Effect of FPI in Debt on Yields of Indian Government Securities

Sunrita Chaudhuri [1st] **, Vandana Mehrotra** [2nd]

[1st & 2nd] Faculty of School of Management, GD Goenka University, Gurgaon

Corresponding author: sunrita.chaudhuri@gdgoenka.ac.in

_____

Abstract: Yields of government securities of various maturities give us the interest rate term structure This is used for pricing of financial instruments and making macroeconomic policies .Macroeconomic variables like output, inflation, fiscal deficit, call money rate and exchange rate have been shown to affect the gsec yields. This study focuses on effect of FPI in debt on yields. In India the FPI regime started in 2014.Since then the limits of debt investments by FPIs have been raised. An increase in FPI in gsec is expected to increase their prices and lower their yields. A regression analysis is conducted to study the effect of FPI in debt on yields of gsec of 1,5 and 10 years maturity. Findings show that an increase in FPI lowered gsec yields during the period of study April 2014 to March 2020 , though for some maturity the coefficient was not statistically significant.

_____

1. Introduction

In an economy with a deregulated financial market, interest rates are market determined variables, driven by either a shortage or a surge in the supply of funds as compared to its demand. Bonds are financial instruments that are used to garner credit from the financial market and yields on bonds represent their rate of return or interest rate. Yields of Government bonds plotted against their maturities generate the term structure of interest rate also called the yield curve. The term structure has wide application in areas of finance and economics. It is used to price financial instruments and formulate macroeconomic policies.

Traditionally, the interest rate term structure has been modelled separately for the financial sector and the real macroeconomic sector. However the financial crisis of 2008 has shown that a crisis in the financial sector can affect the overall macro economy. Therefore the focus has shifted to modelling of the interest rate term structure combining the financial sector and the real macroeconomic sector.

Macroeconomic variables like output, inflation, fiscal deficit, call money rate and exchange rate have been shown to affect the gsec yields

International capital flows can also affect gsec yields. International capital inflow increases the availability of funds in the financial market and thus reduces the interest rates. This reduces the cost of capital in the economy and encourages investments Prasad, Rogoff, Wei and Kose (2005). Capital flows have been considered to be important for emerging economies since they encourage growth and current consumption Bosworth, Collins and Reinhart (1999).

There are 'push' and 'pull' factors contributing to capital flows. Push factors are external factors like global liquidity, interest rates, growth and need for diversification, whereas Pull factors are domestic factors like macroeconomic conditions, effective policy making and sound markets and institutions Hannan (2018).

India had opened up its gates to international investments on a cautious footing. Focussing on the 'pull' factors, India has journeyed a long way into making its financial markets ready for stable international capital flows. The composition of capital flows has changed. Debt creating flows have been reduced whereas FDI, FPI and external commercial borrowings have been increased Mohan (2008).

However there is a vast literature which puts forth alternate views. Mohan and Kapur (2009). shows that this phenomenon of lowering of interest rates and increase in investments would work if there is enough demand for capital and the real and the financial sectors are matured enough to absorb the flows. Capital flows lead to higher investments in the domestic economy if it has proper institutions and sound macroeconomic fundamentals and policies to utilise the capital productively Mody and Murshid (2005).Since international capital looks for high return, they can be highly speculative and volatile in nature. The resulting volatilities in the exchange rates often need sterilisation efforts by the Central Bank which might reverse the positive effect of these flows on cost of capital, Mohan (2008).

Since 1992 FIIs have invested in the Indian equity market and FII investments in Government securities market started in 1998.1st June 2014 marked the beginning of FPI regime in India through which foreign institutions managing funds, like Mutual Funds and Pension Funds can buy equity and debt from primary and secondary market in India.

