
Inflation Indexed Bonds and Public Policy: An Examination in the Indian Context

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Inflation Indexed Bonds (IIBs) could be very useful from the public policy perspective. This instrument has become increasingly popular across countries including emerging market and developing economies. The Government of India has also recently began issuing IIBs as part of the debt management strategy. In this paper, we have tried to examine the potential benefits of IIBs to the public policy in India from three perspectives, *viz.*, public debt management, monetary policy, and external sector management. From the public debt management perspective, we find that IIBs could benefit Government in terms of cost savings at least to the extent of inflation uncertainty premium. Further, as interest payouts on these bonds are linked to actual inflation and so are largely the tax collections, IIBs reduce the mismatch between these two cash flows that arises due to inflation. We find that inflation has significant impact on tax collections as OLS estimation suggests almost one-to-one relationship which is statistically significant. From monetary policy perspective, it has been widely articulated that IIBs for a critical amount in the Government's debt portfolio may improve public policy's credibility towards price stability, besides providing information about inflationary expectations. With regard to external sector management, we find that higher inflation causes higher gold imports. As IIBs would provide an alternative asset for inflation hedging, it is suggested that regular issuance of this instrument as part of the debt management strategy may dissuade investors from investing in gold for inflation protection which, in turn, may curtail gold imports.

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Fiscal policy determines the level of debt to be raised by public debt managers from the market to finance the fiscal deficit during a year. Subsequently, the public debt manager, following the broad objectives of cost minimisation over medium to long run subject to prudent risk level, decides about the debt instruments to be used keeping in view the extant as well as anticipated conditions in the financial market. In this regard, Melecky (2007) mentions that a government seeks to achieve the objective of cost minimisation within the existing

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constraints and its risk aversion/preference¹. Therefore, the instruments chosen by public debt manager within the mandate given by the Government form core of their debt management strategy. It may be mentioned that the public debt managers' decisions are comparable to any private borrower in terms of seeking best terms of borrowing. However, Missale (1999) draws a difference between private borrowers and government in the sense that government choice of an alternative is likely to influence the equilibrium outcome due to large size of borrowings while private borrowers' action may not influence it.

The instruments in the arsenal of public debt managers have grown over the years providing ample manoeuvring to deal with unraveling financial conditions. In fact, the innovation of debt instruments has been conditioned by ever evolving financial conditions/ structure. The investors have become increasingly demanding and require a wider choice of debt instruments (*e.g.*, conventional fixed rate bonds, linkers such as floating rate bonds (FRBs), IIBs, bonds with call and put options, *etc.*). Apart from meeting the core objective of raising market borrowings, some of these instruments arguably could provide useful information for monetary policy formulation and in the process improve the monetary policy transmission. In this regard, Falcetti and Missale (2000) argue that the short maturity debt and floating rate debt are also effective as commitment devices. It would be pertinent to mention here that countries with high level of debt try to shorten the debt maturity and resort to instruments such as FRBs and IIBs to reinforce their commitment towards anti-inflationary stance². Besides improving credibility of the public policy towards its commitment to anti-inflationary stance, issuance of instrument like IIBs enables the monetary policy to derive market-based real interest rate and information about inflationary expectation. The issuance of IIBs is also presumed to allow central bank to gauge its credibility in anchoring inflationary

¹ In other words, the government not only aims to raise funding at low cost but also to structure the composition of its debt portfolio in such a way as to minimise the impact of relevant shocks on its budget or long-term expenditure plan.

² Missale and Blanchard (2000) show that in the period 1960-1989 in three highly indebted countries, Belgium, Ireland and Italy, the share of fixed rate long-term debt displayed a negative relation with the debt-to-GDP ratio.

expectations. Notwithstanding the above enumerated benefits of IIBs, some academicians and researchers have argued against the contribution of IIBs to price stability, which is the core mandate of the monetary policy across countries.

In this study, we have attempted an analysis of various aspects related to the issuance of IIBs as part of the debt management strategy in India. Basically, we investigate whether issuance of IIBs makes a good proposition for public policy objective in general and debt management in particular. The structure of the study is as follows. Section I dwells upon the international experience of IIBs, while the relevance of IIBs for public debt management is examined in Section II. Section III analyses the contribution of IIBs towards public policy objectives, especially monetary policy. The implications of the IIBs for external sector management, *i.e.*, through impacting gold imports have been investigated in Section IV. Section V contains conclusions.

