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## **Ex-post Assessment of Crisis Prediction Ability of Business Cycle Indicators**

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### **Abstract**

The paper examines prediction features of several business cycles indicators before and during the global financial and economic crisis of 2008 and 2009. In the light of business cycles prediction tools the crisis turned out to be an unexpected event. Both appearance of economic crisis and its deepness were not expected. The crisis had several stages of rapid development covering consecutive segments of economies with a domino effect.

Authors of the paper try to identify factors responsible for prediction failure. They investigate whether relatively short time of prediction period typical for majority of business cycles leading indicators is a sufficient explanation of inability to warn on coming crisis. The role of medium- term tools is also reviewed.

Paper is based on empirical data analysis for Poland, selected EU countries (Germany, France, United Kingdom) and USA. Quarterly GDP growth rates represent the crisis developments. A range of business cycle indicators varies from popular measures such as business condition tests and barometers to stock exchange indices.

In one section of the paper the issue of stock market indices as a leading indicator of business cycles turning points is discussed. Stock market indices are commonly classified as procyclical macroeconomic variables. Aggregated share prices are considered as leading indicators of macroeconomic condition. The comparison of stock exchange indices fluctuations and GDP indicators shows that they have not failed in their predictions of the crisis as compared with other indicators.

**Key Words:** Economic fluctuations, Business tendency surveys, Stock exchange, Financial Markets and the Macroeconomics.

**JEL Classification:** E32, E44

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## 1. Introduction

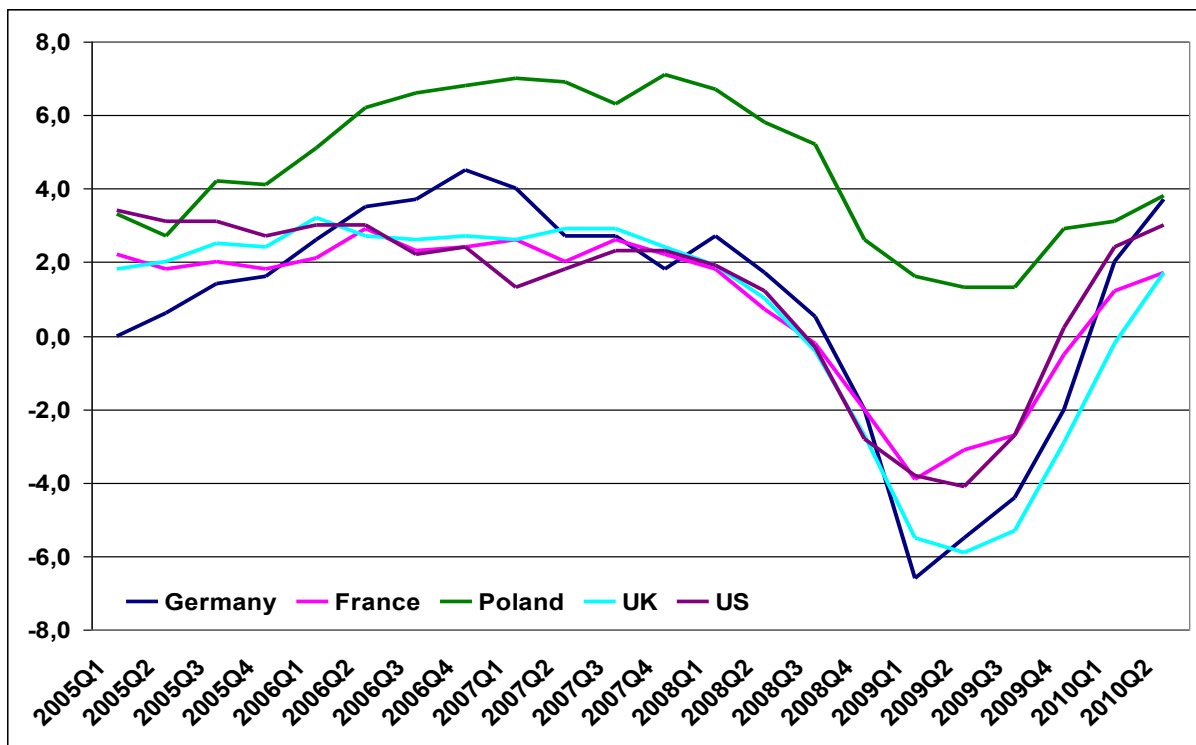
Global financial and economic crisis of 2008/2009 has not been foreseen with satisfactory ex ante by numerous centers and economists involved in forecasting macroeconomic growth in global economy and major world economies. In other words, the crisis (and its deepness) was in fact a surprise not only for public opinion, governments, markets, international organizations but also for practically all forecasters.