With the onset of FPI regime in India, the limits of debt investments by foreign investors have been gradually increased. FPI in debt has primarily flown into government securities market. Since April 2019, FPIs have been allowed to invest in Municipal bonds also. RBI has been encouraging flow of FPI into Corporate bond segment also. Initially investments in corporate bonds were allowed in instruments with residual maturity of not less than 3 years however in June 2018 this has been relaxed to a residual maturity of 1 year. FPIs have also been allowed to invest in unlisted NCDs and structured debt instruments. This has broadened the scope of FPIs in the debt segment.

This paper studies the effect of macroeconomic variables on yields of government securities in India with FPI in debt being one of the variables. The focus of the study is whether in India an increase in FPI in debt leads to a fall in yields of government securities, that is the direction of the effect and whether the fall is significant, that is the size of the effect.

This article is organised in the following order: Section 2 presents the review of literature, Section 3 introduces the variables of the macroeconomic sector and the method used in the study, section 4 lays out the results of the model and Section 5 gives the conclusion of the study.

2. Review of Literature

Before the financial crisis of 2008, interest rate term structure has been modelled separately for financial and macroeconomic purposes.

Purely financial models can be based on principle of equilibrium or no-arbitrage. In models based on equilibrium principle, an interest rate generating process is considered for short-term rates and the rates for longer maturities are given by averages of short term rates for future periods. Prominent models based on equilibrium principle are given by Vasicek (1977), Cox, Ingersoll and Ross(1985),Ho and Lee(1986),Heath, Jarrow and Morton(1992),Duffie and Kan(1996),Dai and Singleton(2000).In no-arbitrage models interest rates calculated from market prices are used to model an interest rate generating process on the basis of no-arbitrage conditions like Nelson and Siegel (1987),Nelson, Siegel and Svensson(1994).

In macroeconomic models, interest rates for shorter maturities are driven by policy changes by the monetary authorities and the policy changes depend on the macroeconomic conditions. Since interest rates for longer maturities depend on expected future interest rates for shorter maturities, interest rates for longer maturities are also driven by the economy's existing and expected macroeconomic conditions Gürkaynak, Sack and Swanson (2005).

Linking the financial models with macroeconomic models, we can say that interest rates or yields of bonds determined by the financial market carry information about the macroeconomic conditions and are affected by changes in such conditions. The 2008 financial crisis showed that events in the financial market have deep rooted effect on the macro economy. Therefore there has been extensive research in jointly modelling the interest rates and macroeconomic variables. Various macroeconomic variables are incorporated in these studies. Ang and Piazzesi (2003) use growth and inflation, Hördahl, Tristani and Vestin (2006) uses the short-term monetary policy rate. These studies show a uni-directional link from macro variables to interest rates. Diebold, Rudebusch and Aruoba (2006) allow a bi-directional flow of cause and effect between the two. The above mentioned studies have used VAR method to establish the macro-finance linkage.

Warnock and Warnock (2009) have also studied the effect of macroeconomic variables on interest rates in the US economy, but the focus of their study was to find out the effect of international capital flows in debt on interest rates in the US economy. Instead of a VAR model like in the other studies, they have used regression analysis. Their work has shown that all interest rates, especially the long-term rates, in the US economy, have been significantly lowered by international capital flows in the debt segment. On similar lines, Carvalho and Fidora (2015) have shown that foreign investments in bonds led to a decrease in interest rates for longer maturities in the Euro area.

In the context of the Indian economy, different variants of the VAR model have been used to specify a bi-directional relationship between government security yields and macroeconomic variables.

Duaand Sahoo(2003) have shown that multivariate models of interest rate forecasting have performed better than univariate models, which establishes the effect of macroeconomic variables on interest rates in India. The macroeconomic variables that have been shown to have an effect on interest rates are monetary policy rates, actual and expected inflation rates, level of economic activity, foreign interest rate and foreign exchange reserves.

