

THE USE OF SURVEY DATA IN ECONOMIC BAROMETERS FOR POLAND*

1. Introduction

The usefulness of survey data in monitoring systems designed to detect changes in economic activity has been evidenced by many theoretical and empirical studies. It has been proved that certain qualitative indicators, reflecting the opinion of economic agents (entrepreneurs, consumers, etc.) on their own situation and on the tendency of business in general, may be a valuable source of information on the actual course of business. On a theoretical plane, the concept of rational expectations explains the link between real economic developments and their reflection in people's attitudes and judgements. On an empirical plane, the analysis of leads and lags between micro- and macroeconomic variables provides strong proof in favour of monitoring and forecasting properties of such qualitative indicators as investment plans, order-books and capacity utilization rates of enterprises, or major purchase intentions of the consumers. Therefore, survey data are widely used in macroeconomic assessments and forecasts.

Several institutions in Poland are continuously testing public opinion about the course of business, collecting qualitative data on different aspects of economic activity in individual sectors of the economy and compiling various composite indicators to indicate the general tendency of business. The most important sources include the surveys made by the Research Institute of Economic Development at the Warsaw School of Economics (RIED) and by the Central Statistical Office (CSO).

The RIED surveys now cover the following sectors:

- (a) industry: since 1986, monthly;
- (b) agriculture: since 1992, bimonthly;
- (c) construction, since 1993, quarterly;
- (d) trade (retail & wholesale): since 1993, quarterly;
- (e) households: since 1990, quarterly.

The CSO surveys cover three sectors:

- (a) manufacturing industry: since 1992, monthly and quarterly;

* Paper presented at the 24th CIRET Conference in Wellington, in March 1999.

- (b) construction: since 1993, monthly and quarterly;
- (c) retail trade: since 1993, monthly and quarterly.

These business surveys are supplemented by the consumer survey carried out since 1991 on a monthly basis by DEMOSKOP, a private polling company.

Qualitative data as well as composite indicators compiled by the above institutions have been continuously used, with more or less success, to depict current business tendencies in relevant sectors. Less attention was devoted to utilize the information rendered by those sources in macroeconomic estimates of the general condition and prospects of national economy.

The aim of this paper is to show the applicability of survey data in macroeconomic appraisals and forecasts pertaining to the general course of business in the national economy of Poland. Section 2 describes the application of certain survey data to a composite leading indicator (CLI), based on quantitative and qualitative data. Section 3 presents alternative variants of an economic sentiment indicator (ESI) for the Polish economy, based exclusively (or predominantly) on survey data. Section 4 brings some conclusions.

2. The Use of Survey Data in Composite Leading Indicators

The research on the development of a composite leading indicator for the Polish economy was initiated by I. Kudrycka and R. Nilsson in 1993 and continued in the next three years [I. Kudrycka, R. Nilsson, 1993, 1995, 1996]. In 1994, this author began to develop his own concept of composite leading indicator for Poland, based on quantitative and qualitative data, using the OECD methods and procedures. As a reference indicator, the author used a composite quantitative indicator called GCI (general coincident index), based on the output data of five major sectors of economy: industry, construction, agriculture, transport, and trade. Sectoral indicators of production volume entering the general index are weighted by yearly shares of the respective sectors in GDP. The GCI index, compiled on a monthly basis for the period starting in January 1975, has been used to reconstruct growth cycles seen in the development of the Polish economy over the last 25 years.

The first presentation of the reference cycle indicator and of the two experimental versions of a short-lead CLI appeared in a paper published in the Polish economic journal „Ekonomista” and in another paper presented at the OECD meeting on leading indicators in Paris in 1996 [Z. Matkowski, 1996]. A revised and more comprehensive set of short- and long-lead CLIs was presented at the 23rd CIRET Conference in Helsinki in August 1997

[Z. Matkowski, 1997]. The 1998 edition of our CLIs was published in the book 'Composite Indicators of Business Activity for Poland based on EU and OECD Standards' (RIED Papers and Proceedings, vol. 61). The full account of methods and procedures employed in compiling our CLIs is contained in the volume 'Synthetic Indicators of Business Activity for the Polish Economy' (RIED Papers and Proceedings, vol. 51), published in 1997.

Looking for the candidates to our CLIs, we have analyzed, apart from quantitative variables, the dynamic properties of ca. 20 qualitative indicators taken from business surveys. Some of them have been found acceptable for CLI purposes in the light of the common criteria.

The last edition of our CLIs contains 7 experimental formulas of a general leading indicator for Poland's economy. The alternative CLI versions are composed of 13-17 individual variables, including 6 indicators taken from business surveys (BS). These are:

- (a) industrial production tendency (RIED),
- (b) industrial production appraisal (RIED),
- (c) future industrial production (RIED),
- (d) economic prospects (RIED),
- (e) consumer sentiments (DEMOSKOP),
- (f) economic prospects (DEMOSKOP).

Indicators taken from the RIED surveys are originally expressed as net balances of positive and negative answers whereas indicators from DEMOSKOP are scaled from 0 to 200. For the aims of our analysis, all the indicators have been rescaled and transformed into indices based on 1992 = 100 as to assure their comparability.

