VARIATION ANALYSIS ON NATIONAL STANDARD INTEREST RATE

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ABSTRACT

This study's main objective is to analyze an econometric model for forecasting purposes concerning the interest rate which is adopted as standard reference within the Brazilian economy, namely, the Actual-Selic rate, so as to verify the feasibility of performing short term predictions as to its variations.

Thus the major variables that impact the Actual-Selic rate, such as price variations of agricultural and power commodities, national industrial production level, exchange rate and public sector net debt, are detailed.

The modern macroeconomic approach describes the relevance of the Central Bank upon achievement of its goals so as to maintain the economic stability, amongst which lies the convergence of verified interest rates with the Selic rate target, as set forth by the Monetary Policy Committee (COPOM).

Furthermore, this study poses to explain the relevance in forecasting, with a reasonable level of accuracy, the benchmark interest rate of Brazilian economy. The proposed model may be used to support decision making concerning investment strategies and as an additional tool for the monitoring of the achievement of macroeconomic policy objectives.

Key words: Interest rate. Selic. Macroeconomics. Econometric analysis.

RESUMO

O propósito central deste estudo é analisar um modelo econométrico para fins preditivos acerca da taxa de juros utilizada como referência na economia brasileira, a qual consiste na taxa Selic-Efetiva, a fim de atestar a viabilidade em efetuar previsões sobre variações desta taxa no curto prazo.

Desta forma, são detalhadas as principais variáveis macroeconômicas que afetam a taxa Selic-Efetiva, como as variações sobre preços de commodities agrícolas e de energia, nível de produção industrial nacional, taxa de câmbio e dívida líquida do setor público.

A abordagem macroeconômica moderna descreve a importância do Banco Central na consecução de suas metas para manutenção da estabilidade econômica, dentre estas, convergir a taxa de juros verificada com a meta estabelecida pelo Comitê de Política Monetária (COPOM) para a taxa Selic.

Ademais, o presente trabalho visa explanar a relevância em se prever, com razoável grau de acuracidade, a taxa de juros referencial da economia brasileira, podendo o modelo proposto ser utilizado no suporte para tomada de decisão para estratégias de investimentos e ferramenta adicional no monitoramento acerca da consecução dos objetivos de políticas macroeconômicas.

Palavras-chave: Taxa de Juros. Selic. Macroeconomia. Análise Econométrica.

1. INTRODUCTION

According to the definition provided by the Central Bank of Brazil, "the overnight rate of the Special Settlement and Custody System (SELIC), expressed in an annual format, is the average rate weighted by the volume of financing operations in a day, backed by public federal titles and which take place under the mentioned SELIC system, in the form of repo or buyback operations" primarily conducted by certified financial institutions, such as banks, savings banks, brokerage houses, securities deliverer societies", [...] whereupon the same is "the base rate employed as reference by the monetary policy".

The Central Bank further informs that the "origin of the Over/SELIC rate is the Special Settlement and Custody System, SELIC, which is under the responsibility of the Central Bank of Brazil and the National Open Market Institutions Association (ANDIMA)", whereupon the mentioned rate arises from the weighted volume of operations average, according to the following formula (source: Central Bank of Brazil):

$$\mu = \frac{\sum_{i=1}^{n} VE_i . DI_i}{\sum_{i=1}^{n} VE_i}$$

Where:

μ = Verified average rate;

VE$_i$ = Issuance value of the i-ith operation;

DI$_i$ = Rate of the i-ith operation;

n = Number of operations in the sample.

Therefore, the Actual-Selic rate derives from interest rates effectively transacted on the market during a given period (BACEN, 2011).

"Interest rates relative to the operations at hand reflect the instantaneous liquidity conditions of the monetary market (supply of resources *versus* demand), which are not subject to the influence of risk borne by the who takes on financial resources under buyback operations, given that the back-up offered is homogenous" (BACEN, 2011).

