A Keynesian explanation of Indian Government Bond yields

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Abstract

John Maynard Keynes held that the central bank's actions mainly determine long-term interest rates through short-term interest rates and various monetary policy measures. His conjectures about the determinants of long-term interest rates were made in the context of advanced capitalist economies and were based on his views on liquidity preference, ontological uncertainty and the formation of investors' expectations. Is Keynes's conjecture that the central bank's action is the main driver of long-term interest rates valid in emerging markets, such as India? This paper empirically investigates the determinants of changes in Indian government bonds' nominal yields. Changes in short-term interest rates, after controlling for other crucial variables, such as changes in the rate of inflation and the rate of economic activity, take a lead role in driving the changes of the nominal yields of Indian government bonds. This suggests that Keynes' s views on long-term interest rates can also be applicable to emerging markets. The empirical findings reveal that higher fiscal deficits do not appear to expert upward pressures on government bond yields in India.

Keywords: *Government bond yields, interest rates, India, emerging markets, Reserve Bank of India, central bank*

JEL classifications: *E43, E50, E60, O16*

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Section I: Introduction

John Maynard Keynes (1930) maintains that while interest rates have their basis on human psychology, social conventions, and liquidity preference. He also suggests that usually the central bank's actions are the primary drivers of long-term interest rates on government bonds. He argues that the central bank sets the risk free short-term interest rates, which in turn influence the complex of long-term interest rates. He holds that short-term realizations drive the investor's long-term expectations because the investor tends to extrapolate the present and the past in developing his view of the long-term outlook. The investor's view of the future is based on his knowledge of current conditions rather than mathematical expectations of an ontologically uncertain future in which probabilities to unknown outcomes cannot be meaningfully assigned. Instead, Keynes observes that the investor takes his cue about long-term interest rates from current conditions and the near term outlook. As a result, short-term interest rates and changes in short-term interest rates are respectively the crucial determinants of the long-term interest rates and the changes in the long-term interest rates.

Keynes's arguments about the main driver of long-term interest rates were developed in the context of advanced capitalist economies. This paper assesses whether Keynes's conjecture is warranted in India, an emerging market. India has monetary

sovereignty and its government bonds are issued in its own sovereign currency. However, India is still a lower-middle income developing country, according to the World Bank.[3] Compared to advanced capital economies, its financial markets and financial system are underdeveloped. Despite liberalization and reforms in recent decades, India's financial markets are less open and more regulated, than that of advanced economies. India's financial system is somewhat "repressed." Its banking system is dominated by state-owned banks. There are still restrictions and limitations on foreign ownership of government bonds. Indian financial institutions, particularly banks, are required to allocate a certain amount of their assets in holding government bonds by regulations. The depth and the liquidity of its government bond market is notably less than that of advanced countries. These features of Indian bond government market, makes its important to ask whether Keynes' conjectures on the relationship between short-term interest rates and long-term government bonds' nominal yields hold in India. To our knowledge, no attempt has yet been made to empirically identify if Keynes's hypothesis on the relationship between short term and long term rates holds in an emerging country like India.

This paper examines whether changes in short-term interest rates are the key drivers of the changes in Indian government bonds' nominal yields. It also examines whether fiscal deficits raise long-term interest rates in India, an important policy

[3] See "Country and Lending Groups," http://data.worldbank.org/about/country-and-lending-groups

question. This paper uses the two step feasible and efficient Generalized Method of Moments (GMM) technique to econometrically model the relationship between the changes of short-term and the changes of long-term interest rates. Several models, based on an *interpretation* of Keynes's view of interest rates and financial markets, are calibrated to estimate the effects of short-term interest rates on long-term government bond yields, after controlling appropriate variables, using monthly and quarterly economic and financial market data from a variety of sources.

Section II describes Keynes's view on the drivers of long-term interest rates in a world of liquidity preference and ontological uncertainty. Section III points out that the Government of India exercises monetary sovereignty. It also provides some institutional background about the government bond market and monetary policy in India. Monetary sovereignty is crucial because it gives the country's central bank, the Reserve Bank of India (RBI), the ability to influence long-term government bonds' nominal yields, if it chooses to do so. Section IV provides a simple model of long-term interest rates and changes in long-term interest rates in light of Keynes's views. Section V describes the data and the econometric method deployed here. Section VI reports the results from several calibrated models of changes in long-term Indian government bonds' (IGBs') nominal yields. Section VII concludes.

Section II: Keynes's View of the Drivers of Long-Term Interest Rates

Keynes's views on the rate of interest are articulated in Chapters 13 ,14, 15, 16 and 17 of *The General Theory* (2007 [1936]), while the connection between the short-term interest rate and the long-term interest rate is formulated both in the *General Theory* and in his earlier *Treatise*. He rejects the loanable funds theory of the interest rate, and dismisses the notion that the interest rate is a return to saving or waiting. For Keynes (2007 [1936], p.167) the crux of the matter lies in "the degree of liquidity preference." Hence, he stresses that "the rate of interest … is a measure of the unwillingness of those who possess money to part with their liquid control over it." For him the necessary condition for liquidity preference "is the existence of uncertainty as to the future of the rate of interest, i.e. as to the complex of rates of interest for varying maturities which will rule at future dates." (p. 168). He believes that the divergence of investors' interest rate expectations will be an additional reason for liquidity preference. He observes that the "expectations as to the future of rate of interest" depends on liquidity-preference (p. 170). Those investors who believe future rates will be higher than the expected rate of interest will prefer to hold cash, while those with the opposite view will borrow to purchase debts of longer maturity. (p.170).