The CSO surveys data could not be included since the available time series are too short for X12 ARIMA and OECD PAT procedures applied to discriminate cyclical components.

Statistical properties of the time series taken from the RIED and DEMOSKOP surveys are shown in Table 1. The code indicates the variable number in our database and the manner of detrending. Letters A and C stand for the PAT automatic routines for moving trend subtraction while letter R denotes linear trend removal.

F-test excludes any identifiable seasonality except of the RIED's series on the industrial production tendency. All indicators from the RIED industrial survey are good in terms of the limited amount of irregular and seasonal movements. Consumer attitudes from the DEMOSKOP survey also display very moderate seasonality but they are quite erratic as regards irregular movements. Most indicators yield ARIMA 12-month forecasts of acceptable reliability.

Table 1

Statistical properties of some leading indicators from business surveys

Code	Indicator	Relative contribution to stationary variance			F-test for seasonality			Arima forecast
		I	S	TC	stable	moving	combined	
A060	Ind. Prod. Tendency (RIED)	0.6	2.9	90.9	8.7*	0.9	yes	no
A061	Ind. Prod. Appraisal (RIED)	5.0	7.7	83.5	11.7*	5.4**	rather not	yes
C062	Future Ind. Prod. (RIED)	4.4	5.0	82.7	6.4*	2.9	no	yes
A069A	Economic Prospects (RIED)	6.0	1.3	88.8	1.5	3.8	no	no
DR02	Economic Prospects (DEMO)	29.2	7.0	56.1	0.5	1.0	no	yes
DR05	Consumer Sentiments (DEMO)	25.5	6.2	62.6	0.3	0.6	no	yes

* Seasonality present at the 0.1 per cent level.

** Seasonality present at the 1 per cent level.

Table 2 shows important performance characteristics of qualitative indicators entering our CLIs. The quality control statistics (QCS) is acceptable for the first three indicators but rather poor for the three other. All the indicators have acceptable MCD length, ranging from 1 to 4 months.

Cross-correlation results indicate that the four qualitative indicators taken from the RIED industrial survey are well correlated with the reference cycle at 3-6 month lead which makes them useful for a short-lead CLI. The two indicators from the DEMOSKOP consumer survey are not so closely correlated with the reference cycle and they display a longer, 16-17 month-lead which makes them more suitable for a long-lead CLI. However, some of these indicators display quite flat correlograms meaning that the established leads may not be very stable.

The period covered by the available survey data is too short for assessing their performance at reference cycle turning points. As Table 3 shows, most indicators revealed quite long leads at both the peak of 1989 and the trough of 1991 and at the new apparent peak of 1997. This seems to indicate that some of the qualitative indicators may signal the changes in general economic activity well in advance.

The evolution of cyclical components of the qualitative leading indicators over time against the reference cycle is also illustrated by the graphs. Figure 1 shows six survey indicators and the reference series in the form of seasonally adjusted, MCD-smoothed and detrended data. Noteworthy is the fact that current slowdown in economic growth was signalled by some of the indicators two or three years earlier.

All the six indicators have been included in the last edition of our CLIs. The RIED survey indicators for industry, along with 13 quantitative indicators,

entered the CLI variants denoted as L115, L116 and L117. Consumer judgements from DEMOSKOP entered the auxiliary variants 115A through 115D.

Table 2
Performance characteristics of leading indicators

Code	Indicator	Start date	QCS	MCD	Cross - correlation against reference series	
					lead (-)	R
	<u>Selected Leading Indicators</u>					
A060	Ind. Prod. Tendency (RIED)	01.1987	0.76	1	-3	0.915
A061	Ind. Prod. Appraisal (RIED)	01.1987	0.94	4	-5	0.905
C062	Future Ind. Prod. (RIED)	01.1987	0.85	3	-3	0.770
A069A	Economic Prospects (RIED)	01.1987	1.50	4	-6	0.846
DR02	Economic Prospects (DEMO)	12.1991	1.61	4	-17	0.693
DR05	Consumer Sentiments (DEMO)	12.1991	1.66	4	-16	0.672
	<u>Composite Leading Indicators</u>					
L115	13 series including A060, 069A	01.1975	.	.	0	0.951
L115C	15 series including A060, A061, C062, A069A, DR02, DR05	01.1975	.	.	0	0.944
L115D	16 series including A060, A061, C062, A069A, DR02, DR05	01.1975	.	.	0	0.942
L116	15 series including A060, A061, C062, A069A	01.1975	.	.	0	0.943
L117	17 series including A060, A061, C062, A069A	01.1975	.	.	0	0.928
	<u>Reference Series</u>					
X091	GCI2D	01.1975	0.62	5	x	x

Table 3
Performance of the selected leading indicators at turning points

Code	Indicator	Start date	Extra (x) or missing (n) cycles	Leads (-) or lags (+) at reference turning points		
				P03/89	T10/91	P04/97
A060	Ind. Prod. Tendency (RIED)	01.1987	1x	-28	-23	-36
A061	Ind. Prod. Appraisal (RIED)	01.1987	1x	-8	-22	-37
C062	Future Ind. Prod. (RIED)	01.1987	1x	-30	-22	+3
A069A	Economic Prospects (RIED)	01.1987	1x	-18	+4	-36
DR02	Economic Prospects (DEMO)	12.1991	0	+4	-14	-15
DR05	Consumer Sentiments (DEMO)	12.1991	0	+4	-14	-14

