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Weekly Business Cycle Barometer

Methodology and Results

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Abstract

The weekly business cycles barometer created by GIME is one of the few world wide weekly composite business cycles indicators. The author's intention was to monitor the future changes in macroeconomic perspective. The current value of the weekly barometer has been published in the influential Polish daily *Rzeczpospolita*.

The methodology of the weekly business cycles barometer as a synthetic indicator is based on leading both demand and supply indicators. The barometer has eight components. Three of them (two on the demand side and one on the supply side) are indicators of business conditions test. Other components represent investors' sentiment, the monetary, cost and credit factors. The logic of the weekly barometer allows to regulate the weights of components according to changing market conditions. Nevertheless, in practice so far, this possibility has not been used.

The results of the weekly business cycles barometer indicate a high level of conformity with the observed developments of Polish economy. The course of the time series for the first 29 quarters of the compiled barometer has demonstrated significant reaction to important domestic and international economic developments. Quarterly aggregates of the barometer value demonstrated convergence between changes in barometer values and GDP growth rate. Monthly aggregates showed a high level of convergence with the dynamics of industrial sales. These two relations lead to the application of the weekly business cycles barometer in macroeconomic forecasting. Prediction attributes, however, are limited to the period of 2 months ahead. Therefore, the weekly barometer can be considered as a leading indicator.

The comparison of the development of the Polish weekly business cycles barometer with a similar barometer for the United States economy (US Weekly Leading Index calculated by Economic Cycle Research Institute) shows important convergence. Assuming that both barometers well represent changes in business cycles in corresponding economies one may formulate a hypothesis on the short-term synchronization of business cycles developments in Poland and in the United States and more general in the global economy. From this perspective, business cycles fluctuations are delayed from three to nine months in Poland in relation to fluctuations in the US economy.

Key Words: leading indicators, business cycles indicators, business cycles synchronization

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1. Introduction

Business cycle indicators are composed of a range of statistical indicators sensitive to changes in the business cycles as well as aggregate indicators derived from them. Business cycle indicators are usually used for assessing the current state of economy and for making predictions for its future changes. However, one should not treat them as a complete and exclusive tool for assessing the current state of the business cycle. Such indicators are usually based on empirical observations of relationships between given economic variables. Such variables are selected either through the use of economic theory or econometric analyses¹.

Business cycle indicators together with business condition tests are a part of indicative methods for business cycle analysis. One of the advantages of using such methods is that the up – to – date and synthetic economic data can be acquired relatively quickly. The official statistical data are usually published with a delay of at least a few weeks with respect to the period they represent. The indicative methods on the other hand can approximate reliably the current state of the business cycle almost “on the fly”².

One of the limiting factors of business cycle indicators impairing the timeliness of results is the frequency of analysis, since most such indicators are published monthly. It is therefore impossible to monitor changes in the business cycle over shorter periods of time. The Weekly Business Cycle Barometer created by the Gdansk Institute for Market Economics fills this gap and allows tracking fluctuations of the business cycle in weekly periods. This article presents the methodology behind it and results obtained through its use.

2. The methodology

The Weekly Business Cycle Barometer is a synthetic indicator, which means it is based on other, independent economic indicators. It is composed of three variables:

- Leading business cycle indicator calculated by GIME (weight 30%);
- Consumer’s optimism indicator (Ipsos, weight 30%);
- Weekly synthetic indicator (weight 40%).

GIME’s leading business cycle indicator is being calculated every month by the Gdansk Institute for Market Economics since 2001 using the business condition test. The weekly barometer requires a national leading indicator to be used, which is calculated on the basis of answers from questionnaires sent to enterprises from three sectors: industrial, services, and banking. This indicator represents the supply side of the economy within the weekly barometer³.

¹ Hubner, Lubinski, Malecki, Matkowski (1994), *Koniunktura gospodarcza*, Panstwowe Wydawnictwo Ekonomiczne, pp. 208 – 209.

² Relates mainly to so called coincident indicators. Besides that, depending on the time relationship between indicator changes and business cycle changes, we can have leading indicators or lagging indicators.

³ Calculation methodology and properties of the GIME’s leading business cycle indicator are widely described in: Lapinski K., Peterlik M. (2006), *National and Regional Patterns of Business Cycle in Poland. The Results of Monthly Business Cycle Research in 2001-2005*, 28th CIRET Conference, Rome.

Consumer's optimism indicator is being calculated monthly by a research company Ipsos since December 1991. The calculation method is similar to the method of business condition test. However, instead of firms a representative group of Polish citizens above the age of fifteen are interviewed. The questions are asking for a subjective point of view regarding economic situation in the country and households, level of unemployment, inflation, amount of personal savings as well as propensity to purchase durable consumer goods. The respondents also give their expectations of future developments of these variables within a forthcoming period of twelve months. This indicator represents the demand side of the economy within the weekly barometer.

The final variable of the barometer (i.e. **weekly synthetic indicator**), alike the entire weekly barometer is composed of a number of components. Each of these six components carries an equal weight within the 40 percent appropriated to the weekly synthetic indicator:

- The **level of WIG 20** – the Warsaw Stock Exchange Index (blue chips) published by the Warsaw Stock Exchange S.A. (investor's attitude factor);
- Percentage change in **M3 money supply** in comparison to the previous month – monthly data published by the National Bank of Poland (NBP) (monetary factor);
- Percentage change in **the number of apartments built** in relation to the same month of previous year – monthly data published by the Central Statistical Office (GUS) (domestic demand factor);
- Percentage change in **average retail price of unleaded Eurosuper 95 petrol** in gas stations around the country in comparison with previous week – data calculated by Reflex (a fuel market research company) and published weekly in daily "Rzeczpospolita" (cost factor);
- **German business cycle indicator**⁴ calculated using the test of business cycle – data published monthly by the Ifo Institut in Munich (external demand factor);
- Change in average **interest rate of credits on current banking accounts** from 20 largest banks in Poland – values published daily in daily "Rzeczpospolita" (credit factor).

The values of barometer are calculated every Monday and take into account changes of all of its components that occur between previous Monday and Friday. Due to the fact that data concerning different variables are published with different frequencies they aren't available at the same time, so the number of changing variables of the weekly business barometer within a week isn't always the same.

