GLOBAL JOURNAL OF COMMERCE & MANAGEMENT PERSPECTIVE
(Published By: Global Institute for Research & Education)
www.gifre.org

Investigating the causal relationship between interest rates structure

Dr. Sanjib Kumar Pakira
Asst. Professor, Dept. of Commerce, Maharaja Manindra Chandra College, Bose Street, Kolkata.

Abstract

The present paper explores the causal relationship between interest rates structure to be specific causal relationship between Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates in India for the period from 2001-02 to 2015-16(up to July 14, 2015) using yearly data with the application of unit root test, Johansen cointegration test and Granger causality test. Though causal relationship and association between various macroeconomic variables have become most mesmerizing area for study but with the view of growth in economy, the importance of investigating the causal relationship and association between various interest rates structure in India cannot be ignored. The present study will try to analyze the causal relationship between interest rates structure in India. Johansen cointegration test result indicates that there exists a long-term relationship among the selected variables. Granger causality test result shows that there must be either bidirectional or no causality among the variables.

Keywords: Call/ Notice Money, Savings, Term Deposits, Lending, unit root test; Granger causality test, Johansen cointegration test.

1. Introduction

The theoretical as well as empirical relationship between the interest rate and other macroeconomic variables has been a debatable issue among the economists. The high interest rate policy is considered important for several reasons. It is necessary to alleviate the exchange rate depreciation and to restrain the inflationary pressure and thereby helps to avoid many undesirable economic consequences. Reserve Bank of India has been using high interest rate policy to contain the excessive volatility of exchange rates in the foreign exchange market. The monetary authorities in many countries resort to high interest rates policy when the currency is under pressure and low interest rates policy when the currency is in normalcy (Bhunia A, 2013). The financial theory explains that the unpredictability in interest rates affects the firm's cash flows, hence the market value of the shares. Additionally, the theory discusses the negative relation between interest rates and stock returns. The reason for this negative relation lies under the investors' behavior of comparing high-risk investments with low-risk interest-bearing securities. Briefly saying, an investor might not make an investment in a high-risk stock market if there is an increase in the interest rates. On the other hand, a decrease in the interest rates stock returns becomes more attractive, and the investors shift from fixed-income instruments to stock market. With another point of view, an increase in the interest rates may affect the spending of households, which cuts down the earnings of companies and ends up with a decrease in the value of the stock (Arora, S 2012). Keeping in view of this, this paper examines the causal relationship between various interest rates structure i.e. Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates in India for the period from 2001-02 to 2015-16.

2. Review of Literatures

There are many researches that examined the relation between various interest rates and other macroeconomic variables. In study of Huang et al.(1984), it indicates that the increase between long and short interest rates, expected and unexpected inflation, industrial production and the spread between high- and low-grade bonds have a crucial influence on the stock prices. Gallinger (1994) observes the relation between stock return and real activity and finds that stock market Granger-cause the interest rate spread between commercial papers and T-bills. Mukherjee et al. (1995) investigates the relationship between stock market and exchange rate, inflation, money supply, real economic activity, long-term government bond rate, and call money rate in Japan. Their findings support a cointegration relation. Keminsky et al (1998) explored the time series correlation between daily exchange rates and interest rates for six countries by using daily data during the second half of 1997. The study found the signs of unstable correlations and concluded that interest rates in those countries must not be an exogenous variable. In the study of Goldfajn et al. (1998) it observed the linkage between real interest rate and real exchange rate for the Asian countries during July 1997 to July 1998 by using Vector Autoregression (VAR) based on the impulse response function from the daily interest rates and exchange rates. They have not found any strong conclusion regarding the relationship between interest rate and exchange rate. Kraay (1998) explored whether an increase in interest rate policy can defend the speculative attack by using monthly data for 75 developed and developing countries over the period 1960-99 and found that the high interest rates policy don't defend the currencies against speculative attacks. Furman et al (1998) examined the effect of an increase in interest rate, inflation, and many non-monetary factors on exchange rate for 9 developing countries during 1992-98. They observed that the high interest rate was related with a subsequent depreciation of nominal exchange rate but the effect was more prominent in low inflation country than in high inflation country. Goldfajn et al (1999) examined 80 currency crisis episodes between 1980 and 1998. They examined that an increase in interest rate is associated with an appreciation of nominal exchange rates. They conclude that the probability of choosing a high interest rate policy during the post-crisis period was low if the country was faced with a banking crisis. Gould et al (2000) examined the relationship between interest rate and exchange rate by analyzing the effect of interest rate, risk premium, and default probabilities on the exchange rates for six countries. They observed that the exchange rates in these countries were subjective by credit spreads and stock prices rather than interest rates. Muradoglu et al. (2000) investigate the causal relation between market returns and exchange

rates, interest rates, inflation, and industrial production for 19 emerging markets from 1976 to 1997. Their findings support that the relation between stock returns and macroeconomic variables was mainly linked to the size of the stock market. In study of Pattanaik et al (2001) it was found that one standard deviation shock to the call rate leads to rupee appreciation in the second month. They also found that in response to one standard deviation shock the exchange rate appreciates by about 8 paise in the second month, but subsequently the exchange rate depreciates more than offsetting the initial impact of the hike in interest rates. Kim (2003) uses monthly data for the period between January 1974 and December 1998 in the United States.

