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DANISH GOVERNMENT BORROWING AND DEBT

2013

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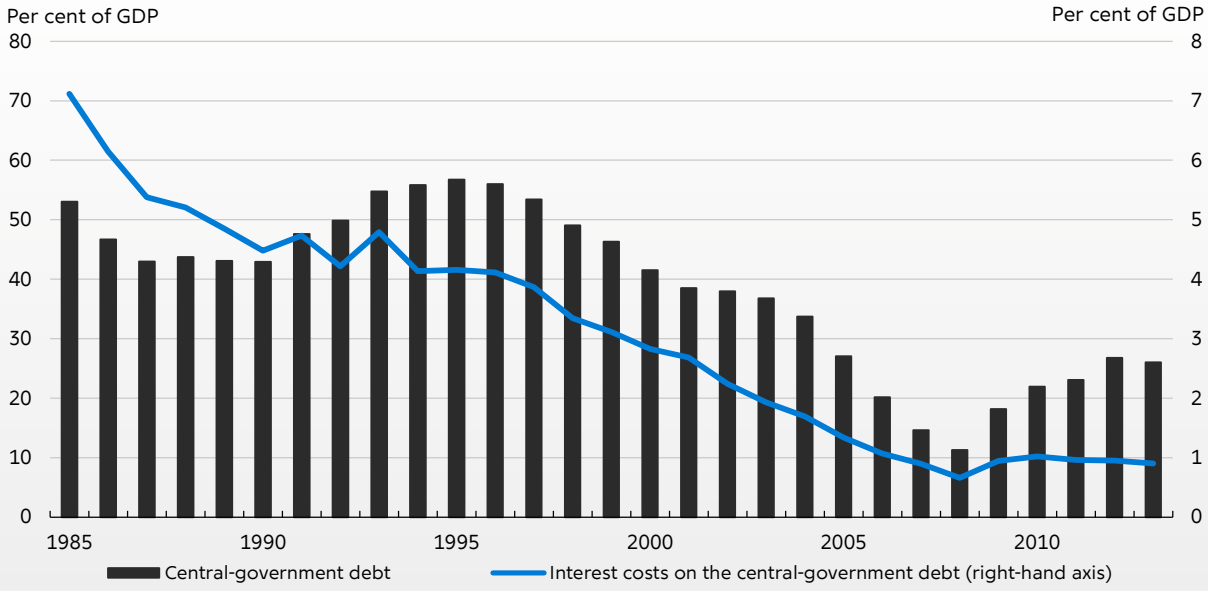
HIGHLIGHTS OF GOVERNMENT DEBT POLICY

Denmark has a low central-government debt by international standards and conducts a robust government-debt policy focusing on ensuring low borrowing costs for the central government, low sensitivity to rising interest rates and modest refinancing risk. In practice, this strategy is implemented by:

- Issuing government securities that are attractive to a broad group of investors.
- Covering most of the central government's refinancing requirement by issuing bonds with long maturities.
- Maintaining large liquidity reserves e.g. by continuing to have a large balance on the central government's account at Danmarks Nationalbank.

Combined with healthy public finances, the low central-government debt has helped to ensure that all major credit rating agencies still give the Danish government's domestic and foreign debt the highest possible rating (AAA/Aaa) with a stable outlook.

Central-government debt and interest costs Chart 1



LOW CENTRAL-GOVERNMENT DEBT AND LOW INTEREST COSTS

At end-2013, Danish government debt amounted to kr. 487 billion, corresponding to 26 per cent of GDP or kr. 87,000 per capita. The interest costs on the central-government debt totalled kr. 17 billion, or 0.9 per cent of GDP in 2013. The central government's interest costs have been maintained at a low level despite the debt increase since 2008, cf. Chart 1. The reason is that redemptions on existing debt and government deficits are financed at very low interest rates.

The sensitivity of the central government's interest costs to rising interest rates is low. If interest rates rise by 100 basis points, interest costs are forecast to increase by only 0.15 per cent of GDP towards 2018. This emphasises that a negative interest cost/debt spiral is unlikely to be triggered by the central-government debt portfolio unless deficits deteriorate. Moreover, the low and slow pass-through ensures that there will be time to make the necessary fiscal adjustments.

LOW DANISH CENTRAL-GOVERNMENT DEBT BY INTERNATIONAL STANDARDS

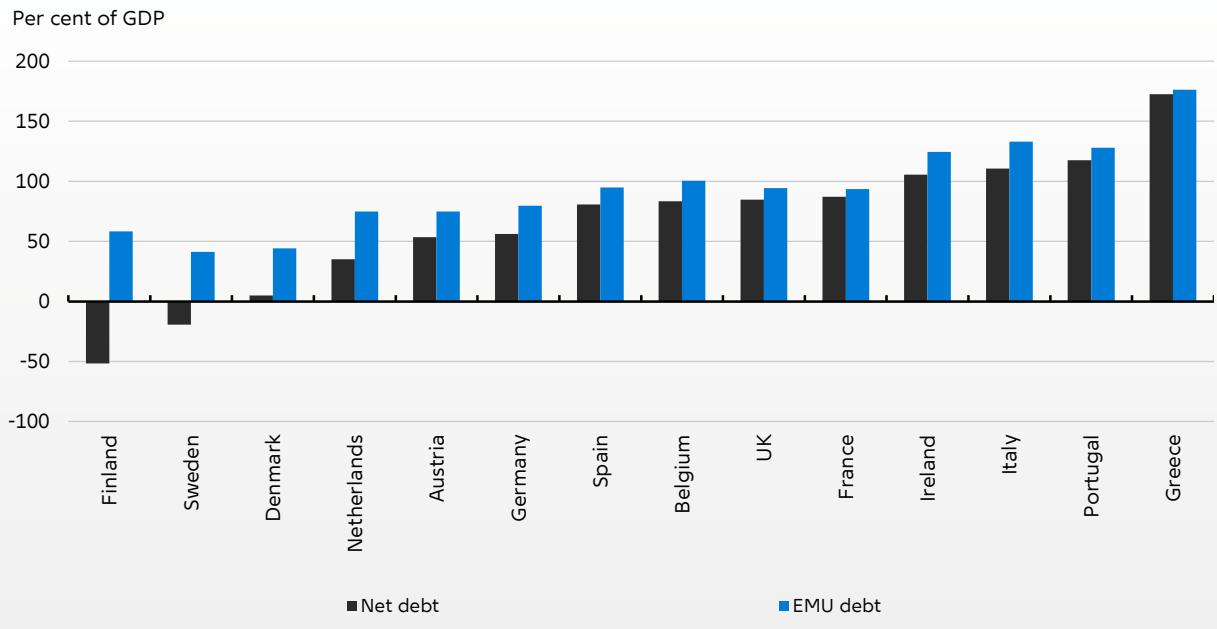
The gross general-government debt (EMU debt) and the net general-government debt are often used in international comparisons of sovereign debt. At end-2013, the Danish EMU debt amounted to 44 per cent of GDP, while net debt amounted to 5 per cent of GDP. These levels are low compared with those of most other European countries, cf. Chart 2.

SOLID DEMAND FOR DANISH GOVERNMENT SECURITIES

In 2013, Danish government yields to a large extent mirrored those of Germany. They rose slightly during the year, cf. Chart 3, but remained at a very low level in a historical perspective. The yield spread between Danish and German government bonds was still among the narrowest in Europe, and at times Danish government yields were lower than the equivalent German yields.

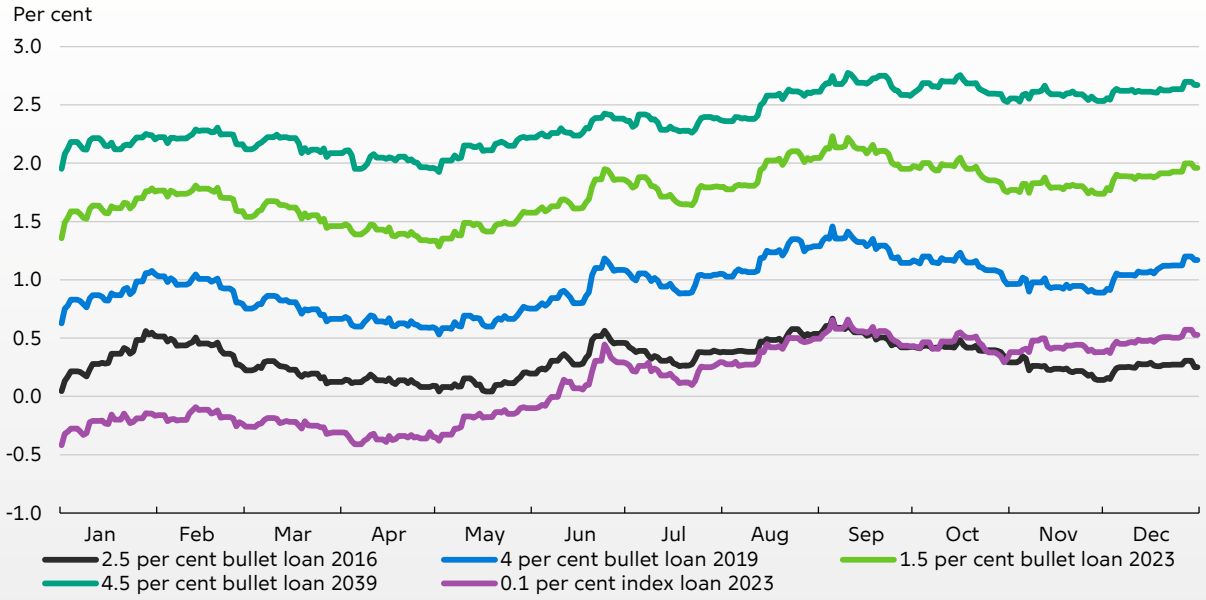
The central government issued in 2013 domestic bonds for kr. 79 billion at an average yield to maturity of 1.4 per cent for nominal

EMU debt and net debt in selected EU member states, end-2013 Chart 2



Note: Net debt is based on forecasts from the IMF, while gross debt is based on European Commission forecasts.
Source: IMF World Economic Outlook, October 2013, and European Commission's autumn forecast, November 2013.

Yield to maturity on the central government's on-the-run issues Chart 3



Note: For 0.1 per cent index loan 2023, the real yield is shown.

bonds and an average maturity of just under 10 years. In line with the strategy, issuance predominantly took place in the 10-year maturity segment, especially the nominal 10-year bond. Demand was high in the government-bond auctions, with bids averaging twice the volume sold.

Issuance in the 10-year inflation-linked bond opened by the central government in May 2012 amounted to just under kr. 13 billion, bringing the total outstanding volume up to a sufficient level to be included in the Barclays index of inflation-linked government bonds. On average, issuance in the inflation-linked bond took place at a real yield to maturity of 0.3 per cent.

In accordance with the strategy, the outstanding volume of T-bills was reduced to kr. 32 billion at year-end, from kr. 45 billion one year earlier. Throughout most of the year, T-bills were issued at negative rates of interest. To increase liquidity in the individual series, the T-bill programme was adjusted in 2013, so that issuance now takes place in two series with maturities not exceeding six months, rather than in three series with maturities of up to nine months.

BOND ISSUANCE IN 2014 WILL PRIMARILY BE AT LONG MATURITIES

The central government's domestic financing requirement is forecast at kr. 84 billion, mainly reflecting redemptions on domestic debt. The 2015 financing requirement is expected to be somewhat higher. In order to ensure investor interest, it is important to avoid large year-on-year fluctuations in sales of government securities. Consequently, the strategy for 2014 is to maintain the targets from 2013 despite the reduced financing requirement. This means that the central government will begin to finance its issuance requirement for 2015 already in 2014.

The target for sales of government bonds in 2014 has been set at kr. 75 billion, while the target for outstanding T-bills is kr. 30 billion at end-2014.

Issuance continues in the 2-, 5-, 10- and 30-year nominal maturity segments and in the 10-year inflation-linked segment. In the 2nd quarter of 2014, a new 10-year bond maturing in November 2025 will be opened, cf. Table 1. The strategy is to issue predominantly in the 10-year maturity segment in order to keep interest-rate and refinancing risk at a low level.

Key on-the-run issues, 1st half of 2014 Table 1

Segment	Key on-the-run issues, beginning of 2014	New key on-the-run issue
Maturity < 1 year	T-bills	
2-year segment	2.5 per cent bullet loan 2016	
5-year segment	4.0 per cent bullet loan 2019	
10-year segment	1.5 per cent bullet loan 2023	x per cent bullet loan 2025
30-year segment	4.5 per cent bullet loan 2039	
10-year inflation-linked bond	0.1 per cent inflation-linked loan 2023	

THE ADDITIONAL COST OF ISSUING LONG-TERM BONDS IS MODERATE

The expected additional cost of issuing long-term rather than short-term bonds is referred to as the term premium. A special-topic chapter (Chapter 9: Significance of Term Premia for the Central Government as Issuer) provides an account of theories about the existence of a term premium, taking Danish market conditions as the point of departure. Based on estimations in a dynamic, stochastic interest-rate model on Danish government yields, term premia over the last 15 years are illustrated. The assessment is that the current level of term premia is moderate and somewhat lower than the historical level. This is part of the reason why the central government currently maintains a long duration of its debt. For 2014, the central government's interest-rate risk is managed within a target band of 11.5 years ± 1 year for the average duration of the central-government debt, calculated without discounting.

ISSUANCE IN FOREIGN CURRENCIES

The strategy is to continue foreign borrowing in the coming years with the aim of ensuring market access and expanding the investor base. In 2014, the strategy is to raise a foreign loan with final exposure in euro for up to kr. 10 billion. The currency and timing of issuance will depend on the market conditions and investor interest. With redemptions of kr. 26 billion, the foreign debt is expected to be reduced further in 2014.

Limited issuance takes place in foreign loans with short maturities (Commercial Paper) to maintain investor interest and market access.

THE CENTRAL GOVERNMENT HAS SWITCHED TO TWO-WAY COLLATERAL

In 2013, the central government concluded new two-way collateral agreements (CSAs) with many of its counterparties. Negotiations with the remaining counterparties will continue in 2014. Higher financing costs for banks and new regulation of the financial sector entail that by using two-way collateral the central government can obtain better conditions when concluding swaps. Furthermore, the central government's switch to two-way collateral is in line with the new European swap market regulations.

SWITCH TO INTEREST-RATE SWAPS BASED ON CITA OR EONIA

The central government concludes interest-rate swaps as part of the management of interest-rate risk on its debt. Until the financial crisis, interest-rate swaps under which the variable payments are determined by a 6-month uncollateralised money-market interest rate were the standard in the interest-rate swap market. The central government's existing interest-rate swaps have also been concluded with variable interest payments based on 6-month Cibor or Euribor. During the financial crisis and the sovereign debt crisis, the spread between uncollateralised and collateralised money-market

Primary dealers in Danish government securities Table 2

Primary dealers in government bonds	Primary dealers in T-bills
Barclays Bank	Danske Bank
BNP Paribas	Nordea
Danske Bank	Nykredit Bank
Deutsche Bank	SEB
HSBC	Sydbank
J.P. Morgan	
Morgan Stanley	
Nordea	
Nykredit Bank	
SEB	
Spar Nord Bank	
Sydbank	

interest rates widened significantly. Since then, interest-rate swaps with the variable interest payments being determined by an overnight money-market interest rate, such as Cita or Eonia, have gained ground.

Interest-rate swaps based on very short-term money-market interest rates reduce the central government's instrument risk and offer a better match between interest rates on assets and liabilities. So going forward, the central government will conclude interest-rate swaps based on Cita or Eonia.

HIGH LIQUIDITY IN DANISH GOVERNMENT SECURITIES

Liquidity in Danish government securities is analysed in a special-topic chapter (Chapter 8: Liquidity in Danish Government Securities). The conclusion is that liquidity is high for all maturity segments and that it is particularly high for bonds with short remaining maturity, a large outstanding volume and benchmark status. The analysis also shows that liquidity varies over time and deteriorates at times of strong market turmoil. However, this applies to the vast majority of assets, and even in periods of heightened uncertainty investors have been able to trade Danish government bonds at relatively low costs. Although liquidity is to a large extent determined by exogenous factors, the government contributes to a liquid market for government securities via its choice of issuance strategy and market structure design.

