Rahul Rangotra
Assistant Professor,
Department of Management
Studies, Central University of
Kashmir, Ganderbal, Jammu
and Kashmir, India

Treasury yield in India: A theoretical framework

Rahul Rangotra

Abstract
The objective of this study is to identify and integrate relevant literature on the treasury yield also called government securities (G-Secs) yield to underpin the relevant research framework in India. Specifically, this paper scrutinizes the relevant literature on factors affecting government securities yield in the Indian G-Secs market. The integrated efforts to synthesize varied literature on the G-Secs market, G-Secs yield, factors influencing G-Secs yield, and yield curve (YC) will help the researchers in the G-Secs market to understand the research framework.

Keywords: G-Secs yield, research framework, relevant literature

1. Introduction

The market of government securities has grown considerably in both developed and emerging economies (Burger *et al.,* 2010 [15]; Bank for International Settlement, 2007; Mihaljek *et al.*, 2002) [57] Indian financial system is changing quite rapidly in terms of the fast-growing global equity market, and that too particularly in the banking sector. However, Indian G-Secs market with respect to liquidity is lagging the developed countries and their Asian peers. Nevertheless, the Indian bond market has shown an increasing trend from 21.3% of gross domestic product (GDP) in 1996 to 43.0% of GDP in March 2014 (Sabnavis & Mehta, 2014) [64], to 67.0% of GDP in April 2020 (Sridharan, 2020) [68]. In Indian G-Secs market, every quarter Reserve Bank of India (RBI) issues press releases to issue treasury bills, dated G-Secs, and state development loans. As per the press release of RBI dated December 27, 2019 (RBI, 2019), RBI had to issue treasury bills of Rs 1, 64, 000 crore during January-March 2020. Also, as per the press release dated September 30, 2019, RBI had to issue dated G-Secs of Rs 2, 68, 000 crore during October-March 2020 (RBI, 2019). Besides, RBI also issued another press release dated December 30, 2019, for state government borrowings of Rs 208611.34 cores (RBI, 2019). All these issues affect the Indian G-Secs market, both in amount and volume. All such government actions have borrowing cost, which varies from country to country, depending on their respective macroeconomic fundamentals. In addition, global economic and political environments also impact the G-Secs yield and yield curve (YC). However, unlike the traditional era, both these changes (National and global changes) impact G-Secs more deeply in the present information technology era. This is primarily because liberalization of financial markets and economic globalization and information technology-savvy environment have entangled effect in the global market, i.e., any financial crisis at a global level has an effect in the domestic financial markets as well, including macroeconomic variables such as GDP growth, international trade, capital flows, exchange rate, fluctuations in the financial markets, inflation, employment, interest rates, etc. (Kumar and Vashisht, 2009; Walia, 2012 and Naudé 2009) [51, 75, 59]. Besides financial factors, scholars namely Alesina *et al.* (1992), Guscina (2008), and Blinder and Watson (2014) [5, 42, 14, 75] have remarked that other factors such as regime change also influence the economic fundamentals of an economy. Because of changes in the policies with regime change and changes in the international financial environment, macroeconomic variables fluctuate, which impact the yield on G-Secs and slope, curvature, and level of the YC. However, their intensity depends upon the nature of the crises and level of integration.

2. Indian Bond Market

Investment alternatives such as debt, equity, commodities, and alternative investment have

Correspondence
Rahul Rangotra
Assistant Professor,
Department of Management
Studies, Central University of
Kashmir, Ganderbal, Jammu
and Kashmir, India

led to the development of four types of financial markets - fixed income or debt markets, equity markets, commodity, and alternative investment markets. Among the various investment alternatives, debt (bonds, debentures, loans, etc.) and equity (Equity and preference shares) are the two most important sources of finance for corporations across the globe. Further, in 2018, "international equity market capitalization was $74.7 trillion, and outstanding international bonds were $102.8 trillion (Securities Industry and Financial Markets Association, 2019)". However, to finance the fiscal deficit, governments all over the world generally raise funds from debt markets through G-Secs with the help of central banks.

