ISSN 1518-3548

BANCO CENTRAL DO BRASIL

Working Paper Series 141

Forecasting Bonds Yields in the Brazilian Fixed Income Market

Jose Vicente and Benjamin M. Tabak

August, 2007

ISSN 1518-3548
CGC 00.038.166/0001-05

Working Paper Series	Brasília	n. 141	Aug	2007	P. 1-29

Working Paper Series

Edited by Research Department (Depep) – E-mail: workingpaper@bcb.gov.br

Editor: Benjamin Miranda Tabak – E-mail: benjamin.tabak@bcb.gov.br
Editorial Assistent: Jane Sofia Moita – E-mail: jane.sofia@bcb.gov.br
Head of Research Department: Carlos Hamilton Vasconcelos Araújo – E-mail: carlos.araujo@bcb.gov.br

The Banco Central do Brasil Working Papers are all evaluated in double blind referee process.

Authorized by Mário Mesquita, Deputy Governor for Economic Policy.

General Control of Publications

Banco Central do Brasil

Secre/Surel/Dimep

SBS – Quadra 3 – Bloco B – Edifício-Sede – 1º andar

Caixa Postal 8.670

70074-900 Brasília – DF – Brazil

Phones: (5561) 3414-3710 and 3414-3567

Fax: (5561) 3414-3626

E-mail: editor@bcb.gov.br

Consumer Complaints and Public Enquiries Center

Address:	Secre/Surel/Diate
	Edifício-Sede – 2º subsolo
	SBS – Quadra 3 – Zona Central
	70074-900 Brasília – DF – Brazil
Fax:	(5561) 3414-2553
Internet:	http://www.bcb.gov.br/?english

Forecasting Bond Yields in the Brazilian Fixed Income Market *

Jose Vicente† Benjamin M. Tabak ‡

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 (2006). Empirical results suggest that forecasts made with the latter methodology are superior and appear accurate at long horizons when compared to different benchmark forecasts. These results are important for policy makers, portfolio and risk managers. Further research could study the predictive ability of such models in other emerging markets.

Keywords:term structure of interest rates; term premia; monetary policy; affine term structure models

JEL Code:E43; G12.

*The views expressed are those of the authors and do not necessarily reflect the views of the Central Bank of Brazil. Benjamin M. Tabak gratefully acknowledges financial support from CNPQ Foundation.

†Banco Central do Brasil. E-mail: jose.valentim@bcb.gov.br.

‡Banco Central do Brasil. E-mail: benjamin.tabak@bcb.gov.br.

1 Introduction

Accurate interest rates forecasts are essential for policy-makers, bankers, treasurers and fixed income portfolio managers. These forecasts are main ingredients in the development of macroeconomic scenarios, which are employed by large companies, financial institutions, regulators, institutional investors, among others. Nonetheless, to date there is very little research on interest rates forecasting and specially on yield curve forecasting.

Duffee (2002), Dai and Singleton (2002) and Ang and Piazzesi (2003) employ Gaussian affine term structure models and are successful in matching certain properties of the U.S. term structure movement and generating time-varying term premia. Recent literature has studied 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 policy and technology shocks, respectively. However, these models focus on fitting term structure models but provide poor forecasts of the yield curve.

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

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

Despite the advances in forecasting yields for the US economy there is very little research applied to emerging markets. However, some emerging countries have large debt and equity markets and receive substantial inflows of foreign capitals, playing an important role in the 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 absolute terms and as a percentage of GDP in Latin American bond markets. In the Brazilian fixed-income market domestic federal public debt is the main asset, with approximately R$ 1 trillion (US$ 545 billions) in June 2006.

In a recent paper Luduvice *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 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[1]. This paper is the first that attempts to study interest rates forecast for the Brazilian economy, however it focuses on long-term interest rates 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 accuracy. The accuracy of out-of-sample forecasts is evaluated using usual mean squared errors and Diebold-Mariano statistics. Empirical results suggest that the Diebold-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 the Diebold and Li (2006) methodology and an affine term structure model. Section 4 presents a comparison of forecasts made by each model while section 5 concludes.

2 Data and stylized facts

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

[1]They, however, find that VAR/VEC models are able to capture future changes in the direction of changes in interest rates.

income market[2].

The data is sampled daily and we build monthly observations by averaging daily yields. The sample begins in May 1996 and ends in November 2006, with 127 monthly observations.

Table 1 presents descriptive statistics for yields. The typical yield curve is upward sloping for time period under analysis. The slope and curvature are less persistent than individual yields. Both the slope and curvature present low standard deviations if compared to individual yields.

Place Table 1 About Here

Figure 1 presents the dynamics of yields for the period under study.

Place Figure 1 About Here

It is important to note that the level and slope are not significantly correlated with each other (it is never larger than 30%). Curvature is also not significantly correlated with the level, however, it's highly correlated with the slope (approximately -70%). This suggests that perhaps two factors (level and slope) may explain well the term structure. This is particularly true for the Brazilian term structure of interest rates as for liquidity reasons we have yields only up to 12-months maturity (which may be seen as the short-term part of the term structure.

3 Yield Curve Models

3.1 Diebold-Li Model

Litterman and Scheinkman (1991) study the US yield curve, which has a pronounced hump-shape, and conclude that three factors (level, slope and curvature) are required to explain movements of the whole term structure of interest rates. However, most studies have concluded that the level factor is the most important in explaining interest rate variation over time.

Most yield curve models include the three factors to account for interest rates dynamics. Diebold and Li (2006) suggest the following three-factor model:

[2]Unfortunately we do not have information on Brazilian bond yields for long time periods. Therefore, we are not able to employ Brazilian bond yields directly.

$$y_t(\tau) = \beta_{1t} + \beta_{2t}(\frac{1-e^{-\lambda_t\tau}}{\lambda_t\tau}) + \beta_{3t}(\frac{1-e^{-\lambda_t\tau}}{\lambda_t\tau} - e^{-\lambda_t\tau}), \quad (1)$$

The authors interpret the coefficients β_{1t}, β_{2t} and β_{3t} as three latent dynamic factors. They can be seen as factors for the level, slope and curvature. The λ_t determines the maturity at which the loading on the curvature achieves it smaximum.

In order to estimate the parameters $\beta_{1t}, \beta_{2t}, \beta_{3t}, \lambda$ for each month t nonlinear least squares could be used. However, the λ_t value can be fixed and set equal to the value that maximizes the loading on the curvature factor.In this case, one can compute the values of the factor loadings and use ordinary least squares to estimate the factors (betas), for each month t. We follow this approach and also let λ vary freely and compare the forecasting accuracy of both procedures.

The next step in the Diebold and Li (2006) approach is to assume that the latent factors follow an autoregressive process, which is employed to forecast the yield curve.