PRIMARY DEALERS SUPPORT THE MARKET FOR DOMESTIC GOVERNMENT SECURITIES

The central government has entered into primary dealer contracts with a number of regional and international banks, cf. Table 2. Primary dealers support the market for domestic government securities by acting as counterparties to the central government's transactions in the primary market, by quoting prices in the secondary market on an ongoing basis and by distributing and marketing Danish government securities to investors.

Danish government securities are primarily sold via auctions. Investors can buy on-the-run issues at the auctions by submitting bids via one of the central government's primary dealers.

REPORT SECTION

1

DOMESTIC BORROWING

Yields on Danish government securities were very low in 2013. Yield spreads to Germany remained among the lowest in Europe and were negative for several maturity segments at times during the year. This reflected continued investor confidence in Denmark, which is one of the few countries to maintain a stable AAA credit rating from the largest rating agencies.

The central government issued bonds for kr. 79 billion in 2013, and the outstanding volume of T-bills was kr. 32 billion at year-end. In accordance with the strategy of the year, most of the bonds were issued in the 10-year maturity segment.

In 2014, the target for issuance of domestic government bonds is kr. 75 billion. The target for the outstanding volume of T-bills at year-end is kr. 30 billion. The target for issuance within any one year takes into consideration the expected financing requirement over several years. This contributes to stabilising central-government issuance over a number of years. Issuance will continue in the 2-, 5-, 10- and 30-year nominal maturity segments and in the 10-year inflation-linked segment. Bond issuance is expected mainly to take place in the long maturity segments.

SOVEREIGN DEBT MARKETS IN 2013

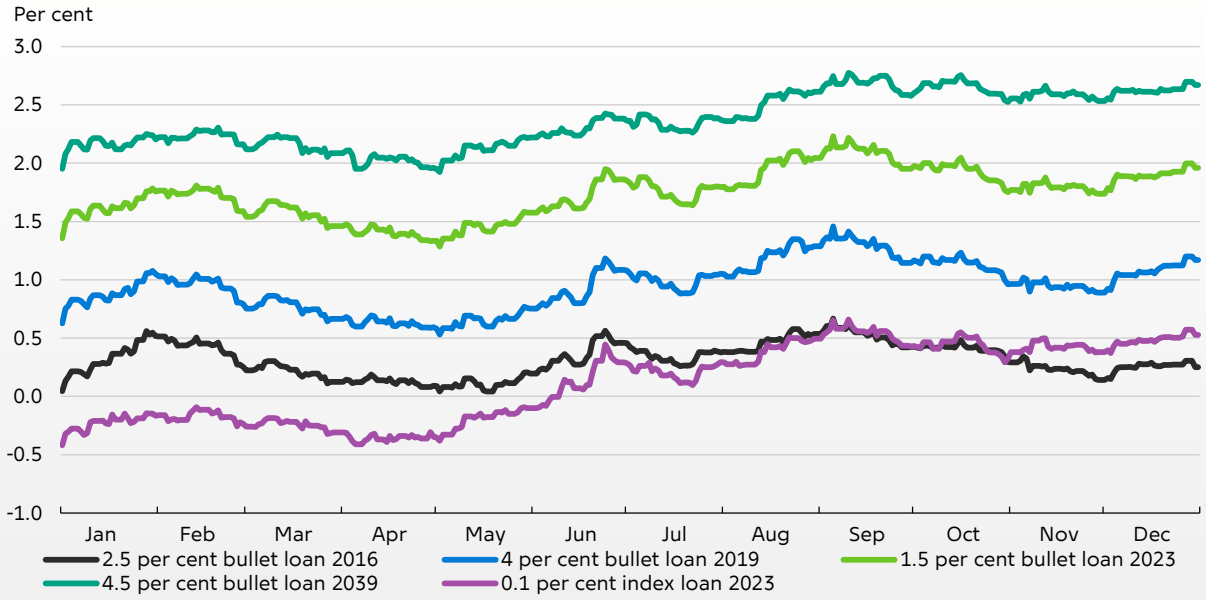
Danish government yields rose slightly in 2013, but viewed in a historical context they remained at very low levels. The increase was strongest in the longer maturity segments, cf. Chart 1.1. Danish government yields to a large extent mirrored developments in the international sovereign debt markets, which were mainly affected by speculations about the timing of the Federal Reserve's phasing out of quantitative easing, and by the European Central Bank's, ECB's, OMT purchasing programme, which helped to calm down the European sovereign debt markets.

STRONG FOCUS ON THE FEDERAL RESERVE IN 2013

Following indications from the then Federal Reserve Chairman, Ben Bernanke, that the Fed would soon begin phasing out its asset purchases, US 10-year government yields rose by approximately 1 percentage point from May to mid-September, cf. Chart 1.2. Contrary to market expectations, the Fed did not announce any phase-out in September. Combined with political uncertainty in the USA about the budget and the debt ceiling, this caused government yields to fall. In December, the Fed announced that tapering of its quantitative easing would commence in January 2014. This decision, as well as positive macroeconomic data releases for the USA, contributed to rising government yields towards the close of the year.

Yields to maturity on the central government's on-the-run issues

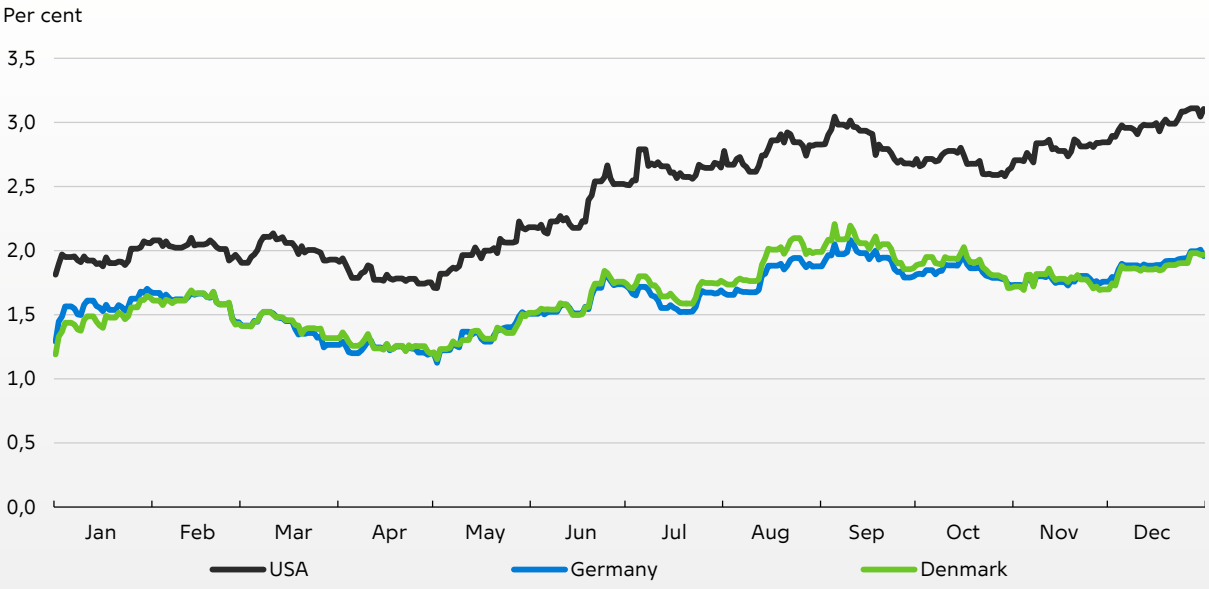
Chart 1.1



Note: For 0.1 per cent index loan 2023, the real yield is shown.

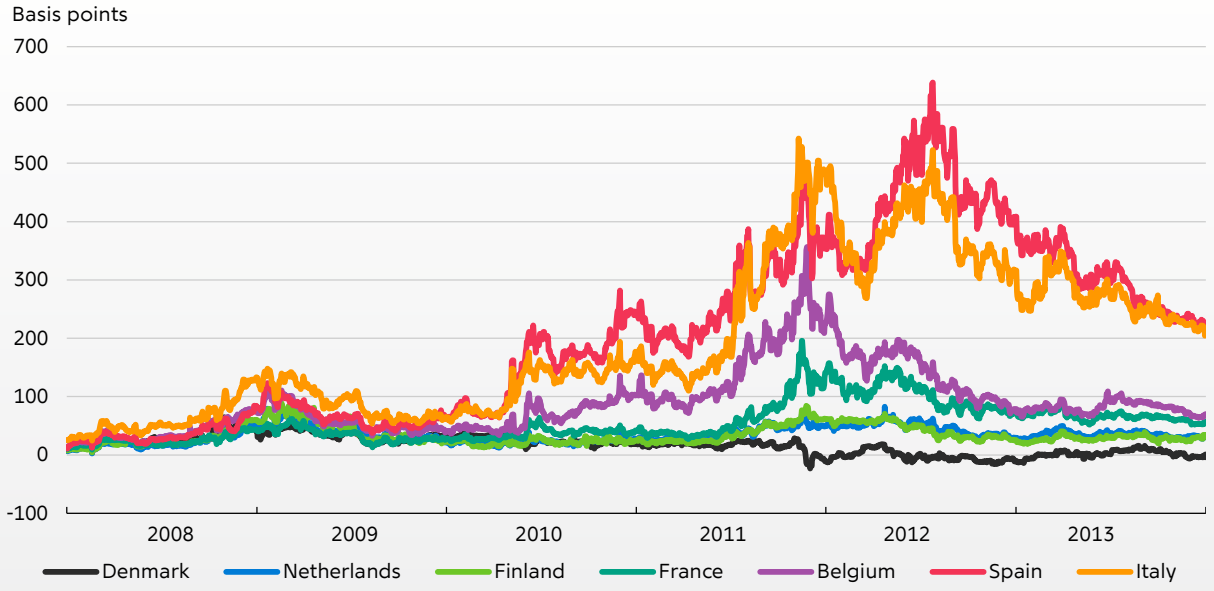
10-year government yields for selected countries

Chart 1.2



Note: 10-year par yields.
Source: Bloomberg.

10-year government yield spreads to Germany for selected countries Chart 1.3



Note: Based on 10-year par yields.
Source: Bloomberg.

FIRST SIGNS OF NORMALISATION OF YIELD SPREADS IN EUROPE

Following a couple of years with widening yield spreads in the European sovereign debt markets, euro area yield levels began to converge in the summer of 2012, cf. Chart 1.3. Presumably, this reflected reduced uncertainty about the solvency and market access of the individual member states as a result of the ECB's launch of its OMT programme. Even though the ECB did not employ the OMT programme, it contributed to calming down the European sovereign debt markets, and in 2013 the spread between government yields in the peripheral euro area member states and Germany narrowed further.

The yield spread between Danish and German government bonds was among the lowest in Europe, as it had been in the preceding years. This reflected investor confidence in Denmark, which is one of the few countries to maintain a stable AAA credit rating from the largest rating agencies.

In 2013, the correlation between government yields in the core euro area member states and Germany once again became high, cf. Chart 1.4. The correlation between yields in Germany and Belgium increased sharply, and the correlation between German and Italian government yields became positive. Throughout the period, Danish government yields have had a very strong and positive correlation with those of Germany.

Several factors, including strong demand for Danish krone-denominated assets, point to the krone and Danish government bonds having acted as safe havens for investors during the sovereign debt crisis in 2011-12.[1] Uncertainty in the international financial markets decreased in 2013. As a result, Danish government yields rose a little, and the yield spread to Germany became positive again at times, cf. Chart 1.5. This can be seen as an indication that the financial markets are beginning to normalise.

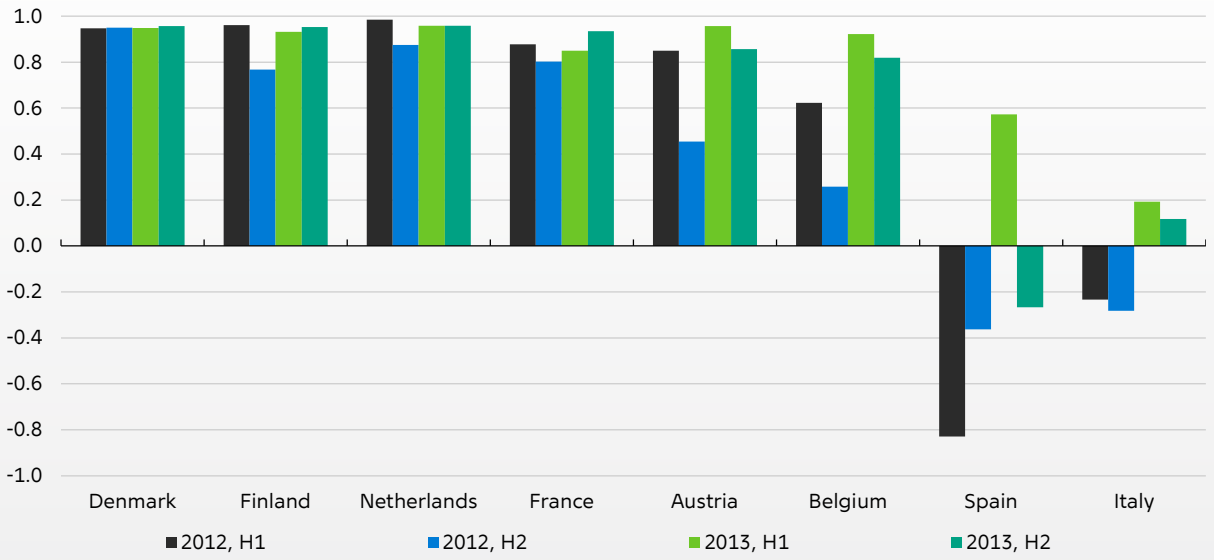
DOMESTIC BORROWING IN 2013

The central government's domestic financing requirement was kr. 100 billion in 2013, cf. Table 1.1. This is kr. 86 billion lower than in 2012, primarily reflecting a lower net domestic financing requirement.

1 Cf. Jørgensen, Larsen and Risbjerg, Was the krone a safe haven during the sovereign debt crisis?, Danmarks Nationalbank, *Monetary Review*, 2nd Quarter 2013, Part 1.

Correlation between 10-year government yields in Germany and selected EU member states

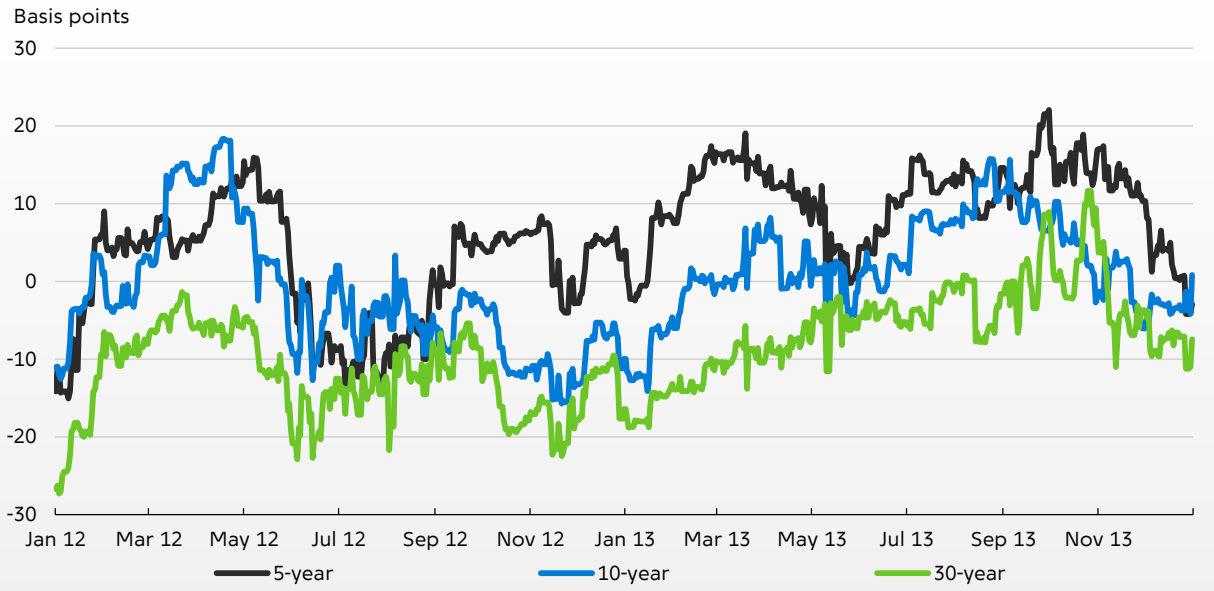
Chart 1.4



Note: The correlation between government yields are measured on a daily basis during the period in question.
Source: Bloomberg.

