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Empirical Analysis on the Applicability of the Term Structure of Interest Rate Theory in Nigeria

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Abstract

This study tested the applicability of the term structure theory of interest rates in Nigeria for the period between 1976 and 2013. This was done by focusing on the expectations theory to determine if it has been valid. In order to accomplish the set out objectives, this paper was split into pre SAP and post SAP analysis. Bearing this in mind, two research hypotheses (H_{o1} - H_{o2}) were formulated which were tested using two analytical techniques. These are the Augmented Dickey Fuller (ADF) Unit Root Test and the Vector Auto Regression Test. Based on the results gotten, H_{o1} was accepted and H_{o2} was rejected. This implied that the expectations theory was not valid before the advent of SAP. The period after SAP however showed that the expectations theory was valid. The study ended by recommending that monetary policy makers should be more transparent and stable in their activities so as to make the policies more predictable. This would be in the interest of the Nation at large.

Keywords: Term structure theory, expectations theory

1. Introduction

The term structure of interest rates also known as the yield curve, refers to the relationship between market interest rates on short term and long term securities. It can also be viewed as the difference in yield on fixed income securities due to the difference in the maturity of the instruments. The yield curve is a very important element in any economy. This is due to the important role it plays in financial institutions and monetary policy. The yield curve can further be defined as one which shows the relationship between interest rate and time to maturity. This curve can be used to assess market expectations about the future course of monetary policy. The main theory developed to understand the term structure of interest rates is the Expectations theory. According to the expectations theory, long-term interest rates are determined by the present level and by the expected path of short-term interest rates. Thus they can be used to estimate future short-term interest rates.

The pure version of the expectations theory sustains that such estimates are unbiased, i.e., that the expected future short term interest rates implicit in the spot long-term interest rates are on average equal to the forward short-term interest rates. However, long-term interest rates tend to overestimate the future short term interest rates. This bias can be due to a term premium, i.e., the additional return required by an investor in order for him to choose investments in larger maturities. If this premium is constant, the expectations theory will still hold in a non-pure version, while if the former is variable the expectations theory will not be valid. If the expectations theory is valid, information on the future path of short-term interest rates can be drawn from the yield curve. Since forward short-term interest rates are in fact advanced indicators of important macroeconomics variables, their knowledge is central for economic actors like portfolio managers.

Furthermore, the validity of the expectations theory allows Central Banks to measure the impact of their monetary policies on the term structure of interest rates, and to exclude the possibility of maturity segmentation in the financial markets.

1.1 Statement of the problem.

The Nigerian economy is known to be plagued with a myriad of problems like poor electricity, education, water supply etc. These are due to a variety of macroeconomic and microeconomic factors. Therefore, any study that attempts to identify ways by which the economy can improve is justified. The study of the term structure of interest rates is thus necessitated by the fact that interest rates have a fundamental role to play in the development of any economy.

Furthermore previous works on this topic have been based on many countries but very few in Nigeria. Due to the importance of the term structure of interest rates in an economy as pointed out in the previous section,

it is a pertinent to know its status in Nigeria.

1.2 Objectives of the study

This study generally sought to investigate the term structure of interest rates in Nigeria. Specifically the study has the under listed as its objectives;

1. To analyze the validity of the expectations theory in the Nigerian economy pre-SAP
2. To analyze the validity of the expectations theory in the Nigerian economy post-SAP

1.3 Research questions

In order to achieve the objectives of this study, the following research questions were treated;

1. To what extent is the expectations theory valid in the Nigerian economy pre-SAP?
2. To what extent is the expectations theory valid in the Nigerian economy post-SAP?

1.4 Research hypotheses

In order to provide a framework for analyzing the term structure of interest rates in Nigeria, the following hypotheses were formulated;

H_{o1} Expectations theory is not valid in the Nigerian economy pre-SAP

H_{o2} Expectations theory is not valid in the Nigerian economy post-SAP

The first hypothesis was necessary to determine if long term interest rates were could be predicted by the short terms rate or otherwise before the era of SAP. The second hypothesis was necessary to determine if this kind of prediction was prevalent after the emergence of the SAP.

1.5 Significance of the study

The significance of this study cannot be overemphasized since the term structure of interest rates is an indispensable tool for enhancing productivity and achieving rapid economic growth and development in any economy. Furthermore, results obtained from this study would be of immense benefit to other researchers and scholars alike as it represents an addition to the existing body of knowledge available on this topic.

