Alternative indifference limens for the Carlson-Parkin method

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December 20, 2015

Abstract

This paper proposes an enhancement to the well-known Carlson-Parkin method for the quantification of qualitative inflation expectations. The traditional approach makes use of information that is not available at the time of expectation formation, introduces an assumption hindering tests for unbiasedness of expectations and makes the quantification results depend on the timeframe over which expectations are quantified. This paper proposes an approach that does not suffer from these drawbacks. The main idea is to let the indifference limen, the central parameter in the Carlson-Parkin method, depend on past magnitudes of inflation change. The paper outlines the approach and demonstrates its application to Euro Area inflation expectation data.

Highlights:

- New calculation method for Carlson-Parkin indifference limens
- Completely based on past magnitudes of inflation change
- No unbiasedness assumption necessary
- Resulting quantified expectations do not depend on future inflation or the quantification timeframe

1 Introduction

For many reasons researchers and practitioners need quantitative inflation expectations. However, many surveys of consumers and business people ask only for qualitative expectations. One reason for this phenomenon is that qualitative questions are easier to answer and are thus assumed to increase the likelihood of response. To transform qualitative survey results into quantitative inflation expectations several methods have been proposed in the literature, the most popular of which is the approach developed by Carlson and Parkin (1975), with various extensions. To raise the scale level of the expectations, the Carlson-Parkin method, as any other quantification method, must integrate information into the survey results that is not present in the original data. Carlson and Parkin (1975) do this by introducing an assumption about the average expected inflation value.

This paper argues that this assumption is difficult to maintain, and proposes a replacement assumption that eliminates the three main problems associated with Carlson/Parkin's (1975) original approach.

2 The Carlson-Parkin method and its drawbacks

Carlson and Parkin (1975) propose an estimator for the population's mean inflation expectation for time t produced at time t_0. With A_t, B_t and C_t being the shares of survey respondents expecting inflation to rise (i.e., be higher at t than at t_0), fall and stay the same, respectively, and assuming normally distributed individual expectations $\Delta \pi_{it}^e$ of the change in the inflation rate they derive

$$\Delta \pi_t^e = \delta \frac{a_t + b_t}{a_t - b_t} \tag{1}$$

as the population's mean expected change in inflation, where $a_t = \Phi^{-1}(B_t)$, $b_t = \Phi^{-1}(B_t + C_t)$ (with $\Phi^{-1}(\cdot)$ being the inverse of the normal distribution) and δ is an indifference limen representing the amount of absolute inflation change that must be exceeded to make respondents perceive a change in inflation (and answer accordingly). Carlson and Parkin (1975) assume this indifference limen to be same for all individuals and constant over time. To derive a numerical value for the limen they assume that expectations are correct on average:

$$\delta = \frac{\sum\limits_{t=\underline{T}}^{\overline{T}} \Delta\pi_t}{\sum\limits_{t=\underline{T}}^{\overline{T}} \frac{a_t+b_t}{a_t-b_t}} \qquad (2)$$

where $[\underline{T},\overline{T}]$ is the time interval for which expectations are quantified.

The Carlson-Parkin method suffers from several problems of which Nardo (2003) provides a detailed account. This paper focuses on three points regarding the indifference limen the third of which has – to my knowledge – not yet been discussed in literature:

1. The indifference limen depends on future inflation. This makes it impossible to calculate quantified expectations *before* actual inflation is realized. It also makes it difficult to interpret the quantified expectations as the *survey respondents'* expectations because survey respondents obviously have no knowledge of future inflation.

2. The indifference limen makes the expectations correct on average. This is sometimes referred to as assuming unbiasedness. In fact, it is only a necessary condition for unbiasedness if we test unbiasedness by the joint hypothesis $\alpha = 0, \beta = 1$ in the regression $\pi_t = \alpha + \beta\pi_t^e$. Anyway, it imposes some structure on the data that makes tests of expectation properties more difficult.

3. The indifference limen depends on the interval $[\underline{T},\overline{T}]$. This means that expectations for any time t depend on the choice of the timeframe over which expectations are quantified and thus on a choice made by the researcher for the purpose of his work. Of course, survey respondents' expectations will in reality not depend on that choice. Figure 1 presents the spread of six-months-ahead inflation expectations depending on the length of the $[\underline{T},\overline{T}]$ interval that has been varied between 48 and 124 months.[1] The smallest interval represents the forecasted time period July 2004 to June 2008; the longest interval runs from July 2004 to August 2014.