Keynes (2007 [1936], p.173) emphasizes that an increase in the quantity of money would generally be expected to reduce the rate of interest, provided other things are

held constant. But he notes that this will not happen if the public's liquidity preference rises more than the quantity of money. He wryly comments that "[t]he habit of overlooking the relation of the rate of interest to hoarding may be a part of the explanation why interest has been usually regarded as the reward of non-spending, whereas in fact it is the reward for non-hoarding." (p. 174). He faults the view of the rate of interest, as articulated in the classical works, such as Marshall (1890), Cassel (1903), and Taussig (1918) and others, for ignoring the effect of the change in the level of income or that the level of income is a function of the rate of investment (p.180).

For Keynes the psychological, social and business incentive to liquidity are quite crucial factors in determining the interest rate (pp.194-209). Keynes identifies four different motives for holding money (pp.195-196): The income motive, the business motive, the precautionary motive, and the speculative motive. He differentiates the two channels through which the speculative motive for holding money operates: (1) the changes in the rate of interest because of changes in the quantity of money while the liquidity function holds constant, and (2) the changes in the rate of interest because of changes in expectations of the liquidity function (p.197). Although Keynes (2007 [1936]) initially states "the rate of interest is a highly psychological phenomenon," he quickly amends that idea with the view that "the rate of interest is a highly conventional, rather than a highly psychological, phenomenon" (p.203). He affirms the public's beliefs, confidence, and social and market convention are key drivers of the rate of interest:

"For its actual values is largely governed by the prevailing view as to what is value is expected to be." Hence, "*any* level of interest which is accepted with sufficient conviction as *likely* to be durable *will* be durable; subject, of course, in a changing society to fluctuations for all kinds of reasons round the expected normal." (p. 203). Under a given state of expectation the public's "potentiality towards holding cash" is determined by the liquidity function (p.204). He asserts that other thing else constant the monetary authority will generally exert control on "a determinate rate of interest, or more strictly, a determinate rate of interest for debts of different maturities." (p.204).

The close relationship between short-term interest rates, which are principally driven by the central bank's monetary policy, and long-term interest rates was well understood by Keynes (1930) in his *Treatise* (Kregel 2011). Keynes holds that since the central bank controls the policy rates, the primary influence of monetary policy is on short-term interest rates. However, he observes that, "experience shows that, as a rule, the influence of the short-term rate of interest on the long-term rate is much greater than anyone … would have expected." (Keynes 1930, p.353, cited in Kregel 2011, p.3). He refers to the analysis of Winfried Riefler (1930) which drew on various Federal Reserve's statistical studies on the relationship between short-term interest rates and long-term interest rates in the United States and their changes between 1919 and 1938. Riefler (1930) reports that not only are long-term interest rates influenced by short-term

interest rates, but also that changes in long-term interest rates are mainly driven by changes in short-term interest rates (Kregel 2011).

Keynes (2007 [1936]) argues that there is a direct relation between monetary authority and interest rates "if the monetary authority were prepared to deal both way on specified term in debts of all maturities and even more so if it were prepared to deal in debt of varying degrees of risk." (2007 [1936], p. 205). He presciently suggests that "a complex offer by the central bank to buy and sell at stated prices gild-edged bonds of all maturities, in place of the single bank rate for short-term bills, is the most important practical improvement which can be made in the technique of monetary management." (2007 [1936], p.206). He holds that "the short-term rate of interest is easily controlled by the monetary authority" but the long-term interest rate is less so, noting that it "may be more recalcitrant when once it has fallen to a level which on the basis of past experience and present expectations of future monetary policy is considered 'unsafe' by representative opinion." (2007 [1936], p.203). Keynes maintains that the credibility of the central bank and the public confidence in the central bank's ability is crucial for it to control and influence on the complex of long-term interest rates. He discerns that (1) "a monetary policy which strikes public opinion as being experimental in character or easily liable to change may fail in its objective of greatly reducing the long-term rate of interest," but (2) "the same policy,…, may prove easily successful if it appeals to public opinion as being reasonable and practicable and in the public interest, rooted in strong

conviction, and promoted by an authority unlikely to be superseded." (2007 [1936], p.203). Keynes acknowledges that the central bank's open market operations could affect the speculative motive through either of the two channels mentioned earlier. But he observes that the "monetary authority often tends in practice to concentrate upon short-term debts and to leave the price of long-term debts to be influenced by belated and imperfect reactions from the price of short-term debts." (2007 [1936], p. 206).

Keynes (1930, pp. 357-358) claims that it is generally profitable to borrow on a short-term basis and lend on a long-term basis when long-term interest rates are higher than short-term interest rates, as long as the value of long-term securities do not decline in the span of their tenor. He believes that the investor is usually affected by current conditions, which color their outlook for the future. It is short-term realizations that drive the investor's long-term expectations (Keynes 1930, pp.359-362, cited in Kregel 2011, p.4).

