BANK OF ALBANIA

MEASURING INFLATION EXPECTATIONS

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CONTENTS

"You can fool some of the people all of the time, and all of the people some of the time, but you cannot fool all of the people all of the time."

Abraham Lincoln

ABSTRACT

This paper attempts to apply some approaches in order to quantify the responses collected via the Consumer Confidence Survey conducted by the Bank of Albania. Moreover, it attempts to better understand the nature of consumer inflation expectations in Albania, which result to be adaptive. Accordingly, if the inflation rate increases, consumers expect an even greater increase of inflation in the subsequent period.

1. INTRODUCTION

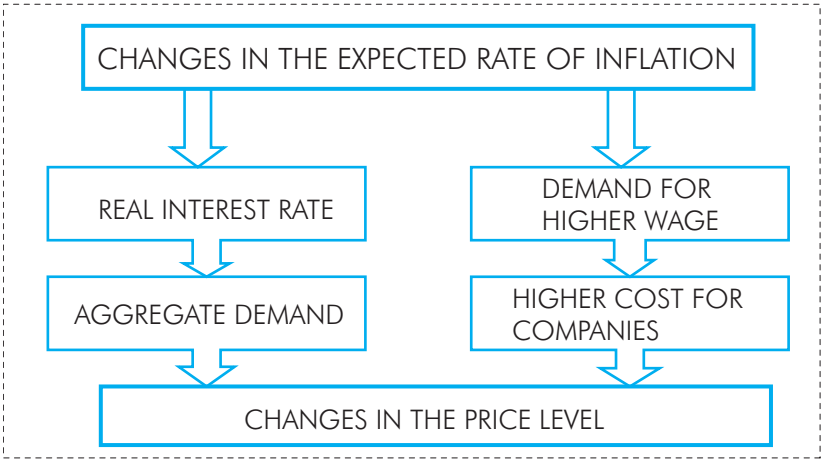
The main objective of most central banks is to maintain price stability; therefore, there exists a vast literature on the factors affecting inflation. The analysis of the role of consumer expectations in the price formation process is of paramount importance. The rational expectations theory dates back in the early 1960s when John F. Muth was the first to formulate the rational expectations hypothesis in a precise way and used it in a number of economic phenomena in which the result depends on what people expect to happen seen from a single market in partial equilibrium viewpoint. The importance of the rational expectations hypothesis became apparent only after a few decades when the Nobel Prize winner in 1995, Robert Lucas, extended the hypothesis to macroeconomic models and to the analysis of economic policy. There is now a broad consensus among the economists that economic actors do not persist in making foolish mistakes in forecasting over time. People are presumed to be able to both detect past patterns in their prediction errors and base their behaviour on the "best possible" forecast of future economic conditions (Bullard 1991). The current wide acceptability of this notion is testament to the success of the rational expectations revolution.

There is evidence that the level of expected inflation and the rational inflation are cointegrated. During the expectations formation process, the economic actors try to forecast what will happen and they are urged to use rules that work well, since if they manage to make accurate forecasts, they will have higher "gains". The accuracy of forecasting is useful to people trading in the stock exchange or to people considering buying a new car. When people need to constantly forecast the price of a product or a basket of products, they tend to adapt the forecast rules in order to avoid possible errors; that is, there is a constant flow of past results and actual expectations.

The importance of inflation expectations – inflation based on consumer expectations – results from the fact that expectations exert influence on the behaviour of economic agents, i.e., in terms of consumption, savings and investment decisions (Lyziak 2003).

Expected inflation may also constitute an important information variable taken into account in forward-looking considerations. Its quantitative measurement may be used as a variable in the inflation forecasting analysis since inflation expectations affect the decisions related to price and wage-setting (Forsells and Kenny, 2002). Moreover, central banks need to assess the credibility of their monetary policy in order to know how the inflation expectations of the general public compare with the price stability objective pursued by the monetary authority (Berk 2000).

Inflation expectations play an important role in price formation. By affecting real interest rates, changes in inflation expectations may lead to changes in aggregate demand, which may then influence prices. On the other hand, an increase in the expected rate of inflation may make employees demand higher wage settlements. Companies, anticipating higher costs to be faced in the future, may see incentives to increase prices.



The paper is organized as follows: Section 2 describes the importance of expectations in the inflation control process and the method of their measurement. Section 3 continues with the methodology of data conversion from qualitative to quantitative, using a number of functions of the probability approach to quantification of inflation expectations. Moreover, this section analyzes the testing of expected inflation indicator in order to derive conclusions related to the nature of consumer inflation

expectations. Section 4 applies the methodology and testing in the case of Albania. The last section provides some preliminary conclusions.

