INFLATION DYNAMICS IN ROMANIA – A NEW KEYNESIAN PERSPECTIVE

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Key words: New Keynesian Phillips Curve, inflation dynamics, GMM estimation, forward looking expectations

Abstract: We investigate in this paper the main factors which drive inflation in Romania: inflation persistence, inflation expectations and real economy variables. We estimate a reduced form hybrid New Keynesian Phillips Curve in order to determine the degree of inertia and the impact of forward looking expectations. As a proxy for real economic activity, we alternatively use the change in the real labour cost, output gap, the capacity utilization rate, the economic sentiment indicator and the unemployment gap. We find that the capacity utilization rate and the unemployment gap are good proxies for the real economic activity. Inflation inertia is more important in explaining CPI inflation than rational expectations confirming the fact that inflation expectations in Romania are still highly adaptive.

I. Introduction

The analysis of inflation dynamics is extremely important as it aims to determine the variables that might exert inflationary pressures in the short run and in the long run and are also important in the view of forecasting the inflation rate and its components. The Phillips Curve has become a standard framework for the analysis of short and medium term inflation for at least three reasons. First of all, the Phillips curve explains inflation using variables describing real economic activity such as real marginal cost, excess demand, output gap, unemployment, capacity utilization, unit labour cost or the economic sentiment indicator. Secondly, all macroeconomic models used by central banks incorporate a certain type of Phillips Curve. Thirdly, as a wide range of empirical analyses show, the Phillips Curve can be successfully used as a tool for forecasting inflation (Stock and Watson (1999), Matheson (2008)).

The early specifications of the Phillips Curve (Phillips (1958), Samuelson and Solow (1960)) are based on an empirically found relationship between the inflation rate or the nominal wage growth rate and the unemployment rate. However, the statistical relationship between the variables was found to be instable and even to break down in the 1970's. The development of the New Keynesian economics, based on micro-foundations and rational expectations, proved the theoretical relationship between aggregate economic activity and inflation expectations.

The New Keynesian Phillips Curve (NKPC) is based on the seminal work of Taylor (1980) and Calvo (1983) and is explicitly derived from an optimization process, assuming staggered price setting by forward looking, monopolistically competing firms. As a result of the optimization process, current inflation is related to future expected inflation and real marginal cost. Also, the parameters of the NKPC are directly linked to the behavior of agents and are thus exempt from the Lucas critique. The hybrid version

of the NKPC is due to Gali and Gertler (1999) and it additionally incorporates inflation inertia.

In the following sections, we will estimate a reduced-form hybrid NKPC for the Romanian economy. To this end, we selected a number of explanatory variables to be used alternatively as a measure of real economic activity: the output gap as a proxy for excess demand, the real labour cost, the unemployment gap and the economic sentiment indicator. Regarding the inflation measure, empirical studies have estimated Phillips curves for the GDP deflator, CPI inflation, import prices inflation or producer prices inflation. We decided to use headline CPI inflation as explained variable although it contains highly volatile components because this is the target inflation rate of the National Bank of Romania. However, as an instrument in our estimations we use Core2 inflation which excludes from the headline consumption basket regulated prices, volatile food prices (vegetable, fruit and eggs) and fuels prices. It is the common view of practitioners and theoreticians that regulated prices, vegetables, fruit and eggs and fuels depend mainly on exogenous factors and, hence, distort CPI inflation especially if they have an important contribution to the basket. In Romania, regulated prices have a contribution of 21.4% to the CPI basket, fuels represent 5.42% of the consumption basket and vegetable, fruit and eggs 6.76%. Figure 1 presents the development of different quarterly year on year inflation measures in Romania in the period of 2001-2007.

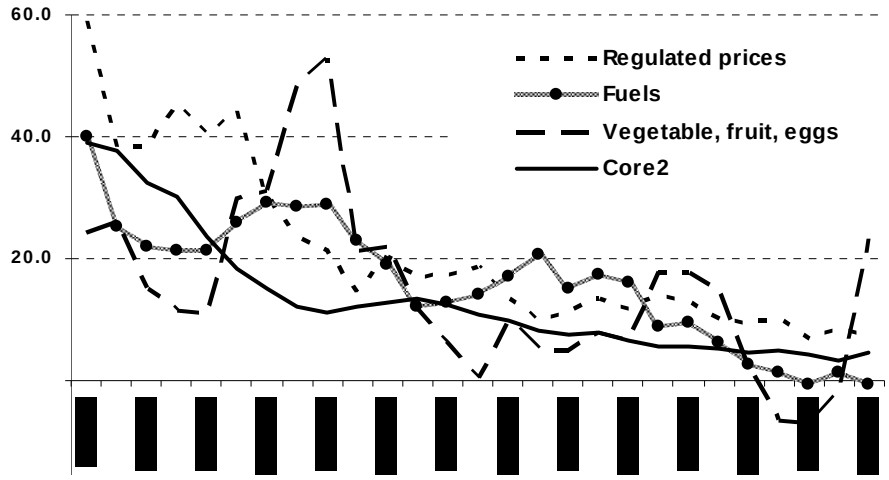

Fig. 1. The development of quarterly inflation in Romania
Source: National Bank of Romania and own calculations