Section I

International Experience

Though the indexation of debt has become popular in the last two decades with increasing number of sovereigns issuing inflation-linked bonds, its roots can be traced as back as in 18th century. The first indexed financial instrument was issued by the Commonwealth of Massachusetts in 1742 when it first issued bills of public debt linked to cost of silver on the London Exchange. Subsequently, the state of Massachusetts decided to link indexed debt to a broader group of commodities in the wake of silver prices appreciating more rapidly than the general price level. Since then, a number of distinguished economists have argued in favour of issuing indexed debt. Notably, Marshall proposed a plan with the intention of drawing greater attention to the concept of indexation. He proposed a passage of law permitting usage of indexation in contracts for deferred payments. Keynes was also a great supporter of indexation and he proposed in 1924 to the Royal Commission on National Debt and Taxation that the British Government issue index-linked bonds. More support for indexation stemmed from renowned economists such as Richard Musgrave, Milton Friedman and Robert Barro (Deacon, *et al*, 2004).

Garcia and Rixtel, (2007) classify issuance of IIBs by sovereigns in three broad categories during the post-war period. The first group comprises of countries which struggled with high and volatile inflation and they used IIBs for raising long-term capital. These countries are Chile (1956), Brazil (1964), Colombia (1967) and Argentina (1973). Italy also issued IIBs in 1983 with a ten-year maturity in a situation when it failed to issue nominal bonds for longer maturities. The second group includes United Kingdom (1981), Australia (1985), Sweden (1994), and New Zealand (1995). These countries issued IIBs not because of inflationary compulsions but out of a deliberate policy choice to improve the credibility of anti-inflationary policy stance. The third group, mainly comprising of industrialised countries, introduced IIBs programme in more recent years and their objective slightly overlapped with the previous group. However, this group's objective weighed more towards social benefits as IIBs were issued as a further step towards completing financial markets and providing an effective hedge against inflation to investors in the long-term. Most prominent countries in this group are Canada (1991), United States (1997), France (1998), Greece and Italy (2003), Japan (2004) and Germany (2006). Many of the countries from second group such as United Kingdom and Australia also issued IIBs at later stage for social benefits. Price (1997) categorises the country experiences with regard to issuance of IIBs broadly into two extremes: the first includes instances where high inflation left issuers with little choice but to index their obligations to the price level (for example, Argentina, Brazil, Chile and Colombia); and the second includes countries which experienced low and stable inflation but issued IIBs to complement the existing nominal bond programs. Currently, IIBs are issued in several countries but their share in total portfolio varies with few countries such as Chile, Argentina, and Brazil having quite large share of their debt under this instrument (Table 1).

In recent years, many emerging market and developing economies have also attempted issuances of IIBs. India also issued IIBs (namely capital indexed bonds) in 1997 with a five-year maturity but discontinued its issuance due to poor response. The poor response could be attributed

Country	Floating Rate	Fixed Rate	Inflation Indexed	Exchange Rate linked
Argentina	14.8	0.8	49.5	34.8
Brazil	21.0	39.6	38.8	0.6
Chile	0.0	20.2	79.8	0.0
India	1.9	98.1	0.0	0.0
Indonesia	17.6	82.4	0.0	0.0
Canada	0.0	92.3	7.7	0.0
South Africa	0.0	74.6	25.4	0.0
Mexico	26.2	52.1	21.7	0.0
Germany	0.0	89.1	10.0	1.0
United Kingdom	0.0	76.8	23.2	0.0
United States	0.0	91.0	9.0	0.0

Source: Bank for International Settlements.

to the product structure wherein inflation protection was provided only to the principal and not to the interest payouts. In the above backdrop, the revised version of IIBs, wherein inflation protection is provided to both principal and interest payments, has been launched through auction in June 2013. The IIBs launched through auction is linked to the Wholesale Price Index (WPI) for inflation compensation. Further, an exclusive series of IIBs for retail investors has been launched in December 2013 where inflation compensation is linked to combined CPI (base: 2010=100).

Section II

IIBs and Public Debt Management

It is argued that IIBs could be effectively used in the debt management strategy, as they could be beneficial for various stakeholders, *viz.*, issuer (sovereign), investors (institutional as well as individuals), public policy, *etc.* We examine the utility of issuing IIBs as part of the debt management strategy in India in the backdrop of such utility articulated in the extant literature on the subject.

Will it be beneficial for the Issuer (Government)?

We have attempted to evaluate the utility of IIBs from issuer's perspective in terms of cost effectiveness, implications on cash management and stability of cost structure.