Keynes develops the notion of ontological uncertainty and the influence of short-term realization on the state of long-term expectations in *The General Theory* (Kregel 2011 and Veneroso 2014). The long-term economic and investment outlook is quite uncertain and often based on limited knowledge and information (Keynes 2007 [1936], p.149).[4] The ontological uncertainty that affects investors' economic and investment

[4] The relevant quotes from Keynes are available in the working paper version.

outlook also colors their outlook for *both* short-term and long-term interest rates. Keynes (2007 [1930], pp.152-153) maintains that the near term views affect the long-term outlook. The investor believes the distant future will be fairly similar to current conditions and the near future. Moreover, changes in current economic and financial conditions and changes in investors' near term views affect changes in the investor's long-term outlook (Keynes 2007 [1936]), pp.152-153). He argues that investors generally tend to extrapolate current trends in developing their long-term outlook, and thus changes in their assessment of current conditions and trends lead to reassessments of the future (Keynes (2007 [1936], p.148). He holds that this is particularly true in liquid markets, where the investor manages other people's money (Keynes 2007 [1936], p.153). He recognizes that investors are subject to waves of optimism and pessimism due to changing fashions and a "herd instinct" among investors. Hence animal spirits and mass psychology, fads and fashion, rather than rational calculation, often provide the basis for speculative investments (Keynes 2007 [1936], p.154). He famously compares the financial markets to beauty contests, sponsored by English tabloids, in which the public participates to select the face that everyone else will choose as the prettiest (Keynes 2007 [1936], p.156).

Keynes realizes the weak and flimsy basis of the formation of the investor's expectations, rather than the calibration of "mathematical expectation." He makes it clear that, "by very uncertain I do not mean the same thing as 'very improbable,'"

(Keynes 2007 [1936], p.148) because there is little reason at all to maintain that there is a reasonable ground for even attempting to use mathematical expectation in formulating the investor's long-term economic outlook (Keynes 2007 [1936], pp.162-163). He accepts that investors often rely on tactic conventions (Keynes 2007 [1936], p.153). He holds that market processes and institutional forces compel the typical investor to follow the conventions of the day (Keynes 2007 [1936], pp.157-158). Human nature and the quest for ensuring demonstrably solid returns and beating the benchmark every quarter more than overwhelms any attempt to consider long-term fundamentals (Keynes 2007 [1936], p.157). The ontological uncertainty about the future and the effect of short-term realizations on long-term expectations can keep long-term interest rates largely in harmony with short-term interest rates, whereas those factors that can cause fluctuations in short-term interest rates also drive investors' long-term outlook, and thus long-term interest rates, according to Keynes (1930, pp. 352-362, cited in Kregel 2011).

Section III: India's Monetary Sovereignty, Institutional Background, and the Evolution of IGBs' Yields

India has monetary sovereignty. The Government of India exercises the sovereign right to issue its own currency. This gives the Government of India the ability to meet its debt obligations. The country's government meets all the criteria for

monetary sovereignty, as articulated in Wray (2003 and 2012) and Tymoigne (2013). The Government of India (1) sets the rupee as the country's unit of account, (2) issues liabilities solely in rupees, that is, its own currency, (3) acts as the legitimate monopoly issuer of unconvertible final means of payment, denominated solely in rupees, and (4) exercises the authority to tax individuals, firms and other institutions domiciled in the union of India and accepts only rupees in payment of the taxes and levies that it imposes. Monetary sovereignty entails that the denomination of the central government's debt is in its own currency. Monetary sovereignty is crucial because it gives the Government of India and the Reserve Bank of India (RBI), the country's central bank, the operational capability to contain and control Indian government bond's (IGBs) nominal yields.

The Government of India issues both short-term and long-term securities. It issues short-term securities in the form of Treasury bills of three types of tenors (91 days, 182 days, and 364 days) and cash management bills with tenor below 91 days. It also issues a wide range of dated long-term securities of various tenors, up to 30 years. It issues different types of securities, including fixed rate bonds, floating rate bonds, zero coupon bonds, inflation-indexed bonds, and bonds with put/call options. The auctions of government securities are conducted by the RBI on behalf of the Government of India.

The RBI uses the repo rate and the reverse repo rate for setting the interest rate corridor. It engages in open market operations. It provides liquidity to banks and financial institutions through overnight repos, fixed term repos, and variable term repos. It uses a Liquidity Adjustment Facility on a daily basis with scheduled banks and primary dealers extend liquidity. It also has used and instituted other types of facilities, such as Marginal Standing Facility and Market Stabilization Schemes, to provide liquidity to various counterparties. Indian banks are required to hold a certain amount of IGBs, gold and cash to maintain the Statutory Liquidity Ratio (SLR).

The RBI exercises its authority as a central bank of country with monetary sovereignty under The Reserve Bank of India Act (1934) (Jácome *et al* 2012). It is the issuer of the country's currency. The RBI's multifaceted roles give it the operational ability to influence government bond yields, if it chooses to do so. The central bank can exert downward (upward) pressure on IGBs' nominal yields by allowing it to keep short-term interest rates low (high) and to use other tools of monetary policy. Figure [1] traces the evolution of 2 year, 5 year, and 10 year IGBs' nominal yields. In India, long-term interest rates are strongly associated with short-term interest rates. The changes in long-term interest rates are also fairly tightly correlated with the changes in short-term interest rates. Figure [2] shows the tight correlation between the percentage point changes, year over year, in the yields of two year IGBs and the percentage point changes, during the same period, in three month Indian Treasury bills' rates.

