Danmarks Nationalbank

Government Debt Management

The Kingdom of Denmark's New Inflation-Linked Bond

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Introduction

On 24 May 2012, the Kingdom of Denmark opens an inflation-linked bond maturing in 2023. This will allow investors to invest in a safe asset with a return that mirrors the development in Danish consumer prices. With the introduction of inflation-linked government bonds, the government expands its on-the-run issues so as to attract a wider group of investors. The primary focus will still be on ensuring liquid nominal on-the-run issues, and the inflation-linked bond should be seen as a supplement to the existing on-the-run issues.

This bond is opened in response to indications of investor interest, especially from the Danish insurance and pension sector. The strategy is to build up the series to at least kr. 20 billion via current auctions. A market-making arrangement and the government's securities lending facility will contribute to the liquidity of the series. In the longer term, the series is expected to be included in international indices of inflation-linked bonds.

What is an Inflation-Linked Bond?

Traditional government bonds are fixed-rate bullet loans for which coupon and redemption payments in kroner are known beforehand. However, the future purchasing power of the return on such bonds is unknown as it will depend on future price developments. In contrast, the principal of an inflation-linked bond is regularly adjusted to reflect developments in consumer prices. This ensures the future purchasing power. Expressed in per cent, the yield on an inflation-linked bond remains fixed, but the actual yield payable is calculated on the basis of the indexed principal, which varies over time.[1]

If there is inflation over the maturity of the inflation-linked bond, the indexed principal – and hence the yield payable – will increase over time. Conversely, if there is deflation, the indexed principal will be reduced over time and the interest payable will decline. However, inflation-linked bonds usually have a "deflation floor" which ensures investors that the loan is always repaid at or above par when the bond matures. This also applies to the new Danish inflation-linked bond.

There exists an international market standard – known as the Canadian model – defining how indexation takes place. The Danish inflation-linked bond will comply with this international format. In Europe, countries such as Germany, France, Italy, the UK and Sweden issue inflation-linked bonds that – with marginal variations – comply with the Canadian model. The main characteristics of the international standard are as follows:

- The principal is linked to developments in consumer prices. The current interest payments make up a fixed share of the indexed value of the principal on the payment date (for the Danish government's new inflation-linked bond, the annual coupon rate is 0.1 per cent).
- A lagged consumer price index ("reference index") is used to calculate the indexed principal at a given time. This is done to ensure that statistics are available well ahead of the time of calculation. The lag will be 2-3 months, depending on the payment date.[2] The reference index is calculated on a daily basis by linear interpolation between the monthly releases of consumer price data.
- The bonds are bullet loans; this means that the loan is redeemed in full when it matures. Hence, no redemption takes place during the term of the loan.

RISING STRUCTURAL DEMAND FOR INFLATION-LINKED BONDS

Institutional investors often see assets for which the nominal return is closely linked to changes in the level of prices as a separate asset class. Within this asset class (often simply referred to as "inflation"), investments are made in

[1] Some government issuers, such as Italy, also issue floating-rate notes (FRN). For such notes, the principal is fixed, as it is for a fixed-rate bond, but the coupon rate varies over time (e.g. in line with a money-market interest rate). For an index-linked bond, on the other hand, the indexed principal varies over time, while the coupon rate payable on this principal remains fixed.

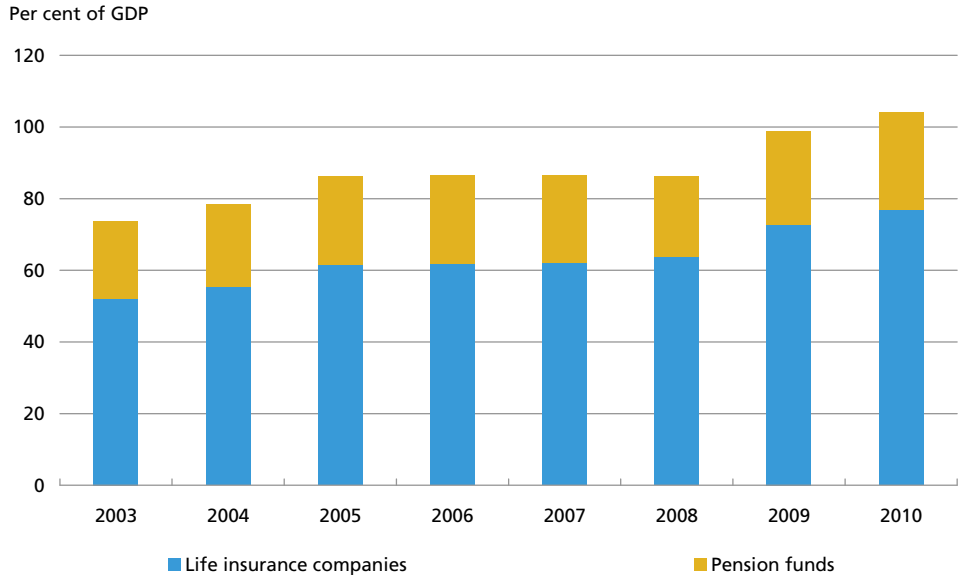
[2] For technical details, see section 10.3 of *Danish Government Borrowing and Debt 2011*, Danmarks Nationalbank.

