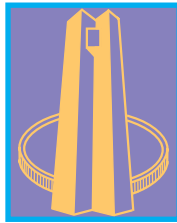


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Index linked bonds

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Index linked bonds

by L P Venter¹

Introduction

In the Budget Review of 17 February 1999, the Department of Finance indicated that the South African Government was investigating the introduction of a bond which would pay interest indexed to an appropriate measure of inflation. If South Africa were to issue index linked bonds, it would become one of a relatively small group of countries in the world to do so. Experiences with the introduction of index linked bonds in these countries, which include the United Kingdom, United States of America, Canada, New Zealand, Australia, Sweden, Argentina, Brazil, Israel, Poland and Mexico, have varied quite significantly. For example, in the United Kingdom consumer price inflation decreased from 11,9 per cent in 1981, the year of first issue, to 4,6 per cent two years later. In the case of Argentina consumer price inflation fell from 61,2 per cent in 1973, the year of issue, to 23,5 per cent in 1974 before it accelerated sharply to 182,9 per cent in 1975.

The issuing of index linked bonds in most countries resulted from the sharp increase in the cost of government debt due to high rates of inflation in the 1970s. These high rates of inflation were inter alia fuelled by high public spending in the United States at the time of the Vietnam War, the ensuing devaluation of the dollar and the first oil crisis and all its repercussions – all against the background of inflation-tolerant policies in many of the G10 countries.

In the 1980s the expansionary fiscal policies in some of these countries accelerated the growth in the public debt. As a result, real interest rates increased quite sharply. The high interest rates added further to public spending and in some cases developed into a persistent increase in public debt in relation to gross domestic product. Consequently, treasuries began searching for ways to manage public debt more effectively by, for example, issuing index linked bonds.

This note explains the mechanics of such bonds and how information about inflation expectations can be extracted once such bonds are issued. This follows the indication recently given by the Governor of the Reserve Bank that the market prices of such bonds would provide valuable information about inflation expectations to the Reserve Bank.

Reasons for issuance of government index linked bonds

The primary objective of government debt management is to minimise over the long term the cost of meeting government's financing needs, taking account of risk, while ensuring that debt management policy is consistent with monetary policy. The secondary objectives of government debt management may be to contribute to the improved functioning of financial markets, to contribute to the development of the bond market specifically or to promote private household saving. These objectives are normally implemented by constructing an optimal issuance strategy, setting out how government intends to finance its borrowing requirement by using different types of debt and maturities.

Government debt managers are primarily responsible for realising the government's borrowing needs, at as low a cost as possible, through non-inflationary ways of financing. Index linked debt has an impact on the real cost of government funding

1 The author is grateful for the valuable contributions made by Johan van den Heever and other colleagues in the Research Department of the South African Reserve Bank. The views expressed in this paper are those of the author and do not necessarily represent those of the Reserve Bank

through its ability to insulate investors against an unexpected increase in inflation. Therefore, if investors are prepared to pay a premium for the guaranteed real returns on index linked bonds, the government should be able to obtain cheaper funding. This saving on the cost of government financing should, however, be weighed against risks; for example, a sharp increase in inflation would lead to a sharp increase in debt service costs.

Index linked debt may also influence the real debt service costs through other possible channels:

- Issuing index linked debt may further reduce real debt service cost by enhancing the government's credibility regarding the conduct of monetary policy; and
- market expectations of inflation may at times be less accurate than the government's own forecasts. If market expectations of inflation are higher than actual future inflation, government will ultimately pay less interest.

The design of index linked bonds

Index linked bonds can be defined as financial instruments designed to protect investors fully or partially against the erosion by inflation of the principal and interest due on their bond investments. A number of practical issues have to be resolved before a government or private-sector entity can issue index linked bonds. These include the choice of the price index, structure of security, time to maturity and the tax treatment of the interest and compensation for inflation.

Choice of the index

The choice of the index will depend on the needs of the issuer and investors. The issuer will want an index that fits well with its income stream expectations, and investors will want one that matches their expected spending flows. So the choice of an index is ultimately a compromise between the needs of potential borrowers and investors. There is no doubt that the preferences of certain groups of investors regarding the index will influence the demand for and also the amount of bonds issued, and therefore also the liquidity in the market for these bonds. In the United States the Treasury considered four price indices before issuing its first index linked bonds in January 1997. These indices were

- the consumer price index;
- the "core" inflation rate;
- the gross domestic product deflator; and
- the employment cost index of average wages.