Cost effectiveness

The Government has the option of raising debt through fixed rate instruments and linkers (mainly floating rate bonds and inflation indexed bonds). Sovereigns across the world have been raising a large part of their debt through fixed rate bonds (nominal bonds). However, the proportion of the debt raised through inflation indexed bonds has gone up significantly over the last two decades. The yields (cost) on nominal bonds entail three components, *viz.*, real return, average expected inflation, and term/uncertainty premia ($i = r + p^e + u$). The term premia³ is largely attributed to the uncertainty about expected inflation. Higher is the uncertainty about average expected inflation over the maturity period of a bond, higher the term premia the investors would seek for. As uncertainty about expected inflation may be proportional to the maturity period, the term premia charged by investors on nominal bonds would also be proportional to the maturity period of the nominal bonds. In case of IIBs, returns are linked to inflation and any increase in inflation is paid for in terms of higher returns. Therefore, investors would not seek for term premia for inflation uncertainty and the cost of borrowing through these instruments could potentially be lower at least to the extent of uncertainty premium (inflation risk premium) demanded on nominal bonds, provided actual inflation equals breakeven⁴/expected inflation. Such cost saving could, however, be realised after the issuances of IIBs reach a critical mass and ample liquidity is generated, otherwise illiquidity premia could outweigh the cost benefit due to absence of uncertainty premia. Furthermore, cost benefit on IIBs to the extent of uncertainty premia would also depend on the actual inflation⁵. The estimates of inflation risk premia, however, vary in the range from 0.1

³ Term premia mainly comprises of uncertainty premia (inflation premia) and illiquidity premia.

⁴ The difference between the yield on IIBs and fixed rate nominal bonds of the commensurate maturity is often called “break-even” inflation rate, which is a hypothetical rate at which return on both types of bonds is identical.

⁵ If actual inflation is above the break-even inflation, the cost saving on account of absence of uncertainty premia, if any, needs to be seen along with differential between actual and break-even inflation.

to 1 percentage points (Working Group, Dutch Central Bank, 2005). Capiello and Guene (2005) estimate the inflation risk premia for French and German long-term bonds to be around 20 and 10 basis points, respectively. In fact, the investors are generally risk averse and, thus, issuer of risky assets (*i.e.*, nominal bonds inherently containing future inflationary risk) will have to pay higher yield to investors to hold such assets⁶. In case of IIBs, inflationary risk element is eliminated and investors are ready to invest in such bonds at lower yield. According to Garcia and Rixtel (2007), Government savings of cost arises from the investors' preference for payment of premium for protection against inflation, which they get from inflation indexed bonds.

It has also been argued that IIBs could result in cost savings to the Government through indirect channel, *i.e.*, lowering of inflation risk premium on nominal bonds. The argument for lowering risk premium mainly dwells on the premise that IIBs will improve the credibility and commitment of the monetary policy towards price stability/ anti-inflationary stance⁷. Reschreiter (2004) estimates that government long-run borrowing cost could be reduced significantly in United Kingdom by issuing IIBs. However, the cost savings on issuance of IIBs need to be judged over the life of the security and not on yearly basis, as high inflation during some period will be evened out by low inflation during other period. In the above backdrop, we feel that in case of India, the issuance of IIBs may result in cost saving to the Government, at least to the extent of term/ uncertainty premia. However, such cost saving needs to be juxtaposed with illiquidity premia charged by investors on IIBs until a critical mass is achieved and reasonable liquidity is generated.

Cash Management of the Government

Another benefit that could be attributed to issuance of IIBs is from cash management perspective, as indexed interest payouts on IIBs

⁶ For instance, corporate bonds pay higher yields than Treasury bonds with comparable maturities since corporate bonds have default risk and Treasury bonds do not (Shen, 1995).

⁷ If issuance of IIBs by government achieves a critical mass, the relative gains from higher inflation may not be significant and this, in turn, would improve the credibility of the anti-inflationary (lower inflationary) policy. In such a scenario, higher inflation would cost the Government dearly whereas investors in IIBs would enjoy insurance against high inflation.

would be largely matching to revenue collections of the Government⁸. In this case, nominal interest payouts would be anchored to the actual inflation and so would largely be the tax collections of the Government and thus, leave not much of the mismatch on account of inflation. We have empirically investigated the impact of the inflation on tax collections by estimating Ordinary Least Square (OLS) taking log of tax collections (LTAX) as dependent variable and log of inflation (LWPI) and log of real GDP (LGDP) as independent variables. The estimation is based on annual data from 1990-91 to 2012-13. The variables are first-differenced in order to avoid unit root problem. The coefficient of D(LWPI) estimated at 1.06 is statistically significant at 10 per cent level of significanceⁱ, suggesting that the response of the tax collections to inflation was almost one-on-one. Barro (1997) also supports this premise by arguing that an optimal tax approach to public debt, taking into account the Government's assets and liabilities, would favour the issuance of long-term inflation-linked bonds. As per Barro's analysis, a tax-smoothing objective dictates the optimal composition of public debt with respect to maturity and contingencies and this objective makes debt payouts contingent on the levels of public outlays and the tax base. Based on the above, we conclude that issuance of IIBs in India would facilitate efficient cash management for the Government.