The forecasting specification is given by:

$$\hat{y}_{t+h/t}(\tau) = \hat{\beta}_{1t,t+h/t} + \hat{\beta}_{2t,t+h/t}(\frac{1-e^{-\lambda_t\tau}}{\lambda_t\tau}) + \hat{\beta}_{3t,t+h/t}(\frac{1-e^{-\lambda_t\tau}}{\lambda_t\tau} - e^{-\lambda_t\tau}), \quad (2)$$

where

$$\hat{\beta}_{i,t+h/t} = c_i + \hat{\gamma}_i\hat{\beta}_{it}, i = 1, 2, 3, \quad (3)$$

and $\hat{c}_i$ and $\hat{\gamma}_i$ are coefficients obtained by estimating a first-order autoregressive process $AR(1)$ on the coefficients $\hat{\beta}_{it}$.

Table 2 presents the results for the estimation of the three factors in the Diebold-Li representation of the Nelson-Siegel model. All three factors are highly persistent and exhibit unit roots, with the exception of β_{1t} in which we reject the null hypothesis at the 10% significance level. These results are similar to the ones obtained in Diebold and Li (2006) and suggest that the factor for the level is more persistent than the factors for slope and curvature.

Place Table 2 About Here

3.2 Affine Term Structure Models

In recent years the class of affine term structure models (ATSMs) has become the main tool to explain stylized facts concerning term structure dynamics and pricing fixed income derivatives. Basically ATSMs are multifactor dynamic term structure models such that the state process X is an affine diffusion[3] and the short term rate is affine in X. From Duffie and Kan (1996) we know that ATSMs yield closed-form expressions for zero coupon bond prices (up to solve a couple of Riccati differential equations) and zero coupon bond yields are also affine functions of X[4].

In order to study problems related to admissibility[5] and identification of these models, Dai and Singleton (2000) proposed a useful classification of ATSMs according to the number of state variables driving the conditional variance matrix of X. For example, when there are three sources of uncertainty[6], they group all three-factor ATSMs in four non-nested families: $A_m(3)$, $m = 0, 1, 2$ and 3, where m is the number of factors that determine the volatility of X. When $m = 0$ the volatility of X is independent of X and the state process follows a three-dimensional Gaussian diffusion. On the order hand ($m = 3$) all three state variables drive conditional volatilities.

In this work we adopt a version of the $A_0(3)$ proposed by Almeida and Vicente (2006)[7]. The short term rate is characterized as the sum of three stochastic factors:

$$r_t = \phi_0 + X_t^1 + X_t^2 + X_t^3,$$

where the dynamics of process X under the martingale measure $\mathbb{Q}$ is given by

$$\mathrm{d}X_t = -\kappa X_t \mathrm{d}t + \rho \mathrm{d}W_t^{\mathbb{Q}},$$

with $W^{\mathbb{Q}}$ being a three-dimensional independent brownian motion under $\mathbb{Q}$, κ a diagonal matrix with κ_i in the i_{th} diagonal position, and ρ is a matrix responsible for correlation among the X factors.

[3] This means that the drift and the diffusion terms of X are affine functions of X.

[4] See also Filipovic (2001).

[5] An affine model is admissible when the bond prices are well-defined.

[6] There is a consensus in the literature of fixed income that three factors are sufficient to capture term structure dynamics. See Litterman and Scheinkman (1991) for a seminal factor analysis on term structure data.

[7] We remind the reader that our principal aim is to forecast bond yields. Then $A_0(3)$ is a natural choice since in this ATSM family all factors capture information about interest rate (there is no stochastic factor collecting information about the volatility process). Duffee (2002) tests the forecast power of ATSMs and shows that this intuition is true.

Following Duffee (2002) we specify the connection between martingale probability measure $\mathbb{Q}$ and physical probability measure $\mathbb{P}$ through an essentially affine market price of risk

$$\mathrm{d}W_t^{\mathbb{P}} = \mathrm{d}W_t^{\mathbb{Q}} - \left(\lambda^0 + \lambda^1 X_t\right)\mathrm{d}t,$$

where λ^0 is a three-dimensional vector, λ^1 is a 3×3 matrix and $W^{\mathbb{P}}$ is a three-dimensional independent brownian motion under $\mathbb{P}$.

On this special framework the Riccati equations, which defined bonds prices, have a simple solution. Almeida and Vicente (2006) show that the price at time t of a zero coupon bond maturing at time T is

$$P(t,T) = \mathrm{e}^{A(t,T)+B(t,T)'X_t},$$

where $B(t,T)$ is a three-dimensional vector with $-\dfrac{1-\mathrm{e}^{-\kappa_i\tau}}{\kappa_i}$ in the i_{th} element and

$$A(t,T) = -\phi_0\tau + \frac{1}{2}\sum_{i=1}^{3}\frac{1}{\kappa_i^2}\left(\tau + \frac{2}{\kappa_i}\mathrm{e}^{-\kappa_i\tau} - \frac{1}{2\kappa_i}\mathrm{e}^{-2\kappa_i\tau} - \frac{3}{2\kappa_i}\right)\sum_{j=1}^{3}\rho_{ij}^2 +$$

$$\sum_{i=1}^{3}\sum_{k>i}\frac{1}{\kappa_i\kappa_k}\left(\tau + \frac{\mathrm{e}^{-\kappa_i\tau}-1}{\kappa_i} + \frac{\mathrm{e}^{-\kappa_k\tau}-1}{\kappa_k} - \frac{\mathrm{e}^{-(\kappa_i+\kappa_k)\tau}-1}{\kappa_i+\kappa_k}\right)\sum_{j=1}^{3}\rho_{ij}\rho_{kj},$$

with $\tau = T - t$.

The model parameters are estimated using the maximum likelihood procedure described in Chen and Scott (1993)[8]. We assume that the zero-coupon-bonds with maturity 1 month, 6 months and 1 year are pricing without error. For the zero-coupon-bonds with maturity 2 months and 3 months, we assume observations with gaussian errors uncorrelated along time. To find the vector of parameters which maximizes the likelihood function we use the Nelder-Mead Simplex algorithm for non-linear functions optimization (implemented in the MatLab$^{\mathrm{TM}}$ *fminsearch* function)[9]. Table 3 presents the values of the parameters as well as asymptotic standard deviations to

[8]For a brief description of this technique see Almeida and Vicente (2006).

[9]The parameters are constrained for admissibility purposes (see Dai and Singleton (2000).

test their significance (parameters not shown on the table are fixed equal to zero).

Place Table 3 About Here

4 Comparison of Forecasting Models

In this section we examine the forecast performance of the Diebold-Li (2006) model assuming a constant λ and allowing for a variable λ with an affine term structure model and the random walk benchmark.

Our forecast accuracy comparisons are based on series of recursive forecasts, which are computed in the following way. We use the first half of the sample to estimate the models and build forecasts from one-month to twelve-months ahead. We then include a new observation in the sample and the parameters are re-estimated and new forecasts are constructed. This procedure is repeated until the end of the sample. These out-of-sample forecasts are used to compute the various measures of forecasts accuracy for yields of different maturities.