The main purpose and benefit from business cycles surveys is providing observers of economic development with information on future direction of macroeconomic development. Less attention is paid on precise projections of growth rates. The real challenge is foreseeing turning points in business cycles. Delivery of ex ante information on turning points should not be too late, however, existing tools of analysis do not guarantee early information satisfactory to public opinion and other interested subjects. The origin of problems with timely information on turning points is difficulty with distinction between slowdowns in economic activity that would evolve to recessions and that would not.

The nature of various tools of business cycles measurement and forecasting implies time distance between delivery of information on a turning point and the turning point. Such time distance should last from one quarter in case of short term forecasting tools to two quarters in the case of long term tools. Time distance of medium term tools should last between one and two quarters.

The course of 2008/2009 recession demonstrated astonishing coordination between the United States and major European Union economies. Even in Poland, the only EU country that avoided recession in 2009, shape of GDP growth rate curve in 2009 – 2010 behaved the same way as in countries experiencing recession. This illustrates very strong coordination of business cycles in world economy.

**Figure 1. Growth rates of GDP in: Germany, France, Poland, United Kingdom and USA, 2005 q1 – 2010 q2**



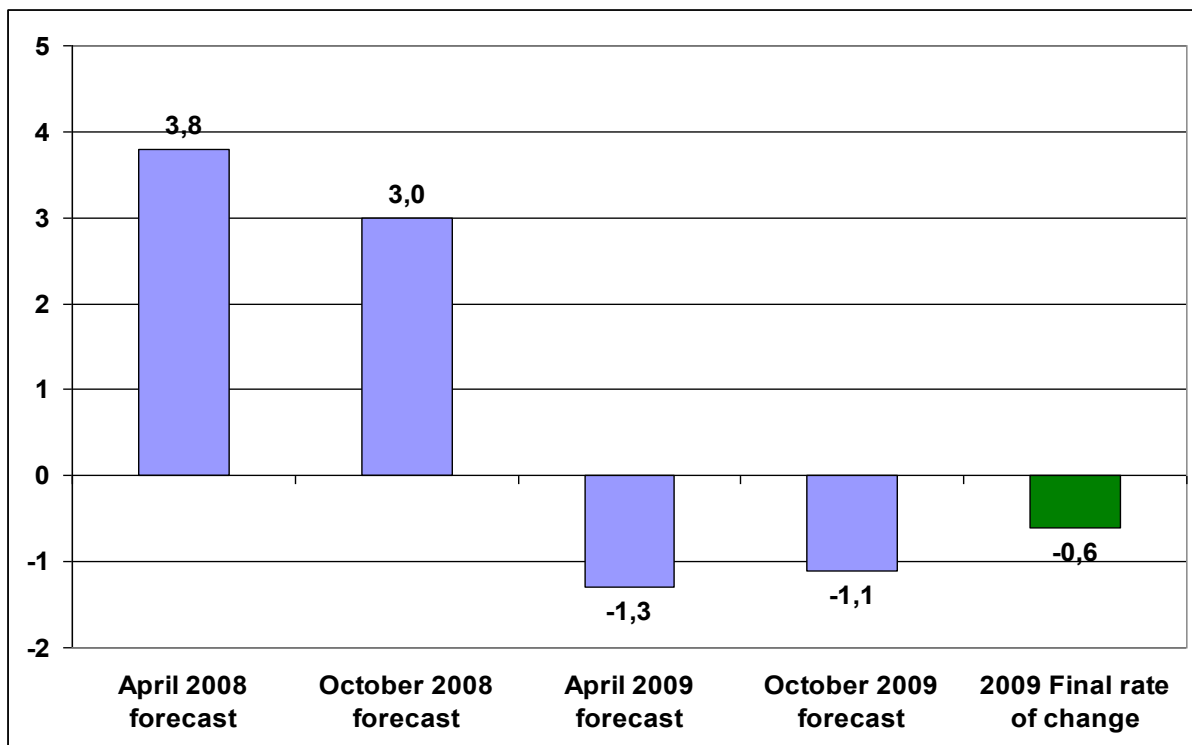
Source: Eurostat.

