Predicting real growth and the probability of recession in the Euro area using the yield spread

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Abstract

Although the spread has been established as a leading indicator of economic activity, recent studies in US and European Union (EU) countries have documented, theoretically and empirically, that the term spread–output growth relationship may not be stable over time and it may be subjected to nonlinearities. Using aggregate data for the Euro area over the period 1970:1–2000:4, we applied linear regression as well as nonlinear models to examine the predictive accuracy of the term spread–output growth relationship. Our results confirm the ability of the yield curve as a leading indicator. Moreover, significant nonlinearity with respect to time and past annual growth is detected, outperforming the linear model in out-of-sample forecasts of 1-year-ahead annual growth. Furthermore, probit models that use the EMU and US yield spreads are successful in predicting EMU recessions.
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1. Introduction

During the last two decades, the literature has accumulated an important volume of studies on the information content of the yield curve, the difference between a long-term interest rate and a short-term interest rate, as an indicator to assess economic conditions and to predict real economic activity.[3] Intuitively, a positive-sloped yield curve is associated with an increase in economic activity, in the rate of inflation and of short-term interest rates. On the contrary, a negative-sloped yield curve is associated with a future decrease in the values of these variables. Formally, these results follow from the combination of the Fisher equation, on one hand, and the expectation

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[3] The terms "yield curve," "term structure of interest rates," or "term spread" will be used interchangeably.

theory of the yield curve, on the other hand (Modigliani & Sutch, 1966), or, alternatively, from the standard IS-LM model for a small open economy (Blanchard & Fischer, 1989, p. 536).

The information content of the yield curve has been the object of countless theoretical and empirical works. The bulk of the studies has concentrated on the US economy (see, e.g., Estrella & Hardouvelis, 1991; Modigliani & Sutch, 1966; Stock & Watson, 1989; Turnovsky, 1989), while others have also investigated some major European countries (see, e.g., Berk & Van Bergeijk, 2000; Bernard & Gerlach, 1998; Davis & Fagan, 1997; Estrella & Mishkin, 1997; Plosser & Rouwenhorst, 1994).

Although a number of empirical studies have documented the relevance of the yield curve to predict recessions and future output growth, more recently, the stability and predictive power of these relationships have been questioned both on theoretical and empirical grounds. As some empirical studies have recently pointed out, the yield curve has been losing predicting power since the late 1980s. A classical example of this fact is its failure to predict the 1990–1991 recession in the United States (Dotsey, 1998; Friedman & Kuttner, 1998; Haubrich & Dombrosky, 1996; Stock & Watson, 2003). In a European context, Davis and Fagan (1997) found that although the yield curve provided the best within-sample prediction results, only three countries (Belgium, Denmark, and UK) satisfied the conditions of significance, stability, and improved out-of-sample forecasts. Other empirical evidence, however, indicates that the predictions with models that use binary indicators of recession or expansions are more successful and stable than continuous ones (Estrella, Rodriguez and Schich, 2003).

From a theoretical point of view, Estrella (1998) and Hamilton and Kim (2002) have studied the abovementioned arguments. Following the model of Fuhrer and Moore (1995), Estrella develops a dynamic rational expectation model to explore the specific circumstances under which the yield curve has predictive power over some macroeconomic variables such as real output and inflation, and demonstrates how the relationship between spread and real economic activity depends, in part, on the preferences of the policymaker between inflation and output deviations from target. In particular,

when the authorities give higher weight to inflation, the relationship between the spread and future real activity is weakened. This is because the impact of any future changes in expected inflation on future real activity is smaller. Following this theoretical argument, we expect to find in empirical works that the spread has a stronger relationship with future output when the monetary authorities are relatively more concerned with output than with inflation.

A notable feature of most empirical works is that the term spread–output growth relation has been modelled using a linear framework, and little attention has been given to the possibility of asymmetric effects and time-varying parameters. Indeed, as some recent studies have shown, based on data for the United States and Canada, the term spread–output relation might not be linear and its predictive content might also have asymmetric effects, as measured in terms of a threshold on the conditional expectation of output growth (Galbraith & Tkacz, 2000). In the case of Canada, Tkacz (2001) uses neural network models and shows that nonlinear models have smaller prediction errors than linear models. In line with these arguments, Venetis, Paya, and Peel (2003) study the predictive power and stability of the spread–output relationship with data from the United States, UK, and Canada using nonlinear autoregression models that can accommodate regime switching-type nonlinear behavior and situations of time-varying parameters. A significant result of this work is that the spread–output growth relationship is stronger when past values of the term spread do not exceed a positive value of the threshold.

Cross-country empirical evidence, including a wide sample of European countries, have also confirmed the usefulness of the yield curve to predict the probability of a recession and future real economic activity (Bernard & Gerlach, 1998; Estrella & Mishkin, 1997; Sensier, Artis, Osborn, & Birchenhall, 2004). Those works have also demonstrated that the term spread–output growth relationship is stronger in countries where monetary policy is independent than in those countries that peg their currencies to a bigger commercial partner. This result is of particular relevance for countries participating in the Euro area. As it is known, after the "Single European Act" agreement, signed in February 1986, most European