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DERIVING INFLATION EXPECTATIONS FROM BUSINESS TENDENCY SURVEY IN SLOVAKIA

1. Introduction

For the last three decades, inflation expectations have been an important topic in the economic literature. Particularly, the influence of the expected inflation rate on the consumers' consumption and savings, companies' investment behaviour and union's position in wage bargaining have been described by economic theory. Regardless of type of economic agents forming their anticipated inflation rate, two major types of inflation expectations are generally distinguished: adaptive and rational. Adaptive expectations are formed on the basis of past inflation outcomes. Thus, an enterprise with adaptive expectations expects the future inflation to be a projection of past inflation values or current inflation rate. In practice adaptive expectations are usually assumed to have the form of a distributed lag of past inflation [2]. According to Łyziak [7], rational expectations include all information available to upgrade the simple adaptive forecast of future inflation and make it closer to the actual future inflation outcome.

The measurement of inflation expectations is needed for their investigation. In Slovakia, the only information source about corporate inflation expectations is business tendency survey made by Statistical Office of Slovak Republic. More detailed description is available in [6]. Companies are asked whether they expect the rapid increase, increase at the same rate, increase at the slower rate, stay about the same or fall of the prices of their own products in the next three months. Unfortunately, only balance statistics that is calculated as a difference between the positive (share of companies expecting rise) and negative (share of companies expecting fall) answers in percentage is regularly published. These data are used in our analysis.

2. Relationship between balance statistics and producer price index in Slovakia

As a first step, we made correlation and regression analysis between time series of balance statistics representing the price expectations of main industrial producers (S) and producer price index (PPI). We took time lags into consideration because respondents are asked about their price plans for the next three months. The most significant relationship was not surprisingly identified between S and one-month delayed PPI . It seems that companies are behaving according to their price plans during following month rather than during current month.

We specified simple linear regression model with help of statistical software R:

$$ePPI[t] = 99.91564 + 0.01446 S[t-1], \quad (1)$$

(0.16899) (0.004289)

where: $ePPI[t]$ represents estimated Producer price index at time t ,

$S[t-1]$ represents balance statistics in industrial companies at time $t-1$.

The value of the correlation coefficient is 0.3. We used Spearman Rank Order Correlation Test [5, p. 78] to verify homoscedasticity at the significance level 0.01.

One of general properties of transition economies is inertia in the behaviour of economic agents who accommodate their decisions to current economic situation with low flexibility. According to this fact we investigate relationship between PPI and past values of S . General formulation of the model is following:

$$PPI[t] = \alpha + \beta_0 S[t] + \beta_1 S[t-1] + \dots + u_t. \quad (2)$$

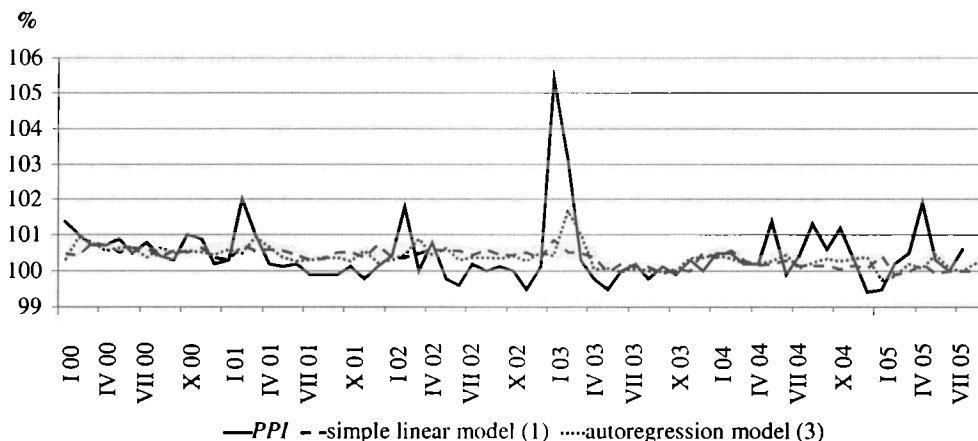


Fig. 1. PPI , simple linear model and autoregression model

We apply the transformation of Koyck [5, p. 106] and after that we estimate the parameters of the autoregression model as follows:

$$ePPI[t] = 75.649066 + 0.011082 S[t] + 0.242814 PPI[t-1]. \quad (3)$$

(8.691335) (0.004199) (0.086697)

The value of the correlation coefficient is 0.36. We used Spearman Rank Order Correlation Test [5] to verify homoscedasticity at 0.01 level of significance.