All variables of the barometer (including the components of synthetic indicator) have been standardised and converted to fit common range of between minus 100 and plus 100. For five of them (value of WIG 20, changes in money supply, number of apartments, petrol prices and interest rate) this required establishing an acceptable range of fluctuation in order to eliminate a possible over-significance of one variable for the value of weekly barometer. After applying said operations, the value of a barometer can be calculated as a linear combination of normalised variables:

$$B_j = \left(\sum_{i=1}^n \alpha_{ij} b_{ij} w_{ij} \right) / 2 + 1000$$

Where: B_j – value of the barometer in j-th week;

α_{ij} – weight of i-th component in j-th week;

⁴ Germany is the main trading partner for Poland.

b_{ij} – standardising parameters and those limiting fluctuation range;

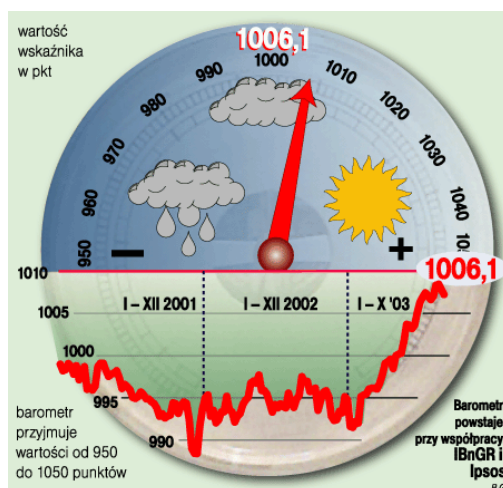
w_{ij} – value of i -th component in j -th week;

n – number of components.

Two final operations (i.e. dividing by two and adding 1000) are supposed to make the whole barometer look more appealing to an average reader. Standardizing and setting fluctuation ranges parameters set the barometer fluctuation range to the minus 100, plus 100 bracket. The application of described monotonic transformation changes the range of fluctuations of the barometer to between 950 and 1050 which is similar to the range of typical meteorological barometer. Values below 1000 suggest a “low pressure” thus bad conditions, whereas values above 1000 – “high pressure” thus good “business climate”. Without the transformation the results are less visible but still intuitive. Values below 0 indicate an economic downturn and values above 0 indicate an upturn.

In the further parts of this article the final range of fluctuations is used (i.e. 950 – 1050 points). An example of a press release is shown in figure 2.1.

Figure 2.1 The weekly business cycle barometer as seen in daily “Rzeczpospolita” newspaper



Source: Rzeczpospolita.

The fact that the two first indicators of the weekly barometer (GIME’s leading indicator and Ipsos’ consumer’s optimism) have been assigned equal weights is intended to balance the significance of supply and demand factors within the calculation. Thus:

$$\alpha_{1j} = \alpha_{2j} = 0,3$$

Variables that are a part of the weekly synthetic indicator and represent different economic factors have also been assigned equal weights within the remaining 40 percent:

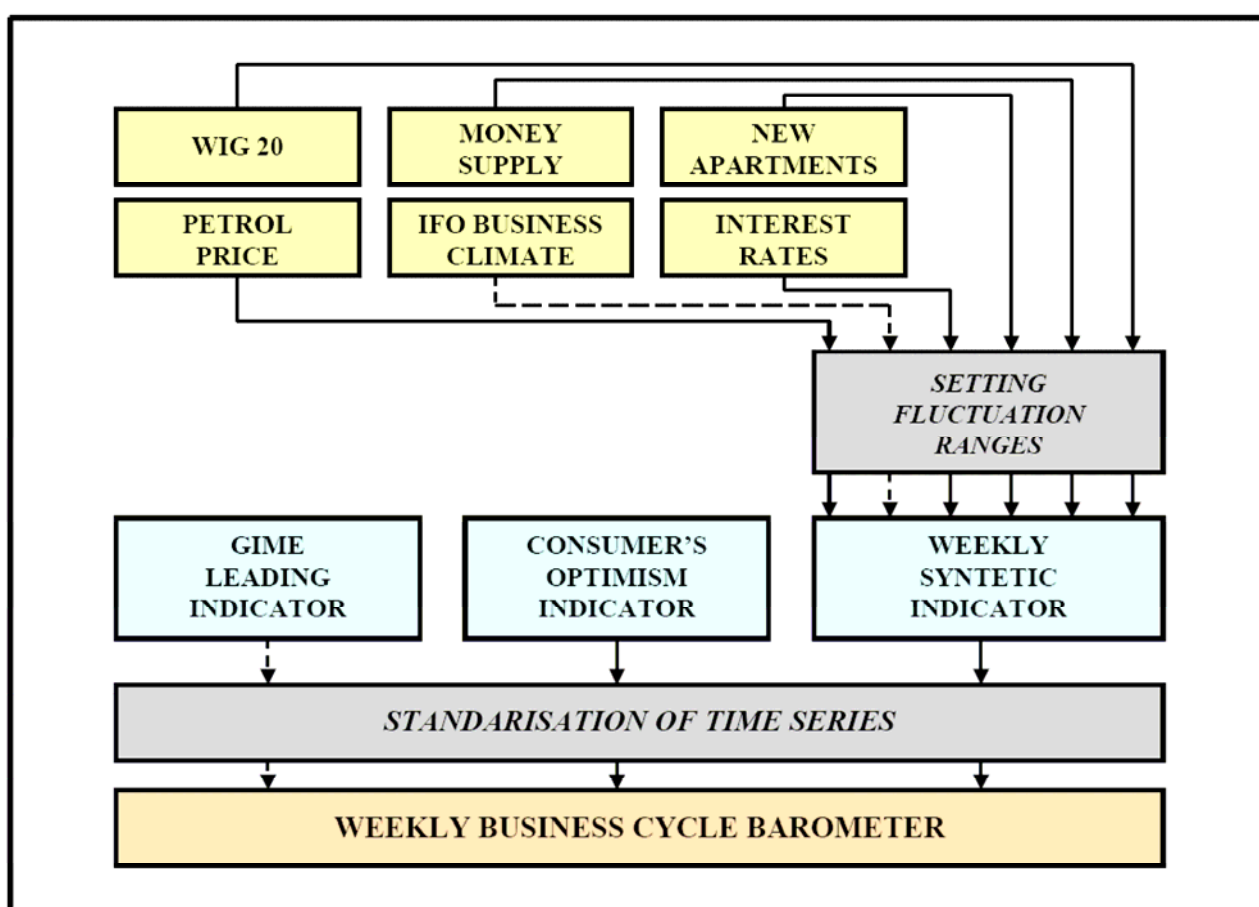
$$\alpha_{3j} = \dots = \alpha_{8j} \approx 0,067$$