The forecasts of the affine term structure model follow Duffee (2002) and therefore we employ half of the sample to estimate the model and then build the forecasts. However, we do not re-estimate the parameters.

Table 4 records the results for the mean squared error (MSE) of each of the models used to forecast the term structure of interest rates. It is possible to see that for one-month ahead forecasts the MSE of the random walk benchmark is lower than most of the competitor models. However, as we increase the forecasting horizon the Diebold and Li (DL and DL with variable λ) models seem to gain forecasting accuracy and present lower MSE.

Place Table 4 About Here

Table 5 presents Diebold-Mariano (1995) tests for equal forecast accuracy. Under the null hypothesis of equal forecast accuracy this statistic has a standard normal asymptotic distribution. We compare all the models with the random walk benchmark. Empirical results suggest that the DL model provides better forecasting accuracy than the random walk benchmark for interest rates up to three-months for twelve-months ahead forecasts (long-term). However, evidence suggests that the random walk provides better short-term forecasts.

Place Table 5 About Here

5 Final Considerations

This paper compares the yield curve forecasting accuracy of the Diebold and Li (2006), affine term structure and random walk models. The empirical results suggest that the Diebold and Li (2006) model provides superior forecasts, specially at longer time horizons for short-term interest rates.

This is the first paper that presents some evidence of forecasting accuracy for the Brazilian yield curve, with promising results. These results are important for fixed-income portfolio managers, institutional investors, financial institutions, financial regulators, among others. They are particularly useful for countries that have implemented explicit inflation targets and use short-term interest rates as policy instruments such as Brazil.

The models proposed in this paper may be used for policy purposes as they may prove useful in the construction of long-term scenarios for the yield curve. Nonetheless, more research is needed to develop models that may provide reasonable short-term forecasts.

Further research could expand the set of models employed to compare forecasting accuracy and study other emerging markets. Perhaps models that incorporate other macroeconomic variables would perform well as well. Finally, it would be quite interesting to compare Asian and Latin American bond markets.

References

[1] Ang, A. and M. Piazzesi (2003). A No-Arbitrage Vetor Autoregression of Term Structure Dynamics with Macreconomics and Latent Variables. *Journal of Monetary Economics*, **50**, 745-787.

[2] Bidarkota, P.V. (1998). The comparative forecast performance of univariate and multivariate models: an application to real interest rate forecasting. *International Journal of Forecasting*, **14**, 457-468.

[3] Chen R.R. and L. Scott (1993). Maximum Likelihood Estimation for a Multifactor Equilibrium Model of the Term Structure of Interest Rates. *Journal of Fixed Income*, **3**, 14-31.

[4] Dai Q. and K. Singleton (2000). Specification Analysis of Affine Term Structure Models. *Journal of Finance*, **LV**, 5, 1943-1977.

[5] Dai Q. and K. Singleton (2002). Expectation Puzzles, Time-Varying Risk Premia, and Affine Models of the Term Structure. *Journal of Financial Economics*, **63**, 415-441.

[6] Diebold F. and C. Li (2006). Forecasting the Term Structure of Government Yields. *Journal of Econometrics*, **130**, 337-364.

[7] Duffee G. R. (2002). Term Premia and Interest Rates Forecasts in Affine Models. *Journal of Finance*, **57**, 405-443.

[8] Duffie D. and R. Kan (1996). A Yield Factor Model of Interest Rates. *Mathematical Finance*, Vol. 6, **4**, 379-406.

[9] Filipovic, D. (2001). A General Characterization of one Factor Affine Term Structure Models. *Finance and Stochastics*, **5**, 389-412.

[10] Greer, M. (2003). Directional accuracy tests of long-term interest rate forecasts. *International Journal of Forecasting*, **19**, 291-298.

[11] Litterman R. and J.A. Scheinkman (1991). Common Factors Affecting Bond Returns. *Journal of Fixed Income*, **1**, 54-61.

[12] Lima, E. A., Luduvice, F., and Tabak, B.M. (2006). Forecasting Interest Rates: an application for Brazil. *Working Paper Series of Banco Central do Brasil*, 120.

[13] Nelson C.R. and A.F. Siegel (1987). Parsimonious Modeling of Yield Curves. *Journal of Business*, **60**, 4, 473-489.

[14] C. Almeida and Vicente J.V.M. (2006). Term Structure Movements Implicit in Option Prices. Working Paper, Graduate School of Economics, Getulio Vargas Foundation.

[15] Wu,T.(2006). Macro Factors and the Affine Term Structure of Interest Rates. *Journal of Money, Credit, and Banking*, **38**, 7, 1847-1875.

Maturity (Months)	Mean	Std. Dev.	Maximum	Minimum	$\rho(1)$	$\rho(12)$	$\rho(24)$
1	0.192	0.050	0.379	0.127	0.878	0.268	-0.017
2	0.192	0.049	0.389	0.126	0.880	0.255	-0.020
3	0.193	0.048	0.390	0.125	0.878	0.249	-0.023
6	0.196	0.047	0.378	0.123	0.882	0.242	-0.041
12	0.200	0.049	0.383	0.122	0.893	0.249	-0.072
Slope	0.008	0.024	0.070	-0.056	0.815	0.096	0.140
Curvature	-0.006	0.013	0.023	-0.044	0.774	0.141	0.137

Table 1: This Table presents descriptive statistics for monthly yields at different maturities. The slope is defined as the difference between the 1-year and 1-month yields and the curvature is defined as twice the 3-months yield minus the sum of the 1-month and 1-year yields. We present sample autocorrelations for 1, 12 and 24 months.

Factor	Mean	Std. Dev	Maximum	Minimum	$\rho(1)$	$\rho(12)$	ADF
$\hat{\beta}_{1t}$	20.93	5.71	37.28	14.28	0.92	0.16	-3.26*
$\hat{\beta}_{2t}$	-2.19	5.15	6.06	-14.91	0.89	-0.02	-2.76
$\hat{\beta}_{3t}$	-2.22	5.13	5.14	-15.71	0.80	-0.11	-1.19

Table 2: This Table presents descriptive statistics for the three factors in the model proposed in Diebold and Li (2006) using monthly data 1996:05-2001:03. The last column presents Augmented Dickey-Fuller unit root tests (ADF). The symbol * refers to the rejection of the null hypothesis of the existence of a unit root at the 10% significance level.

