Dynamic Estimation of the Hungarian Zero-Coupon Term Structure

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This presentation focuses on structural properties of the Hungarian zero coupon term structure. Generally, there are two ways to achieve this: static yield curve fitting (this is most commonly used by both researchers and practitioners including the National Bank of Hungary) and implementing a dynamic approach (to gain a better understanding of the dynamic evolution of the yield curve). The second option is taken here via econometric methods. The speaker's goal is to implement a pure dynamic approach using Hungarian government bond data and draw international conclusions where possible. As Hungary is a key European emerging market, empirical findings might offer value for both researchers and market participants.

After briefly showing descriptive statistics and Principal Component Analysis (PCA) implied consequences for the Hungarian term structure, a semi non-parametric (SNP) model is estimated to summarize structural properties of the sample data set (panel data of 15 maturities over the period 2000 – 2008 with N=2007) without making any parametric assumptions. The optimal SNP score is a VAR(1), GARCH(1,1) process, where the innovation is found to be a 6th order polynomial with a time lag of 1. This score is optimal not only in the 1-dimensional cases (for all chosen maturities of 6M, 2Y, 5Y and 10Y), but also in a panel data approach (where the sample data set has all four dimensions and the process includes cross sectional effects as well). This compares with Dai and Singleton (2000)'s finding of a VAR(1), GARCH(1,2) process with an innovation of a 4th order polynomial with a time lag of 1, for their U.S. sample data set (one of the most widely used benchmark study for U.S. markets). No signs for volatility asymmetry (leverage effect) are found to persist in the Hungarian case.

Thereafter parametric assumptions are made and the most widely used mean reverting affine models of literature (Vasicek and CIR) are calibrated with up to 3 factors via the Kalman-filter. To compare results with benchmark U.S. markets, the same models are estimated for the U.S. yield curve, too. An important conclusion of the empirical research by the author is that the 3-factor Vasicek model is well suited for the domestic bond market, however the CIR model – supporting the findings of Brigo and Mercurio (2006) – is unable to cope with the inverted nature of the Hungarian term structure.

Finally, out-of-sample forecasting capabilities of the 3-factor Vasicek model are tested on several forecasting horizons. Since out-of-sample forecasting errors are several-fold of those in the in-sample approach, the benefits of the presented methodology are more likely to show up as more efficient risk management of commercial banks than hard profits of proprietary trading desks.

Keywords: Interest rate model, term structure, Kalman-filter