and troughs in total			Correlation in relation to referential indicator	
		mean	median	standard deviation	lead (-)	correlation coefficients
WWKZK1	GDP10, BOLP	-1.4	-1.5	0.71	-1	0.97
WWKZK2	NSK210, N2GD18, N2PI10, ZSK210, ZGD8, ZPI3	-3.2	-2.5	1.46	-4	0.7
WWKZK3	GDP10, BOLP, NSK210, N2GD18, N2PI10, ZSK210, ZGD8, ZPI3	-2.3	-2.0	1.67	-2	0.87
WWKZK4	GDP10, BOLP, PM1	-2.3	-2.0	1.39	-2	0.9
WWKZK5	GDP10, BOLP, M1	-1.6	-1.0	1.06	-2	0.87
WWKZK6	GDP10, BOLP, M1, WIG20	-2.5	-2.3	2.12	-2	0.86
WWKZK7	GDP10, BOLP, BOKZ	-0.8	-1.0	0.41	-1	0.95
WWKZK8	ZGD8, ZPI3, ZPPRY3	-1.8	-1.0	1.72	-2	0.91
WWKZK9	GDP10, BOLP, ZGD8, ZPI3, ZPPRY3	-1.7	-1.0	1.51	-1	0.94

Source: own calculations.

The highest value of cross correlation coefficient (0.97) in relation to the cycle of the referential value was obtained in the case of WWKZK1 barometer with a forecasting horizon of one quarter. This barometer is composed of two variables:

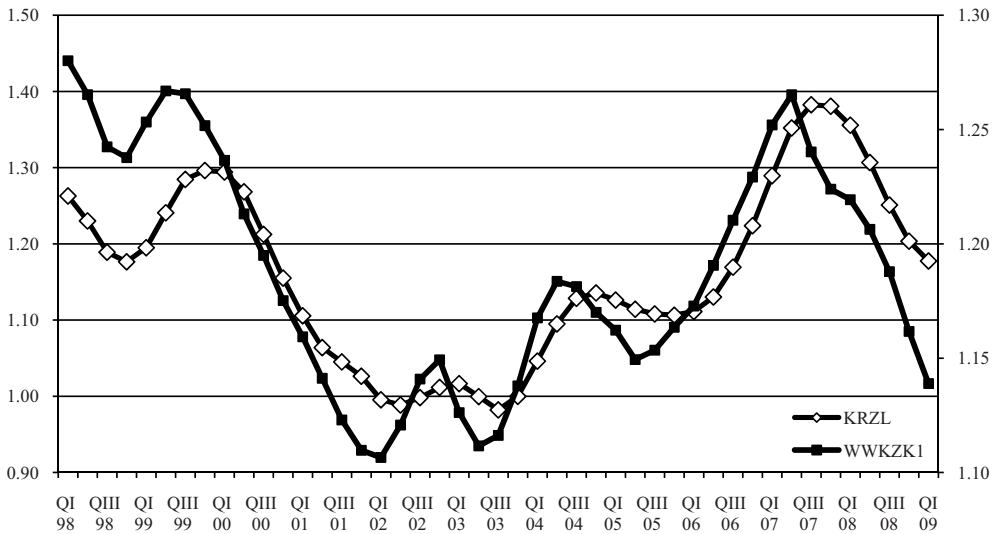


Figure 4. PLN loans (KRZL) and WWKZK1 barometer

Source: own calculations.

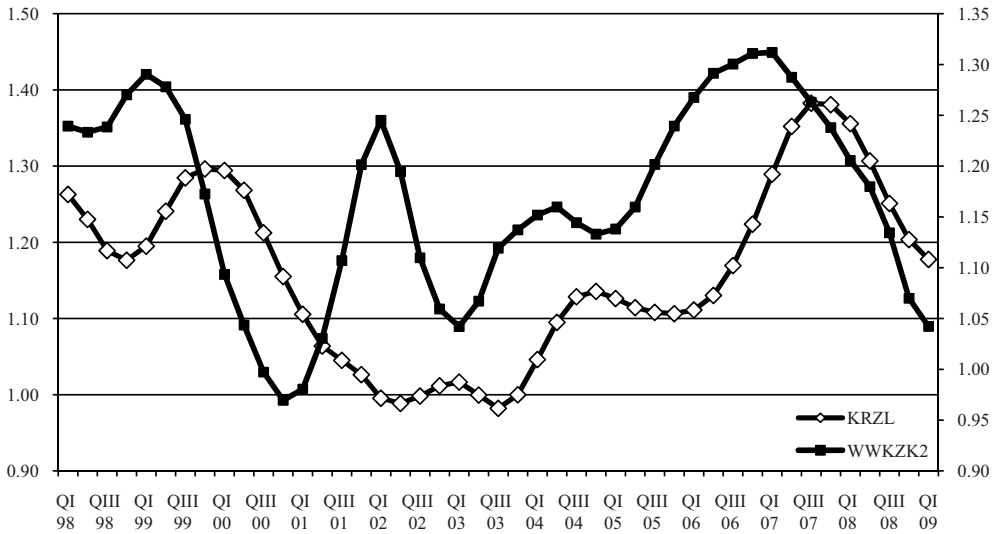


Figure 5. PLN loans (KRZL) and WWKZK2 barometer

Source: own calculations.