## 2. Medium- and long-term

Forecasts of 2009 published by the International Monetary Fund can be used as example of too late warning of coming crisis.

According to IMF global GDP fell by -0,6% in 2009, while growth rate for 2008 was estimated as 3%. One has to remember that world economy grew at average 4% between 2001 and 2008. In 2008 (Figure 2.) IMF projections for 2009 did not show a possibility of economic slowdown. Quite opposite, the expectations were optimistic and even better than 2008 growth: 3,8% in April and 3% in October, according do main semi-annual World Economic Outlooks of IMF. Between October 2008 and April 2009 projection was revised down to -1,3%.

**Figure 2. Consecutive IMF forecast of 2009 global GDP**



Source: World Economic Outlook.

Similarly important change of projections for the year 2009 had place in the case of the US economy. IMF expected growth of American GDP at 0,6% and 0,3% in two 2008 semi-annual reports. In 2009 the deepness of the crisis was forecasted correctly both in April (-2,8%) and in October (-2,7%) with the final estimate -2,6%. IMF's projections for euro area and major European economies (Germany, France and United Kingdom) were rather optimistic in 2008 reports, while in 2009 reports they were closer to reality and demonstrated natural (for forecasts) dispersion around final estimate.

Explanations of delayed information provided by forecasters on coming recession in the case of annual global GDP lays in several factors.

First of them is connected with the fact, that majority of demand for forecasts is constrained to short term (up to one year ahead), less attention is paid to medium term (two to four years), while interest for long term forecasts is less significant. Such situation leads to better development of short and medium term prediction tools, more precisely models, while tools for long term forecasting are relatively less developed. On the other hand, the shorter the period of a forecast the more precise prediction. Experience shows that long term macroeconomic forecasts

should not be treated as precise projections, but rather as scenarios of future developments depending mostly on model assumptions. For this reason many long term forecasts contain pessimistic, base and optimistic scenarios.

The best known and the most popular forecasts tools concentrate on short term. Business condition tests and business cycles barometers have prediction horizon not longer than three to six months. Methods based on national accounting models and systems of accounts more often are applied to quarterly than annual data and are used for medium term projections. Long term forecast are in majority generated by econometric model.

Another factor of forecasts' weak ability to foresee of turning points is long duration of good and very good macroeconomic situation. As shown in table 1. average duration of the US business cycles was longer in the second half of the twenty century than in previous periods. Average duration of full business cycle measured by number of months between consecutive troughs was 20 months longer between 1945 and 2009 than between 1919 and 1945. For this reason "historical memory" of models parameters were biased towards relatively long business cycles with relatively mild and short recessions. As we know it now, 2008/2009 recession occurred earlier than expected (from the point of view of duration of cycles) and was longer than her two predecessors.

**Table 1. Duration of US business cycles, selected periods**

Business cycles reference dates		Duration in months			
Peak	Trough	Contraction	Expansion	Cycle	
		Peak to trough	Previous peak to this trough	Trough from previous trough	Peak from previous peak
July 1990	March 1991	8	92	100	108
March 2001	November 2001	8	120	128	128
December 2007	June 2009	18	73	91	81
Average, all cycles					
1854-1919 (16 cycles)		22	27	48	49
1919-1945 (6 cycles)		18	35	53	53
1945-2009 (11 cycles)		11	59	73	66

Source: NBER.

Turning points in business cycles are difficult to identify. The reason for this difficulty are irregular slowdowns in economic growth that may or may not evolved toward recessions. Taking into account relatively short period of time from the trough of the previous recession (March 2001 in the US), forecasters' approach to classify slowdowns as new recessions was full of caution. Majority of slowdowns are false signals of potential recessions.