e.g. property and infrastructure. Inflation-linked bonds also constitute a significant element of such portfolios.

The transition to pension schemes without nominal guarantees in parts of the Danish pension sector has, to some degree, changed the focus of investment strategies. Management of the pension sector's growing assets is now to a large extent aimed at ensuring the long-term purchasing power of pensions rather than achieving specific nominal returns. As a result, inflation-linked assets meet a rising structural demand from the Danish pension sector, among others. Government Debt Management has received a number of indications of investor interest in krone-denominated inflation-linked bonds.

Moreover, the balance sheets of Danish pension companies are still growing and now exceed 100 per cent of GDP, cf. Chart 1. Ever larger balance sheets and increased focus on the purchasing power of pensions will presumably lead to continued demand for inflation-linked bonds in the coming years.

DANISH PENSION COMPANIES' TOTAL ASSETS — Chart 1



Note: Balance-sheet total at year-end as a percentage of GDP at current prices.
Source: Danish Financial Supervisory Authority and Statistics Denmark.

Foreign institutional investors have also expressed an interest in inflation-linked Danish government bonds. This often reflects a wish to hedge inflation risk without assuming significant credit risk.

WHAT ARE THE ADVANTAGES TO THE CENTRAL GOVERNMENT OF ISSUING INFLATION-LINKED BONDS?

The government's main reason for issuing inflation-linked bonds is to ensure a broad and stable investor base. By issuing long-term inflation-linked bonds, the central government can attract part of the increased structural demand from stable long-term investors. This contributes to the robustness of government debt policy and helps to keep the government's long-term borrowing costs low.

Government Debt Management aims for current issuance in the inflation-linked bond, and a market-making arrangement will be established.[1] This

[1] A market maker offers liquidity by quoting both bid and ask prices for an asset.

means that market prices for the bond can be continuously observed. Demand for the central government's existing nominal on-the-run issues is expected to remain unchanged at a strong level since investors often see inflation-linked bonds as a separate asset class.

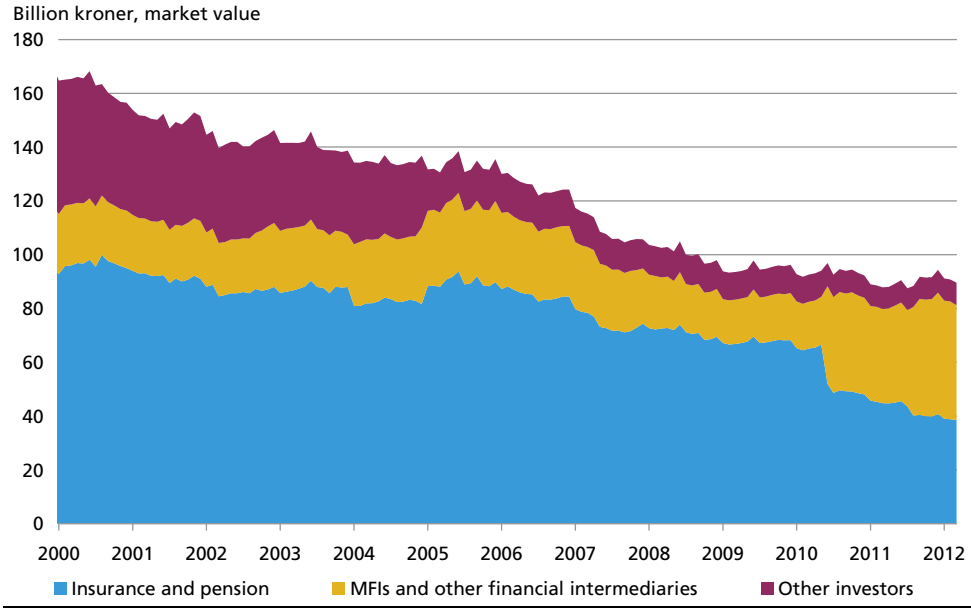
The Market for Inflation-Linked Government Securities