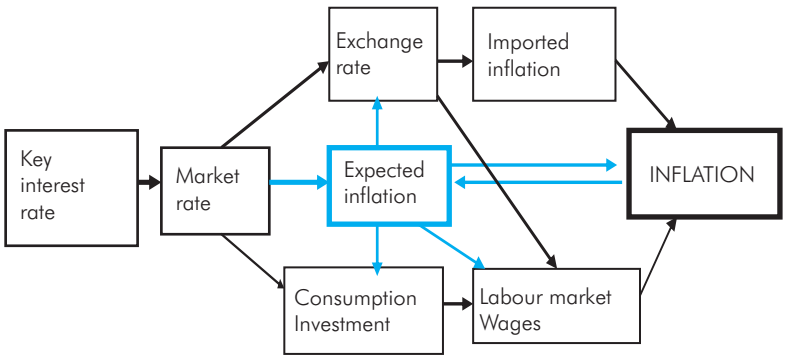
2. THEORETICAL CONSIDERATIONS

2.1 INFLATION EXPECTATIONS AND MONETARY POLICY

The Bank of Albania has for quite a long time formulated an action plan, which aims at enhancing the efficiency of the communication channel with the public. The objective of enhancing the communication efficiency implies the achievement of a higher level of transparency and accountability to the public, which help to improve the latter's credibility in the monetary authority decisions. Communication is a crucial aspect of monetary policy decisions' transmission. Monetary policy transparency and central bank credibility – key elements in direct inflation targeting – allow monetary policy to meet its ultimate objective of price stability (Lyziak 2003).

Given the importance of consumer expectations in meeting the inflation objective, central banks are ever-increasingly interested in monitoring the nature of inflation expectations and understanding the consumer expectations' formation process. By means of two simple examples, we emphasize the importance

Diagram 1 Inflation formation process



of having a reliable measure of expected inflation. First, to the extent that expectations provide an unbiased predictor of future inflation, quantitative measures of expected inflation may constitute an important information variable taken into account in forward-looking considerations. Second, in the event employees anticipate an increase in prices they will demand higher wage settlements. If this is the general trend of the economy, companies/employers will be more willing to pay higher wages since they may see incentives to transfer the higher costs into higher prices (Diagram 1).

2.2 FORMATION OF EXPECTATIONS AND THEIR ESTIMATION APPROACHES

We argued that inflation expectations may be very useful in assessing the monetary policy credibility and the judgements on their empirical rationality are becoming ever-increasingly useful in the monetary policy conduct process. In order to assess and control the empirical features of inflation expectations, it is important to find methodologies that can collect the expectations from the public and transform them into time series. This process is frequently considered as difficult given the errors associating the aggregation and generation procedures.

Figure 1 Formation of inflation expectations

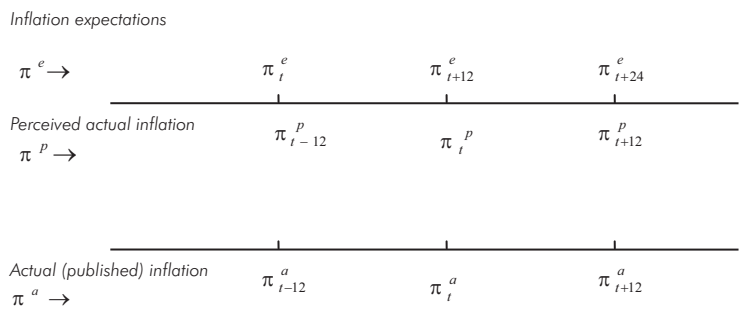


Figure 1 shows the formation of inflation perceptions during the 12-month periods, using the information on published inflation.

The inflation expectations series is composed of expected rates of inflation π^e for the period ahead, while the agents contain information on the actual published inflation π^a. It is also important to distinguish between actual π^a and perceived actual inflation π^p. Consumer perception of inflation in time *t* may not be equal with the actual published inflation rate.

If we have a given time *t*, then assuming that we have information on the actual inflation π_t^a, the agents form their inflation expectations π_{t+12}^e for the period ahead, in this case for the next 12 months. The selection of the length of the period generally depends on the motivation to make the expectations comparable with the annual inflation objectives. However, in what follows we will see that in the case of Albania, the expectations consider the 3-month period, not the 12-month one, and that the advantages of choosing one over the other remain questionable given the lack of adequate 12-month data to make comparisons[1].

Consumer responses are quantified in order to derive the expectations series, which is expressed as: $[\pi_t^e, \pi_{t+12}^e, \pi_{t+24}^e \ldots]$.

The literature identifies three approaches that allow the collection of information on consumer expectations of inflation.

The first approach is to construct an economic model that includes expectations as variables and certain assumptions about how these expectations are formed. In order to estimate the equations, the expectations are proxied with the *past* or *lagged* inflation rates, based on preliminary assumptions on the way they are formed. In several cases, the model uses expectations generated from the quantification of survey data[2]. The estimation of equations provides information on the way expectations are formed - whether they are forward-looking –, and on their rationality level. However, the analysis of inflation expectations is in this case indirect and conditioned by the selection of the behaviour model[3].