{INSERT FIGURE [1] HERE}

{INSERT FIGURE [2] HERE}

Section IV: A Simple Model of Long-Term Interest Rates

In light of Keynes's views, a simple model of long-term interest rates and changes in the long-term interest rate is developed here, following Akram and Das (2014a and 2014b). The key institutional assumption underlying the model is that of monetary sovereignty, where the country's government issues its own currency and its central bank sets the appropriate policy rate(s). The central bank controls short-term interest rates through setting the policy rate(s). It also has the discretion to use various tools of monetary policy. The features of a central bank under a regime of monetary sovereignty enable it to influence long-term interest rates.

The long-term government bonds' nominal yield can be understood as a function of short-term interest rates and forward interest rates. The yield of a long-term bond, r_{LT}, depends on the short-term interest rate, r_{ST} and an appropriate forward interest rate, $f_{ST,LT-ST}$:

$$(1 + r_{LT})^{LT} = (1 + r_{ST})^{ST}(1 + f_{ST,LT-ST})^{LT-ST} \quad \textbf{[4.1]}$$

The long-term rate, r_{LT}, is a function of the short-term interest rate, r_{ST}, and an appropriate forward interest rate, $f_{ST,LT-ST}$. That is,

$$r_{LT} = F^1\left(r_{ST}, f_{ST,LT-ST}\right) \quad \textbf{[4.2]}$$

The forward rate, $f_{ST,LT-ST}$, depends on the future short-term interest rate, r_F, and the term premium, z.

$$f_{ST,LT-ST} = F^2(r_F, z)$$

However, the future short-term interest rate and the term premium are determined by the expected rate of inflation, π^E, and the expected rate of economic activity, g^E. Hence,

$$F^2(r_F, z) = F^3(\pi^E, g^E)$$

However, if one holds that near-term views almost always affect the investor's long-term outlook, the current rate of inflation, π, and the current rate of economic activity, g, would respectively influence the investor's expected rate of inflation and the expected rate of economic activity. That is, $\pi^E = F^4(\pi)$ and $g^E = F^5(g)$. Hence,

$$f_{ST,LT-ST} = F^2(r_F, z) = F^3(\pi^E, g^E) = F^3\left(F^4(\pi), F^5(g)\right) \quad \textbf{[4.3]}$$

The forward rate is a function of the current rate of inflation and the current rate of economic activity, under the "Keynesian" assumption that the near term view is almost always the key determinant. As a result, the long-term interest rate, r_{LT}, is a

function of the short-term interest rate, r_{ST}, the current rate of inflation, π and the current rate of economic activity, g.

$$r_{LT} = F^1\left(r_{ST}, F^3\left(F^4(\pi), F^5(g)\right)\right) = F^6(r_{ST}, \pi, g) \quad \textbf{[4.4]}$$

For monthly data, year over year changes are defined as follow: $\Omega[\mathrm{X}] = X(t) - X(t-12)$

For quarterly data, year over year changes are defined as follow: $\Pi[X] = X(t) - X(t-4)$

Changes in long-term interest rates are functions of changes in short-term interest rates, the changes in the rates of inflation, and the changes in the rates of economic activity. These functions are operationalized to provide a Keynesian framework for estimating several behavioral models relating the effects of changes in short-term interest rates and changes in a variety of control variables on IGBs' nominal yields. These models are based on an interpretation of Keynes's views on the nature of long-term expectations.

Section V: Data and Methodology

Time series data on interest rates, various indices of inflation, industrial production and general government finance are used here for the econometric models. Table [1] below summarizes the variables and the data used in the models.

In this paper three sets of equations are estimated in order to identify the determinants of changes in long-term Indian government bonds' nominal yields. In the first set of equations, changes in long-term government bonds' nominal yields of various maturities are determined only by changes in short-term interest rates of various maturities. In the second set of equations, changes in long-term government bonds' nominal yields are determined by both changes in short-term interest rates and changes in the rates of inflation. Finally, in the third set of equations, changes in long-term government bonds' nominal yields are determined by changes in short-term interest rates, changes in inflation and changes in the growth of economic activity. The quarterly equations are the same as the monthly equations, but also include fiscal balance.

Time series variables with large T are often characterized by unit root processes, that is, variables are integrated of order one, I(1). The most commonly used test to check for stationarity is the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979 and 1981). Phillips-Perron (PP) Test (Phillips and Perron, 1988) is a modified version of the Dickey-Fuller (DF) test. It proposes a *t*-statistic corrected for both autocorrelation and heteroskedasticity. Both these tests are applied and the results are presented in Tables [2] and [3]. Results in Table [2] show that the year over year percentage point changes of all the monthly variables are stationary. Results in Table

[3] show that the year over year percentage point changes of almost all of the quarterly variables used in the econometrics models are also stationary.