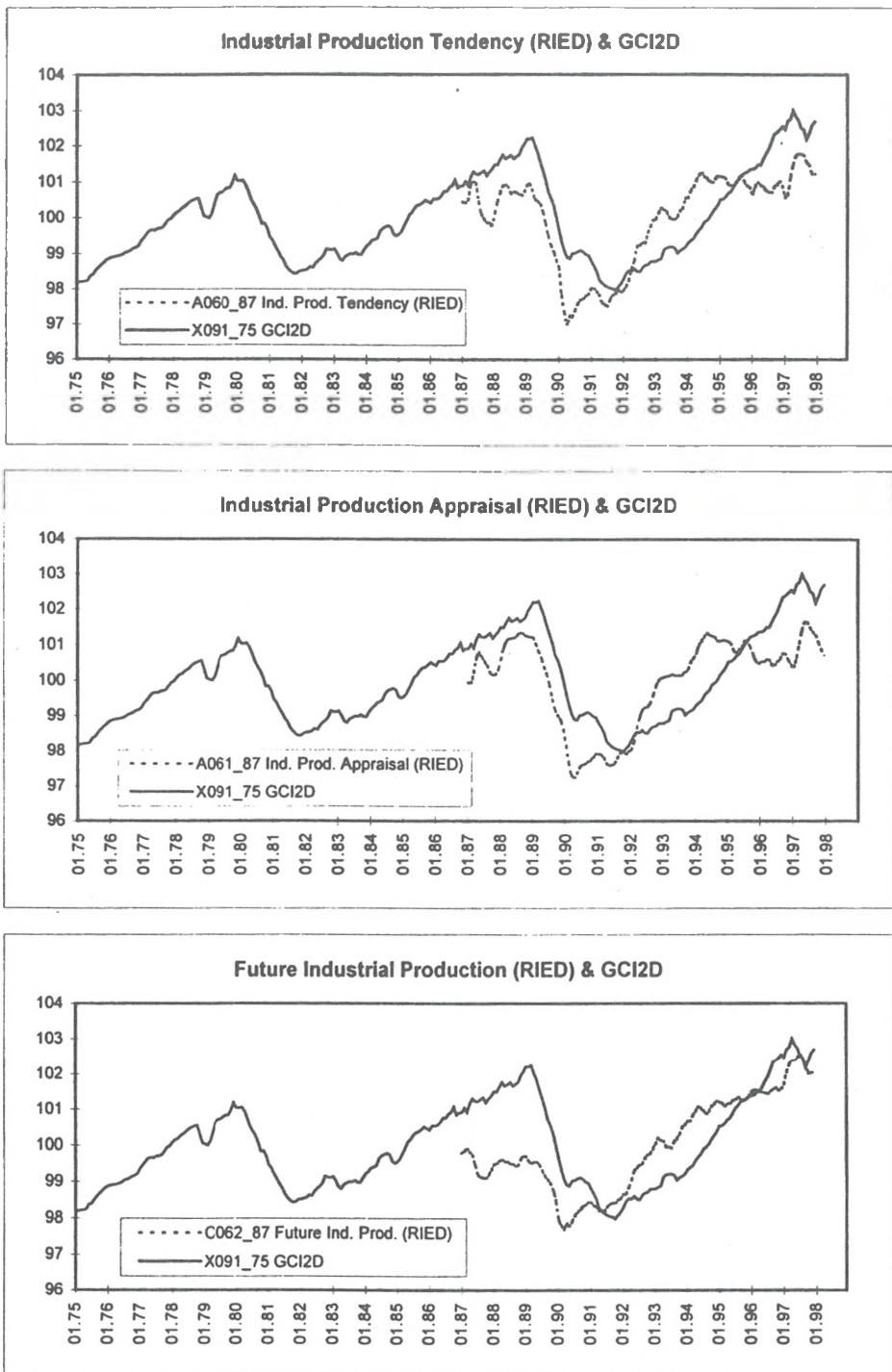


Figure 1
Leading indicators from business surveys and the reference cycle

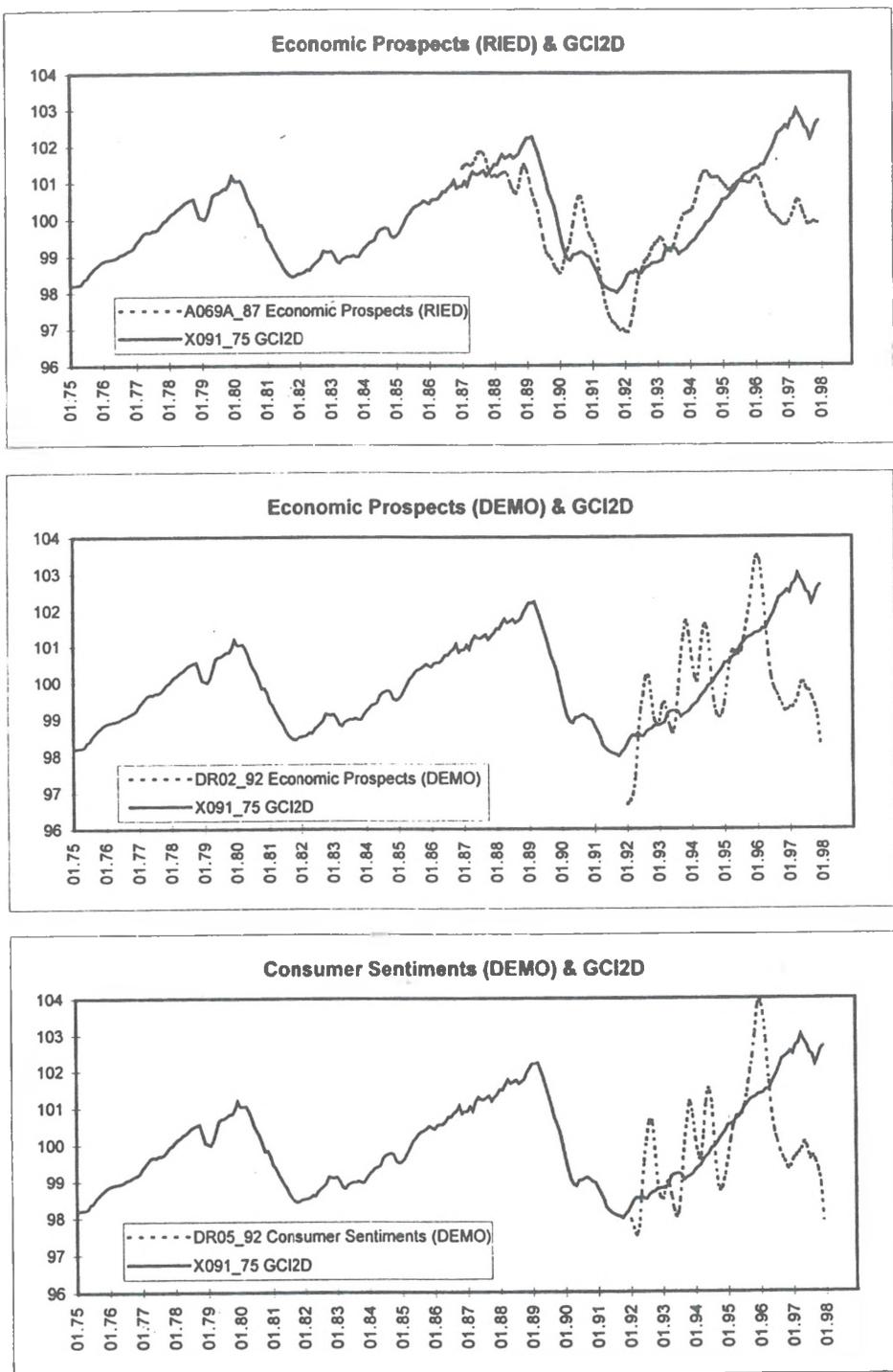


Figure 1 (cont.)