Kanjilal (2011) has shown that with the introduction of LAF, a link has been established between factors representing the interest rate term structure like level, slope and curvature and macroeconomic variables like growth rate, inflation rate and monetary policy rate. However the direction of causality has been shown to be primarily from yield to the macroeconomy whereas the flow in the opposite direction has been weak. Sahoo and Bhattacharyya (2012) have constructed a monetary policy index and have shown a strong linkage between the index and the factors representing the term structure. Chakraborty (2012) has shown that fiscal deficit which leads to government borrowings, has no statistically large effect on interest rates in India. Shareef and Shijin (2017) have incorporated fiscal deficit as one of the macroeconomic variables in a macro-finance study.

Thus various macroeconomic variables like level of economic activity (IIP), inflation rate (WPI),exchange rate(NEER),call money rate(CMR) and Fiscal Deficit have been incorporated in macro-finance studies on interest rates in India. However few have been included international capital flow as a determinant of interest rates. Ghosh and Herwadkar (2009) have studied the effect of FPI on the Indian financial markets where FPI included both debt and equity flows. They have shown that the surplus generated due to inflow of FPI reduces the overnight call money rate but the long-term rates change due to the OMOs conducted to sterilise Reserve Bank's exchange rate stabilising actions, post FPIs.

This study focuses on FPI in debt and its impact on government security yields. As the limits of debt investments by foreign investors have been gradually increased in India, it remains to be seen whether increase in FPI in debt has lowered the yields or interest rates. Such lowering of interest rates is expected to encourage investments and lead to further growth in the economy.

3. Data and Methodology

Following the study by Warnock and Warnock (2009),a regression model is used with government security yields of 1 year, 5 years and 10 years maturity as dependent variable and chosen macroeconomic variables as independent variables with FPI in debt being one of the macroeconomic variables.

Government security yield is a forward-looking variable and would therefore depend on expected values of macroeconomic variables. However unlike the developed countries like the US and the UK, India does not publish very reliable data on expected growth and inflation. The macroeconomic variables are chosen keeping this limitation in mind. The period of study is chosen as April 2014 to March 2020,since 2014 marked the beginning of the FPI regime in India. Monthly data is used for the analysis.

Research Objective: To study the direction and size of the effect of an increase in FPI in debt on yields of government securities in India

Research Question: If foreign portfolio investment in debt increases then what is the direction and size of change in yields of government securities in India?

Null Hypothesis: If foreign portfolio investment in debt increases then there is no significant change in yields of government securities in India.

3.1 <u>Data</u>

3.1.1 <u>Macroeconomic variables</u>

<u>Output</u>

Gross Domestic Product measures the level of economic activity. However Data on GDP is published on a quarterly basis. Since this study is based on monthly data, following the footsteps of research on Indian economy which uses IIP as an indicator of real activity, we have used the monthly IIP data published by MoSPI. Thus difference between log of IIP with lag of 12 months is used as a measure of growth in output (GR_IIP). Studies by Singh and Sensarma (2006 Kanjilal (2011), Sahoo and Bhattacharyya (2012), Shareef and Shijin (2017) have used IIP as a measure of output.
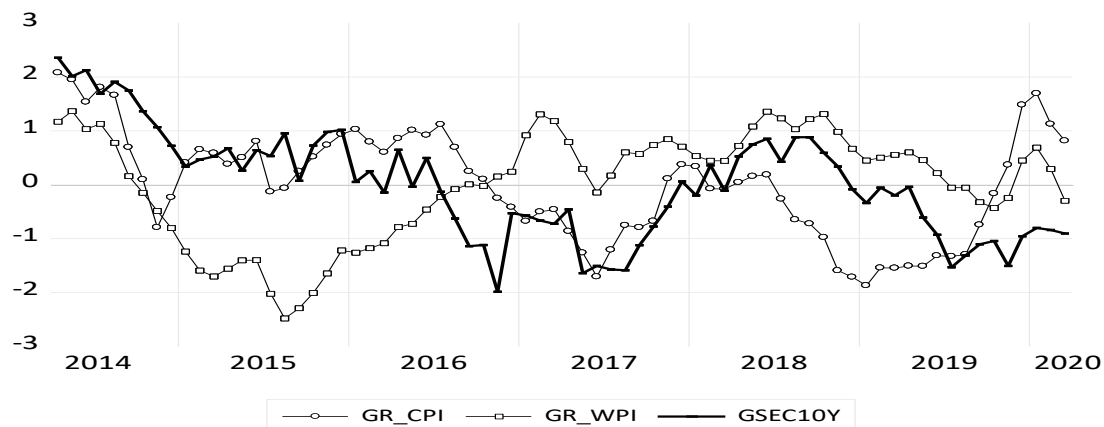
<u>Inflation</u>