Indian bond market has three segments: corporate bond market, G-Secs market, and public sector undertaking (PSU) bonds market. Debt securities issued by state and central governments and PSUs are called bonds, while debt securities issued by the corporate sector are called debentures. Besides corporations and public sector undertakings, bonds in the debt market are also issued by RBI (India's central bank) on behalf of central government and state governments (RBI, n. d.). RBI issues G-Secs of different maturities ranging from 15 days to 30 years (RBI, n. d.). Figure 1.1 shows the maturity loans raised by issuing G-Secs in the Indian G-Secs market. On the y-axis, the figure shows the percentage share of under-five, between five and ten, and over ten years government of India (GOI) rupee loans and on x-axis represents the time in years. The figure depicts the changing trend of the maturity pattern of the Indian rupee loans. It also illustrates that in 1976 around 60% of loans had maturity over ten years; around 20% of loans had maturity between five to ten years; while around 15% of loans had maturity less than five years.
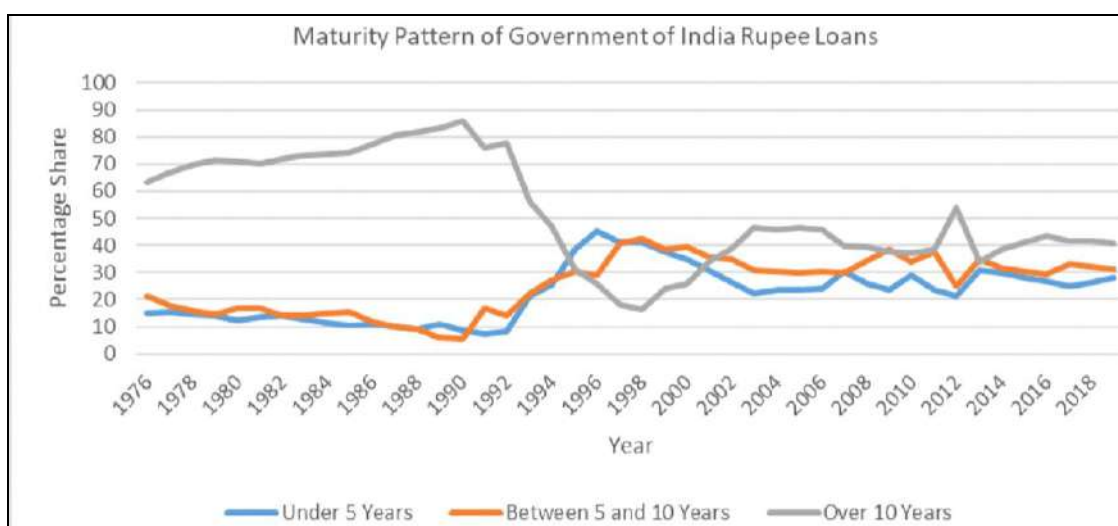
Source: Researcher's Calculations from RBI's Database on Indian Economy

Fig 1: Maturity Pattern of GOI Rupee Loans

In the year 2018, the figure shows that the respective share of under-five, between five and ten, and over ten years GOI loans, changed to around 30%, 30%, and 40% respectively. Further, it is observed that till 1995, the GOI was issuing a higher percentage of long-term loans however, thereafter mixed maturity pattern was followed i.e., issuing securities of various maturities. Fixed interest on the bonds (coupon rate) is paid on the face value of these securities. Governments issue different types of G-Secs like fixed coupon, flexible rate or floating rate, inflation-indexed, capital indexed, and zero-coupon G-Secs. Besides this governments also issue G-Secs with call and put provisions etc (RBI, n. d.).

2.1 Indian G-Secs Market
The Indian G-Secs market has undergone a considerable change in last twenty years. From low liquidity, segmentation, barrier to entry, lack of transparency, and physical bonds, the Indian G-Secs market is moving towards a developed debt market. The G-Secs market has become quite reformed and is now focusing on screen-based trading, a high degree of transparency, high liquidity and low transaction cost, and improvement in the dissemination of information to make the market more transparent, liquid and secure for investors. Further, there is also growth in the investment by foreign institutional investors in the Indian G-Secs market from 0.18 percent in March 2007 to 4.53 percent in December 2017 (RBI, n. d.). The major characteristics of the G-Secs are briefly given as under:

i) **Nature of G-Secs:** G-Secs have a major share in the Indian bond market. Both state and central Governments, with the help of RBI, issue the securities to finance the budget deficit. Each quarter RBI publishes a calendar for issuing G-Secs, namely treasury bills (with maturities of 14, 91, 182, and 364 days) and dated securities (ranging from 1 to 30 years maturity). Also, at the start of financial year, the government with the help of RBI, prepares a schedule of the securities to be issued every week during the financial year to meet the budget deficit of that year. Besides G-Secs, other bodies such as PSUs also issue bonds in the Indian debt market. In addition to the G-Secs market, a small corporate debt market also exists in India. Corporates generally issue long-term and medium-term debentures with fixed coupon rates while commercial papers are issued as short-term instruments. Unlike G-Secs, the Securities Exchange Board of India controls corporate debt market.