Danish government yield spreads to Germany

Chart 1.5



Note: Par yields.
Source: Bloomberg.

The central government's domestic financing requirement Table 1.1

Kr. billion	2012	2013
Domestic net financing requirement	82	0
Redemptions on domestic long-term government debt, etc.	60	55
Outstanding volume of T-bills, beginning of year	44	45
Domestic financing requirement	186	100
Financing:		
- Issuance of domestic government bonds	102	79
- Outstanding volume of T-bills, year-end	45	32
- Drawing on central government's account	40	-12

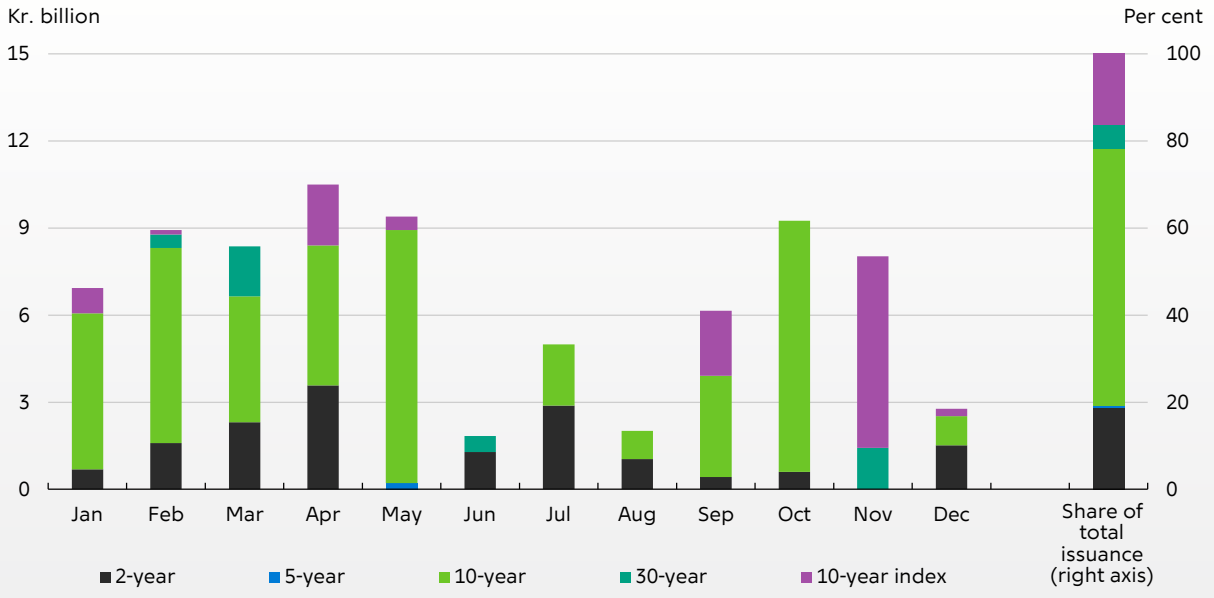
Note: Drawing on the central government's account is exclusive of the impact of foreign borrowing.
Source: Ministry of Finance and own calculations.

ISSUANCE OF DOMESTIC GOVERNMENT BONDS IN 2013

Bond issuance by the central government in 2013 amounted to kr. 79 billion at market value. Issuance took place in all on-the-run issues. In accordance with the strategy, most of the issuance took place in the 10-year segment, cf. Chart 1.6.

With issuance totalling just under kr. 13 billion, the government's 10-year inflation-linked bond was built up to a total nominal outstanding volume of kr. 22.5 billion. This means that it

Government bond issuances in 2013 across maturity segments Chart 1.6



Note: Government bond issuances stated at market value.

Issuance of government bonds in 2013 Table 1.2

	Sales at market value, kr. million	Average yield to maturity, per cent	Average maturity, years
2.5 per cent bullet loan 2016	15,910	0.31	3.4
4.0 per cent bullet loan 2019	217	0.72	6.5
1.5 per cent bullet loan 2023	46,220	1.72	10.5
4.5 per cent bullet loan 2039	4,156	2.33	26.4
Total, nominal bonds	66,504	1.42	9.6
0.1 per inflation-linked loan 2023	12,684	0.28[1]	10.2
Total	79,188		

Note: Yields to maturity have been weighted by market value. Maturities have been weighted by nominal value.
1. Real yield to maturity.

meets the conditions for being included in the Barclays World Government Inflation-Linked Bond index[2], which is regarded as the most important index internationally. Barclays has announced that the Danish inflation-linked bond will be included in the index from the 2nd quarter of 2014, with an expected weight of around 0.2 per cent of the total market value of the index.[3]

The central government issued government bonds at an average yield to maturity of 1.4 per cent for nominal bonds and an average maturity of just under 10 years, cf. Table 1.2. The inflation-linked bond was issued at an average real yield to maturity of 0.3 per cent.

Most of the issuance took place at the 19 government bond auctions, cf. Table 1.3. At all the auctions, the government offered two bonds, and in 17 cases one of them was the 10-year nominal government bond. This reflects the strategy to issue predominantly in the longer maturity segments. Demand was generally high at the auctions, with an overall bid-to-cover ratio of just under 2.

Government Debt Management regularly consults the central government's primary dealers with a view to obtaining current information about investor demand in the various maturity segments. This information can be used to support the choice of bonds offered at the individual auctions.

SALES OF T-BILLS

The outstanding volume of T-bills was kr. 32 billion at end-2013, down from kr. 45 billion at end-2012. This means that the programme was reduced as planned. Generally speaking, demand for T-bills was solid, and throughout most of 2013 issuance took place at negative interest rates. On average, T-bills were issued at an effective interest rate of 0.09 per cent.

Three T-bills were offered in each of the first 10 auctions during the year. In the 4th quarter of 2013, the T-bill programme was adjusted so that in future a new 6-month series will be opened every three months.[4] Consequently, the T-bill programme will be reduced to two open series. This adjustment is aimed at improving liquidity in T-bills by increasing the outstanding volume in each series. At the same time, the individual series are built up faster. So since the November auction, issuance has taken place in only two T-bills at each auction.

2 The formal requirement for being included in the index is an outstanding volume in the inflation-linked bond programme of USD 4 billion. The issuance volume in the central government's inflation-linked programme met this requirement at the audit of the index on 31 December 2013.

3 "Denmark to Join Barclays Inflation-Linked Benchmarks", Barclays, 2 January 2014.

4 Previously, a new 9-month series was opened every three months.

Results of auctions and supplementary tap sales in 2013

Table 1.3

	Number of auctions	Bids at auctions, kr. billion	Sales at auctions, kr. billion	Tap sales, kr. billion
2.5 per cent bullet loan 2016	11	33.4	13.8	1.0
4.0 per cent bullet loan 2019	1	0.7	0.2	0.0
1.5 per cent bullet loan 2023	17	80.7	44.3	2.9
4.5 per cent bullet loan 2039	4	7.9	2.3	0.6
0.1 per inflation-linked loan 2023	5	19.4	11.9	1.0
Total	19	142.1	72.5	5.5

Anm.: Bud, salg og tapsalg er opgjort til nominel værdi.

BUY-BACKS

In 2013, regular buy-back auctions were held for 5 per cent bullet loan 2013 and 2 per cent bullet loan 2014. Compared with the preceding years, the central government conducted only small buy-backs in the shortest-term series. Seen from an overall government debt perspective, it was not attractive to buy back short-term securities, especially since Danish short-term government bond yields were very low. Altogether, bonds totalling kr. 10 billion maturing after 2013 were bought back in the market, cf. Table 1.4. These buy-backs have reduced the financing requirement in 2015 by kr. 3 billion.

The government funds' placement requirements were met by buying back off-the-run government securities with longer maturities.

INVESTORS IN DANISH GOVERNMENT SECURITIES

The central government is aiming to reach a wide range of domestic and non-resident investors. Issuance in several maturity segments, including an inflation-linked bond, contributes to this. As in previous years, the two largest groups of investors in domestic government securities were the domestic insurance and pension sector and non-resident investors. At

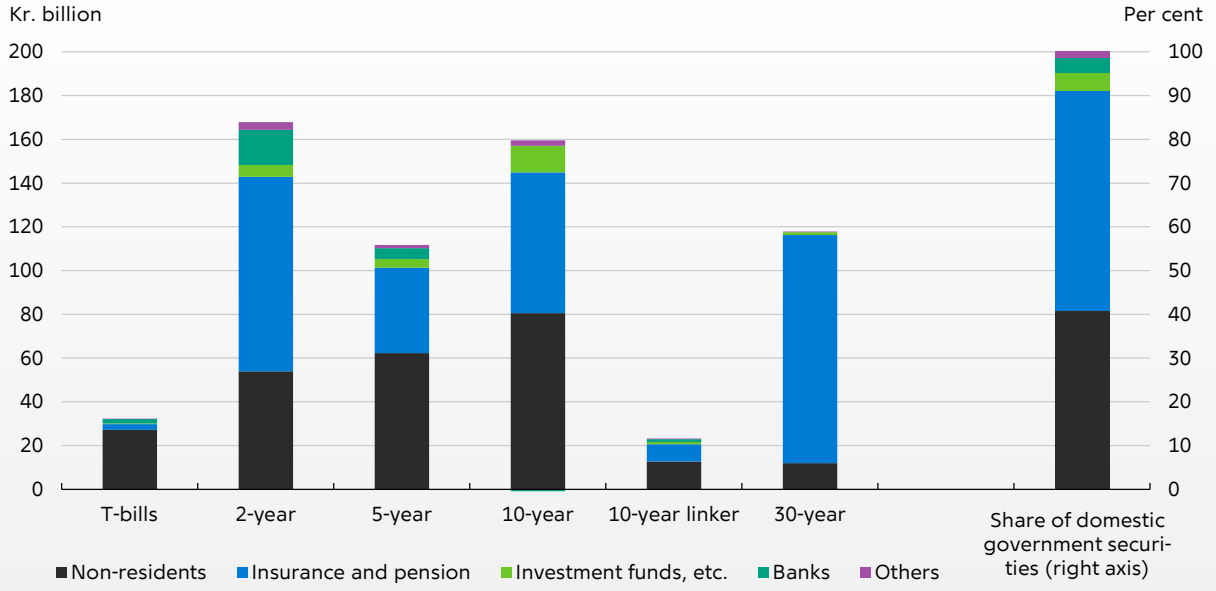
Buy-backs by the central government and net buy-backs by the government funds in 2013

Table 1.4

Kr. million, market value	Central government	The Social Pension Fund	The Fund for Better Working Environment and Labour Retention	The Advanced Technology Foundation	Total buy-backs from the market
5 per cent bullet loan 2013	10,863	-9,366	-223	-265	1,009
2 per cent bullet loan 2014		348			348
4 per cent bullet loan 2015	2,816	-2,262			555
4 per cent bullet loan 2017		117			117
3 per cent bullet loan 2021		6,224		837	7,062
7 per cent bullet loan 2024		1,872			1,872
Total buy-backs	13,680	-3,067	-223	572	10,961
Of which bonds maturing after 2013	2,816	6,299		837	9,952

Note: Negative figures indicate net sales.

Issuance of bonds in 2013 broken down by maturity segments Chart 1.7



Note: Ownership shares are calculated on the basis of nominal holdings excluding the holdings of the government funds. Investment funds, etc. corresponds to the category *Other financial intermediaries etc.* in the Securities Statistics, while Banks correspond to the MFI sector.
Source: Danmarks Nationalbank, *Securities Statistics*.

the end of the year, these two investor groups had a combined ownership share of more than 90 per cent, cf. Chart 1.7.

The insurance and pension sector holds government bonds in all maturity segments, with a particularly high ownership share of the 30-year bond. The insurance and pension sector has a natural interest in Danish krone-denominated bonds for hedging its commitments in kroner.

Non-resident investors hold significant ownership shares of all government securities up to and including the 10-year segment. In 2013, several non-resident investors bought short-term krone-denominated securities and swapped the exposure, mainly to dollars. Due to the pricing of currency swaps between Danish kroner and dollars, this gave them an excess yield compared with equivalent assets denominated in dollars.

Non-resident investors own more than half of the inflation-linked bond. Their ownership share is higher than for nominal bonds with the same maturity and for government bonds in general. This is partly attributable to strong global investor focus on alternatives to nominal fixed-rate bonds, combined with a limited supply of high-rated inflation-linked bonds. The inclusion in the Barclays World Government Inflation-Linked Bond index is supportive of continued strong interest in this issue from non-residents.

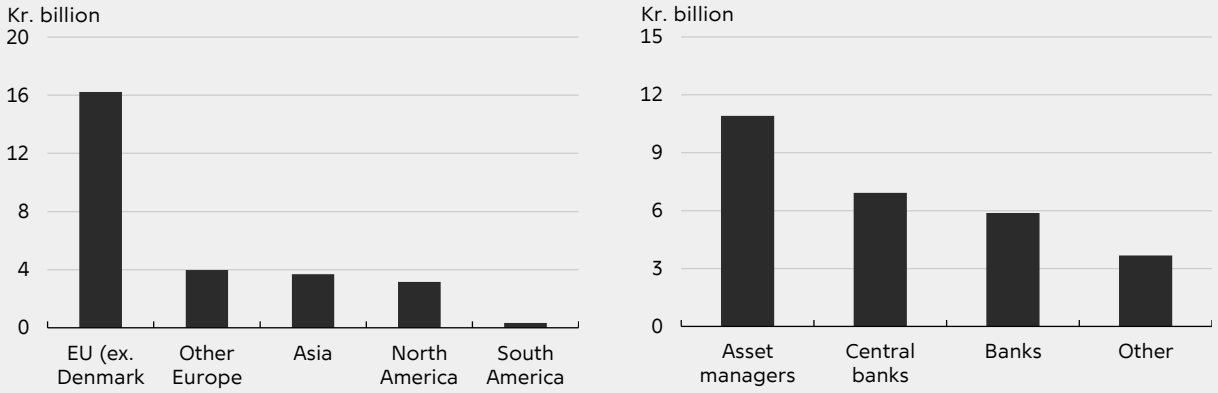
The non-resident investor base is geographically diverse. This is reflected in the breakdown of investors' net purchases of Danish government bonds, cf. Chart 1.8.

ISSUANCE STRATEGY FOR 2014

The overall objective of the government debt policy is to cover the central government's financing requirement at the lowest possible long-term borrowing costs, while taking the degree of risk into account. The central government's issuance strategy aims at meeting this objective by:

1. Ensuring sufficient liquidity in government securities
2. Issuing government securities that are attractive to a broad investor group
3. Ensuring low refinancing risk
4. Ensuring flexibility in government debt policy, including market access

Non-resident investors' net purchases of Danish government bonds in 2013 Chart 1.8



Source: Reporting of purchases and sales of nominal Danish government bonds by eight of the central government's 12 primary dealers.

The issuance strategy is determined on the basis of a medium-term strategy laying down the overall framework for the sale of government securities in the medium term, ensuring that the central government's financing requirement is met, and providing for a suitable mix of on-the-run issues.

MEDIUM-TERM ISSUANCE STRATEGY

The central government's medium-term strategy is to issue predominantly in the longer maturity segments, especially in the nominal 10-year segment. This ensures sufficient liquidity in the individual series, as well as a relatively smooth redemption profile, which in turn helps to ensure that the government does not have a large refinancing requirement at times when market conditions are unfavourable. The strategy should not be seen as binding for individual years, as e.g. changes in demand may cause issuance to deviate from the medium-term strategy.

On the basis of a projection of the central government's domestic financing requirement in bonds and a strategy whereby issuance predominantly takes place in the longer maturity segments, the average annual domestic financing requirement in bonds is forecast at just over kr. 85 billion towards 2023, cf. Chart 1.9.

DOMESTIC FINANCING REQUIREMENT

The central government's domestic financing requirement for 2014 is forecast at kr. 84 billion, cf. Table 1.5, primarily reflecting redemptions on domestic debt. As a result of the net bond purchases of the government funds[5] and net payments in kroner to the central government from currency swaps, redemptions on domestic long-term government debt is lower than the outstanding government bonds maturing in 2014. In 2015, the financing requirement is expected to be somewhat higher due to larger redemptions and a government deficit.

