International Journal of Forecasting 31 (2015) 51–62

Contents lists available at ScienceDirect

International Journal of Forecasting

journal homepage: www.elsevier.com/locate/ijforecast

Quantifying survey expectations: A critical review and generalization of the Carlson–Parkin method

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ARTICLE INFO

Keywords:
HOPIT model
Household data
Inflation rate

ABSTRACT

This paper provides a critical review of the popular Carlson–Parkin (CP) quantification method using household-level data from the University of Michigan's *Survey of Consumers*. We find strong evidence against the threshold constancy, symmetry, homogeneity, and overall unbiasedness assumptions of the CP method. To address these violations, we generalize the CP method using a hierarchical ordered probit (HOPIT) model. By comparing the quantified inflation expectations with quantitative expectations obtained from the same set of households directly, we show that the generalized model performs better than the CP method. In particular, when the CP unbiasedness assumption is replaced by a time-varying calibration, the resulting quantified series is found to track the quantitative benchmark well, over diverse time periods.

1. Introduction

Household and business surveys that elicit qualitative/ordinal responses provide important information about respondents' expectations and perceptions on many aspects of overall business and economic conditions. Quantified information extracted from these less demanding surveys is often used by researchers and policy makers in forecasting macroeconomic aggregates and testing canonical economic theories like the rational expectations hypothesis (REH), see Pesaran and Weale (2006).

Since the seminal paper of Theil (1952), researchers have scrutinized various quantification methods, of which the approach suggested by Carlson and Parkin (1975), henceforth CP, is arguably the most appealing one. Even though the CP method (and the probability approach in general) is used widely, many existing studies have reported evidence of considerable errors associated with the quantified series it produces (e.g., Löffler, 1999; Terai, 2009). To address this issue, a number of studies have evaluated, refined, and extended this method.[1] Early comparisons of different approaches are provided by Dasgupta and Lahiri (1992) and Smith and McAleer (1995). A more recent review of quantification methods is given by Nardo (2003), with a focus on the shortcomings of different approaches in modeling ordinal responses.

In this paper, we provide a critical review of the latest evidence regarding the assumptions made in the CP approach, together with a feasible generalization of the method. Using matched qualitative and quantitative micro-level data from the University of Michigan's Surveys

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[1] See, among others, Balcombe (1996), Batchelor (1986), Batchelor and Orr (1988), Dahl and Xia (2004), Fishe and Lahiri (1981), Kanoh and Li (1990), Maag (2010a,b), Mitchell (2002), Scheufele (2011), Seitz (1988), Smith and McAleer (1995), and references therein.

http://dx.doi.org/10.1016/j.ijforecast.2014.06.003
0169-2070/

of Consumers on one-year-ahead inflation expectations, we evaluate the CP assumptions on threshold constancy, symmetry, homogeneity, and overall unbiasedness by comparing the CP quantified expectations with aggregated quantitative expectations from the same set of households over the period 1978–2012 using monthly observations. We then cast and generalize the CP method in an ordered choice model that relies on less restrictive assumptions. The performance of this generalized model is tested by using it to quantify the same qualitative survey data and comparing the results with both the CP estimates and the quantitative responses from the survey. Two alternatives to the CP unbiasedness assumption are proposed and evaluated. The first alternative relies on a rolling-window regression, and the second employs a time-varying parameter model. The generalized model and the alternative calibration schemes we advocate in this paper are applicable to a wide array of data sets and can be implemented easily in real time.

This study fills two gaps in the existing literature. First, even though there is a rich body of literature on the performance of the Carlson–Parkin method, to the best of our knowledge, no study has modeled both the time variation and the cross-sectional heterogeneity (in the thresholds as well as the variances) and examined their effects on the performance of the CP method. In a recent study, Breitung and Schmeling (2013) report a "surprisingly weak correlation" between the quantified and quantitative forecasts of stock returns, which is attributed to the importance of time-varying and heterogeneous thresholds. They argue analytically that when the variance of the target variable greatly exceeds that of the individual expectations, cross-sectional heterogeneity plays little role in determining the performance of the CP method. While this is likely to be true for highly volatile targets like stock returns, the situation could be different when the variable of interest is consumer expectations for a closely-monitored and tightly-controlled variable like the inflation rate or the real GDP growth rate. Nevertheless, there is a clear need for less restrictive assumptions about the thresholds. The generalization we propose in this paper addresses this issue directly by allowing for time-varying and heterogeneous thresholds. Secondly, while quantified household inflation expectations from the *Survey of Consumers* are often used in forecasting (e.g. Ang, Bekaert, & Wei, 2007) or for testing the REH (e.g. Souleles, 2004), no study since those of Batchelor (1986) and Fishe and Idson (1990) has examined the quality of these quantified expectations by comparing them with the quantitative expectations.[2] It is certainly both important and informative to benchmark the quantified expectations against the target variable, e.g., the official statistic. However, as was first pointed out by Dasgupta and Lahiri (1992), in general, a lack of fit alone should not be considered a sign of poor performance of the quantification method, due to the existence of unforeseen aggregate shocks. We also study the effects on the quality of the resulting estimates of two alternative identification schemes that relax the CP unbiasedness assumption.

We find strong evidence against the threshold symmetry, constancy, and homogeneity assumptions of the Carlson–Parkin method. When these assumptions are relaxed, materially important improvements in the quantified expectations are observed, particularly during tumultuous periods with high levels of disagreement in individual responses and asymmetric shocks. As long as the same unbiasedness assumption is imposed as in the CP method, allowing for cross-sectional heterogeneity does not seem to increase the correlation between the quantified expectations and the quantitative benchmark significantly. This problem can be alleviated by replacing the unbiasedness assumption with more flexible calibration schemes. Using a rolling-window linear regression calibration scheme or a time-varying parameter scheme, we obtain quantified expectations that have significantly higher correlations and lower root mean squared errors (RMSE) than the mean of the quantitative survey responses.

The structure of the paper is as follows. In the next section, we introduce the data from the *Survey of Consumers* used in this study. In Section 3, we present our theoretical framework and briefly describe the Carlson–Parkin method. We extend the method using a generalized ordered choice model that allows for time-varying and heterogeneous thresholds and variances explicitly. In Section 4, we use matched household inflation expectations data to evaluate the assumptions and the performance of the CP method. We also compare the estimates it produces with those produced by the generalized model. The two alternative calibration schemes are discussed in this section as well. Concluding remarks are presented in Section 5.

2. Inflation expectations data

Data on household-level matched qualitative and quantitative inflation expectations are obtained from the Surveys of Consumers. These data are also used to construct the well-known Index of Consumer Sentiment (ICS). The survey has been being administered on a monthly basis by the Survey Research Center of the University of Michigan since 1978. Some earlier studies of household inflation expectations used this survey dataset starting in 1966, when it was still administered quarterly, e.g., Fishe and Lahiri (1981). The sample size decreased from around 1000 to 700 households per month during the early 80s, further declined to around 500 households by about 1988, and remained steady thereafter. The survey features a rotating panel sample design, where survey respondents are reinterviewed six months after they were randomly drawn into the sample. Due to lower response rates for the second interviews, in a typical month, about 60% of the respondents are new and 40% were interviewed six months previously.

The survey covers many aspects of household expectations and perceptions, as well as household socio-demographic characteristics. Among other things, the survey asks about expectations and/or perceptions on household financial situations, overall business conditions,

[2] A number of studies have used matched quantitative and qualitative data from other sources, e.g., Breitung and Schmeling (2013), Defris and Williams (1979), Lui, Mitchell, and Weale (2011a,b), and Müller (2009).