The second approach is to try to infer the expected inflation rate from the prices of financial instruments. One way would be if, for example, both nominal and index linked bonds with identical risk,

liquidity and maturity characteristics are traded, it is in principle possible to obtain a very accurate measure of expected inflation (Berk 2000). However, there are certain drawbacks which relate to the practical application of this approach. The limited number of index-linked bonds requires making strong auxiliary assumptions to infer expected inflation from the prices of these nominal assets, thereby clouding the information content of the expected inflation series that has been derived. Other problems include the unreliability of financial market indicators in general. Financial markets tend to over-react to shocks and are susceptible to herding and speculative phenomena, leading to time-varying risk premia that hinder the use of such measures for monetary policy purposes (Mylonas and Schich 1999).

The most common approach to measuring the expectations is the information obtained via surveys. This approach is widely used by many central banks and it has many advantages as compared to other approaches. Worth noting is the possibility to model the expectations and the simple way of measuring them. Moreover, this approach does not require any auxiliary assumptions that may affect the accuracy of indicators. However, it is often difficult to get the real opinion of the respondent, since there are no incentives to report. Even when the respondent provides the real opinion on the expectations, there are no urges to behave similarly to the opinion provided, as in the case of the financial markets, owing to the frequent non-rational behaviours. Moreover, the results of sample surveys are overly sensitive to sampling errors and to the precise formulation of the questions posed.

The measurement of inflation expectations via surveys is a widely used approach. However, deciding whether these expectations are good representatives of the real public confidence is quite a debatable issue. Nonetheless, for the purpose of this proposal, we will rely on the consumer confidence survey. In order to convert the qualitative responses into quantitative indicators of expectations, we will apply the adjusted probability method developed by Carlson and Parkin (1975).

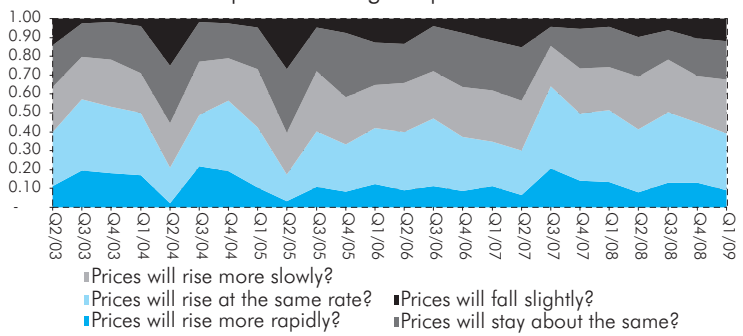
3. METHODOLOGY

3.1 CONSUMERS' ESTIMATION OF THE EXPECTED RATE OF INFLATION VIA THE CONSUMER CONFIDENCE SURVEY

In order to measure the inflation expectations, we have used qualitative data obtained from the Consumer Confidence Survey. This survey collects information from about 1200 consumers and it is conducted on a quarterly basis. The survey questions on the inflation expectations do not require a numerical answer from the respondent. They indicate the expected direction and the rate of price change, comparing their expectation with the rate of price change in the quarterly period when the survey is conducted. They respond to the following question: *"How do you think prices will change in the next three months? They will…: 1) rise more rapidly, 2) rise at the same rate, 3) rise at a slower rate, 4) stay about the same, 5) fall slightly"*. For the fifteen surveys conducted so far, the percentages of each category in this question are given in Chart 1.

Chart 1 shows that the respondents acknowledge the downward seasonal trend of prices in the summer months (the percentage of the answer "fall slightly" increases) and their rise at the end of the season.

Chart 1 Responses of the CCI survey on the expected change in prices



Source: Consumer Confidence Survey

3.2 QUANTIFICATION APPROACH – PROBABILITY METHODS

The quantitative probability method was first employed by Theil (1952) in order to measure the inflation expectations. This method represented an alternative to simple "balance statistics", defined as the difference between the percentage of respondents reporting an increase in prices and the percentage of respondents reporting a decrease.

There are two central assumptions in probability methods. Firstly, each individual is supposed to have a probability function over the expected price change. Secondly, it is assumed that, if the expected price change falls within a certain interval (-s,+s), the respondents will report that prices are going to stay the same. This interval is termed "sensibility interval" or "indifference interval".

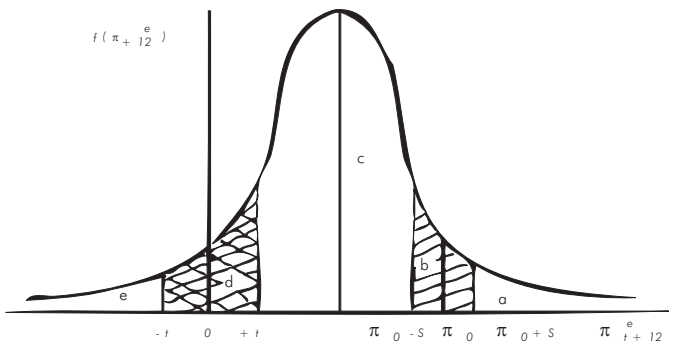
This material uses the normal probability method to describe the respondents' responses on expected prices, since the number of respondents is sufficiently large (around 1200 respondents).