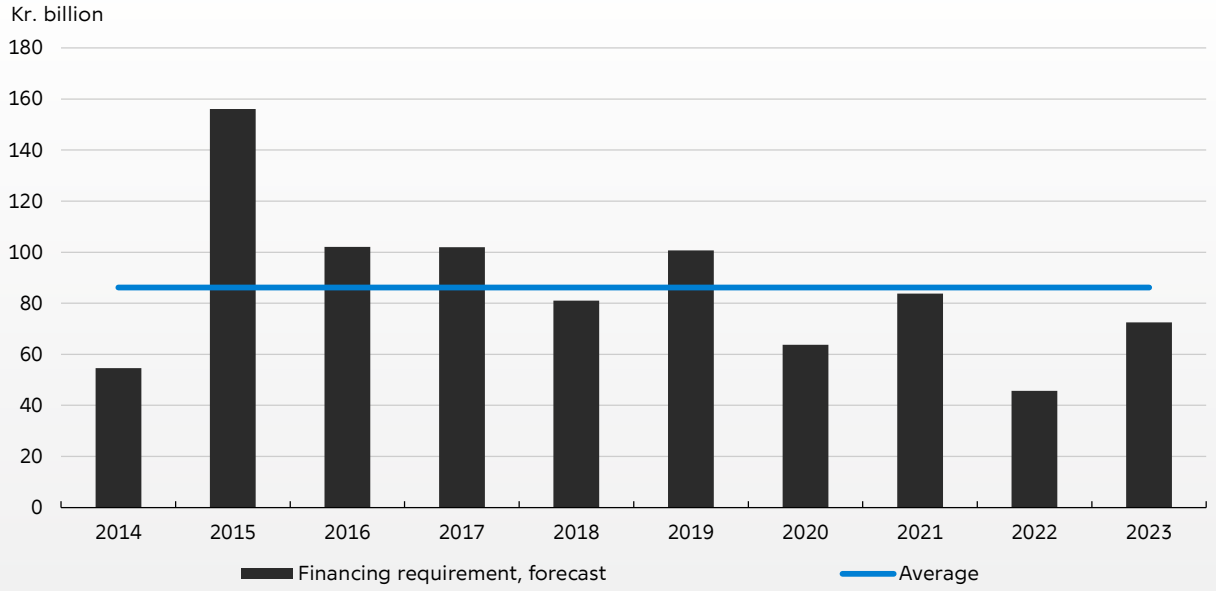
ISSUANCE TARGETS IN 2014

In 2014, the target for domestic bond issuance is kr. 75 billion, while the target for the outstanding volume of T-bills at year-end is kr. 30 billion. Both targets are unchanged compared with 2013.

In order to retain investor interest in Danish government securities and ensure the continuity of the government debt policy, it is desirable that sales of bonds and T-bills do not fluctuate excessively from year to year. Given the high expected financing requirement in 2015, the strategy is to start financing the 2015 issuance requirement in 2014.

5 The net bond purchases of the government funds comprise bond purchases for reinvesting excess liquidity and bond sales in connection with transfers from the funds to the relevant government ministries. For an elaboration on the activities of the government funds in 2013, see Chapter 3.

Domestic financing requirement in bonds Chart 1.9



Note: The projection of the financing requirement is based on Budget Outlook 3, December 2013, and the Ministry of Finance's medium-term projections.
Source: Ministry of Finance and own calculations.

The central government's domestic financing requirement Table 1.5

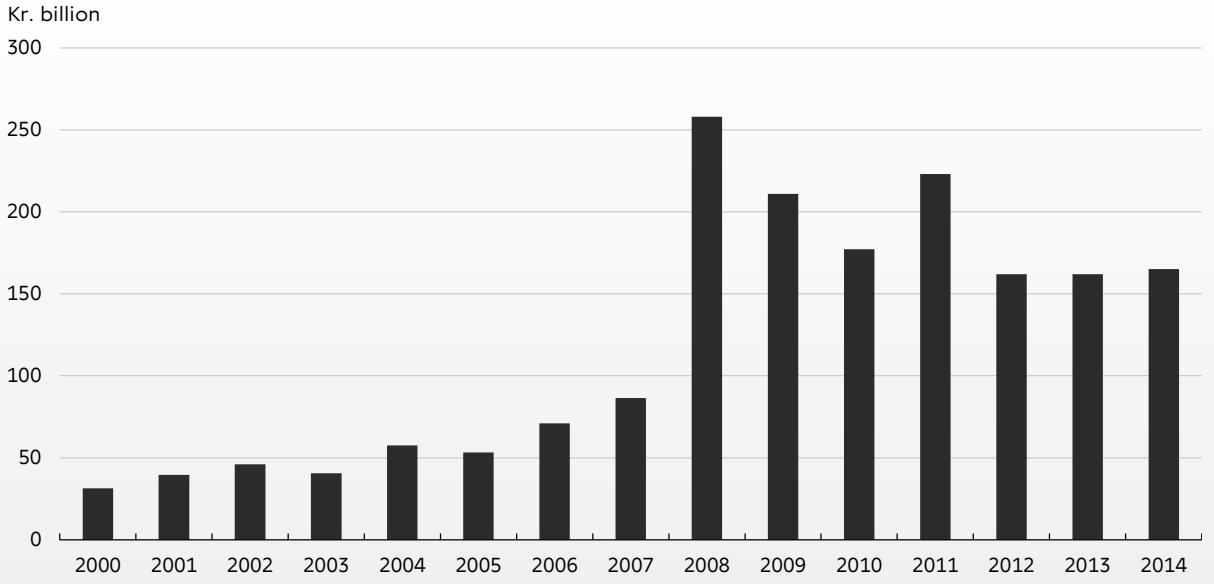
Kr. billion	2014
Domestic net financing requirement	4
Redemptions on domestic long-term government debt, etc.	48
Outstanding volume of T-bills, beginning of year	32
Domestic financing requirement	84
Financing target:	
- Issuance of domestic government bonds	75
- Expected outstanding volume of T-bills, year-end	30
- Drawing on central government's account	-21

Note: Drawing on the central government's account covers financing of the domestic financing requirement. Drawing on the central government's account has been calculated exclusive of the impact of foreign borrowing.
Source: Budget Outlook 3, December 2013.

As part of *Agreements on Growth Plan DK*[6], the option to pay early tax on capital pensions has been extended to include 2014. The size of this revenue is subject to uncertainty both upwards and downwards. The strategy is that any additional revenue from capital pension taxation will not change the targets for sales of government bonds and T-bills in 2014. Instead, additional revenue will be used to reduce issuance in the subsequent years.

6 The agreements are from April 2013 and can be found (in Danish) at http://www.fm.dk/publikationer/2013/aftaler-om-vaekstplan-dk/~/media/Publikationer/Imported/2013/Aftaler%20V%C3%A6kstplan%20DK/web_aftaler_om_vaekstplan_DK_pdfa.pdf

Balance of the central government's account at year-end Chart 1.10



Note: The balance of the central government's account at end-2014 is a forecast.

In 2013, the T-bill programme was scaled down to an outstanding volume of kr. 32 billion. The target for 2014 is an outstanding volume of kr. 30 billion at year-end. Maintaining the T-bill programme contributes to the central government's liquidity reserves. Experience from other countries in recent years has emphasised that T-bills are among the products in which issuance can continue during periods of strong market turmoil. It is assessed that an outstanding volume of around kr. 30 billion will ensure sufficient liquidity in the individual series.

THE CENTRAL GOVERNMENT'S ACCOUNT

The balance of the central government's account increased markedly in connection with the introduction of the 30-year bond in the autumn of 2008. Since then, it has been reduced, but nevertheless remains relatively high, cf. Chart 1.10.

In 2014, the strategy is to maintain a high balance of the account as part of the central government's liquidity reserves. Based on the domestic and foreign issuance strategies, the balance of the account is expected to be approximately kr. 165 billion at end-2014.[7] The government's large liquidity reserves make it possible to handle lags between incoming and outgoing government payments, while also contributing to reducing the central government's refinancing risk. In addition, they make the central government less vulnerable to changes in the financing requirement. Credit rating agencies and investors have indicated that the large balance of the account is unequivocally positive for their assessment of Denmark.

Additional revenue beyond that already budgeted for from restructuring of capital pensions will increase the balance of the central government's account in 2014. The intention is that any such additional revenue is to be used to finance a lower issuance volume in the coming years, thereby gradually reducing the balance of the account.

7 When the central government raises foreign loans, the proceeds in foreign exchange are exchanged into Danish kroner and deposited in the central government's account. Hence, a change in the central government's contribution to the foreign-exchange reserve is reflected in the balance of the account.

ON-THE-RUN ISSUES

Issuance in the 2-, 5-, 10- and 30-year nominal maturity segments and in the 10-year inflation-linked segment continues in 2014. A number of factors indicate that issuance should still predominantly take place in the long maturity segments.

- Investors have indicated that demand is highest for the 10-year nominal bond.
- The expected additional costs of issuing long-term rather than short-term bonds remain modest, cf. Chapter 9.
- By issuing predominantly in the longer maturity segments, the government maintains a low annual refinancing requirement.

Against this background and in accordance with the medium-term issuance strategy, most of the issuance in 2014 is expected to take place in the 10-year maturity segment, especially the 10-year nominal bond. The exact distribution between the 2-, 5-, 10- and 30-year segments is not determined beforehand, but will depend on investor interest.

Nominal issuance

In the 2nd quarter of 2014, a new 10-year nominal on-the-run issue maturing in November 2025 will be opened. Apart from that, no changes will be made to the on-the-run issues in the 1st half of 2014, cf. Table 1.6. This means that:

- 2.5 per cent bullet loan 2016 continues as the 2-year on-the-run issue throughout 2014.
- 4.0 per cent bullet loan 2019 continues as the 5-year on-the-run issue in the 1st half of 2014. Since the outstanding volume is already high, the strategy is to issue only to a limited amount in this bond.
- The current 10-year on-the-run issue, 1.5 per cent bullet loan 2023, has a remaining maturity of less than 10 years and an outstanding volume of approximately kr. 60 billion, cf. Chart 1.11. In the 2nd quarter of 2014, a new 10-year on-the-run issue maturing in November 2025 will be opened.
- 4.5 per cent bullet loan 2039 will continue as the 30-year on-the-run issue. The strategy is to issue only to a limited extent in this series.

Inflation-linked issuance

From the beginning of the 2nd quarter of 2014, the Danish inflation-linked bond will be included in the Barclays World Government Inflation-Linked Bond index, which is expected to boost international investor interest.

The strategy for 2014 is to continue to issue in the existing bond. In other words, no new inflation-linked bond will be opened in 2014. As a result, the outstanding volume in the existing bond, 0.1 per inflation-linked loan 2023, will increase, which will contribute to improved liquidity in this issue. The inflation-linked bond is expected to be included regularly at the auctions in 2014.

BUY-BACKS OF DOMESTIC GOVERNMENT BONDS

The central government's buy-back policy is aimed at reducing the refinancing risk. In addition, buy-backs take place in order to meet the placement requirements of the government funds and to ensure a well-functioning market for government bonds.

Buy-backs from the market can be conducted in all domestic and foreign issues, although key on-the-run issues are excepted as a general rule. Buy-back may take place via auctions, on tap or via switch auctions. In 2014, regular buy-back auctions will be held for 2 per cent bullet loan 2014 and 4 per cent bullet loan 2015.

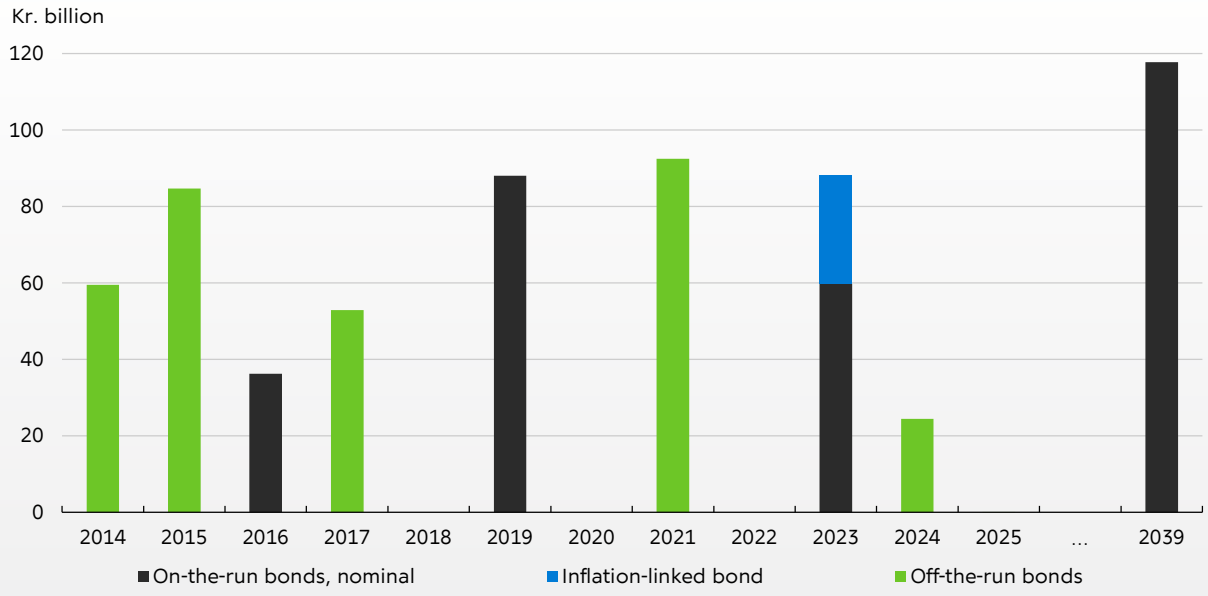
On-the-run issues, 1st half of 2014

Table 1.6

Segment	On-the-run issue, beginning of 2014	Replacement on-the-run issue
Maturity < 1 year	T-bills	
2-year segment	2.5 per cent bullet loan 2016	
5-year segment	4.0 per cent bullet loan 2019	
10-year segment	1.5 per cent bullet loan 2023	x per cent bullet loan 2025
30-year segment	4.5 per cent bullet loan 2039	
10-year inflation-linked bond	0.1 per cent inflation-linked loan 2023	

Redemptions of domestic government bonds, end-2013

Chart 1.11



Note: The redemption profile is exclusive of T-bills, currency swaps and Fisheries Bank bonds. The calculation of the redemption of the inflation-linked bond assumes annual inflation of 2 per cent until 2023.

2

FOREIGN BORROWING

In 2013, the central government raised a 3-year dollar loan of 1.5 billion dollars. The loan was swapped to 1.1 billion euro, corresponding to approximately kr. 8.5 billion. The central government's foreign debt was reduced by kr. 14 billion to kr. 76 billion due to redemptions of kr. 22 billion.

The strategy is to continue the foreign borrowing in the coming years with the aim of preserving and expanding the investor base. In 2014, the strategy is to raise a foreign loan with final exposure in euro for up to kr. 10 billion. The currency and timing of issuance will depend on market conditions and investor interest. In view of redemptions totalling kr. 26 billion, the foreign debt is expected to be reduced further in 2014.

FOREIGN BORROWING IN 2013

In April, in accordance with the announced strategy, the central government issued a 3-year dollar loan of 1.5 billion dollars, which was swapped to 1.1 billion euro, corresponding to approximately kr. 8.5 billion, cf. Box 2.1. The central government achieved cheaper financing by issuing in dollars and swapping the proceeds to euro, compared to issuance directly in euro. At the same time, the issuance in dollars provided access to investors that complemented the investor base in krone-denominated bonds to a higher degree than for issuance in euro.

In 2013, the central government's foreign redemptions amounted to approximately kr. 22 billion, and foreign central-government debt was reduced by kr. 14 billion to kr. 76 billion, corresponding to 4 per cent of GDP.

ISSUANCE OF COMMERCIAL PAPER IN 2013

In order to maintain the liquidity of the central government's two Commercial Paper (CP) programmes, USCP (USA) and ECP (Europe), and preserve market awareness, continuous issuance was made in both programmes in 2013. All issuances in dollars are hedged to euro via forward contracts with Danmarks Nationalbank. Issuance in both programmes totalled around kr. 5 billion during 2013, which was in line with the preceding years, cf. Chart 2.1.