In the future one cannot disregard the fact that these weights may need to be adjusted to reflect more accurately the economic situation. However, between January 2001 and March 2008 no

evidence that this will be required has come up. On the other hand, fluctuation ranges for some variables have changed over the years. An example might be the WIG 20 Index which initially was limited to maximum of 1800 points and with time was changed to 2200. In autumn of 2005 a further change to 2600 was required, and at the beginning of 2006 the limit was moved upwards to 3000 points. In mid 2006 another change occurred setting the limit at 3500 points.

Schematic explanation of the calculation methodology has been shown in figure 2.2. The sizes of fields on the illustration do not correspond to actual weights of components. Dotted lines indicate that a given procedure does not relate to given variable. Fields “setting fluctuation ranges” and „standardisation of data” indicate algebraic operations carried out on initial data which are different for each component they relate to. The illustration doesn’t take into account the final step of calculation (i.e. monotonic transformation), which sets the fluctuation range of barometer to 950 – 1050 points.

Figure 2.2 Architecture of the weekly business cycle barometer



Source: GIME.

3. Results (January 2001 – March 2008)

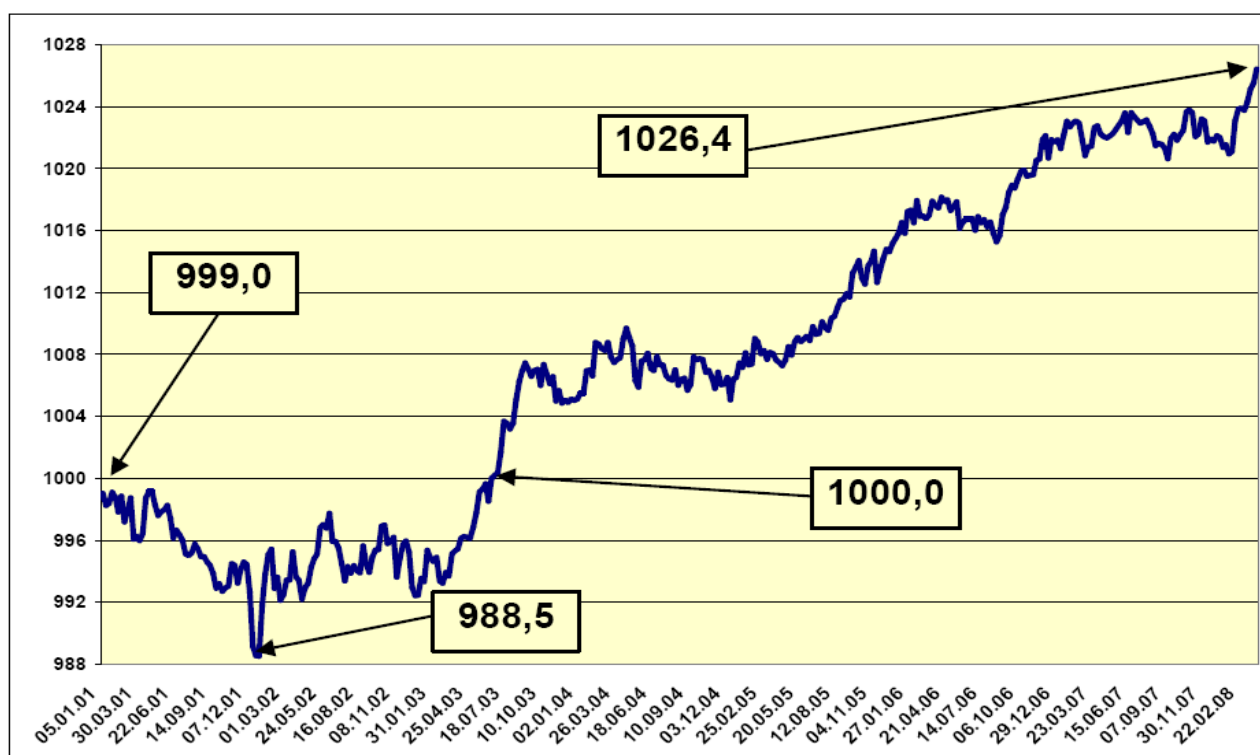
In the year 2002, when the study of business cycle using the above mentioned method began, the course of the time series was set *ex post* for the year 2001 because one of the main indicators – the leading indicator – was first calculated in the beginning of 2001.

During the 29 quarters of the barometer existence, 378 observations were made. During that time, the average number of changing variables within a week was slightly above 3, ranging from 1 to

6 and attaining extreme values rarely. One change a week was noted only nine times and six changes only four times. The average change in value of the barometer equalled to more or less 0.62 of a point, with 3.28 being the highest weekly increase (4th of January 2002) and 3.5 points being the highest weekly decrease (14th February 2001). The spread, which is the difference between highest and lowest historical value was equal to 37.9 points.

Graph 3.1 shows the values of the barometer between January 2001 and end of March 2008 with significant points marked. The first point shows the value of barometer in week ending 5th of Jan 2001 (999 points). Lowest values occurred on 21st and 28th of Dec 2001. On 13th of June 2003 the barometer reached the neutral value of 1000 points for the first time in history. The highest value observation occurred on 28th of March 2008 (1026,4 points).

Graph 3.1 Values of weekly barometer between January 2001 and March 2008



Source: GIME.