The findings support that stock price has a positive correlation with industrial production, but a negative relationship with the real exchange rate, interest rate, and inflation. Nishat et al. (2004) examined the relationship between a set of macroeconomic variables and the stock market in Pakistan using the Index of Karachi Stock Exchange. The macroeconomic variables in their study include industrial production index, money supply, interest rate, and inflation. They found that industrial production has the largest positive relationship with stock prices. Ray (2012) observed the relation between different macroeconomic variables and the stock prices in India for the periods 1990 to 1991 and 2010 to 2011. They found that no causal association between stock price and interest rate. The conclusive sum of this retrospective review of relevant literature produced till date on the offered subject reveals wide room for the soundness and instigates of this work and replicates a few crucial supports that emphasize its feasibility, as may be marked here it. The subsistence of gold price, exchange rates and sensex of stock market in India are hardly available. Therefore, the present study aspires to observe the impact of gold price and exchange rates on sensex in India.

A significant number of studies on the impact of interest rates on other macroeconomic variables have already been undertaken. Though causal relationship and association between various macroeconomic variables have become most fascinating area for study but with the view of growth in economy, the importance of investigating the causal relationship and association between various interest rates structure in India cannot be ignored. The comparative analysis of different interest rates structure is an area which has not yet explored.

The conclusive sum of this retrospective review of relevant literatures produced till date on the offered subject reveals wide room for the validity and originates of this work and reflects some crucial clues that affirm its viability, as may be marked here it. No study has incorporated the causal relationship and association between various interest rates structure in India. The comparative analysis of diverse interest rates structure at international level is an area which has not yet explored. The present study will try to analyze the causal relationship between interest rates structure to be specific causal relationship between Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates in India for the period from 2001-02 to 2015-16(up to July 14, 2015).

3. Materials and Methods

3.1 Data source

The study is based enormously on secondary data acquired from RBI database for the period from 2001-02 to 2015-16(up to July 14, 2015).

3.2 Sample design

This study considers yearly data encircling the Call/ Notice Money Rates (CMR), Savings Rates (SVR), Average Term Deposits Rates above five years (ATDAF) and Average Lending Rates(ALDR). After appropriate fitting the data, there are 13 observations. Eviews 7.1 package program has been used for arranging the data and execution of econometric analyses.

3.3 Tools used

In the course of analysis of the present study, only econometric tools include Augmented Dickey Fuller (ADF) both at levels and 1st differences, Johansen's system co-integration test and Granger causality test have been used.

3.4 Hypotheses taken

Hypothesis-1

H_0: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are not stationary.

H_1: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are stationary.

Hypothesis-2

H_0: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are not associated in the long period.

H_1: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are particularly associated in the long period.

Hypothesis-3

H_0: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are not related pairwise.

H_1: Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates are very much related pairwise.

4. Empirical Results and Analysis

4.1 Unit root test results

Cointegration test technique is greatly supportive to detect the cointegration association between the two variables in the long period and it is realistic if the two variables are stationery in any case. In the present research paper, four indicators, namely, Call/ Notice Money Rates (CMR), Savings Rates (SVR), Average Term Deposits Rates above five years (ATDAF) and Average Lending Rates (ALDR) may be connected in the long period on the prerequisite that they

are not unpredictable or stationery. For the purpose of stationarity test, the present study use ADF and PP unit root test, both at levels and at 1st differences (intercept without trend and intercept with trend) in hopethesis-1 above.

Table-1: Unit Root Test Results

ADF		
Test equation-intercept	at level	at 1st difference
LALDR	-1.544658 (0.4827)	-3.469688 (0.0276)
LATDAF	-1.556853 (0.4769)	-3.898474 (0.0132)
LCMR	-2.320060 (0.179371)	-4.314201 (0.0065)
LSVR	-1.486784 (0.5105)	-4.881940 (0.0025)
Critical values		
1%	-4.004425	-4.057910
5%	-3.098896	-3.119910
10%	-2.690439	-2.701103
PP		
Test equation-intercept	at level	at 1st difference
LALDR	-1.6263568 (0.4440)	-3.469688 (0.0276)
LATDAF	-1.556853 (0.4769)	-4.124481 (0.0089)
LCMR	-2.352147 (0.1709)	-6.496146 (0.0002)
LSVR	-1.722378 (0.3997)	-6.496146 (0.0002)
Critical values		
1%	-4.004425	-4.057910
5%	-3.098896	-3.119910
10%	-2.690439	-2.701103

*MacKinnon (1996) one-sided p-values.

