

How has the last financial crisis changed the business cycle in Poland

– spectral analysis conclusions.

Marta Skrzypczyńska¹

Summary

The analysis concerns the influence of the last financial crisis on the Polish business cycle. On the basis of the cyclical component extracted from the unobserved components model, the spectrum and cross-spectral measures were calculated twofold: on the whole sample and excluding the period of the last financial crisis that began in the second half of 2008, called further the crisis. The shorter sample refers to the period 1995-2007. Such a dichotomy allows to describe the influence of the crisis on the cyclical fluctuations among different sectors of the economy.

The database included logarithms of quarterly time series: gross value added, construction, transportation and storage, trade and repair of motor vehicles and monthly indicators: sold production of industry, manufacturing, durable consumer goods, non-durable consumer goods, capital goods, intermediate goods, energy and production of electric power. The quarterly data ranged from the first quarter of 1995 to the fourth quarter of 2011, except for transportation and storage, trade and repair of motor vehicles – the last observation was the third quarter of 2011. The sample of monthly data included the period from January 1995 to January 2012. The cycles of gross value added and industrial production were the reference series to the cycles of other economic activity indicators, quarterly and monthly respectively.

Polish business cycle fluctuations are determined by the longest cycles. The biggest changes in the spectral density after the crisis can be seen especially in the lower frequencies. The spectrum changed the most in construction, then trade, transportation and gross value added. As far as the monthly economic activity indicators are concerned, the greatest revision after the crisis relates to capital and intermediate goods, the moderate to durable and non-durable goods, industry and manufacturing, production of electric power and energy.

In construction the similarity of cycles to gross value added fluctuations measured by the coherence is strong, moderate in trade and statistically insignificant at the 0.05 level in

¹ PZU Group and Warsaw School of Economics

transportation - before the crisis it was significant, but still weak for lower frequency cycles. The correlation in reference to industrial production is very strong among all frequencies in manufacturing, then in the lowest frequency of capital and intermediate goods. In lower frequencies the medium correlation with reference to industry have durables and non-durables. Energy and production of electric power fluctuations have low, not always statistically significant and quite variable among various frequencies correlation with industry. After the crisis the relationship between all variables and industry weakened, except for longer cycles of energy, production of electric power and medium cycles of non-durables – the relation strengthened. Dynamic correlation coefficient is positive for all variables indicating their procyclicality and after the crisis the change in their relation with gross value added and industry was similar to revision indicated by coherence.

The gain describes the amplitude compared to its counterpart of reference series. Transportation fluctuates the most compared to gross value added. After the crisis the amplitude in construction in reference to gross value added increased. whereas the variation of trade stayed bigger compared to gross value added. In trade and construction the range of fluctuations before and after the crisis was alike. The amplitudes of all monthly economic indicators are higher compared to industry within the whole frequency domain with the exception of the production of electric power, where the fluctuations of the shortest cycles are lower. The average gain of trade, transportation, durables, non-durables, intermediate goods diminished indicating that the higher variability during the crisis was sustained. Pietrzak (2014) also confirms the intensified variation of economic activity in Poland during the crisis. On the other hand, the amplitudes in other sectors have decreased.

The phase shift allows to identify the leads and lags of the time series for a given frequency. This measure had the highest values for the lowest frequencies, which fluctuations in construction and trade are lagged in reference to gross value added. There were no significant changes for these sectors after the crisis. The substantial difference for these frequencies occurred in transportation – before the crisis the fluctuations were lagging in relation to gross value added. The fluctuations of manufacturing are coincident with industrial production. The longest cycles of non-durables, durables, intermediate goods and production of electric power are leading in relation to economic activity in industry, whereas the capital goods and energy are lagging. Cycles lasting less than 3 years are coincident compared to industry with the exception of non-durables and production of electric power. The slowdown of economic activity during the crisis induced mostly the intensification of phase shifts in

reference to industrial production for low frequencies of durable and capital goods. The average phase shifts indicate that the construction may be treated as a lagging indicator, whereas the activity in other sectors as coincident to fluctuations of reference series.

References

1. Bruzda J. (2011), Business cycle synchronization according to wavelets – the case of Poland and the euro zone member countries, *Bank i Kredyt*, Vol. 42, No. 3, 5-32.
2. Chagny O., Döpke J. (2001), Measures of the Output Gap in the Euro-Zone: An Empirical Assessment of Selected Methods, Kiel Working Papers, nr 1053.
3. Chatfield C. (1996), *The Analysis of Time Series: An Introduction*, Fifth Edition, Chapman & Hall, London.
4. Clark P. K. (1987), The Cyclical Component of U.S. Economic Activity, *The Quarterly Journal of Economics*, Vol. 102, No. 4, 797-814.
5. Croux C., Forni M., Reichlin L. (2001), A measure of comovement for economic variables: theory and empirics, *The Review of Economics and Statistics*, 83(2), 232-241.
6. Fidrmuc J., Korhonen I. (2010), The impact of the global financial crisis on business cycles in Asian emerging economies, *Journal of Asian Economics* Vol. 21, No. 3, 293-303.
7. Hallett A.H., Richter C. (2012), Has the financial crisis changed the business cycle characteristics of the GIPSI countries?, Working Paper. International Network for Economic Research, Bonn, Germany
8. Hamilton J. (1994), *Time series analysis*, Princeton University Press, Princeton, New Jersey.
9. Konopczak K., Marczewski M. (2011), Why so different from other CEECs – Poland's cyclical divergence from the euro area during the recent financial crisis, *Bank i Kredyt*, Vol. 42, No. 2, 7-30.
10. Koopman S. J., Shephard N., Doornik J. A. (1999), Statistical Algorithms for Models in State Space using SsfPack 2.2, *Econometrics Journal*, Vol. 2, No. 1, 107-160.
11. Nelson Ch. R. (1987), Spurious Trend and Cycle in the State Space Decomposition of a Time Series with a Unit Root, Technical Working Paper, No. 63, National Bureau of Economic Research.

12. Pietrzak M. (2014), Opis cykli koniunkturalnych w wybranych krajach Europy Środkowo-Wschodniej oraz ich synchronizacja ze strefą euro, *Bank i Kredyt*, Vol. 45, No. 2, 133-162.
13. Skrzypczyńska M. (2011), Pomiar cyklu koniunkturalnego – analiza porównawcza, *Bank i Kredyt*, Vol. 42, No. 4, 11-54.
14. Skrzypczyńska M. (2014), Cyclical Processes in the Polish Economy, *Central European Journal of Economic Modelling and Econometrics*, Vol. 6, No. 3, 153-192.
15. Skrzypczyński P. (2010), Metody spektralne w analizie cyklu koniunkturalnego, *Materiały i Studia*, Zeszyt nr 252, Narodowy Bank Polski.
16. Watson M. W. (1986), Univariate Detrending Methods with Stochastic Trends, *Journal of Monetary Economics*, Vol. 18, No. 1, 49-75.
17. Wyrobek, J. M., Stanczyk Z., Business Cycle Synchronization in Poland, The Euro Zone and New Member States of the European Union (March 25, 2012). Available at SSRN: <http://ssrn.com/abstract=2028639> or <http://dx.doi.org/10.2139/ssrn.2028639>