Stability of cost structure

Another benefit of inflation indexed bonds is the stability of borrowings cost in real terms as the real component of the coupon on IIBs is fixed. Since the coupon rate of NFRBs is determined by current inflationary expectations, such bonds issued during high inflation period remain very costly even when inflation declines and vice versa. Table 2 below indicates that inflation in India has historically remained quite volatile and hence, issuance of IIBs would be more logical from the above mentioned real yield perspective⁹.

⁸ It may be noted that a large part of the Government's revenue is de facto indexed to inflation because taxes are collected in nominal terms.

⁹ Standard deviation (SD), a standard measure of volatility, of inflation rate (based on WPI) in India was estimated at 3.6 during the last two decades. SD was 4.2 and 1.9 during 1990s and 2000s, respectively.

Some researchers have, however, pointed out that issuing IIBs along with nominal bonds will entail segmentation of the public debt market and turn various debt instruments less liquid. Eventually, this may escalate the cost of borrowing of the Government to the extent of liquidity premia and off-set the gains to be realised on account of removal of inflation risk premium. Townend (1997) compare the liquidity of IIBs and Nominal Fixed Rate Bonds (NFRBs) in terms of their bid-cover spread and reported a bid-cover ratio of 16 ticks for large trades on IIBs as opposed to 2 ticks for similar nominal bonds. Nonetheless, investors of IIBs are generally financial institutions such as insurance companies, pension funds, *etc.*, and for them liquidity is secondary concern as they largely buy such bonds to hold to maturity (HTM).

How could they be beneficial for investors?

Investors in IIBs may derive major benefits in terms of holding long-term fixed real yield assets with inbuilt protection from inflation. Although investors factor-in average inflationary expectations plus inflation risk premia while pricing NFRBs, projections about medium to long-term inflation are generally not robust especially in emerging market and developing economies where inflation path remains quite volatile. The projections of inflation are, however, credible over short-term. Hence, NFRBs may end up either underperforming or over performing in the medium to long-term. In such situations, IIBs are appropriate product for long-term investors providing insurance against inflation. Nonetheless, there are other instruments which also provide hedge against inflation. In this regard, Garcia and Rixtel (2007) put forth the argument that availability of other instruments for investors to hedge against unanticipated inflation does not stand up to empirical investigation. Shen (1995) also argues that none of the investment alternatives such as rolling over short-term Treasury securities, real assets (such as commodities and real estate), *etc.*, are capable of offering investors fixed long-term yields that are free from inflation risk¹⁰. We

¹⁰ Rolling over 3-month Treasury bills is inferior to investing in long-term indexed bonds. In this case, investors have to face uncertain future short-term yields and therefore, an uncertain overall long-term yield. Further, investing in real assets would be an even less satisfactory substitute for investing in indexed Treasury bonds. The correlation between yield on the real assets and inflation has been found typically quite low; for example, during post war period, correlation between inflation and growth in the price of gold, which many consider to be a relatively good hedge against inflation, is only 0.47.

have estimated the correlation coefficient between inflation rate (based on WPI index) and variation in real estate prices in Mumbai and Delhi, which could be used as proxy to measure the extent of hedging against inflation in real estate (assets) investment. The correlation coefficient has been estimated at 0.22 and 0.16, respectively during 2010:Q1-2013:Q2¹¹. The low correlation between inflation rate and growth in the prices of real assets exhibits that investment in real assets does not provide any significant hedge against inflation and thus, are not a good substitute of IIBs. Further, even if investment in real assets may provide some insurance against inflation, these assets are fraught with risks other than inflation and such risks are hard to estimate. For example, demand and supply conditions would greatly influence the prices of real assets. Therefore, based on the above arguments, it may be inferred that investing in other instruments for inflation hedge may also result in trading inflation risk with other risks.

In India, inflation has remained quite volatile across the categories, viz., retail as well as wholesale (Table 2). It has surged significantly in the last few years. The high volatility in inflation makes it difficult for investors to have realistic projections about it and thus, the expected inflation factored - in while pricing of NFRBs fails to provide desirable real return. In such situations, the IIBs provide an opportunity for investors to earn desirable real return on their investment, as IIBs provide for actual inflation compensation.

Period	Average (%)			Standard Deviation		
	WPI	CPI-IW	CPI-AL	WPI	CPI-IW	CPI-AL
1980s	8.0	9.0	8.1	3.9	2.4	4.6
1990s	8.1	9.5	9.0	3.6	3.0	5.0
2000s	5.4	5.9	5.4	1.6	2.9	4.4
2010s	8.6	9.7	9.4	1.1	1.2	0.9
1980s-2010s	7.3	8.3	7.7	3.2	3.0	4.6

WPI=Wholesale Price Index; CPI=Consumer Price Index; IW= Industrial Workers; and AL= Agricultural Labourers.

¹¹ Real estate prices have been represented by housing prices index published by National Housing Bank (NHB).