Issuance in both programmes was primarily in dollars. This reflects that market conditions and imbalances in the pricing of the currency swap between dollars and euro made it more advantageous to issue in dollars rather than in euro. Issuance after the swap to euro was made at negative interest rates during most of 2012 and 2013. The advantage of issuing in dollars diminished in 2013 in step with the reduction of the imbalance in the currency swap between dollars and euro.

Issuance of dollar loan in April 2013

Box 2.1

On 17 April 2013, the central government issued a syndicated 3-year dollar loan of 1.5 billion dollars. Barclays Bank, Danske Bank, Deutsche Bank and Morgan Stanley were lead managers, while Nykredit Bank was co-lead manager.

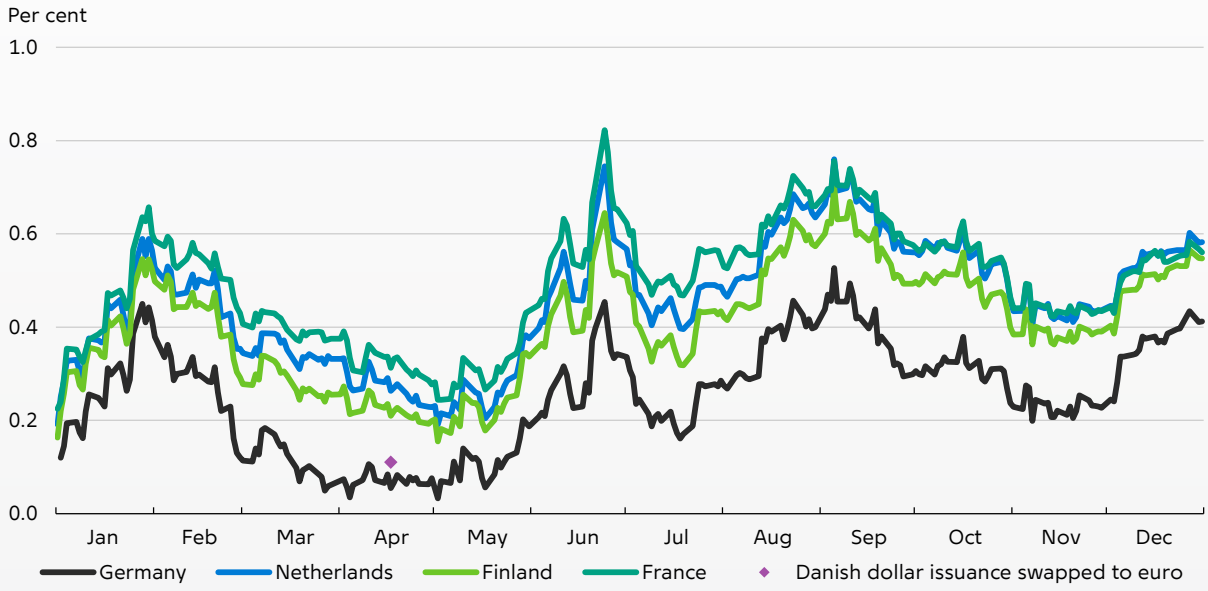
The yield to maturity in dollars was 0.45 per cent, corresponding to mid-swap -3 basis points or 11.6 basis points higher than a corresponding US government bond.

The syndicate banks were asked to quote a price for a currency swap for 0.5 billion dollars out of the loan proceeds, and a swap was then entered with the bank quoting the best price. The remainder of the loan was swapped with Danmarks Nationalbank on the same terms as the swap with the winning bank.

Overall, the loan proceeds were swapped to 1.1 billion euro with a 3-year yield to maturity in euro of 0.11 per cent. The yield in euro was thus marginally higher than the yield on German government bonds, but considerably lower than the yields on government bonds from other highly rated euro area member states, cf. Chart A.

3-year government yields and the central government's dollar issuance swapped to euro

Chart A



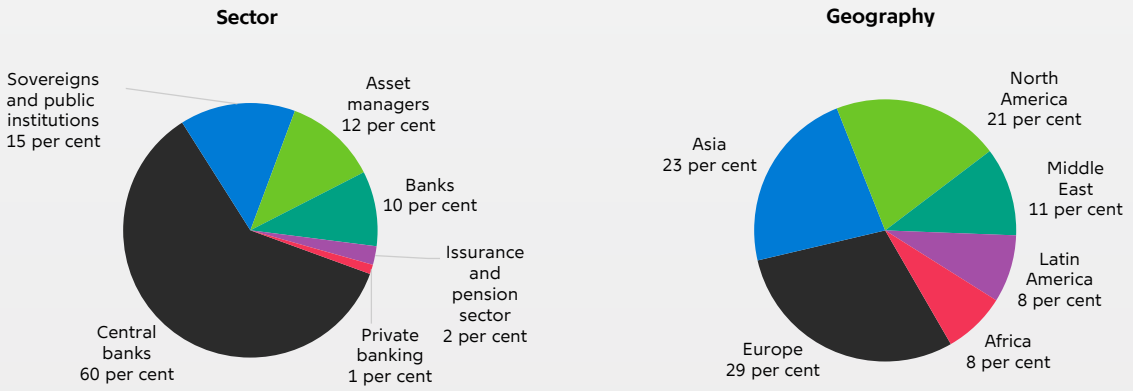
Note: Par yields

Under the market conditions existing at the time, the central government could save around 15 basis points by issuing in dollars and swapping to euro rather than issuing directly in euro. The saving mainly reflected conditions in the swap markets, which made it advantageous for creditworthy issuers for long periods in 2013 to issue in dollars rather than euro.

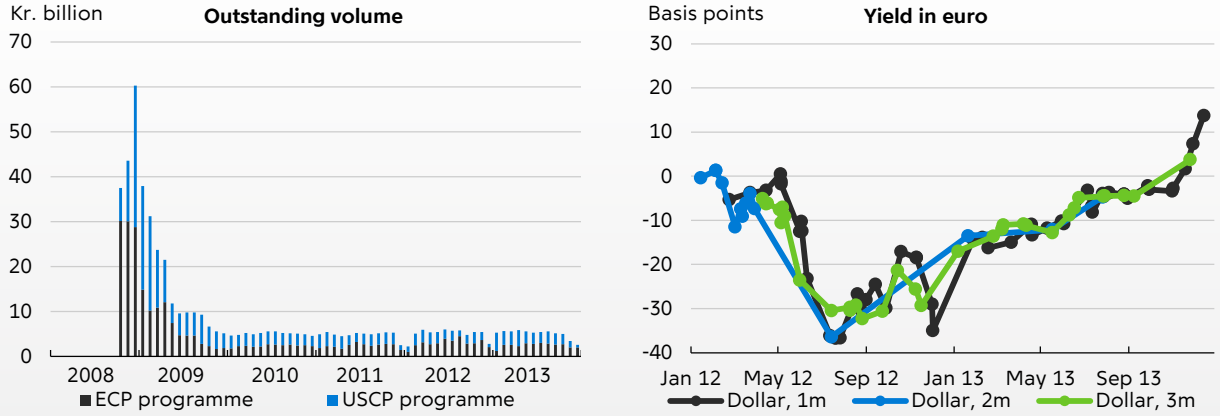
Investor interest was particularly high from central banks and public institutions, which accounted for around 75 per cent of the issuance in total, cf. Chart B. There was a wide geographical distribution of investors from many parts of the world.

Investor distribution by sector and geography

Chart B



Outstanding volume in the central government's CP programmes and yield in ECP Chart 2.1



Note: The euro yield in ECP reflects the implied yield in euro payable by the central government on issuance in dollars in its European CP programme. A point on the curve denotes actual issuance.

FOREIGN BORROWING STRATEGY

The central government raises loans in foreign currency in order to maintain the foreign-exchange reserve. The foreign funding rule entails that, as a general rule, the central government issues debt denominated in foreign currency equivalent to the redemptions on the foreign debt, unless Danmarks Nationalbank wishes to expand or reduce the foreign-exchange reserve.

Given the relatively high level of the foreign-exchange reserve, cf. Chart 2.2, the central government's contribution to the foreign-exchange reserve was reduced considerably from 2010 to 2013, resulting in an equivalent reduction of the foreign debt.

Experience from the financial crisis has shown that ongoing market presence is important to accommodate a possible need for borrowing considerable amounts in foreign currency at short notice. It is time-consuming and may be expensive to (re-)establish relations with banks and investors.

Moreover, foreign borrowing provides access to the market for domestic government bonds for a number of foreign banks and investors, including actors with no immediate interest in Danish krone-denominated bonds.

Against this background, the strategy is to annually issue a syndicated foreign loan with final exposure in euro for up to kr. 10 billion, even though the size of the foreign-exchange reserve does not call for foreign borrowing. This allows the central government to retain its access to the debt markets in euro and dollars, and the well-diversified investor base is supported.

The strategy for 2014 is to issue a syndicated foreign loan with final exposure in euro for up to kr. 10 billion. The choice of currency and timing of issuance will depend on market conditions and investor interest.

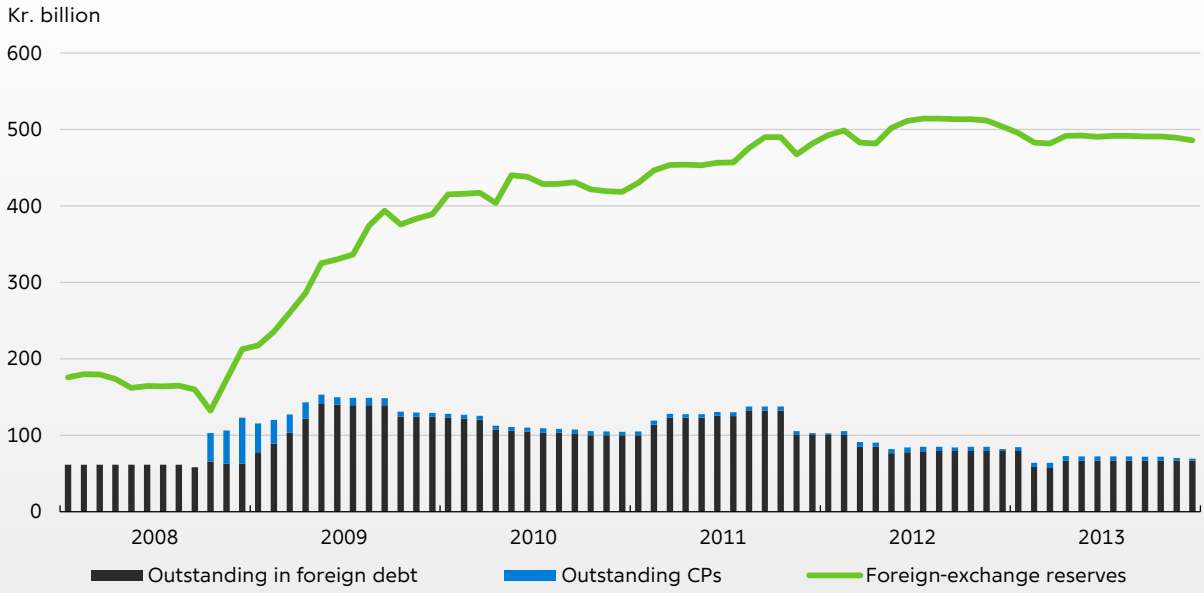
In 2014, the central government's redemptions on foreign debt will total kr. 26 billion, cf. Table 2.1. Foreign redemptions are distributed on a relatively small loan maturing in February 2014 and two loans and one currency swap in euro maturing in March. The strategy is expected to reduce the foreign debt to approximately kr. 60 billion at end-2014. Most of the debt will mature in 2015 and 2016.

COMMERCIAL PAPER ISSUANCE IN 2014

Commercial Paper issuance in the central government's US and European CP programmes will be limited. The strategy is to keep the volume of issuance at the 2013 level, i.e. a total outstanding volume of up to kr. 10 billion in the

Danmarks Nationalbank's foreign-exchange reserve and the central government's foreign debt

Chart 2.2



two programmes. An outstanding of that size is found to be sufficient to retain market maker awareness of the programmes and to maintain relations with the investor base. The outstanding in the programme can be increased in the event of a need to adjust the foreign-exchange reserve.

The central government's foreign redemption profile, 2014-16

Table 2.1

Nominal, kr. billion	2014	2015	2016
EMTN and government bonds	24.1	21.4	20.1
Currency swap	1.5	-	-
Total	25.6	21.4	20.1

Note: As of end-2013. The redemption profile is exclusive of Commercial Paper and currency swaps in relation to re-lending to Danish Ship Finance.

3

DEBT AND INTEREST COSTS

At end-2013, the central-government debt amounted to kr. 487 billion, corresponding to 26 per cent of GDP. This is virtually unchanged compared with the preceding year. Interest costs on the central-government debt totalled kr. 17 billion, or 0.9 per cent of GDP. The Danish government debt is low compared with those of other EU member states. The central-government debt has the highest possible credit rating (AAA/Aaa) for both domestic and foreign debt from the major rating agencies.

The gross general-government debt (EMU debt) amounted to 44 per cent of GDP at the end of 2013. The EMU debt has decreased since 2011 and has been stable below the limit of 60 per cent of GDP stipulated in the Stability and Growth Pact.

CONTINUED LOW GOVERNMENT DEBT IN 2013

The central-government debt is calculated as the nominal value of domestic and foreign debt less the balance on the central government's account at Danmarks Nationalbank and the assets of the three government funds. In 2013, the central-government debt remained unchanged,[1] amounting to kr. 487 billion at year-end, cf. Table 3.1. This is equivalent to 26 per cent of GDP. Central-government debt at market value was kr. 558 billion at end-2013, or kr. 46 billion lower than at end-2012.

In Denmark, a number of government-owned companies can issue loans through the central government (re-lending), cf. Chapter 5. The calculation of the central-government debt includes government issues used to finance the loans, whereas the assets, i.e. the central government's receivables from the companies, are not deducted from the central-government debt. If the central-government debt is adjusted for the volume of outstanding re-lending, the central-government debt is reduced to 21 per cent of GDP, cf. Chart 3.1.

In 2013, two-way collateral agreements (CSAs) were concluded with many of the central government's swap counterparties, cf. Chapter 7. The only acceptable collateral under the new CSAs is cash deposits in Danish kroner. At end-2013, the counterparties had pledged kr. 3.6 billion net as collateral for the market value by way of cash deposits. The pledging of collateral is an obligation to the counterparties, a liability, which is offset by a higher balance on the central government's account, an asset. This means that, on aggregate, the central-government debt is not affected by the pledging of collateral.

1 Except for capital gains/losses on issues, the development in the central-government debt from year to year corresponds to the central government's net financing requirement, which is the sum of the central government's actual receipts and disbursements. In 2013, the net financing requirement amounted to kr. 0 billion, cf. Danmarks Nationalbank's press release Foreign Exchange and Liquidity and Monthly Balance Sheet, December 2013.