Leading indicators from business surveys and the reference cycle

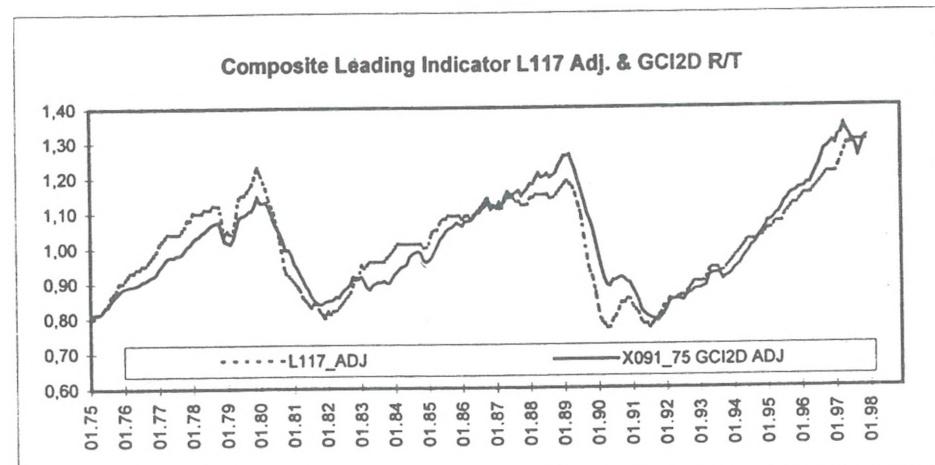
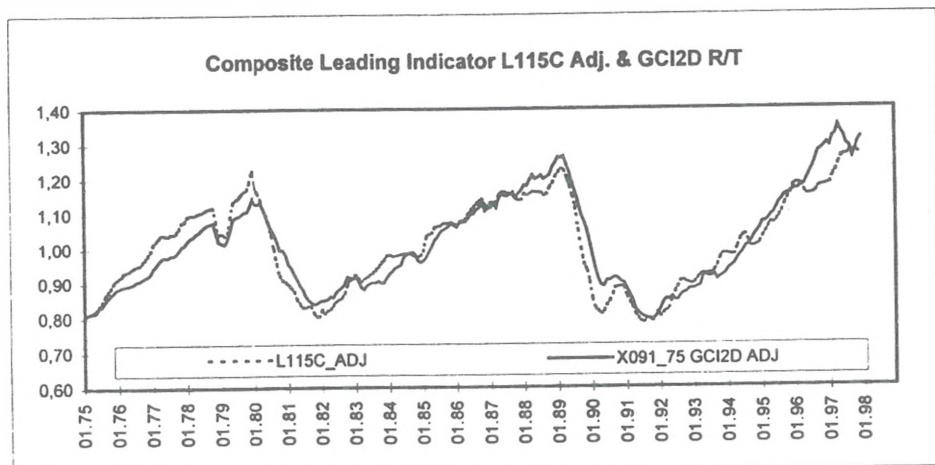
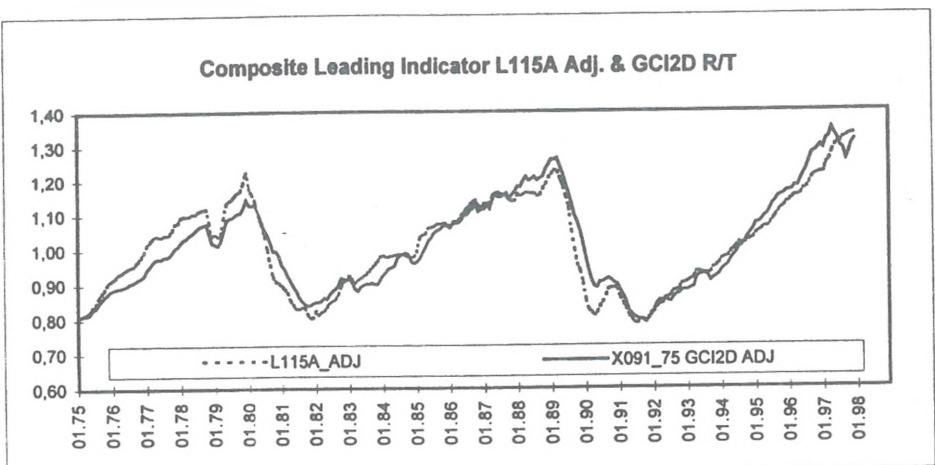


