Risk Free Rate in the Context of Indian Market

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ABSTRACT

In the developed countries, investors have a clear view on getting the risk free rate to evaluate their investment. The return on local government securities is the only best forecasting on riskless rate. Most investors in developed countries choose the return on the government bonds to be risk free rate. The valuation on their investment is done easily because the basic point, risk free rate, is available every time. However, the concept of risk free rate in developing countries is very complicated for investors in choosing the right one. We cannot, sometimes, find the riskless rate to be basic start in evaluating the investment. The risk free rate is derived from the expected return on a risk-free asset. On the basis of risk free rate, the expected returns on the risky investments are calculated with the risk creating an expected risk premium which is added on to the risk free rate. Moreover, the risk free rate is also the basic factor for some empirical tests of financial theories: the Capital Asset Pricing Model (CAPM), Modern Portfolio Theory, and Black-Scholes Model.
The purpose of this study is to determine the risk free rate using in valuation of investment in the context of India. The specific objectives include: To determine the conditions for risk free rate, To find out the different types of government securities which are available in India, To compare the variability between the return on Indian and the US government securities, To find out whether the return on Indian government securities is to be risk free or not.

Keyword: *risk, free, rate, Indian market*

I. Introduction

The risk free rate gives analysts the basic point to use in the financial theories. Estimating the return on risky asset, for example, is measured in related to the riskless return, with adding the risk creating an expected risk premium to the risk free rate. Anyway, the concept of risk free rate is derived from the expected return on risk-free asset, so the first step is to know what risk free asset is. In investment, investors buying assets are expecting the returns on those assets for over a period of time they hold the assets. The risk comes in when the actual returns are different from the expected returns on the assets we invested. In simple term, risk in finance is defined as the variation in actual returns around the expected returns. Therefore, for an investor to get risk free in his/her investment the actual returns should be equal to the expected returns.

II. Literature Review

After knowing the concept of riskless asset, next we discuss the condition of risk free expected rate. According to AswathDamodaran (2008), in order to get expected return which is riskless there are two basic conditions to be met. Firstly, no default risk is in the expected return. Default risk means the possibility that issued companies may fail to pay the principal or interest on the securities during the stipulated date. Therefore, this risk is associated with any security issued by a private company, as the largest or safest firms have some measures of default risk, for instance the case of collapse of Lemad Brother, the biggest private company in the US. The only securities which provide riskless are government securities. It is not because the government performs better than the private firms but because the government has the authority in printing the money in the country. And government never shut down but private firm does. At least the government should be able to fulfill the promises. The other condition is that

there can be no reinvestment risk during the holding period of investors. It is the risk that the investment's principal market value will raise or fall during the period to maturity as a function of change in the general level of interest rate. Each security which has no default risk doesn't mean there is no reinvestment risk. For example, the government bonds have no default risk, but they don't have any reinvestment risk since the coupons on the bond will be invested at rates that cannot be predicted today.

Roger J. Grabowski (2010) provided the definition of risk-free rate as the return available on the security that the market regards as free of the risk of default. He stated that there are three main components that the risk-free rate reflects. The first one is Rental Rate which is a real return from the fund you lend over a period of investment. Thus, forgoing consumption for which the funds could be used. Next, it is related to inflation which means the expected rate of inflation over term of the risk-free investment. The third one is maturity risk or reinvestment which is the risk that investors can invest their funds during the period of holding government bonds. He also illustrated that all the securities will give the yields to maturity equipped with these three economic factors for any given maturity length.

III. Three Main Condition for Risk Free Rate

A. No Default Risk

Thus, the most important feature of riskless rate is no default risk. When investors put their money in any type of investment, they want to get their principal back along with return on time. The most important desire for investors is to get out of fear of losing their money while taking investment decision making. The government securities give the investors the guaranty in paying back their principal and interest. It is not because government can earn more profit than other issuance companies, but it is because the government never falls down. It can be said that government run forever. Even though it does not have ability to pay its debt this year, then it has obligation to pay back next year, for example. Moreover, government is legal controller of money circulating in the country. It has central or national bank which issues the currency note. Therefore, if the government issues the debts for publics and it does not have ability to pay back, the government will manage to give them back. All these reasons give guarantee to government securities.

B. No Reinvestment Risk

Another important condition for risk-free rate of return is that there can be no reinvestment risk which investors always considered. Market interest rates have fluctuated from day to day, which leads to the chance of reinvestment on the investor's fund and interest generated. The chance of reinvesting in getting a higher return from new investment will be possible during the period holding the securities. For example, you have invested in company's bonds which have face value of Rs. 10,000 for each one with the coupon rate of 10%. After one month, because of the fluctuation in the market interest rate, there is a chance for you to invest in another type of bond which provides you a coupon rate of 12%. This leads to risk of reinvestment for your fund if other conditions remain the same. That is why most of investors consider government securities as no reinvestment risk instruments. It is because the rates of return on government securities do not significantly differ from time to time. The reason is that the government has authority in determining the interest rate in the country. During the short-term period there is a slightly change in the yields in the government securities. This is what investors think about government instruments.

C. Inflation Expectation

The price level change in the consumer goods is another factor that investors care about. It will change the purchasing power of investors' funds. Thus, inflation is also considered as another risk factor for investors' decision-making. Under conditions of high and unstable inflation, valuation is often done in real terms. Effectively, this means that cash flows are estimated using real growth rates and without allowing for the growth that comes from price inflation. In decision related to riskless rate, the rate should reflect the expected effect of inflation. While the government bonds may offer returns that are risk-free in normal terms, they are not risk free in real terms since expected inflation can be volatile. The standard approach of subtracting an expected inflation rate from the normal interest rate to arrive at a real risk free rate provides at best an estimate of the real risk free rate. Until recently, there were few traded default-free securities that could be used to estimate real risk free rates, but the introduction of inflation-indexed treasuries has filled this void. However, the inflation-indexed treasury security (TIPs) is available

in some developed countries. We cannot find it in developing country, like in India. But this year, 2013, the government of India will introduce TIPs to the investors who can use it to cope with inflation.