The figure above shows the high volatility of the inflation for regulated prices, fuels and vegetables, fruit and eggs compared to the smooth development of Core2 inflation. Taking this into consideration, we will estimate the NKPC for CPI inflation, but we will use as an instrument the Core2 inflation. Figure 2 depicts the evolution of quarterly Core 2 inflation in comparison with quarterly CPI inflation in the period of 2002Q1-2007Q4.

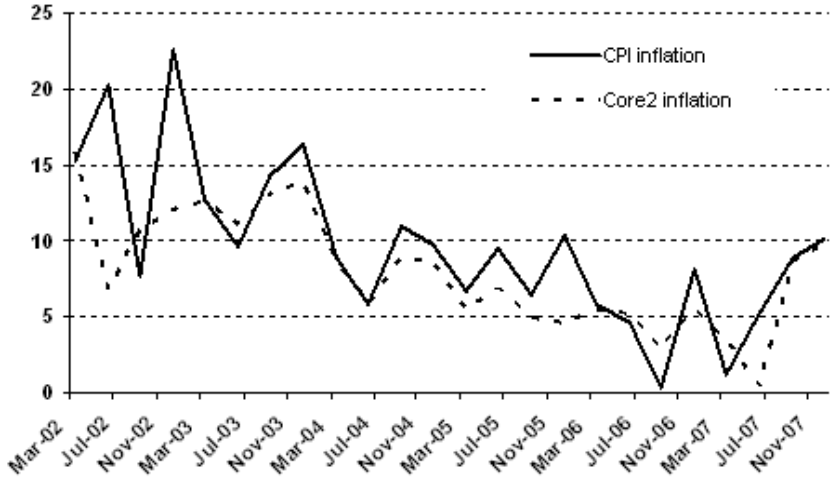

Fig. 2. The development of quarterly Core2 inflation and quarterly CPI inflation in Romania

Source: National Bank of Romania and own calculations

The rest of the paper is organized as follows: section II presents the methodology used to conduct our analysis, section III presents the results of the estimations, while section IV concludes.

II. Methodology

In order to analyze CPI inflation dynamics, we employ the classic version of the reduced form hybrid NKPC developed by Gali and Gertler(1999) for closed economies and extended for open economies by Leith and Malley (2007):

$$\pi_t = \gamma_b \pi_{t-1} + \gamma_f E[\pi_{t+1}] + \lambda mc_t + \varepsilon_t \quad (1)$$

where π_t is inflation at time t, $E[\pi_{t+1}]$ is the rational expectation of inflation for the next period, mc_t is the real marginal cost and ε_t is the error term.

The open economy version of (1) also includes the real cost of imported goods:

$$\pi_t = \gamma_b \pi_{t-1} + \gamma_f E[\pi_{t+1}] + \lambda^l (w_t - a_t) + \lambda^m q_t + \varepsilon_t \quad (2)$$

where $(w_t - a_t)$ is the real wage corrected for labour augmented technology, while q_t is the real cost of a unit of imported goods.

The coefficient γ_b shows the inflation persistence or inflation inertia, while γ_f shows the relative importance of forward looking expectations in the formation of current inflation. Because the real marginal cost is not statistically available at aggregate level, there is much controversy in the literature regarding the appropriate proxy for this variable. Gali and Gertler (1999) and Gali, Gertler and Lopez-Salido (2005) use the unit labour cost as a proxy, while Gwin and VanHoose (2007) and Matheson (2008) investigate the use of a number of variables as proxy for the real marginal cost. We will determine the appropriate variable describing aggregate economic activity by estimating equation (1) with different proxies for the real marginal

cost: the deviation of real GDP from a Hodrick-Prescott filter (the output gap), the change in real labour costs, the capacity of utilization and the economic sentiment indicator. We also check for a relationship between inflation and unemployment by including in equation (1) as a measure of real economic activity the deviation of unemployment from a Hodrick-Prescott filter (unemployment gap).