3   Substituting the unbiasedness assumption

In this section, we propose a new type of limen. The limen depends on (1) the magnitude of (*absolute*) inflation at the time the expectations are formed (t_0) and (2) the typical magnitude of inflation *change*. Feature (1) relates to the Weber-Fechner law that Henzel

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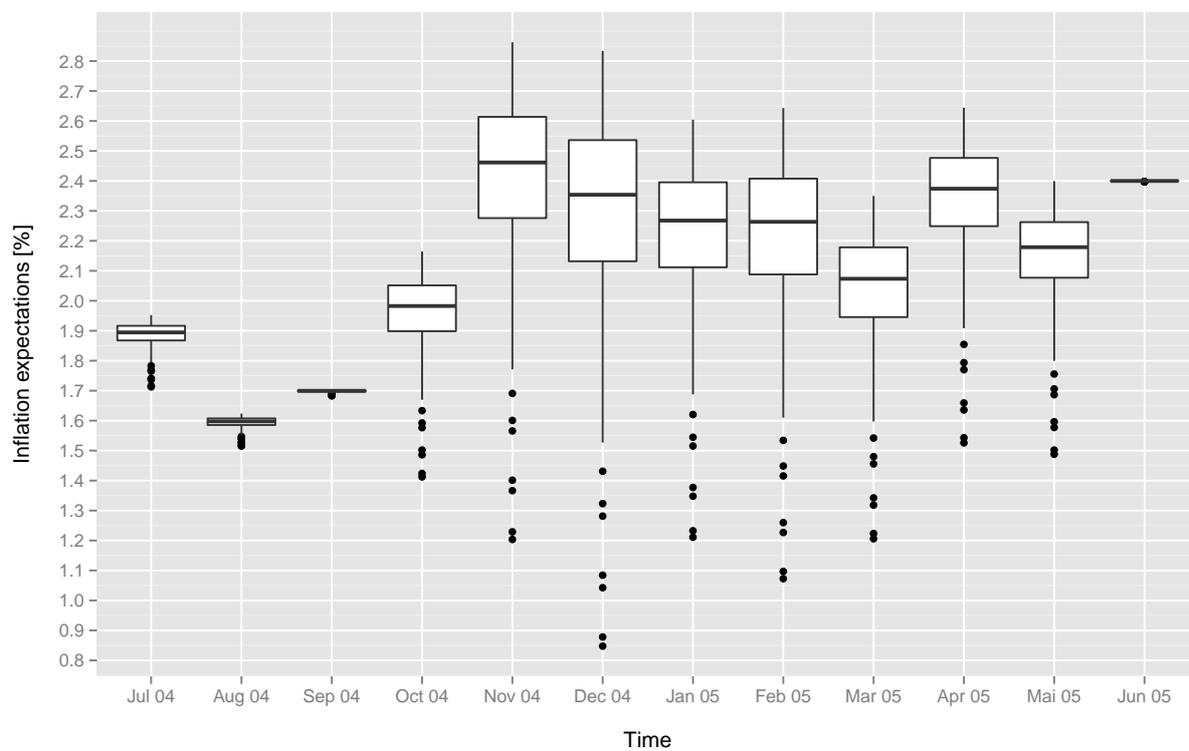[1]The dataset is presented in section 4.

Figure 1: Spread of inflation expectations depending on the quantification interval $[\underline{T}, \overline{T}]$

and Wollmershäuser (2005) employ for limen derivation (they maintain, however, the unbiasedness assumption). The calculation of the limen is now performed in the following way:

1. Calculate the median change of inflation over n periods *before* the expectations are formed and take a certain share of the result as the relative limen:

$$\theta_{t_0} = f \cdot median \left(\frac{\pi_i - \pi_{i-1}}{\pi_{t-i}} \right) \tag{3}$$

with $i = t_0, .., t_0 - n$, $n \epsilon \mathbb{N}$ and f being a percentage of the median. This step requires fixing the parameter n, the number of past periods over which inflation change is considered, and the parameter f. It might make sense to choose a smaller f in case of expectations of professional forecasters and a larger f for, e.g., consumer surveys, because professionals will likely be more sensitive to inflation changes.

2. Determine the absolute indifference limen by applying the limen factor θ to the level of inflation at time t_0:

$$\delta_{t_0} = \theta_{t_0} \cdot \pi_{t_0} \tag{4}$$

The limen can then be inserted into the Carlson-Parkin estimator.

This approach provides several advantages over the classical Carlson-Parkin limens:

- The limen does not depend on future inflation any longer. Its calculation is entirely based on information that is potentially available to survey respondents at time t_0.

- The limen does not impose any unbiasedness condition that makes tests of expectations characteristics such as unbiasedness possible.

- The limen is time-varying because the timeframe over which past inflation changes are considered moves with t_0 and the result is applied to the current inflation at time t_0.