Parameter	Value	Standard Error	t-statistics
κ_1	4.4172	0.2333	**18.92**
κ_2	1.9644	0.0472	**41.61**
κ_3	-0.0091	0.004736	**-1.93**
ρ_{11}	0.2343	0.0149	**15.64**
ρ_{21}	-0.1935	0.0256	**-7.54**
ρ_{22}	0.1029	0.0433	**2.38**
ρ_{31}	0.0061	0.0006	**9.86**
ρ_{32}	-0.0396	0.0381	-1.04
ρ_{33}	0.0962	0.0056	**17.23**
$\lambda^0(1)$	0.3165	0.5062	0.63
$\lambda^0(2)$	-0.0885	0.1233	-0.72
$\lambda^0(3)$	0.0505	0.0206	**2.45**
$\lambda^1(11)$	-0.9655	0.1536	-1.86
$\lambda^1(21)$	0.0280	0.1015	**2.15**
$\lambda^1(22)$	0.2440	0.0372	**6.29**
$\lambda^1(31)$	0.1339	0.0418	1.73
$\lambda^1(32)$	0.1339	0.3813	**5.83**
$\lambda^1(33)$	-0.4428	0.4865	-0.3511
ϕ_0	-0.4190	0.1272	**-3.29**

Table 3: Parameters and Standard Errors for the $A_0(3)$ Model. Significant t-statistics are in bold.

	Random Walk	DL	Affine	DL - Variable λ
1-month forecast				
y_1	0.001849236	0.002098129	0.001942738	0.002007605
y_2	0.002147072	0.002124832	0.002190248	0.002119687
y_3	0.002343081	0.002261082	0.002292119	0.002234052
y_6	0.002848165	0.00279635	0.002667497	0.00265806
y_{12}	0.003944768	0.004157651	0.003871837	0.003937806
3-months forecast				
y_1	0.00968121	0.008476022	0.005507391	0.008411354
y_2	0.009745494	0.008301889	0.006192385	0.00826154
y_3	0.00982919	0.008714388	0.007090455	0.008495199
y_6	0.011502015	0.011626086	0.010849607	0.010857756
y_{12}	0.015798506	0.016691762	0.016312642	0.015771641
6-months forecast				
y_1	0.028085384	0.019884699	0.016922863	0.019343557
y_2	0.028075811	0.020312088	0.019503393	0.019595936
y_3	0.028423832	0.021756182	0.022343976	0.020580832
y_6	0.031400518	0.028019025	0.030327459	0.025709813
y_{12}	0.038675424	0.037614651	0.039646336	0.035458477
12-months forecast				
y_1	0.059509453	0.044203579	0.064503337	0.042265436
y_2	0.059953062	0.045234434	0.065901286	0.043484339
y_3	0.060051943	0.047615567	0.066767276	0.04532249
y_6	0.060061913	0.056668262	0.068369388	0.052883419
y_{12}	0.065191422	0.069434807	0.071529166	0.066702033

Table 4: This Table presents Mean Squared Errors for 1,3,6 and 12-months out-of sample forecasts for different maturities. We compare the performance of the random walk, Diebold-Li (DL), Affine model and Diebold-Li with variable λ.

		1-month		3-months		6-months		12-months	
		DM	p-value	DM	p-value	DM	p-value	DM	p-value
y_1	DL	-2.33	0.99	-0.13	0.55	0.50	0.31	3.26	0.00
y_2	DL	-1.84	0.97	0.34	0.37	0.64	0.26	5.27	0.00
y_3	DL	-1.38	0.92	0.47	0.32	0.77	0.22	2.25	0.01
y_6	DL	-0.84	0.80	0.042	0.48	0.43	0.33	-0.11	0.54
y_{12}	DL	-1.88	0.97	-0.69	0.75	-0.51	0.70	-0.63	0.74
y_1	Affine	-0.26	0.60	0.81	0.21	0.72	0.24	0.07	0.47
y_2	Affine	-0.47	0.68	0.78	0.22	0.54	0.29	-0.06	0.53
y_3	Affine	-0.32	0.63	0.72	0.23	0.42	0.34	0.01	0.50
y_6	Affine	0.57	0.28	0.21	0.42	0.09	0.46	0.16	0.44
y_{12}	Affine	0.17	0.43	-0.12	0.54	0.00	0.50	0.18	0.43
y_1	DL-Variable λ	-2.52	0.99	-0.13	0.55	0.60	0.27	7.14	0.00
y_2	DL-Variable λ	-2.01	0.98	0.33	0.37	0.77	0.22	0.00	0.50
y_3	DL-Variable λ	-1.43	0.92	0.51	0.30	0.99	0.16	0.00	0.50
y_6	DL-Variable λ	-0.25	0.59	0.36	0.36	0.91	0.18	0.24	0.41
y_{12}	DL-Variable λ	-1.33	0.91	-0.41	0.66	-0.25	0.60	-0.58	0.72

Table 5: This Table presents Diebold Mariano (DM) with it's respective p-values for 1,3,6 and 12-months out-of sample forecasts for different maturities. We compare the performance of the random walk, Diebold-Li (DL), Affine model and Diebold-Li with variable λ.