{INSERT TABLE [2] HERE}

{INSERT TABLE [3] HERE}

Given the variables are stationary, the standard ordinary least square (OLS) method is first used to examine the relationship between long-term government yields, short-term interest rates and other important variables. The results from the application of the OLS method are available in the working paper version (**Citation to be inserted after the review process**). These results support the hypothesis that percentage point changes to short-term interest rates, year over year, are the key drivers of changes in IGB's nominal yields during the same period.

While the OLS method provides some benchmark results, it should be noted that there may be the presence of endogeneity among long-term government bonds' nominal yields, short-term interest rates and the rate of inflation. The relationships among these variables may not necessarily show a one-way causal chain (Akram and Das 2014a and 2014b). Hence, estimating the equations using the standard least square (LS) procedures may result in inconsistent estimates of relevant coefficients (Greene 2003, p.221). Therefore, an instrumental variable (IV) approach is appropriate here. To

accommodate the problem of endogeneity, the two-step feasible and efficient Generalized Method of Moments (GMM) technique is used. This approach not only provides consistent estimates over other instrument variables techniques, but it is considered to be appropriate in the presence of endogeneity (Baum *et al* 2003). Moreover, the technique used in the econometric estimations also accommodates the problems of arbitrary heteroskedasticity and autocorrelation. While using instrumental techniques, it is crucial to identify valid instruments that are correlated with endogenous regressors but are uncorrelated to the error term. First and second period lags of changes of short-term interest rates and changes in the rate of inflation are used as instruments in the relevant equations. Finally, the Hansen (1982) test of over identifying restrictions is used to check for the exogeneity of instruments.

Section VI: Empirical Results

GMM estimation results are presented in Tables [4]—[7].[5] The monthly results are in Tables [4] and[5], while the quarterly results are in Tables [6] and [7]. For the monthly models Equations [6.1], [6.2], and [6.3] use the change in three month Treasury bills' rate as the change in short-term interest rates, while Equations [6.4], [6.5], and [6.6] use the change in six month Treasury bills' rate as the change in short-term interest rates. In Equations [6.1] and [6.4] the change in short-term interest rates is the only

[5] Additional econometric results, using a more extensive data set from across the yield curve of IGBs, are available in the working paper version.

explanatory variable, while in Equations [6.2] and [6.5] the change in short-term interest rates and the change in inflation are the explanatory variables. Equations [6.3] and [6.6] have the change in short-term interest rates, the change in inflation and the change in the growth of industrial production as the three explanatory variables. The quarterly models always include the change in fiscal balance as an explanatory variable. Equation [6.7] includes the change in three month Treasury bills' rate and the change in fiscal balance as explanatory variables. Equation [6.8] includes the change in three month Treasury bills' rate, the change in inflation, and the change in fiscal balance as explanatory variables, while Equation [6.9] includes the change in three month Treasury bills' rate, the change in inflation, the change in the growth of industrial production and the change in fiscal balance as explanatory variables.

{INSERT TABLE [4] HERE}

{INSERT TABLE [5] HERE}

{INSERT TABLE [6] HERE}

{INSERT TABLE [7] HERE}

Hansen criteria are met for almost all equations. This means the null hypothesis that the instrument variables are uncorrelated with the error terms and are exogenous is not rejected. This corroborates the validity of the instruments used in the models. The

coefficients of short-term interest rates, proxied by changes in rates in T-bills of 3 month and 6 month tenors, are always found to be positive and statistically significant at the 1% level. The magnitude of the coefficient of this variable becomes smaller as the tenors of the government bond rises. These results suggest that the changes in the nominal yields of long-term IGBs are strongly influenced by the changes in short-term interest rates. The coefficient for the year over year changes in inflation is positive but it is not statistically significant. The coefficient of the change in the growth of industrial production is positive and statistically significant. This variable is mostly significant at least at the 5% level, whenever it is included in the equation. The size of this variable lies approximately between 0.02 to 0.03. This implies that changes in the nominal yields of long term IGBs are fairly sensitive to changes in the growth of industrial production but are insensitive to changes in inflation. The GMM results of the monthly models reinforce the benchmark findings of the OLS estimations.

The results from the quarterly models show that the coefficients of the change in fiscal balance are positive and statistically significant in equations [6.7] and [6.8]. However, in equation [6.9] the coefficient is negative but it is not statistically significant. The findings imply that fiscal deficits do not raise IGBs' nominal yields. The effect of higher fiscal deficits on government bond yields is an important policy question. These results obtained here are contrary to the conventional wisdom of the mainstream literature (such as Baldacci and Kumar 2010, Gruber and Kamin 2012, Lam and

Tokuoka 2011, Poghosyan 2012, and Tokuoka 2012) which maintains that, other things held constant, the deterioration of fiscal balance (that is, higher fiscal deficits) generally raise government bonds' nominal yields. But the results obtained here are consistent with the view that higher (lower) government spending leads to increased (decreases) reserve positions, which could cause government bonds' nominal yields to decline (rise), unless the central bank actively undertakes defensive actions to offset the downward (upward) effects of increased (decreased) government spending on interest rates.