As per the Fischer equation, expected Inflation added to the real interest rate gives the nominal interest rate. Thus interest rates depend on inflation rates expected in the future. Countries like the US, conduct periodic surveys and publish expected inflation rates. Since 2005surveys have been conducted by the RBI to capture households' expectations of inflation rate for 3 months and 12 months period ahead.

However such survey data for India have been shown to perform poorly in terms of forecasting inflation. Sharma and Bicchal (2018) show that univariate model like ARIMA provides better estimate of expected inflation. Further, this study highlights the fact that in India inflation expectations are primarily backward looking and thus past inflation rates affect the expected inflation rates in the future.

CPI and WPI are two price indices in India. Given that inflation targeting monetary policy measures were introduced in 2014 and CPI was the index used for measuring inflation, CPI is a better index to use in this study. Earlier studies have used WPI because of the non-availability of monthly data for CPI prior to 2012. Given the period of study, CPI is chosen as the price index. Thus difference between log of CPI with lag of 12 months is used as a measure of inflation for short-term period (GR_CPI).

Following Estrella (2005) the slope of the yield curve measured as the 10 year G-Sec yield less the 1 year G-Sec yield is taken as a measure of expected long-run inflation (EXP_INFL).

Figure 1: Movement of Inflation Rate and 10 Year G-Sec Yield

<u>Source:</u> RBI DBIE

Gross Fiscal Deficit

Almost all modern-day government follow a deficit budget and India is no exception. When taxes and other government revenues fall short of its expenditure, the government has to borrow and in a matured macro-economic setup, the government borrows from the market. Therefore they add to the total demand for funds in the loan able funds market and exert upward pressure on interest rates. Shareef and Shijin (2017) introduced fiscal deficit as a determinant of term structure .Chakraborty (2012) has studied the relation between fiscal deficit and interest rates.

Fiscal deficit to GDP ratio is used a macroeconomic variable. Quarterly GDP data is converted into monthly data using EViews and then the Fiscal Deficit to GDP ratio is calculated (FD_TO_GDP).
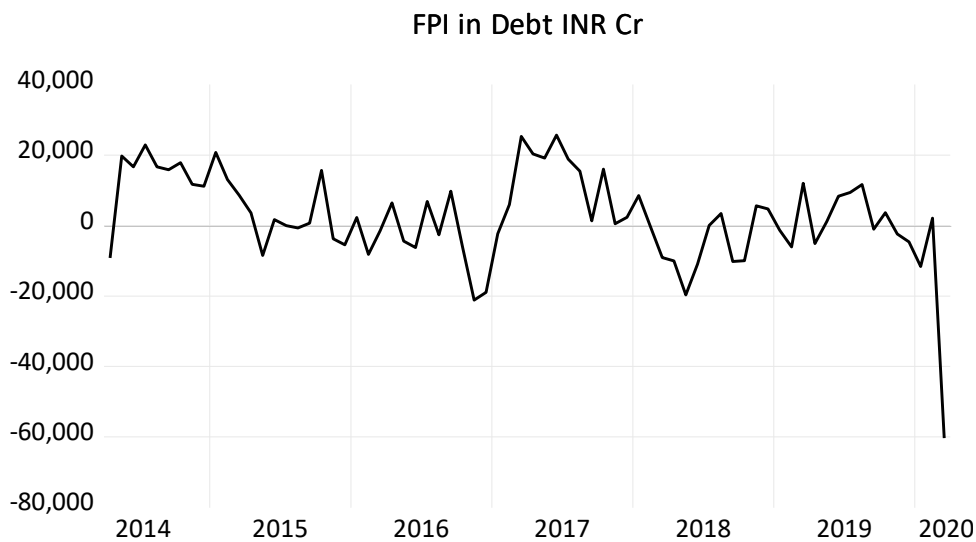
Call Money Rate