With relatively stable development path of global economy and in majority of countries, interest of forecasters focused more on other variables than rate of economic growth. More effort and attention was put on variables and phenomena like structural change, competitiveness or productivity. Interest in various phenomena other than economic growth was also a result of fast changes like IT revolution, globalization, growing importance in world economy of emerging markets, especially BRIC countries, growing level of international competition and more complicated economic relations observed in global markets. Another phenomenon not fully investigated and explained by economic theory is interconnection between financial markets and real economy. In this aspect the role of turbulences on financial markets in influencing confusions

in real economy and generating disturbances in the course of business cycles should be searched.

Forecasters tend to stay with their projections in line with other forecasters. This is especially true in predicting general course of economic development. Individual projections rarely differ dramatically from projections of other forecasters. So called consensus forecasts which normally are either averages or medians of many forecasting centers often show general direction of development.

### 3. Short term

Stock exchange indices are aggregated measures of transactions and processes taking place on stock exchanges. Their role in contemporary market economies is, however, much more complex. Broader context and long term perspective allows for observation that stock exchange indices are considered as indicators of business cycles development. Stock exchange indices are often treated as procyclical macroeconomic variables with the function of leading indicators for the real sphere of the national economy.

Empirical verification of the hypothesis on interconnections between macroeconomic and stock exchange cycles requires methodology, which should allow for matching macroeconomic time series with stock exchange data. In the methodology proposed in the paper macroeconomic developments are represented by GDP data and stock exchange fluctuations are represented by quotations of stock exchange indices.

Research procedure applied in the paper matches GDP and stock exchange data to a convention of GDP data availability. In other words, for stock exchange indices average quarterly levels were calculated. Calculations covered closing values of each trade day. Next, growth rates of quarterly averages related to analogous quarters of previous years were calculated. The growth rates of average indices were compared to growth rates of GDP. Growth rates of stock exchange indices are higher than GDP growth rates, however, statistical procedures make analysis possible.

The survey covers United States, United Kingdom, Germany, France and Poland. Comparable GDP data from Internet data banks of Eurostat<sup>1</sup>, was used. Some data (US, Poland) was collected from national statistical offices. Time series of stock exchange indices are from Internet portals for investors<sup>2</sup>. The survey covers a period 1996 q1 – 2010 q2 (58 quarters).

Relationship between GDP and stock exchange fluctuations is shown on figure 3. The course of both series is convergent. Correlation coefficient between both series between first quarter of 1996 to the second quarter of 2010 varies from 0.47 (for UK) up to 0.73 (for France). A hypothesis on strong relationship between fluctuations of economic and stock exchange cycles may be confirmed in the surveyed countries.

The second element of empirical analysis was attempt of verification of a widely held opinion that stock exchange indices are in reality leading indicators for macroeconomic business cycles. Correlation coefficients between GDP time series and lagging, coincident and leading values of average stock exchange indices for each country were calculated. The results are presented in table 2.

The message from table 2. is clear: stock exchange indices can play a role as a one quarter leading indicator for business cycles in surveyed countries. Average correlation coefficient between one quarter lagged values of average stock exchange indices and GDP indices are higher than coincident. It has to be stressed that most of the lower turning points of visible quasi-cycles, quarterly changes of average indices turned out to be leading indicators for the GDP. For