1.6 Scope of the study

This study was centered on the term structure of interest rates in Nigeria. Since the study emcompasses both pre SAP and post SAP eras, the time frame utilized between 1976 and 2013. A major macro-economic indicator, interest rate is the variable of interest. Different interests with different maturities are considered in this study.

1.7 Organization of the study

This paper aims at testing the expectations theory for the term structure of interest rates in Nigeria. This is done using economic Nigerian data from 1976 to 2013.i.e. pre sap and post sap. The paper is divided into five sections. Section one gave a general introduction of the topic under scrutiny. Other sub-topics here were;

1) Statement of the problem
2) Objectives of the study
3) Significance of the study
4) Research questions
5) Scope of the study

The second section took a critical look at the literature relating to the term structure of interest rates in other countries. Section three covered details on the methods employed in the course of this study. Here the research design, sources of data collection, model specification and method of data analysis were all spelt out. Section four dealt with the presentation of data collected, its analysis and interpretation. Section five gave conclusions on the study.

2.0 Theoretical framework and literature review

2.1 Theoretical framework

The theories considered here are the ones relating to the term structure of interest rates. These are as follows;

- Expectations Theory
- Market Segmentation Theory
- Substitutability Theory
- Liquidity Premium Theory

2.1.1 Expectations theory

This explains the yield curve in terms of expected short term rates. It was a theory originated by Irvin fisher and it assumes that individuals form expectations about their future interest rates and are risk neutral (investopedia 2014) . These future interest rates are the main determinants of the present structure of interest rates. Thus, it is therefore a hypothesis that long term interest rates contain a prediction of future short term rates. According to the theory, an investor will earn the same amount of interest by investing in a one year bond today and rolling that investment over into a new one year bond one year later when compared to buying a two year bond today.

The expectations theory thus explains the fact that interest rates for different maturities tend to move together over time. It also shows the reason why yields on short term bonds are more volatile than yields on long term bonds. The key assumption in this theory is the fact that bond investors do not prefer bonds of one maturity over another i.e they see bonds as perfect substitutes and thus assume no inflation risk or interest rate risk.

The long term rates are all averages of expected future short term rates. Thus, if long term rates change, the short term rates will change also in the same direction. Furthermore the fact that long term rates are seen here as averages tends to smoothen them out.

The weakness of this theory is that it tends to overstate future short term rates since it assumes that investors have no preference when it comes to choosing between different maturities and risks associated with securities. Furthermore, it is not possible to achieve the result where the predicted rates of today over different maturities exactly match future spot rates. The theory also does not explain why yield curve has an upward slope most of the time.

2.1.2 Market segmentation theory

This theory deals with the supply and demand in a certain maturity sector which determines the interest rate for that sector. It is used to explain all types of yield curves an investor can meet in the market. If an investor wants to go out of his sector, he will want to be compensated for the additional risk. It is thus also called the preferred habitat theory (Wikipedia 2014).

According to this theory, markets for different maturity periods of bonds are completely segmented. Thus bonds are not substitutes and the expected return from a bond of a particular maturity has no effect on the demand of a bond of a different maturity. Because bonds of shorter term have lower inflation and interest rate risk, this theory predicts that yields on longer bonds will generally be higher. Since markets are segmented, there is no reason why short term and long term yields should move together.

This theory assumes extreme risk aversion and as such, investors match maturity of their assets and liabilities. The theory also expands on the expectations theory by explaining why a long term bond tends to pay more interest than 2 shorter term bonds that add up to the same maturity. This is because, according to the theory, investors prefer short term bonds but are only interested in moving over to long term bonds if they receive an additional income for the risk involved in such a move i.e. risk premium.

2.1.3 Substitutability theory

This theory states that short and long term securities are substitutes for borrowers and lenders in the market. It assumes optimizing behavior and free access to securities market. Thus, arbitrage actions of buyers and sellers eliminate discrepancies between long and short term interest rates. An increase in price of short term securities tend to be followed by an increase in price of long term ones (investopedia 2014). The factors causing this parallel movement of both long term and short term securities are as follows;

a. The substitutability of alternative market investment opportunities (for lenders) and sources of funds (for borrowers)
b. The tendency for changes in credit and monetary conditions to have a simultaneous effect on the financial market.