Section VII: Conclusion

The findings of this paper suggest that Keynes's conjectures about the determinants of long-term interest rates are valid in emerging markets, such as India. In particular it shows that changes in the long-term IGBs' nominal yields are associated with changes in short-term interest rates, changes in the rates of inflation, and changes in the rates of economic growth as represented by in the growth in industrial production. Monetary sovereignty gives the Reserve Bank of India (RBI) the ability to control short-term interest rates and the Government of India the operational ability to service its sovereign debt issued in Indian rupees, the national currency. Changes in short-term interest rates are the main drivers of changes in long-term IGBs' nominal yields, while changes in the rates of inflation and changes in the rates of growth also

affect government bond yields. Higher fiscal deficits do not appear to exert upward pressure on IGBs' nominal yields.

Keynesian conjectures that short-term interest rates rule the roost, after controlling for a host of relevant variables, appears to hold not just in advanced countries, such as Japan (Akram and Das 2014a and 2014b, and Akram 2014), but also in emerging economies, such as India. The empirical findings of this paper, in conjunction with the understanding of modern tax-driven money (Wray 2003 and 2012, and Tcherneva 2011), recent developments in mainstream monetary theory (Sims 2013a and 2013b and Woodford 2001) and the analysis of actual operations of central banking (Bindseil 2004 and Fullwiler 2008), lend further credence to Keynes's insightful conjectures about the drivers of long-term interest rates in the real world, characterized by ontological uncertainty and liquidity preference. These findings suggest that his views hold, not only in advanced countries, but also in emerging economies like India. In future research it would be worthwhile to compare and contrast the results of various Keynesian models of long-term interest rates on government bonds, both for advanced countries and emerging markets, with more conventional models that try to explain these in term of a real policy rate, an inflation premium, a term premium, and other relevant factors.

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FIGURES AND TABLES

Figure [1]: The evolution of Indian Government Bonds' (IGBs) nominal yields

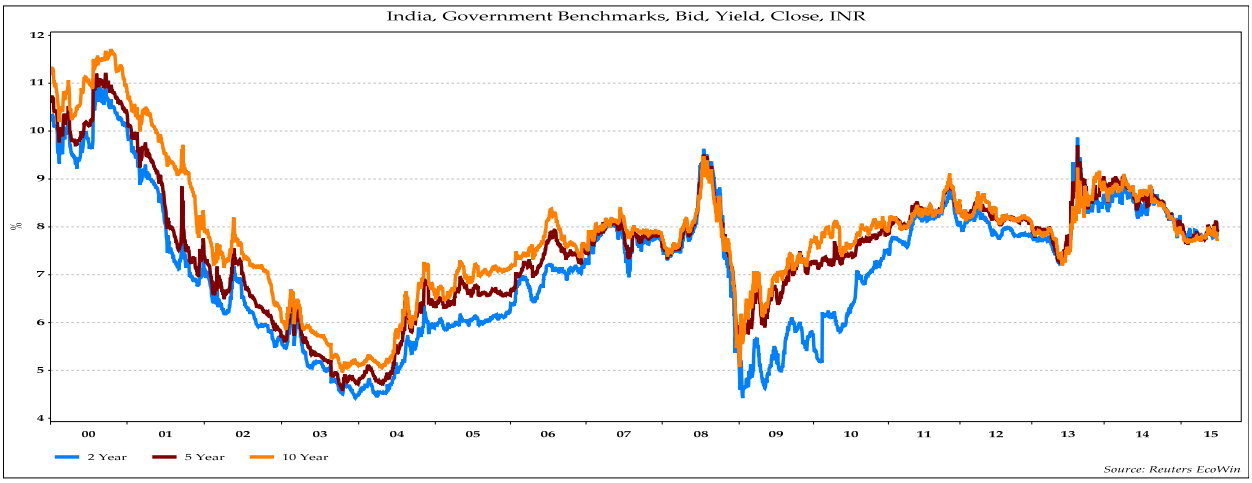

Fig [2]: The percentage point changes, year over year, in the yields of 2 year Indian government bonds and the percentage point changes, during the same period, in 3 month Indian Treasury Bill rates