In the following part of this material, the following notations apply:

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;
$\Pi^{e}_{+3}{}^{4}$ - expected rate of price change over the next quarter, assumed to be normally distributed (m, σ^2);
Π_0 - perceived rate of price change over the previous quarter;
f - density function of expected rate of inflation;
F - cumulative distribution function of expected rate of inflation;
Nz - cumulative standardised normal distribution function.

Chart 2 makes a graphical presentation of the adjusted Carlson and Parkin (1975), applied with the consumer confidence survey results.

Chart 2 Adjusted Carlson and Parkin (1975) method



Source: Carlson and Parkin

After making some algebraic transformations and using the standard normal cumulative distribution function, we derive the following result for the expected rate of inflation:

$$m = \Pi_0 (C+D) / C+D-(A+B)$$

$$\sigma = -2\Pi_0 / C+D-(A+B)$$

where $A = Nz^{-1}(1-a)$; $B = Nz^{-1}(1-a-b)$; $C = Nz^{-1}(1-a-b-c)$; $D = Nz^{-1}(1-a-b-c-d)$; $E = Nz^{-1}(e)$.

and m is the mean of the expected inflation rate.

The responses on the change in future prices in the case of Albania are presented in Table 1 of the Statistical Annex.

3.3 DISTRIBUTION FUNCTIONS

The choice of the distribution function is not a simple task. Carlson

and Parkin (1975) propose to use a normal distribution and justify this assumption by appeal to the Central Limit Theorem. Many empirical studies follow this suggestion also out of convenience, because the normal distribution is easy to handle and extensively explored and tabulated.

3.3.1 Assuming a normal distribution, we have:

General form:

$$ {}_te_{t+1} = \Phi^{-1}({}_tE_{t+1}) $$

$$ {}_td_{t+1} = \Phi^{-1}({}_tE_{t+1} + {}_tD_{t+1}) $$

$$ {}_tc_{t+1} = \Phi^{-1}({}_tE_{t+1} + {}_tD_{t+1} + {}_tC_{t+1}) $$

$$ {}_tb_{t+1} = \Phi^{-1}({}_tE_{t+1} + {}_tD_{t+1} + {}_tC_{t+1} + {}_tB_{T+1}) $$

where Φ is the cumulative standard normal distribution function.

Despite these advantages the normal distribution might not cope with the empirical findings. There are theoretical and empirical reasons to reject the assumption of normality. One deviation observed by Carlson (1975) and Lahiri and Teigland (1987) while analyzing inflation forecasts and correspondingly by Vining and Elwertowski (1976), for the actual price changes is the peakedness which is not in line with the normal distribution. To account for this deviation, we have employed the logistic and the central t-distribution. They are both more peaked than the normal distribution.

3.3.2 The logistic distribution function is defined as:

General form:

$$ H(x_{t+1} / \Omega_t) = \frac{1}{1 + e^{\frac{-x_{t+1} - {}_tm_{t+1}}{\beta_t}}} $$

where β_t is the scaling parameter and ${}_t\sigma_{t+1} = \frac{\Pi}{\sqrt{3}}\beta_t$. Using this definition the mean is calculated as in the case of normal distribution and standard deviation[5]:

$$ {}_t\sigma_{t+1} = -m_t \cdot \frac{2\Pi}{\sqrt{3}} \cdot {}_t q_{t+1} $$

As a result:

$$ {}_t e_{t+1} = ln\,({}_t E_{t+1} / 1 - {}_t E_{t+1}) $$
$$ {}_t d_{t+1} = ln\,[({}_t E_{t+1} + {}_t D_{t+1}) / (1 - ({}_t E_{t+1} + {}_t D_{t+1})] $$
$$ {}_t c_{t+1} = ln\,({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1}) / [1 - ({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1})] $$
$$ {}_t b_{t+1} = ln\,\{({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1} + {}_t B_{t+1}) / [1 - ({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1} + {}_t B_{t+1})]\}. $$

3.3.3 The central t-distribution is defined as:

General form:

$$ T_c = \frac{Y_1}{\sqrt{Y_2 / n}} $$

where Y_1 follows the standard normal distribution and Y_2 is independently distributed as $\aleph^2$ with n degrees of freedom. The variance of the central t-distribution is given by $\frac{n}{n-2}, n > 2$.

Praetz (1972) shows that to model the distribution of share price changes best a central t-distribution, scaled with its standard deviation, is used.

