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Expectations hypothesis in the context of debt crisis: Evidence from five major EU countries

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ABSTRACT

The present paper examines the empirical adequacy of the expectations hypothesis of the term structure of interest rates in the context of the current debt crisis. Using a sample consisted of the five largest EU countries, namely France, Germany, Italy, Spain and the United Kingdom, and accounting for structural breaks in the data, I investigate cointegration, spread stationarity, validity of the cross-equation restrictions implied by the theory, and the possibility of excess returns. Overall, the empirical findings are against the EHTS for the whole maturity spectrum, implying evidence of economically important deviations from the theory. Only for specific spreads of France, Germany, Italy and the United Kingdom there is some evidence in favour of the expectations hypothesis.

1. Introduction

The term structure of interest rates has been analysed by many economists because, among others, it provides valuable information regarding the future movements of the long-term interest rate of a country. Additionally, as empirical studies have suggested, the spread between the long and the current short rate has a good predictive power about the cyclical behaviour of an economy (Estrella and Hardouvelis, 1991; Lahiri and Wang, 1996; Estrella and Mishkin, 1998; Estrella et al., 2003; Estrella, 2005; Moneta, 2005; Ang et al., 2006).[1] A major theory that has been developed in order to explain the term structure of interest rates and the shape of the yield curve is the expectations hypothesis of the term structure (EHTS). According to the EHTS, the yield to maturity on a long-term bond is the average of the current short yield and the expected future yields on the bonds of shorter maturities, plus a possibly time varying term premium. Thus, for a given term premium, if future short yields are expected to rise, then the yield curve will be upward sloping and vice versa.

The EHTS has been investigated extensively in the literature, with mixed and, sometimes, contradictive results regarding its empirical adequacy.[2] Among others, Campbell and Shiller (1987, 1991) estimated bivariate vector autoregression (VAR) models for short yields and spreads for the USA and found that the behaviour of the long yield was similar to that implied by the EHTS, even though the EHTS was statistically rejected. Hall et al. (1992) studied the US Treasury bills and found supportive evidence of the EHTS. The empirical results of Hardouvelis (1994) are in favour of the EHTS for all G7 countries except for the USA, while the evidence of Cuthbertson (1996) for the UK interbank market supports the EHTS only at shorter maturities. Jondeau and Ricart (1999) used euro rates in their analysis and found evidence that supports the EHTS for France and the UK, but rejects it for Germany and the USA. Similar results obtained by Bekaert and Hodrick (2001), who used

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[1] Kauppi and Saikkonen (2008) found similar evidence regarding the predictive power of the term spread. However, these authors indicate that the very recent US recessions were harder to be predicted than the earlier ones.

[2] Shiller (1990) provides an excellent survey of the EHTS theory and empirical studies.

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Eurocurrency rates in order to study the EHTS. Their findings are supportive of the EHTS for the UK, but against it for Germany and the USA.

Lanne (2003) investigated the EHTS for the US Eurodollar deposit rates and found supportive evidence of the EHTS at the short end of the maturity spectrum, only when a potential regime shift was allowed for the data. Also, the empirical results of Brüggemann and Lütkepohl (2005) for the Euro area and the USA were consistent with the EHTS. Diebold et al. (2006) studied the US Treasury bills and developed a yield curve model that incorporates yield factors and macroeconomic variables. Their evidence was in favour of the EHTS for certain periods, but not for the entire sample. Bekaert et al. (2007) examined the EHTS on implied zero-coupon yields of Germany, Japan, the UK and the USA. Their results were against the EHTS in general, but actual and theoretical yield spreads did not behave very differently, especially at long horizons. Koukouritakis and Michelis (2008) investigated the EHTS for the 12 countries that joined the EU in 2004 and 2007 and found evidence in favour of the EHTS for all countries except Malta. Also, Koukouritakis (2010) studied the EHTS in the presence of structural breaks for four Central European EU countries. His empirical results support the EHTS for the Czech Republic and Hungary and reject it for Poland and Slovakia.

