INTEREST RATE, EXCHANGE RATE & CONSUMER PRICE INDEX AND SOVEREIGN BOND RETURNS IN INDIA

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Abstract-Macroeconomic variables play a vital role in determining sovereign bond returns of a country. This paper examines the impact of selected macroeconomic variables on Sovereign Bond Market returns of India. A causal design has been used to examine effect of macroeconomic variables on bond market return. It is revealed that 40% of sovereign bond return is explained by interest rate, exchange rate and consumer price index. It is also found out that there existed a strong correlation (relationship) between the variables used in the study viz. sovereign bond returns, interest rate, exchange rate and consumer price index.
Key words: Bond returns, India, macroeconomic variables, regression

1. INTRODUCTION

Financial markets are the institutional arrangements, which enables business tycoons, corporates and government to raise funds from those who have excess money. Financial markets and institutions such as stock exchanges, bond market, banks and other non-banking financial institutions play an important role in channelizing funds from common people to big corporates. A well-functioning financial market is vital factor in producing high economic growth and vice versa (Mishkin, 2010). A bond market is an important component of financial market. Bond market is the third key component of financial system and is positively related to economic growth of a country. (De Bondt, 2002). A bond is a financial instrument which acknowledges that the issuer to repay principle amount as well as interest to the investor. The issuer of the bond will repay to the investor the amount borrowed plus interest over a specified period of time (Fabozzi and Jacob, 1999). Macroeconomics is concerned with the economy as a whole. It is concerned with aggregate demand and supply (Mishkin, 2010). Macroeconomic factors that typically influence the sovereign bond returnsof India include a wide range of variables viz. Inflation rate, interest rate, exchange rate, oil prices, Gross domestic product, domestic and external borrowings, unemployment rate, tax rates etc. Bond market in India plays a vital role in economic development of country by channelizing surplus funds from both domestic as well as foreign investors and enables union government to finance budget deficit. The Indian bond market is subdivided into corporate bond market, Municipal bond market, Government and agency bond market, Funding bond market and Mortgage backed and collateral debt obligation bond market. The bond market in India has been diversified to a large extent and is a huge contributor to the stable growth of the economy. India recorded a Government Debt to GDP of 66.10 percent of the country's Gross Domestic Product in 2014. Goldman Sachs has estimated the debt capital market in India is to grow about $1.5 trillion by 2016, which is almost twice its present size, or roughly 43% of GDP today (Goldman Sachs Report).

Enormous studies literature is available on determinants of bond returns in advanced countries and their findings are contradictory regarding the factors driving bond returns. Many researchers argued that macroeconomic variables such as Debt to GDP ratio, deficit, current account deficit, and unemployment are the vital determinants of sovereign bond returns (Bernoth et al., 2004; Pagano and von Thad den, 2004; Georgoutsos and Migiakis, 2012; Sosvilla-Rivero and Morales-Zumaquero, 2012). On the other hand researchers Schuknecht et al., 2010; Mody, 2009; Longstaff et al., 2011) found that common factors such as a generalized risk aversion factors effect sovereign bond returns. In Indian context (Yogendra Singh, 2013) argued that UK bond, US bond and BSE have positive impact on Indian bond returns. Alexander and Anker (1997), Lemmen and Goodhart (1999), Lonning (2000), Copeland and Jones (2001) and Codogno, Favero and Missale (2003) consistently confirm a positive relationship between public debt and interest rates. Alesina, De Broeck, Prati and Tabellini (1992) use data from 12 OECD countries and show that the differential between public and private bond returns are positively related to the level of public debt. Smirlock (1986) analyzed the Inflation response of the long-term bond market. Smirlock (1986) study discovered a significant positive response of long-term rates to unpredicted price increase.

The rest of the paper is organized as follows: section 2 includes data and research methodology, in section 3 empirical analysis and discussion and section 4 conclusions.

2. DATA AND METHODOLOGY

The data used in the study is secondary and was collected from Bloomberg database, IFS and BIS. The study period is of 15 years spanned from 1998 to 2012 and the frequency of data is monthly. There is no problem of

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multicollinearity between the independent variables i.e. interest rate, exchange rate and consumer price index (CPI) used in the study.

2.1 Model Specification

The model used in this study is multiple linear regression models. This is attempted to look at the effects or the relationship between a dependent (responsive) variable and number independent (explanatory) variables.

With regard to this study, the dependent variable is 05 year sovereign bond returns and the independent or explanatory variables are interest rate, exchange rate and consumer price index (CPI).

The model specified is therefore:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + eij$. Letting Bond returns= Y, Interest rate = X1, and exchange rate = X2 and CPI=X3. The model is re-specified as Bond returns= β_0 + β_1Interest rate + $\beta_2$exchange rate + β_3CPI, where β_0, β_1, β_2 and β_3 are the regression coefficients which are estimated from the sample data. The e_{ij}. is the random error term.