As we have previously mentioned, we will estimate the NKPC for the CPI inflation. The original NKPC was estimated in deviations from the steady state. As this is inappropriate for the Romanian economy, we will estimate the NKPC for the deviation of the CPI inflation from a Hodrick-Prescott filter.

The estimations are conducted on quarterly data from 2000Q1 to 2007Q3. The data series come from the NBR database, the Eurostat database and the European Commission. We seasonally adjusted CPI and Core2 inflation using the Census X12 procedure.

Considering the presence of rational expectations in the two equations, we will estimate them using the GMM procedure. For each model estimated, we employed the following instruments: two lags of the deviation of Core2 inflation from a Hodrick-Prescott filter (t-1, t-2), one lag of the real interest rate (t-4), three lags of the real exchange rate gap (t-1, t-2, t-3) and two lags of the endogenous variables.

III. Results

The results of the estimations for equation (1) are summarized in Table 1. We report the values of the estimated parameters and the p-value for each coefficient. Each equation estimated with a certain measure of real economic activity is labeled with a number from 1 to 5.

Table 1

The value and significance of estimated coefficients for equation (1)

Proxy for real marginal cost		γ_b	γ_f	λ
1. Change in Real labour cost	Coefficient	0.348257*	0.66023*	-0.13351*
	p-value	0.0000	0.0000	0.0115
2. Output gap	Coefficient	0.444348*	0.327658*	0.010958
	p-value	0.0000	0.0545	0.9625
3.Capacity utilization	Coefficient	0.770781*	0.3331*	0.005212
	p-value	0.0001	0.0017	0.0777
4.Economic sentiment indicator	Coefficient	0.312779*	0.440929*	-0.00205
	p-value	0.002	0.0286	0.2137
5.Unemployment gap	Coefficient	0.627826*	0.477248*	-1.33219*
	p-value	0.0000	0.0000	0.0634

** denotes significance at 10% significance level*

A few important conclusions emerge from the table above. The Phillips Curve estimated using the change in real labour cost has statistically significant coefficients, but the sign of the change in real labour cost is not consistent with economic theory. The output gap and the economic sentiment indicator are both statistically insignificant which means that they don't explain inflation dynamics in Romania. However, the coefficient of the capacity utilization rate and the unemployment gap are significant

which means that we must analyze only models 3 and 5 in the above table. In both equations, forward looking expectations and inflation inertia are statistically significant. The inflation inertia coefficient is in both cases bigger than the forward looking component showing the fact that in Romania persistence was more important than expectations in explaining inflation dynamics. This result is sustained by other analyses performed on transition countries. Lendvai (2005) for Hungary, Ribon (2004) for Israel and Arratibel et al. (2002) for a number of New member states find that the weights of persistence and expectations in explaining inflation are roughly equal. Because Romania has experienced high inflation rates and has started the disinflationary process only in 2000, inflation expectations are still highly adaptive. Other countries, characterized by low and stable inflation rates and where expectations are firmly anchored have a much smaller contribution of inertia to inflation (Gali, Gertler, Lopez-Salido (2001, 2005)).

The coefficient of capacity utilization is positive. An increase in the percentage utilization of production capacity generates additional costs and fosters inflationary pressures. On the other hand, a positive deviation of unemployment from its trend signifies the existence of a supply deficit and, hence, a decrease in inflation.

We also tested the following restriction on the coefficients describing inflation inertia and inflation expectations: $\gamma_b + \gamma_f = 1$. This restriction insures the fulfillment of the neutrality principle which suggests that real variables don't influence nominal variables in the long run. Both in case of model 3 and 5 the data sustain the restriction.

IV. Conclusions

The present paper characterizes inflation dynamics in Romania in the period of 2000Q1-2007Q4 using the reduced form of a closed economy hybrid New Keynesian Phillips Curve. We explain CPI inflation using a lag of its own, the expected CPI inflation for the next quarter and a measure of real economic activity. As a proxy for the latter variable we use the change in real labour cost, the output gap, the capacity utilization rate, the economic sentiment indicator and the unemployment gap. We find statistically significant coefficients only in case of the change in real labour cost, the capacity utilization rate and the unemployment gap. However, the sign of the coefficient estimated for the real labour cost is economically incorrect so we discard that model. We conclude that the capacity utilization rate and the unemployment gap are successful in explaining the deviation of CPI inflation from its trend. We find that in Romania inertia was more important than expectations in characterizing inflation dynamics. This is common in case of transition economies that experienced high rates of inflation and where inflation expectations have a high adaptive component. We find that CPI inflation has an inertia of 0.77 or 0.63 according to the estimated model. Also, the inflation persistence coefficient and the inflation expectation coefficient statistically sum to one proving the fact that the data sustain the principle of neutrality.

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