IV. Choosing Risk Free Rate

In valuation of long term investment made by businesses, practitioners generally consider long-term U.S. government bonds as riskless rate security. This convention represents a realistic simplifying assumption. Most business investments have long durations and suffer from a reinvestment risk comparable to that of long-term U.S. government bonds. Most of financial analysts use the return on government long-term bond as risk free rate. It is the rate of return on 10-year or 20-year government bond with constant maturity, or sometime 30-year bond. While the choice of risk-free rate was relatively easy during period of stability, it became problematic beginning in September 2008, as financial crisis started to unfold. All U.S. government security yields declined and long-term U.S. government bond yields became abnormally low for several months. So, it is not easy to choose the riskless rate because it varies from one day to another. T. Therefore, in order to avoid the risk, the securities should possess little change in the interest over a period of time. Inflation should be considered in risk-free rate in order to know about the real term of it. The best source of risk-free rate is from government securities, because they provide guarantee for repaying back and the interest on the securities also slightly fluctuate. Moreover, Treasury Inflation Protected Securities are available in the government securities.

Indian Government Bonds

India is one of developing countries, whose bond market started developing in later stage only since liberalization began in the 1990s when the interest rates were deregulated. The major development in the Indian bond markets recently is shown in the Appendix I. Most government bonds in India are traded in secondary market, if we compared to corporate bonds (as can be seen in Appendix II: list of outstanding government securities as on 11 February 2013). Prior to the 1990s the market for government securities in India was massively controlled with captive investors- banks and insurance companies. These companies invest in the almost entire government issue of securities with coupon rates to finance the budget deficit leading to its immediate monetization.

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II. Types of Government Securities

Before we discuss the types of government instrument, we should know what the government securities are. According to RBI, a government security is a tradable instrument issued by the Central Government or the State Governments, which acknowledges the government's debt obligation. In other word, G-sec

There are two main types of government securities, short-term and long-term securities. Short-term government securities refer to treasury bills, with original maturity of less than one year, while as, long-term government securities are the government bonds or dated securities with original maturity of more than one year. However in reality, Indian Government securities have divided three main categories which are shown in the following table 1.

Table 3.1: Issuers, Instruments and Maturity in Indian Government Securities

Issuer	Maturity	Instruments
Central Government	91/182/364 days	T-Bills
	Less than 91days	Cash Management Bills
	2-30 years	Dated securities
State Government	5-13 years	Dated Securities

	5-13years	State Development Loans

Source: RBI, 2011

The table 1 shows the four different types of Indian government instruments up to 2011. The first category is T-Bills, which have maturity of 91days, 182 days or 364days. Treasury bills are zero-coupon securities and pay no interest. However, they issued at discount rate and redeemed at face value at maturity. The Reserve Bank of India conducts auctions mostly every Wednesday to issue T-bills. Payments for the T-bills purchased are made on the following Friday. The 91 day T-bills are auctioned on every Wednesday. The Treasury bills of 182 days and 364 days tenure are auctioned on alternate Wednesdays. T-bills of 364 days tenure are auctioned on the Wednesday preceding the reporting Friday while 182 T-bills are auctioned on the Wednesday prior to a non-reporting Fridays. The Reserve Bank releases an annual calendar of T-bill issuances for a financial year in the last week of March of the previous financial year. The Reserve Bank of India announces the issue details of T-bills through a press release every week.

The next category is Cash Management Bills (CMBs). They are new short-term instruments which are issued to meet the temporary mismatches in cash flow of government. CMBs have the generic character of T-bills but are issued with a maturity of less than 91 days. Like T-bills, they are issued at a discount rate and redeemed at face value at maturity. The tenure, notified amount and date of issue of the CMBs, depends upon the temporary cash requirement of the government. The announcement of their auction is made by Reserve Bank of India through a Press Release which will be issued one day prior to the date of auction. The settlement of the auction is on T+1 basis. The non-competitive bidding scheme has not been extended to the CMBs. However, these instruments are tradable and qualify for ready forward facility. First set of CMBs were issued on May 12, 2010.

Another type of government securities is dated securities. They are long-term securities which are issued with fixed or floated coupon rate on the face value, payable at fixed time periods, normally semi-annual. Dated securities of both Central and State Government are issued by Reserve Bank through auctions. The Reserve Bank announces the auctions a week in advance through press releases or sometime through advertisement in major dailies. Thus, the investors are given adequate time to plan for purchase of government dated securities through such auctions. Under the dated securities, there are seven subcategories.

i. Fixed Rate Bonds: they are the bonds whose coupon rate is fixed for the entire live of bonds. Most of government bonds are issued at fixed coupon rate.

ii. Floating Rate Bonds: They are securities whose coupon rate is not fixed. It is reset at pre-announced intervals, say, every six months or one year, by adding a spread over a base rate. The spread is decided through the auction. Floating Rate Bonds were first issued in September 1995 in India.

iii. Zero Coupon Bonds: They are bonds with no coupon payments. Like T-bills, zero coupon bonds are issued at a discount rate to the face value. Until 1990s, it has no issuance of zero coupon bonds.

iv. Capital Indexed Bonds: these are bonds the principal of which is linked to an accepted index of inflation with a view to protecting the holder from inflation. A capital indexed bond, with the principal hedged against inflation, was issued in December 1997 with maturity in 2002, but it no longer exists. This year, 2013, the minister of finance is planning to issue Inflation Indexed Bonds again. The payment of principal and coupon will be linked to an inflation index (Whole Price Index).

v. Bonds with Call/Put Options: Bonds can also be issued with features of option whereas the issuer can have option to buy-back (call option) or the investor can have the option to sell the bond (put option) to issuer. The first bond with call/put options was issued on July 18th, 2002 for 10 years maturing on July 18th 2012. The government has the right to buy the bond back at par value while the investor has the right to sell the bond to government at par value at the time of any of the semi-annual coupon dates starting from July 18th, 2007.

vi. Special Securities: The government of India issues, from time to time, special securities to entities like Oil Marketing Companies, Fertilizer Companies, Food Cooperation of India, etc. as compensation to these companies in

lieu of cash subsidies. These securities are usually long dated instruments carrying coupon with a spread of about 20-25 basis points over the yield of the dated securities of comparable maturity.

vii. STRIPS: Separate Trading of Registered Interest and Principal of Securities are instruments wherein each cash flow of the fixed coupon security is converted into a separate tradable Zero Coupon Bond and traded. STRIPS will also provide institutional investors with an additional instrument for their asset-liability management. Furthermore, they have zero reinvestment risk, being zero coupon bonds, they can be attractive to retail or non-institutional investors.