The present study examines the empirical adequacy of the EHTS for five major EU countries, namely France, Germany, Italy, Spain and the United Kingdom. Structural breaks have been included in the analysis, which uses the most recent data set from the early 1980s to the end of 2012. The inclusion of breaks is quite important because it is well known from the recent literature that not accounting for shifts in the data when in fact exist can lead to biased inference. The five EU countries were chosen for the following three reasons. Firstly, these countries are the largest and the most important EU economies. Secondly, during the sample period, these countries have been affected by specific economic events. For example, the German unification in 1990 had important effects on the German economy. Also, the signing of the Treaty on European Union (TEU) and the introduction of the euro in 1999 probably affected France and the two Mediterranean economies, Italy and Spain, while the financial crisis in mid-1992 and the subsequent collapse of the Exchange Rate Mechanism (ERM) of the European Monetary System harmed the UK economy. Thirdly, the current financial and debt crisis may have also affected the validity of the EHTS. Due to the increased uncertainty in the Eurozone, bonds with different maturities may no longer be perfect substitutes among them, as implied by the EHTS. These events are likely to have caused structural breaks in the term structure of these countries. In order to capture these breaks, I employed recently developed unit root tests (Lee and Strazicich, 2003) and cointegration tests (Saikkonen and Lütkepohl, 2000; Johansen et al., 2000).

The paper is organised as follows. Section 2 describes briefly the EHTS and discusses the testable implications of the theory. Section 3 reports the unit root and cointegration tests in the presence of structural shifts, while Section 4 describes the data and analyses the empirical results. Section 5 provides some concluding remarks.

2. Theoretical framework of the EHTS and testable implications

2.1. The EHTS

The EHTS can be written in the following linearised form (Shiller, 1990):

$$R_{k,t} = (1/k)\sum_{j=1}^{k} E_t R_{1,t+j-1} + \Phi_{k,t}, \tag{1}$$

where $R_{k,t}$ is a continuously compounded yield to maturity of a k-period pure discount bond, E_t is the expectations operator conditional on market information up to and including time t, and $\Phi_{(n,m),t}$ is a time invariant but maturity dependent term premium that is related to investors' preferences about risk or liquidity.[3] Subtracting $R_{1,t}$ from both the sides of Eq. (1), one gets

$$S_{(k,1),t} = (1/k)\sum_{i=1}^{k-1}\sum_{j=1}^{i} E_t\,\Delta R_{1,t+j} + \Phi_{k,t}, \tag{2}$$

where $S_{(k,1),t} \equiv (R_{k,t} - R_{1,t})$ is the actual yield spread. In general, optimality implies that besides S no other variable at time t can predict future changes in short yields. A consequence of this result is that S Granger causes changes in short yields. The assumption that yields are $I(1)$ processes implies that the right-hand side of Eq. (2) is a stationary process. This implies that the left-hand side of Eq. (2) is also a stationary process and $(1,-1)'$ is a cointegrating vector for $R_{k,t}$ and $R_{1,t}$.

The EHTS implies that any yield series is cointegrating with the one period yield. Thus, in a set of p yields, including the one period yield, each of the $p-1$ p-dimensional spread vectors $[-1\ \ 1\ \ 0\ \ \ldots\ \ 0]'$, $[-1\ \ 0\ \ 1\ \ \ldots\ \ 0]'$, ..., $[-1\ \ 0\ \ 0\ \ \ldots\ \ 1]'$ is cointegrating. Thus, the cointegration space has rank $p-1$, which means that there is only one common stochastic trend that is driving the whole system in the long run. As Hall et al. (1992) show, the spread between any two yields also spans the cointegration space. The reason is that the spread between any two yields is just a linear combination of the spreads defined using the one period yield. Because linear combinations of stationary variables are also

[3] The pure EHTS holds when there is no term premium of any kind ($\Phi_{k,t} = 0$), while the weaker version of the EHTS allows for a constant term premium in Eq. (1).