The standardized variable is scaled with $\theta^1 = \sqrt{\frac{n}{n-2}}$ and equations change to:

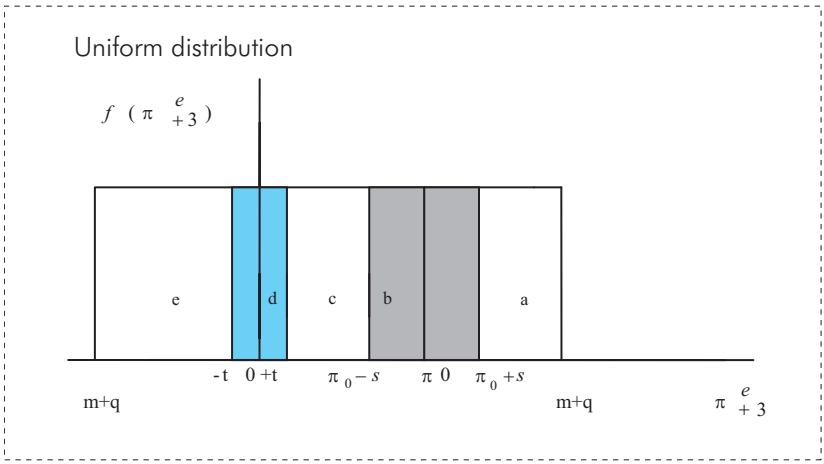
$$ {}_t e'_{t+1} = \theta^{(1)}\, {}_t e'_{t+1} = T_C^{-1}\, ({}_t E_{t+1}) $$
$$ {}_t d'_{t+1} = \theta^{(1)}\, {}_t d'_{t+1} = T_C^{-1}\, ({}_t E_{t+1} + {}_t D_{t+1})] $$
$$ {}_t c'_{t+1} = \theta^{(1)}\, {}_t c'_{t+1} = T_C^{-1}\, ({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1}) $$
$$ {}_t b'_{t+1} = \theta^{(1)}\, {}_t b_{t+1} = T_C^{-1}\, ({}_t E_{t+1} + {}_t D_{t+1} + {}_t C_{t+1} + {}_t B_{t+1}) $$

and:

$$ {}_t m_{t+1} = m'_t \cdot ({}_t e'_{t+1} + {}_t d'_{t+1}) \; {}_t q'_{t+1} $$

$$ {}_t \sigma_{t+1} = - m'_t \; 2\theta^{(1)} \; {}_t q'_{t+1} $$

where: $ {}_t q'^{-1}_{t+1} = {}_t e'_{t+1} + {}_t d'_{t+1} - {}_t c'_{t+1} - {}_t d'_{t+1} $



Uniform distribution

In this case, the following relationships may be recorded:

$a = 1/2q \cdot (m + q - \pi_0 - s)$

$b = s/q$

$c = 1/2q \cdot (\pi_0 - s - t)$

$d = t/q$

$e = 1/2q \cdot (- t - m - q)$

Where the set of dependent variables comprises *m* (mean of the expected rate of price change), *q* (half of the range between the minimum and maximum expected inflation) and also *s* and *t*

(sensibility intervals). There are six explanatory variables, namely a, b, c, d, e (fractions of respondents choosing the respective replies to the survey question) and π_0 (current rate of inflation). The solution of equations may be expressed as:

$$s = \frac{b \cdot \pi_0}{2c + b + d}$$

$$q = \frac{\pi_0}{2c + b + d}$$

$$t = \frac{d \cdot \pi_0}{2c + b + d}$$

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

where the last equation defines the expected rate of inflation based on this distribution.

3.4 BASIC TESTING FOR RATIONALITY

The methods that measure the expected inflation as described in the previous section provide useful information on the future consumer price developments compared with some other simple methods, which are based on the balance of respondents' responses. In this section, we try to test the indicators of expected inflation in order to derive conclusions related to the nature of Albanian consumer inflation expectations.

The measuring of expectations requires almost always further testing on the nature and properties, which generally relate to the rationality level of expectations. This is because the nature of expectations affects the response of economic agents to the actions of the policy-making institution, in our case of the Bank of Albania. The rationality of expectations is strongly related to their formation.

In the case of rational expectations hypothesis, it is assumed that the agents consider all the available information to make unbiased forecasts. While in the case of adaptive expectations hypothesis, the economic agents consider only the past information of the variable.

There are a number of interpretations related to the properties of the expectations series that make them rational or irrational; however, the main tests include the testing for bias, the periodic revision of errors and macroeconomic efficiency.

Testing for bias helps us to establish whether the consumers, on average, systemically under or overpredict inflation over the long run. A formal test for bias can be carried out using the following equation:

$$\pi_t = \alpha + \beta \pi_t^e + \varepsilon_t$$

If the null hypothesis H_0:$(\alpha, \beta) = (0,1)$ cannot be rejected, it can be concluded that the expectations are unbiased in a statistical sense (See Foresells & Kenny 2002, Lyziak 2003).

In general, the test results show that the respondents have poorly predicted the expected inflation in the next three months. In statistical terms, for the entire surveyed period (Q3 2003 – Q4 2006), the null hypothesis is rejected in the majority of cases.