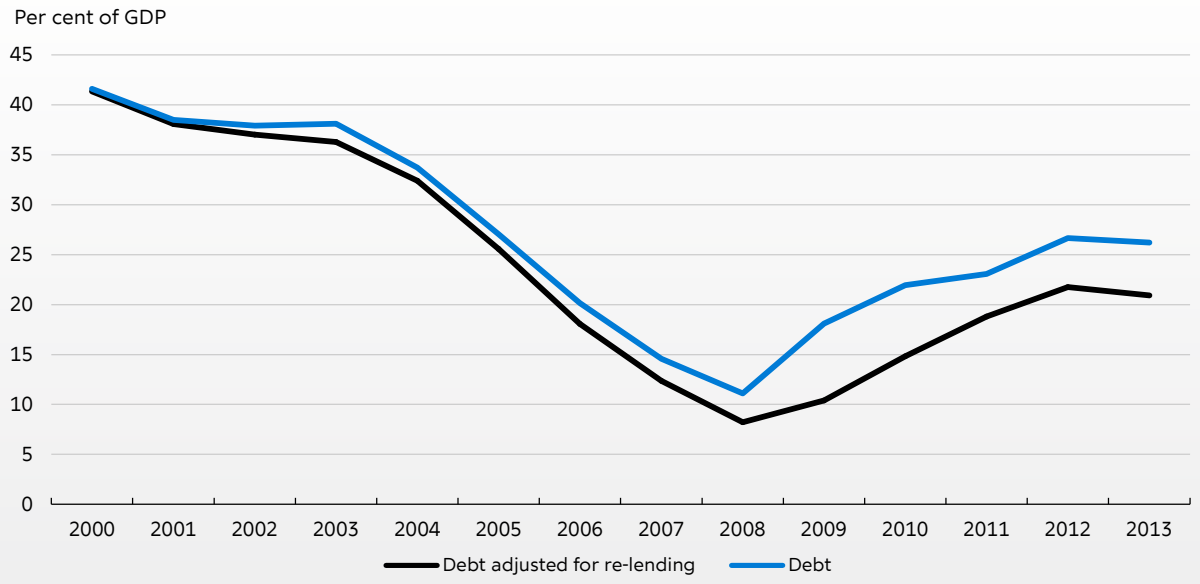
Central-government debt Table 3.1

Kr. billion, year-end	2011	2012	2013
Domestic debt[1]	645.9	667.5	664.2
Foreign debt[1]	111.8	90.0	75.9
Pledging of collateral for swaps[2]	-	-	3.6
Central government's account at Danmarks Nationalbank	-223.1	-162.0	-162.0
Social Pension Fund	-105.6	-92.9	-82.4
Advanced Technology Foundation	-13.4	-14.3	-11.6
Fund for Better Working Environment and Labour Retention	-1.7	-1.5	-0.9
Central-government debt	413.9	486.8	486.8
Central-government debt, per cent of GDP	23.1	26.7	26.2

Note: A positive figure indicates a liability; a negative figure indicates an asset. The central-government's account includes the funds' balance on the account.
Source: Central-government's accounts 2011 and 2012. For 2013, figures are provisional.

1. The central government has concluded currency swaps, whereby payments in kroner are swapped to euro and dollar payments, including in connection with re-lending to Danish Ship Finance. In 2013, this increased foreign debt by kr. 8 billion and reduced domestic debt correspondingly.
2. Since the market value of swaps with two-way collateral service agreements was positive for the central government, and the counterparties consequently pledged collateral by way of cash deposits, part of the balance on the central government's account was offset by an obligation linked to the pledging of collateral on the swap portfolio.

Central-government debt Chart 3.1

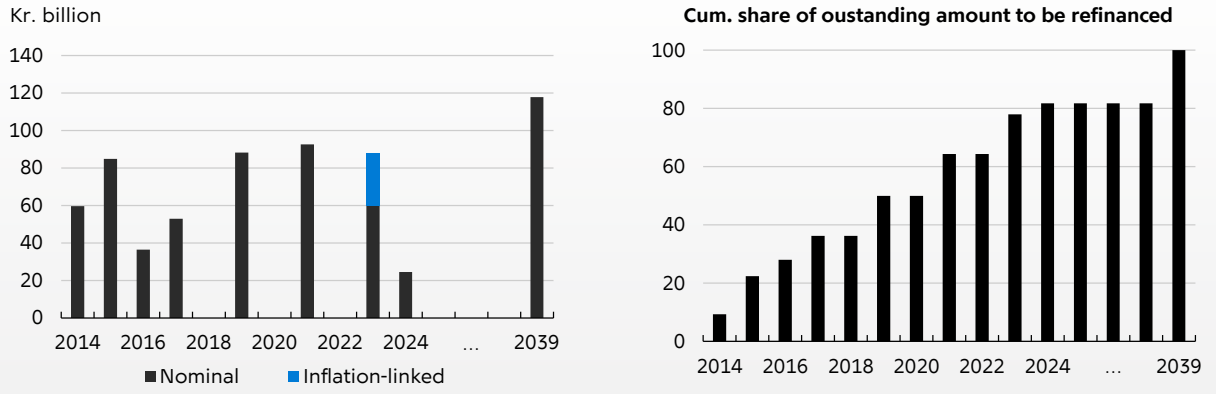


DOMESTIC DEBT

The domestic debt is calculated as the nominal value of the domestic government securities and currency swaps from foreign currency to kroner. The domestic debt amounted to kr. 664 billion at end-2013, which is more or less unchanged relative to 2012. The outstanding volume of domestic bonds has a relatively long remaining maturity, cf. Chart 3.2.

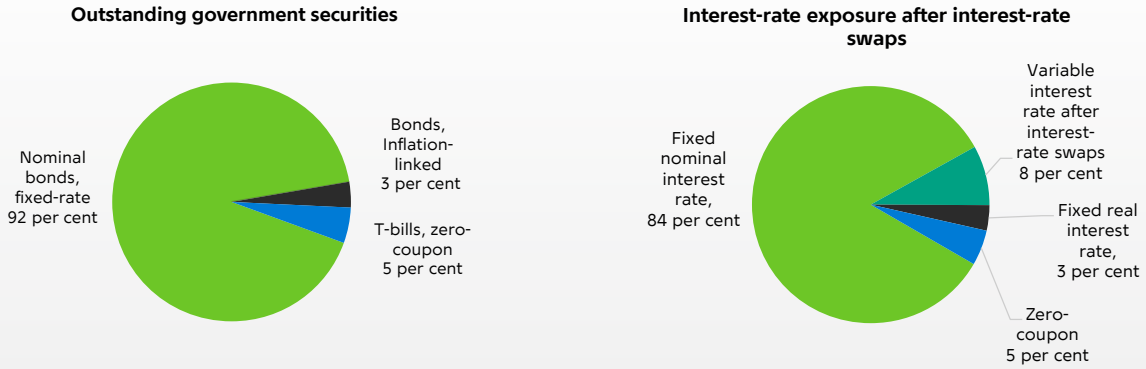
92 per cent of the domestic debt is fixed-interest bonds, cf. Chart 3.3. In addition, there is the T-bill programme and the inflation-linked bond. The central government has concluded interest-rate swaps in order to reduce the

Redemption profile for domestic government bonds, end-2013 Chart 3.2



Note: The redemption profile includes Fisheries Bank bonds. An annual inflation rate of 2 per cent is assumed for calculating redemptions in the inflation-linked bond.

Rates of interest on domestic government securities before and after interest-rate swaps, end-2013 Chart 3.3



Note: Interest-rate exposure calculated after interest-rate swaps.

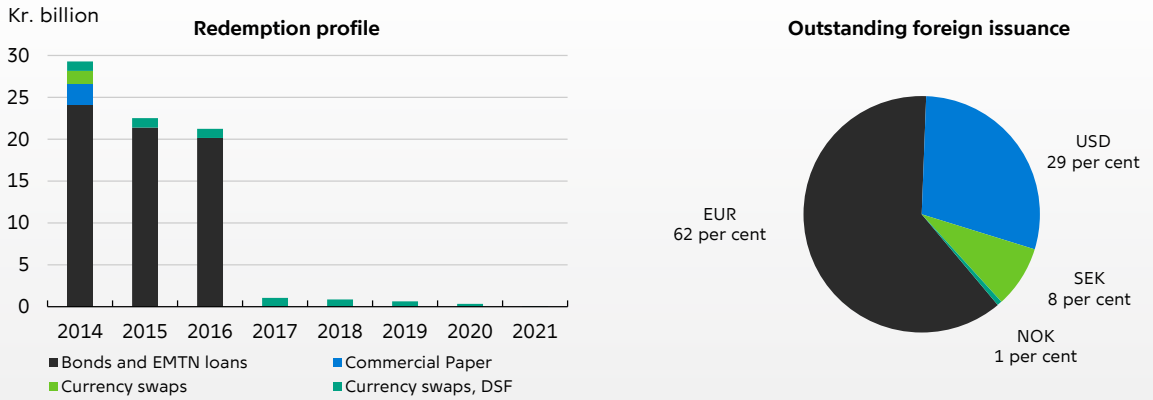
duration of the central-government debt. This means that the central government has concluded swaps in which the central government receives a fixed rate of interest and pays a variable short-term interest rate. In total, 8 per cent of the central-government debt is swapped to a floating rate.

FOREIGN DEBT

Foreign debt comprises the nominal value of bonds issued in foreign currency, Commercial Paper and currency swaps. Foreign debt amounted to kr. 76 billion at the end of 2013. Most of the debt was issued in euro through the central government's EMTN programme and will mature within the next three years, cf. Chart 3.4. Before swaps, 62 per cent of the foreign debt is in euro. After swaps, the exposure is solely in euro, except for currency swaps concluded as part of the re-lending to Danish Ship Finance (DSF).[2]

2 As part of re-lending to Danish Ship Finance A/S the central government has concluded currency swaps with end-exposure in dollars. The exposure in dollars matches the re-lending to Danish Ship Finance A/S.

Foreign debt redemption profile and outstanding foreign issuance, end-2013 Chart 3.4



Note: Outstanding foreign issuance shows the actual foreign issuance currency, excluding currency swaps.

Interest payments on the central-government debt Table 3.2

Kr. billion	2011	2012	2013
Domestic debt	23.7	22.3	21.4
Foreign debt	3.5	2.0	1.4
Interest-rate swaps, net	-3.2	-2.5	-2.6
Central government's account at Danmarks Nationalbank	-1.8	-0.2	0.0
Social Pension Fund	-4.5	-3.7	-3.1
Advanced Technology Foundation	-0.5	-0.5	-0.4
Fund for Better Working Environment and Labour Retention	-0.1	-0.1	0.0
Interest costs on the central-government debt	17.2	17.2	16.7
Central-government re-lending	-2.6	-2.9	-2.6
Interest costs on central-government debt adjusted for re-lending	14.5	14.4	14.1

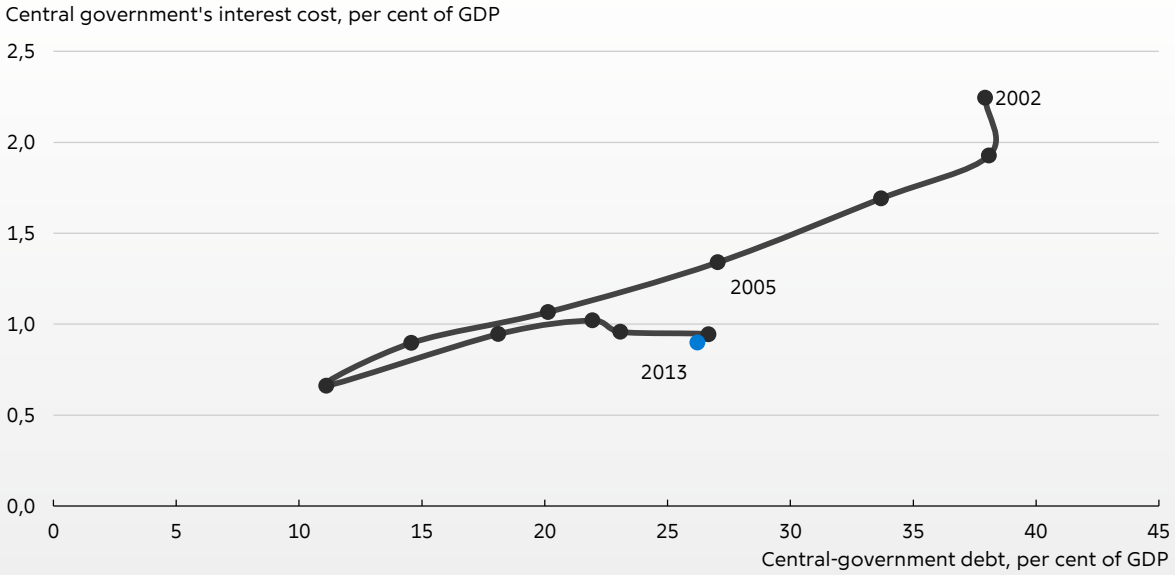
Note: A positive sign indicates interest costs; a negative sign indicates interest income.
Source: Central-government's accounts 2011 and 2012. For 2013, figures are provisional.

INTEREST COSTS ON CENTRAL-GOVERNMENT DEBT

The interest costs on the central-government debt totalled kr. 17 billion, or 0.9 per cent of GDP, in 2013, cf. Table 3.2. The central government's interest costs have been maintained at a low level despite the debt increase since 2008, cf. Chart 3.5. The reason is that redemptions on existing debt and government deficits are financed at very low interest rates. Adjusted for interest income from central-government re-lending, the interest costs amounted to kr. 14 billion in 2013.

The central government terminated interest-rate swaps in 2013 with a view to reducing the exposure to uncollateralised money-market interest rates, cf. Chapter 7. In connection with the termination, the counterparties transferred the market value of the terminated swaps, kr. 0.5 billion, to the central government. This increased the central government's interest income from interest-rate swaps in 2013 by kr. 0.5 billion, thereby reducing the total interest costs by an equivalent amount. The increased interest income will be offset by a corresponding rise in interest costs in the coming years.

Central-government debt and interest costs Chart 3.5



THE CENTRAL GOVERNMENT'S CREDIT RATING

The central-government debt has the highest possible credit rating for both domestic and foreign debt from Moody's, Standard & Poor's, DBRS Rating and Fitch Ratings, cf. Table 3.3.

In December 2013, Moody's confirmed the central government's Aaa rating with a stable outlook for the domestic and foreign debt. The central government's domestic debt has been Aaa rated by Moody's since November 1986.

In October 2013, Standard & Poor's confirmed the central government's AAA rating with a stable outlook for the domestic and foreign debt. The central government's domestic debt has been AAA rated by Standard & Poor's since July 1992.

In October 2013, DBRS Rating confirmed the central government's AAA rating with a stable outlook for the domestic and foreign debt. DBRS provided its first credit rating of Denmark in 2012.

In September 2013, Fitch Ratings confirmed the central government's AAA rating with a stable outlook for the domestic and foreign debt. The central government's domestic debt has been AAA rated by Fitch Ratings since October 1995.

The central government's credit rating Table 3.3

	Domestic debt		Foreign debt			
	Long-term	Short-term	Long-term	Short-term	Outlook	Most recently confirmed
Moody's	Aaa	P-1	Aaa	P-1	Stable	December 2013
Standard & Poor's	AAA	A-1+	AAA	A-1+	Stable	October 2013
DBRS Ratings	AAA	R-1 (high)	AAA	R-1 (high)	Stable	October 2013
Fitch Ratings	AAA	F1+	AAA	F1+	Stable	September 2013

Note: The central government has the highest possible credit rating in all categories from all credit rating agencies.
Source: Moody's Investor Services, Standard & Poor's, Fitch Ratings and DBRS Ratings.

THE GENERAL-GOVERNMENT BUDGET BALANCE AND DEBT

The general-government budget balance and the gross general-government debt (EMU debt) are often used in international comparisons of deficits and debt. According to the EU Stability and Growth Pact, the general-government deficit of member states must not, as a general rule, exceed 3 per cent of GDP, while the limit for the EMU debt is, as a general rule, 60 per cent of GDP.

THE GENERAL-GOVERNMENT BUDGET BALANCE

Following a number of years of government surpluses, there have been deficits since 2009, cf. Chart 3.6. In December 2013, the Ministry of Economic Affairs and the Interior forecast a government deficit for the period 2013-15 of less than 3 per cent of GDP. So Denmark is likely to meet the main requirement of the EU recommendation to sustainably reduce the government deficit to less than 3 per cent of GDP by 2013 at the latest.[3]

The general-government budget balance in the national accounts does not include payments on swaps, which are regarded as financial transactions. When the EMU balance is calculated, the general-government budget balance is adjusted by including swap payments. Hence, the EMU balance provides a truer and fairer picture of the central government's actual payment obligations. Payments on swaps are actual interest payments on a par with payments on loans and are therefore included in calculations of the central government's financing requirement and risk. Transparency relating to the central government's debt commitments is a high priority in central-government debt policy, which is in accordance with recommendations from the OECD, the IMF and the World Bank. Simple interest-rate and currency swaps are central government debt management instruments to separate risk management from issuance policy. This makes it possible to concentrate issuance on a few series and subsequently adjust the risk profile using interest-rate swaps, which is particularly important for small issuers.

Central-government debt policy is designed in accordance with the central government's actual financing requirement and budget risk rather than a compilation of the general-government budget balance based on the national accounts.

THE GENERAL-GOVERNMENT STRUCTURAL BALANCE

The general-government budget balance is affected by cyclical developments and movements in the financial markets. Consequently, assessments of fiscal sustainability are often based on the general-government structural balance, which is adjusted for cyclical fluctuations and other factors of an extraordinary nature.