Monetary policy measures are based on economic conditions mainly pertaining to growth of output, inflation and external factors. In the presence of a pure interbank call money market, the monetary policy measures affect the Call Money Rate (CMR) which is then transmitted to the yields of different maturities. Thus CMR is chosen as an independent variable.

FPI in Debt

There are two types of data for foreign portfolio investment (FPI), the stock data and the flow data. In India monthly data for capital flow in debt and equity is compiled by NSDL. For the current study we use the flow of FPI in debt to GDP ratio as an independent variable (FPI DEBT_TO_GDP).The graph below shows that FPI in debt has been quite volatile over the period under consideration.
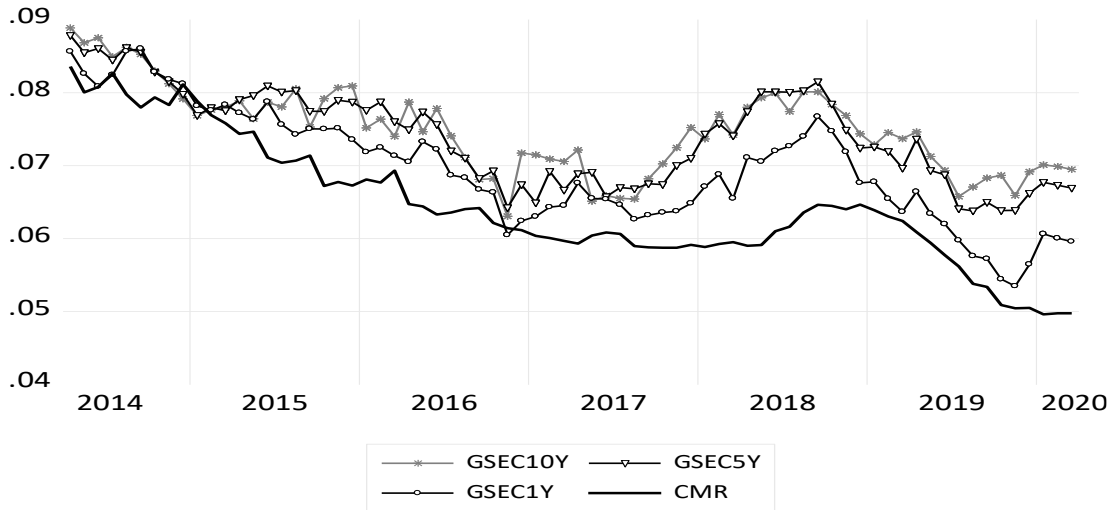
Figure 2: FPI in Debt

Source: NSDL.co.in

3.1.2 Yields of Government Securities

Government Security GSEC1Y, GSEC5Y and GSEC10Y are used as dependent variable. An average of the three yields which would represent the overall level of yields is also used in one of the equations (GSEC_AVG).

Figure 3: Movement of the G-Sec yields and Call Money Rate

3.2 Methodology

We perform regression of government security yield of each maturity on macroeconomic variables. Two types of equations are constructed for each government security yield, one in which only domestic variables are used and a second in which FPI_DEBT_TO_GDP is used along with the domestic variables.

One concern with using regression analysis as pointed out by Warnock and Warnock (2005) is endogeneity of the variables. However following their work, if we assume that the yields do not have a contemporaneous effect on the macroeconomic variables but rather affect them with a lag, then we can use regression analysis.

It is worth mentioning that since there is a possibility of endogeneity between variables. VAR model has been used in various studies, which allows a bidirectional flow of effect between yield and macroeconomic variables.