Last but not least, state development loans are issued by state government through an auction similar to the auctions conducted for dated securities issued by the Central Government. The interest is paid at semi-annual intervals and the principal is repaid on the maturity date.

III. Investors in Indian Government Securities

Why institutional and individual investors invest in government securities is still a question because they are issued at lower coupon rate than private securities. The following is the advantages of holding government security.

i. Besides providing a return in the form of coupons (interest), Government securities offer the maximum safety as they carry the Sovereign's commitment for payment of interest and repayment of principal.

ii. They can be held in book entry, i.e., dematerialized form, thus, obviating the need for safekeeping.

iii. Government securities are available in a wide range of maturities from 91 days to as long as 30 years to suit the duration of a bank's liabilities.

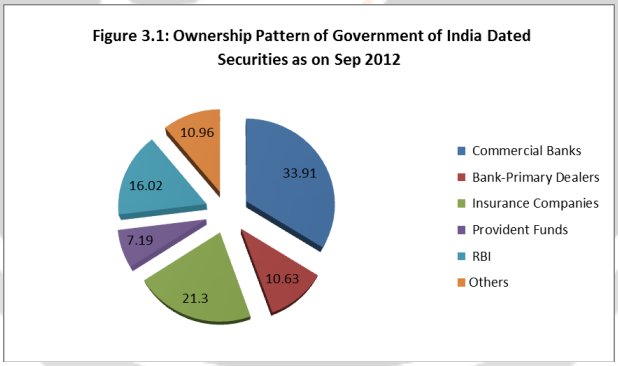
iv. Government securities can be sold easily in the secondary market to meet cash requirements.

v. Government securities can also be used as collateral to borrow funds in the repo market.

vi. The settlement system for trading in Government securities, which is based on Delivery versus Payment (DvP), is a very simple, safe and efficient system of settlement. The DvP mechanism ensures transfer of securities by the seller of securities simultaneously with transfer of funds from the buyer of the securities, thereby mitigating the settlement risk.

vii. Government security prices are readily available due to a liquid and active secondary market and a transparent price dissemination mechanism.

viii. Besides banks, insurance companies and other large investors, smaller investors like Co-operative banks, Regional Rural Banks, Provident Funds are also required to hold Government securities according to regulation.



The figure 3.1 illustrates the different types of investors holding government dated securities in India as on September 2012. Actually, the ownership pattern of government of Indian dated securities differs from time to time. However, here we provide only the last data of that pattern on the date of September 2012.

The biggest segment of Indian dated securities consisting of 33.91 percent was held by commercial banks, followed by insurance companies accounting for 21.3 percent. The reason why commercial banks have large amount in government instruments is that they have much of deposit and they need invest in government as per the Statutory Liquidity Radio of banks. Next, 16.02 percent of total government dated securities was on the hand of Reserve Bank of India. Whereas, bank-primary dealers invested in Indian dated securities, 10.63 percent out of total the securities. Provident funds in India held only 7.19 percent which was less, compared to other investors. Last but not least, other investors including non-bank primary dealers, mutual funds, co-operative banks, financial institutions, corporate companies, foreign institutional investors and others, totally accounted for 10.96 percent.

In short, there are five major investors in government securities of India. They are RBI, commercial banks, bank-primary dealers, provident funds and insurance companies. As complying with the law they are need to invest in the securities.

IV. Risk involving in Government Securities

A. Types of Risk

Government securities are generally referred to as risk free instruments as sovereigns are not expected to default on their payments. However, as is the case with any financial instrument, there are risks associated with holding the Government securities. Hence, it is important to identify and understand such risks and take appropriate measures for mitigation of the same risks. The following are the major risks associated with holding Government securities.

1. Market risk: Market risk arises out of adverse movement of prices of the securities that are held by an investor due to changes in interest rates. This will result in booking losses on marking to market or realizing a loss if the securities are sold at the adverse prices. Small investors, to some extent, can mitigate market risk by holding the bonds till maturity so that they can realize the yield at which the securities were actually bought.

2. Reinvestment risk: Cash flows on a Government security includes fixed coupon every half year and repayment of principal at maturity. These cash flows need to be reinvested whenever they are paid. Hence there is a risk that the investor may not be able to reinvest these proceeds at profitable rates due to changes in interest rate scenario.

3. Liquidity risk: Liquidity risk refers to the inability of an investor to liquidate (sell) his holdings due to non-availability of buyers for the security, i.e., no trading activity in that particular security. Usually, when a liquid bond of fixed maturity is bought, its tenor gets reduced due to time decay. For example, a 10 year security will become 8 year security after 2 years due to which it may become illiquid. Due to illiquidity, the investor may need to sell at adverse prices in case of urgent funds requirement. However, in such cases, eligible investors can participate in market repo and borrow the money against the collateral of the securities.

B. Risk Avoidance

Holding securities till maturity could be a strategy through which one could avoid market risk. Rebalancing the portfolio wherein the securities are sold once they become short term and new securities of longer tenor are bought could be followed to manage the portfolio risk. However, rebalancing involves transaction and other costs and hence needs to be used judiciously. Market risk and reinvestment risk could also be managed through Asset Liability Management (ALM) by matching the cash flows with liabilities. ALM could also be undertaken by matching the duration of the cash flows in assets with that in liabilities.

Advanced risk management techniques involve use of derivatives like Interest Rate Swaps (IRS) through which the nature of cash flows could be altered. However, these are complex instruments requiring advanced level of expertise for proper understanding. Adequate caution, therefore, need to be observed for undertaking the derivatives transactions and such transactions should be undertaken only after having complete understanding of the associated risks and complexities.

