



Do liquidity variables improve out-of-sample prediction of sovereign spreads during crisis periods?



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ABSTRACT

This paper addresses the out-of-sample prediction of European Monetary Union yield spread changes. We extend the Longstaff and Schwartz (1995) approach by using liquidity variables, namely funding liquidity as measured by European Central Bank's unconventional monetary policy as well as a commonly used market liquidity proxy. Our out-of-sample results highlight that the economic forecasting models outperform the autoregressive moving average benchmark during times of crisis, when liquidity-based models yield superior predictions. However, the economic models do not yield forecasting gains during the pre-crisis period. Hence, our results provide evidence for the usefulness of economic models in predicting sovereign spreads during crisis periods.

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1. Introduction

The recent European sovereign debt crisis increased the interest in European Monetary Union (EMU) sovereign yield spreads immensely. However, previous studies mostly focus on explaining yield spreads rather than predicting them.¹ Given this situation, it remains an open issue of how to predict sovereign yield spread changes out-of-sample.

In this paper, we address the out-of-sample prediction of 1-month ahead EMU yield spread changes. To do so, we follow the tradition of Longstaff and Schwartz (1995) on yield spread explanation by using an asset factor, represented by the local stock market index, as well as an interest rate factor as a basic economic forecasting model. Moreover, we apply two additional predictor variables, namely the total assets of the European Central Bank's (ECB) balance sheet and market liquidity modeled by the Hu et al. (2013) noise measure, which is explicitly designed for bond markets. Both liquidity variables are used to extend the traditional Longstaff and Schwartz (1995) approach and are also employed in a separate two-factor liquidity risk model that links the effects of unconventional ECB monetary policy interventions and their repercussions for market liquidity. We use ECB's unconventional monetary policy, as short-term interest rates have historically been low (almost zero) since 2010. Therefore, from this time onwards, additional conventional monetary policy interventions may no

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¹ A notable exception is Favero (2013), who finds that EMU sovereign yield spreads during the European sovereign debt crisis cannot be predicted by standard models. He uses a global vector autoregressive model with a completely different set of predictors from those applied in this study. His results indicate that expectations of exchange rate devaluation are the most important factor driving the EMU yield spreads in the European sovereign debt crisis. However, this evidence is reported without considering a formal forecast evaluation approach.

longer be effective. We motivate the application of Longstaff and Schwartz's (1995) approach, which was originally developed for corporate debt, to sovereign debt for several reasons. First, there is previous evidence that sovereign debt and stock markets are negatively related (see Longstaff et al., 2011; Afonso et al., 2014). A downturn in stock markets yields higher sovereign default risk, as it indicates a deteriorated business climate with lower tax revenue expectations. Second, an increase in the risk-free rate coincides with higher refinancing costs and increased default risk. In addition, we use an autoregressive moving average (ARMA) model as a time series benchmark to test whether our economic forecasting models can outperform a pure time series model.

For our set of competing models, we analyze the relative out-of-sample forecasting performance of each model as compared with a naive forecast using the historical average of yield spread changes (see Campbell and Thompson, 2008). In addition to that, we propose a mean difference test for analyzing the cross-sectional differences among our forecasting models. For this purpose, we use monthly sovereign yield spread changes from January 2000 to December 2014, including core and peripheral countries. Our focus is on the largest EMU member countries to avoid biases due to different monetary policies. The results highlight that our proposed liquidity models are useful for forecasting EMU yield spreads in crisis periods.

The remainder of this paper is organized as follows. Section 2 describes the data set and the forecasting approach for yield spread changes. Section 3 contains the results of the out-of-sample forecasts for 1-month ahead changes in EMU yield spreads. Finally, Section 4 concludes.

2. Data and approach

2.1. Data

Our data set consists of sovereign bond yields for euro-denominated issues of Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Spain retrieved from EUROSTAT.² The yield spread of the i th country at time t is defined as $S_{i,t} = Y_{i,t} - Y_{G,t}$, where $Y_{i,t}$ is the bond yield of country i and $Y_{G,t}$ denotes the corresponding yield of a German Bund with 10-year maturity. Since yield spreads are not stationary, we consider yield spread changes, $\Delta S_{i,t}$, in the following analysis from January 2000 to December 2014. The starting point of the sample is set as January 2000 to exclude any biases resulting from the newly implemented EMU. Next, we provide a description of our set of predictors, which are all based on monthly data.

Local equity market return: The continuously compounded return of the local equity index, $R_{i,t}$, is given by $R_{i,t} = \ln(P_{i,t}) - \ln(P_{i,t-1})$, where $P_{i,t}$ is the monthly closing price of a country's most important stock market index received from Thomson Reuters. Our sample consists of the following indices: ATX (Austria), BEL 20 (Belgium), OMXH 25 (Finland), CAC 40 (France), ATHEX Composite (Greece), ISEQ (Ireland), FTSE MIB (Italy), AEX (the Netherlands), PSI 20 (Portugal) and IBEX 35 (Spain). $R_{i,t}$ contains country-specific macro risk with a strong causality to bond yields, which is confirmed by previous work of, for example, Batten et al. (2006), Ilmanen (2003) and Keim and Stambaugh (1986).

Risk-free rate: The variable $\Delta R_{f,t}$ presents the change in the 12-month European interbank offered rate (EURIBOR) and is used as a proxy for the change in the risk-free rate. It is obtained from the ECB Statistical Data Warehouse. A lower risk-free rate increases the present value of a bond's cash flows; therefore, its price will rise.

Unconventional monetary policy: The role of the ECB and its forecast impact is captured by the variable ΔECB_t , which is denoted as the change in the natural logarithm of the total assets on the ECB's balance sheet retrieved from the FRED Economic Database. Unconventional ECB monetary policy, such as the bond purchase program, initiates an increased demand for sovereign bonds, resulting in lower EMU yield spreads.

Market liquidity: Hu et al. (2013) construct a market liquidity measure that is based on pricing errors in aggregate bond markets, in which high pricing errors indicate a lack of liquidity. A major advantage of this approach is the inclusion of various volatile market episodes with market-wide liquidity risk. The noise measure is obtained from Jun Pan's homepage and is calculated for the US treasury market. We use the first difference, $\Delta Noise_t$, as a global proxy for changes in market-wide liquidity in bond markets.

Table 1 presents summary statistics of changes in EMU sovereign yield spreads, $\Delta S_{i,t}$, and a set of predictors ($R_{i,t}$, $\Delta R_{f,t}$, ΔECB_t and $\Delta Noise_t$) with a monthly frequency. The means of $\Delta S_{i,t}$ for all core countries are around zero, whereby the peripheral countries, with the exception of Ireland, indicate low positive average values. The highest and lowest changes in yield spreads are documented for Greece. The distribution of $\Delta S_{i,t}$ is leptokurtic for all countries and mostly positively skewed. Obviously, the skewness and kurtosis of the four regressors deviate clearly from a normal distribution.

2.2. Yield spread forecasting approach

2.2.1. Predictive regression model

To forecast yield spread changes, we use a predictive regression for $i = 1, \dots, N$ countries and $t = 1, \dots, T$ time periods:

$$\Delta S_{i,t+1} = \alpha_i + X'_{i,t} \beta_i + \epsilon_{i,t+1}, \quad (1)$$

² Greek data are from the local currency before Greece joined the EMU in 2001.

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