ii) **Participants:** State government, GOI, insurance companies, primary dealers, banks, PSUs, provident funds, mutual funds etc. are various participants in the Indian G-Secs market.

iii) **Types of investors:** RBI issues the dated G-Secs and treasury bills in the primary market through auctions with the help of primary dealers. Its public debt office manages the record of G-Secs. To initiate the process, every investor-institutional (Such as pension funds, insurance companies, mutual funds, etc.) or retail - must open an account with the public debt office of RBI. Institutional investors' account with RBI is called a subsidiary general ledger (SGL) account. However, SGL account facility is limited to large investors. While, small retail investors must open an account with primary dealers or commercial banks to trade in G-Secs. Further, retail and other small investors like cooperative banks, regional rural banks, etc. must open a gilt account with commercial banks or primary dealers known by constituent SGL account.

iv) **Format:** G-Secs (Treasury bills/dated G-Secs) are nowadays available in the dematerialized form; although these securities can also be held in paper form. But this is rare these days. The Clearing Corporation of India Ltd. (CCIL) is clearinghouse for G-Secs market in India and helps in the settlement and clearing of the securities.

2.1.1 Auction in G-Secs
Institutional and retail investors invest in G-Secs through competitive and non-competitive bidding, respectively, on E-Kuber, RBI's platform for G-Secs. Yield and price-based methods are used to auction G-Secs. In the yield-based auction, securities are allotted to the bidder who bids lower than cut-off yield, whereas, in the price-based auction, securities are allotted to the bidder who bids the price higher than cut-off price.

2.1.2 Secondary Market of G-Secs
In secondary market, G-Secs can be traded through Negotiated Dealing System-Order Matching (NDS-OM), operated by CCIL. Stock Exchanges like NSE and BSE are permitted to facilitate trading in G-Secs. The NSDL and CDSL act as depositories in the case of G-Secs traded through stock exchanges, which are regulated by SEBI. Besides, RBI also intervenes in the G-Secs market through the sale and purchase of G-Secs through liquidity adjustment facility (LAF), and buyback of G-Secs, to maintain liquidity in the market and implement monetary policy (MP). Due to change in demand and supply of G-Secs in secondary market, price and yield of these securities fluctuate.

3 Review of Literature
A review of existing studies related to the G-Secs market is necessary to find a research gap. This section discusses the synthesized literature on macroeconomic variables, including the international financial crisis and regime change (internal) on G-Secs yield and YC. The tabular review of the literature focusing on respective objectives, methodology, and findings is also designed to understand the study characteristics of the research conducted on bonds.

3.1 Synthesised Review of Literature
3.1.1 Macroeconomic Determinants of G-Secs Yield
Empirical research on the G-Secs market is attracting significant attention among researchers for the last three decades. Studies conducted in the G-Secs market investigated varied macroeconomic variables such as debt to GDP ratio (Bernoth *et al.* 2004, Codogno *et al.* 2003, Copeland & Jones, 2001, Lemmen & Goodhart, 1999, and Alexander & Anker, 1997) [13, 18, 20, 52-53, 6], GDP growth (Afonso, 2009; Thomas & Williams, 2003) [1, 74] and inflation (Fisher, 1930; Taylor, 1993 and Mishkin & Simon 1995) [35, 71, 58] that affect interest rates in the economy. Most of the studies on macroeconomic variables affecting G-Sec yield employ the US, European, and OECD data (Alesina *et al.*, 1992; Lemmen, 1999 and Bernoth *et al.* 2004) [5, 13, 52-53] while, comparatively limited literature exists in context to developing countries. The major macroeconomic variables impacting the G-Secs yield examined in the literature are discussed as under:

3.1.1.1 Debt to GDP Ratio
Ability of a country to pay back its debt is measured by debt to GDP ratio. Studies found a direct relationship between debt to GDP and the risk of default (Manasse *et al.*, 2003 and Engen & Hubbard, 2004) [29, 56]. According to Manasse *et al.* (2003) [56] and Engen & Hubbard (2004) [29], government debt may affect real bond yield because of two main reasons. First, an increase in debt increases the default risk premium, which increases the G-Secs yield. Second, with the increase in federal government debt, the marginal product of the capital increase, which increases the G-Secs yield. Both reasons imply a long-run positive association between real bond yield and government debt. Also, large debt induces a credit risk premium and decreases the capacity of the government to repay the debt, particularly if growth decreases. Higher inflation expectations due to the deficit financing to fund the large budget deficit also increases the G-Secs yield. Numbers of empirical studies have confirmed a positive relationship between G-Secs yield and the level of government debt. For example, Alesina *et al.* (1992) [5] analysed yield differentials between the public and private bond yield of twelve OECD countries and showed that the yield is directly related to the level of public debt. Lemmen (1999) [52-53] found that the yield spread of bonds issued by state governments in Germany, Australia, and Canada are positively related to the government debt to GDP ratio. To extend this relationship further, Bernoth *et al.* (2004) [13] studied the determinants of G-Secs risk in EU (European Union) countries and the impact of the start of the European monetary union on the bond pricing of member states. The authors established a direct relationship between debt, debt service ratio, and default risk. That is, higher the debt and debt service ratio of issuer country higher is default risk. Further, Baldacci and Kumar (2010) [11] established a direct relationship between the public debt and long-term domestic bond yields in both developed and emerging markets. However, the literature is scarce on emerging economies. Recently, Akram and Das (2019) [4] found that the debt ratio of the Indian government has no significant impact on the Indian G-Secs yield over the long run. Further, Credit Rating Information Services of India

Limited (CRISIL, 2020) [22] concludes that in Indian economy higher fiscal stress does not always increase the G-Secs yield.

3.1.1.2 Economic Growth

Economic theory documents that an increase in real GDP increases the average interest rate in both developed and developing economies. Scholars namely Thomas and Williams (2003) and Afonso (2009) [1, 74] examined the relationship among economic growth and rate of interest. Thomas and Williams (2003) [74] remarked that higher economic growth increases the real interest rate through two key channels. First, with the increase in GDP, the return on investment increases, which increases the demand for investment. Second, households increase their consumption and reduce their savings in anticipation of an increase in future earnings. Hence, higher investment demand and lower savings increase the real interest rate. Thomas and Williams (2003) [74] also stated that economic growth increases the demand for transaction money and money required to finance the projects, which again increases the interest rate in the economy. Their study was focused on the USA economy. Other empirical studies confirmed that rapidly growing economies pay a higher interest rate. For instance, Afonso (2009) [1] studied the ten-year G-Secs yield for fourteen EU countries and found that yields are directly related to the better growth forecasts and inversely related to budget balance to GDP ratios. Afonso (2009) [1] also stated that higher interest rates in economy increase the yield of the G-Secs. Studies such as Khandwala (2015), Kanagasabapathy and Goyal (2002) [47], and Subramaniam and Prasanna (2018) [50, 69] established a significant impact of output growth on G-Secs in the Indian context. Khandwala (2015) [50] suggested that in the Indian G-Secs market YC has a significant impact the output growth. Further, Kanagasabapathy and Goyal (2002) [47] showed that yield spread acts as a leading indicator of economic growth in Indian economy. Recently, Subramaniam and Prasanna (2018) [69] found that output growth significantly affects the long end of the YC in Asian economies.

