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Forecasting bond yields in the Brazilian fixed income market

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Abstract

This paper studies the predictive ability of a variety of models in forecasting the yield curve for the Brazilian fixed income market. We compare affine term structure models with a variation of the Nelson–Siegel exponential framework developed by Diebold and Li [Diebold, F., & Li, C. (2006). Forecasting the Term Structure of Government Yields. *Journal of Econometrics*, 130, 337–364]. Empirical results suggest that forecasts made with the latter methodology are superior, and appear to be more accurate at long horizons than other different benchmark forecasts. These results are important for policy-makers, as well as for portfolio and risk managers. Further research could study the predictive ability of such models in other emerging markets.

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1. Introduction

Accurate interest rate forecasts are essential for policy-makers, bankers, treasurers and fixed income portfolio managers. These forecasts are the main ingredients in the development of macroeconomic scenarios, which are employed by large companies, financial institutions, regulators, and institutional investors, among others. Nonetheless, to date there has been

very little research on interest rate forecasting, and specifically on yield curve forecasting.

Duffee (2002), Dai and Singleton (2002), and Ang and Piazzesi (2003) have employed Gaussian affine term structure models, and were successful in matching certain properties of the U.S. term structure movement and generating time-varying term premia. Recent studies have looked at the joint dynamics of the term structure and the macroeconomy in a general equilibrium framework. Wu (2006), for example, develops an affine term structure model within a dynamic stochastic general equilibrium framework, and provides macroeconomic interpretations of the term structure factors. The author argues that changes in the “slope” and “level” factors are driven by monetary

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policy and technology shocks, respectively. However, these models focus on fitting term structure models and provide only poor forecasts of the yield curve.

Other researchers have studied the forecasting accuracy of interest rate surveys, and shown that such forecasts correctly predicted the direction of changes in long-term interest rates for the US (see Greer, 2003). Bidarkota (1998) compared the forecasting performance of univariate and multivariate models for real interest rates for the US and found that bivariate models perform quite well for short-term forecasting.

In a recent paper, Diebold and Li (2006) proposed a model, based on the Nelson and Siegel (1987) exponential framework for the yield curve, for forecasting the yield curve. The authors present convincing evidence that their model is superior to more traditional ones such as vector autoregression, the random walk and forward rate and curve regressions. They show that the model provides more accurate forecasts of the US term structure of interest rates at long horizons than standard benchmark forecasts.

Despite the advances in forecasting yields for the U.S. economy, there has been very little research into emerging markets. However, some emerging countries have large debt and equity markets and receive substantial inflows of foreign capital, thus playing an important role in international capital markets. Brazil deserves attention, as it has large equity and debt markets, with liquid derivatives markets, and therefore represents interesting opportunities for both domestic and international investors. Brazil has the largest stock of bonds in Latin American bond markets, both in absolute terms and as a percentage of GDP. In the Brazilian fixed income market, domestic federal public debt is the main asset, with approximately R\$1 trillion (US\$545 billion) in June 2006.

In a recent paper, Lima et al. (2006) study different models for the forecasting of interest rates in Brazil. They compare the forecasting accuracy of vector autoregressive (VAR) and vector error correction (VEC) models with that of naive forecasts from a simple random walk model. The authors find that VAR/VEC models are not able to produce forecasts that are superior to the random walk benchmark.² This paper is the first that has attempted to study interest rate

forecasts for the Brazilian economy; however, it focuses on long-term interest rate forecasts.

Our paper contributes to the literature by estimating and calibrating a variety of models to the Brazilian term structure of interest rates and comparing their forecast accuracies. The accuracy of the out-of-sample forecasts is evaluated using the usual mean squared error and Diebold Mariano statistics. Empirical results suggest that the Diebold and Li (2006) model has good forecasting power if compared with an affine term structure model and the random walk benchmark, especially for short-term interest rates. Therefore, it provides a good starting point for research applied to emerging markets.

The remainder of the paper is organized as follows. Section 2 presents the data and stylized facts, while Section 3 discusses the Diebold and Li (2006) methodology and an affine term structure model. Section 4 presents a comparison of forecasts made by each model, and Section 5 concludes.

2. Data and stylized facts

The main data employed in this study are interest rate swaps denominated in Brazilian reals maturing in 1, 2, 3, 6, and 12 months' time. In these swap contracts, a party pays a fixed rate over an agreed principal and receives a floating rate over the same principal, the reverse occurring with his counterpart. There are no intermediate cash-flows and contracts are settled on maturity, which implies that these interest rates may be seen as zero coupon yields. Therefore, as proxies for yields we use the fixed rates on swap contracts, negotiated in the Brazilian fixed income market.³

The yields from the swap contracts are provided by the Brazilian Mercantile & Futures Exchange (BM&F), which offers a clearing service for the Brazilian swap market. BM&F has been able to differentiate its service by offering an (optional) credit guarantee in addition to the simple registry service, which allows parties that enter into interest swap contracts to avoid counterparty risk.⁴ Swap contracts have margin requirements, as the

³ Due to liquidity restrictions and the lack of availability of a sufficient number of vertices and a time series on bond yields, we are not able to employ Brazilian bond yields directly.

⁴ BM&F utilizes modern risk management procedures to mitigate both market and counterparty risk by asking for collateral, limiting concentration in operations and asking for margins in most derivatives contracts.

² However, they do find that VAR/VEC models are able to capture future changes in the direction of changes in interest rates.

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