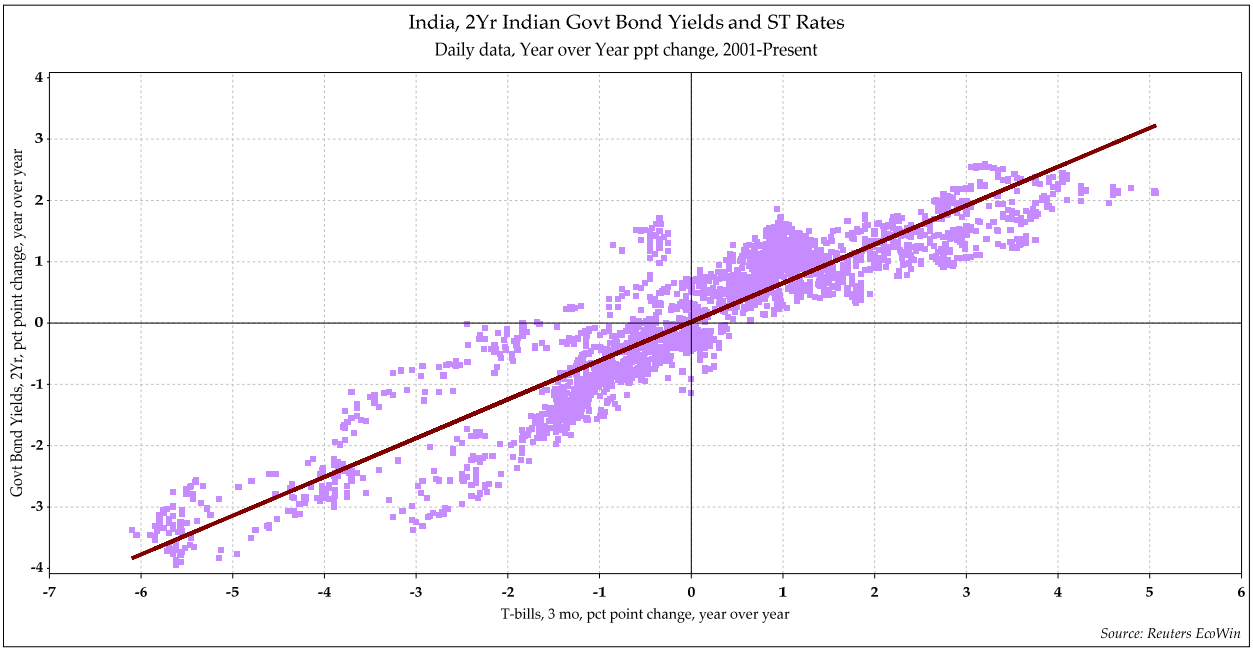

Table [1]: Summary of the Data and the Variables

Variable Labels	Data Description, Date Range	Frequency	Sources
Indian Treasury Bills' Rates			
TB3M; TB3M_Q	Treasury bills, bid, 3 month, % yield; Sep 2001 – Sep 2014; 3Q2001 – 4Q2014	Daily; converted to Monthly; converted to Quarterly	Reuters; Thomson Reuters EcoWin
TB6M; TB6M_Q	Treasury bills, bid, 6 month, % yield; Sep 2001 – Sep 2014; 3Q2001 – 4Q2014	Daily; converted to Monthly; converted to Quarterly	Reuters; Thomson Reuters Ecowin
Indian Government Bond Yields			
IGB2YR; IGB2YR_Q	Government bond, bid, 2 year, % yield, close; Jan 2000 – Sep 2014; 1Q2000 – 4Q2014	Daily; converted to Monthly; converted to Quarterly	Reuters; Thomson Reuters Ecowin
IGB10YR; IGB10YR_Q	Government bonds, bid, 10 year, %, yield, close; Jan 2000 – Sep 2014; 1Q2000 – 4Q2014	Daily; converted to Monthly; converted to Quarterly	Reuters; Thomson Reuters Ecowin
Inflation			
CPIYOY; CPIYOY_Q	Consumer price index, % change, y/y; Jan 2000 – Aug 2014; 1Q2000 – 3Q2014	Monthly; converted to Quarterly	Labour Bureau, Government of India; Thomson Reuters EcoWin
Economic Activity			
IPYOY; IPYOY_Q	Industrial production, % change, y/y; Apr 2006 – Aug 2014; 2Q2006 – 3Q2014	Monthly; converted to Quarterly	Central Statistical Organisation, India; Thomson Reuters EcoWin
Government Finance			
FBALANCE_Q	Government net lending, annualized rate, seasonally adjusted, % of nominal GDP; 1Q2001 – 3Q2014	Quarterly	OECD Economic Outlook

Table [2]: Unit Root Tests for Monthly Variables, Percentage Point Change, Year Over Year

Variable	Augmented Dickey-Fuller (ADF)	Phillips-Perron (PP)
Ω[IGB2YR]	-2.86***	-2.53**
Ω[IGB10YR]	-2.66***	-2.43**
Ω[TBILL3MO]	-2.93***	-2.62***
Ω[TBILL6MO]	-2.95***	-2.57**
Ω[CPIYOY]	-2.08**	-3.41***
Ω[IPYOY]	-4.77***	-4.13***

Notes: *** and ** indicate statistical significance at the 1% and 5% level respectively. Null hypothesis of both ADF and PP tests is that the series contains unit root.

Table [3]: Unit Root Tests for Quarterly Variables, Percentage Point Change, Year Over Year

Variable	Augmented Dickey-Fuller (ADF)	Phillips-Perron (PP)
Π[IGB2YR]	-3.01***	-2.50**
Π[IGB10YR]	-2.07**	-2.27**
Π[TBILL3MO]	-2.30**	-2.87***
Π[CPIYOY]	-1.21	-3.11***
Π[IPYOY]	-2.82***	-2.66***

Notes: *** and ** indicate statistical significance at the 1% and 5% level respectively. Null hypothesis of both ADF and PP tests is that the series contains unit root.