2.1.4 Liquidity premium theory

This theory can be seen as a synthesis of both the expectations theory and the market segmentation theory. This is because it utilizes the insight from both to explain the common phenomenon of long term yields being higher than short term ones. According to this theory, the economy needs both long term as well as short term bonds. Investing in long term bonds are far more difficult because of uncertainty. Since long term bond holders keep their money tied up longer, miss other short term opportunities and face more uncertainty, the yield is better as a form of compensation. Thus the theory agrees that bonds of different maturities are substitutes but not in the perfect sense as expectations theory suggests (Wikipedia 2014).

This theory is significant in the sense that it serves as a market mechanism to encourage equilibrium between long and short term bond holders. It stresses that while the two types of bonds are very similar, they are not identical. The theory also explains all three term structure facts being;

- Interest rates for different maturities tend to move together
- Yield curves tend to have steep upward slope when short rates are low and downward slope when short rates are high i.e short term yields are more volatile than long term yields
- Long term yields tend to be higher than short term ones i.e yield curves are usually upward sloping.

This is an improvement considering the fact that the expectations theory only explains the first two facts while the market segmentation theory only explains the third fact.

Of all the theories considered here, this paper is centered on the expectations theory in order to examine the term structure of interest rates between 1976 and 2013.

2.2 Literature review

Mankiw and Miron (1986) argued that the expectations theory will fare poorly in periods in which the central bank conducts policy in such a way as to make it difficult for financial market participants to forecast future changes in short-term interest rates. The explanation they gave is that when the expected path of short-term interest rates is horizontal, movements in the term structure will be dominated by changes in the risk premium. Since tests of the expectations theory assume that risk premiums are constant, they will then reject the null hypothesis. By contrast, if the central bank sets monetary policy in such a way as to make future changes in interest rates easy to predict, for instance because it moves short-term interest rates in response to the output gap, movements in the term structure may be dominated by changes in the expected path of interest rates, leading the expectations theory to be accepted.

Gerlach and Smets (1997) provide more evidence in support of Mankiw and Miron's hypothesis. Using data from 17 economies on short-term euro-currency interest rates, they find that the expectations theory is not rejected in those economies in which one-month interest rates are relatively easily predictable. Gerlach and Smets (1998), in a closely related study, note that the Expectations theory tends not be rejected in economies with fixed exchange rates, essentially because occasional episodes of exchange-market pressures have led to spikes in short-term interest rates. Since these increases were temporary, market participants expected them to be undone over time, which lead to considerable predictability of interest rates that dominated any variability of the term premium. In economies with floating exchange rates, by contrast, future changes in short-term interest rates were more difficult to predict, so that movements in the term-structure reflected largely variations in term-premia. As a consequence, the expectations theory was rejected.

A number of papers examine the spectral density functions for various interest rates with different maturities for differences in cyclical and seasonal movements. Fand (1966) finds spectral peaks at seasonal and cyclical periodicities in US short rates that are not present for long rates. Lagged long rates therefore turn out to be better predictors for future long rates than lagged short rates. Dobell and Sargent (1969) confirm this finding with Canadian
interest rates. Using cross-spectral analysis they conclude that the short rate fluctuates with much greater amplitude than the long rate over all frequencies except the trend and that both rates show a surprisingly large degree of independence. Granger and Rees (1968) find that the coherence between UK interest rates of different maturities over long-run frequencies is large and declines in shorter frequency bands. On his part, Sargent (1968) finds that the long rate leads the short rate and that the lead increases as shorter interest rates are considered. Cargill and Meyer (1972) employ spectral methods to estimate the coefficients of a time-domain distributed lag model. They find that long rates respond quickly to changes in the short rate, but that the coefficient is significantly smaller than unity and the expectations theory is thus rejected. In a related paper, Sargent (1972) also rejects constancy of the term premium using spectral methods. Donati and Donati (2007) decomposed the yield curve and investigated the relation of its long-term, medium-term and short-term components with

macroeconomic variables. Kim and Orphanedes (2005) identified monetary policy shocks to the federal funds rate and investigated their propagation to other rates using a Vector Auto Regression.

3. Research methodology

3.1 Research design

A research design can be seen as the structure of a study. It is the glue that binds all the elements in a research paper. It can also be seen as the research blueprint which shows how the major parts of the research work together to achieve the research objective(s). These parts are the research questions, research variables and data analysis (Wikipedia, 2014). Indeed, the quality of any research project is enhanced if an appropriate research design is utilized. Therefore, this study utilized the descriptive research design (Quickmba, n.d.) to critically examine the term structure of interest rates theory in Nigeria between 1976 and 2013.

