Decomposing time-frequency relationship between producer price and consumer price indices in Romania through wavelet analysis

Aviral Kumar Tiwari [a], Mihai Mutascu [b,c,*], Alin Marius Andries [d]

[a] Faculty of Management, ICFAI University Tripura, Kamalghat, Sadar, West Tripura, Pin-799210, India
[b] West University of Timisoara, Faculty of Economics and Business Administration, 16, J.H. Pestalozzi Street, 300115, Timisoara, Romania
[c] LEO (Laboratoire d'Economie d'Orléans) UMR7322, Faculté de Droit d'Economie et de Gestion, University of Orléans, Rue de Blois - B.P. 6739, 45067, Orléans, France
[d] Alexandru Ioan Cuza University of Iasi, Faculty of Economics and Business Administration, B-dul Carol 1 nr.22, Iasi, 700505, Romania

ABSTRACT

This study analyses Granger-causality between the return series of CPI and PPI (i.e., inflation measured by CPI and PPI) for Romania, by using monthly data covering the period of 1991m1 to 2011m11. To analyse the issue in depth, this study decomposes the time-frequency relationship between CPI- and PPI-based inflation through a continuous wavelet approach. Our results provide strong evidence that there are cyclical effects from variables (as variables are observed in phase), while anti-cyclical effects are not observed.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

In this study we analyse the relationship between Producer Price (PPI) and Consumer Price (CPI) indices in Romania using the Wavelet Transform Method (also referred to as the Wavelet Analysis Method) in order to assess the causality between CPI and PPI. The relationship between CPI and PPI is very important for the measurement of inflation, for the analysis of the process of inflation within an economy, and for the efforts of the monetary authorities to minimise the uncertainly introduced by price instability into economic analysis and any decision-making process.

To forecast inflation and manage inflation expectations, and to achieve (implicit) inflation targets, policymakers need to better understand what types of factors influence the inflation process (Mihailov et al., 2011). Having an adequate inflation target is essential for good monetary policymaking in cases where a country decides on a flexible exchange rate regime (Ghatak and Moore, 2011). Also, the setting of

the inflation target is found to have an important international dimension because higher world inflation is positively correlated with inflation targets (Horváth and Matějů, 2011). Analysis of inflation in Romania is perhaps more important than in other countries, considering the fact that the year 1989 marked the beginning of the transition of Romanian economy from a centralised economy, where most consumer prices were fixed, to a market economic system. The transition proved to be much more complicated than initially thought, entailing reforms in the political, economic, financial, banking and social areas (Cerna et al., 2004) and, unfortunately, has been marked by high and volatile inflation rates.

In Romania, as with many other European countries' national or central banks, the primary objective of the National Bank of Romania (NBR) is to ensure and maintain price stability, and the main tasks of the NBR are to define and implement the monetary policy. Furthermore, without prejudice to its primary objective, the NBR supports the general economic policy of the government.

Monetary policy choices have been rooted in an understanding of inflation as an excess aggregate demand phenomenon. The policy framework has changed throughout transition, from broad money targeting (1990–1996) to high-powered money targeting (1997–2005), and then to inflation targeting (Gabor, 2008). During the first years of the

* Corresponding author at: West University of Timisoara, Faculty of Economics and Business Administration, 16, J.H. Pestalozzi Street, 300115, Timisoara, Romania.
E-mail addresses: aviral.eco@gmail.com, aviral.kr.tiwari@gmail.com (A.K. Tiwari), mihai.mutascu@gmail.com (M. Mutascu), alin.andries@uaic.ro (A.M. Andries).

transition period, the NBR used, as an operational objective of monetary policy, a broad monetary aggregate (M2) and, from the second half of 1993, after having created the basis for exerting indirect control over the money supply, the NBR attempted to directly control the base money (M0). The period until 1998 was marked by the pre-eminence of exchange rate stabilisation over monetary targeting considerations, but starting from 1999 until 2005, the NBR's monetary targeting strategy used M0 as the operational objective and M2 as the intermediate objective (Sánchez, 2011). Between 1994 and 2005, Romania had no official commitment to a monetary policy strategy (Frömmel et al., 2011), and the pursuit of a monetary targeting strategy by the NBR was justified because the attempts at using the exchange rate as an anti-inflationary anchor failed, while, to this end, the interest rate was not taken into consideration (Popa et al., 2002). In order to achieve its primary objective, the NBR continued to improve its discretionary monetary policy, and in 2005 announced the transition to inflation targeting, although many deviations from the inflation-targeting principles could be noted (Nenovsky and Villieu, 2011).

This monetary policy strategy is a CPI-based inflation target and was adopted after completing a preparatory process that involved bringing the annual inflation rate to single-digit levels, earning and strengthening central bank credibility, and getting a better insight into macroeconomic behaviour patterns and economic mechanisms in order to identify and enhance the effectiveness of monetary policy transmission channels (Popa, 2005). By adopting inflation targeting, the central bank more clearly assumed the task of consistently pursuing the fulfilment of its fundamental objective, its accountability for achieving the inflation target being more clearly expressed (NBR, 2005).