Trading and Yield-to-Maturity in Indian Government Instruments

I. Trading in G-sec in India

A. Issuance of G-sec

Government securities are issued through auctions conducted by the RBI. Auctions are conducted on the electronic platform called the NDS – Auction platform. Commercial banks, scheduled urban co-operative banks, Primary Dealers (a list of Primary Dealers with their contact details is given in Appendix III), insurance companies and provident funds, who maintain funds account (current account) and securities accounts (SGL account) with RBI, are members of this electronic platform. All members of PDO-NDS can place their bids in the auction through this electronic platform. All non-NDS members including non-scheduled urban co-operative banks can participate in the primary auction through scheduled commercial banks or Primary Dealers. For this purpose, the urban co-operative banks need to open a securities account with a bank / Primary Dealer – such an account is called a Gilt Account. A Gilt Account is a dematerialized account maintained by a scheduled commercial bank or Primary Dealer for its constituent (e.g., a non-scheduled urban co-operative bank).

The RBI, in consultation with the Government of India, issues an indicative half-yearly auction calendar which contains information about the amount of borrowing, the tenor of security and the likely period during which auctions will be held. A Notification and a Press Communiqué giving exact particulars of the securities, viz., name, amount, type of issue and procedure of auction are issued by the Government of India about a week prior to the actual date of auction. RBI places the notification and a Press Release on its website (www.rbi.org.in) and also issues an advertisement in leading English and Hindi newspapers. Information about auctions is also available with the select branches of public and private sector banks and the Primary Dealers.

B. Types of Auctions

Prior to introduction of auctions as the method of issuance, the interest rates were administratively fixed by the Government. With the introduction of auctions, the rate of interest (coupon rate) gets fixed through a market based price discovery process.

An auction may either be yield based or price based.

1. **Yield Based Auction:** A yield based auction is generally conducted when a new Government security is issued. Investors bid in yield terms up to two decimal places (for example, 8.19 per cent, 8.20 per cent, etc.). Bids are arranged in ascending order and the cut-off yield is arrived at the yield corresponding to the notified amount of the auction. The cut-off yield is taken as the coupon rate for the security. Successful bidders are those who have bid at or below the cut-off yield. Bids which are higher than the cut-off yield are rejected.
2. **Price Based Auction:** A price based auction is conducted when Government of India re-issues securities issued earlier. Bidders quote in terms of price per Rs.100 of face value of the security (e.g., Rs.102.00, Rs.101.00, Rs.100.00, Rs.99.00, etc., per Rs.100/-). Bids are arranged in descending order and the successful bidders are those who have bid at or above the cut-off price. Bids which are below the cut-off price are rejected.Depending upon the method of allocation to successful bidders, auction could be classified as Uniform Price based and Multiple Price based.

In a Uniform Price auction, all the successful bidders are required to pay for the allotted quantity of securities at the same rate, i.e., at the auction cut-off rate, irrespective of the rate quoted by them. On the other hand, in a Multiple Price auction, the successful bidders are required to pay for the allotted quantity of securities at the respective price / yield at which they have bid.

An investor may bid in an auction under either Competitive Bidding or Non-competitive Bidding. In a competitive bidding, an investor bids at a specific price / yield and is allotted securities if the price / yield quoted is within the cut-off price / yield. Competitive bids are made by well informed investors such as banks, financial institutions, primary dealers, mutual funds, and insurance companies. The minimum bid amount is Rs.10,000 and in multiples of Rs.10,000 thereafter. Multiple bidding is also allowed, i.e., an investor may put in several bids at various price/ yield levels.

However, with a view to providing retail investors, who may lack skill and knowledge to participate in the auction directly, an opportunity to participate in the auction process, the scheme of non-competitive bidding in dated securities was introduced in January 2002. Non-competitive bidding is open to individuals, HUFs, RRBs, co-operative banks, firms, companies, corporate bodies, institutions, provident funds, and trusts. Under the scheme, eligible investors apply for a certain amount of securities in an auction without mentioning a specific price / yield. Such bidders are allotted securities at the weighted average price / yield of the auction.

C. Open Market Operation (OMO)

OMOs are the market operations conducted by the Reserve Bank of India by way of sale/ purchase of Government securities to/ from the market with an objective to adjust the rupee liquidity conditions in the market on a durable basis. When the RBI feels there is excess liquidity in the market, it resorts to sale of securities thereby sucking out the rupee liquidity. Similarly, when the liquidity conditions are tight, the RBI will buy securities from the market, thereby releasing liquidity into the market.

D. Buyback of G-sec

Buyback of Government securities is a process whereby the Government of India and State Governments buy back their existing securities from the holders. The objectives of buyback can be reduction of cost (by buying back high coupon securities), reduction in the number of outstanding securities and improving liquidity in the Government securities market (by buying back illiquid securities) and infusion of liquidity in the system. Governments make provisions in their budget for buying back of existing securities. Buyback can be done through an auction process or through the secondary market route, i.e., NDS/NDS-OM.

E. Trading G-sec in Secondary Market

There is an active secondary market in Government securities. The securities can be bought / sold in the secondary market either (i) Over the Counter (OTC) or (ii) through the Negotiated Dealing System (NDS) or (iii) the Negotiated Dealing System-Order Matching (NDS-OM).

1. Over the Counter (OTC)/ Telephone Market:

In this market, a participant, who wants to buy or sell a government security, may contact a bank / Primary Dealer / financial institution either directly or through a broker registered with SEBI and negotiate for a certain amount of a particular security at a certain price. Such negotiations are usually done on telephone and a deal may be struck if both counterparties agree on the amount and rate. In the case of a buyer, like an urban co-operative bank wishing to buy a security, the bank's dealer (who is authorized by the bank to undertake transactions in Government Securities) may get in touch with other market participants over telephone and obtain quote.