Table 1 : Results of ADF test for stationarity

Test for Unit Root

Variables	Level			First Difference		
	T-Statistic	Critical Value	p-Value	T-Statistic	Critical Value	p-Value
GSEC10Y	-2.20	-2.90	0.21	-11.40	-2.90	0.00
GSEC1Y	-1.69	-2.90	0.43	-8.29	-2.90	0.00

GSEC5Y	-1.99	-2.90	0.29	-9.85	-2.90	**0.00**
GSEC_AVG	-1.99	-2.90	0.29	-9.37	-2.90	**0.00**
CMR	-1.41	-2.90	0.58	-9.22	-2.90	**0.00**
GR_IIP	-3.71	-2.90	**0.01**			
GR_CPI	-2.97	-2.90	**0.04**			
FD_TO_GDP	-1.11	-2.91	0.71	-9.67	-2.91	**0.00**
EXP_INFL	-2.80	-2.90	0.06	-10.88	-2.90	**0.00**
FPI_DEBT_TO_GDP	-3.57	-2.90	**0.01**			

The yields, CMR and the EXP_INFL are non-stationary and are co integrated. Therefore following the work of Warnock and Warnock (2009) we impose a restriction that the sum of coefficients of CMR and EXP_INFL in the regression equation adds to one.

4. Results and Discussions

Table2: Regression results with Domestic Macroeconomic Variables					
Table 2.a			Table 2.b		
Dependent Variable: GSEC10Y			Dependent Variable: GSEC1Y		
	Coefficient	Prob.		Coefficient	Prob.
CONSTANT	0.03	0.00	CONSTANT	0.01	0.00
CMR	0.57	0.00	CMR	0.87	0.00
EXP_INFL	0.43	0.00	EXP_INFL	0.13	0.00
GR_CPI	0.06	0.00	GR_CPI	0.02	0.24
GR_IIP	0.04	0.11	GR_IIP	0.03	0.12
FD_TO_GDP	0.01	0.07	FD_TO_GDP	0.02	0.04
R-square	0.76		R-square	0.87	
Table 2.c			Table 2.d		
Dependent Variable: GSEC5Y			Dependent Variable: GSEC_AVG		
	Coefficient	Prob.		Coefficient	Prob.
CONSTANT	0.03	0.00	CONSTANT	0.02	0.00
CMR	0.66	0.00	CMR	0.7	0.00
EXP_INFL	0.34	0.00	EXP_INFL	0.3	0.00
GR_CPI	0.05	0.03	GR_CPI	0.05	0.03
GR_IIP	0.05	0.06	GR_IIP	0.04	0.07
FD_TO_GDP	0.02	0.05	FD_TO_GDP	0.02	0.04
R-square	0.75		R-square	0.82	

Table 3: Regression results with Domestic Macroeconomic Variables and flow of FPI in Debt

Table 3.a			Table 3.b		
Dependent Variable: GSEC10Y			Dependent Variable: GSEC1Y		
	Coefficient	Prob.		Coefficient	Prob.
CONSTANT	0.03	0.00	CONSTANT	0.010	0.00
CMR	0.6	0.00	CMR	0.900	0.00
EXP_INFL	0.4	0.00	EXP_INFL	0.100	0.00
GR_CPI	0.06	0.01	GR_CPI	0.020	0.42
GR_IIP	0.04	0.06	GR_IIP	0.040	0.06
FD_TO_GDP	0.01	0.07	FD_TO_GDP	0.020	0.04
FPI_DEBT_TO_GDP	-0.07	0.09	FPI_DEBT_TO_GDP	-0.070	0.08
R-square	0.77		R-square	0.88	
Table 3.c			Table 3.d		
Dependent Variable: GSEC5Y			Dependent Variable: GSEC_AVG		
	Coefficient	Prob.		Coefficient	Prob.
CONSTANT	0.02	0.00	CONSTANT	0.02	0.00
CMR	0.72	0.00	CMR	0.74	0.00
EXP_INFL	0.28	0.00	EXP_INFL	0.26	0.00
GR_CPI	0.04	0.11	GR_CPI	0.04	0.08
GR_IIP	0.06	0.01	GR_IIP	0.05	0.02
FD_TO_GDP	0.02	0.04	FD_TO_GDP	0.02	0.03
FPI_DEBT_TO_GDP	-0.14	0.00	FPI_DEBT_TO_GDP	-0.09	0.02
R-square	0.78		R-square	0.83	