Among the above indices, the consumer price index was the overwhelming choice of not only the United States but also all the countries that had issued index linked bonds. The main reason for this choice was that the consumer price index is well established in the financial markets and has legal status. However, the consumer price index has one drawback: it includes indirect taxes which can, in theory, be manipulated by the government just before the day of maturity.

Structure of the security

The choice of structure, like that of the index, also involves a compromise among interest groups to obtain the highest level of liquidity. Unlike the index, the structure of the bonds can be re-engineered after the bond has been issued. In the case of the United States, four different structures were considered:

- A zero-coupon bond whose payment is linked to the inflation index;

- a mortgage-type bond whose periodic interest plus principal are linked to the index;
- a fixed-coupon bond whose outstanding principal is linked to the index, also known as the "Canadian" model or capital-indexed bond; and
- a "floater" structure, similar to the Canadian model, except that the principal accrued is paid on each coupon date and not postponed until final maturity.

The most widely known model is the Canadian model or the capital-indexed bond used in Canada, the United States and the United Kingdom. The capital-indexed bond links the principal to the index.

Time to maturity

It is difficult to decide on the time to maturity for an index linked bond, as the size and maturity structure of existing stock should be taken into account. It seems, however, that the idea of indexation is most relevant for long-term bonds where investors face greater uncertainty about inflation. Institutions such as insurance companies and pension funds might be interested in securing real purchasing power over a period of two to three decades. However, this could decrease the liquidity of this kind of bond, as the market in most countries is normally more liquid in the ten-year maturity area.

Tax treatment of the interest and compensation for inflation

In terms of South African tax law, coupon interest and the adjustment made to the underlying capital in order to compensate for inflation, would be regarded as nominal yield and be taxed accordingly. Therefore the index linked bonds would not be completely risk-free for an investor who pays income tax: the real pre-tax yield would be certain but the real after-tax yield would depend on the actual tax rate.

Mechanics of a capital-index bond

The indexation of the capital-index bond occurs on the capital (principal) and the coupon becomes a fixed nominal percentage of the real value of the principal. Effectively, therefore, as the principal grows with the index, coupon payments also increase because the fixed coupon rate is multiplied by the accrued principal amount on each payment date. The accrued principal is paid in full at maturity. The principal value is adjusted by multiplying the value at issuance by an index ratio which changes in accordance with measured inflation. The index ratio for a particular date is equal to the price index number applicable to that date, divided by the index number at the date of issue.

For example, suppose the government launches a two-year bond with an initial nominal value of R1 000 on 15 December 1999. At that date, of course, the consumer price index for December 1999 is not yet available; the latest available consumer price index is for October 1999. At redemption on 15 December 2001 the latest available consumer price index would be for October 2001. The bond's initial nominal value is therefore linked to the consumer price index value recorded two months earlier. An inflation-adjusted nominal value is calculated on the basis of changes in the consumer price index, so as to keep the real value of the bond constant. Suppose that it pays coupon interest every six months at a rate of 5 per cent per annum of the adjusted nominal value. This translates into 2½ per cent, or a nominal coupon amount of R25 at initial prices, every six months. If the bond is issued at par, the cash flows are as indicated in the Table.

Hypothetical cash flows related to an index linked bond

Month	Consumer price index		Initial nominal value	Inflation adjusted nominal value	Interest: Adjusted nominal value times 2½%	Investor receives	Payment date
	1995=100	Oct 99 = 100					
			Rand	Rand	Rand	Rand	
Oct 1999.....	120,0	1,000	1 000	1 000	...	-1 000	15 Dec 1999
Apr 2000.....	124,0	1,033	1 000	1 033	26	26	15 Jun 2000
Oct 2000.....	130,0	1,083	1 000	1 083	27	27	15 Dec 2000
Apr 2001.....	135,0	1,125	1 000	1 125	28	28	15 Jun 2001
Oct 2001.....	141,0	1,175	1 000	1 175	29	29	15 Dec 2001
Oct 2001.....	141,0	1,175	1 000	1 175	...	1 175	15 Dec 2001

Consistency with monetary policy

In many cases in the past, governments have covered their borrowing needs largely, or exclusively, through recourse to central bank credit. Today, however, in most member countries of the Organisation for Economic Co-operation and Development (OECD) and in South Africa, this way of raising funds for the government is largely avoided, or rigidly controlled for reasons of general economic and monetary policy. Although index linked debt has the potential to contribute to the credibility of monetary policy, it should not be seen as an instrument which could help to reduce inflationary expectations and hence inflation, for it should never be seen as a substitute for a country's monetary track record and its proven commitment to low inflation.