3.2 Sources of data

The data used for this study were generally extracted from secondary sources. These secondary sources were basically websites and other relevant books.

3.3 Method of data collection

This paper made use of the desk research method. This is a method of data collection in which data was gotten from the internet.

3.4 Techniques of data analysis

After careful collation and tabulation of the data extracted from the various sources mentioned above, the next step was the analysis of the data. The methods jointly employed to ensure the reliability of the results achieved are:

1. The Augmented dickey fuller (ADF) unit root test was carried out to test variables for non-stationarity. This is because it is a known fact that, whenever unit root is present in a time series data, there is the presence of random walk, which in turn implies weak form efficiency (Enowbi, Guidi & Mlambo, 2009). Also, the presence of non-stationarity in a time series can lead to spurious regression results.
2. The Vector Auto Regression analysis.

3.5 Model specification

To analyse the applicability of the expectations theory in Nigeria, it is necessary to begin with assuming a simple result that relates pairs of interest rates with different maturities; the greater maturity of both is called the long-term, and the smallest is named the short-term. R_{tn} stands for the long-term interest rate observed in moment t (n being the longer maturity) and R_{tm} is the short-term interest rate observed in moment t (m being the shorter one). Maturities m and n are such that $m<n$ and n/m is an integer. The expectations theory for the term structure of interest rates implies that the theoretical long-term interest rate in moment t (R_{tn}^*) equals a simple average of the present and future values for the short term interest rates that economic agents in moment t expect for the period running between t and $t+n$($E_t R_{t+mi}$ i=0,….,(n-m)/m), plus a constant term premium (c). This, according to Campbell and Schiller (1986) is represented thus

$$R_{tn}^* = m/n \sum_{I=0}^{(n-m)/m} E_t R_{t+mi} + Cmn \qquad (1)$$

Where

R_{tn}^*= Theoretical long interest rate in moment

E_t = Expectation at moment t

i = future time periods

The term premium is defined as the additional return (i.e., the yield additional to the expected rate of return of a succession of n/m short-term - maturity investments) demanded by an investor, during the period running from t to $t + n$, which makes the investor indifferent between this investment and a long-term investment with maturity in period $t + n$.

Equation (1) does not specify the process by which expectations are formed. Taking a cue from Campbell and Schiller (1991), expectations regarding the future path of interest rates are assessed by using a vector auto regression (VAR).

Let $S_{tnm} = R_{tn} - R_{tm}$ and $S_{tnm*} = R_{tn*} - R_{tm}$ stand for the observed and the theoretical spread between the long-term and short-term interest rates respectively, and $\Delta R_{tm} = Rt_m - Rt_{m-1}$ stand for the first difference of short-term interest rates. Rearranging, the following expression for the theoretical spread is obtained:

$$S_{tnm*} = \sum_{I=1}^{(n-m)/m} (n-mi)/n \left[\sum_{J=1}^{m} E_t \Delta R_{t+mi-j} \right] + Cmn \qquad (2)$$

.Equation (2) indicates that the theoretical spread must predict future changes in the short term interest rate whenever the expectations theory is verified. The prediction of the future change in m-maturity rates is obtained with a VAR including S_{tnm} , ΔR_{tm} and lagged values of those variables; these variable are assumed to constitute all the necessary information to forecast future interest rate changes. The first order VAR can be written as follows

$$z_t = AZ_{t-1} + U_t \qquad (3)$$

where $z_t = [\, \Delta R_{tm}, \ldots, \Delta R_{tm-p+1}, S_{tnm}, S_{tnm-p+1} \,]'$

A = matrix of the VAR coefficients and

U_t = vector of residuals in period t.

For the purpose of this paper, treasury bill rate was used as a proxy for short term interest rate while corporate bond interest rate was used as a proxy for long term interest rate.

4.0 Data presentation and analysis

4.1 Data presentation

In this section, the necessary data collected were presented, analyzed and interpreted in order to arrive at cogent conclusions. The data needed for the analysis were that on interest rates of different maturities from 1976 to 2013. The data needed to test the applicability of the expectations hypothesis in Nigeria were

1. Treasury bill rate
2. Corporate bond interest rate

All of these data were presented in appendix 1.

