and "The Origins of American International Retailing: Tiffany of New York in London and Paris, 1837–1914" (Business History Review [2017]), among other works.

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The Behavioral Economics of Inflation Expectations: Macroeconomics Meets Psychology. *By Tobias F. Rötheli*. New York: Cambridge University Press, 2020. 243 pp. Illustrations, references, index. ISBN: 978-1-108-44706-5.

Reviewed by Richard Curtin

The basic premise of this book is that the formation of economic expectations "consists of extrapolating simple time series patterns for the variable to be forecast" (p. 3). The model of pattern-based extrapolation is not simply a measurement technique but a theory of expectations that is based on time-invariant characteristics of human subjective forecasting. Humans excel at pattern recognition, and their experience of past patterns determines their future expectations.

Author Tobias F. Rötheli used a visual depiction of each pattern in an economic series and asked respondents to estimate its future value. Each data pattern was then matched to the observed data in the history of some economic data series, using the expectation associated with each pattern as its expected future value. Expectations are more commonly estimated by contemporaneous surveys, whereas this new method has no such limitation. This new theory enables an analysis of expectations on behavior in historical periods as well as in more modern times. Indeed, the book contains estimated inflation expectations back to the year 1702 for the United Kingdom and back a half century for many other economic series for a wide range of countries. The efficiency of this new technique is that it requires a "once-only survey" to form expectations that cover the entire history of an economic series, both past and future (p. 9).

Rötheli describes in the first five chapters the procedures he used to form these new estimates of expectations. The critical assumption is that people have an innate ability to recognize patterns based on just a few past observations. There were three steps to his estimation process. In the first step, a lab survey was conducted that asked respondents to associate future expectations with each pattern based on the preceding four (and later three) observations. In the second step, another lab survey asked respondents to match the basic patterns used in the prior step with actually observed patterns in the selected economic statistic.

Similarity weights apportioned the total weight to one or more of the chosen patterns by the proportion of subjects who selected each matching pattern. The final step calculated scaling weights to bring the estimated expectations in line with the observed rates of change in the actual economic series.

This behavioral estimation methodology used by Rötheli is quite distinctive. He frequently refers to data collected in a laboratory setting. No experiment was conducted, however—only answers to survey questions about the implications of the patterns observed were recorded. Presumably he prefers the term "lab survey" because his hypothesis depended on pattern visualization, which could be best shown by the patterns the data formed on charts as well as allowing the respondent to visualize how the expectation fit within the pattern.

I will focus on just two critical aspects of Rötheli's unique methodology. First, his analytic framework assumes that all information necessary to form economic expectations is contained in its relatively recent patterns of change in the variable itself. Second, people form expectations easily and automatically by recognizing patterns based on an innate mental faculty, and that skill exhibits little variance across people and over time.

It seems hardly worth mentioning that the economic and psychological literature rarely restricts agents to base their expectations solely on the recent history of the variable. Rötheli argues that parsing the total multiperiod change into up-trends, down-trends, or mixed trends extracts more information that is relevant for forming expectations than simply basing estimates on the individual figures. He uses the inductive logic of psychology to spell out the behavioral formation process and then switches to the deductive logic of economics to test its usefulness in models. This nicely illustrates the point made in the book's subtitle, "macroeconomics meets psychology." The implications of this division are made clear in chapter 6. In a comparison of the year-ahead inflation expectations drawn from population surveys conducted by the University of Michigan, Rötheli finds that "pattern-based expectations cannot claim to be a superior predictor of inflation" (p. 71). Rather, he notes that pattern-based extrapolation is "not primarily a forecasting tool. It is a descriptive model of how people form expectations" (p. 77). This serves to justify his simultaneous use of both methodological standards.

The assumption that pattern recognition was innate with little variation across time or people was presumably the reason the lab survey can be conducted just once, based on very small numbers of subjects (usually about fifty per survey), with the student subjects only selected to be knowledgeable about economic concepts and jargon, rather than for

pattern recognition skills. There is no information given about the usual survey metrics that are typically used to define the quality and reliability of survey data.

The balance of the book devotes chapters to judging the relative performance of pattern-based expectations in various models: inflation, its heterogeneity and uncertainty, the Phillips curve, interest rates (nominal and real), income expectations, and the Fischer effect, with separate analyses for US, Asian, and African economies. These comparison tests generally found that pattern-based expectations performed quite well. The organization of the materials suggests that the contents were ordered by how the research evolved over time. A reorganization would have started with a discussion of the "generalized model" (now in chapter 10) that used three instead of four observations to define the relevant data pattern and formed the basis for the extensive listing of expectations at the end of the book. Notably, the author makes all files needed for the computation of expectations available on the book's website.

All models that use some form of extrapolation—including adaptive, learning, and error correction models—can be shown to be equivalent to a weighted average of past realizations by the Koyck transformation (*Distributed Lags and Investment Analysis* [1954]). The dominance of pattern-based extrapolations over the more traditional forms of extrapolation would establish the unique power of the embedded patterns. In these models, the independent variables, the impact of the "patterns," and the dependent variable would be the subsequent period-to-period change. Such a model would be more in line with traditional economic models. Presumably, if the dominance of pattern-based extrapolation proved to be true, it would quickly revolutionize conventional economic research.

RICHARD CURTIN, University of Michigan, Ann Arbor, MI

Richard Curtin is director emeritus of the University of Michigan's expectations surveys, which he directed from 1976 to 2022, and currently a research professor at the University of Michigan. His latest book is Consumer Expectations: Micro Foundations and Macro Impact *(2019).*