Historically there has been a substantial market for inflation-linked debt in Denmark.[1] But since 2000 issuance of Danish inflation-linked bonds has been negligible. Internationally, on the other hand, there has been significant growth in the outstanding volume of inflation-linked bonds over the last 10 years, although the financial crisis led some countries to focus on issuance in the more liquid nominal securities rather than inflation-linked bonds.

THE DANISH MARKET FOR INFLATION-LINKED BONDS

In 1982, the first inflation-linked bonds (IS series) were issued to finance subsidised housing construction. Subsequently, inflation-linked agricultural loans and ship finance loans, among others, were also issued. However, the IS bonds made up the lion's share of the market and had the longest maturities (up to 50 years) so that they still exist. For a number of years, inflation-linked bonds enjoyed tax advantages under the system of real interest rate tax. When these tax advantages were abolished, issuance ceased and the market shrank considerably over time, cf. Chart 2. Trade and liquidity in the remaining outstanding volume of approximately kr. 94 billion is very modest. So in recent years Danish investors with an appetite for inflation-linked bonds have turned their attention to other countries.

OWNERSHIP DISTRIBUTION OF INFLATION-LINKED DEBT ISSUED IN DKK — Chart 2



Note: Other investors include portfolios held by the general government (e.g. social security funds) and by households.
Source: Securities statistics, Danmarks Nationalbank.

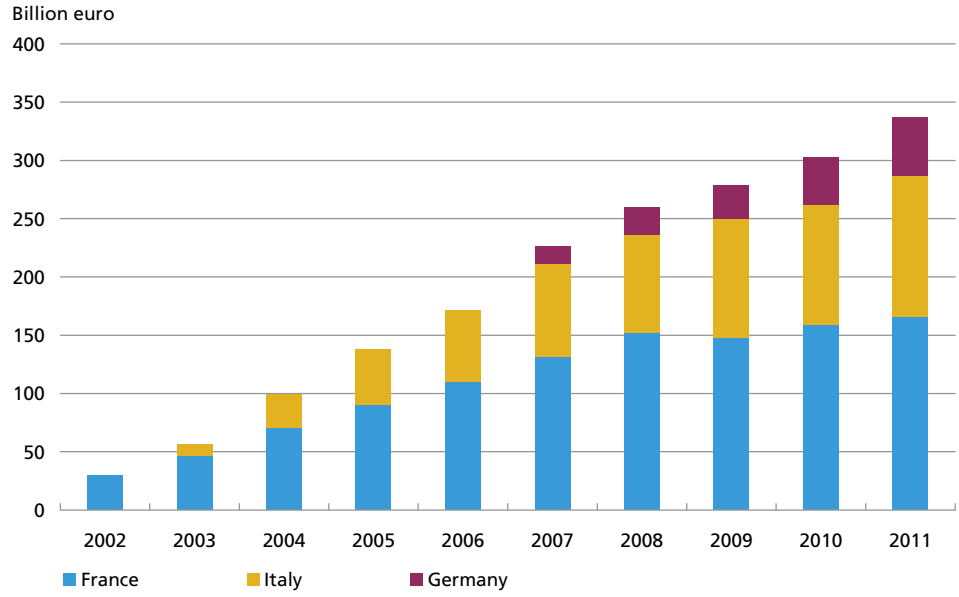
[1] See J. V. Andersen and J. Gyntelberg, Index-Linked Mortgage Bonds, Danmarks Nationalbank, *Monetary Review*, 1st Quarter 1999.

THE INTERNATIONAL MARKET FOR INFLATION-LINKED GOVERNMENT SECURITIES

The outstanding volume of inflation-linked euro area government bonds has grown considerably over the last 10 years, cf. Chart 3. At end-2011, the total outstanding volume of inflation-linked government bonds in the largest three euro area member states amounted to 337 billion euro, more than 10 times the volume at end-2002. At end-2011, inflation-linked bonds as a share of the total outstanding volume of domestic government bonds was 13 per cent in France, 10 per cent in Italy and 5 per cent in Germany.[1] A number of non-euro area member states also have a substantial share of inflation-linked bonds in their government debt portfolios. In both the UK and Sweden, inflation-linked bonds make up around one fourth of the outstanding volume of government bonds. Outside Europe, the USA, Brazil, Japan, Canada and Israel in particular have large outstanding volumes of inflation-linked government bonds.