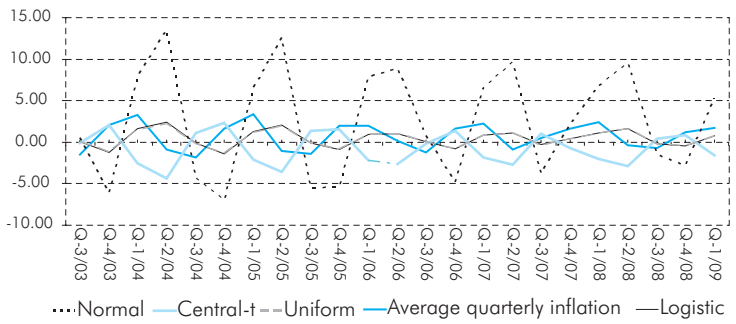
The short data series of the Consumer Confidence Survey[6] affects the above result significantly. The series of inflation expectations is insufficient to carry out further testing[7], in order to derive the dynamic properties of expectations that provide more information on the evolution of expectations than the above tests.

4. APPLICATION OF PROBABILITY METHODS IN THE CASE OF ALBANIA

The following charts show the expected quarterly inflation rate, measured based on the respective probability distribution

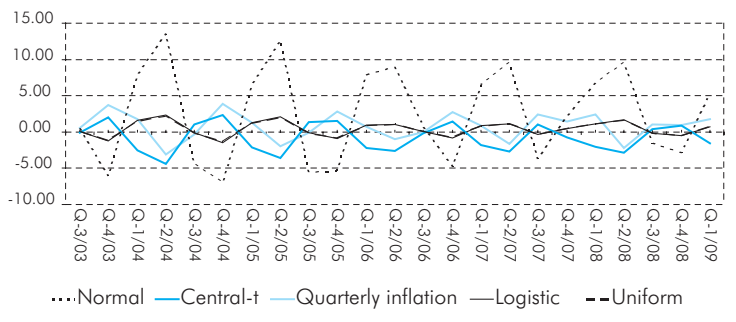
functions. In the first chart, the average inflation rate of the last quarter has been considered for measuring the expected inflation. In the second chart, the quarterly inflation rate is used. The time length of data covers the period from the second quarter of 2003 to the first quarter of 2009. In Charts 1, 2 and 4, the average actual rate or the simple quarterly inflation rate is positioned in the same period as the average or simple expected inflation, but predicted in the previous period.

Chart 3 Expected inflation as measured by average actual quarterly inflation and the respective probability distributions



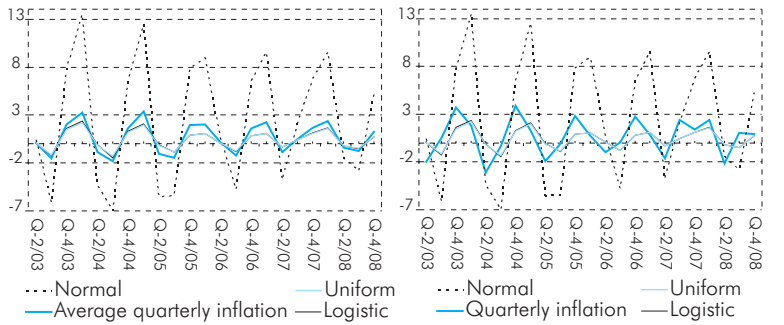
Source: Authors' own estimation

Chart 4 Expected inflation as measured by actual quarterly inflation and the respective probability distributions



Source: Authors' own estimation

Chart 5 Expected inflation for period t+1 and actual inflation (simple or average)

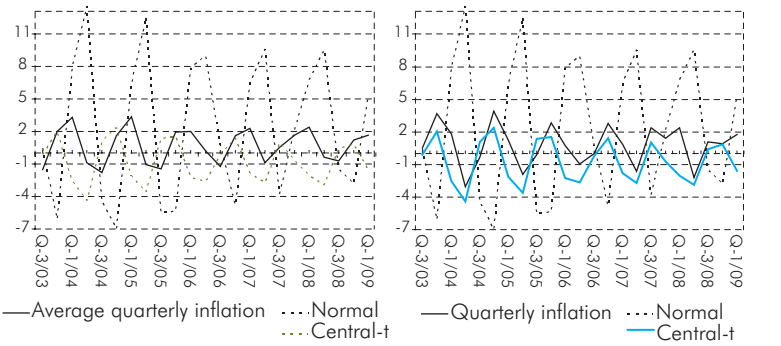


Source: Authors' own estimation

The charts show that the expected rate of inflation for the normal, logistic and uniform distributions is similar to both the actual rate of quarterly and average quarterly inflation with a lag of one period of time. This is shown more markedly in Chart 3 where the actual rate of inflation is positioned in the chart in the same period of time with the expected rate of inflation, for period *t+1* predicted in period *t*. Hence, if the actual inflation increases, the expectations for the period ahead indicate a higher increase of inflation and vice versa. The normal distribution function shows a greater shift from actual inflation compared with the other two functions, which reduces with the passing of time. The rationale behind is the enhanced education of the public or the familiarity of respondents with the consumer questionnaire.