3.1.1.3 Inflation

Although studies have explored the impact of inflation on G-Secs in a fragmented manner, its effect on short, medium, and long-term G-secs along with YC is not explored in any developed and developing economies. Studies namely Fernando *et al.* (2001), Dua and Raje (2014) [28], Subramaniam and Prasanna (2018), and Das (2021) [69, 24] found inflation as another major factor affecting G-Secs yield. Mishkin and Simon (1995) [58] observed a direct relationship between long run interest rates and price level in Australian economy. The scholars remarked that with the increase in inflation in the economy, the nominal interest rate increases, that increases yield on the G-Secs. They also stated that this relationship majorly exists in high inflation countries. It is noticed that central bank in high inflation country generally applies tight MP to reduce inflation, which increases the yield on the G-Secs. The seminal contributions by Fisher (1930) and Taylor (1993) [35, 71], which relate inflation with interest rates, are worth to be noted. Fisher's effect by Fisher assumes that nominal interest rates in any period are equivalent to real interest rates and inflation. He established that there exists a direct relationship between inflation and interest rates. Also, real rate in the economy is determined by the productivity of capital and investor's time preference. The relationship between inflation and interest rate is also examined by Taylor (1993) [71] and is widely recognized and known as Taylor's Rule. Taylor's Rule proposes that central bank should raise interest rates to reduce inflation. Central banks worldwide, including Bank of Japan and Bank of England, use Taylor's Rule to understand the inflation effects on interest rates (Asso *et al.* 2010). It is also used to study and predict interest in the economy. Fernando *et al.* (2001), in their study, established that interest rate set by central bank has direct relationship with price level. Subramaniam and Prasanna (2018) [69], in their research, found that the inflation rate significantly affects short end of YC in Asian economies. Dua and Raje (2014) [28] observed that the impact of inflation on G-Secs yield in the Indian G-Secs market decreases with maturity. Very recently Das (2021) [24] in his study observed that besides MP, inflation expectations also impact the curvature, level, and slope of YC in the Indian G-Secs market.

3.1.1.4 Monetary Policy (MP)

Impact of MP on G-Secs yield and YC is examined in the literature in context to both developed and developing countries. Evans and Marshall (1998), in their study, established significant impact of MP on short-term interest rates. They used vector auto-regression (VAR) model to explain movement of YC by MP, economic activity, and inflation. In 2007, in their extended study, Evans and Marshall found little support that budget policy affects interest rate variability. Afonso and Martins (2010) [2] also support the significant effect of MP on interest rates in German market. Subramaniam and Prasanna (2018) [69], in their research, found that the policy rate significantly affects the short end of the YC in Asian markets. Kapur *et. al.* (2018) found that bank rate is the key driver of G-Secs yield in India. The study found that with the increase in maturity of the G-Secs yield, the impact of the policy rate weakens. Dua and Raje (2014) [28] studied the determinants of G-Secs yield in Indian G-Secs market with using VAR model. They observed that MP rate and growth of high-powered money have more impact on short term G-Secs yield than long term yield. They also observed that the impact of inflation decreases with maturity. Other studies such as Khandwala (2015) [50] suggested that MP directly affects the YC in the Indian G-Secs market. Further, recently Das (2021) [24] studied the impact of MP, inflation, and global spill overs on the shape of the YC in the Indian G-Secs market. He employed a dynamic latent factor yield macro model for estimating the YC in India. He established that MP rates are the most important factor affecting the slope of the YC. Besides, Credit Rating Information Services of India Limited (CRISIL, 2020) [22] also showed that macroeconomic variables such as MP and crude oil prices significantly influence the short-term movement in G-Secs yield.

3.1.2 International Financial Crisis

As per The Economist (n.d.) essay titled "The Slumps that Shape the Modern Finance," during the great depression

from 1929 to 1933, around 1100 banks failed, the unemployment rate increased to 25 percent, and the money supply in the world dropped to over 30 percent. Jones and Ocampo (2009) [45] put forward those remittances, capital flows, and trade play key roles to spread the effect of financial crises on emerging economies. Baig and Golfajn (1998) and Lim *et al.* (2008) [9, 54] studied the impact of Asian financial crisis of 1997 on Thailand, Malaysia, Indonesia, Korea, and Philippines markets. They stated that cross-country correlations in currency and equity markets were significant during crisis due to financial panic. Lim *et al.* (2008) [54] studied the impact of Asian financial crisis that occurred in year 1997. They found that Asian financial crisis of 1997 harmfully affected the efficiency of Asian stock markets due to chaotic financial environment during the crisis. They observed that the efficiency of the Hong Kong stock market was badly affected, followed by Philippines, Malaysia, Singapore, Thailand, and Korea. In another study, Kumar and Vashisht (2009) [51] revealed that the financial crisis of 2008 affected India through the exchange rate, financial markets, and trade flows. They found that the financial crisis is seen with respect to decreased export demand, the reversal of capital inflows, and a decline in GDP by more than two percentage points in fiscal year 2008-2009. Walia (2012) [75], in his study, mentioned the impact of global recession on various sectors of Indian economy. The study found that the impact on foreign portfolio investment, the balance of payment, and export and imports is significant. Whereas, Naudé (2009) [59] remarked that effect of the 2008 financial crisis was transmitted to developing countries in terms of banking failure, reductions in export earnings, domestic lending, and financial flows to the emerging economies. Ghosh and Chandrasekha (2009) and Fidrmuc and Korhonen (2010) [39, 34] also confirmed the same. Fidrmuc and Korhonen (2010) [34] found that international financial crises have significantly affected economic development in emerging Asian economies.