2. Negotiated Dealing System:

The Negotiated Dealing System (NDS) for electronic dealing and reporting of transactions in government securities was introduced in February 2002. It facilitates the members to submit electronically, bids or applications for primary issuance of Government Securities when auctions are conducted. NDS also provides an interface to the Securities Settlement System (SSS) of the Public Debt Office, RBI, Mumbai thereby facilitating settlement of transactions in Government Securities (both outright and repos) conducted in the secondary market. Membership to the NDS is restricted to members holding SGL and/or Current Account with the RBI, Mumbai. 4 In August, 2005, RBI introduced an anonymous screen based order matching module on NDS, called NDS-OM. This is an order driven electronic system, where the participants can trade anonymously by placing their orders on the system or accepting the orders already placed by other participants. NDS-OM is operated by the Clearing Corporation of India Ltd. (CCIL) on behalf of the RBI (Please see answer to the question no.19 about CCIL).

3. Stock Exchanges:

Facilities are also available for trading in Government securities on stock exchanges (NSE, BSE) which cater to the needs of retail investors.

II. Do's and Don'ts in Dealing in G-sec

RBI have issued instructions regarding the Do's and Don'ts of all parties dealing in government securities in July 1st, 2010 and updated from time and time. The following are Do's and Don'ts:

Do's

- Segregate dealing and back-up functions. Officials deciding about purchase and sale transactions should be separated from those responsible for settlement and accounting.
- Monitor all transactions to see that delivery takes place on settlement day. The funds account and investment account should be reconciled on the same day before close of business.
- Keep a proper record of the SGL forms received/issued to facilitate counter-checking by their internal control systems/RBI inspectors/other auditors.
- Seek a Scheduled Commercial Bank (SCB), a Primary Dealer (PD) or a Financial Institution (FI) as counterparty for transactions.
- Give preference for direct deals with counter parties.
- Use CSGL/ Gilt Accounts for holding the securities and maintain such accounts in the same bank with which the cash account is maintained.
- Insist on Delivery versus Payment for all transactions.
- Take advantage of the non-competitive bidding facility for acquiring Government of India securities in the primary auctions conducted by the Reserve Bank of India.
- Restrict the role of the broker to that of bringing the two parties to the deal together, if a deal is put through with the help of broker.
- Have a list of approvedbrokers. Utilize only brokers registered with NSE or BSE or OTCEI for acting as intermediary.
- Place a limit of 5% of total transactions (both purchases and sales) entered into by a bank during a year as the aggregate upper contract limit for each of the approved brokers. A disproportionate part of the business should not be transacted with or through one or a few brokers.
- Maintain and transact in Government securities only in dematerialized form in SGL Account or Gilt Account maintained with the CSGL Account holder.

- Open and maintain only one Gilt or dematerialized account.
- Open a funds account for securities transactions with the same Scheduled Commercial bank or the State Cooperative bank with whom the Gilt Account is maintained.
- Ensure availability of clear funds in the designated funds accounts for purchases and sufficient securities in the Gilt Account for sales before putting through the transactions.
- Observe prudential limits for investment in permitted non-SLR securities (bonds of nationalized banks, unlisted securities, unlisted shares of all-India Financial Institutions and privately placed debt securities).
- The Board of Directors to peruse all investment transactions at least once a month.

Don'ts

- Do not undertake any purchase/sale transactions with broking firms or other intermediaries on principal to principal basis.
- Do not use brokers in the settlement process at all, i.e., both funds settlement and delivery of securities should be done with the counter-parties directly.
- Do not give power of attorney or any other authorization under any circumstances to brokers/intermediaries to deal on your behalf in the money and securities markets.
- Do not undertake Government Securities transaction in the physical form with any broker.
- Do not routinely make investments in non-SLR securities (e.g., corporate bonds, etc) issued by companies or body other than in the co-operative sector.

Yield-To-Maturity on G-sec

Calculation of YTM

In order to study the behavior of government bonds, first we need to know how to measure the yield on those securities. The most widely used measure of return on bonds is known as yield to maturity. It may be defined as the compounded rate of return an investor is expected to receive from a bond purchased at the current market price and held to maturity. It is really the internal rate of return earned from holding a bond till maturity.

The yield to maturity or YTM depends upon the cash outflow for purchasing bond, that is, the cost or current market price of the bond as well as the cash inflows from the bond, namely the future interest payments and the terminal principal repayment. YTM is the discount rate that makes the present value of cash inflows from the bond equal to the cash outflow for the purchasing the bond.

The relation between the cash outflow, the cash inflow and the YTM of a bond can be expressed as:

$$MP=\sum_{t=1}^{n}(Ct/(1+YTM)^t +TV/(1+YTM)^t)$$

Where

MP= Current market price of the bond

Ct = Cash inflow from the bond throughout the holding period.

TV= Terminal cash inflow received at the end of the holding period.

However, the way we can get YTM is not easy for calculation. Here are two main methods in finding YTM. First, through a process of trial and error the value of YTM that equates the two sides of the equation maybe be determined. The other is that, with the help of MS. Excel in computer, we can find it easily with the formula of yield.

Manual (Trial and Error) Method: Manual or trial and error method is complicated because Government securities have many cash flows running into future. This is explained by taking an example below.

Take a two year security bearing a coupon of 8% and a price of say Rs. 102 per face value of Rs. 100; the YTM could be calculated by solving for 'r' below. Typically it involves trial and error by taking a value for 'r' and solving the equation and if the right hand side is more than 102, take a higher value of 'r' and solve again. Linear interpolation technique may also be used to find out exact 'r' once we have two 'r' values so that the price value is more than 102 for one and less than 102 for the other value.

$$4/(1+r/2)1+ 4/(1+r/2)2 + 4/(1+r/2)3 + 104/(1+r/2)4$$

Spread Sheet Method using MS Excel:In the MS Excel program, the following function could be used for calculating the yield of periodically coupon paying securities, given the price.

YIELD (settlement, maturity, rate, price, redemption, frequency, and basis)

Wherein;

Settlement is the security's settlement date. The security settlement date is the date on which the security and funds are exchanged.

Maturity is the security's maturity date. The maturity date is the date when the security expires.