The chart of the central t-distribution function is presented overturned compared with the other three charts of probability distribution functions. The highest points of inflation predicted based on the central t-distribution function correspond with the lowest points of inflation predicted based on the normal distribution and vice versa.

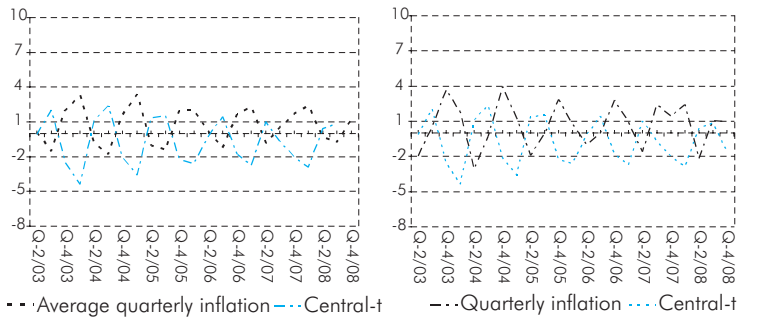
Chart 6 Expected inflation of period t based on the normal and central t-distribution and the actual inflation of period t (simple or average)



Source: Authors' own estimation

If we look at the chart in which the actual inflation rate is positioned with the expected inflation rate of period *t+1*, we note that it is overturned compared with the average or simple actual inflation.

Chart 7 Expected inflation of period t+1 and actual inflation (simple or average)



Source: Authors' own estimations

These conclusions are also supported by the results of statistical equations applied in each case of the probability distribution function (see the results in the Annex) and by the estimation of forecast errors. From the application of equations, it is clear that the

correlation between actual and expected inflation is stronger in the case when the inflation of period *t* is in regression with the expected inflation of period *t+1*. In addition, the results derived from the equations, more specifically the R^2 coefficient and the Root Mean Square Error, show that the respondents form their expectations of the quarterly inflation of period *t* based on the average inflation of the preceding quarter *(t-1)*[8]. The adaptive behaviour of consumers is also reflected in the test results of expectations rationality, where $H:(\alpha, \beta) = (0,1)$ is rejected.

4.1 ESTIMATION OF THE FORECAST ERROR

In order to assess the quality of inflation forecasts and compare the various methods applied for measuring the inflation expectations we have used the Root Mean Square Error (RMSE), which is calculated using the following formula:

$$RMSE = \{\sum_{t=1}^{T}(F_t - A_t)^2\}^{\frac{1}{2}}$$

where T is the number of inflation forecasts, F is the expected (or forecast) inflation and Ais the actual inflation.

The estimation of this statistical indicator based on the survey data is presented in the following table:

Table 1 RMSE of expected inflation as measured by probability methods

RMSE		
Distribution function	Based on average quarterly inflation	Based on quarterly inflation
Logistic	9.5	12.9
Normal	33.1	38.3
Central t	13.9	10.3
Uniform	9.3	12.7

Source: Authors' own estimations

The results show that average quarterly inflation is mostly considered by consumers when forming their inflation expectations

for the quarter ahead. Moreover, the value of the indicator suggests that the closest figures for consumer expectations in the short-term are better modelled when applying the probability method, which considers the logistic or uniform distribution functions. This is clearly evidenced in Chart 2 in the present material.

5. CONCLUSIONS

In order to measure the expected inflation, we have used in this material qualitative quarterly data obtained from the (BoA) Consumer Confidence Index survey, which covers the period from September 2003 to March 2009. In absence of considerable data series[9] on an annual basis, the inflation expectations are estimated on a quarterly basis. In order to convert the qualitative responses into quantitative indicators of expectations, we have applied the probability method. We have also applied a number of probability distribution functions in order to avoid bias (distortion and peakedness).

The results of the tests show that the consumers consider the average inflation rates of the last quarter if they need to make an inflation forecast for the quarter ahead. If the average inflation rate increases, the respondents expect an even greater increase of inflation in the subsequent period and vice versa. This provides evidence that the Albanian consumers have adopted an adaptive behaviour, which is based on the past inflation of the variable.

However, this issue requires further analysis, since the improvement in consumer perceptions of macroeconomic indicators – in our case of inflation – and the improved data base would enhance the forecasting process. The use of longer time series and the establishment of annual inflation expectations series in particular, will be important tools for improving the measurement of inflation expectations and forecast based on the Consumer Confidence Survey.

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STATISTICAL ANNEX

Table 1 Frequency of responses to the question "How do you think prices will change in the next three months?"