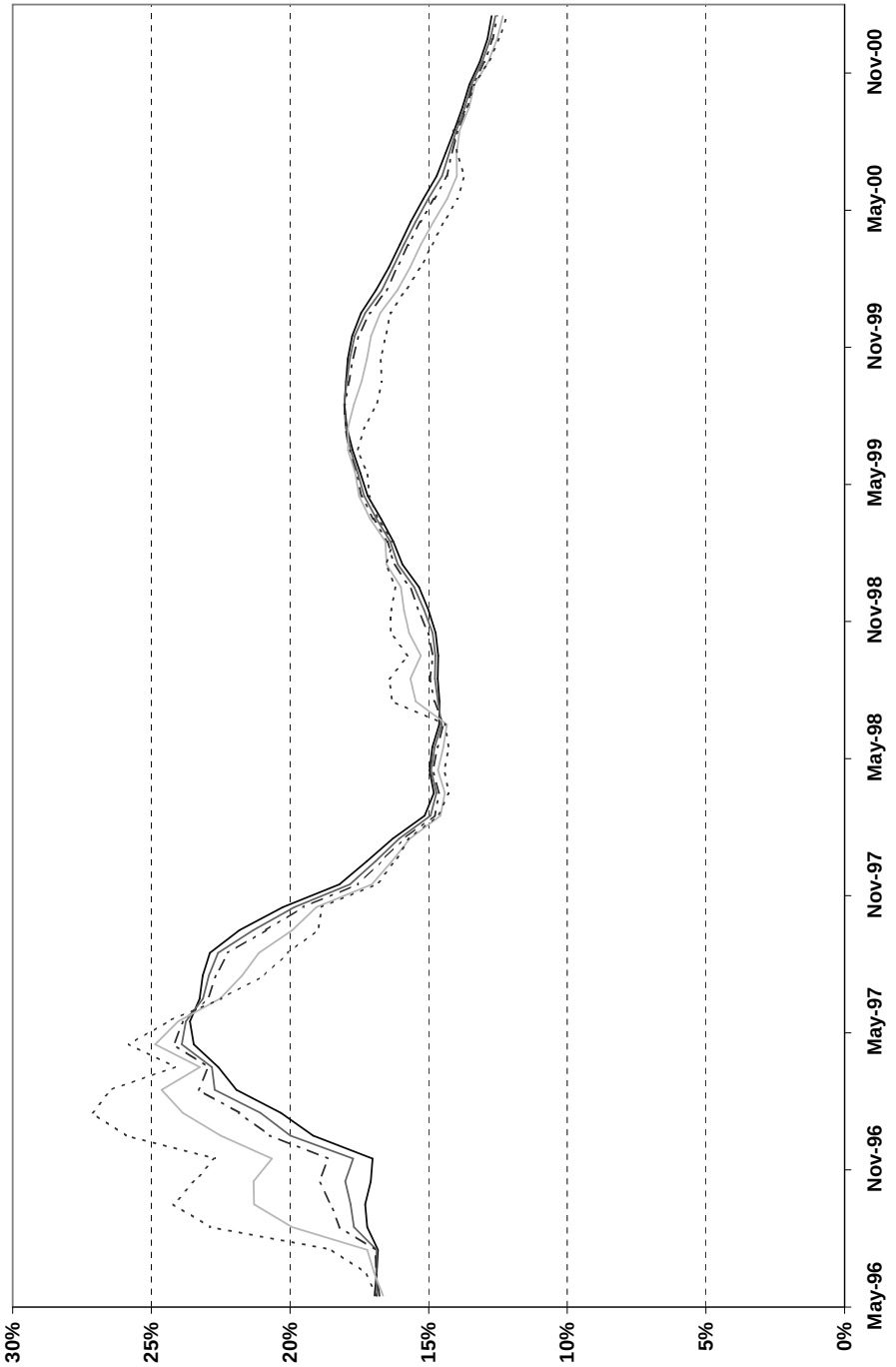

Figure 1: 1, 2, 3, 6 and 12-months yields for the Brazilian economy1996:05-2006:11.

Banco Central do Brasil

Trabalhos para Discussão

Os Trabalhos para Discussão podem ser acessados na internet, no formato PDF, no endereço: http://www.bc.gov.br

Working Paper Series

Working Papers in PDF format can be downloaded from: http://www.bc.gov.br

1	**Implementing Inflation Targeting in Brazil** *Joel Bogdanski, Alexandre Antonio Tombini and Sérgio Ribeiro da Costa Werlang*	Jul/2000
2	**Política Monetária e Supervisão do Sistema Financeiro Nacional no Banco Central do Brasil** *Eduardo Lundberg*	Jul/2000
	Monetary Policy and Banking Supervision Functions on the Central Bank *Eduardo Lundberg*	Jul/2000
3	**Private Sector Participation: a Theoretical Justification of the Brazilian Position** *Sérgio Ribeiro da Costa Werlang*	Jul/2000
4	**An Information Theory Approach to the Aggregation of Log-Linear Models** *Pedro H. Albuquerque*	Jul/2000
5	**The Pass-Through from Depreciation to Inflation: a Panel Study** *Ilan Goldfajn and Sérgio Ribeiro da Costa Werlang*	Jul/2000
6	**Optimal Interest Rate Rules in Inflation Targeting Frameworks** *José Alvaro Rodrigues Neto, Fabio Araújo and Marta Baltar J. Moreira*	Jul/2000
7	**Leading Indicators of Inflation for Brazil** *Marcelle Chauvet*	Sep/2000
8	**The Correlation Matrix of the Brazilian Central Bank's Standard Model for Interest Rate Market Risk** *José Alvaro Rodrigues Neto*	Sep/2000
9	**Estimating Exchange Market Pressure and Intervention Activity** *Emanuel-Werner Kohlscheen*	Nov/2000
10	**Análise do Financiamento Externo a uma Pequena Economia Aplicação da Teoria do Prêmio Monetário ao Caso Brasileiro: 1991–1998** *Carlos Hamilton Vasconcelos Araújo e Renato Galvão Flôres Júnior*	Mar/2001
11	**A Note on the Efficient Estimation of Inflation in Brazil** *Michael F. Bryan and Stephen G. Cecchetti*	Mar/2001
12	**A Test of Competition in Brazilian Banking** *Márcio I. Nakane*	Mar/2001

13	**Modelos de Previsão de Insolvência Bancária no Brasil** *Marcio Magalhães Janot*	Mar/2001
14	**Evaluating Core Inflation Measures for Brazil** *Francisco Marcos Rodrigues Figueiredo*	Mar/2001
15	**Is It Worth Tracking Dollar/Real Implied Volatility?** *Sandro Canesso de Andrade and Benjamin Miranda Tabak*	Mar/2001
16	**Avaliação das Projeções do Modelo Estrutural do Banco Central do Brasil para a Taxa de Variação do IPCA** *Sergio Afonso Lago Alves*	Mar/2001
	Evaluation of the Central Bank of Brazil Structural Model's Inflation Forecasts in an Inflation Targeting Framework *Sergio Afonso Lago Alves*	Jul/2001
17	**Estimando o Produto Potencial Brasileiro: uma Abordagem de Função de Produção** *Tito Nícias Teixeira da Silva Filho*	Abr/2001
	Estimating Brazilian Potential Output: a Production Function Approach *Tito Nícias Teixeira da Silva Filho*	Aug/2002
18	**A Simple Model for Inflation Targeting in Brazil** *Paulo Springer de Freitas and Marcelo Kfoury Muinhos*	Apr/2001
19	**Uncovered Interest Parity with Fundamentals: a Brazilian Exchange Rate Forecast Model** *Marcelo Kfoury Muinhos, Paulo Springer de Freitas and Fabio Araújo*	May/2001
20	**Credit Channel without the LM Curve** *Victorio Y. T. Chu and Márcio I. Nakane*	May/2001
21	**Os Impactos Econômicos da CPMF: Teoria e Evidência** *Pedro H. Albuquerque*	Jun/2001
22	**Decentralized Portfolio Management** *Paulo Coutinho and Benjamin Miranda Tabak*	Jun/2001
23	**Os Efeitos da CPMF sobre a Intermediação Financeira** *Sérgio Mikio Koyama e Márcio I. Nakane*	Jul/2001
24	**Inflation Targeting in Brazil: Shocks, Backward-Looking Prices, and IMF Conditionality** *Joel Bogdanski, Paulo Springer de Freitas, Ilan Goldfajn and Alexandre Antonio Tombini*	Aug/2001
25	**Inflation Targeting in Brazil: Reviewing Two Years of Monetary Policy 1999/00** *Pedro Fachada*	Aug/2001
26	**Inflation Targeting in an Open Financially Integrated Emerging Economy: the Case of Brazil** *Marcelo Kfoury Muinhos*	Aug/2001
27	**Complementaridade e Fungibilidade dos Fluxos de Capitais Internacionais** *Carlos Hamilton Vasconcelos Araújo e Renato Galvão Flôres Júnior*	Set/2001