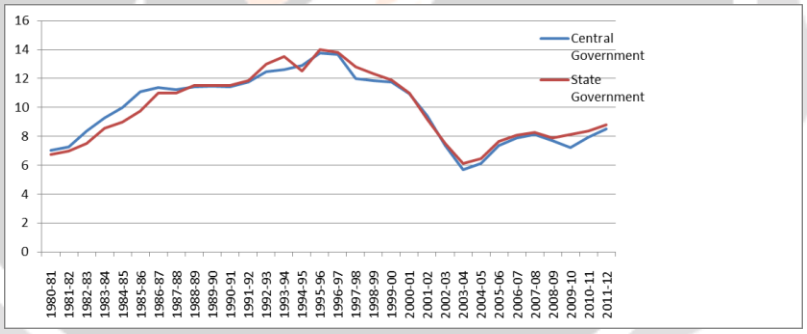
Rate is the security's annual coupon rate.
Price is the security's price per Rs.100 face value.
Redemption is the security's redemption value per Rs.100 face value.
Frequency is the number of coupon payments per year. (2 for Government bonds in India)
Basis is the type of day count basis to use. (4 for Government bonds in India which uses 30/360 basis)

Trends in YTM on G-sec

In India, the government securities have been issued by two main bodies- the central government and state government. The central government has issued the government bonds in order to raise the fund available for development of the whole country, while the state government has issued them in order to raise fund for the sake of its own state. However, the YTMs on both securities are not far different from each other. The following is the trend in YTM in government bonds.

Yields on government securities are determined by the monetary policy stance affecting the short-rate coupled with the yield curve. They have followed a U-shaped pattern since liberalization reaching a trough in 2003-2004 and rising since then as shown in figure 3.2. The reversal of the interest rate trend since 2003-2004 have posed significant challenges for commercial banks as the value of their government security investment- which, as has already been observed, was considerably high- fell sharply. Banks have tried to wiggle some room for them in this situation, with the help from RBI, through juggling the rule of the game a bit. Banks need to classify their investment portfolio into three categories: held to maturity, available for sale and held for trading. These categories have with progressively mark-to-market norms. The "held to maturity" category securities need not be mark-to-market, but those under the category of "available for sale" or "held for trading" are to be mark-to-market at year end and monthly, respectively or more frequently. In 2004, RBI changed the limit of "held to maturity" category from 25% of total investment in government securities to total demand and time liabilities allowing banks to mark-to market a smaller proportion of their holdings.

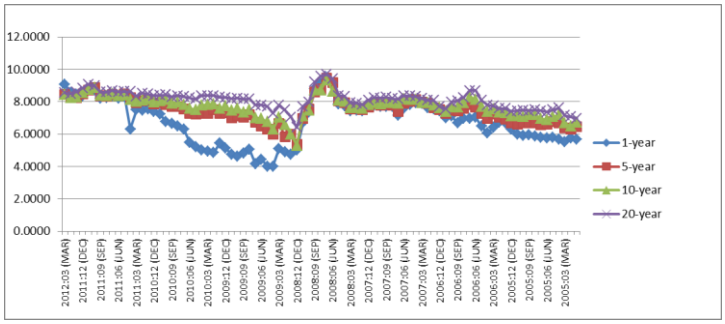
Figure 4.1: Trends in Weighted Average Yields in Government Securities



Source: Reserve Bank of India, 2012

Trends in weighted average yields in both central government and state government securities in India for the period starting from 1980-81 to 2011-12, are shown in figure 4.1. The yields on both types of securities, as can be observed, are significantly different, even though some years there is slightly different. The shaped pattern of both curves is the same. It means that while the return on central government securities rose, the yield on the state government securities also increased. As can be seen, starting from 1980-81 to 1987-88, the return on central government securities is somewhat higher than that on state government instruments. Until 1988-89 both securities yield the same rate of return which was about 11.5%. That rate continued until 1991-92. The rate of return on state government securities has been higher than that of central government securities in 1992-93 onward. Both securities reached the peak in 1996-97 at the rate of 14%. After that the yields have dramatically decreased from year to year. Until 2003-04 the yields on both securities fell down at the lowest point, only 6% of rate of return. However, the yields started to raise but not much, because from 2007 to 2009 there was financial crisis all over the world and adding the sovereign debt crisis in EU in 2010, the rates of return fluctuated over the last 3 years.

Figure 4.2: Trends in Yield to Different Maturities in Central Government Securities



Source: Reserve Bank of India, 2012

The above graph shows the trends in YTM on the central government bonds in India for the various maturities, which are 1 year, 5 years, 10 years and 20 years. The YTMs on central government security of the 1 year maturity is lowest if compared to other three types. And the fluctuation in this bond was also complicated, which rises and declines from year to year.On the other hand, the 5-year and 10-year maturity securities had the same YTM for all the years that data collect, even we can see that 10-year maturity bond give slightly higher YTM than that of 5-year maturity.In conclusion, government securities are the instruments issued by the central government of India or state government in all the states in India. There are 5 main types of government instruments which are T-bills, Cash Management bills, Dated Securities and State Development Loans. They provided the variety of rates of return which was low for some year and high for some another year. All the data present here show that for the long-term securities YTM was not much fluctuated than short-term ones. For example, the 20-year maturity government security yields the more stable than securities with less maturity.

3. Data and Methodology

I. Data Collection

The data was mainly collected from the statistic source of Reserve Bank of India and Board of Governors of the Federal System, the United State. Under this study, we take into consideration only the monthly yield to maturity on both government bonds in the US and in India, starting from December 2008 to March 2012. The date was at the end of global financial crisis and during the EU sovereign debt crisis.