Table-1 demonstrate the ADF and PP unit root test results at level and at 1st difference where it authenticates that Call/ Notice Money Rates (CMR), Savings Rates (SVR), Average Term Deposits Rates above five years (ATDAF) and Average Lending Rates (ALDR)are not stationary at levels [I(0)] and are stationary at 1st difference [I(1)] because test statistics are less than critical value at levels [I(0)] at 1% level of significant and test statistics are more than critical value at 1st difference [I(1)] at 5% level both in the intercept without trend and intercept with trend. The unit root test moreover authenticates that constant variance is seen in case of error terms that indicates statistical dependency, as supported in (Shahzadi and Chohan, 2012).

4.2 Cointegration test results

Because Call/ Notice Money Rates (CMR), Savings Rates (SVR), Average Term Deposits Rates above five years (ATDAF) and Average Lending Rates (ALDR) are stationary, for that reason, multivariate cointegration method in Johansen approach can be applied to identify the cointegration connection between the variables in the long period. Simultaneously, this method can be determined the cointegration vectors. Since we make out two likelihood ratios, specifically, the Trace Test and the Maximum Eigen Value test can decide the cointegration vectors. At the time of testing, the present research study accepts linear deterministic trend unrestricted with intercepts without trends on account of using a lag of 1 to 1 at 1st differences derived from Swartz Information Criterion (SIC) for the selected indicators under the study.

Table-2 reveals the multivariate cointegration test results in the course of Johansen approach that offers surety regarding connection between Call/ Notice Money Rates (CMR), Savings Rates (SVR), Average Term Deposits Rates above five years (ATDAF) and Average Lending Rates (ALDR) in the long period as trace statistics is more than critical value in case of both the likelihood ratio test, to be exact, the trace test and the maximum eigenvalue test. Consequently, the results of the multivariate cointegration test do not accept the null hypothesis (talked about in hypothesis-2 above). Trace test indicates 4 cointegrating eqn(s) at the 0.05 level and Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level. This test also established the number of cointegration vectors. It is moreover indicating that two common stochastic trends or a degree of market integration are present there.

Table-2: Cointegration Test Results

Included observations: 13 after adjustments
Trend assumption: Linear deterministic trend
Series: LALDR LATDAF LCMR LSVR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.998073	118.5517	47.856123	0.0000
At most 1*	0.749028	37.27856	29.79707	0.0057
At most 2*	0.658796	19.30718	15.49471	0.0127
At most 3*	0.336280	5.328632	3.841466	0.0210

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.998073	81.27314	27.58434	0.0000
At most 1	0.749028	17.97138	21.13162	0.1309
At most 2	0.658796	13.97855	14.26440	0.0554
At most 3*	0.336280	5.328632	3.841466	0.0210

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.3 Pairwise causal test

To establish the causal relationship with movement of causation between Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates, pairwise causal (Granger) test has been utilized in the present study. Table-3 illustrates the results of pairwise causal test and point up that there is no causal relationship exist (talked about in hypothesis-2 above) between (i) Term Deposits Rates above five years and Lending Rates, (ii) Lending Rates and Term Deposits Rates above five years, (iii Call/ Notice Money Rates and Lending Rates, (iv) Lending Rates and Call/ Notice Money Rates, (v) Savings Rates and Lending Rates (vi) Call/ Notice Money Rates and Term Deposits Rates above five years, (vii) Term Deposits Rates above five years and Call/ Notice Money Rates, (viii) Savings Rates and Term Deposits Rates above five years, (ix) Term Deposits Rates above five years and Savings Rates, (x) Savings Rates and Call/ Notice Money Rates, (xi) Call/ Notice Money Rates and Savings Rates because the probability is more than 0.05. Table-3 also shows that there is bi-directional causal relationship exist between Lending Rates and Savings Rates because the probability is less than 0.05. Hence, pairwise causal assertion linking Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates indicates that trend in one indicator is not the grounds for trend in other indicator under the study. Therefore, this study may conclude that causal relationship is merely a trend of the selected data under the period of study, as supported in (Awe, 2012).