The Ministry of Economic Affairs and the Interior expects the general-government structural balance for 2013 to show a deficit of 0.2 per cent of GDP, cf. Chart 3.6. This means that the structural balance improved by 1.5 per cent of GDP from 2010 to 2013, in line with the requirement in the EU recommendation from 2010. For 2014 and 2015, the structural deficits are forecast at be 0.5 per cent and 0.4 per cent of GDP, respectively. According to the Danish Budget Act,[4] the structural deficit must not exceed 0.5 per cent of GDP.

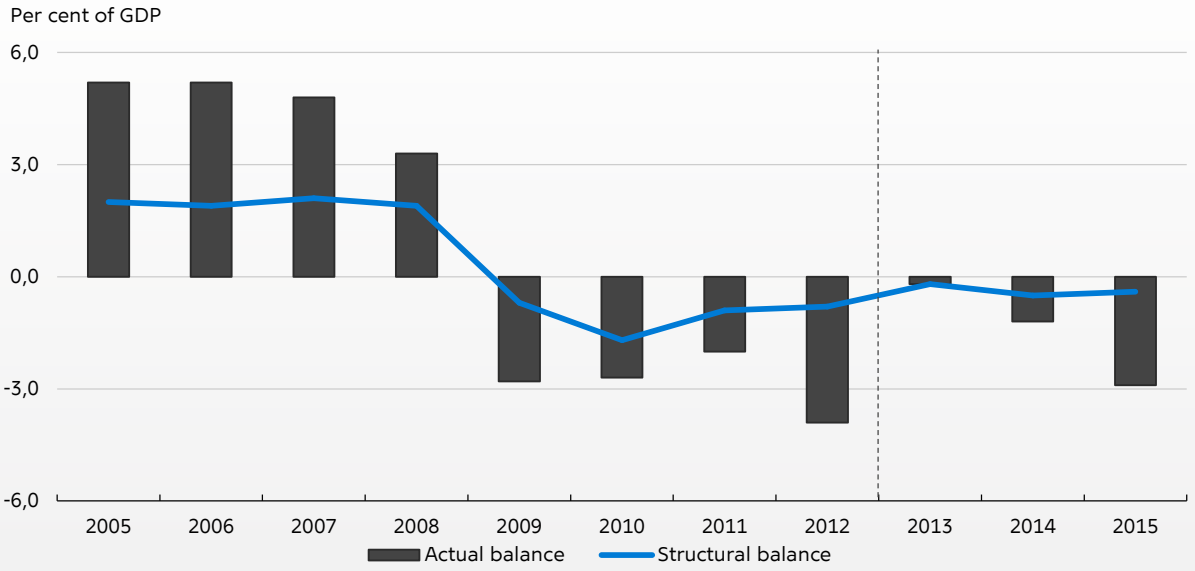
EMU DEBT

The EMU debt is a concept of gross debt reflecting a consolidated compilation of the debt at nominal value for the central, regional and local governments as well as social security funds. This means that the government secu-

3 In July 2010, the European Commission recommended that the Danish government reduce the government deficit (the EMU balance) to less than 3 per cent of GDP by 2013 at the latest and that it consolidate its structural deficit by an average of no less than 0.5 per cent of GDP annually during the period 2011-13. The recommendation will subsequently be cancelled if, in its spring forecast 2014, the European Commission estimates that the government deficit (the EMU balance) will remain below 3 per cent in 2014 and 2015.

4 For a description of the Budget Act, see the article Public Expenditure Management in Denmark, Danmarks Nationalbank, Monetary Review, 2nd Quarter 2012, Part 1. The Budget Act implements parts of the requirements in the EU Fiscal Compact.

General-government budget balance and general-government structural balance Chart 3.6



Note: Forecasts from the Economic Survey, December 2013, have been used for the period 2013-15. In 2012, the deficit was 3.9 per cent of GDP, reflecting e.g. extraordinary expenditure corresponding to approximately 1.5 per cent of GDP for the repayment of early retirement contributions as part of the retirement agreement of June 2011.
Source: Statistics Denmark and the Ministry of Economic Affairs and the Interior.

rities portfolios of the government funds are subtracted from the EMU debt, but the balance on the central government's account at Danmarks Nationalbank is not subtracted.

At end-2013, Denmark's EMU debt totalled 44 per cent of GDP, cf. Chart 3.7. The EMU debt has thus declined by 2.5 percentage points of GDP over the last two years and has been stable below the limit of 60 per cent of GDP stipulated in the Stability and Growth Pact. The EMU debt is low compared with that of other EU member states, cf. Chart 3.8.

The strategy in recent years has been to maintain a high balance on the central government's account. Adjusted for the balance on the central government's account at Danmarks Nationalbank, the EMU debt is reduced from 44 to 36 per cent of GDP, cf. Chart 3.7.

NET GENERAL-GOVERNMENT DEBT

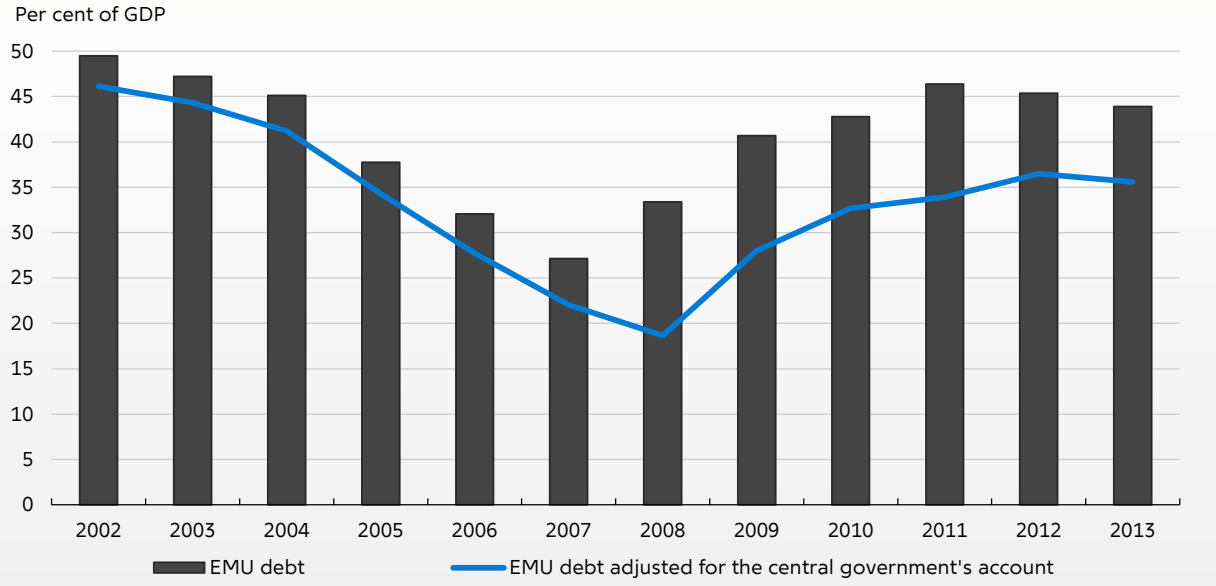
Assessment of the sustainability of public finances is often based on the net general-government debt, comprising all financial assets and liabilities of the central, regional and local governments as well as social security funds.

The central government's asset side includes the account at Danmarks Nationalbank, all assets in government funds, re-lending to government-owned companies and the central government's equity portfolio, e.g. shareholdings in DONG Energy, Copenhagen Airport and Post Danmark (the Danish Postal Service). The net general-government debt is calculated at market value and is thus affected by value adjustments of government assets and liabilities. At end-2013, the net general-government debt amounted to just under 5 per cent of GDP. This is very low by international standards, cf. Chart 3.8.

ASSETS IN THE GOVERNMENT FUNDS

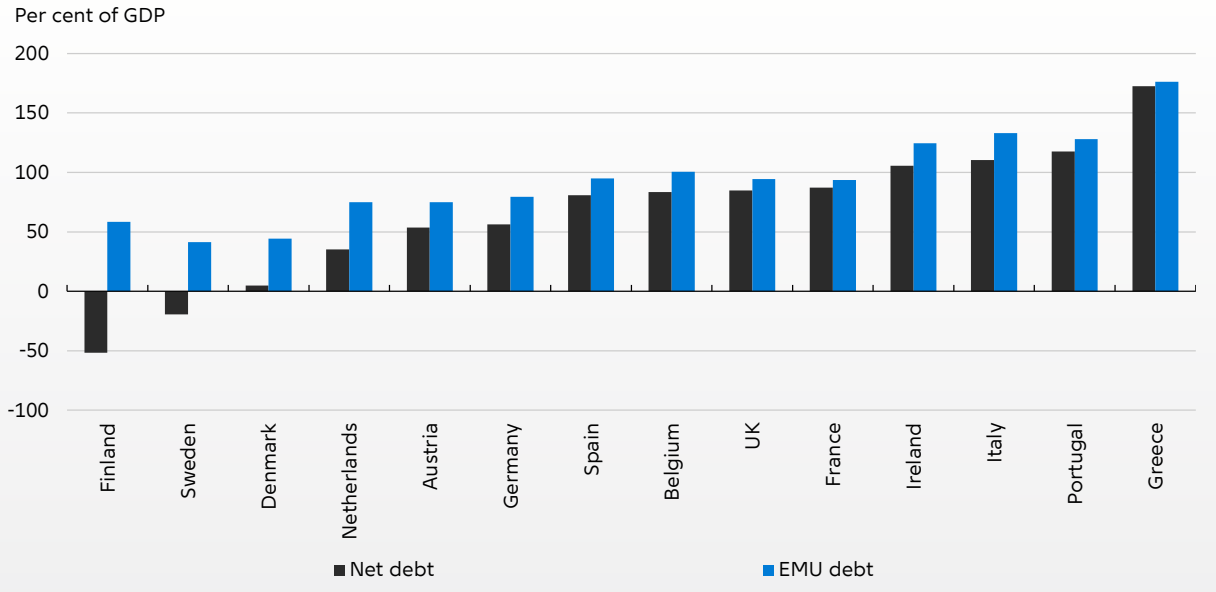
Danmarks Nationalbank administers the assets of the Social Pension Fund, SPF, the Advanced Technology Foundation and the Fund for Better Working Environment and Labour Retention on behalf of the central government. The assets of the government funds are included in the total

EMU debt adjusted for the central government's account Chart 3.7



Note: 2013 based on forecasts from *Budget Outlook 3*, December 2013.
Source: Statistics Denmark and Ministry of Finance.

EMU debt and net debt in selected EU member states, end-2013 Chart 3.8



Note: Net debt is based on forecasts from the IMF, while gross debt is based on European Commission forecasts.
Source: IMF World Economic Outlook, October 2013, and European Commission's autumn forecast, November 2013.

central-government debt and are managed on a consolidated basis with other financial assets and liabilities of the central government in the area of government debt.

THE SOCIAL PENSION FUND

SPF is managed by a committee comprising representatives of the Ministry of Finance, the Ministry of Children, Gender Equality, Integration and Social Affairs and Danmarks Nation-

The government funds' assets, end-2013 Table 3.4

Nominal value, kr. billion	SPF	Advanced Technology Foundation[1]	Fund for Better Working Environment and Labour Retention	Share of outstanding volume, per cent[2]
2 per cent bullet loans 2014	0.3	-	-	1
4 per cent bullet loans 2015	7.4	3.9	-	13
4 per cent bullet loans 2017	10.8	3.0	0.9	28
4 per cent bullet loans 2019	12.3	3.1	-	18
3 per cent bullet loans 2021	5.6	0.8	-	7
7 per cent bullet loans 2024	13.6	0.9	-	59
Government bonds, total	**50.0**	**11.6**	**0.9**	
Mortgage bonds etc.[3]	27.3	-	-	
Inflation-linked bonds[4]	5.1	-	-	
Balance of account	1.9	2.9	0.4	
Total	**84.3**	**14.5**	**1.3**	

1. As a result of a political agreement of October 2013, the Advanced Technology Foundation will be part of the Danish National Innovation Foundation, which is expected to be fully established by 1 April 2014.
2. States the funds' total ownership share of the issue.
3. Mortgage bonds, municipal, Fisheries Bank and Ship Finance bonds other than inflation-linked bonds.
4. Indexed nominal value.

albank. Day-to-day management of the assets is undertaken by Danmarks Nationalbank. The principles for asset management are laid down in *Regulations governing the management of the Social Pension Fund*.[5] According to these regulations, the assets can be invested in Danish listed bonds. The assets of the fund are managed on a consolidated basis with other central-government financial assets and liabilities under the government debt area.

At end-2013, the assets of SPF totalled kr. 84 billion nominally, cf. Table 3.4. Of this sum, kr. 50 billion, or 59 per cent of SPF's total assets, was invested in government bonds. In 2013, SPF only reinvested surplus liquidity in Danish government bonds.

Since 1995, the asset portfolio of SPF stated at nominal value has gradually declined as a result of yearly transfers to the Ministry, as stipulated in the annual Finance Act, exceeding interest income on SPF's bond portfolio.

In 2013, kr. 12 billion was transferred from SPF to the Ministry of Social Affairs, Children and Integration (that, from February 2014, changed its name to the Ministry of Children, Gender Equality, Integration and Social Affairs), and the net expenditure amounted to kr. 10 billion, cf. Table 3.5.

Market risk is managed via a band for the average Macaulay duration. The risk on SPF's assets is assessed separately, but is included in the consolidated risk management of the total central-government debt. In 2013, the duration band was 4.5 years ± 0.5 year. Throughout 2013, the duration was within the specified band. In 2014, the duration band for SPF will be maintained at 4.5 years ± 0.5 year.

THE ADVANCED TECHNOLOGY FOUNDATION

In October 2013, the central government and the Folketing (Danish Parliament) entered into an agreement to establish the Danish National Innovation Foundation. The assets of the Advanced Technology Foundation, the Danish

5 The Regulations are available at www.statsgaeld.dk/DNUK/GovernmentDebt.nsf/side/Government_Debt_Management!OpenDocument.

The government funds' revenues and expenditures in 2013 Table 3.5

Kr. million	SPF	Advanced Technology Foundation[1]	Fund for Better Working Environment and Labour Retention
Revenue:			
Interest etc.[2]	3,091	425	50
Expenditure:			
Transfer to relevant ministry	12,410	400	292
Pension-yield tax	623	-	-
Net revenue	-9,943	25	-242

1. As a result of a political agreement of October 2013, the Advanced Technology Foundation will be part of the Danish National Innovation Foundation, which is expected to be fully established by 1 April 2014.
2. Net statement of interest received, interest receivable, and distributed capital losses on issue.

Council for Strategic Research and the Danish Council for Technology and Innovation will be concentrated in the Foundation. Disbursements from the Advanced Technology Foundation and the Foundation's capital structure will continue unchanged for the time being. The Danish National Innovation Foundation is expected to be fully established by 1 April 2014.

At end-2013, the assets of the Advanced Technology Foundation amounted to kr. 15 billion nominally, cf. Table 3.4. It is a statutory provision that the assets of the Foundation may be invested in Danish government bonds only. The investment strategy for the Foundation is to seek to achieve an equal distribution on short-, medium- and long-term Danish government bonds.

In 2013, the Foundation transferred assets roughly equivalent to the interest income, cf. Table 3.5.

THE FUND FOR BETTER WORKING ENVIRONMENT AND LABOUR RETENTION

The Fund for Better Working Environment and Labour Retention was established in 2007. Its assets are used for preventive measures, retention and inclusion in the labour market. The Fund provides support for measures to prevent physical and mental impairment, work-related accidents and occupational diseases. A total of kr. 3 billion was transferred to the Fund when it was established, and no further capital injections from the government are planned. It is a statutory provision that the assets of the Fund for Better Working Environment and Labour Retention may be invested in Danish government bonds only. The investment strategy is aimed at achieving revenue from interest and redemptions to match future transfers to the Ministry of Employment.

At end-2013, the assets of the Foundation totalled kr. 1 billion, cf. Table 3.4.

4

METHOD OF ISSUANCE AND PRIMARY DEALERS

Danish government securities are primarily sold via auctions. Investors can buy on-the-run issues at the auctions by submitting bids via one of the central government's primary dealers. Since 2010, the group of primary dealers has comprised 12 banks for government bonds and five banks for T-bills.