Figure 2
Composite leading indicators and the reference cycle

Figure 2 shows three versions of our CLI denoted L115A, L115C and L117, composed of 13-17 individual leading indicators, including the above mentioned qualitative indicators. They are presented in the form of amplitude adjusted and MCD-smoothed R/T series against the reference index. All the CLIs are very well correlated with the reference index ($R = 0.94$ or 0.95), but in the last updating they have almost entirely lost their short lead properties displayed before. This is because of the new peak which appeared in the cyclical movement of the reference index in early 1997 but has not yet been reflected in the cyclical development of most component leaders. Presumably, the leading properties of our CLIs will be restored with the next updating.

Our barometer is not yet fully operational and it calls for further testing and improvement. Nonetheless, some of the CLI constructions, repeatedly tested and modified in the successive editions of our barometer, seem to be useful for monitoring purposes, helping us to detect changes in general economic activity in the country. Noteworthy, our barometer correctly detected the current slowdown in economic growth as early as in the beginning of 1997, or roughly one year earlier than most other sources did. Our estimate of the GDP growth rate in 1998, based on a GCI projection, was conservative in comparison with most other forecasts, yet it proved very precise and has been recently confirmed by the official statistical data.

3. General Indicators of Economic Activity Based on Survey Data

Another part of our research aims at developing a general indicator of economic activity for Poland based exclusively (or predominantly) on qualitative data from business surveys. The basic idea behind these attempts is to combine composite indicators of business activity in individual sectors of economy, compiled from survey data, into a single synthetic indicator reflecting the general condition of national economy. This kind of macroeconomic index resembles the EU concept of the economic sentiment indicator, though some of the tested formulas have different coverage and weights.

The first attempts to construct a general indicator of business activity for Poland based on survey data were made in 1993 independently by two researchers using the RIED survey data [K. Stanek, 1993; Z. Matkowski, 1993]. Both of them calculated a general indicator inspired by the EU ESI concept, but different in coverage. Since 1994, K. Stanek continues to compile two versions of his synthetic indicator covering industry, agriculture, households, construction and trade (since 1997, also transport), using his own system of constant weights and two different concepts of sectoral composite

indicators. The first is called 'RIED formula', and the second one is denoted 'EU formula', though the latter differs from the harmonized ESI concept both in coverage and weights.

In 1998, this author developed several alternative formulas of a general indicator of economic activity for Poland based on survey data and filled them with the RIED and CSO survey data, supplemented by the consumer sentiment indicator provided by DEMOSKOP. The analysis, aimed at evaluation of different formulas of the indicator and the selection of the best operational formula, covered the period from November 1993 till January 1998, for which the original data were available at the time of study (March 1998).

Full presentation of the results appeared in two papers included in the book published by the author in 1998 [Z. Matkowski, 1998]. Here we wish to present some of the variants compiled from the RIED survey data.

