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On the directional accuracy of forecasts of emerging market exchange rates

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ABSTRACT

We use survey data to study whether the exchange-rate forecasts made by professional forecasters are informative with respect to the direction of subsequent changes of (Asian, Eastern European, and South American) emerging market exchange rates. While results vary across exchange rates, we find that forecasts often contain information with respect to directional changes of exchange rates. We derive our empirical results using techniques developed to analyze relative operating characteristic (*ROC*) curves.

1. Introduction

Since the seminal work of Meese and Rogoff (1983) a key stylized fact of the international-finance literature has been that forecasts of exchange-rate fluctuations derived from structural macroeconomic models of exchange-rate determination hardly perform better than simple random-walk forecasts, and increasingly complex models have been advocated to forecast the returns and the volatility of exchange rates (see, for example, Huang, Peng, Li, & Ke, 2011; Yuan, 2011). The poor forecasting power of structural models has led researchers to study in detail the properties of survey data of exchange-rate forecasts of professional forecasters. Results of much significant empirical research, however, show that survey data of exchange-rate forecasts often violate traditional criteria of forecast rationality (for a survey, see MacDonald, 2000). Accounting for the possibility that professional forecasters form exchange-rate forecasts under an asymmetric loss function does not necessarily weaken evidence against forecast rationality (Fritsche, Pierdzioch, Rülke, & Stadtmann, 2014, 2015). Moreover, results of recent empirical research demonstrate that professional forecasters anti-herd when they form their exchange-rate forecasts (Pierdzioch & Stadtmann, 2010). In the case of emerging market exchange rates, Pierdzioch, Rülke, and Stadtmann (2012) report strong evidence of forecaster anti-herding. Forecaster anti-herding implies that exchange-rate forecasts are biased predictors of subsequent changes in exchange rates because forecasters seek to differentiate their forecasts from the forecasts of others. Attempts to differentiate one's forecasts from the forecasts of others naturally arise if forecasters have a non-standard loss function that, for example, depends on relative forecast accuracy (Laster, Bennett, & Geoum, 1999).

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Hence, while forecaster anti-herding helps to explain why classic unbiasedness tests often signal violations of forecast rationality, it does not necessarily imply that forecasts in fact are irrational. As a result, forecaster anti-herding, biases in forecasts, and violation of traditional criteria of forecast rationality warrant the application of instruments other than traditional tests of forecast rationality to study the informational content of exchange-rate forecasts. In this research, we apply one such instrument. The instrument that we apply to study the properties of survey data of exchange-rate forecasts sheds light on the accuracy of forecasts with regard to the direction of change of subsequent exchange-rate fluctuations. Even if exchange-rate forecasts are biased predictors of exchange-rate fluctuations, they still may be useful predictors of the direction of change of exchange rates.

In earlier research, it has been common practice to study the directional accuracy of forecasts extracted from survey data by means of market-timing tests that have been widely studied in the finance literature (Schnader & Stekler, 1990; Stekler, 1994; Sinclair, Stekler, & Kitzinger, 2010; Fritsche, Pierdzioch, Rülke, & Stadtmann, 2013, see Baghestani, 2010 for an application to exchange-rate forecasts, see also Bofinger & Schmidt, 2003). We go beyond earlier research in that we use techniques developed for the analysis of relative operating characteristic (*ROC*) curves to study the directional accuracy of survey data of exchange-rate forecasts of professional forecasters with regard to the direction of change of subsequent exchange-rate fluctuations. While the techniques for the analysis of *ROC* curves have been extensively studied in disciplines like meteorology and radiology, *ROC* curves have been popularized in economics only very recently. Lahiri and Wang (2013) use *ROC* curves to study survey data on probability forecasts of GDP declines, Stein (2005) uses *ROC* curves for default prediction of loans, and Berge and Jordà (2011) use *ROC* curves to study the directional accuracy of indicators of business-cycle fluctuations. In the international finance literature, Jordà and Taylor (2012) use *ROC* curves and trading rules to study the directional accuracy of various forecasting models for exchange rates in major industrialized countries. While they apply techniques developed for the analysis of *ROC* curves in the context of exchange-rate forecasting, they do not study the directional accuracy of survey forecasts of exchange rates, and they do not study emerging-market exchange rates.