We can see comparison of real values of *PPI* and results from models (1) and (3) in the Fig. 1.

3. Quantification of expected producer price index based on results of qualitative survey

Another approach to price indexes forecast is to use qualitative data from business tendency surveys to quantify the expected inflation rate. For this purpose, probability techniques are used.

We will use the following denotation:

a – percentage of respondents expecting prices to rise faster,

b – percentage of respondents expecting prices to rise at the same rate,

c – percentage of respondents expecting prices to rise more slowly,

d – percentage of respondents expecting prices to stay at their present level,

e – percentage of respondents expecting prices to go down,

π_0 – current rate of inflation,

m – expected rate of inflation,

q – half of the range between the minimum and maximum expected inflation.

We assume that the expected rate of inflation in the population is uniformly distributed and falls within an interval $(m - q, m + q)$.

Following Łyziak's approach we design the uniform distribution method for surveys containing five decisive responses to the question regarding inflation expectations. Unfortunately in general we cannot obtain these percentages from statistical office. Only their aggregated balance statistics $S = a + b + c - e$ are available. Therefore we try to express the expected rate of inflation using *S*. Let $\pi_0 > 0$. It is easy to see that from Łyziak's formula

$$m = \frac{\pi_0 \cdot (1 - d - 2e)}{2c + b + d}$$

it follows:

$$m = \frac{\pi_0 \cdot S}{S + 1 - 2a - b}, \quad q = \frac{\pi_0}{S + 1 - 2a - b}.$$

Let $S > 0$ and a, b, c, d, e be unknown. It is obvious that $a + b + c > 0$. The most “optimistic” possible case is then $a = b = 0, c > 0$, which means: everybody presumes the rise of prices and expects the prices will rise more slowly. Using this assumption it follows

$$m = \frac{\pi_0 \cdot S}{S + 1}, \quad q = \frac{\pi_0}{S + 1},$$

i.e. we obtain the “lower bound” of expected rate of inflation.

Let $S < 0$ and a, b, c, d, e be unknown. The most pessimistic case is then $b = c = 0, a < e$, and we obtain again

$$m = \frac{\pi_0 \cdot S}{S + 1}, \quad q = \frac{\pi_0}{S + 1},$$

i.e. the “upper bound” of mean of expected rate of inflation.

If $\pi_0 < 0$, it is difficult to interpret the answers of the respondents. In case of deflation, considering the rate of the growth of prices (faster, slower or unchangeable) according to actual negative inflation rate make no logical sense. Therefore, the questionnaire should change in case of deflation to make respondents’ answers interpretation reasonable.

Theoretically, we consider analogical division of answer “e” into three sub-categories as follows:

- e – percentage of respondents expecting prices to go down faster,
- f – percentage of respondents expecting prices to go down at the same rate,
- g – percentage of respondents expecting prices to go down more slowly.

The mean of expected inflation rate is then:

$$m = \frac{\pi_0 \cdot S}{S - 1 + 2g + f}, \quad q = \frac{\pi_0}{S - 1 + 2g + f}.$$

Let $S > 0$ ($S = a + b + c - e - f - g$) and a, b, c, d, e, f, g be unknown. Using “optimistic approach” it holds

$$m = \frac{\pi_0 \cdot S}{S - 1}, \quad q = \frac{\pi_0}{S - 1},$$

where m is the “lower bound” of mean of expected rate of inflation.

Let $S < 0$ and a, b, c, d, e, f, g be unknown. Applying “pessimistic approach” $g = f = 0, e > 0$, we obtain the “upper bound” of expected rate of inflation:

$$m = \frac{\pi_0 \cdot S}{S - 1}, \quad q = \frac{\pi_0}{S - 1}.$$

We can see development of *PPI* and *m* (bounds of mean of expected *PPI*) in Fig. 2.