Arguments for and against index linked bonds

Arguments for the issuing of index linked bonds include the following:

- Index linked bonds can protect the purchasing power of accumulated savings;
- other financial assets do not provide as good a hedge against inflation;
- it allows the issuer to annul the inflation-risk premium;
- it has the potential for encouraging saving;
- it expands the range of investment opportunities;
- the successful implementation of index linked government bonds could activate the development of an index linked corporate debt market;
- it allows the monetary authorities to obtain useful information about real interest rates and inflation expectations;
- it eliminates the incentive for the state to inflate the economy; and
- it satisfies the hedging needs of the state: as revenue is positively correlated with the inflation rate, expenditure also needs to be positively correlated with the inflation rate.

Arguments against the issuing of index linked bonds include the following:

- It may be viewed as an explicit admission of surrendering to inflation;
- such bonds can be replicated by alternative securities or strategies, for example the issuing of floating-rate bonds;
- it involves the risk for the investor that the index basket may lose its significance because of possible future changes;
- it could reduce saving as there may no longer necessarily be a precautionary demand for securities in response to the uncertainty about future inflation rates;

- the introduction of index linked securities by the Treasury might alter the rates of return on other assets and on balance the representative investor might be worse off;
- the success of such bonds has been limited in countries such as Argentina;
- if these bonds were superior to fixed income bonds, they would have been issued by private firms; and
- the introduction of index linked bonds entails the costs of information gathering and administration.

Measuring expected inflation

The above example clearly indicates that the indexed linked bond compensates the investor for the erosion of purchasing power and also pays a real rate of return. By contrast, conventional securities are generally issued at a fixed coupon rate which incorporates the underlying expected real rate of return in the economy, the market's expectation of inflation over the life of the instrument at the time when the security was issued, a premium to compensate for uncertainty about future rates of inflation and an adjustment reflecting the tax treatment of interest. If the latter is ignored for the moment, the nominal rate of return can implicitly be split into a real rate of return and an estimate of inflation over the period until the bond matures. The American economist, Irving Fisher, captured this in the identity:

$$i = r + \dot{p}$$

where i is the nominal rate of return, r the real rate of return and $\dot{p}$ the expected inflation rate. However, as this is rather simplistic, the Fisher identity above can be refined to:

$$i = r + \dot{p} + d$$

where d is a risk premium, based on the variability of inflation and factors such as tax treatment, and political and exchange rate risks.

On the one hand, investors in nominal bonds will receive the nominal rate (i) and bear the onus and risk of future inflation plus the inflation variability risk and factors such as tax treatment, political and exchange rate risks ($\dot{p} + d$). On the other hand, investors will receive the real rate (r) with certainty, but they will still bear the risks of changes in the tax treatment of interest income and political and exchange rate risks. The issuer will bear the cost associated with expected inflation and inflation volatility.

Indexed bonds can therefore be viewed as providing to investors a form of insurance, namely purchasing power insurance. Unfortunately, the empirical estimation of the premium d is complicated by the fact that both $\dot{p}$ and d are not observable. However, as these bonds, like conventional bonds, are traded in the secondary market, both yields will include key risks such as tax treatment, and political and exchange rate risks. Therefore the difference between the real yield on the inflation-indexed bond of a certain maturity and the nominal yield of a conventional bond of the same maturity will be an indication of expected inflation and the inflation variability risk factor. The nominal rate equals the real rate plus the forward inflation rate; the latter is wider than expected inflation, and is equal to the expected inflation rate plus a risk premium (or a risk discount) that depends on the variances and covariances of the risk factor and on the degree of risk aversion of economic agents.

If, very simplistically, the assumption is made that the effective inflation rate is always equal to the expected inflation rate, the risk premium will be zero and the difference between the real interest rate and the nominal interest rate will be equal to the expected inflation rate. As stated above, this is a very simplistic assumption and as soon as enough data on directly measured inflation expectations are available, risk can be assessed empirically using standardised mathematical models (De Cecco et al.). More realistically, in the interim, it can be assumed that the difference between the nominal interest rate and real (index linked) rate is proportional to (but not equal to) the expected inflation rate; the expected inflation rate is probably somewhat lower than the difference.

Introducing inflation linked bonds in South Africa

The monthly average of nominal yields on long-term South African government bonds in the first half of 1999 fluctuated in the region of 14,5 to 15,9 per cent per annum. Adjusted by using the historical core inflation rate as proxy for expected inflation, this implies a real rate of around 6,6 to 8,0 per cent per annum, employing the subtraction method. As indicated above, this "real rate" in fact includes an element of compensation for risk on account of inflation's volatility.