3. EMPIRICAL ANALYSIS AND DISCUSSIONS

Model formulation

To check the relationship of our responsive variable (bond returns) with explanatory variables (interest rate, exchange rate and CPI) a linear Regression model was developed.

Table-3.1 Regression Coefficients

Model		Unstandardized Coefficients		Sig.
		B	Std. Error	
1	(Constant)	3.051	.295	.000
	interest log	-.431	.072	.000
	exchange log	-1.142	.177	.000
	CPI	.013	.002	.000

Dependent Variable: bond log

From table 3.1 above, the exact regression model that can be developed is $Y=3.051$ -$0.431X_1$ -$1.142X_2$+ $0.013X_3$Where Y, X_1, X_2 and X_3 denote their usual meanings. The model is thus interpreted as follows. The constant value of 3.051 is the intercept and represents total bond return given that interest rate, exchange rate and CPI are zero. All others factors are held constant. On the other hand coefficients of interest rate i.e. X_1= -0.431 which implies how much bond return changes when there is one unit change in X1 i.e. interest rate. It also shows that X_1 i.e. interest rate are negative. This corroborates with economic theory that interest rate and bond returnsmove in opposite direction means that when interest rate rises bond return falls and vice versa. The coefficients of exchange rate i.e. X_2 = -.1.142, which implies how much bond return changes when there is one unit change in X_2 i.e. exchange rate. It also shows that X_2 i.e. exchange rate and bond return are inversely related to each other means that bond returnsdecreases with increase in exchange rates. The coefficients of CPI i.e.X_3= 0.013 which means that bond returnschanges 0.013 when there is one unit change in X_3 i.e. exchange rates. It shows there is positive relationship between CPI and bond returns.

Table-3.2 Model Summary of other Regression Coefficients Model Summary

Model	R	R Square	Adjusted R Square	Sig	Durbin-Watson
1	.629	.395	.385	.000	.140

a. Predictors: (Constant), CPI, exchange log, interest log b. Dependent Variable: bond log

The multiple linear regression models developed in the table 3.2. is used to check the model adequacy. The results show that R and R2 represent the multiple correlation and coefficient of determination respectively. The R (0.629) shows that there exists a strong positive relationship between Bond return as the dependent variable and interest rate, exchange rate and CPI as independent variables. This also implies that behavioral patterns of interest rate, exchange rate and CPI have impact on bond returns of India during study period. This is consistent with existing studies it is hypothesized that, because of the stochastic nature of interest rates and the embedded option associated with the government's ability to time its borrowings, there should be a negative relationship between interest rate volatility and Treasury returns. Moreover, this negative relationship should be stronger for longer-maturity bonds, other things remaining constant. This hypothesis is tested empirically, using bond return data from the US Treasury market. The main finding is that interest rate volatility does indeed have a significant negative effect on bond returns, and the

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significance is greater for 20-year bonds than for 10-year bonds. (Sarkar and Mohamed Ariff) Furthermore, the R^2 (coefficient of determination) value of 0.395 or 40% means that approximately 40% of the bond return variations are explained by interest rate, exchange rate and CPI together.

Table-3.3 Analysis of Variance (ANOVA)

Model		Sum of Squares	F	Sig.
1	Regression	.579	37.725	.000
	Residual	.885		
	Total	1.465		

a. Dependent Variable: bond log, b. Predictors: (Constant), CPI, exchange log, interest log

The analysis of variance (ANOVA) table 3.3 is used to test the overall significance of the model developed and to check whether the beta coefficient are same or not.

The hypothesis that is tested here is:

H0: The overall model is not significant, i.e. H0: $\beta = 0$

H1: The overall model is significant, i.e. H1: $\beta \neq 0$

The results reveals that significance value 0.000 is less than 0.05, therefore we fails to accept null hypothesis rather we accept alternate hypothesis, means that at least one beta coefficient is not zero and concludes that the overall model is significant.

CONCLUSION

Macroeconomic variables play a vital role in determining sovereign bond returnsof a country. This paper tries examining the impact of selected macroeconomic variables on Sovereign Bond Market returns of India. it can be concluded that there existed a strong positive correlation (62.9%) between responsive variable (bond returns), and explanatory variables (interest rate, exchange rate and consumer price index). In other words the behavioral patterns of interest rate, exchange rate and consumer price index influences the sovereign bond returns in India during the study period. The results of the study reveals that R^2 value of 0.395(40%) this implies that an approximately 40% variations in sovereign bond returns in India are explained by interest rate, exchange rate and consumer price index during the study period. Therefore rest 60% of the sovereign bond returns in India is needed to be investigated.

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