Inflation-linked bonds are usually issued at long maturities since investors typically use them to hedge long-term commitments. This means that the issuer's credit rating is even more important to price formation than for nominal bonds.[2] The large budget deficits in the wake of the financial crisis have weakened the credit ratings of many government issuers, which has made it relatively more expensive for some countries to issue long-term securities, including inflation-linked bonds.

OUTSTANDING INFLATION-LINKED GOVERNMENT BONDS — Chart 3



Note: Stated at indexed value.
Source: National debt management offices.

1 Calculations of percentages are based on the indexed value of the index-linked bonds.
2 Besides the long maturities in themselves, payments on index-linked bonds have been shifted towards the maturity date. The reason is that nominal interest payments are always lower initially for index-linked bonds than for nominal bonds with the same maturity. Conversely, payments on maturity are typically higher for index-linked bonds because the principal can be adjusted upwards.

Implications for the Interest-Rate Sensitivity of Government Debt

The introduction of inflation-linked bonds affects the central government's risk profile. In Denmark's case, with inflation-linked bonds constituting only a small part of the total outstanding volume, the effect on the risk profile will, however, be marginal.[1] Whether inflation-linked bonds contribute to reducing the interest-rate risk on government debt depends on several factors, including the risk perspective.

Issuance of inflation-linked bonds increases the *nominal* interest-rate risk compared with issuance of fixed-rate bonds with the same maturity. The reason is that the central government's interest costs on the indexed part of the debt are variable in nominal terms – as they are for variable-rate debt.

In a broader risk perspective, however, with focus on interest costs as a share of GDP, inflation-linked debt may in fact contribute to reducing the central government's aggregate interest-rate risk. This is because inflation-linked debt dampens fluctuations in the debt ratio, since nominal GDP and the indexed part of the debt are affected in the same way by price developments.

THE RISK IMPACT DEPENDS ON THE TYPE OF SHOCK

A broad risk perspective, which includes not only interest costs, but also the central government's other budget items, inflation-linked bonds may either dampen or amplify fluctuations in the government budget balance. The effect depends on whether the economy is hit by demand-side or supply-side shocks.

In the event of a negative demand-side shock, lower inflation – and thus reduced interest costs on the indexed part of the debt – will coincide with relatively low economic growth and hence deterioration of the primary budget balance. This means that interest costs on the inflation-linked bond are low when the central government's primary balance deteriorates – and vice versa. In this way, inflation-linked bonds help to stabilise the government budget balance. In theory, this has favourable macroeconomic effects, as the need for welfare-reducing fluctuations in tax rates, etc. declines.[2]

Supply-side shocks, such as an oil crisis, have the opposite effect. Negative supply-side shocks impede economic growth, and public finances will deteriorate. At the same time, interest payments on inflation-linked bonds increase because prices go up. All other things being equal, this amplifies fluctuations in the government budget balance.

The future relative strengths and frequencies of demand-side and supply-side shocks are not known. This indicates that a diversification gain can be achieved by issuing both nominal and inflation-linked government bonds, to the extent that the issuance requirement is sufficient to ensure liquidity in both instruments. A fairly recent Canadian analysis finds that a certain share of inflation-linked bonds reduces the aggregate interest-rate risk.[3]

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1 The index-linked bond will be built up to at least kr. 20 billion. The total outstanding amount of domestic government securities was kr. 651 billion by end-2011.