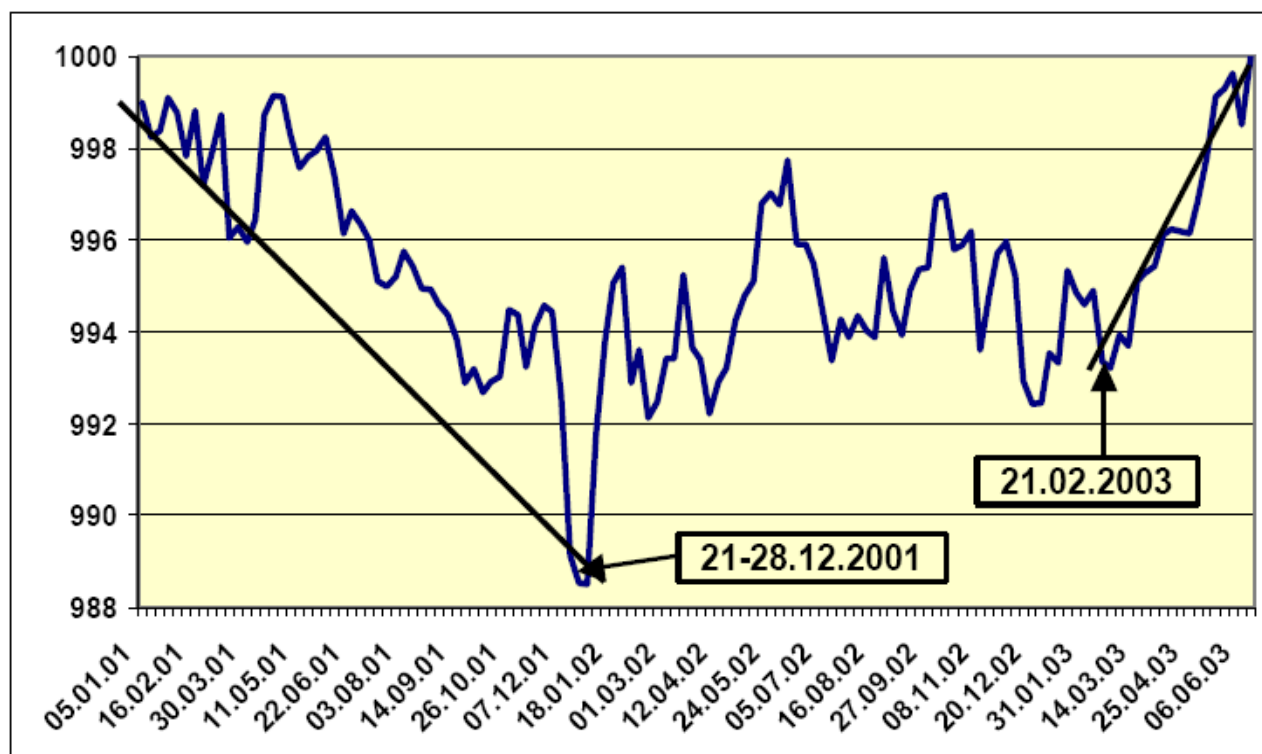
Analysis of the results demonstrates convergence with actual observed tendencies in the Polish economy. At the beginning of 2001 the weekly barometer showed values slightly below the neutral value of 1000 points. In reality almost during the entire year of 2001 the economy was in a downturn, which is depicted by a negative – slope line shown in graph 3.2. These trends seem to be quite clear if one looks at the dynamic GDP growth rate at that time. However autumn turned out to be even more pessimistic than the rest of the year. This was caused by worsening economic situation of the country as well as weakening of GDP dynamics. By the end of the year the overall economic situation has been adversely affected by the September 11th terrorist attacks and unfavourable developments in Poland, such as budgetary deficit and introduction of capital gains tax.

The year 2002 has seen more optimistic attitude because of expectations for rapid development of the economy. However these were sustained only till the summer. The economic data were confusing. On one hand there was encouraging information regarding foreign trade balance and low inflation but on the other hand there was a lot of disappointment with the GDP growth rate, industrial

output growth, investment ratio and internal demand⁵. Therefore the graph for the year 2002 was fluctuating a lot so one cannot establish a proper trend.

Since the second half of February 2003 signs of economic improvement were becoming more vivid, which is shown by a positive – slope line in graph 3.2. The value of weekly barometer was growing together as new favourable economic data were being published. For the first time in history the barometer reached 1000 points which indicated end of stagnation and improvement of overall economic situation.

Graph 3.2 Values of the weekly barometer January 2001 – June 2003



Source: GIME.

Constant growth of value of the weekly barometer lasted for more than a year, ending in mid – April 2004. The GDP growth rate was changing in every quarter of that period of time – it was 2.3 percent in the first quarter of 2003 and 7 percent in the same quarter of 2004. The only major deviation from the trend happened in October and November of 2003 which was a result of growing uncertainty for future developments coupled with short and medium – term fiscal policy of the government as well as resulting perturbations in the currency and stock markets. This uncertainty was amplified by discussions regarding the prospects for the future macroeconomic development after joining the European Union and possible downturn which may have happened after the accession.

Last months of 2003 and beginning of 2004 have seen the previous growth trend of the weekly barometer come back and in April 2004 reach its highest value at this period. This was supported by positive signs of economic development and favourable perspectives for the future. After reaching the peak, just before accession to the EU, value of the barometer began to fall. The highest falls occurred until mid – May when a new negative trend was established and lasted nearly till the end of the year.