Another argument in favour of investing in IIBs is that these instruments are the only long-term assets which provide hedging against two risks, *viz.*, inflation risk and credit risk. These virtues of IIBs issued by sovereigns make them truly risk-free long-term assets available for investors. Campbell and Viceira (2002) substantiate the argument that the IIBs are safe asset for long-term. From the portfolio diversification perspective also, investors should hold a part of the total assets in IIBs, especially in a scenario when inflation is quite uncertain. In fact, Fischer (1975) propagated this argument to support the issuance of inflation-linked bonds by the Government or by other issuers¹².

IIBs are particularly helpful to some of institutional investors such as pension funds whose payments obligations are linked to inflation. Regular issuance of IIBs will help portfolio management of such institutional investors and boost their growth. Thus, regular issuance of IIBs in India will help broadening the investor base and providing stability to the demand for government bonds.

Section III **IIBs and Monetary Policy**

The countries with high level of debt and strong political economy may be tempted to use inflation as a tool to erode the real value of the debt and contain debt to GDP ratio. Aizenman and Marion (2009) argue in this regard that a government that has lots of nominal debt denominated in the domestic currency has an incentive to try to inflate it away to decrease the debt burden. Temptation to use inflation is greater if foreign creditors hold a significant portion of the public debt denominated in domestic currency¹³. However, if IIBs constitute a significant part of the public debt, it would disincentivise the use of inflation to reduce real value of the public debt. Furthering this argument, it may be pointed out that indexing of public debt does not eliminate the inflationary risk but

¹² He equally argued that the diversification benefits for holders of the bonds justified a positive inflation risk premium.

¹³ For example, the share of foreign creditors in the US public debt increased from almost zero until 1960s to about 50 per cent in 2010. Hence, the foreign creditors would bear 50 per cent of inflation tax, should inflation be used to reduce the debt burden.

shift it from investors to Government and this way, it discourages the Government to reduce the debt burden through inflation. Furthermore, it will incentivise the Government to take all potent measures to contain inflation as rise in inflation will result in higher interest payments by the Government on IIBs. Another channel through which IIBs can affect inflation is higher savings and lower consumption, exerting downward pressure on prices. Samuelson (1988) elaborates that acceleration in savings on account of issuance of IIBs allows Government to finance a given expenditure level in less inflationary ways, thus dampening inflation. In the above backdrop, it may be concluded that issuance of IIBs in India for a critical mass has potential to improve the commitment and credibility of the public policy, in particular the monetary policy towards price stability.

In the last two decades, the independence of the central banks has increased significantly across countries. This was accompanied by the improved credibility of the central banks and their clear mandate for price stability which has considerably eliminated the uncertainty about inflationary expectations. Despite enhanced commitment towards price stability, the increased independence of central banks could not completely eradicate the inflationary risks and hence, many countries especially from emerging markets and developing economies have issued IIBs in the recent past.

Some arguments in the literature have also been made against indexing public debt from the price stability perspective and other destabilising effects. The large issuances of IIBs may lead to a higher level of indexation of the economy (*e.g.*, indexation of financial contracts, wages, *etc.*) which may undermine the policy aimed at controlling inflation. The use of appropriate policy mix can, however, prevent the indexing leading to higher inflation (Fischer, 1983)¹⁴. Another argument against contribution of IIBs to price stability is that their issuance may induce acceptability of inflation in public and in

¹⁴ Fischer analysed the data of 40 countries with different level of indexation after the 1974 oil-price shock. He concluded that appropriate monetary and fiscal policies were effective in preventing the impact of higher indexation on inflation.

turn, reduce pressure on the central bank to maintain its anti-inflationary stance. Nonetheless, this argument is quite paradoxical to the central bank independence and its commitment towards price stability being its primary objective across countries.

Will they help monetary policy formulation?

In addition to the benefits accruing to Government and investors, the indexation of public debt enables central banks to derive market-determined real interest rates and inflationary expectations, which greatly contribute in firming up monetary policy stance¹⁵. A recent inter-departmental study by RBI (2013) empirically finds that investment and growth is sensitive to changes in real interest rate. Therefore, estimates of market determined real interest rates could help monetary policy in assessing investment and growth prospects.

The information about inflationary expectations also facilitates central banks to assess their credibility towards price stability and accordingly, central banks are in a position to affect any appropriate monetary policy actions, if required. However, critical mass of indexed debt is essential for liquidity, which remains pivotal for extracting any market related information for policy purposes. Provided inflation risk remains constant over time, the change in the difference between real yield on IIBs and nominal yield on fixed rate nominal bonds will display the change in average inflation expectations of the market participants over the residual maturity of bonds. The difference between real yield on IIBs and nominal yield on fixed rate nominal bonds is also called break-even inflation rate (BEIR) in the literature. Shen (1995) points out that without information on real yield, policymakers will not be able to know whether the change in nominal yield is attributed to variation in inflationary outlook or change in the real yield. Further, the BEIR derived from difference between real and nominal yield should be construed with enough caution since difference between yield on IIBs and NFRBs also contains inflation risk premium required by investors in *lieu* of compensation for inflation uncertainty while holding NFRBs.