Besides studying after the crisis effect, a few studies such as Chionis *et al.* (2014) [16] also examined both before and after the financial crisis impact. Chionis *et al.* (2014) [16] studied the influence of debt to GDP ratio, inflation, deficit, and unemployment on ten-year Greek G-Secs before and after the financial crisis of 2008. The authors revealed that before the Greek crisis, both inflation and unemployment have significantly impacted the yield but immediately after the crisis, fiscal deficit had a significant impact on yield while growth rate had no significant impact on bond yield. Previously Dua and Sinha (2007) [27] and Dholakia (1998) [26] found that effect of Asian financial crisis on India was not substantive. However, Dua and Sinha (2007) [27] remarked the effect of Asian financial crisis of 1997 on currency was insignificant. They suggested that this might be because of the relative stringent policies of India. They particularly mentioned that tightening of MP, restrictions on capital flow, and the RBI's involvement in foreign exchange market are significant steps for reducing the impact of the Asian financial crisis.

3.1.3 Political Economy Variable: Regime Change
The impact of regime change on the G-Secs market in developed, as well as developing countries, is examined by

the limited number of studies. Studies like Alesina *et al.* (1992) [5] studied the political environment in 113 countries from 1950 to 1982 and stated that an unstable political environment decreases the speed of investments and economic growth. Similarly, Guscina (2008) [42] established that an uncertain political climate, unstable macroeconomic environment, and poor-quality institutions in emerging economies hinder the development of the domestic debt market. Aisen and Veiga (2010) studied political instability in 169 countries from 1960 to 2004 and found that "higher degrees of political instability is associated with lower growth rates of GDP per capita as political instability adversely affects physical and human capital accumulation and growth".

Particularly, studies like Clara and Valkano (2003), Comiskey and Marsh (2012), and Blinder and Watson (2014) [14] identified regime change impact in the US context. Clara and Valkano (2003) showed that during democratic presidencies in the US, the excess return in the stock market was higher than during Republican presidencies. However, they did not find any reason for such behaviour and considered it as a puzzle. Comiskey and Marsh (2012) confirmed the same by examining the data from 1949-2009. They reported that democratic presidents have stronger economic records in terms of higher growth, lower unemployment, and lower inequality than republican presidents. Blinder and Watson (2014) [14] found a large gap in the economic performance between the presidencies of the democratic and republican presidents. The authors stated that oil shocks, productivity shocks, favourable global conditions, and consumer expectations are significant factors that explain around half of 1.8 percent democratic and republican real GDP growth gap.

Huang *et al.* (2014) studied the international political risk in 34 countries from 1988 to 2007 and found a positive association between G-Secs yields and international political risk as investors demand higher risk premium during political uncertainty. Baldacci *et al.* (2011) [10] studied effect of political and fiscal risk on sovereign spread in emerging markets from the period 1997 to 2008. The results showed that both political and fiscal risks affect the emerging market sovereign spread. Another study by Das (2021) [24] in the Indian G-Secs market established that policy uncertainty at the global level impacts the curvature, level, and slope of YC, which shows the rising integration of the Indian G-Secs market to global spill overs. A study by Dholakia (1998) [26] in the Indian context revealed that political uncertainty could be the cause of the decrease in India's industrial growth, exports, and stock market decline in last quarter of 1997.

3.1.4 US T-Bills, LIBOR & Exchange Rate
In addition to aforesaid factors, international factors like LIBOR (London Interbank Offered Rate) exchange rate, and US T-bills (treasury bills) are equally important to know how they affect the corporate and public bonds. It is well documented in the literature that fluctuation in LIBOR affects the cost of borrowing of corporations since they borrow from international markets (RBI, 2014). Though the interest rate that the corporations pay on the external commercial borrowings is tied up with the LIBOR, very meagre research is conducted to study impact of these

global benchmarks on Indian G-Secs yield and the determinants underlying the impact. However, at the same time, Tata Securities, Research Analyst Report (2015) found a very high correlation (up to 86%) between the US T-Bills, LIBOR, and Indian G-Secs yield, which need to be validated.