If expectations of future inflation differ significantly from the latest historical inflation rate, this calculation should of course be adjusted accordingly, although the problem is that expected inflation is not directly observable. If the issuers of debt instruments have an expectation of future inflation deviating substantially from the average expectation among investors, issuing (or not issuing) inflation-linked bonds gives the issuers an opportunity to capitalise on the differing expectations.

It appears quite possible that South Africa is heading towards structurally lower inflation than the annual average rate of 7,8 per cent established in the past four years. Several reasons for such optimism may be noted:

- Firstly, in the Constitution and in the South African Reserve Bank Act, the South African Reserve Bank has been given the task of combating inflation and is fully committed to performing this task in a responsible way.
- Secondly, the Growth, Employment and Redistribution strategy (GEAR) is strongly endorsed by government, which is therefore committed to prudent fiscal policies and the elimination of various constraints on the expansion of aggregate supply and employment.
- Thirdly, and related to the GEAR strategy, is the discipline imposed by South Africa's stronger international linkages. Reduced tariffs and other barriers to trade increase the level of competition that domestic producers face and limit their ability to change prices. It also makes it easier to import cost-reducing technologies.

International financial account liberalisations mean that investors can convert their rand-denominated assets into alternative currencies if they become suspicious of South Africa's macroeconomic policies, thus imposing additional discipline on policy makers. To ensure that a comprehensive picture of the economic environment and policies is disseminated to investors on a timely basis, macroeconomic information is released in a manner that meets the specifications of the Special Data Dissemination Standard of the International Monetary Fund. Private-sector analysts worldwide are accordingly well informed about changes in the South African economic situation, and would be quick to react to prospects of deteriorating inflation.

Tactical issues

If the South African authorities were to decide to issue inflation linked bonds, a number of important tactical questions would need to be addressed. These include the number, size and maturity of the issues, as well as the coupon rate of interest attached to the bonds and the taxation of these bonds.

From the point of view of the South African taxpayer, benefits would be optimised if the real rate on the bonds was as low as possible at issue. It follows that the issues would have to be structured in a way which would reduce as far as possible the illiquidity premiums perceived by investors. It would be prudent at the outset to limit the number of issues – for example by launching just a ten-year bond, and by making it known to investors that the issue of specific stock would be gradually expanded through net selling into the market, which would not exceed a certain amount per annum. This would address the fears of investors who are wary of being caught long in a bond, if the authorities should suddenly decide to expand the supply greatly. It would also be helpful if private-sector entities were appointed to make a market in the inflation linked bonds on a continuous basis. The availability of these bonds in small denominations to tap the market for individuals seeking certainty might also be helpful, but would involve substantial administrative costs.

It is generally admitted that the only economically fair taxation of interest would be a tax levied on the real interest component of total interest accrued. In an imperfect world, however, such treatment solely for inflation indexed bonds would give them an unfair tax advantage over conventional bonds. In practice, therefore, the tax on the interest income derived from inflation linked bonds could be expected to be levied on the sum of the coupon interest paid and the nominal revaluation of the underlying capital amount. As with conventional bonds, the major holders of indexed bonds could therefore be expected to be tax-exempt institutions and institutions subject to a comparatively low tax rate on all interest income, such as retirement funds. To this may be added individuals making use of the R2 000 per annum tax-exempt interest income allowance, and individuals earning comparatively little income overall and desiring a high degree of certainty about the purchasing power of their savings.

As with conventional bonds, a higher coupon rate of interest would lead investors to bid up the price of the indexed bonds at issue, perhaps to a higher level than the initial nominal value stipulated on the bond. A lower or zero-coupon rate would have the opposite effect. To arouse the interest of savers who need the cash flow income from their savings to maintain their standard of living but wish to maintain the real value of their capital, it would be advisable to rule out a zero-coupon rate and instead, set this rate at a level considered to lead to minimal discount or premium at issue.

Concluding remarks

Notwithstanding the arguments against the issuing of index linked bonds, a case can be made for the inclusion of index linked bonds in government's portfolio of liabilities if these bonds are introduced at a time when financial stability is improving and monetary and fiscal authorities are committed to prudent policies. It is difficult to estimate how large the proportion of index linked debt in government's portfolio should be. This would depend on the depth of the market, as index linked debt is normally held by institutional investors who seek to match liabilities defined in real rather than nominal terms. In terms of risk, index linked bonds could provide government with a hedge against high *ex post* real borrowing costs, while providing a long-term, low-risk hedge against inflation for investors with long-term real liabilities.

Index linked bonds also have the potential to contribute to the credibility of monetary policy and to provide valuable information about inflation expectations and real interest rates.

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