¹⁵ Information on expected inflation and its change would help monetary policy makers better understand inflationary pressure in the economy, allowing them to make better adjustments to monetary policy (Shen, 1995).

Similarly, real yield on IIBs may include liquidity premium due to them being relatively less liquid and to that extent change in average inflationary expectation would be underestimated. Notwithstanding the aforementioned caveats, BEIRs are best available indicators of expected inflation from the policymakers' perspective and their utility improves over time with increased issuance of IIBs under wider maturity range and improved liquidity in this segment of market. In this regard, Garcia and Rixtel (2005) points out that some caution is advisable when monitoring movements in BEIRs for monetary policy purposes and it would be useful to focus on changes rather than levels of BEIRs when interpreting them in terms of long-term inflation expectations.

In India, the central bank collects information only about short-term inflationary expectations (up to one year) through surveys and not the medium to long-term. While regular issuance of IIBs for various tenors could provide information about inflationary expectations across the term structure (*i.e.*, over short, medium and long-term). The inflationary expectations extracted from IIBs for short-term could be used to corroborate the results of the survey conducted to ascertain the same. In the above backdrop, it may be concluded that the regular issuance of IIBs could help the monetary policy formulation in India.

Will they serve any social objective?

Although IIBs provide protection to investors against inflation, issuance of such bonds by sovereigns has also some social implications. First and foremost, inflation is generally created by sovereign or monetary authority and hence, responsibility automatically dwells on sovereign to provide such investment instruments enabling public to protect their wealth. Further, issuance of IIBs by sovereigns would catalyse further financial innovations and public at large would be benefitted. For instance, pension funds, insurance companies, and mutual funds would be able to offer new financial products with inbuilt protection from inflation for retail investors¹⁶. As per the standard argument in the literature, IIBs should constitute an important part of

¹⁶ Garcia and Rixtel (2007) mentions that following the introduction of US Government inflation-linked bonds, the Chicago Board of Trade introduced futures and options referenced to these bonds (five and ten year maturities). Mutual funds benchmarked on these bonds also developed and inflation-linked investment plans and annuities were introduced by pension funds.

any funded pension management arrangement because they would create pension holdings with the same characteristics as social security pension (*i.e.* provision of inflation indexed annuities).

Theoretical exposition of welfare implications of IIBs is provided by Magill and Quinzii (1997) through comparison of two second-best situations, having a nominal bond which is subject to inflationary risk or an indexed bond which is subject to risk caused by relative prices movements. They concluded with the help of a welfare gains function that indexed bonds result in higher potential gains due either to low variability of real income or strong correlation between payoffs of indexed bond and that of other securities. While discussing various aspects of IIBs, Price, (1997) argues that IIBs enhances social welfare through providing completeness to the financial markets, incentivising savings behaviour, and enabling better distribution of wealth and income.

Issuance of IIBs will also discourage public from transferring their investment from financial assets to real assets especially where future inflationary expectations are very high and in turn, would contribute to both accelerating and stabilising the savings rate. Amid high inflation, the financial disintermediation in household savings was visible in the last few years, as the share of physical savings increased from 52 per cent in 2009-10 to 68 per cent during 2012-13 notwithstanding overall decline in household savings rate during this period. RBI's Annual Report (2013) also mentions that within household savings, while the financial savings rate declined, the physical savings rate increased in 2011-12 because of households' preference for the latter in the high inflationary environment. The acceleration in savings rate is required more for higher investments and employment in emerging market and developing economies. Another important social implication is related to contribution of IIBs to distribution of real wealth. It has been argued that unanticipated inflation (or deflation) results in transfer of real wealth from lenders to borrowers (or borrowers to lenders). Investment in IIBs leads to elimination the element of uncertain inflation and arrest the redistribution of real wealth¹⁸.

¹⁸ Please refer to Drudi and Giordano (2000) for detailed discussion on distributional effects of IIBs.