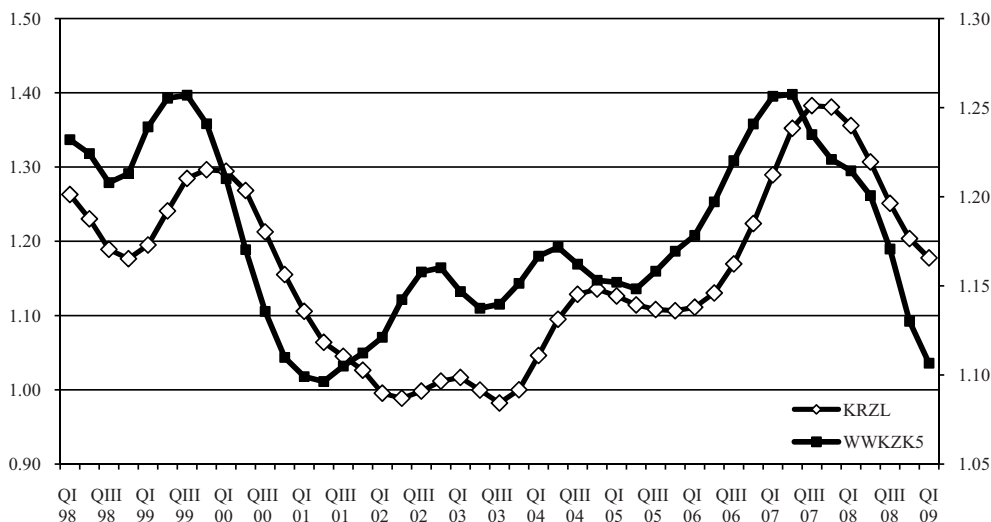


Figure 6. PLN loans (KRZL) and WWKZK5 barometer

Source: own calculations.

domestic demand (GDP10) and the assessment of the number of customers served (BOLP). This indicator signalled, with a 1-2 quarter lead, all turning points and, at the same time, it was characterized by the lowest standard deviation of the leads of turning points, which proves a greater stability in their signalling.

The WWKZK5 barometer, which contains, apart from the two abovementioned components, also the M1 variable (money supply M1), has similar features. Also in this case the change in business cycle was signalled with a lead (average lead of troughs – 2 quarters, peaks – 1.3 quarters). However, the lead in turning points was less regular (higher standard deviation value) and, at the same time, the correlation in relation to the cycle of the referential value was weaker.

Among the constructed barometers there is one (WWKZK2) which can be considered as an indicator with a long lead (mean 3.2 quarters, median 3.5 quarters). It is a barometer composed of 6 elements, namely: MFIs loans and other claims on individual entrepreneurs (NSK210), other MFIs loans and other claims (excluding interest) on households over 3 up to 5 years (N2GD18), other MFIs loans and other claims (excluding interest) on individual entrepreneurs over 3 up to 5 years (N2PI10), deposits and other liabilities of MFIs to individual entrepreneurs (ZSK210), Overnight deposits of MFIs to households (ZGD8) and deposits and other liabilities of MFIs to individual entrepreneurs (ZPI3). This barometer signals with a lead all troughs (mean of 3.5 quarters) and peaks (mean of 2.8 quarters) of the referential value; however, it has a relatively long standard deviation in the lead length. The latter proves a higher irregularity of the leads exhibited by the barometer in turning points. At the same time, the barometer sends the longest-lead signal (4 quarters) while its correlation coefficient has a relatively low value (0.7).

6. Conclusions

Composite leading indicators are useful in the assessment of business cycle in the banking sector and for short-term forecasts. The constructed barometers are correctly signalling both the peaks and troughs in the cycle of a referential variable. In the case of loans, the average lead amounts to, depending on a barometer, from 1 to 3 quarters and in the case of deposits – from 3 to 4 quarters. In turn, the longest lead periods of signalling the changes in business cycle do not exceed 3-4 quarters in the case of credits and amount to 5-6 quarters in the case of deposits.

The barometers constructed for loans more often indicate a longer lead for troughs than for peaks of a referential variable's cycle. This means that they are sending a signal concerning the upcoming end of a downturn phase and the improvement of a business cycle faster than in the case of the end of a growth phase and the approaching slowdown or recession. In the case of barometers for deposits, there are no such regularities.

Barometers constructed for PLN deposits are characterized by slightly longer leads than in the case of PLN credits. Moreover, the correlation is slightly higher. However, their weakness is, in most cases, omitting one of the cycles in the referential variable.

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ZASTOSOWANIE BAROMETRÓW KONIUNKTURY W PRZEWIDYWANIU ZMIAN SYTUACJI NA RYNKU BANKOWYM

Streszczenie: barometry koniunktury, budowane jako wskaźniki złożone na podstawie zmiennych mających właściwości wyprzedzające, wyznaczone niemal od 100 lat, stosowane są bardzo często do określania kierunku przyszłych zmian sytuacji w całej gospodarce lub jej sektorach. W związku z ogromnym znaczeniem sektora bankowego dla funkcjonowania gospodarki prognozowanie zmian na rynku bankowym nabiera szczególnego znaczenia.

Prezentowane w artykule barometry – zbudowane dla dwóch najważniejszych wielkości z rynku bankowego depozytów złotych i kredytów złotych – umożliwiają trafne prognozowanie występowania punktów zwrotnych cyklu koniunkturalnego. Złożone wskaźniki wyprzedzające konstruowane dla obu zmiennych referencyjnych zachowywały w większości przypadków dobre właściwości prognostyczne i sygnalizowały prawie wszystkie punkty zwrotne cyklu kredytów złotych oraz depozytów złotych. Potwierdza to przydatność zastosowanej metody do prognozowania rozwoju rynku usług bankowych.