28	**Regras Monetárias e Dinâmica Macroeconômica no Brasil: uma Abordagem de Expectativas Racionais** *Marco Antonio Bonomo e Ricardo D. Brito*	Nov/2001
29	**Using a Money Demand Model to Evaluate Monetary Policies in Brazil** *Pedro H. Albuquerque and Solange Gouvêa*	Nov/2001
30	**Testing the Expectations Hypothesis in the Brazilian Term Structure of Interest Rates** *Benjamin Miranda Tabak and Sandro Canesso de Andrade*	Nov/2001
31	**Algumas Considerações sobre a Sazonalidade no IPCA** *Francisco Marcos R. Figueiredo e Roberta Blass Staub*	Nov/2001
32	**Crises Cambiais e Ataques Especulativos no Brasil** *Mauro Costa Miranda*	Nov/2001
33	**Monetary Policy and Inflation in Brazil (1975-2000): a VAR Estimation** *André Minella*	Nov/2001
34	**Constrained Discretion and Collective Action Problems: Reflections on the Resolution of International Financial Crises** *Arminio Fraga and Daniel Luiz Gleizer*	Nov/2001
35	**Uma Definição Operacional de Estabilidade de Preços** *Tito Nícias Teixeira da Silva Filho*	Dez/2001
36	**Can Emerging Markets Float? Should They Inflation Target?** *Barry Eichengreen*	Feb/2002
37	**Monetary Policy in Brazil: Remarks on the Inflation Targeting Regime, Public Debt Management and Open Market Operations** *Luiz Fernando Figueiredo, Pedro Fachada and Sérgio Goldenstein*	Mar/2002
38	**Volatilidade Implícita e Antecipação de Eventos de *Stress*: um Teste para o Mercado Brasileiro** *Frederico Pechir Gomes*	Mar/2002
39	**Opções sobre Dólar Comercial e Expectativas a Respeito do Comportamento da Taxa de Câmbio** *Paulo Castor de Castro*	Mar/2002
40	**Speculative Attacks on Debts, Dollarization and Optimum Currency Areas** *Aloisio Araujo and Márcia Leon*	Apr/2002
41	**Mudanças de Regime no Câmbio Brasileiro** *Carlos Hamilton V. Araújo e Getúlio B. da Silveira Filho*	Jun/2002
42	**Modelo Estrutural com Setor Externo: Endogenização do Prêmio de Risco e do Câmbio** *Marcelo Kfoury Muinhos, Sérgio Afonso Lago Alves e Gil Riella*	Jun/2002
43	**The Effects of the Brazilian ADRs Program on Domestic Market Efficiency** *Benjamin Miranda Tabak and Eduardo José Araújo Lima*	Jun/2002

44	**Estrutura Competitiva, Produtividade Industrial e Liberação Comercial no Brasil** *Pedro Cavalcanti Ferreira e Osmani Teixeira de Carvalho Guillén*	Jun/2002
45	**Optimal Monetary Policy, Gains from Commitment, and Inflation Persistence** *André Minella*	Aug/2002
46	**The Determinants of Bank Interest Spread in Brazil** *Tarsila Segalla Afanasieff, Priscilla Maria Villa Lhacer and Márcio I. Nakane*	Aug/2002
47	**Indicadores Derivados de Agregados Monetários** *Fernando de Aquino Fonseca Neto e José Albuquerque Júnior*	Set/2002
48	**Should Government Smooth Exchange Rate Risk?** *Ilan Goldfajn and Marcos Antonio Silveira*	Sep/2002
49	**Desenvolvimento do Sistema Financeiro e Crescimento Econômico no Brasil: Evidências de Causalidade** *Orlando Carneiro de Matos*	Set/2002
50	**Macroeconomic Coordination and Inflation Targeting in a Two-Country Model** *Eui Jung Chang, Marcelo Kfoury Muinhos and Joanílio Rodolpho Teixeira*	Sep/2002
51	**Credit Channel with Sovereign Credit Risk: an Empirical Test** *Victorio Yi Tson Chu*	Sep/2002
52	**Generalized Hyperbolic Distributions and Brazilian Data** *José Fajardo and Aquiles Farias*	Sep/2002
53	**Inflation Targeting in Brazil: Lessons and Challenges** *André Minella, Paulo Springer de Freitas, Ilan Goldfajn and Marcelo Kfoury Muinhos*	Nov/2002
54	**Stock Returns and Volatility** *Benjamin Miranda Tabak and Solange Maria Guerra*	Nov/2002
55	**Componentes de Curto e Longo Prazo das Taxas de Juros no Brasil** *Carlos Hamilton Vasconcelos Araújo e Osmani Teixeira de Carvalho de Guillén*	Nov/2002
56	**Causality and Cointegration in Stock Markets: the Case of Latin America** *Benjamin Miranda Tabak and Eduardo José Araújo Lima*	Dec/2002
57	**As Leis de Falência: uma Abordagem Econômica** *Aloisio Araujo*	Dez/2002
58	**The Random Walk Hypothesis and the Behavior of Foreign Capital Portfolio Flows: the Brazilian Stock Market Case** *Benjamin Miranda Tabak*	Dec/2002
59	**Os Preços Administrados e a Inflação no Brasil** *Francisco Marcos R. Figueiredo e Thaís Porto Ferreira*	Dez/2002
60	**Delegated Portfolio Management** *Paulo Coutinho and Benjamin Miranda Tabak*	Dec/2002

61	**O Uso de Dados de Alta Freqüência na Estimação da Volatilidade e do Valor em Risco para o Ibovespa** *João Maurício de Souza Moreira e Eduardo Facó Lemgruber*	Dez/2002
62	**Taxa de Juros e Concentração Bancária no Brasil** *Eduardo Kiyoshi Tonooka e Sérgio Mikio Koyama*	Fev/2003
63	**Optimal Monetary Rules: the Case of Brazil** *Charles Lima de Almeida, Marco Aurélio Peres, Geraldo da Silva e Souza and Benjamin Miranda Tabak*	Feb/2003
64	**Medium-Size Macroeconomic Model for the Brazilian Economy** *Marcelo Kfoury Muinhos and Sergio Afonso Lago Alves*	Feb/2003
65	**On the Information Content of Oil Future Prices** *Benjamin Miranda Tabak*	Feb/2003
66	**A Taxa de Juros de Equilíbrio: uma Abordagem Múltipla** *Pedro Calhman de Miranda e Marcelo Kfoury Muinhos*	Fev/2003
67	**Avaliação de Métodos de Cálculo de Exigência de Capital para Risco de Mercado de Carteiras de Ações no Brasil** *Gustavo S. Araújo, João Maurício S. Moreira e Ricardo S. Maia Clemente*	Fev/2003
68	**Real Balances in the Utility Function: Evidence for Brazil** *Leonardo Soriano de Alencar and Márcio I. Nakane*	Feb/2003
69	**r-filters: a Hodrick-Prescott Filter Generalization** *Fabio Araújo, Marta Baltar Moreira Areosa and José Alvaro Rodrigues Neto*	Feb/2003
70	**Monetary Policy Surprises and the Brazilian Term Structure of Interest Rates** *Benjamin Miranda Tabak*	Feb/2003
71	**On Shadow-Prices of Banks in Real-Time Gross Settlement Systems** *Rodrigo Penaloza*	Apr/2003
72	**O Prêmio pela Maturidade na Estrutura a Termo das Taxas de Juros Brasileiras** *Ricardo Dias de Oliveira Brito, Angelo J. Mont'Alverne Duarte e Osmani Teixeira de C. Guillen*	Maio/2003
73	**Análise de Componentes Principais de Dados Funcionais – Uma Aplicação às Estruturas a Termo de Taxas de Juros** *Getúlio Borges da Silveira e Octavio Bessada*	Maio/2003
74	**Aplicação do Modelo de Black, Derman & Toy à Precificação de Opções Sobre Títulos de Renda Fixa** *Octavio Manuel Bessada Lion, Carlos Alberto Nunes Cosenza e César das Neves*	Maio/2003
75	**Brazil's Financial System: Resilience to Shocks, no Currency Substitution, but Struggling to Promote Growth** *Ilan Goldfajn, Katherine Hennings and Helio Mori*	Jun/2003