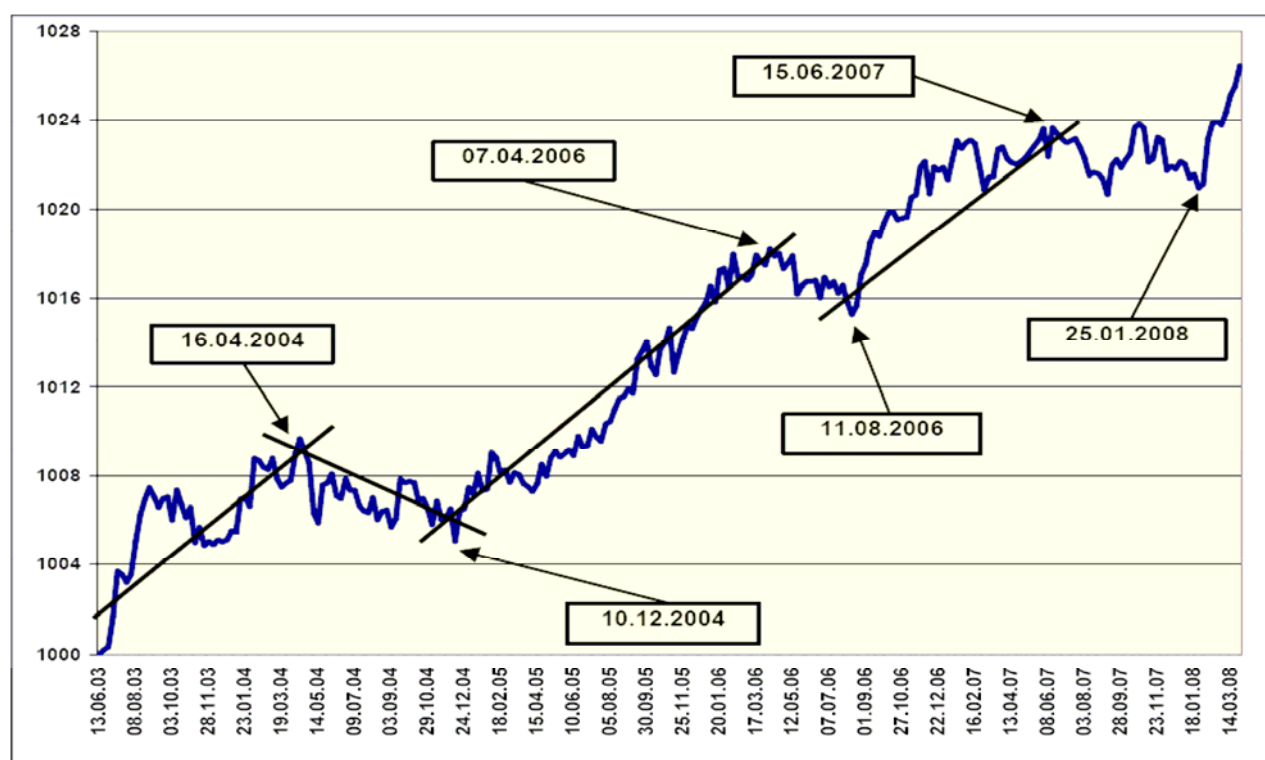
⁵ Fundowicz, Wyznikiewicz (2003), Tygodniowy barometr koniunktury, *Ekonomika i Organizacja Przedsiębiorstwa*, No. 4 (639), p.35.

This downturn was a reaction to previous rapid growth caused by EU accession and the so called “accession bubble”. In the economy this was reflected by growing inventories caused by fear of changing regulation and growing prices. Analysis of statistical data shows that overall economic activity in Poland right after the EU accession fell. Value of the barometer began to fall as early as two weeks before the accession but it is unclear whether this was caused by prognostic characteristics of the indicator or because of an actual downturn in the business cycle.

A real improvement happened in mid – December 2004. Since mid – 2005 till the beginning of April 2006 a series of all – time high’s were recorded. It is worth mentioning that within this period of time the economic development significantly accelerated.

Another downturn happened in April 2006, which was coupled with significant changes in politics. A party seen as highly populist joined a coalition to form the government, which caused a lot of disappointment and distress among consumers and investors. Even though it didn’t really influence the overall macroeconomic situation of the country it did affect value of the barometer in the short run. In August 2006 a growing trend was established again and lasted until mid – 2007. New changes in the government – elections in November 2007, which brought new political parties to rule – caused a minor slowdown that lasted only till the early 2008. It is worth mentioning that growing value of the barometer (since mid – 2006) reflected the growth of the economy, which exceeded 6 percent.

Graph 3.3 Values of the weekly barometer June 2003 – March 2008



Source: GIME.

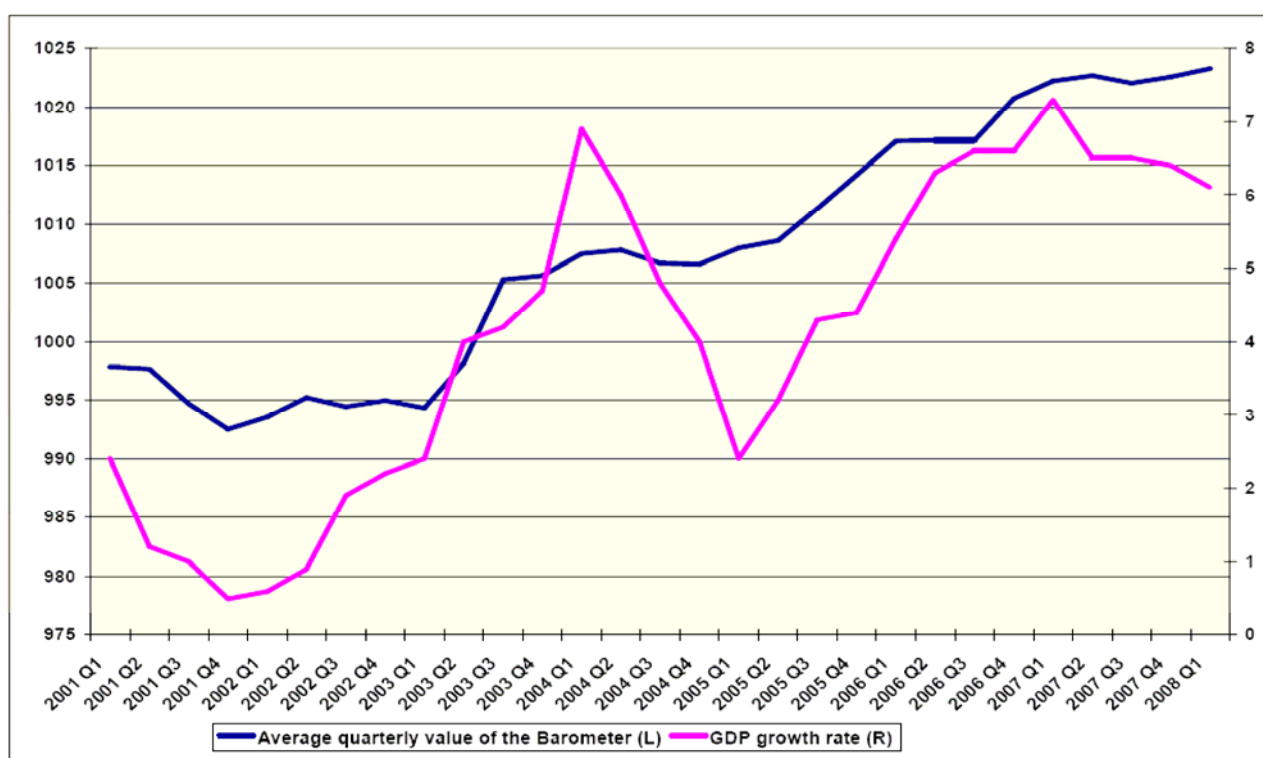
Empirical verification of the ability of the weekly barometer to reflect changes in actual business conditions requires confronting its values with official statistical data. However, since these are usually published monthly or quarterly it was necessary to adapt the barometer data to fit this convention. For this purpose a series of quarterly and monthly averages of the barometer’s values was calculated.