Although Romania has made substantial progress in lowering inflation over time, inflation continues to be an issue of key policy concern. This is due to the persistent character of inflation rates and to the remaining risks of inflationary spikes. Given the moderate and persistent character of inflation, it is particularly important to better understand the extent to which inflation is a demand-driven phenomenon so that the policies aimed at limiting discretionary demand can be used to bring down inflation and stabilise the economy. On the other hand, it is also important to find out the role that supply-side of economy has in maintaining inflation at a moderate level.

Theoretical literature suggests that movements (shocks) in producer prices should affect, through the production chain, consumer prices. This is a standard supply-side or cost-push explanation of changes in consumer prices. Based on this point of view, changes in producer prices at earlier stages of production should pass through to producer prices at later stages of production and, ultimately, to consumer prices (Clark, 1995). Following these presumptions, information on producer prices should offer valuable predictive power about consumer prices and could therefore be useful for central banks in identifying cost-push shocks and improving forecasts of consumer-price inflation (Caporale et al., 2002).

Colclough and Lange (1982) argue that an alternative view of the causal relationship between CPI and PPI that stresses the demand side seems equally plausible and they provide evidence of a bidirectional relationship between CPI and PPI. According to this view, changes in the demand for final consumer goods exert an influence on input prices through the impact of changes in the prices of consumer goods on the derived demands for inputs. Also, Jones (1986) suggests that a valid theoretical explanation of the relationship between CPI and PPI must include both demand-pull and cost-push aspects of aggregate price determination, and recommends that for the bivariate model consisting of the CPI and the PPI, the simultaneous equation approach is the appropriate method for estimation. Also, Caporale et al. (2002) reported bivariate causality between PPI and CPI.

The literature on the dynamic relationship between CPI and PPI shows that PPI could be used as a short-term indicator of inflationary trends. Furlong and Ingenito (1996) reveal that PPI represents a strong and statistically robust leading indicator of inflation, especially during the period with unstable and high CPI or with significant increase of PPI. Cushing and McGarvey (1990) re-evaluate the theoretical and empirical debate surrounding the bivariate time-series relationship between wholesale and consumer price inflation. They argue that the existence of a one-sided Granger causal relationship running from PPI to CPI cannot be taken as evidence of either markup pricing or cost-push inflation, and find that wholesale price shocks had little or no permanent effect on consumer price inflation.

Mehra (1991) shows that long-run movements in the rate of growth in CPI and production costs are correlated over time, but the presence of this correlation appears to be due to Granger-causality running from inflation to wage growth, not from wage growth to the rate of inflation. Blomberg and Harris (1995) analyse the short- and long-run relationships between production and consumer prices, and show that PPI inflation did have predictive power in explaining CPI inflation. They also present evidence that commodities have either lost that power or, in some cases, are sending perversely negative signals. Also, Hess and Schweitzer (2000) show that there is little systematic evidence that production costs, especially wages, are helpful for predicting inflation. In fact, the authors show that there is more evidence that inflation helps predict wages.

In a recent study, using frequency domain approach, Tiwari (2012a) explores the Granger-causality between the producers' and the consumers' price in the case of Australia.[1] The dataset covers the period 1969q3–2010q4. According to the author, the consumers' price Granger-causes producers' price at an intermediate level of frequencies, providing evidence of medium-run cycles. Otherwise, the producers' price does not Granger-cause consumers' price at any level of frequencies. Using the same methodology, Tiwari (2012b) conducts another analysis focused on India. The main outputs reveal that "CPI Granger-cause WPI (whole sale price index) at a lower, intermediate as well as higher level of frequencies reflecting very long-run, intermediate as well as short-run cycles." WPI Granger-causes CPI at intermediate frequencies, reflecting significant intermediate cycles. Finally, Shahbaz et al. (2012) treat the causality between WPI and CPI in the case of Pakistan, from 1961 to 2010. The frequency-domain approach demonstrates the unidirectional causal relationship from CPI to WPI, which varies across frequencies. Moreover, "CPI Granger-causes WPI at lower, medium as well as higher level of frequencies reflecting long-run, medium and short-run cycles."

Based on this literature framework, the aim of this paper is to examine the relationship between PPI and CPI in Romania, using monthly data from 1991m1 to 2011m11. In order to analyse the relationship between Producer Price and Consumer Price Indices at different time scales, we use the wavelets analysis method. All data are obtained from an International Monetary Fund (IMF) CD ROM (2012) of IFS (International Financial Statistics). The results provide strong evidence of cyclical effects from variables, while the anti-cyclical effects are not observed. This paper extends the literature in the field, improving on the studies of Tiwari (2012a,b) and Shahbaz et al. (2012). In this way, using the wavelet method, the objective of our investigation is twofold: (i) to demonstrate if there is anti-cyclical relationship, and (ii) to show in which year these cyclical and anti-cyclical relationships are observed.

This paper is organised as follows. Section 2 presents the wavelet analysis method adopted, while Section 3 describes data and reveals empirical findings on the relationship between Producer Price and Consumer Price Indices at different time scales. The paper concludes in Section 4.

---

[1] To the best of our knowledge Tiwari (2012a) is the first study to analyse the Granger-causality in the frequency-domain approach.