Table 4
*Component variables entering the general indicators of business activity
 based on the RIED survey data*

Code	Indicator / Formula	Compiled as:
ZH01	Business Indicator - Ind. (RIED)	Avg. of ind.prod. appraisal & forecast - 2 months
ZH03A	Ind. Activity Tendency (ZM)	Avg. of ind. prod. appraisal & forecast
ZH05A	Ind. Confidence Indicator (EU)	Future ind. prod., change in stocks & order book
ZH11A	Constr. Activity Tendency (ZM)	Avg. of constr. prod. appraisal & forecast
ZH09	Constr. Confidence Indicator (EU)	Order book & expected change in employment
ZH17	Business Indicator - Trade (RIED)	Future sale tendency, anticipated change in supplies, commodity stocks
ZH20A	Trade Sale Tendency (ZM)	Avg. of sale appraisal & forecast
ZH25	Business Indicator - Agr. (RIED)	Current & future revenue tendency, adjusted for anticipated economic condition of the farm
ZH28	Consumer Conf. Indicator (RIED)	Change in income and savings, modified by an anticipation factor; since 1995 - EU formula
ZD05	Consumer Conf. Indicator (DEMO)	EU formula
ZW01	Warsaw Share Price Index	Not detrended
ZWR01	Warsaw Share Price Index R/T	Detrended

Table 4 includes the list of component indicators entering the general index based on the RIED data. Most of them are in fact composite indices composed of 2-5 single time series representing general tendency of business in the given sector. Some of the component variables have been calculated by the author according to his own (ZM) or harmonized (EU) formulas. Two supplementary series describing consumer attitudes and the Warsaw Stock Exchange Index were also included in some of the tested variants.

The alternative formulas of the general indicator based on the RIED data have been denoted ZHG1 to ZHG5 while similar formulas of the indicator filled with the CSO survey data are recorded as ZGG1 to ZGG5. Here we present four variants of the indicator based on the RIED data.

Variant 1 is the closest implementation of the harmonized EU ESI concept. It was calculated according to the formula:

$$ZHG1 = \frac{1}{3} Industry + \frac{1}{3} Households + \frac{1}{6} Construction + \frac{1}{6} Share Prices.$$

The entry variables here are: the industrial confidence indicator, consumer sentiment indicator, construction confidence indicator (all compiled according to the EU harmonized standards), and the detrended share price index of Warsaw Exchange.

Variant 3 refers to the RIED concept of the synthetic business indicator, denoted RIED-EU. It applies the EU concept of confidence indicators for industry and construction, and a compromise RIED-EU concept of consumer sentiments, but it also includes agriculture and trade, with confidence indicators compiled specifically. Unlike the original EU ESI concept, this indicator does not include the share price index. Industry and households are given weights twice as high as each of the remaining sectors. The resulting general indicator was calculated according to the algorithm:

$$ZHG3 = \frac{2}{7} Industry + \frac{2}{7} Households + \frac{1}{7} Construction + \frac{1}{7} Trade + \\ + \frac{1}{7} Agriculture.$$

Variant 4 includes four productive sectors: industry, construction, agriculture, and trade, which directly contribute to the creation of GDP. Composite indicators reflecting the business tendency in each sector are calculated according to EU concepts except for agriculture where business tendency is determined according to the RIED's own formula. Unlike in the preceding variants, component indicators reflecting the activity in individual sectors are combined using no arbitrary constant weights, but weights that represent their actual share in the GDP (more precisely, in gross value added). The weights are changed each year, according to the changing structure of the economy. For the period covered by the analysis, the average shares were: industry - 32.8%, construction - 6.4%, agriculture - 7.1%, trade - 16.3%. Since the above sectors do not cover the whole economy (amounting to slightly less than 2/3 of GDP), sum total of the weighted indices must be divided by the sum of weights. The resulting algorithm is:

$$ZHG4 = \frac{a_1 \times Industry + a_2 \times Construction + a_3 \times Trade + a_4 \times Agriculture}{a_1 + a_2 + a_3 + a_4}$$

where weights a_1, a_2, a_3, a_4 reflect the contribution of individual sectors to the creation of GDP in the given year.

Variant 5 has the same coverage and the same weights as variant 4, but it is filled with homogeneous component indicators reflecting the business tendency in individual sectors. Instead of different concepts of business tendency for different sectors (a practice adopted in RIED and recommended by EU harmonized standards), this variant employs a uniform concept of business tendency for each sector, namely the average of the production (sales) appraisal and forecast (except of agriculture where the available survey data do not provide the relevant information). The algorithm here used is the same as in variant 4:

$$ZHG5 = \frac{a_1 \times Industry + a_2 \times Construction + a_3 \times Trade + a_4 \times Agriculture}{a_1 + a_2 + a_3 + a_4}$$

The general indicators of economic activity calculated according to the above formulas have been filled with survey data of the period from November 1993 till January 1998 which were available at the time of analysis (March 1998). Quarterly data were transformed into monthly series by interpolation. All the component series entering the combined indicator have been smoothed with 3-month moving average and standardized using the following formula [OECD, 1987]:

$$\left[(x - \bar{x}) : \frac{\sum |x - \bar{x}|}{n} \right] + 100$$

where x denotes numerical values of the given variable, \bar{x} - arithmetic mean of the time series values, n - number of observations (months). Standardized component series and the composite general indicators derived thereof usually range between 95 and 105.