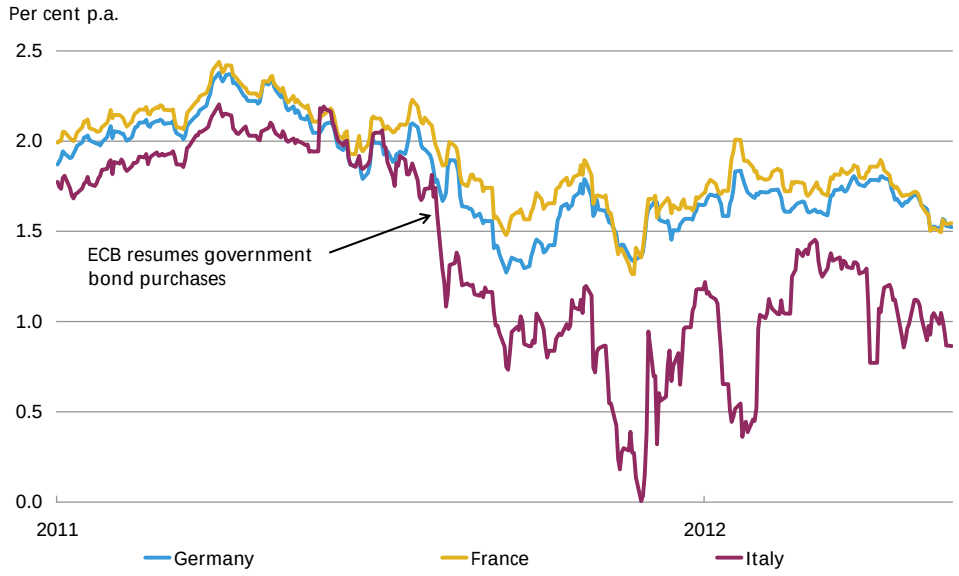
2 See A. Missale *The Fiscal Insurance Approach to Debt Management*, 2011, for an overview of recent literature on the interaction between fiscal policy and government debt policy.

3 See D. Bolder and S. Deeley, *The Canadian Debt-Strategy Model: An Overview of the Principal Elements*, Bank of Canada discussion paper no. 3, 2011.

Inflation-Linked Bonds and Market-Based Inflation Expectations

The yield on inflation-linked bonds is often used for calculating market-based indicators of inflation expectations. A frequently used indicator, break-even inflation, can be calculated by deducting the yield to maturity on an inflation-linked bond from the yield to maturity on a nominal government bond with a similar maturity, cf. Chart 4. In future it will also be possible to calculate this indicator for Denmark.

10-YEAR BREAK-EVEN INFLATION FOR THE EURO AREA — Chart 4



Note: Based on bonds maturing in 2020 (Germany and France) and 2021 (Italy). The inflation-linked bonds in question are all linked to the development in HICP excluding tobacco for the euro area.
Source: Barclays Capital and own calculations.

BREAK-EVEN INFLATION IS INFLUENCED BY MARKET DISTORTIONS

However, there are a number of methodological complications linked to interpreting break-even inflation purely as inflation expectations. Firstly, the yield spread between nominal and inflation-linked bonds also includes an inflation risk premium. This is the excess yield that market participants require in return for being exposed to fluctuations in the future purchasing power of a nominal claim.

Secondly, temporary price distortions between nominal and inflation-linked bonds are also reflected in break-even inflation. This is most pronounced in periods of significant market stress. Heavy demand for the most liquid benchmark bonds may contribute to strong declines in nominal yields for the most creditworthy issuers.

An even stronger effect has been seen on break-even inflation derived from Italian government bonds, which dived after the ECB resumed its purchases of

(nominal) government bonds in August 2011.[1] The effect of distortions of break-even inflation is parallel in the two cases, although the background to the "excess demand" for nominal securities is different.

Since all three indicators of inflation expectations shown in Chart 4 refer to the same underlying price index (HICP excl. tobacco for the euro area) and to comparable maturities (approximately 10 years), it is clear that other factors besides fundamental inflation expectations influence break-even inflation. Indicators of inflation expectations derived from the bond market should therefore be interpreted with caution. This also applies to indicators based on the new Danish government bond.

[1] Finally, rising government risk premia may contribute to lower break-even inflation. This is attributable to the above-mentioned shift in payments on index-linked bonds towards the date of maturity. If the credit risk premium is rising over the maturity of the bond, this shift means that the impact on the real yield will be greatest when the credit risk premium rises. This leads to lower break-even inflation. This effect can be eliminated by comparing nominal and real yield curves rather than the yield to maturity for individual securities.

The Next Steps

On Thursday, 24 May, Danmarks Nationalbank will hold the opening auction for the government's new inflation-linked bond. The maximum volume to be sold at the auction will be kr. 6 billion. The strategy is to build up the series to at least kr. 20 billion. The inflation-linked bond will be included in the key on-the-run issues as the 10-year inflation-linked benchmark bond. Like other key on-the-run issues, this bond will be offered regularly at the ordinary auctions of government securities. In these auctions, government securities are sold to investors via the central government's primary dealers. Government Debt Management provides information about future auctions at www.governmentdebt.dk.