4.2 Data analysis

The data presented in appendix 1 was analyzed using Eviews 7 statistical software.The test for each pair of maturities (m, n) consists of:

1. estimating the VAR model given by equation (3)
2. calculating the theoretical spread, given by equation (2) and
3. testing if the estimated series are similar enough to those observed, by calculating the correlation coefficient between the observed and the theoretical spreads, as well as the ratio between the standard deviations of those spreads.

For the null hypothesis to be rejected, both statistics must be close to one.(Adao and Louis 1997)

Note that the test performed is in fact a compound test of two hypothesis: first, the hypothesis according to which the expectations theory with constant term premium explains the movements exhibited by long-term interest rates; and second, the hypothesis that the best prediction of the future path of the first differences of short-term interest rates is given by a VAR including the past values of the spreads and of the first differences of short-term rates. Consequently, accepting the null hypothesis could either be an indication that the term premium is not constant over time (i.e., that the expectations theory is not valid) or that economic agents are not using the information encompassed in the VAR in their prediction of the future path of the short-term interest rates in first

differences.

The first test performed was ADF unit root test on the variables. The result of this test was shown in appendix 2. From the result it was seen that both had unit root because the calculated t-value was greater than the critical t-value at all levels. Therefore it was necessary to difference the variables in order to eliminate the unit root. The unit root test on the resulting variables was shown in appendix 3. The result here showed that both variables were stationary because the critical t-values were less than the calculated t-value (in absolute terms). Also the value of probability was less than 0.05

From other results, it was observed that the short term interest rates were stationary before SAP but not stationary after SAP. The period before SAP exhibited a negatively sloped yield curve while that after SAP exhibited a significantly positively sloped one.

Appendix 4 and 5 show the correlations between spreads and the spreads' standard deviation for pre-SAP period and post-SAP respectively . These figures correspond to a VAR with 3 lags. The results show that both standard deviation ratios and correlation coefficient are not close to one pre-SAP, but are close to one post-SAP. Thus, the null hypothesis is accepted pre SAP but rejected post SAP.

.5.0 Conclusions

The applicability of the expectations theory has been analysed by a wide range of international empirical studies. This paper presents a similar test to the term structure of Nigerian interest rates, as to determine if the expectations theory is applicable. The analysis was split into 2, using the year of introduction of SAP (1986) as a bench mark for the divide. The results obtained, using the method proposed by Campbell and Schiller (1986) point towards the acceptance of the null hypothesis pre SAP and its rejection post SAP. These findings imply that forward interest rates were not used as a central estimate for future spot rates before SAP. This was not the case after the advent of SAP.

Thus it can be concluded that there is an interdependence of long and short term interest rates after the advent of SAP i.e markets for long term and short term securities are not segmented. However, the unstable pattern of interest rates due to inconsistencies in policy formulation affect the information content of the term structure of interest rates. The implication of these findings for monetary policy makers is simple. To the extent that the expectations theory is rejected because market participants cannot form expectations of future interest rates, high levels of transparency and consistency in setting and conducting monetary policy is desirable. The is due to the fact that bonds and other securities will experience relatively large and undesirable valuation gains and losses in response to unpredicted changes in monetary policy. Greater transparency makes monetary policy more predictable and reduces the severity of such valuation changes. Furthermore, government should also bolster its activities in the bonds market to ensure it is also stable. All these will improve the predictive ability of the term structure of interest rate about the future activities in the Nigerian economy.

REFERENCES

Adao, B. and Luis J.B.(1997). *Testing the expectations theory for the portugese yield curve,* Economic bulletin, 5, 101-111

Campbell, J. Y. and Shiller, J. R. (1986), Cointegration and tests of present value models, *Journal of political economy*, 95, 1062-1088.

Campbell, J. Y. and Shiller, J. R. (1991), Yield spreads and interest rate movements: A bird's eye view, *Review of economic studies*, 58, 495-514.

Cargill, F. and Meyer, A. (1972), A spectral approach to estimating the distributed lag relationship between long and short term interest rates, *International economic review*, 13, 223-238.

Dobell, R. and Sargent, J.T. (1969), The Term Structure of Interest Rates in Canada, *Canadian Journal of Economics*, 2, 65-77.

Donati, P. and Donati, F. (2007), *What Moves the Yield Curve? Inflation and Money at Different Horizons*, European Central Bank mimeo.

