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A biannual recession-forecasting model

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ABSTRACT

The model predicts out-of-sample whether an NBER-defined peak or trough will occur within the next half-year. It yields a 100% proportion of correct recursive forecasts from 1970 to 2015. All the necessary data are readily available in un-revised form.

1. Introduction

Reliably forecasting the turn in the cycle has long been the elusive Holy Grail of empirical macroeconomics. In this paper, I develop a biannual forecasting model that predicts whether a turn in the U.S. business cycle will occur within six months. The model correctly forecasts, out-of-sample and with no false-positives, ALL recessions in the U.S. since the early 1970s, a success rate seldom matched by other forecast models. Overall, the model herein provides a potentially longer advance warning than one-quarter-ahead models, and outperforms Wright's (2006) yield spread and fed funds model.

The payoffs to anticipating turning points reliably are significant and benefit all sectors of society.[1] First, it is imperative for the Federal Reserve to recognize the peak before it occurs; otherwise, it may delay the necessary easing, or it may continue to tighten even after a recession has begun.[2] Second, risk-management models perform poorly independently of recession forecasts. Trusting their value-at-risk models, and unable to predict the looming recession, financial firms required trillions of dollars from the public trust to avoid ruin during the recent global Great Recession. Third, Peláez (2015a) shows that switching out of stocks when the probability forecast of recession equals or exceeds 0.5, is extremely profitable. Fourth, uncertainty, and fear regarding the direction of the economy has important negative macroeconomic consequences. Fifth, forecasts are most useful and forecast errors are largest, when the economy veers suddenly from its recent trend.

The next section shows the biannual state variable as it relates to the official NBER monthly and quarterly chronologies. Section 3 identifies the objectives guiding model selection. Section 4 presents full-sample estimation results. Section 5 shows

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[1] Real GDP dropped by 4.25% from 2007Q4 to 2009Q2. During the last ten recessions real GDP contracted on average by 1.87% from the NBER-designated peak to the trough.

[2] Greenspan (2001) noted, "In many of the postwar recessions Fed policy continued to tighten even after the recession had begun, either because inflation was a particular problem or because recognition of the deteriorating state of the overall economy was slow to occur."

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recursive probability forecasts for 1970–2015. Section 6 shows alternative forecast results obtained with a yield spread and fed funds model. Section 7 tests for robustness. The final section concludes.

2. The binary state variable

The Business Cycle Dating Committee (BCDC) of the National Bureau of Economic Research (NBER) sets the official monthly and quarterly chronologies of peaks and troughs for the U.S. economy. It views recessions as "*a significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income less transfer payments, and real wholesale-retail sales*" (BCDC, 2001). The BCDC (2008) notes, "*a recession begins when the economy reaches a peak of activity and ends when the economy reaches its trough*." The committee waits about one year to announce the turn, or until product and income measures of economic activity confirm. Table 1 shows the official monthly and quarterly chronologies.

Due to the noise factor in monthly series, practically all empirical work on business cycles utilizes quarterly data consisting of averages of monthly observations. No other work utilizes a semi-annual chronology for the U.S. We construct one in which the state variable, Z_t, is unitary from the calendar half-year containing an NBER peak month to the calendar half-year containing the next trough month, and is zero otherwise. See columns 4 and 5 in Table 1.

Instead of forecasting recession start or end dates, the model forecasts the half-year of the turn. Clearly, recession start or end dates need not coincide with the turn. If the peak occurs in the last month of the half-year, the recession could begin one or two months later. Consider the NBER peak of December 2007. Monthly coincident measures of economic activity grew in December 2007, and in January 2008. The currently available data shows that a broad contraction began in February 2008 (Peláez, 2015b).

Depending on when the turn occurs, the semi-annual model uses information more efficiently than a quarterly model that forecasts two-quarters ahead. Consider the NBER peak of March 2001. While September 2000 is the estimation cut-off point for a quarterly model that forecasts two-quarters ahead, December 2000 is the cut-off point of a semi-annual model forecasting for the first half of 2001. The advantage of the additional three months of data disappears if the peak occurs in the second quarter of the half-year, say, in June 2001. In that case, both models use data through December 2000.

Fig. 1 shows that the growth rate of real GDP is congruent with the binary Z_t variable shown as shaded bars extending from peak to trough.[3] GDP growth decreased before each semi-annual peak since 1947, averaging −0.61% in the shaded areas, while remaining positive in the clear areas where it averages 4.29%.

3. Modeling objectives

Predictive accuracy, parsimony, and robustness are sought-after objectives. Parsimony is important for several reasons. First, if irrelevant regressors proxy for omitted variables, biased forecasts result when either suffers a break. Second, as the number of regressors with small partial effects increases, so does forecast variance. Third, unnecessary parameters usually lead to higher coefficient standard errors, making it more difficult to detect significant relationships. Fourth, over-parameterized models may fit data-specific features such as outliers or noise that are not replicated out-of-sample, i.e., the models fit the in-sample data well, but yield inaccurate out-of-sample forecasts. Fifth, a parsimonious model designed to forecast the turn should outperform large-scale macro models containing complex interactions among many variables and feedback effects. Greenspan (2001) attributed forecast failure to the fact that in some models a decrease in aggregate demand induces a sufficiently rapid fall in interest rates to rebalance economy before it falls into recession. Greenspan (2001) also cautions that forecasting recessions is more luck than skill.[4] Stockton (2000) observes: "... as I noted in the July chart show, the staff [of the FOMC] – and for that matter virtually all economic forecasters – fail to reliably forecast recessions" (Transcript, FOMC Meeting of December 19, 2000, p. 11).[5]

Models are robust in the measure that predictive accuracy does not deteriorate beyond the estimation sample. Generally, models selected using ex post or latest-revised data perform well in-sample, but do poorly in real-time. Diebold and Rudebusch (1991) show that the U.S. index of leading economic indicators (LEI), does well predicting recessions ex post, but not in real-time. Thus, model selection, estimation, and forecasting utilize only series that are not benchmarked or otherwise revised.[6] The result is a strikingly robust model.

[3] The growth rate of GDP is from end-of-period to end-of-period.

[4] "In any event; I would conclude that we do not have the capacity actually to forecast a recession" (see Transcript, FOMC Meeting, January 30–31 2001, p. 125).

[5] Stockton served as director of the Division of Research and Statistics at the Board of Governors of the Federal Reserve.

[6] Almost all economic time series are obtained by sample surveys and require multiple revisions to correct for sampling and non-sampling errors. Sampling error results from using a sample to draw inferences about a population. Non-sampling error originates with measurement, response, and processing errors common to all surveys. Sample-based series are benchmarked periodically to revised population totals, sometimes to the point that the signs of the original growth rates are reversed. Additionally, the sampling instrument, and sample coverage change over time. There is also the issue of periodic sample rotation. In some cases macroeconomic series undergo definitional/compositional revisions. If the new and old series are not comparable, previously formulated models are useless.