The results show that in the Indian context the GSEC yield of all maturities are significantly affected by monetary policy driven variable, the CMR.CMR reflects the liquidity condition in the inter-bank market. RBI increases or decreases liquidity in this market through LAF, MSF and term Repos thus affecting the CMR. CMR therefore reflects the monetary policy stance of RBI. If the monetary policy is transparent and its objectives are clearly communicated, then the change in rates with shorter maturities are transmitted to the rates with longer maturities through changes in expectation about future policy actions. The above results indicate such transmission.

Further, the regression coefficients show that the effect of short-run inflation GR_CPI and long-run inflation expectation EXP_INFL on yields increase with the increase in maturity. FD_TO_GDP does not significantly affect GSEC10Y yield though the coefficients are significant for GSEC1Y and GSEC5Y yield. GR_IIP does not have a significant effect on yields but the effect is significant if we take a lag by a quarter. So effectively 12-month growth of IIP pertaining to a particular month affects the yield of government securities 3 months later.

Domestic variables affect the yields on expected lines. Call money rate and long-term inflation expectation have the highest effect on the yields. Fiscal deficit on the other hand do not have any large effect on yields. This result is similar to the findings by Chakraborty (2012).

.

The sign of coefficient for FPI_DEBT_TO_GDP is negative for all the regression results. Inflow of FPI in debt increases demand for debt securities and tends to push up their prices. Given the inverse relation between price and yield of debt securities, yields come down. Therefore we get inverse relation between FPI_DEBT_TO_GDP and the yields of government securities. We can therefore conclude that increase in FPI in debt has lowered yields in India. If RBI follows an expansionary policy to achieve the objective of growth then inflow of FPI would make that policy move more effective.

However the p-values show statistical significance for co-efficient for GSEC1Y, GSEC5Y and the average yield depicted by GSEC_AVG but not for GSEC10Y. This points at the fact that foreign portfolio investors are more interested in buying shorter duration government securities. There is a cap on investment in short term securities at 30% of total investment but outside these limit investors tend to prefer comparatively shorter duration securities. Prices of securities with shorter maturities are less sensitive to changes in interest rates and therefore restricts portfolio losses in case of adverse interest rate movements.

5. Conclusion

The above study focuses on how FPI changes government security yields. From the findings we can conclude that FPI in debt reduces yield of government securities. Since government security yields are used as benchmark for all other interest rates in the economy it would lead to lowering of interest rates across all products and an increase in economic activity. However we need to consider that an increase in FPI leads to appreciation of the domestic currency and the RBI, in order to prevent the appreciation, often buys foreign exchange from the market leading to an increase in money supply and lowering of interest rates. Thus an increase in FPI in bonds might lower interest rates not through the price and yield relation but through unsterilized intervention in the foreign currency market.

It is also important to keep in mind that India runs a current account deficit and in order to attract capital flows it tries to keep the interest rates above the international benchmark rates to maintain the 'pull' factor and therefore the lowering of interest rates might go against this objective.

Indian policy makers have been slowly opening up the debt segment to foreign portfolio investments after the trading, payments and settlement systems were reformed adequately. While these investments will lead to a better price and yield discovery in the market, the macroeconomic effects of these investments need to be monitored.

The above study shows a unidirectional effect of FPI on interest rates but interest rates affect macroeconomic variables too. So future scope lies in exploring macro-finance models treating both interest rates and the macroeconomic variables as endogenous to understand the bidirectional flow of effect between the financial sector and the real economy.