Enowbi, B. M., Guidi, F. & Mlambo, K. (2009). *Testing the weak-form market efficiency and the day of the week effects of some african countries*.

Fand, D. I. (1966), A Time-Series Analysis of the "Bills-Only" Theory of Interest Rates, *Review of Economics and Statistics*, 48, 361-371.

Gerlach, S. and Smets, F. (1997), The Term Structure of Euro-Rates: Some Evidence in Support of the Expectations Hypothesis, *Journal of International Money and Finance*, 16, 305-321.

Gerlach, S. and Smets, F. (1998), *Exchange Rate Regimes and the Expectations Hypothesis of the Term Structure*, Monetary Policy and Interest Rates, Macmillan, London, 11-35.

Granger,W. J. and Rees, H. B. (1968), Spectral Analysis of the Term Structure
of Interest Rates, *Review of Economic Studies*, 35, 67-76.
Investopedia. (2014). Expectations theory.
Investopedia. (2014). *Substitutability theory.*
Kim, D.H. and Orphanides, A. (2005), *Term Structure Estimation with Survey Data on Interest Rate Forecasts*, Federal Reserve Board Finance and Economics Discussion Series No. 48.
Mankiw, N. G. and Miron, A. J. (1986), The Changing Behavior of the Term Structure of Interest Rates, *Quarterly Journal of Economics*, 101, 211-228
Quickmba (n.d.). *Marketing research.*
Sargent, Thomas J. (1968), Interest Rates in the Nineteen-Fifties, *Review of Economics and Statistics*, 50, 164-172.
Sargent, Thomas J. (1972), Rational Expectations and the Term Structure of Interest Rates, *Journal of Money, Credit, and Banking*, 4, 74-97.
Wikipedia. (2014). *Liquidity premium theory.*
Wikipedia. (2014). *Market segmentation theory.*
Wikipedia. (2014). *Research design.*

Appendix 1
Long and short term rates utilised (%)

Year	Corporate Bonds Rate (Average)	Treasury Bill Rate
1976-1979	N/A	N/A
1980	9.4	5.00
1981	9.4	5.00
1982	9.5	7.00
1983	9.2	7.00
1984	9.3	8.50
1985	9.7	8.50
1986	11.4	8.50
1987	12.2	11.75
1988	13.9	11.75
1989	14.1	17.50
1990	14.6	17.50
1991	15.9	15.00
1992	16.1	21.00
1993	21.1	26.90
1994	21	12.50
1995	18.4	12.50
1996	17.5	12.25
1997	17.2	12.00
1998	18.1	12.95
1999	19	17.00
2000	10.7	12.00
2001	11.1	12.95
2002	11.3	18.88
2003	10.9	15.02
2004	18.5	14.21

2005	18	7.00
2006	17.8	8.80
2007	21.4	6.91
2008	21.4	9.55
2009	15.3	6.13
2010	11.8	10.25
2011	12.5	16.75
2012	13.2	17.20
2013	15.1	12.50

Source: CBN statistical bulletin and SEC data

Appendix 2

ADF test on variables

Null Hypothesis: R_{tn} has a unit root

Exogenous: Constant

Lag Length: 11 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.384677	1.0000
Test critical values:	1% level	-3.510259	
	5% level	-2.896346	
	10% level	-2.585396	

Null Hypothesis: R_{tm} has a unit root

Exogenous: Constant

Lag Length: 09 (Automatic - based on SIC, maxlag=09)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.524127	1.0000
Test critical values:	1% level	-2.314229	
	5% level	-3.64232	
	10% level	-3.123376	

Source: Eviews 7

Appendix 3

ADF test on differenced variables

Null Hypothesis: DR_{tn} has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.535061	0.0000
Test critical values:	1% level	-3.501445	
	5% level	-2.892536	
	10% level	-2.583371	

Null Hypothesis: DR_{tm} has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.511325	0.0000
Test critical values:	1% level	-2.734426	
	5% level	-3.121311	
	10% level	-2.812423	

Source: e views 7

Appendix 4

Correlation coefficients and standard deviation ratios between observed and theoretical spread of interest rates

CBR →	5- YEAR (PRE-SAP)	5YEAR (POST-SAP)
TBR ↓		
3 MONTHS CC	0.514	0.999
3 MONTHS SD	2.022	1.014

Source: E views 7

NB: CBR stands for corporate bond rate, TBR stands for treasury bill rate, CC stands for correlation coefficient while SD stands for standard deviation

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