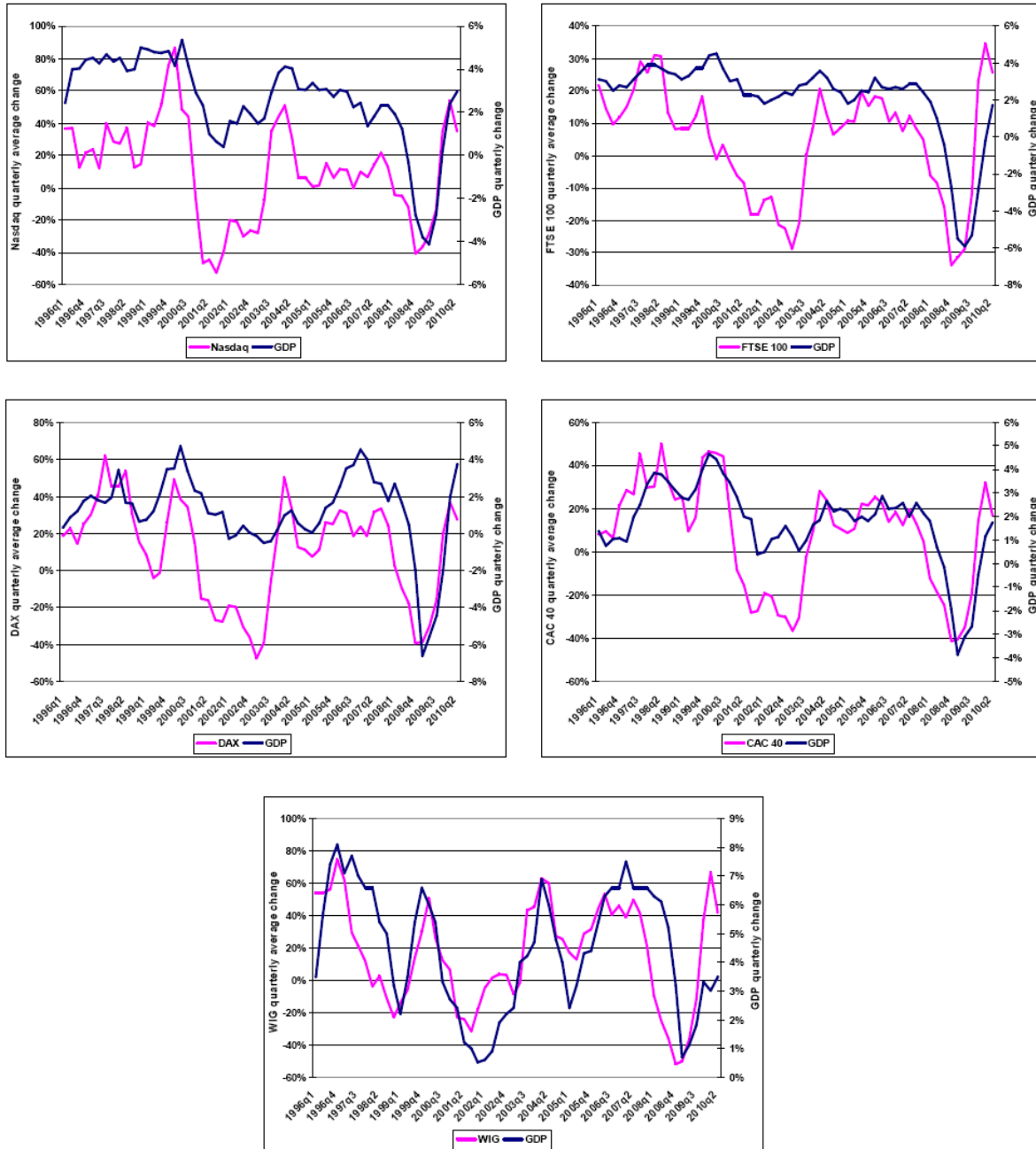
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<sup>1</sup> ([http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database))

<sup>2</sup> (<http://finance.yahoo.com>), (<http://www.money.pl>), (<http://www.parkiet.com.pl>)

upper turning points changes in stock indices were either coincident indicators or lagged indicator for GDP.

**Figure 3. Relation between GDP growth and stock exchange indices in: USA (NASDAQ), United Kingdom (FTSE 100), Germany (DAX), France (CAC 40) and Poland (WIG), 1996-2010**



Source: Authors' calculations based on Eurostat, OECD and stock markets' data.