Further, FPI in debt has been quite volatile over the period considered in the study . Therefore India needs to work towards making these flows more stable by identifying and improving the parameters which affects these flows. This offers scope for future study on policy making.

References

Ang, A., &Piazzesi, M. (2003). A no-arbitrage vector autoregression of term structure dynamics with macroeconomic and latent variables. *Journal of Monetary economics*, *50*(4), 745-787.

Bosworth, B. P., Collins, S. M., & Reinhart, C. M. (1999). Capital flows to developing economies: implications for saving and investment. Brookings papers on economic activity, 1999(1), 143-180.

Carvalho, D., &Fidora, M. (2015). Capital inflows and euro area long-term interest rates. *Journal of International Money and Finance*, *54*, 186-204.

Chakraborty, L. (2012). Interest rate determination in India: Empirical evidence on fiscal deficit–interest rate linkages and financial crowding out.

Diebold, F. X., Rudebusch, G. D., &Aruoba, S. B. (2006). The macroeconomy and the yield curve: a dynamic latent factor approach. *Journal of econometrics*, *131*(1-2), 309-338.
Dua, P., Raje, N., & Sahoo, S. (2003). *Interest Rate Modelling and Forecasting in India*. Department of Economic Analysis and Policy, Reserve Bank of India.

Estrella, A. (2005). Why does the yield curve predict output and inflation?. *The Economic Journal*, *115*(505), 722-744.

Ghosh, S., &Herwadkar, S. (2009). Foreign portfolio flows and their impact on financial markets in India. *Reserve Bank of India Occasional Papers*, *30*(3), 51-71.

Ghosh, J. (2005). The economic and social effects of financial liberalization: a primer for developing countries.

Gürkaynak, R. S., Sack, B., & Swanson, E. (2005). The sensitivity of long-term interest rates to economic news: Evidence and implications for macroeconomic models. *American economic review*, *95*(1), 425-436.

Hannan, S. A. (2018). Revisiting the Determinants of Capital Flows to Emerging Markets–A Survey of the Evolving Literature. International Monetary Fund.

Hördahl, P., Tristani, O., &Vestin, D. (2006). A joint econometric model of macroeconomic and term-structure dynamics. *Journal of Econometrics*, *131*(1-2), 405-444.

Kanjilal, K. (2011). Macroeconomic factors and yield curve for the emerging Indian economy. *Macroeconomics and Finance in Emerging Market Economies*, *4*(1), 57-83.

Mohan, R., &Kapur, M. (2009). Managing the impossible trinity: volatile capital flows and Indian monetary policy. *Available at SSRN 1861724*.

Mody, A., & Murshid, A. P. (2005). Growing up with capital flows. *Journal of international economics*, *65*(1), 249-266.

Mohan, R. (2008). Capital flows to India. *BIS papers*, *44*, 235-263.

Prasad, E., Rogoff, K., Wei, S. J., &Kose, M. A. (2005). Effects of financial globalization on developing countries: some empirical evidence. In India's and China's recent experience with reform and growth (pp. 201-228). Palgrave Macmillan, London.

Patnaik, I., & Prateek, S. M. R. P. (2013). *Foreign investment in the Indian Government bond market*. Publications Unit, National Institute of Public Finance and Policy.

Rudebusch, G. D. (2010). Macro-finance models of interest rates and the economy. *The Manchester School*, *78*, 25-52.

Sharma, N. K., &Bicchal, M. (2018). The properties of inflation expectations: Evidence for India. *Economia*, *19*(1), 74-89.

Sahoo, S., & Bhattacharyya, I. (2012). Yield curve dynamics of the indian g-sec market: A macro-finance approach. *Indian Economic Review*, 157-182.

Shareef, K. H., & Shijin, S. (2017). The term structure of interest rates and macroeconomic factors: Evidence from Indian financial market. *Borsa Istanbul Review*, *17*(4), 249-256.