Section IV

IIBs and External Sector Management

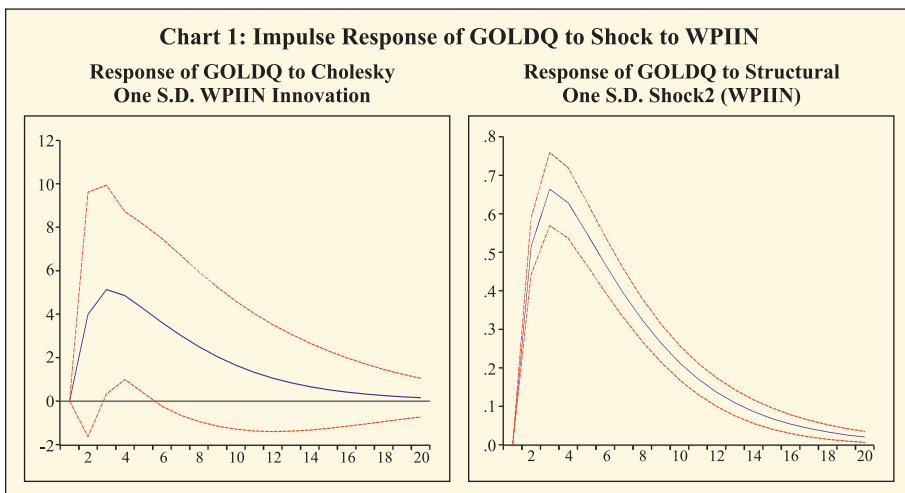
IIBs would provide an investment instrument to the public that will enable complete inflation hedging. It has been often observed that in the absence of such instrument, people tend to look for alternative asset class such as gold for inflation hedging. In India, IIBs were not available for investment till few months back and the people might have invested in gold for inflation protection. In order to explore the preliminary relationship between inflation and demand for gold, we have estimated the correlation between inflation rate (based on WPI index) and movement in prices of gold in India during the period 1971-72 to 2012-13. The correlation coefficient between inflation rate and change in gold prices show that both are closely associated (Table 3).

We further investigate the impact of inflation on investment in gold, especially the impact of inflation on gold imports, by estimating Ordinary Least Square (OLS) and Structural Vector Auto Regression (SVAR). The above models have been estimated taking monthly data from April 2003 to July 2013 on quantity of gold imports in metric tons (GOLDQ) and inflation rate based on Wholesale Price Index (WPIIN). The investigation of the unit root properties shows that both GOLDQ and WPIIN are of $I(0)$ order and thus, we find it appropriate to estimate OLS and SVAR at levels. In OLS, GOLDQ has been taken as dependent variable and WPIIN as explanatory variable. The results of OLS show that the short-term and long-term coefficients of WPIIN at 2.43 and 3.70, respectively, are statistically significant at 99 per cent confidence levelⁱⁱⁱ. This means that increase in inflation rate leads to higher gold imports. For VAR, the three lag length selection criteria, *viz.*, Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and

Period	Average inflation (WPI)	Correlation coefficient
1971-1980	9.4	0.85
1981-1990	8.0	0.70
1991-2000	8.1	0.60
2001-2013	6.1	0.49

Hannan-Quinn Criterion (HQ) are used and based on majority criteria, two lags are selectedⁱⁱⁱ. The results of the VAR Granger Casualty also show one-way causality from WPIIN to GOLDQ, *i.e.*, WPIIN causes GOLDQ and not the other way around^{iv}. Further, SVAR has been estimated to capture the contemporaneous impact of the WPIIN on GOLDQ and impulse response of the GOLDQ to one standard deviation structural shock to WPIIN is found to be very robust (Chart 1).

Based on the above empirical results, it may be inferred that the high inflation may have spurred demand for gold in the recent past and due to non-availability of adequate quantity of gold domestically, India had to import large amount of gold, which contributed to widening of current account deficit (CAD). India's gold imports increased from about USD 21 billion during 2008-09 to about USD 53 billion in 2012-13 (in terms of quantity, gold imports increased from 767 metric tons to 1010 metric tons during this period) and the CAD during this period rose from about USD 28 billion to USD 88 billion. The regular issuance of IIBs by the Government would provide an alternative asset for investors for inflation hedging and thus, such issuances may dissuade investors from investing in gold to some extent and reduce the imports of gold and current account deficit. Therefore, it appears that regular issuance of IIBs by the Government could be useful in external sector management.