Table [4]: GMM Estimations for Ω[IGB2YR]

	Eq. 6.1	Eq. 6.2	Eq. 6.3	Eq. 6.4	Eq. 6.5	Eq. 6.6
Constant	0.040	0.013	0.078	0.026	0.003	0.056
	(0.42)	(0.15)	(1.52)	(0.36)	(0.05)	(1.35)
Ω[TB3M]	0.638***	0.676***	0.590***	-	-	-
	(13.28)	(16.77)	(16.22)			
Ω[TB6M]	-	-	-	0.701***	0.739***	0.650***
				(15.19)	(21.05)	(18.72)
Ω[CPIYOY]	-	0.045	-0.017	-	0.041	-0.007
		(1.35)	(-1.26)		(1.53)	(-0.58)
Ω[IPYOY]	-	-	0.033***	-	-	0.023***
			(4.76)			(3.49)
Hansen *J*	0.30	0.58	2.39	0.46	0.80	2.46
Obs.	143	142	88	143	142	88
Time Period	Nov 2002-Sep 2014	Nov 2002-Aug 2014	Apr 2007-Aug 2014	Nov 2002-Sep 2014	Nov 2002-Aug 2014	Apr 2007-Aug 2014

Notes: 1) *z*-Statistics are in parentheses. 2) *** implies the significance levels at 1%. 3) Instruments used: Eq. 6.1: first and second lags of Ω[TB3M]; Eqs. 6.2 and 6.3: first and second lags of Ω[TB3M] and Ω[CPIYOY]; Eq. 6.4: first and second lags of Ω[TB6M]; Eqs. 6.5 and 6.6: first and second lags of Ω[TB6M] and Ω[CPIYOY].

Table [5]: GMM Estimations for Ω[IGB10YR]

	Eq. 6.1	Eq. 6.2	Eq. 6.3	Eq. 6.4	Eq. 6.5	Eq. 6.6
Constant	-0.016	0.006	0.047	-0.030	-0.006	0.040
	(-0.10)	(0.05)	(0.41)	(-0.19)	(-0.05)	(0.37)
Ω[TB3M]	0.397***	0.436***	0.270***	-	-	-
	(6.07)	(7.29)	(6.66)			
Ω[TB6M]	-	-	-	0.453***	0.489***	0.300***
				(6.49)	(8.03)	(7.38)
Ω[CPIYOY]	-	0.076	0.010	-	0.079	0.016
		(1.42)	(0.31)		(1.52)	(0.49)
Ω[IPYOY]	-	-	0.029**	-	-	0.025**
			(2.47)			(2.18)
Hansen *J*	0.59	0.92	2.43	0.65	1.00	2.37
Obs.	143	142	88	143	142	88
Time Period	Nov 2002-Sep 2014	Nov 2002-Aug 2014	Apr 2007-Aug 2014	Nov 2002-Sep 2014	Nov 2002-Aug 2014	Apr 2007-Aug 2014

Notes: 1) *z*-Statistics are in parentheses. 2) *** implies the significance levels at 1%. 3) Instruments used: Eq. 6.1: first and second lags of Ω[TB3M]; Eqs. 6.2 and 6.3: first and second lags of Ω[TB3M] and Ω[CPIYOY]; Eq. 6.4: first and second lags of Ω[TB6M]; Eqs. 6.5 and 6.6: first and second lags of Ω[TB6M] and Ω[CPIYOY].

Table [6]: GMM Estimations for Π[IGB2YR_Q]

	Eq. 6.7	Eq. 6.8	Eq. 6.9
Constant	0.031	-0.020	0.176***
	(0.35)	(-0.27)	(2.74)
Π[TB3M_Q]	0.603***	0.675***	0.525***
	(7.87)	(10.64)	(16.99)
Π[FBALANCE_Q]	0.122***	0.094**	-0.196
	(2.87)	(2.25)	(-1.25)
Π[CPIYOY_Q]	-	0.068*	-0.109*
		(1.77)	(-1.73)
Π[IPYOY_Q]	-	-	0.102**
			(2.15)
Hansen *J*	0.93	1.93	2.12
Obs.	47	47	30
Time Period	1Q2003 - 3Q2014	1Q2003-3Q2014	2Q2007 – 3Q2014

Notes: 1) *z*-Statistics are in parentheses. 2) ***, ** and * imply the significance levels at 1%, 5% and 10% respectively. 3) Instruments used: Eq. 6.7: first and second lags of Π[TB3M] and Π[FB]; Eqs. 6.8 and 6.9: first and second lags of Π[TB3M], Π[FB] and Π[CPIYOY].

Table [7]: GMM Estimations for Π[IGB10YR_Q]

	Eq. 6.7	Eq. 6.8	Eq. 6.9
Constant	0.024	0.018	0.182***
	(0.19)	(0.27)	(2.86)
Π[TB3M_Q]	0.308**	0.384***	0.191***
	(3.56)	(3.49)	(9.03)
Π[FBALANCE_Q]	0.132**	0.182**	-0.065
	(2.17)	(2.45)	(-0.63)
Π[CPIYOY_Q]	-	0.109***	-0.024
		(3.50)	(-0.56)
Π[IPYOY_Q]	-	-	0.069**
			(2.04)
Hansen *J*	1.68	3.21	2.49
Obs.	47	47	30
Time Period	1Q2003 – 3Q2014	1Q2003-3Q2014	2Q2007- 3Q2014

Notes: 1) *z*-Statistics are in parentheses. 2) *** and ** imply the significance levels at 1% and 5% respectively. 3) Instruments used: Eq. 5.7: first and second lags of Π[TB3M] and Π[FB]; Eqs. 6.8 and 6.9: first and second lags of Π[TB3M], Π[FB] and Π[CPIYOY].