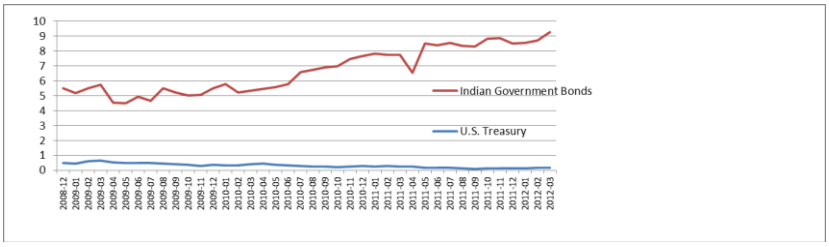
The data was collected only for the Yield-to-Maturity on the government bonds with maturity of 1 year, 10 years and 20 year both in the US and India. In all the three conditions, the YTM on Indian government bonds were considerably higher than that on the US treasuries. It means that the rate of return on the US treasury is lower because the US treasury is preferable for investors. Another reason is that The US is a well-developed country with stable economy, while India is one of among developing countries with fragile economy. Therefore, the cost of borrowing in India is higher than in the US.

There are internal and external factors affecting YTM of both government securities. For internal factors, the monetary policy of each country is more relevant to YTM. For external factors, the world economic and financial crisis will be the most important factor for determining YTM of government.

In this study, because we cannot compare the mean of YTM on both the countries, we study only the variability of YTM with help of statistical tool of standard deviation (SD).

The following graphs show the data collected from the US government treasury and Indian government security.

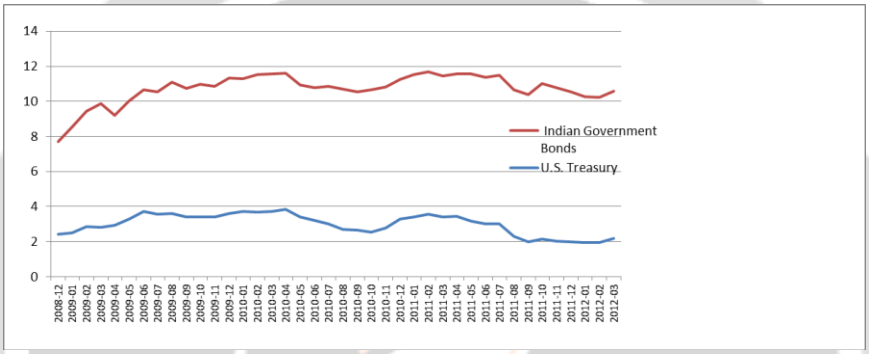
Figure 5.1: The Yield-to-Maturity on the 1-year government bonds in the US and India



Source: Reserve Bank of India and Board of Governors of the Federal Reserve System, 2012

The YTM on government bonds both in the United States and India with maturity of 1 year starting from December 2008 to March 2012 illustrates in the figure 5.1. There are significantly different between the YTM on the government securities in the US and India. While YTM on Indian government bonds is more than that of the US government. It can be said that there is no factor affecting YTM on the US treasury during the date stated above. As can be seen, the curve of YTM of the US treasury is nearly straight line. There was slightly changed during that period. Whereas, YTM on the Indian government fluctuated between December 2008 and March 2012. Government bond in India with 1 year maturity yielded not stable. For example, in March 2011 YTM is 7.49 percent and then it declined sharply to 6.31 percent.
In short, YTM on 1-year government bonds in India has increased while that on the US treasury has decreased for the period of study.

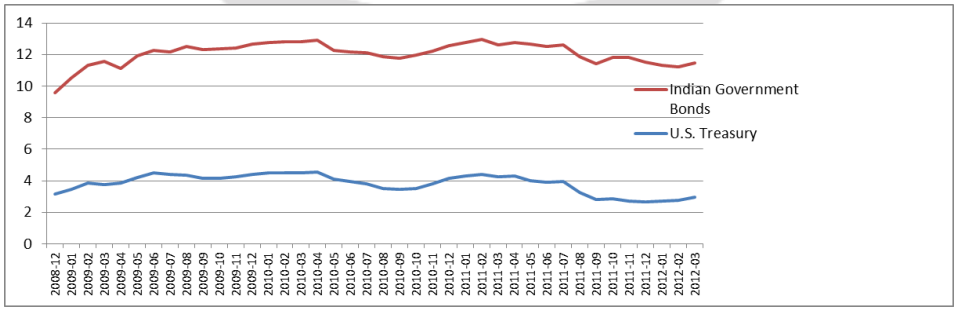
Figure 5.2: The Yield-to-Maturity on the 10-year government bonds in the US and India



Source: Reserve Bank of India and Board of Governors of the Federal Reserve System, 2012

The graph 5.2 depicts the YTM on the 10-year government bonds in India and the 10-year US treasury. The shapes of curves look similarity for 10 years maturity. From the starting point, December 2008, the Indian government bond's YTM increased at higher rate than that of the US treasury.
When there was an increase in YTM of Indian government security, there was also an increase in YTM of the US treasury. As can be seen, the rate of return decreased during the months of April 2010 until October 2010 which was the EU sovereign debt crisis. This situation affected both the economy of India and the United States. At the end of the study period, we found that YTM in the context of India had declined while that in the US had been stable.

Figure 5.3: The Yield-to-Maturity on the 20-year government bonds in the US and India



Source: Reserve Bank of India and Board of Governors of the Federal Reserve System, 2012

Now we discus YTM on the 20-year government bonds both in India and in the US, which is shown in figure 5.3. The graph looks the same pattern of fluctuation in YTM on the government bonds in both countries. However the difference is that the YTM in case of Indian government is higher than in case of the US.
To cut the story short, the YTMs on the US Treasury with maturity of 1 year have less volatility for over period of times, compared with the US treasury with more than 1 year maturity. However, Indian government bonds with 1 year maturity have more volatility.

Data Analysis

In order to study the variation of YTM on Indian government securities, we use the Hypothesis Testing of sample of variables. The Z-test is applied here to find out the difference between the two standard deviations of two random samples. According to the hypothesis, the two tail test is applied in this study.