A *ROC* curve visualizes the directional accuracy of forecasts by plotting the rate of true signals (sensitivity) against the rate of false signals (one minus specificity) for alternative values of a decision criterion that define signals and nonsignals. In our application, a signal is a forecast of a subsequent depreciation of an emerging market exchange rate. A true signal, thus, occurs if a professional forecaster correctly predicts a depreciation of the exchange rate. A false nonsignal occurs if a professional forecaster does not predict a depreciation of the exchange rate. If forecasts are completely useless with regard to predicting a depreciation of the exchange rate then the rate of true signals should equal the rate of false signals. If, in contrast, forecasts have predictive power with respect to subsequent changes in emerging market exchange rates then the rate of true signals should dominate the rate of false signals. Because a *ROC* curve summarizes the magnitude of the rate of true signals relative to the rate of false signals, the directional accuracy of forecasts can be assessed in terms of the area under the *ROC* curve. A *ROC* curve is easy to compute and, as has been stressed by Berge and Jordà (2011), it does not depend on the shape of a forecasters' loss function, and its properties can be assessed in terms of statistics that have large sample Gaussian distributions.[1]

In our empirical analysis, we study the survey data of exchange-rate forecasts of professional forecasters also studied in earlier research by Pierdzioch et al. (2012), who report evidence of forecaster anti-herding of emerging market exchange-rates. Studying the same survey data as they do is interesting because their dataset covers a broad set of Asian, Eastern European, and South American emerging market exchange rates. Our *ROC*-based empirical analysis suggests that, while empirical results vary across exchange rates, the exchange-rate forecasts made by professional forecasters often contain information with respect to the direction of subsequent changes of emerging market exchange rates. Hence, while forecaster anti-herding, biases in forecasts, and deviations from forecast rationality are certainly important facets of survey data of exchange-rate forecasts, our empirical results suggest that forecasts may still contain useful information regarding the direction of change of emerging market exchange rates.

We organize the remainder of this research as follows. In Section 2, we describe the *ROC*-based method that we use to measure the directional accuracy of forecasts. In Section 3, we summarize our empirical analysis. In Section 4, we offer some concluding remarks.

2. Directional accuracy of forecasts

In terms of notation, we let $E_t s_{t+1}$ denote a period-t forecast of the exchange rate, s_{t+1}, in period of time $t+1$. An actual depreciation occurs when we observe $s_{t+1} > s_t$. We call an actual depreciation of the exchange rate an "event", and an actual appreciation or an unchanged exchange rate a "nonevent". Further, a "signal" occurs when a forecaster predicts a change of the exchange rate that equals or exceeds a decision criterion, $c \in (-\infty, +\infty)$, such that $E_t s_{t+1} - s_t \geq c$. Conversely, a "nonsignal" occurs when a forecast of a change in the exchange rate implies $E_t s_{t+1} - s_t < c$. The rate of true signals (sensitivity) and the rate of true nonsignals (specificity) can then be computed as the relative frequency of the sum of true signals (nonsignals) relative to the sum of all events (nonevents) as follows:

$$SE(c) = Prob\left(E_t s_{t+1} - s_t \geq c \,|\, s_{t+1} - s_t > 0\right), \tag{1}$$

$$SP(c) = Prob\left(E_t s_{t+1} - s_t < c \,|\, s_{t+1} - s_t \leq 0\right). \tag{2}$$

[1] As we shall lay out in detail in Section 2, while constructing an *ROC* curve does not require assumptions regarding forecasters' utility function, the identification of an *optimal* point on an *ROC* curve does depend on the utility function being assumed.