Section V

Conclusion

Overall, IIBs are considered useful debt instruments especially from a public policy perspective and have become increasingly popular across countries including emerging market and developing economies. The Canadian version of IIBs has also been launched by the Reserve Bank of India, in consultation with Government of India in June 2013. Further, the Government has launched an exclusive series of IIBs for retail investors in December 2013. Against this backdrop, this study has attempted to analyse the usefulness of the IIBs from three perspectives, *viz.*, public debt management, monetary policy, and external sector management. From public debt management perspective, it has been observed that IIBs could benefit Government in terms of cost savings at least to the extent of inflation uncertainty premium and at the same time, they are equally attractive for private investors providing them protection against inflation particularly for long-term assets. These bonds would allow the debt management to expand the bouquet of instruments and broaden the investor base and at the same time, would allow the investors to diversify their portfolio. Further, interest payouts on these bonds are linked to actual inflation and so are the tax collections of the Government. Empirical investigation through OLS estimation reveals that impact of inflation on tax collections is almost one-to-one and statistically significant. Thus, IIBs will help the alignment of cash flows of the government, particularly those cash flows which are sensitive to inflation. From monetary policy perspective, it has been widely articulated that issuance of IIBs for a critical amount in the Government's debt portfolio may demonstrate public policy's commitment towards price stability. Therefore, issuance of IIBs could potentially improve the credibility of the public policy, in particular the monetary policy, towards its primary objective of price stability. Further, IIBs could provide very useful information on market determined real yield and inflationary expectations, which are critical for the Central Bank to initiate monetary policy actions to reinforce its anti-inflationary stance. Several social benefits such as providing hedging against inflation to public at large, arresting redistribution of wealth from creditors to debtors, discouraging government from eroding public debt

through inflation, *etc.*, are also associated with issuance of IIBs. With regard to external sector management, it has been argued that people invest in gold for inflation hedging and that leads to increase in gold imports and higher CAD. In order to draw a point in this context, the empirical examination of the relationship between inflation and gold imports through OLS and SVAR estimation indicated that the higher inflation causes higher gold imports. IIBs would provide an alternative investment asset for investors with inbuilt hedge against inflation and thus, issuance of this instrument may dissuade investors from investing in gold for inflation protection which in turn, may curtail gold imports. To summarise, IIBs could potentially be very useful instruments for public policy at large. Therefore, it may be desirable that IIBs become regular feature in the debt management strategy and certain portion of market borrowing of the Government of India is raised through this instrument every year.

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ⁱ In order to analyse empirically the impact of inflation on tax collections of the Government of India, we have estimated simple OLS taking annual data from 1990-91 to 2012-13. The variables that have been taken in the estimation are log of WPI (LWPI), log of gross tax collections (LTAX), and log of GDP at constant prices (LGDP). Due to unit root problem, the variables have been taken in the first difference form. The results of the OLS furnished in the table below show that impact of the inflation on tax collections of the government is almost one-to-one and statistically significant.

OLS Results [D(LTAX) dependent variable]			
Explanatory variables	Coefficient	t-Statistics	Prob.
C	-0.06	-1.00	0.3286
D(LWPI)	1.02	1.92	0.0693
D(LGDP)	2.03	3.28	0.0037

R-squared: 0.37; Adjusted R-squared: 0.30
F-statistic: 5.78; DW Statistic: 1.94

ⁱⁱ The impact of inflation rate on gold imports has been estimated, taking monthly data on inflation rate (WPIIN) and quantity of gold imports (GOLDQ) from April 2003 to July 2013. The data on quantity of gold import has been derived by dividing value of gold imports by price of gold. The price of gold had been taken from the World Gold Council. The results of OLS estimation are furnished in the table below, which show that coefficient of WPIIN and lagged GOLDQ are positive and statistically significant.

OLS Results (GOLDQ dependent variable)				
Explanatory variables	Coefficient		t-Statistic	Prob.
	Short-term	Long-term		
C	29.35		8.47	0.0007
WPIIN	2.43	3.70	1.10	0.0297
GOLDQ _{t-1}	0.34		4.01	0.001

R-squared: 0.19; Adjusted R-squared: 0.17
F-statistics: 13.71; DW Statistic: 1.956; LM-Statistic: 0.041 (Prob: 0.83)

iii The lag selection in VAR has been done based on three lag selection criteria, viz., Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Criterion (HQ) and results based on majority criteria indicate two lags.

VAR Lag Selection Criteria			
Endogenous variables: GOLDQ, WPIIN			
Sample period: 2003M04 to 2013M06			
Included Observations: 115			
Lag	AIC	SC	HQ
0	14.52252	14.57025	14.54189
1	12.26738	12.41060	12.32551
2	12.02387	12.26256*	12.12075*
3	12.02411	12.35827	12.15974
4	11.96369*	12.39333	12.13808
5	12.01290	12.53801	12.22604
6	12.04398	12.66458	12.29588
7	12.05284	12.76891	12.34348
8	12.09273	12.90428	12.42214

iv The VAR Granger Causality test has been conducted to corroborate the results of OLS estimates. The results given in the Table below demonstrate that null hypothesis of exclusion of WPIIN is rejected at 5 per cent significance level.

VAR Granger Causality/Block Exogeneity Wald Tests			
Sample: 2005M04 2013M06			
Included observations: 99			
Excluded	Chi-sq	df	Prob.
Dependent variable: RGOLD			
WPIIN	6.576089	2	0.0373
All	6.576089	2	0.0373
Dependent variable: WPIIN			
RGOLD	0.833998	2	0.659
All	0.833998	2	0.659