The formula is:
$Z=(s_1-s_2)/\sqrt{(〖s_1〗^2/(2n_1)+〖s_2〗^2/(2n_2))}$
Where,

s_1=the standard deviation of the first sample
s_(2)=the standard deviation of the second sample
n_1=the size of the first sample
n_2 = the size of the second sample

A. 1-Year YTM of Government bonds

Table 5.1: Mean, Variance and SD on 1-Year-Maturity Government Bonds

Details	Numbers of Data	Mean	Variance	Standard Deviation
US Government Bonds	40	0.31525	0.021308	0.145971
Indian Government Bonds	40	6.3617	2.660458	1.631091

Here in the table 5.1, the numbers of both the samples are the same 40 months. The mean of YTM of the US treasury is 0.31525% while in India it is 6.3617% which the difference is large, i.e. 6.04645%. The standard deviation of the US treasury and Indian bond are 0.145971 and 1.631091, respectively.
The hypothesis testing is used to test at the level of significance of 5%, so the confident level is 95%.

We have: s_1=0.145971 s_(2)=1.631091, n_1=40, n_2 = 40
$Z=(0.145971-1.631091)/\sqrt{(〖(0.145971)〗^2/(2*40)+〖(1.631091)〗^2/(2*40))}$
Z=-8.1114

According to table, for 5% level of significance the critical value is -1.96 and +1.96.
Since the calculated value (Z = -8.1114) falls in the rejection region, the H_o is rejected at 5% level of significance. Hence, it can be concluded that there is significantly different between the two standard deviations. It means that for 1-year maturity government bonds, the variation in YTM on Indian government bond is different from that on the US treasury.

B. 10-Year-Maturity Government Bonds

Table 5.2: Mean, Variance and SD on 10-Year-Maturity Government Bonds

Details	Numbers of Data	Mean	Variance	Standard Deviation
US Government Bonds	40	2.99025	0.352038	0.593328
Indian Government Bonds	40	7.7260	0.579587	0.761306

In the table 5.1, the numbers of both the samples are the same 40 months. The mean of YTM of the US treasury is 2.99025% while in India it is 7.7260% which the difference is large, i.e. 4.78235%. The standard deviation of the US treasury and Indian bond are 0.593328 and 0.761306, respectively.
The hypothesis testing is used to test at the level of significance of 5%, so the confident level is 95%.
We have: s_1=0.593328, s_(2)=0.761306,n_1=40, n_2 = 40
Z=(0.593328-0.76306)/√(〖(0.593328)〗^2/(2*40)+〖(0.761306)〗^2/(2*40))
Z=-0.153199

According to table, for 5% level of significance the critical value is -1.96 and +1.96.
Since the calculated value (Z = -0.153199) falls in the acceptance region, the $H_{\circ}$ cannot be rejected at 5% level of significance. Hence, it can be concluded that there is not significantly different between the two standard deviations. It means that for 10-year maturity government bonds, the variation in YTM on Indian government bond is the same as that on the US treasury.

C. 20-Year-Maturity Government Bonds

Table 5.3: Mean, Variance, and SD on 20-Year-Maturity Government Bonds

Details	Numbers of Data	Mean	Variance	Standard Deviation
US Government Bonds	40	3.81675	0.354638	0.595515
Indian Government Bonds	40	8.2400	0.259498	0.509409

In the table 5.3, the numbers of both the samples are the same 40 months. The mean of YTM of the US treasury is 3.81675% while in India it is 8.24% which the difference is large, i.e. 4.42325%. The standard deviation of the US treasury and Indian bond are 0.595515 and 0.509409, respectively.
The hypothesis testing is used to test at the level of significance of 5%, so the confident level is 95%.
We have:
s_1=0.595515 s_(2)=0.509409,n_1=40, n_2 = 40
Z= (0.595515-0.509409)/√(〖(0.595515)〗^2/(2*40)+〖(0.509409)〗^2/(2*40))
Z=0.9828

According to table, for 5% level of significance the critical value is -1.96 and +1.96.
Since the calculated value (Z = 0.9828) falls in the acceptance region, the $H_{\circ}$ cannot be rejected at 5% level of significance. Hence, it can be concluded that there is no significant difference between the two standard deviations. It means that for 20-year maturity government bonds, the variation in YTM on Indian government bond is not different from that on the US treasury.

I. Findings:

The major findings of this project study are as furnished hereunder:

- There is significant difference between the standard deviations of YTM on the US and Indian government bonds with maturity of 1 year. Hence, the variability in rate of return on Indian government securities with 1-year maturity is higher than that of the US Treasury.
- There is no significant difference between standard deviations of YTM on the US and Indian government bonds with maturity of 10 years. Therefore, the variability in the rate of return on both government securities with 10-year maturity of the two countries is considered as the same for the period of study.
- Last but not least, there is no significant difference between the two standard deviations of the two random samples which are YTMs on the US and Indian government securities with 20-year maturity. Hence, there is no difference in variability in the rate of return on both government bonds.

II. Suggestions:

Some of the suggestions are furnished hereunder, based on the interpretation and findings from this project study:

- The market participants including regulators, especially RBI, should take note of this project study in understanding or framing appropriate strategies, rules, regulations and policies, especially on the bonds with 1-year maturity.
- Individual and institutional investors can take the risk free rate in India from the long-term government securities, saying more than 10 years.
- The rate of return on India government securities is higher than in that of the US treasury and the availability of that securities is easy to access, so investors should consider investing in Indian government bonds in their portfolio.

III. Conclusion:

The risk free rate is an important input in one the most widely used finance models such as the Capital Asset Pricing Model, Black-Scholes Model, etc. In India there is problem in choosing risk free rate to valuation of assets because of various factors. According to RBI, There are 4 different types of government securities in India. They are Treasury Bills, Cash Management Bills, Dated Securities and State Development Loans.

However, this project study gives the empirical test of the rate of return on Indian government with that of the US treasury which is considered as the standard one. The goal of this study is to identify the variation of YTM on Indian government bonds higher than that on the US Treasury. The study is on monthly YTM on government bonds in Indian and the US for the period of 40 months only. The results show that India 1-year-Maturity government bonds have higher variability in YTM than that with maturity of more than 1 year. Investors can choose any rate of return on government securities with maturity of 10 years or 20 years depended on the maturity of their investment. Since this study uses only the 40 months of data available in Indian government bonds' YTM, the results have been limited. The further study should be made in the future in order to make it clearer.

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