It should be noted that the resulting general indicators express relative deviations of the values observed from their long run average ($= 100$), so they should not be mistaken for simple dynamic indices. Anyway, numerical values of indicator higher than 100 mean that current level of business activity is assessed positively (above the average) while values lower than 100 indicate that current condition of the economy is perceived as rather poor (below the long-run trend). An increase of the indicator suggests a rising (favourable) tendency of economic activity whereas its decrease is tantamount to a slowdown.

Four alternative variants of the general indicator calculated from the RIED

data are shown in Figure 3. The general tendency of economic development in Poland during the last 4-5 years, in the light of these indicators, is somewhat uncertain. ZHG1 and ZHG3 show a rising tendency with some signs of slowdown towards the end of the period. ZHG4 displays massive seasonal fluctuations, reinforced by the changing yearly weights, with no distinct trend. ZHG5 indicates a levelling of the boom between 1994 and 1996, and a sharp slowdown since 1997. In fact, the Polish economy developed quite rapidly during the five years 1992-1997, but the last year brought about a marked slowdown in economic growth, with the decrease of GDP growth rate from 6-7 percent a year to less than 5 percent. Macroeconomic forecasts suggest a further slackening of economic growth in 1999.

Table 5

*Component variables entering the general indicators of business activity
based on the CSO survey data*

Code	Indicator / Formula	Compiled as:
ZG01	Industrial Climate (CSO)	Avg. of ind. enterprise situation & prospect
ZG03A	Ind. Activity Tendency (ZM)	Avg. of ind. prod. appraisal & forecast
ZG05A	Ind. Confidence Indicator (EU)	Future ind. prod., change in stocks & order book
ZG08	Constr. Climate (CSO)	Avg. of constr. prod. appraisal & forecast
ZG08A	Constr. Activity Tendency (ZM)	Avg. of constr. prod. appraisal & forecast
ZG10A	Constr. Confidence Indicator (EU)	Order book & expected change in employment
ZG13	Retail Trade Climate (CSO)	Avg. of trade enterprise situation & prospect
ZG15A	Retail Sale Tendency (ZM)	Avg. of sale appraisal & forecast
ZD05	Consumer Conf. Indicator (DEMO)	EU formula
ZW01	Warsaw Share Price Index	Not detrended
ZWR01	Warsaw Share Price Index R/T	Detrended

The author has also compiled a parallel set of general indicators of business activity based on the CSO survey data, supplemented by the DEMOSKOP consumer survey. The formulas here used were analogous with those applied to RIED survey data except of the modified weights due to a narrower coverage (CSO surveys do not cover agriculture). For the lack of space, we cannot discuss the peculiarities of the synthetic indices derived from this source. Table 5 lists the component time series included in the aggregate index. Four alternative CSO-founded indicators, based on similar formulas to those employed to RIED data, are presented in Figure 4.

Comparing the RIED- and CSO-based general indicators of economic activity, we see that the latter display a more pronounced seasonal pattern which can be removed during the next updating, when the time series reach the