The graph that follows pictures the course of the Actual-Selic rate and that of independent variables employed in the econometric model chosen for the purpose of this study, during the evaluated period, namely:
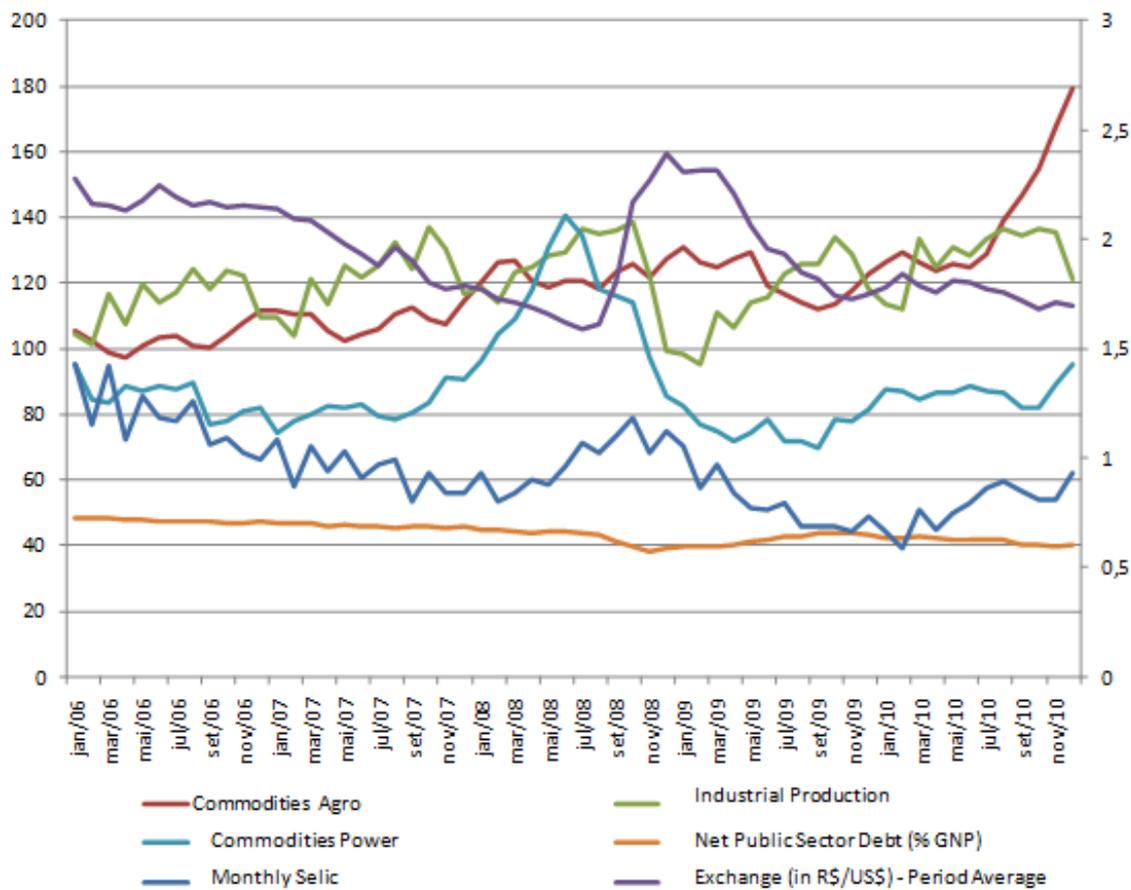

Figure 1: Selic rate and independent variables
Source: author

1.1. Overall Purpose

This study's general objective poses to identify and analyse the variations the Brazilian economy's standard interest rate (Actual-Selic rate)

has presented and how oscillations in macroeconomic variables have influenced the same.

1.2. Specific Objectives

This study's specific objectives include the following items:

- Prepare an econometric model that poses to demonstrate the existing relationship between the dependent variable and the chosen independent variables.

- Evaluate, by using E-Views software, the proposed conceptual models, considering the Actual-Selic rate as a dependent variable and the variations of the available macroeconomic data, as independent variables.

- Select the best model and verify if the same is compatible with the explanation concerning the calculation of the Actual-Selic rate during the period comprised between January 1st, 2006 and December 31st, 2010 certifying whether the selected model complies with the theoretical model's assumptions.

- Identify the marginal effect and measure each variable's elasticity, so as to identify which were most significant in terms of explaining the oscillations of the Actual-Selic rate, during the period of analysis.

2. THEORETICAL JUSTIFICATION AND HYPOTHESIS TO TEST

The Selic rate is considered the most relevant monetary policy instrument that the Central Bank holds via COPOM (Monetary Policy Committee), which periodically establishes the target for the mentioned rate, whilst the Central Bank of Brazil's open market operations desk, remains accountable for maintaining the actual daily rate, in and around the target as set.