A comparison of average quarterly values of the barometer with quarterly GDP growth rate with regard to the same period of previous year shows that in both cases the direction of changes is similar. An impairment of the GDP growth rate is often accompanied by a fall in average value of weekly barometer. During the 29 quarters of the study such relationship occurred 21 times. However, it seems very interesting to examine one case when this didn't happen.

In the second quarter of 2004 the GDP growth rate slowed down while the value of the weekly barometer increased. This can be explained by an institutional disruption caused by accession to the European Union (the aforementioned "accession bubble"), which adversely affected the time series of the weekly barometer. High economic activity which took place just before EU accession contributed towards increased value of the weekly barometer which consequently increased the value of the quarterly average. Since the beginning of April, as the barometer indicated, the economic activity slowed down. Nevertheless, the fall was too little in comparison with previous increase to compensate for the "accession effect".

It is also worth mentioning that when comparing average values of the barometer with rate of GDP growth rate it is important to consider the direction of changes rather than their intensity. This is shown on graph 3.4, especially with regard to the period of time between mid – 2004 and third quarter of 2005. Even though the directions of changes remained pretty much identical (with an exception of first quarter of 2005), the changes of GDP growth rate were significantly higher than those of the weekly barometer.

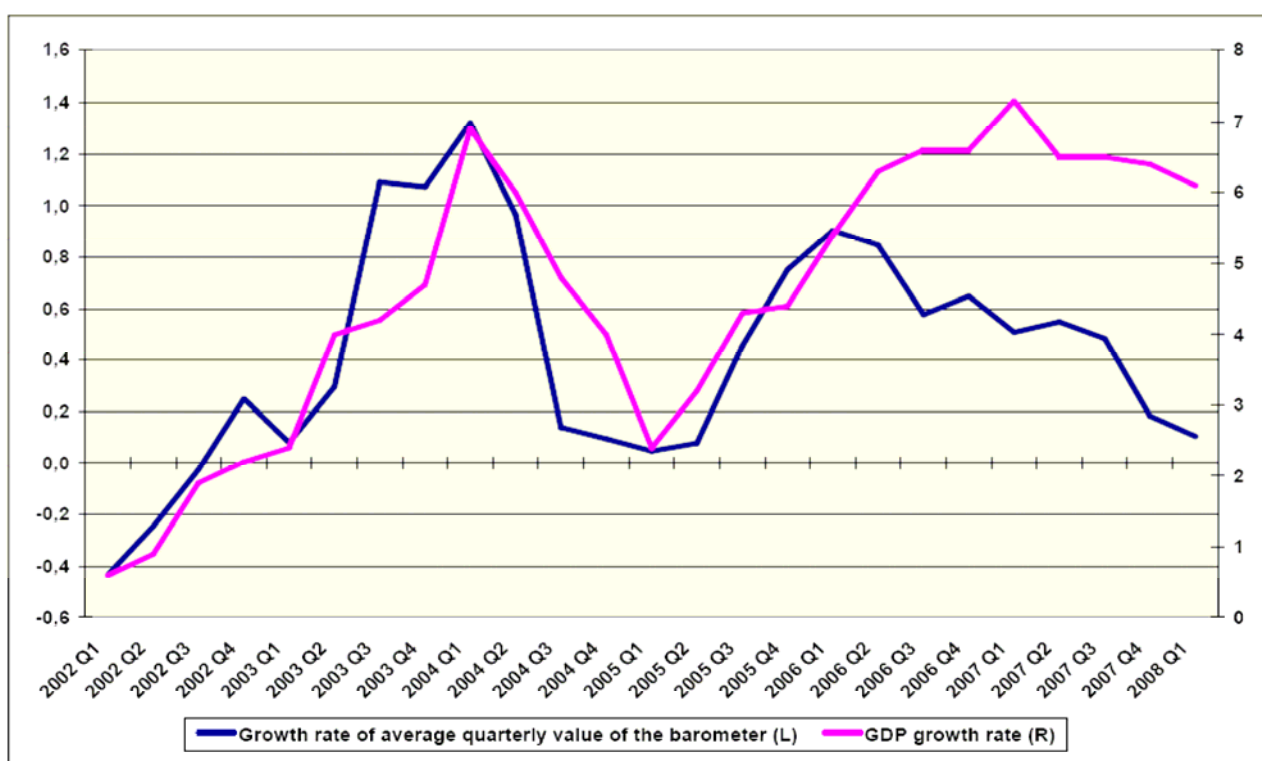
Graph 3.4 Average quarterly values of the weekly barometer and GDP growth rate with respect to the same period of previous year (January 2001 – March 2008)



Source: GIME, Central Statistical Office.