**Table 2. Correlation coefficients between lagging and leading average quarterly stock exchange indices levels and GDP growth rates**

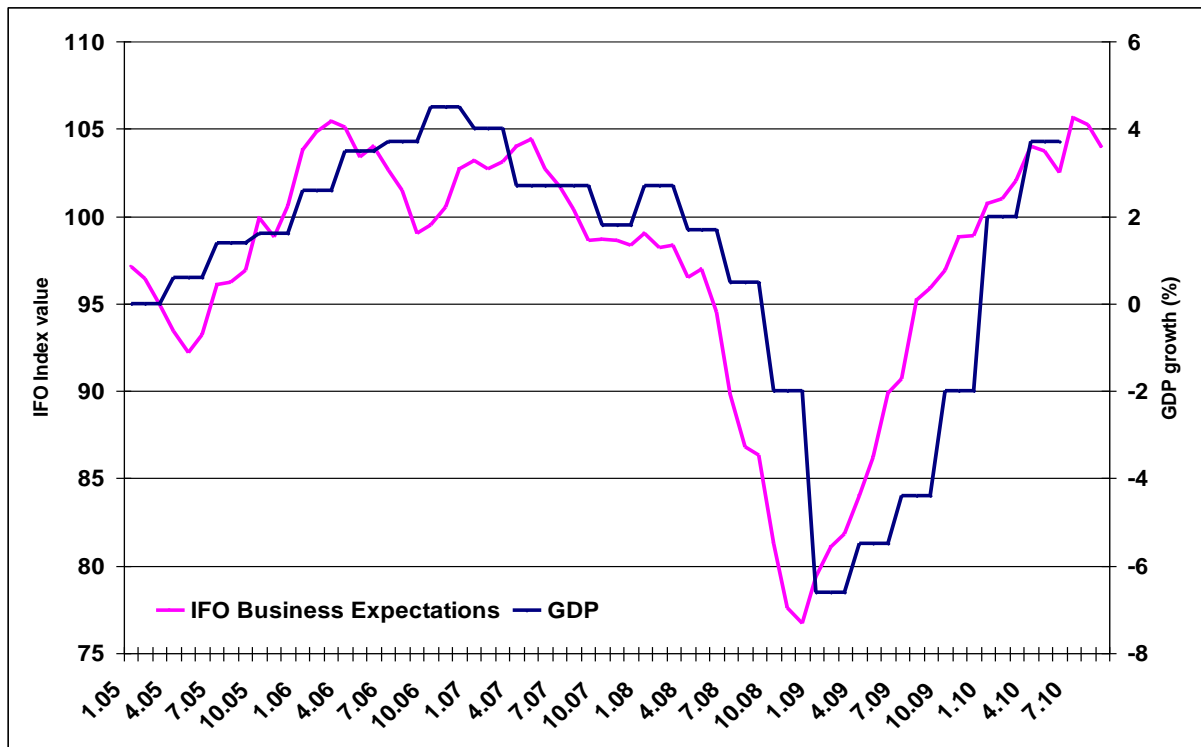
	Leads			0	Lags		
	+3	+2	+1		-1	-2	-3
<b>USA</b>	0,47	0,65	<b>0,72</b>	0,68	0,52	0,30	0,15
<b>UK</b>	0,51	<b>0,61</b>	<b>0,59</b>	0,47	0,27	0,05	-0,11
<b>Germany</b>	0,44	0,61	<b>0,68</b>	0,60	0,42	0,18	-0,05
<b>France</b>	0,67	0,77	<b>0,81</b>	0,73	0,55	0,32	0,11
<b>Poland</b>	0,62	<b>0,72</b>	<b>0,71</b>	0,61	0,42	0,13	-0,16
<b>Average</b>	0,54	0,67	<b>0,70</b>	0,62	0,44	0,20	-0,01
<b>Median</b>	0,53	0,66	<b>0,71</b>	0,61	0,43	0,19	-0,03

The highest correlation coefficients are printed in bold.

Source: Authors' calculations based on Eurostat, OECD and stock markets' data.