Also, the exchange rate risk is another important factor affecting the local currency bond yield (Gadanecz *et al*., 2014) [37]. Further, it is an established fact that higher exchange rate risk results in higher expected return, and hence, the same effect is assumed on the G-Secs. For example, depreciation in the exchange rate makes imports costly, which increases inflation and consequently affects G-Secs yield (Gagnon 2008) [38]. Subramaniam and Prasanna (2018) [69] found that depreciation in the currency increases the level of YC. However, research is relatively thin on this determinant. Further, as per Credit Rating Information Services of India Limited (CRISIL, 2020) [22], variables such as MP and crude oil prices significantly influence the short-term movement in G-Secs yield.

3.1.5 Literature on Yield Curve
The relationship between the maturity of G-Secs and theoretical spot rates calculated using a bootstrapping methodology (Frank & Steven, 2012) [36] is called the zero-coupon YC. Litterman and Scheinkman (1991) [55] found that the historical returns on the zero-coupon G-Secs can be explained with the change level of rates, slope, and curvature of the YC. Litterman and Scheinkman [55] found that 90 percent of the returns on the zero-coupon G-Secs are explained by a change in the level of YC, while slope and curvature explain 8.5% and 1.5%, respectively. These models conclude that in the economy interest rates are driven by curvature, level, and slope. These factors (curvature, level, and slope) are characterized by a large body of literature in finance (Cox *et al.* (1985); Dai & Singleton, (2000); Nelson & Siegel, 1987; Diebold *et al.* 2006 [21, 23, 60, 25], among others). The literature that links the macroeconomic factors with the YC is primarily contributed by studies namely Gurkaynak and Wright (2012), Rudebusch and Wu (2008), Diebold *et al.* (2006), Piazzesi (2005) Ang and Piazzesi (2003) and Evans and Marshall (1998) [63, 25, 61, 7].

Bernard and Gerlach (1996) [12] found that the YC flattens with the unexpected change in the central bank rate. They also discovered that for predicting output and inflation, the predictive power of term structure would be stronger for countries having independent MP such as the US and Germany. Estrella and Mishkin (1997) [30] showed that YC is the indicator of market expectations and is impacted by the contractionary and expansionary MP in Europe and the United States. The objective of their research was to find whether the information in the YC help the central bank and whether the central bank can control the YC spread through bank rate. The results of the research showed that long-term yield is impacted by inflation and real activity. They also found that the central bank cannot control the YC but can influence it. Piazzesi (2005) [61] explored the linkage between the macroeconomic variables and YC and found that the link reduces the pricing error. Further, Diebold *et al.* (2006) [25] found the two way relationship between and YC. They also found a strong correlation of level and slope with

inflation and real activity, respectively, in the US economy. Ang and Piazzesi (2003) and Piazzesi (2005) [61, 7] found dynamics of YC are affected by the observable macroeconomic factors and slope, level, and curvature of YC. They also show that the entire YC is affected by inflation, but the medium end of the YC is affected by the real activity shocks, and the MP shocks move the short rates more than long rates. Hawtrey (1929) [43] argued that central bank uses short-term interest for implementing MP and short-term rates have little effect on long-term rate.

Research on Indian G-Secs market by Sahoo and Bhattacharyya (2012) [67] found that exchange rate changes affect slope of the YC, while MP significantly affects level and curvature of YC. Kanjilal (2011) [48] found that the latent factors to macroeconomic factors significantly affect the YC, but YC has an insignificant effect on the macroeconomic variables. Kanjilal (2013) [49] found that for the period 1997-2011, more than 90% of the variation in YC is explained by the level factor. Sensarma and Bhattacharyya (2016) [63] found that although MP has an impact on the entire YC, it has a strong effect on short end of YC and credit spread. A study by Subramaniam and Prasanna (2018) [69] revealed that inflation and policy rate affect the short end of YC, and output growth significantly affects the long end of the YC, i.e., long-term G-Secs yield. They also found that depreciation in the currency increases the level of YC.

4. Conclusion
The study showed the literature on the role of select macroeconomic variables namely debt to GDP ratio, output growth, inflation, and MP, ten-year benchmark US treasury yield, LIBOR & exchange rate along with international financial crisis and regime change variables that may impact G-Secs yield and curvature, level and slope of YC in Indian settings. This will help the researchers in the G-Secs market to understand the literature in Indian G-Secs market.

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