Caetano et al (p. 3-4) indicate that "given the relevance of the theme, several studies have sought empirical evidence that might pinpoint

how the interest rate ought to behave. Some have sought a reaction function for the monetary authority [...]", given that "the decisions of the Monetary Policy Committee (COPOM) concerning the SELIC interest rate have been closely followed by several institutions and financial analysts, economic agents, scholars, politicians [...] with views to understanding and foreseeing possible movements in the interest rate".

The same above mentioned authors state that "most recent research concerning [monetary] policy rulings have emphasized, as prime instrument, the nominal short term interest rate, whilst others, to a lesser extent, have been or rather, might be suggested and analysed such as for instance, the monetary base or some other monetary aggregate [...]; nevertheless, *such possible instruments lost their standing to the interest rate*" (emphasis added).

Acknowledging the relevance of the standard interest rate applied to Brazil in the recent past, Giambiagi et al (2005, p. 174-175) state that during Fernando Henrique Cardoso's first government (from 1995 to 1998), "[...] economic policy faced a classic stabilization program issue: the lack of "grounding", represented by the fiscal policy. Without the support of the latter, the *success of the Real depended almost exclusively on the strictness of the monetary policy and interests played a vital role in preserving the Plan*" (emphasis added), thus demonstrating the prevailing role of the interest rate in maintaining macroeconomic stability.

Therefore, the hypothesis to be tested in this study seeks to verify if the variations of prices of agricultural commodities, power commodities, metal commodities, exchange rate, public sector net debt and average worker income present relations concerning the variations verified in the Actual-Selic.

3. DATA BASE

Seven distinct data bases were employed to perform statistical analysis comprising, in a standardized manner, monthly series for the period ranging from January 1st, 2006 and December 31st, 2010 totalling 60 observations as herein under detailed:

- Interest rate – Selic in a monthly basis (Source: Central Bank of Brazil);
- ICB – Brazil Commodities Index (Source: Central Bank of Brazil), which contains the segregated bases with prices for:

    - Agricultural commodities – Internal Market (mix of beef, cotton, soybean oil, wheat, sugar, corn, coffee and pork);

    - Power commodities – Internal Market (mix of *brent* oil, natural gas and coal);

    - Metal commodities – Internal Market (mix of aluminium, iron ore, copper, tin, zinc, lead and nickel);

- Official exchange rate, considering R$/US$ (Source: Central Bank of Brazil);
- Public sector net debt – PSND (Sources: Central Bank of Brazil – BCB - Bulletin/Public Finances);
- General industry industrial production (Source: IBGE – Brazilian Geography and Statistics Institute);
- Open unemployment rate – percent of the economically active population (Source: IBGE);
- Average actual income effectively received by people of 10 or more years of age, employed, per Metropolitan Regions: Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo e Porto Alegre (Source: IBGE).

The above data was extracted from the IPEA Data, Central Bank of Brazil and Brazilian Geography and Statistics Institute (IBGE) official websites.

4. TECHNICAL METHODOLOGY AND ECONOMETRIC TECHNIQUE EMPLOYED

According to Wooldridge (2006, p. 64), "multiple regression analysis is that which is most receptive to *ceteris paribus* analysis since it allows for the explicit control of several other factors which, in a simultaneous manner, impact the dependable variable".

The above mentioned author claims that "the multiple regression model is still the most extensively employed means to conduct economic empirical analysis [...]. Likewise, the ordinary least squares method is widely used to estimate the parameters of the multiple regression model".

By means of the OLSM (Ordinary Least Squares Method), two models were taken into account for the purpose of explaining Actual-Selic rate variations (dependent variable). The first model was conceptually constructed as follows:

Model I

Selic Rate = β_0 + β_1*(Agricultural Commodities Prices) + β_2*(Power Commodities Prices) + β_3*(Metal Commodities Prices) + β_4*(Exchange Rate) + β_5*(PSND) + β_6*(Industrial Production Level) + β_7*(Average Workers Income) + β_8*(Unemployment Rate) + u

In order to improve the Model I, the second model was designed as follows:

Model II

Selic Rate = β_0 + β_1*Log (Agricultural Commodities Prices) + β_2*Log (Power Commodities Prices) + β_3*Log (Exchange Rate) + β_4*Log (PSND) + β_5*Log (Industrial Production Level) + u

Whereby:

Selic Rate: actual monthly accumulated Selic rate (dependent variable);

Agricultural Commodities Prices: prices of agricultural commodities in Brazil (independent variable);

Power Commodities Prices: prices of power commodities in Brazil (independent variable);

Metal Commodities Prices: prices of metal commodities in Brazil (independent variable);

Exchange Rate: exchange rate in R$/ US$ (independent variable);

PSND: Public Sector Net Debt, in % of the GNP (independent variable);

Industrial Production Level: variation of the level of the general industrial production, on a nationwide basis (independent variable);

Average Workers Income: average actual income of workers (independent variable);

Unemployment Rate: percent of unemployed people, in % of Economically Active People (EAP) (independent variable).

Wooldridge (2006, p. 80-91) defines that the multiple linear regression model must adequately address the following hypothesis:

Hypothesis 1: Linear as to parameters;

Hypothesis 2: Random sample;

Hypothesis 3: Zero conditional mean;

Hypothesis 4: Non perfect co-linearity;

Hypothesis 5: Homoscedasticity.

The statistical criteria poses to test the consistency of parameters employed in the model, in addition to verifying its level of adjustment, as specified herein under.

4.1. R^2: Determination Coefficient

The Determination Coefficient corresponds to the ratio between the explained variable and the total variable given that $0 < R^2 < 1$ and that values closest to 1 indicate a better adjustment.

It is worth noting that in social sciences $R^{2'}$s presenting non high values are not uncommon, and that a small R^2 does not certify that a given regression may be deemed as useless (WOOLDRIDGE, 2006).

4.2. Student's t Test

Test which identifies the statistical significance of individual coefficients of the proposed econometric model whereby sample results are used to certify if a null hypothesis is true or false, as per:

Source: Wooldridge, J. M.

$$t = \frac{\hat{\beta}_i - \beta_i}{S\beta i}$$

So that the test may be performed as of the null hypothesis which consists in H_0: $\beta_i = 0$, and of the alternative hypothesis, described as H_A: $\beta_i \neq 0$, whereby "n" represents the quantity of observations, K represents the number of variables, and n – K results from the quantity of degrees of freedom at a 5% of significance.

In the event of acceptance of the null hypothesis and of non-statistically significant parameters, the test thus supports that the variable is not appropriate to explain the variations verified in the dependent variable (Actual-Selic rate).

4.3. Snedecor's F Test

The purpose of this test is to verify if the independent variables influence the dependable variable, the test posing to evaluate if, at least, one of the independent variables adopted in the model presents influence on the dependent variable. This test is also considered an R^2 significance test, comprising the following hypothesis applied to the herein proposed models:

Model I

H_0**:** $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$

H_A**:** $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 \neq 0$, i.e., at least one of the parameters is non zero.

Model II

H_0**:** $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

H_A**:** $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 \neq 0$, i.e., one of the parameters is non zero.

Should F's probability prove to be statistically significant at a level higher than 5%, the null hypothesis is rejected, considering that, at least, one of the estimated parameters is other than zero.

4.4. Confidence Interval

Wooldridge (2006, p. 131-132) explains that "under the hypothesis of the classic linear model, one may [...] build a **confidence interval** (**CI**) for the population parameter β_j. Confidence intervals are also known as *interval estimates* since they provide an extension of the probable values of the population parameter e not merely a spot estimate".

Furthermore, "a confidence interval of 95%, results from: $\beta_j \pm c$. $ep(\beta_j)$, whereby "c" is the 97.5[th.] percentile of a t_{n-k-1} distribution".

5. RESULTS

Amongst the multiple regression analysis conducted throughout the current study, two models are worthy of mention, as previously highlighted, one of which was elected as most appropriate to explain the variations of the Actual-Selic rate, as hereinafter described.

