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A reappraisal of the leading indicator properties of the yield curve under structural instability

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Abstract

This paper provides an extensive re-examination of the leading indicator properties of the yield curve in four major developed countries (Canada, Germany, the United Kingdom, and the United States). We study whether the yield spread still qualifies as a useful predictor of real activity in the presence of structural change. Based on tests for multiple structural breaks, we find strong evidence of instability in the relationship between the yield spread and output growth, which allows us to pin down the exact dates associated with these breaks for the different countries. We find that the window selection methods recently developed for forecasting in the presence of structural change generally offer some improvements in terms of forecast accuracy. However, our overall results strongly suggest that the yield curve has been losing its edge as a predictor of output growth in recent years.

Keywords: Yield curve; Macroeconomic forecasting; Structural change; Forecast window selection; Forecast breakdowns

1. Introduction

The slope of the yield curve is one of the most widely followed economic variables. The alertness of professional economists, market watchers and central bankers can largely be ascribed to the large body of empirical literature which has documented the term spread's usefulness for predicting future GDP growth (see e.g. Estrella & Hardouvelis, 1991; Hamilton & Kim, 2002; Harvey, 1989; Stock & Watson, 1989, etc). In recent times, however, concerns have been raised over the fact that the predictive performance of the term spread may be time-variant, and that predictive regressions based on the yield spread may suffer from parameter instability (e.g. Estrella, Rodrigues, & Schich, 2003; Giacomini & Rossi, 2006; Stock & Watson, 2003).

The main goal of this paper is therefore to investigate whether the yield spread is still a useful leading indicator in environments characterized by model instability. Our main focus is on the following two issues: (i) how the out-of-sample (OOS) forecasts of the yield spread for real activity perform, and, more

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significantly, how this OOS predictive performance evolves over time; and (ii) whether newly developed window selection techniques for environments characterized by structural breaks (put forth in a recent article by Pesaran & Timmermann, 2007) may help to enhance the empirical performance of the yield curve for forecasting. Given that the major focus of the previous literature has been on the empirical relationship between the yield curve and subsequent output growth in the US, we consider international data from Canada, Germany, and the UK as additional "hold-out samples" to examine the usefulness of the yield curve as a leading indicator.

While the in-sample predictive performance of the yield curve for real output growth is well studied and established, the time-varying nature of the relationship is comparatively unexplored, and has only begun to receive attention in recent years. A major motivation of this paper is therefore to take a closer look at the time-varying forecasting performance. The main economic rationale for the yield spread's predictive power is that it serves as an indicator of the effectiveness or the stance of the monetary policy (see e.g. Estrella et al., 2003). If the central bank raises short-term interest rates and market participants expect this policy to be effective in curbing inflation in the long run, long-term rates (the averages of future expected short rates, according to the expectations hypothesis) should rise in smaller proportions. Thus, a restrictive monetary policy tends to flatten the yield curve, and at the same time slows down the economy (see e.g. Estrella, 2005). However, there are strong theoretical reasons to believe that the relationship may vary over time. As was noted by Estrella et al. (2003), for instance, the predictive power may depend on underlying factors, such as the form of the monetary policy reaction function or the relative importance of real and nominal shocks in the economy. Both factors may be subject to variation over time, which raises the need to investigate the time-variation of the relationship in greater detail.

To date, most of the papers addressing the issue of model instability have focused on an *in-sample* analysis of time-varying predictive ability, using mainly sub-sample analyses (e.g. Stock & Watson, 2003), parameter stability tests (e.g. Estrella et al., 2003), and time-varying parameter models (e.g. Benati & Goodhart, 2008). However, one may argue that market participants and policy makers are ultimately concerned with *out-of-sample* forecast accuracy, as well as a good predictive performance toward the end of the sample period. Hence, our paper distinguishes itself from the rest of the literature by its explicit focus on the time-varying out-of-sample (OOS) forecasting properties of the yield curve. We illustrate the dynamics of the forecasting ability via diagnostic plots displaying the evolution of squared forecast errors over time, as compared to those of a benchmark model. This approach was recently put forward by Goyal and Welch (2008) in the field of stock return predictability. Using these tools, we document a substantial amount of time-variation in the predictive accuracy of the yield spread which has not previously been shown in the literature. Our findings also suggest that the relative forecast accuracy of models based on the yield spread has generally been rather weak over a prolonged period during the "great moderation period" (Stock & Watson, 2002), for almost all countries considered.

We therefore take a closer look at potential reasons for this degeneration of predictive power, and forecast breakdowns by running several modern (in-sample) tests for parameter stability, in order to back up the OOS evidence by further formal tests. These tests largely corroborate our out-of-sample results. We find that the relationship between the yield curve and output growth is subject to substantial instabilities in all countries considered. Hence, it seems natural to investigate whether methods of optimal forecast window selection – which have recently been put forward by Pesaran and Timmermann (2007) for situations where structural breaks are present – yield a better forecast accuracy when the predictive regressions are plagued by parameter instabilities. According to our findings, these optimal window selection methods typically do a good job of reducing the bias in the forecast errors. There is also some (though not uniform) evidence of improvements in forecast error variance. However, our finding that the OOS forecast capacity of the yield curve has generally become weaker over the recent sample period still holds under these modified forecasting schemes.

We conduct several further investigations in order to provide a more detailed and complete interpretation of our results. The major results of these additional checks can be summarized as follows: (i) using US