76	**Inflation Targeting in Emerging Market Economies** *Arminio Fraga, Ilan Goldfajn and André Minella*	Jun/2003
77	**Inflation Targeting in Brazil: Constructing Credibility under Exchange Rate Volatility** *André Minella, Paulo Springer de Freitas, Ilan Goldfajn and Marcelo Kfoury Muinhos*	Jul/2003
78	**Contornando os Pressupostos de Black & Scholes: Aplicação do Modelo de Precificação de Opções de Duan no Mercado Brasileiro** *Gustavo Silva Araújo, Claudio Henrique da Silveira Barbedo, Antonio Carlos Figueiredo, Eduardo Facó Lemgruber*	Out/2003
79	**Inclusão do Decaimento Temporal na Metodologia Delta-Gama para o Cálculo do VaR de Carteiras Compradas em Opções no Brasil** *Claudio Henrique da Silveira Barbedo, Gustavo Silva Araújo, Eduardo Facó Lemgruber*	Out/2003
80	**Diferenças e Semelhanças entre Países da América Latina: uma Análise de *Markov Switching* para os Ciclos Econômicos de Brasil e Argentina** *Arnildo da Silva Correa*	Out/2003
81	**Bank Competition, Agency Costs and the Performance of the Monetary Policy** *Leonardo Soriano de Alencar and Márcio I. Nakane*	Jan/2004
82	**Carteiras de Opções: Avaliação de Metodologias de Exigência de Capital no Mercado Brasileiro** *Cláudio Henrique da Silveira Barbedo e Gustavo Silva Araújo*	Mar/2004
83	**Does Inflation Targeting Reduce Inflation? An Analysis for the OECD Industrial Countries** *Thomas Y. Wu*	May/2004
84	**Speculative Attacks on Debts and Optimum Currency Area: a Welfare Analysis** *Aloisio Araujo and Marcia Leon*	May/2004
85	**Risk Premia for Emerging Markets Bonds: Evidence from Brazilian Government Debt, 1996-2002** *André Soares Loureiro and Fernando de Holanda Barbosa*	May/2004
86	**Identificação do Fator Estocástico de Descontos e Algumas Implicações sobre Testes de Modelos de Consumo** *Fabio Araujo e João Victor Issler*	Maio/2004
87	**Mercado de Crédito: uma Análise Econométrica dos Volumes de Crédito Total e Habitacional no Brasil** *Ana Carla Abrão Costa*	Dez/2004
88	**Ciclos Internacionais de Negócios: uma Análise de Mudança de Regime Markoviano para Brasil, Argentina e Estados Unidos** *Arnildo da Silva Correa e Ronald Otto Hillbrecht*	Dez/2004
89	**O Mercado de *Hedge* Cambial no Brasil: Reação das Instituições Financeiras a Intervenções do Banco Central** *Fernando N. de Oliveira*	Dez/2004

90	**Bank Privatization and Productivity: Evidence for Brazil** *Márcio I. Nakane and Daniela B. Weintraub*	Dec/2004
91	**Credit Risk Measurement and the Regulation of Bank Capital and Provision Requirements in Brazil – A Corporate Analysis** *Ricardo Schechtman, Valéria Salomão Garcia, Sergio Mikio Koyama and Guilherme Cronemberger Parente*	Dec/2004
92	**Steady-State Analysis of an Open Economy General Equilibrium Model for Brazil** *Mirta Noemi Sataka Bugarin, Roberto de Goes Ellery Jr., Victor Gomes Silva, Marcelo Kfoury Muinhos*	Apr/2005
93	**Avaliação de Modelos de Cálculo de Exigência de Capital para Risco Cambial** *Claudio H. da S. Barbedo, Gustavo S. Araújo, João Maurício S. Moreira e Ricardo S. Maia Clemente*	Abr/2005
94	**Simulação Histórica Filtrada: Incorporação da Volatilidade ao Modelo Histórico de Cálculo de Risco para Ativos Não-Lineares** *Claudio Henrique da Silveira Barbedo, Gustavo Silva Araújo e Eduardo Facó Lemgruber*	Abr/2005
95	**Comment on Market Discipline and Monetary Policy by Carl Walsh** *Maurício S. Bugarin and Fábia A. de Carvalho*	Apr/2005
96	**O que É Estratégia: uma Abordagem Multiparadigmática para a Disciplina** *Anthero de Moraes Meirelles*	Ago/2005
97	**Finance and the Business Cycle: a Kalman Filter Approach with Markov Switching** *Ryan A. Compton and Jose Ricardo da Costa e Silva*	Aug/2005
98	**Capital Flows Cycle: Stylized Facts and Empirical Evidences for Emerging Market Economies** *Helio Mori e Marcelo Kfoury Muinhos*	Aug/2005
99	**Adequação das Medidas de Valor em Risco na Formulação da Exigência de Capital para Estratégias de Opções no Mercado Brasileiro** *Gustavo Silva Araújo, Claudio Henrique da Silveira Barbedo,e Eduardo Facó Lemgruber*	Set/2005
100	**Targets and Inflation Dynamics** *Sergio A. L. Alves and Waldyr D. Areosa*	Oct/2005
101	**Comparing Equilibrium Real Interest Rates: Different Approaches to Measure Brazilian Rates** *Marcelo Kfoury Muinhos and Márcio I. Nakane*	Mar/2006
102	**Judicial Risk and Credit Market Performance: Micro Evidence from Brazilian Payroll Loans** *Ana Carla A. Costa and João M. P. de Mello*	Apr/2006
103	**The Effect of Adverse Supply Shocks on Monetary Policy and Output** *Maria da Glória D. S. Araújo, Mirta Bugarin, Marcelo Kfoury Muinhos and Jose Ricardo C. Silva*	Apr/2006