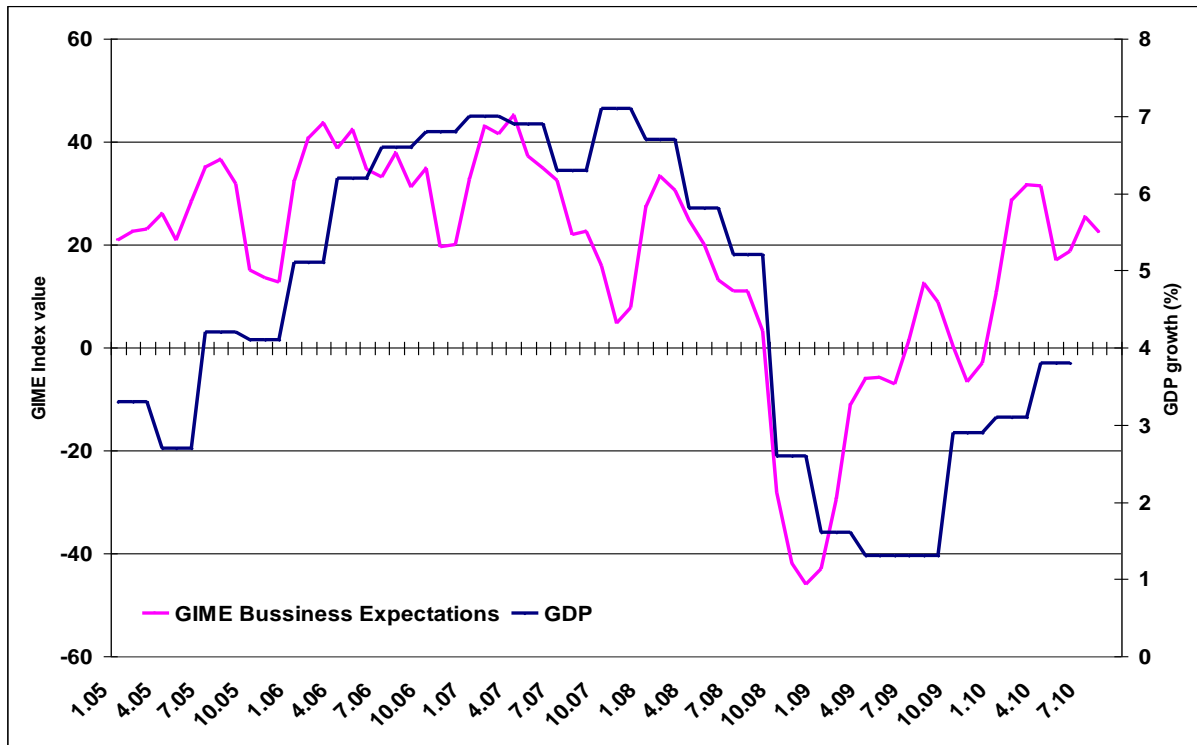
Two examples of business condition tests for Germany and Poland (two neighborhood countries) support the opinion that short term tools provide warnings on slowdowns and recessions. In both countries results of surveys in due time anticipated oncoming slowdown in economic activity. In Germany signals of oncoming recession (sharp and continuous move down of a curve Ifo Business Expectations) started in May 2008. In Poland GIME Business Expectations curve started to go down in the same time.

**Figure 4. Ifo Business Expectations Index (2000=100) and GDP growth rates (%) in Germany, 2005 m1 – 2010 m9**



Source: Ifo.

**Figure 5. GIME Business Expectations values and GDP growth rates (%) in Poland, 2005 m1 – 2010 m8**



Source: GIME.

This and other examples of business expectations surveys show that this method gives more accurate signals of lower turning points than signals of upper turning points. In both countries signals of recovery appeared at the same time, in September 2009. One explanation of such well coordinated business expectation is that 25 percent of Polish exports go to Germany.

The last two observations suggest that early warnings on turning points in business cycles can be derived from analysis of business condition surveys of several economies. If business expectations are similar in two or three countries the probability of oncoming turn in business cycle is much probable.

Analysis of prediction ability of business cycle barometers is difficult for two reasons. First is that leading indicators, by definition, have short term (up to one quarter) prediction abilities. Second reason is that several barometers adjust their historical course to ex-post available data. With such adjusted data assessment of prediction ability is hardly possible.

#### 4. Conclusion

The ex-post survey of assessment of crisis prediction ability demonstrate that 2008/2009 crisis had been predicted up to six months before it occurred. Business cycles surveys have prediction ability similar to econometric models. Stock exchange indices could be considered as efficient tools of leading indicator of oncoming recessions.

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