5.1. Model I

The results of the multiple regression analysis undertaken are presented below and two variables prove to not be statistically significant (namely: average income and unemployment rate), resulting in a R^2 of 0.8338 and in an Ajusted R^2 of 0.8077:

Dependent Variable: SELIC
Method: Least Squares
Date: 04/09/11   Time: 21:49
Sample: 2006M01 2010M12
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.148255	0.646740	-7.960312	0.0000
AGRO	0.005697	0.001522	3.742496	0.0005
CAMBIO	0.900685	0.099764	9.028172	0.0000
DLSP	0.051621	0.008294	6.224240	0.0000
ENERGIA	0.006650	0.000779	8.541070	0.0000
METAL	-0.002010	0.000994	-2.023425	0.0483
PRODUCAO_INDUSTRIAL	0.007748	0.001455	5.324332	0.0000
RENDIMENTO_MEDIO	5.85E-05	0.000154	0.380519	0.7051
TAXA_DE_DESEMPREGO	0.003349	0.027857	0.120237	0.9048

R-squared	0.833806	Mean dependent var	0.934500
Adjusted R-squared	0.807736	S.D. dependent var	0.184799
S.E. of regression	0.081030	Akaike info criterion	-2.050504
Sum squared resid	0.334862	Schwarz criterion	-1.736352
Log likelihood	70.51512	Hannan-Quinn criter.	-1.927622
F-statistic	31.98376	Durbin-Watson stat	1.526937
Prob(F-statistic)	0.000000		

5.2. Model II

The outcomes pictured below demonstrated that all the variables of this model are statistically significant, resulting in a R^2 of 0.7974 and an Adjusted R^2 of 0.7786:

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Revision: Grammatical, normative and layout

Dependent Variable: SELIC
Method: Least Squares
Date: 04/10/11   Time: 17:21
Sample: 2006M01 2010M12
Included observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16.11123	2.436172	-6.613336	0.0000
LOG(AGRO)	0.550646	0.185737	2.964652	0.0045
LOG(ENERGIA)	0.673452	0.080721	8.342982	0.0000
LOG(CAMBIO)	1.864416	0.170009	10.96655	0.0000
LOG(DLSP)	1.740245	0.315785	5.510858	0.0000
LOG(PRODUCAO_INDUSTRIAL)	0.752274	0.172225	4.367961	0.0001

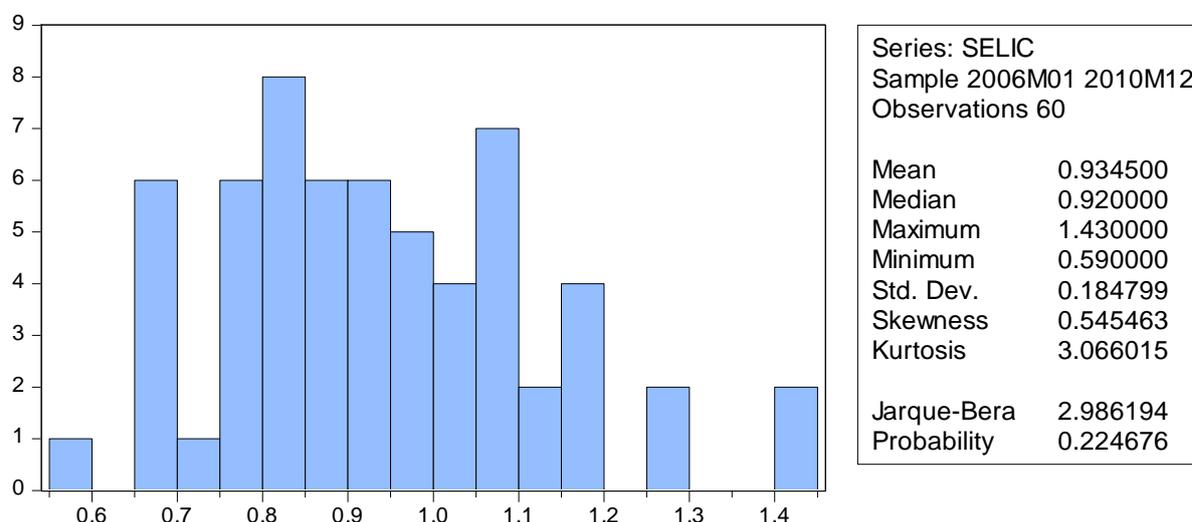|				
R-squared	0.797413	Mean dependent var		0.934500
Adjusted R-squared	0.778655	S.D. dependent var		0.184799
S.E. of regression	0.086943	Akaike info criterion		-1.952491
Sum squared resid	0.408190	Schwarz criterion		-1.743057
Log likelihood	64.57473	Hannan-Quinn criter.		-1.870570
F-statistic	42.51042	Durbin-Watson stat		1.375711
Prob(F-statistic)	0.000000			

5.3.   Preference Justifications to Model II

Based on previous knowledge resulting from outcomes verified in Model I, choice fell upon improving and simplifying the same as much as feasible, excluding those independent variables that did not help explain in a coherent manner, Actual-Selic variations selected for Model II in percent variations, used in a functional manner involving logarithms.