104	**Extração de Informação de Opções Cambiais no Brasil** *Eui Jung Chang e Benjamin Miranda Tabak*	Abr/2006
105	**Representing Roommate's Preferences with Symmetric Utilities** *José Alvaro Rodrigues Neto*	Apr/2006
106	**Testing Nonlinearities Between Brazilian Exchange Rates and Inflation Volatilities** *Cristiane R. Albuquerque and Marcelo Portugal*	May/2006
107	**Demand for Bank Services and Market Power in Brazilian Banking** *Márcio I. Nakane, Leonardo S. Alencar and Fabio Kanczuk*	Jun/2006
108	**O Efeito da Consignação em Folha nas Taxas de Juros dos Empréstimos Pessoais** *Eduardo A. S. Rodrigues, Victorio Chu, Leonardo S. Alencar e Tony Takeda*	Jun/2006
109	**The Recent Brazilian Disinflation Process and Costs** *Alexandre A. Tombini and Sergio A. Lago Alves*	Jun/2006
110	**Fatores de Risco e o *Spread* Bancário no Brasil** *Fernando G. Bignotto e Eduardo Augusto de Souza Rodrigues*	Jul/2006
111	**Avaliação de Modelos de Exigência de Capital para Risco de Mercado do Cupom Cambial** *Alan Cosme Rodrigues da Silva, João Maurício de Souza Moreira e Myrian Beatriz Eiras das Neves*	Jul/2006
112	**Interdependence and Contagion: an Analysis of Information Transmission in Latin America's Stock Markets** *Angelo Marsiglia Fasolo*	Jul/2006
113	**Investigação da Memória de Longo Prazo da Taxa de Câmbio no Brasil** *Sergio Rubens Stancato de Souza, Benjamin Miranda Tabak e Daniel O. Cajueiro*	Ago/2006
114	**The Inequality Channel of Monetary Transmission** *Marta Areosa and Waldyr Areosa*	Aug/2006
115	**Myopic Loss Aversion and House-Money Effect Overseas: an Experimental Approach** *José L. B. Fernandes, Juan Ignacio Peña and Benjamin M. Tabak*	Sep/2006
116	**Out-Of-The-Money Monte Carlo Simulation Option Pricing: the Join Use of Importance Sampling and Descriptive Sampling** *Jaqueline Terra Moura Marins, Eduardo Saliby and Joséte Florencio dos Santos*	Sep/2006
117	**An Analysis of Off-Site Supervision of Banks' Profitability, Risk and Capital Adequacy: a Portfolio Simulation Approach Applied to Brazilian Banks** *Theodore M. Barnhill, Marcos R. Souto and Benjamin M. Tabak*	Sep/2006
118	**Contagion, Bankruptcy and Social Welfare Analysis in a Financial Economy with Risk Regulation Constraint** *Aloísio P. Araújo and José Valentim M. Vicente*	Oct/2006

119	**A Central de Risco de Crédito no Brasil: uma Análise de Utilidade de Informação** *Ricardo Schechtman*	Out/2006
120	**Forecasting Interest Rates: an Application for Brazil** *Eduardo J. A. Lima, Felipe Luduvice and Benjamin M. Tabak*	Oct/2006
121	**The Role of Consumer's Risk Aversion on Price Rigidity** *Sergio A. Lago Alves and Mirta N. S. Bugarin*	Nov/2006
122	**Nonlinear Mechanisms of the Exchange Rate Pass-Through: a Phillips Curve Model With Threshold for Brazil** *Arnildo da Silva Correa and André Minella*	Nov/2006
123	**A Neoclassical Analysis of the Brazilian "Lost-Decades"** *Flávia Mourão Graminho*	Nov/2006
124	**The Dynamic Relations between Stock Prices and Exchange Rates: Evidence for Brazil** *Benjamin M. Tabak*	Nov/2006
125	**Herding Behavior by Equity Foreign Investors on Emerging Markets** *Barbara Alemanni and José Renato Haas Ornelas*	Dec/2006
126	**Risk Premium: Insights over the Threshold** *José L. B. Fernandes, Augusto Hasman and Juan Ignacio Peña*	Dec/2006
127	**Uma Investigação Baseada em Reamostragem sobre Requerimentos de Capital para Risco de Crédito no Brasil** *Ricardo Schechtman*	Dec/2006
128	**Term Structure Movements Implicit in Option Prices** *Caio Ibsen R. Almeida and José Valentim M. Vicente*	Dec/2006
129	**Brazil: Taming Inflation Expectations** *Afonso S. Bevilaqua, Mário Mesquita and André Minella*	Jan/2007
130	**The Role of Banks in the Brazilian Interbank Market: Does Bank Type Matter?** *Daniel O. Cajueiro and Benjamin M. Tabak*	Jan/2007
131	**Long-Range Dependence in Exchange Rates: the Case of the European Monetary System** *Sergio Rubens Stancato de Souza, Benjamin M. Tabak and Daniel O. Cajueiro*	Mar/2007
132	**Credit Risk Monte Carlo Simulation Using Simplified Creditmetrics' Model: the Joint Use of Importance Sampling and Descriptive Sampling** *Jaqueline Terra Moura Marins and Eduardo Saliby*	Mar/2007
133	**A New Proposal for Collection and Generation of Information on Financial Institutions' Risk: the Case of Derivatives** *Gilneu F. A. Vivan and Benjamin M. Tabak*	Mar/2007
134	**Amostragem Descritiva no Apreçamento de Opções Européias através de Simulação Monte Carlo: o Efeito da Dimensionalidade e da Probabilidade de Exercício no Ganho de Precisão** *Eduardo Saliby, Sergio Luiz Medeiros Proença de Gouvêa e Jaqueline Terra Moura Marins*	Abr/2007

135	**Evaluation of Default Risk for the Brazilian Banking Sector** *Marcelo Y. Takami and Benjamin M. Tabak*	May/2007
136	**Identifying Volatility Risk Premium from Fixed Income Asian Options** *Caio Ibsen R. Almeida and José Valentim M. Vicente*	May/2007
137	**Monetary Policy Design under Competing Models of Inflation Persistence** *Solange Gouvea e Abhijit Sen Gupta*	May/2007
138	**Forecasting Exchange Rate Density Using Parametric Models: the Case of Brazil** *Marcos M. Abe, Eui J. Chang and Benjamin M. Tabak*	May/2007
139	**Selection of Optimal Lag Length inCointegrated VAR Models with Weak Form of Common Cyclical Features** *Carlos Enrique Carrasco Gutiérrez, Reinaldo Castro Souza and Osmani Teixeira de Carvalho Guillén*	Jun/2007
140	**Inflation Targeting, Credibility and Confidence Crises** *Rafael Santos and Aloísio Araujo*	Aug/2007