Consecutive phase of verification of usefulness of the weekly barometer was comparing rates of changes in average quarterly values of the barometer with rates of change of GDP. Results of such comparison are illustrated on graph 3.5. Both data sets turned out to be similar – the correlation coefficient calculated for time period of between January 2002 and March 2008 (i.e. 25 quarterly observations) was equal to nearly 0.66. It needs to be mentioned that both variables are in different scales simply because the rate of change of GDP has a much wider fluctuation range than the rate of change of values of the barometer. This means that a relatively high increase in GDP is reflected by a relatively small percentage change in value of the barometer.

Graph 3.5. Growth rate of average quarterly values of the weekly barometer and GDP growth rate with respect to the same period of previous year (January 2001 – March 2008)



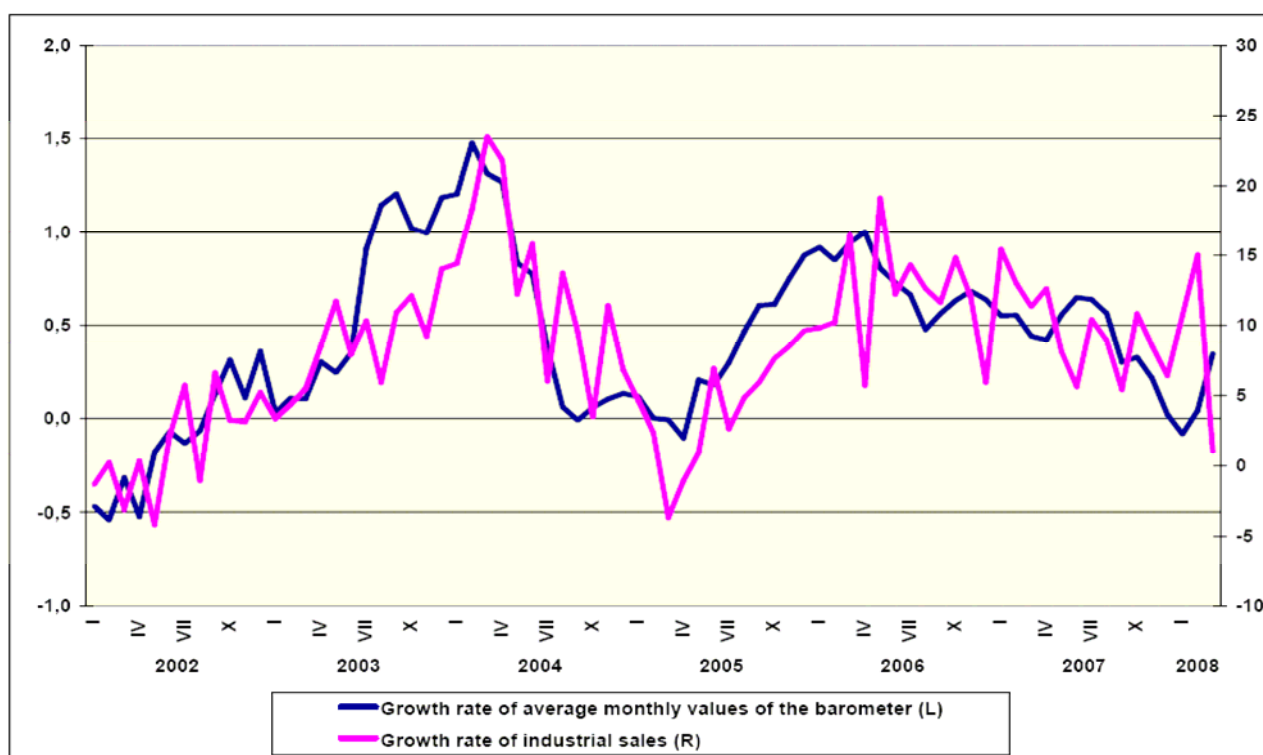
Source: GIME, Central Statistical Office.

The abovementioned relationships between the characteristics of the weekly barometer and GDP growth rate may have a prognostic use. Firstly, they allow to establish the direction of economy's growth rate, and secondly – the approximate value of this change. The biggest obstacle for predictive qualities of the barometer is its short time horizon. Data concerning quarterly dynamics of GDP is being published by the Central Statistical Office with 60 – day delay counting from the last day of a quarter. Calculation of the final value of the indicator is possible only when a calendar quarter ends. Approximate values of the average, which get more and more accurate as the end of period nears, can be published even a few weeks before the quarter ends. The prognostic advance of the barometer equals to only a few weeks and its predictive value results from natural delays in official data being published⁶.

⁶ Fundowicz, Wyznikiewicz (2003), Tygodniowy barometr koniunktury, op. cit., p. 37.

A similar method to the one mentioned above was applied to the process of comparison of dynamics of changes in monthly values of the barometer with dynamics of changes in industrial sales. For this purpose an unadjusted seasonally data set for industrial sales published by Central Statistical Office was used (constant prices for 2000). Both data sets (industrial sales and average monthly barometer values) were calculated with respect to values of the same period of previous years. The results are shown in graph 3.6.

Graph 3.6 Growth rates of average monthly values of the barometer and industrial sales with respect to values of the same period of previous years (January 2002 – March 2008)



Source: GIME, Central Statistical Office.