Despite the above specified Model I presenting higher R^2 and Adjusted R^2's than those of Model II (R^2 = 0.83 and R^2Aj = 0.81 in Model I, to R^2 = 0.80 and R^2Aj = 0.78 in Model II), the second model prove to contemplate outcomes which are subject to coherent, relevant economic interpretations and in a simpler manner, utilizing fewer variables without jeopardizing the final results whilst all of its independent variables were found to be statistically significant.

Should the probability result in over 0.05, the normality of residues hypothesis is not rejected. As can be seen from the chart that follows, the

probability of acceptance of the null hypothesis is 0.22. Thus there is no evidence to reject the hypothesis that residues present a normal distribution, namely:

Series: SELIC	
Sample 2006M01 2010M12	
Observations 60	
Mean	0.934500
Median	0.920000
Maximum	1.430000
Minimum	0.590000
Std. Dev.	0.184799
Skewness	0.545463
Kurtosis	3.066015
Jarque-Bera	2.986194
Probability	0.224676

5.4. Selected Model's Multi co-linearity Analysis

As pictured in the table below, as far as the selected model is concerned, there is no evidence for the acceptance of the multi co-linearity hypothesis given the indicator is less than 10:

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	5.934936	47108.48	NA
LOG(AGRO)	0.034498	6236.310	4.031170
LOG(ENERGIA)	0.006516	1035.558	1.247748
LOG(CAMBIO)	0.028903	102.1090	2.904550
LOG(DLSP)	0.099720	11299.22	3.295239
LOG(PRODUCAO_INDUSTRIAL)	0.029662	5414.610	2.000566

5.5. Selected Model's Homoscedasticity, or Constant Variance Analysis

Keeping the data herein under presented in mind, one may verify that for the selected model there is no evidence to reject the homoscedasticity hypothesis, namely:

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.836126	Prob. F(5,54)	0.5299
Obs*R-squared	4.311361	Prob. Chi-Square(5)	0.5055
Scaled explained SS	4.699294	Prob. Chi-Square(5)	0.4537

6. CONCLUSION

This study posed to analyse and explain the variations of the interest rate known as Actual-Selic, from a discrete approach perspective. It was verified that the independent variables "agricultural commodities price variations", "power commodities price variations", "exchange rate variations", "industrial production level variations" and "public sector net debt variations" prove to be statistically significant and economically coherent for explanations concerning the Actual-Selic rate's behaviour.

The positive signals of these coefficients demonstrate that a rise in the five above mentioned explanatory variables, once the remainder is constant (*ceteris paribus*), would enable the observance of a rise in the Selic rate practiced by the market. The model further demonstrated that two variables were highlighted during the explanation of the dependent variable, amongst which, respectively, variations in the exchange rate and variations in the public sector's net debt (PSND).

In as much as the variable exchange rate is concerned, Sicsú (p. 134) in one of his articles intuitively stated that "although statistical procedures were not utilized to analyse the existing causal relationship between the studied variables, the economic events suggest that the CBB has reacted, raising the interest rate (or has refrained from reducing it) when the exchange rate presents previous volatility rises movements [...]". Therefore, this study sought to empirically establish the relation between the Selic and exchange rates, in addition to the other variables, measuring the existing linkage.

Given that this study did not only comprise a single model, the approach enabled the analysis and elimination of the originally designed model (Model I), likewise allowing for the exclusion of independent variables which prove not to be statistically significant to the proposed analysis and/or economically coherent from a theoretical point of view, namely, unemployment rates, the level of workers income and metal commodities price variations.

The finding concerning the fact that Brazil's unemployment rate does not explain variations in the standard interest rate contrasts with the American reality, whereby, according to Barro (2006, p. 5):

> "*Notably, in the U.S., interest rates tend to rise when the labor market is tight, and vice versa*".