- The limen does not depend on the timeframe over which expectations are quantified.

4 Application of the new indifference limen

As an example of the application of the new limen type this section presents quantified inflation expectations for six-months-ahead Euro Area inflation based on qualitative data from the Financial Market Report, a publication of the Centre for European Economic Research (ZEW) at the University of Mannheim, Germany. For the Financial Market
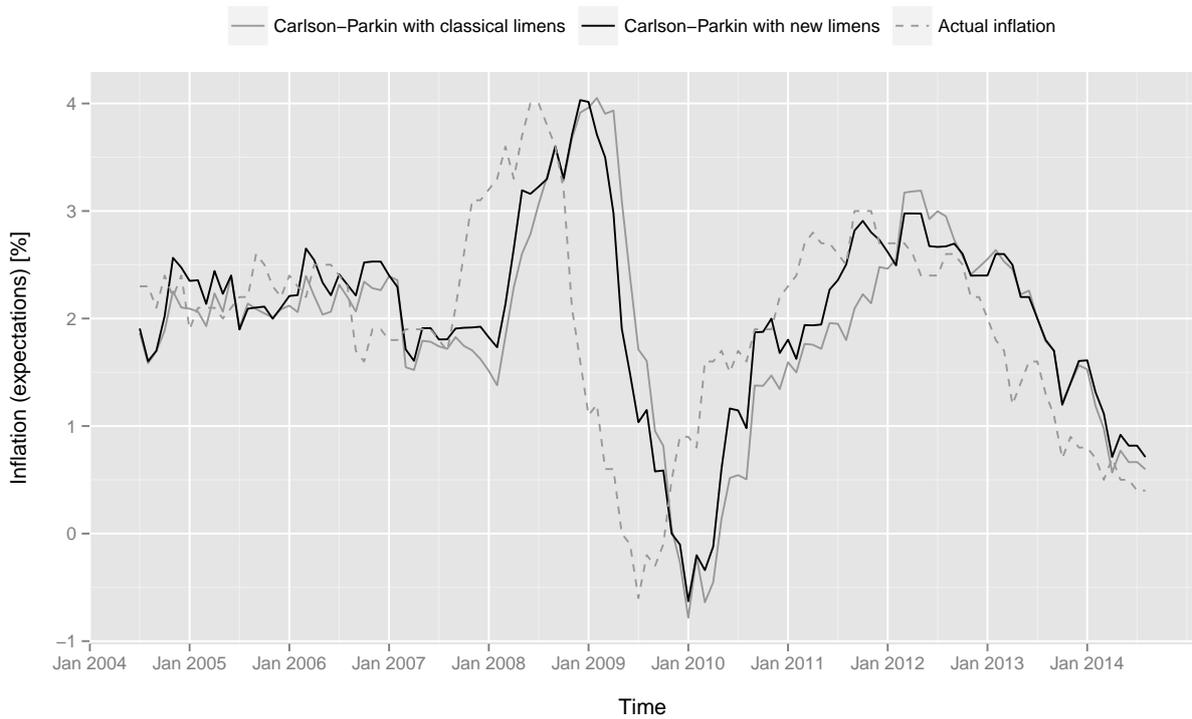
Figure 2: Eurozone inflation expectations quantified with the traditional Carlson-Parkin method and the new limen

Report, more than 350 analysts from banks, insurance firms and large industrial companies are surveyed each month. The quantification based on the traditional Carlson-Parkin method and the Carlson-Parkin method with the new limen is presented in figure 2. The new limen has been calculated with parameters $f = 0.3$ and $n = 12$ months. The deviation between actual inflation and the quantified expectations as measured by the mean absolute error (MAE) is a bit lower for the new than for the traditional Carlson-Parkin method (0.62 versus 0.72 percentage points). Figure 3 presents the sensitivity of the results to the choice of f, which is obviously very moderate (MAE between expectations quantified with $f = 0.1$ and $f = 0.5$ is 0.05 percentage points). A similiar picture results when analyzing the sensitivity to changes in n.

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Figure 3: Sensitivity of the quantification results to the choice of the limen parameter f

5   Conclusion

This paper proposes a new approach to determining the indifference limen used in the Carlson-Parkin method for quantification of qualitative survey results. The proposed limen does not depend on future inflation rates which is not known to survey respondents at the time of expectation formation, nor does it use any type of unbiasedness assumption or makes the quantification results depend on the timeframe over which expectations are quantified. The new limen can be utilized as an alternative to the traditional Carlson-Parkin limen and as a means for checking the robustness of the results achieved by employing the traditional approach.

References

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