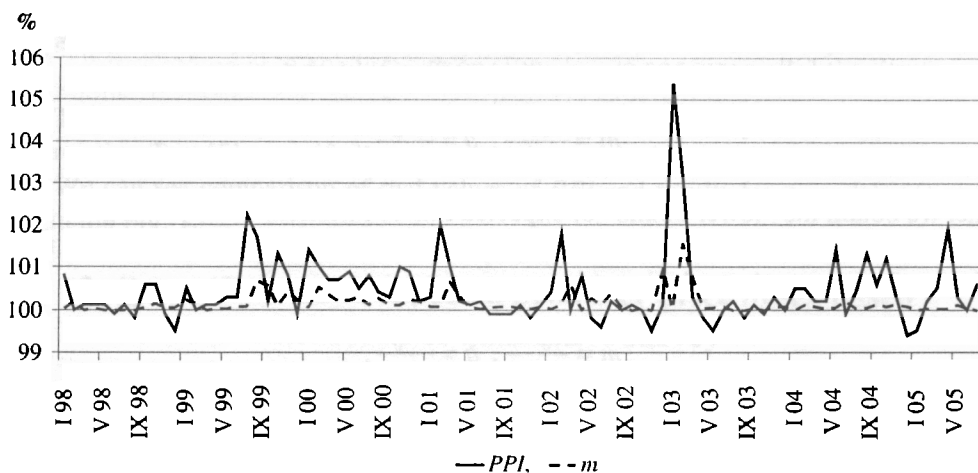


Fig. 2. *PPI* and *m* (bounds of mean of expected *PPI*)

Source: Statistical Office of Slovak Republic (www.statistics.sk) and results of own calculations.

Previous modifications were made because only aggregate balanced statistics are available in Slovakia. After multiple requests for necessary data (*a*, *b*, *c*, *d*, *e*) we were pleased to obtain them for the last three months. We present Łyziak's and our's results in Table 1.

Table 1. Real and modelled values of *PPI* (%)

Month	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	Łyziak's method	Our method	Real PPI
VI 05	0.8	11.6	8.6	65.0	14.0	0.0224	0.0196	0.0
VII 05	0.6	16.3	2.1	69.0	12.0	0.0000	0.0000	0.6
VIII 05	1.4	8.7	12.9	67.0	10.0	0.0768	0.0690	

4. Conclusions

The method we defined for deriving quantitative value of expected producer price index seems to allow us to indicate the estimation of expected inflation rate in Slovak companies at least in periods without outstanding changes. It seems also that inflation expectations in Slovak companies tend to be adaptive rather than rational what reduces their prediction potential. The formation of rational expectations could be influenced by transparent monetary policy (among others). In this

case, the communication strategy of central bank could influence the other economic agents towards inflation goals of central bank if they are available and credible. In 2005, the National Bank of Slovakia reoriented to direct inflation targeting. The inflation targets to 2008 are published and new predictions of the central bank are communicated quarterly. The efficiency of this "communication revolution" and the aspects of the corporate inflation expectations rationality could be the object of further research.

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WYPROWADZANIE OCZEKIWAŃ INFLACYJNYCH Z SONDAŻU TENDENCJI GOSPODARCZYCH W SŁOWACJI

Streszczenie

Oczekiwanie inflacyjne są ważnym elementem ekonomii i narzędziem polityki ekonomicznej, zwłaszcza polityki monetarnej. Współcześnie banki centralne wierzą, że są w stanie sterować tymi oczekiwaniami przez strategię komunikacji banku narodowego. Oczekiwanie inflacyjne mogą zatem stać się racjonalne. Aby analizować zachowanie oczekiwanej stopy inflacji, potrzebny jest jakiś pomiar oczekiwań. W państwach bez efektywnego rynku finansowego dane oparte na sondażach są jedynym wyborem w celu otrzymania szeregów czasowych oczekiwań inflacyjnych. Cel artykułu jest dwójaki: (1) identyfikacja relacji między wynikami sondażu tendencji gospodarczych i bieżącą inflacją, (2) wykorzystanie jakościowych danych do obliczania oczekiwanej stopy inflacji. Jeśli chodzi o pierwszą sprawę, wyspecyfikowano modele prostej regresji liniowej i autoregresji, które pozwoliły

estymować indeks cen producenta na podstawie przeszłych wyników statystyki bilansowej. W drugiej kwestii została zastosowana metoda probabilistyczna w celu obliczenia oczekiwanego *PPI* i z powodu braku danych zmodyfikowano wspomnianą metodę w celu dostosowania do dostępnych danych.

Słowa kluczowe: oczekiwania inflacyjne, sondaż tendencji gospodarczej.