It is worth noting that a rise finding or the mere generation of expectations amongst market agents concerning trends to raise the Selic rate, potentially contributes with the increase in interest rates actually practiced in the Brazilian economy, a change that in turn potentially directly or indirectly impacts relevant financial and economic dynamics and expectations, such as:

- The increase in the cost of raising funds for companies;
- A reduction in the return of the Bovespa Index. A study conducted by Costa in 2010, identified an inversely proportional outcome of a 3.28% variation in the IBOVESPA in relation to every 1% of variation in the Selic rate;
- An expectation of future reduction in the inflation level in view of the rise in interest rates, which might lead to postponing of consumption;
- An increase in the national public debt;
- Investor preference in acquiring Selic linked public titles, expecting to earn greater returns;
- A contraction of the credit channel in the local market;
- Greater attraction of foreign capital.

Considering the relevance of analysing trends concerning variations of interest rates, and given that the model presented herein is a tool for the analysis of trends concerning the subject variable, future and complementary studies are deemed necessary so as to verify utilization modalities and the application of the present model in subsidizing effective decision making, and consequently operationalize the application of the model as a means of contributing with the execution of the adopted strategy.

It's worth noting that care must be taken in relation to the exclusive use of historical series since it is expected that the prescriptive utilization of a model is complemented with other analytical methods given that, if one considers the current political and economic environments and the context in which the country is inserted, these might bring along both positive and negative influences, arising from factors other than the variables tested in the models analysed for the purpose of this study.

7. REFERENCES

BANCO CENTRAL DO BRASIL. Available at: <http://www.bcb.gov.br/?SELICINTRO> Accessed 10 April 2011.

BARRO, Robert J. Milton Friedman: Perspectives, particularly on monetary policy. Available at: <http://www.cato.org/events/monconf2006/barro.pdf>. Accessed 9 April 2011.

CAETANO, Sidney Martins; HILLBRECHT, Ronald Otto; JUNIOR, Geraldo Edmundo Silva. Dinâmica da taxa Selic–meta. Available at: <http://bibliotecadigital.fgv.br/ocs/index.php/ebf/7EBF/paper/viewFile/1799/909> Accessed 8 April 2011.

CARNEIRO, Dionísio D.; YEN HON WU, Thomas; Contas externas e política monetária, Revista Brasileira Economia, v.58, n.3, p. 307-310, Jul./Set., 2004.

CASTRO, Lavínia Barros de Castro; GIAMBIAGI, Fabio; HERMANN, Jennifer; VILLELA, André. Economia brasileira contemporânea (1945-2004). Rio de Janeiro: Elsevier, 2005. 425 p.

CORDEIRO, Ariela Diniz. Universidade Federal da Paraíba. A regra de Taylor: um estudo econometrico para o Brasil (1995-2005). Paraíba, 2006. Available at: <http://www.sineziomaia.hpg.com.br/Ariela.pdf>. Accessed 11 April 2011.

GARCIA, Márcio G. P.; MEDEIROS, Marcelo C.; SALGADO, José S. Maria. Monetary policy during brazil´s real plan: estimating the central bank´s reaction function. Available at: <http://cdi.mecon.gov.ar/biblio/docelec/puc/td444.pdf > Accessed 10 April 2011.

GARCIA, Marcio G. P.; VALPASSOS, Marcus Vinicius F. Capital flows, capital controls and currency crisis: The case of Brazil in the nineties. Available at: <http://www.econ.puc-rio.br/pdf/td389.pdf> Accessed 12 April 2011.

JUNIOR, Walter Gonçalves. "surpresas com relação à política monetária e o Mercado de capitais: evidências do caso brasileiro". 2007. 81 f. Dissertação (Mestrado - Programa de Pós-Graduação) – Escola de Administração de Empresas de São Paulo da Fundação Getúlio Vargas, São Paulo, 2007.

RIBEIRO, Alexandre Romaguera Rodrigues da Costa. "Os impactos das mudanças inesperadas da Selic no mercado acionário". 2010. 33 f. Dissertação (Mestrado Profissionalizante em Economia) – Faculdade de Economia e Finanças Ibmec, Rio de Janeiro, 2010.

SICSÚ, João. Flutuação Cambial e Taxa de Juros no Brasil. Available at: <http://www.joaosicsu.org/textos/artigosrevistasreferee/Flutuacao%20Cambial%20e%20Taxa%20de%20Juros%20no%20Brasil.pdf> Accessed 7 April 2011.

WOOLDRIDGE, Jeffrey M.; Introdução à Econometria: uma abordagem moderna. São Paulo: Thomson Learning, 2006. 684 p.