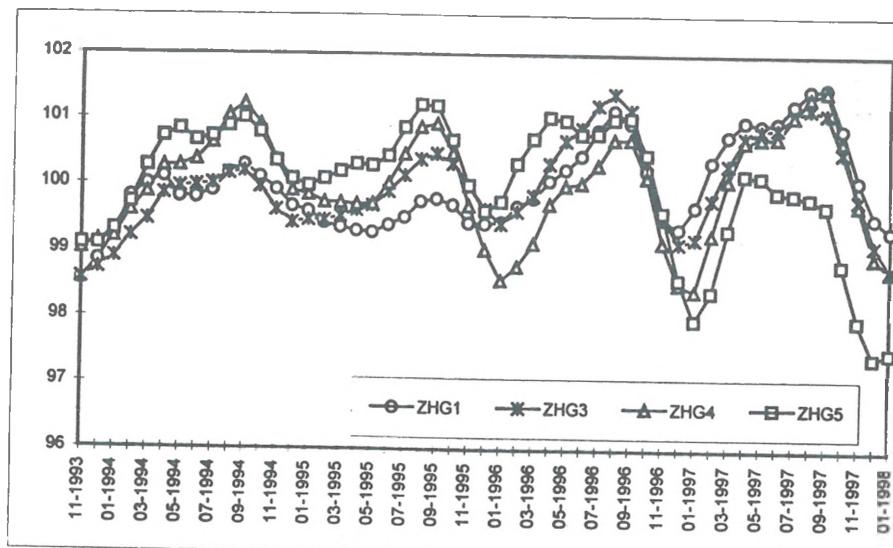


Figure 3
General indicator of economic activity
based on the RIED survey data

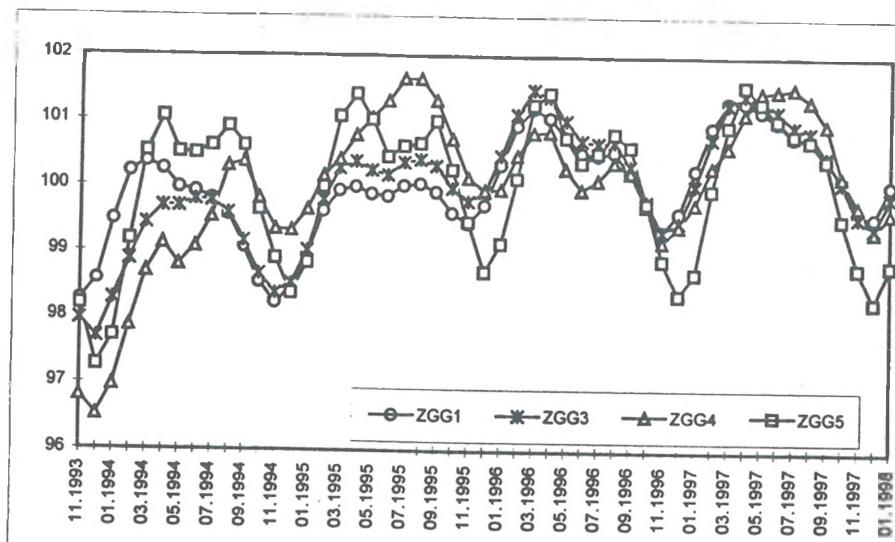


Figure 4
General indicator of economic activity
based on the CSO survey data

suitable length. At the same time, the general trend indicated by the CSO indices is a little more encouraging than the tendency implied by the RIED data - a finding not surprising since CSO surveys do not include agriculture, the sector most severely affected by the transformation process. Nevertheless, the CSO-based synthetic indicators also reveal a slowdown of economic boom towards the end of period.

The most adequate formula of the general indicator of business activity derived from survey data will be chosen by comparing the evolution of alternative indicators over a longer period with the actual development of the economy, as reflected by the GDP growth rates and other objective statistical measures, including our monthly reference index GCI. A more comprehensive and thorough analysis of our indicators will be undertaken in March 1999, when the available time series reach the 5-year length required for the X12-ARIMA routine.

4. Conclusion

1. Several qualitative indicators from business and consumer surveys have been used in composite leading indicators for the Polish economy and they have proved helpful in macroeconomic forecasts.
2. Alternative formulas of a general indicator of economic activity for Poland filled with business survey data have been developed and tested in order to find the most adequate formula.
3. The research on economic barometers for the Polish economy justifies the conclusion that survey data may efficiently be used in macroeconomic assessments and forecasts, increasing their accuracy.
4. The author believes that the experience gained in our work on economic barometers for Poland may also be of interest for the analysts engaged in developing similar monitoring systems for other economies in transition.

Bibliography

- I. Kudrycka, R. Nilsson, *Business Cycles in the Period of Transition*, „Z Prac Zakładu Badań Statystycznych GUS i PAN”, no. 216, GUS, Warszawa 1993.
- I. Kudrycka, R. Nilsson, *Business Cycles in Poland*, „Z Prac Zakładu Badań Statystycznych GUS i PAN”, no. 227, GUS, Warszawa 1995.

- I. Kudrycka, R. Nilsson, *Cyclical Indicators in Poland*, in: *Cyclical Indicators in Poland and Hungary*, OECD, Paris 1996.
- Z. Matkowski, *In Search for an Economic Sentiment Indicator for Poland: The RIED Approach and Preliminary Results*, Workshop on Business Surveys in Transition Countries, Poznań 1993.
- Z. Matkowski, *Ogólny wskaźnik koniunktury dla gospodarki polskiej* (General Indicator of Business Activity for Poland), „Ekonomista”, no. 1, 1996.
- Z. Matkowski, *Composite Leading Indicators for Poland and the Concept of the Reference Cycle*, A contributed paper prepared for the meeting on OECD Leading Indicators: OECD, Paris, 1996.
- Z. Matkowski, *Business Cycles in Poland*, 23rd CIRET Conference, Helsinki 1997, in: *Social and Structural Change - Consequences for Business Cycle Surveys* (K.H. Oppenlaender, G. Poser, eds.), Ashgate, Aldershot - Brookfield - Singapore - Sydney 1998.
- Z. Matkowski, *Cykle w rozwoju gospodarki polskiej* (Cycles in the Development of the Polish Economy), „Ekonomista”, no. 5-6, 1997.
- Z. Matkowski (ed.), *Z prac nad syntetycznymi wskaźnikami koniunktury dla gospodarki polskiej* (Synthetic Indicators of Business Activity for the Polish Economy), „Prace i Materiały IRG”, vol. 51, SGH, Warszawa 1997.
- Z. Matkowski (ed.), *Złożone wskaźniki koniunktury dla gospodarki polskiej oparte na standardach UE i OECD* (Composite Indicators of Business Activity for Poland based on EU and OECD Standards), „Prace i Materiały IRG”, vol. 61, SGH, Warszawa 1998.
- OECD Leading Indicators and Business Cycles in Member Countries 1960-1985*, „Main Economic Indicators. Sources and Methods”, no. 39, OECD, January 1987.
- K. Stanek, *Koncepcja barometru gospodarczego koniunktury* (The Concept of an Economic Barometer), in: *Badania koniunktury gospodarki Polski*, SGH, Warszawa 1993.
- K. Stanek, *Syntetyczny wskaźnik koniunktury IRG SGH* (Synthetic Business Indicator by RIED), in: „Zeszyty koniunktury w gospodarce polskiej”, no. 6, SGH, Warszawa 1994.