	Q2/03	Q3/03	Q4/03	Q1/04	Q2/04	Q3/04	Q4/04	Q1/05	Q2/05	Q3/05	Q4/05	Q1/06	Q2/06
a	11.2	19.5	18.0	17.2	2.0	21.8	19.3	10.3	3.2	10.9	8.3	12.5	9.1
b	28.5	37.6	35.4	32.8	19.0	27.0	37.3	32.2	14.2	29.4	25.1	29.7	30.7
c	24.0	22.8	25.0	21.0	23.6	28.2	22.3	30.6	22.0	31.8	24.9	22.5	26.1
d	22.0	17.8	19.8	25.1	30.5	21.2	18.6	22.3	33.9	23.3	34.1	22.5	20.7
e	14.3	2.4	1.8	3.9	24.9	1.8	2.5	4.5	26.7	4.6	7.7	12.8	13.4

Q3/06	Q4/06	Q1/07	Q2/07	Q3/07	Q4/07	Q1/08	Q2/08	Q3/08	Q4/08	Q1/09
11.4	8.7	11.1	6.5	20.5	14.0	13.4	8.1	13.2	12.9	9.2
35.9	28.5	23.7	23.5	43.7	35.7	38.0	33.2	37.0	32.1	29.9
24.9	26.5	27.1	26.4	21.1	23.8	23.0	27.8	27.9	24.7	28.7
23.9	28.7	26.7	28.4	10.3	21.0	21.2	21.0	15.8	19.8	20.4
4.0	7.6	11.5	15.2	4.4	5.5	4.4	9.9	6.1	10.5	12.0

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;

Figure 1 Methods of calculating the expected inflation

$\pi_t = \alpha + \beta\pi_t^e + \varepsilon_t$ where π_t^e is the expected inflation for period *t* forecasted in period *t-1*.

	α	β	R^2	X^2 for H
Central limit t	0.79 (1.43)	-0.01 (0.05)	0.00	31.91 [0.000]
Logistic	0.86 (1.42)	-0.09 (0.19)	0.00	5.85* [0.053]
Normal	0.79 (1.44)	0.01 (0.12)	0.00	278 [0.00]
Uniform	0.84 (1.41)	-0.07 (0.15)	0.00	5.34* [0.069]

$\pi_t = \alpha + \beta\pi_t^e + \varepsilon_t$ where π_t^e is the average expected inflation for period *t* forecasted in period *t-1*.

	α	β	R^2	X^2 for H
Central limit t	0.69 (1.32)	-0.01 (0.04)	0.00	26.19 [0.000]
Logistic	0.74 (1.41)	-0.11 (0.26)	0.01	7.01* [0.03]
Normal	0.68 (1.31)	0.01 (0.11)	0.00	204 [0.00]
Uniform	0.73 (1.4)	-0.11 (0.23)	0.00	6.24* [0.044]

$\pi_t = \alpha + \beta\pi_t^e + \varepsilon_t$ where π_t^e is the expected inflation for period *t+1*.

	α	β	R^2	X^2 for H
Central limit t	-0.02 (0.45)	0.43 (61.73)	0.9966	7308 [0.000]
Logistic	-0.39 (1.59)	1.61 (8.68)	0.85	10.74 [0.00]
Normal	0.16 (3.18)	0.23 (42.65)	0.9929	21372 [0.00]
Uniform	-0.36 (1.66)	1.71 (10.04)	0.885	17.34 [0.00]

$\pi_t = \alpha + \beta\pi_t^e + \varepsilon_t$ where π_t^e is the average expected inflation for period *t+1*.

	α	β	R^2	X^2 for H
Central limit t	0.012 (0.25)	-0.81 (36.79)	0.990	7401.77 [0.000]
Logistic	0.01 (0.12)	1.47 (15.08)	0.946	25.8 [0.000]
Normal 19209.34	0.03 (0.63)	0.25 (43.56)	0.992	 [0.000]
Uniform	(0.03) (0.24)	1.58 (17.21)	0.96	43.3 [0.000]

ENDNOTES

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Albania.

[1] The data series on expected inflation in annual terms is still short to derive statistically significant conclusions.

[2] See Roberts (1997), for instance.

[3] Estrella and Fuhrer (1998) make a critique on the models assuming entirely rational expectations.

[4] In our version, we have replaced the expected 12-month inflation rate with the expected 3-month inflation rate given the nature of questions in the Albanian Consumer Confidence Survey.

[5] Where Π is not connected with the inflation, but with the number 3.14.

[6] The expected inflation rates are measured based on a series of only 24 terms.

[7] These tests imply, on one hand, the testing of the periodic revision of forecasts from the economic agents, including their errors, in light of more updated information or the acceptance of the macroeconomic efficiency testing in order to test the expectations rationality.

[8] This way of behaviour is referred to as adaptive, while the vice versa is termed rational.

[9] In the questionnaire, the question on the annual prices was first applied in March 2005.

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