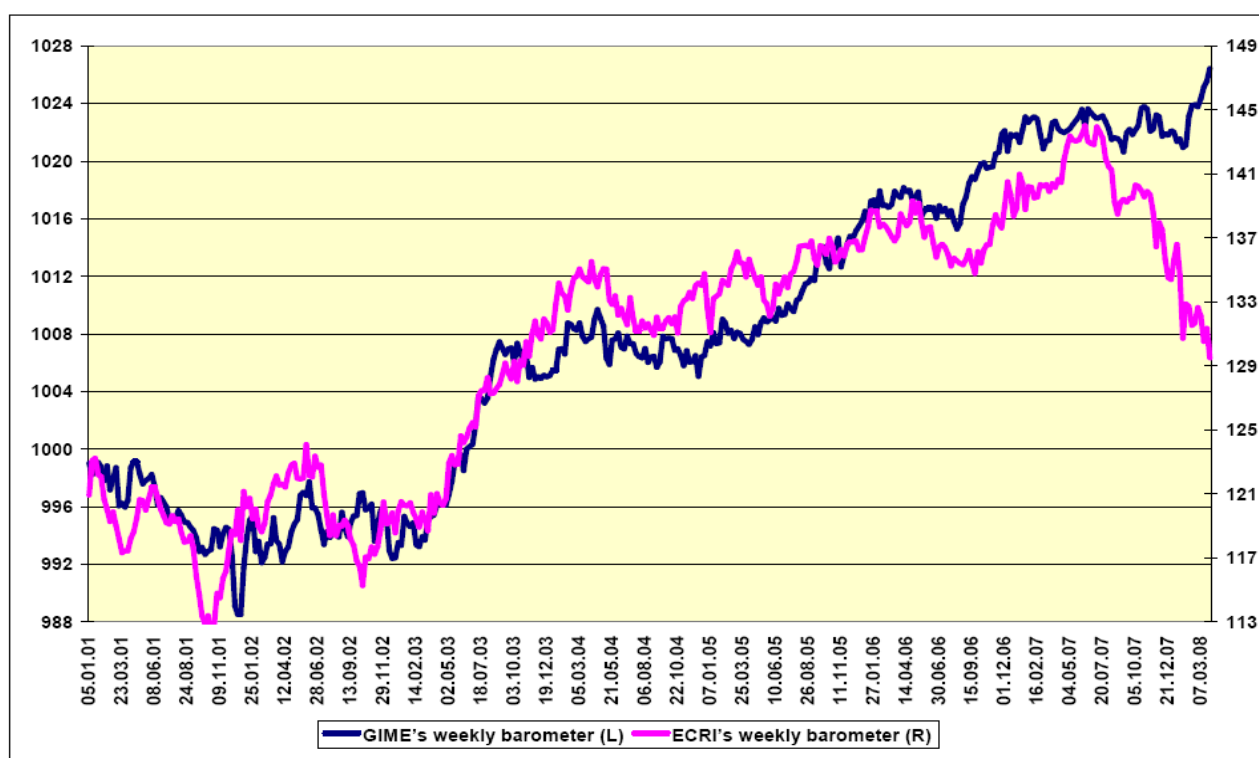
Correlation coefficient between these two variables is quite high and equalled, for time period of between January 2002 and March 2008 (75 monthly observations), 0.70. Variables are in separate scales because the fluctuation range of industrial sales is much wider than the one of the growth rates of monthly averages of weekly barometer. Similarly to the case when barometer was compared to GDP growth rates, a relatively high increase in industrial sales is reflected by a relatively small percentage change in value of the barometer. Furthermore, the predictive value of the barometer is limited to a short time horizon and results mostly from a natural delays in official data being published.

Another interesting characteristics of the GIME's weekly barometer is its high results comparability with the barometer devised by the Economic Cycle Research Institute (ECRI) of New York for the American economy. The values of the US Weekly Leading Index (USWLI) have been calculated since January 1967, and similarly to GIME's barometer, are a result of aggregation of few components. The USWLI is based on seven variables: money supply, interest rates, price index for industrial goods, stock market indexes, number of unemployment benefits applied for, number of mortgages applied for, and a market valuation of the difference between profitability of government

and corporate bonds. Thus some of the variables used to calculate the GIME's weekly barometer are similar to those used by its American counterpart.

Graph 3.7 shows a set of values of ECRI's weekly barometer for the US together with the values of GIME's weekly barometer. The two sets are very similar. Correlation coefficient calculated for these two variables for time period between January 2001 and March 2008 equaled 0.92. One can notice that in the first quarter of 2008 there was a slight divergence of values of the two variables. This indicates that economic situation in Poland with respect to America improved. Sub-prime rate crisis pushed down economic growth in the United States, while positive effects of the European integration is pushing up the growth pace in Poland.

Graph 3.7. Values of the GIME's weekly barometer and ECRI's US WLI (January 2001 – March 2008)



Source: GIME, ECRI.

Studies carried out in the Economic Cycle Research Institute show that their indicator reflects accurately changes in the American business cycle. Its leading characteristics mean that for upper turning points in the business cycle the lead is equal to more or less ten months and for lower turning points – around three months⁷. One can claim that business cycle fluctuations in Poland and in the US are to some extent synchronised, since GIME's weekly barometer accurately reflects changes in Polish business cycle. However, the fluctuations in Polish economy would be delayed by three to ten months with respect to those in US economy.

Thesis that changes in American and Polish business cycles are synchronised requires additional empirical confirmation for which a basis already exists. The US economy is the biggest and in globalised world still remains the most important economy. Therefore, the American economy can

⁷ <http://www.businesscycle.com>

generate “initial” business cycle impulses, which would have an effect on countries all over the world, including those of the EU. High degree of dependence of Polish economy on global markets accelerates its rate of growth but at the same time makes it more vulnerable to sudden changes. Thus, the “business cycle impulses” can reach Poland directly from the US as well as through countries which have strong trade bonds with America. Other significant channel for transferring such impulses are financial markets⁸.

4. Conclusions

Research on the business cycle using the weekly business cycle barometer have been carried out in Gdansk Institute for Market Economics since 2002. Despite a relatively short period of time which they encompass, the obtained results seem to be in line with the actual developments in the economy. Firstly, observation of medium – term trends, which can be established from fluctuations of the barometer, allowed to pinpoint the most influential events in the Polish economy. Secondly, high correlation between rates of change of GDP and industrial sales and values of the weekly barometer has been proved. This relationship may carry some prognostic value but is limited to a short time horizon. Finally, high similarity of values of GIME’s weekly barometer and ECRI’s US Weekly Leading Index may suggest that a tight link between changes in US and Polish economies or global economy exists. However, to prove this thesis some additional experiments supported by empirical studies would need to be carried out.

Methodology of calculating the weekly barometer allows taking into account both supply and demand side of the economy. An advantage of this method is that its components may be modified and new weights assigned in order to reflect more accurately any structural changes in the economy as well as appearance or disappearance of some specific factors influencing business cycle in Poland. For the data set encompassing the first 29 quarters of the study this was never necessary.

⁸ Fundowicz, Wyznikiewicz (2002), Wplyw zewnetrznych cykli koniunkturalnych na polska gospodarke, Prace i Materialy Instytutu Rozwoju Gospodarczego SGH, No. 72, p. 259 – 260.

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