Table-3: Pairwise Granger Causality Tests (Lags: 2)

Null Hypothesis	Obs	F-Statistic	Prob.	Decision	Type of Causality
ATDAF ↑ ALDR	13	2.17017	0.1766	DNR H_0	No causality
ALDR↑ ATDAF		0.00867	0.9914	DNR H_0	No causality
CMR ↑ ALDR	13	3.86422	0.0669	DNR H_0	No causality
ALDR↑ CMR		1.11593	0.3737	DNR H_0	No causality
SVR ↑ ALDR	13	1.12148	0.3721	DNR H_0	No causality
ALDR ↑ SVR		15.8401	0.0017	Reject H_0	Bi-directional causality
CMR ↑ ATDAF	13	1.00822	0.4069	DNR H_0	No causality
ATDAF ↑ CMR		2.45391	0.1476	DNR H_0	No causality
SVR ↑ ATDAF	13	0.30677	0.7441	DNR H_0	No causality
ATDAF ↑ SVR		1.18303	0.3547	DNR H_0	No causality
SVR ↑ CMR	13	2.40056	0.1525	DNR H_0	No causality
CMR ↑ SVR		3.13063	0.0990	DNR H_0	No causality

Note: Decision rule: reject H_0 if P-value < 0.05, DNR = Do not reject; ↑ = does not Granger cause.

5. Conclusions

The primary finding of the present study is that selected four financial variables are stationery time series data at I(1) that is an indication of the affiliation between Call/ Notice Money Rates, Savings Rates, Term Deposits Rates above five years and Lending Rates in the long period. The empirical results of cointegration method in the course of Johansen approach mention that protected cointegration association between the selected variables under the study are greatly present in the long period. This research moreover illustrates that there are bidirectional causal connection present between Lending Rates and Savings Rates in the study period.

References

Bhunia A (2013). "Cointegration and Causal Relationship among Crude Price, Domestic Gold Price and Financial Variables-An Evidence of BSE and NSE." *J. Contemp. Issues in Bus. Res*. 2(1), 1-10.

Arora, S (2012). "Information Content of Stock Market, Gold & Exchange Rate: An Indian Market Perspective", a dissertation paper submitted to Jindal Global Business School, taken online from www.slideshare.net/SukantArora/final-draft-20100040-13836194.

Huang, R. D., and Kracaw, W. (1984), "Stock market returns and real activity: A note." *The Journal of Finance*, Vol. XX.XIX, Issue 1, March 1984.

Gallinger, W. G. (1994), "Causality tests of the real stock return—real activity hypothesis." *The Journal ofFinancial Research*, Vol. 17, Issue 2, Summer.

Mukherjee, T. K., and Naka, A. (1995), "Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error correction model." *Journal of Financial Research*,Vol. 18, Issue 2, pp. 223–237.

Keminsky, G. and Schumulkler, S. (1998), "The Relationship Between Interest Rates and Exchange Rates in Six Asian Countries" *World Bank, Development Economics and Office of the Chief Economist*, Washington, D.C.28

Goldfajn, I. and Baig, T. (1998), "Monetary Policy in the Aftermath of Currency Crises: The Case of Asia", *International Monetary Fund Working Paper, WP/98/170*, Washington D. C.

Kraay, A. (1998), "Do High Interest Rates Defend Currencies against Speculative Attacks?", *Policy Research Working Paper 2267, World Bank*, Development Research

Furman, J. and Stiglitz J. E. (1998), "Economic Crises: Evidence and Insights From East Asia" *Brooking Papers on Economic Activity*, No. 2, Brooking Institution,Washington D.C.

Goldfajn, I. and Gupta, P. (1999), "Does Monetary Policy Stabilize the Exchange Rate Following a Currency Crisis?", *International Monetary Fund Working Paper,WP/99/42*, Washington D. C.

Gould, D. M. and Kamin, S. B. (2000), "The Impact of Monetary Policy on Exchange Rates During Financial Crisis", *International Finance Discussion Paper 669, Board of Governers of the Federal Reserve System*, Washington D.C.

Muradoglu, G., Taskin, F., and Bigan, I. (2000), "Causality between stock returns and macroeconomic variables in emerging markets." *Russian & East European Finance and Trade*, Vol. 36, Issue 6, pp. 33–53.

Pattnaik, S. and Mitra A. K. (2001), "Interest Rate Defence of Exchange Rate:Tale of the Indian Rupee", *Economic and Political Weekly*, November 24, pp. 4418-4427.

Kim, K. (2003), "Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model." *Review of Financial Economics*, Vol. 12, Issue 3, pp. 301–313.

Nishat, M., and Shaheen, N. (2004), "Macroeconomic factors and Pakistani equity market." *Department of Finance and Economic*s, Institute of Business Administration Karachi, Pakistan.

Ray, S. (2012), "Testing Granger causal relationship between macroeconomic variables and stock price behaviour: Evidence from India." *Advances in Applied Economics and Finance*, Vol. 3, Issue 1, 2012, ISSN2167-6348.

Shahzadi, H and Chohan, M. N (2012). Impact of Gold Prices on Stock Exchange: A Case Study of Pakistan", Working paper series, Karachi Stock Exchange, 10 (2), 1-14.