The key obligations of the primary dealers are to act as counterparties at auctions of government securities and to support liquidity by quoting prices in the secondary market on an ongoing basis. 2013 saw a sharp narrowing of the bid-ask spread. This should be seen in light of improved market conditions and a tightening of the requirements for primary dealers' price quotation.

HOW ARE DANISH GOVERNMENT SECURITIES ISSUED?

In Denmark, domestic government securities are issued at regular auctions or by tap sales in the secondary market. At auctions, investors can buy a large amount of government securities directly from the central government by bidding at the auction via one of the central government's primary dealers. Danish government bonds, denominated in foreign currency, are issued by syndication in which a group of banks market the issuance to investors and undertake the book-building process.

AUCTIONS AND TAP SALES

Auctions are used for the issuance of domestic government bonds and T-bills. For government bonds, preliminary auction dates are announced for the next three months, cf. Box 4.1. As a general rule, two different issues of government bonds are sold at each auction to offer securities that are attractive to a broad group of investors. T-bills are issued at regular monthly auctions, usually on the second last banking day of the month. At bond auctions, bids are placed for the price, while rates are offered at T-bill auctions.

At the auctions, the cut-off price is determined on the basis of a number of factors, including financing requirement, demand, yield spread to other countries and prices in the secondary market.

To supplement auction issuances, tap sales of government bonds are made in the secondary market.[1] Tap sales are current issuances in which securities are offered directly in the secondary market.

CHOICE OF ISSUANCE METHOD

Government securities may be issued using various issuance methods. Among the OECD countries, the three most widely used issuance methods are:

1 Tap sales take place via the MTS Denmark trading platform with primary dealers as counterparties.

- Auction
- Syndication
- Tap sale

Most OECD countries use a combination of several issuance methods. Most issuances take place at auctions, typically supplemented by syndication and/or tap sales. Syndication is used primarily for foreign-currency issuances or opening of new securities, especially for ultra-long (30+ year) government bonds. The three issuance methods are described in more detail in Box 4.2.

Danish government bond auctions

Box 4.1

The central government's auctions are conducted through the MTS Denmark auction system with primary dealers as counterparties. Investors can place bids at the auctions through primary dealers. The auction procedure can be summarised in four steps:

1. Announcement of auction calendar
An auction calendar with preliminary auction dates for the next three months is published regularly. Auctions are announced via DN News[1] and published at www.governmentdebt.dk. The auctions depend on stable market conditions.

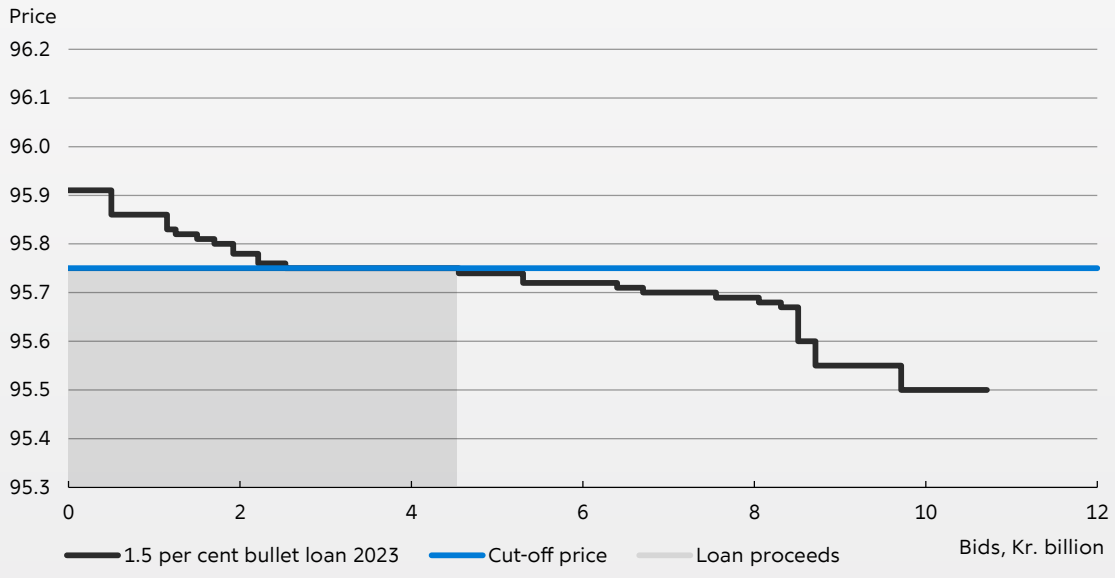
2. Choice of government securities for auction
The government bond(s) to be auctioned will be announced no later than three trading days prior to the auction. The choice of bond(s) for auction will be based on the issuance strategy. Investor demand for the various maturity segments is also taken into account. For current information on investor demand for the various maturity segments, the central government's primary dealers are consulted.

3. Pricing, bids and allotment
The auction principle is uniform pricing. This means that bids at the cut-off price or above are met at the cut-off price, cf. Chart A. Securities can be allotted pro rata to bids at the cut-off price, entailing that all investors with bids at the cut-off price are allotted the same share of their bids. It should be noted that an auction can be completed without allotment.
Each primary dealer may place an arbitrary number of bids. The deadline for submitting bids on the auction day is typically 10:15 a.m. A cut-off price is then fixed and announced within 10 minutes. On average, the cut-off price was announced after three minutes in 2013.

4. Announcement of auction results
When the auction has been completed, the auction results are announced via DN News and published at www.government-debt.dk.

Allotment under uniform pricing, example

Chart A



1. Danmarks Nationalbank's system for dispersing information to connected news agencies, including Bloomberg, Reuters and RB-Børsen.

Primary issuance methods in the OECD countries Box 4.2

Auctions

Auctions are announced well in advance in order to create awareness of and increase interest in the issuance. Participants in the auction are typically limited to a group of banks (primary dealers). End-investors participate in the auction through the primary dealers. Auctions typically comprise several securities at the same time to maximise the probability that the auction reflects demand.

The primary advantage of auctions is that demand is observed directly. Furthermore, auctions help to ensure that end-investors can buy a large amount of government securities without notably shifting the market price. At the same time, primary dealers can avoid keeping the bonds on their balance sheets to meet investor demand. The flexibility of auctions is limited by the fact that auction calendars and on-the-run issues are announced in advance of the auction. Therefore, the trend has been to hold more and smaller auctions, announced at a shorter notice than previously.

Syndication

When syndication is used for issuance of government securities, investor bids are received via a group of banks (the syndicate), which undertakes the book-building process and markets the issuance to investors. The sales forces of the banks help to increase awareness of the issuance. The final price is determined on the basis of demand.

In order to achieve broad investor support, the syndicate markets the product to a broad range of investors at different geographical locations and in different sectors. If a large part of the outstanding volume is placed with buy-and-hold investors, this may cause some sluggishness in the subsequent secondary trading. In order to reach the broadest possible group of investors, efforts are made to compose the syndicate of a group of banks complementing each other's investor relations. The banks participate in syndication against remuneration, typically calculated as a fixed share of the issuance (7.5 to 12.5 basis points of the principal). The advantages of syndication should, therefore, be seen in relation to the fact that the total (direct) issuance costs are higher than for other methods of issuance.

Tap sales

Issuance via tap sales enables banks to meet the demand from investors outside auction days and support the market in the event of extraordinary demand. Moreover, the issuer is less exposed to market developments on specific days, which is expedient – especially during periods of high volatility. Tap sales are less well suited for issuance of large volumes of government securities, since it is not possible to observe overall demand in the market.

In Denmark, most domestic issuances take place via auctions. Due to the issuance requirement for domestic government securities, it is possible to conduct auctions throughout the year. Consequently, primary dealers can buy on-the-run issues on an ongoing basis, which maintains investor knowledge of the auctions. Given the advantages (information about demand, low (direct) issuance costs and possibility of issuing large volumes), auctions are assessed to be the best issuance method for domestic government securities.

The opposite applies to the issuance of foreign debt, whereby the central government typically issues a limited amount of bonds once or a few times per year. This means that it would be excessively expensive to maintain investor and banking knowledge of the auction system. Therefore, Danish government securities denominated in foreign currency are issued through syndication in which banks make targeted marketing of individual issuances.

Trading platforms for purchase and sale of Danish government securities Table 4.1

Interdealer platforms	Dealer-to-customer platforms
MTS Denmark	Tradeweb
Eurex Bonds	Bloomberg
ICAP/BrokerTec	Bondvision
Nasdaq OMX	

PRIMARY DEALERS AND MARKET MAKING

Danish government securities are traded on a number of electronic interdealer and dealer-to-customer trading platforms as well as over-the-counter, cf. Table 4.1. In most of these transactions, primary dealers are one party to the transaction.

Primary dealers in Danish government securities Box 4.3

The central government has entered into primary dealer contracts with a number of regional and international banks. Primary dealers support the Danish government securities market as counterparties in the central government's transactions in the primary market, by regularly quoting two-way prices in the secondary market and through distribution and marketing of Danish government securities to investors.

Primary dealer in government bonds	Primary dealer in T-bills
Barclays Bank	Danske Bank
BNP Paribas	Nordea
Danske Bank	Nykredit Bank
Deutsche Bank	SEB
HSBC	Sydbank
J.P. Morgan	
Morgan Stanley	
Nordea	
Nykredit Bank	
SEB	
Spar Nord Bank	
Sydbank	

To support the primary and secondary markets, the central government has entered into primary dealer contracts with a number of regional and international banks, cf. Box 4.3. Moreover, the central government has a price-quoting system on Nasdaq OMX under which four Danish banks have committed to quote current bid-ask prices. In addition to the price-quoting systems, various other initiatives have been taken to support trading and liquidity in the Danish market for government securities, for instance the securities lending facilities for primary dealers and buy-backs. Liquidity in Danish government securities is generally high across maturity segments particularly in bonds with short remaining maturity, a large outstanding volume and benchmark status, cf. Chapter 8, which analyses liquidity in Danish government securities.

MARKET MAKING OBLIGATIONS

Primary dealers' market making obligations in government bonds are defined relative to the price quotation of other primary dealers.[2] This means that each primary dealer must quote a bid-ask spread that is below primary dealers' average bid-ask spread multiplied by a factor of 1.25 calculated for each security. In July 2013, this factor was reduced from 1.5 to narrow the bid-ask spread, which was too wide by international comparison. The relative nature of the system entails that deterioration in the market conditions under which, for instance, higher volatility leads to a higher bid-ask spread, is automatically factored into the requirements for primary dealers' quoted bid-ask spread.

Until the end of 2011, the relative market making system was efficient, with rapid adjustment of bid-ask spreads to market conditions. Volatility in European sovereign debt markets around the turn of the year 2011/12 caused the spread to widen sharply, cf. Chart 4.1. Subsequently, the bid-ask spreads remained at a higher level for a period of time despite more stable market conditions. In 2013, the relationship between market conditions and the bid-ask spread was restored, causing a sharp contraction in the spread. This should be seen in light of the introduction of more stringent market making obligations and broad consent among primary dealers to narrow the spread. This relationship is expected to be maintained looking forward, which should ensure an efficient market making system with appropriate levels of bid-ask spreads.

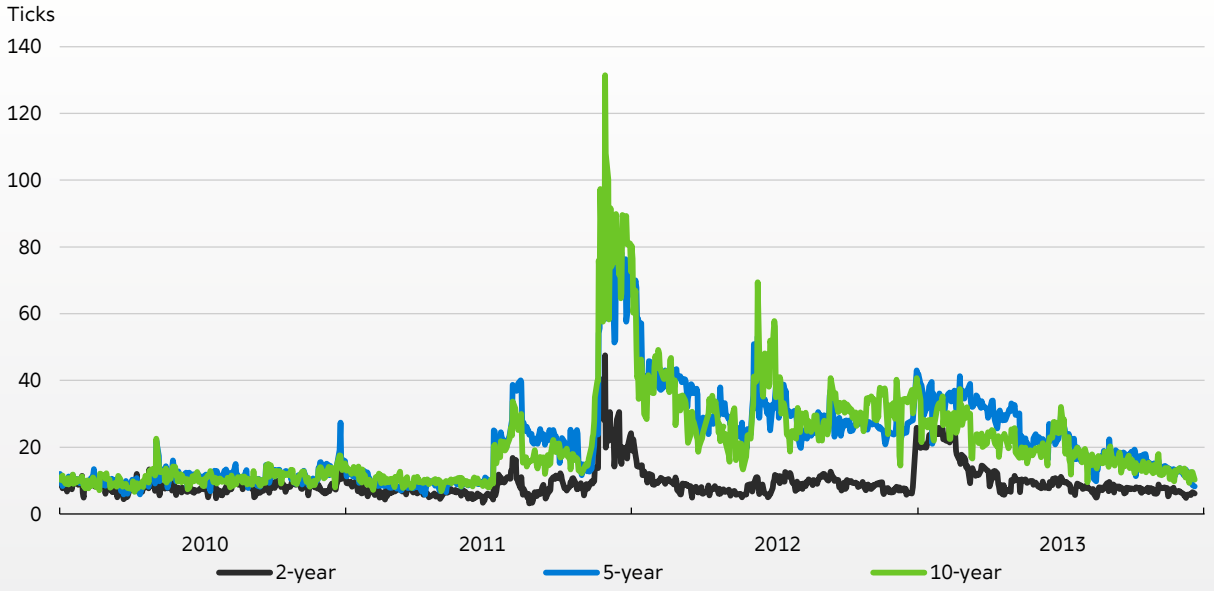
EVALUATION OF PRIMARY DEALERS

Primary dealer activity is evaluated on an ongoing basis using various indicators such as turnover in the secondary market, the quoted bid-ask spread, participation in auctions and quality of advisory services.

The evaluation is an overall assessment, including both quantitative and qualitative elements. To disincentivise inappropriate conduct among primary dealers, such as "artificial

2 For a full review of market making obligations, see *Danish Government Borrowing and Debt 2009, Chapter 12.*

Bid-ask spreads for benchmark securities Chart 4.1



Note: Average of the day's bid-ask spread based on the best bid-ask prices. 1 tick is equivalent to 0.01 price point.
Source: MTS Denmark.

trading"[3], a formal quantitative ranking system is not applied to primary dealers.

LAUNCH OF MORE MARKET MAKING TRADING PLATFORMS

Since the introduction of electronic market making in 2003, primary dealers have chosen MTS Denmark as the only trading platform for fulfilling market making obligations. This should be seen in light of the fact that there have been no enquiries from other trading platforms.

In 2013, following an enquiry from the Eurex Bonds trading platform, it was decided that, starting on 1 January 2014, primary dealers may also use Eurex Bonds to perform their market making obligations. Consequently, looking forward, primary dealers may choose to fulfil their market making obligations using either MTS Denmark or Eurex Bonds. In the 1st half of 2014, 11 of the 12 primary dealers have chosen MTS Denmark, while one has chosen Eurex Bonds.

Provided they meet the stipulated minimum requirements, other trading platforms may also be approved as trading platforms on which primary dealers may fulfil their market making obligations, cf. Box 4.4.

DEALERS IN THE CENTRAL GOVERNMENT'S COMMERCIAL PAPER PROGRAMMES

The central government has entered into agreements with a number of international banks on issuance under the central government's two Commercial Paper (CP) programmes, cf. Table 4.2. There is a keen interest in being a dealer under the Danish CP programmes and the number of dealers in the USCP programmes is expected to be increased in 2014.

3 "Artificial trading" is trading done solely for the purpose of improving one's ranking among the group of primary dealers.

Procedure for approval of trading platforms

Box 4.4

The following steps must be completed before a new trading platform can be approved:

1. Request
A potential trading platform contacts Danmarks Nationalbank with a view to being approved for market making.

2. Application
The trading platform submits its business plan and costs and advantages of approving the respective trading platform for market making. In addition, documentation is provided that the platform meets the stipulated minimum conditions[1], the most important requirement being that there should be a free choice of clearing in VP, Euroclear or Clearstream.

3. Evaluation
The application is evaluated in cooperation between the primary dealers and Danmarks Nationalbank. During this phase, the trading platform may submit supplementary documentation.

4. Decision
At one of their semi-annual meetings, the primary dealers decide whether the platform will be approved for fulfilling market making obligations

When a platform has been approved, an implementation period follows during which the reporting of the platform, in particular, must be adjusted to the existing system. Every six months, each primary dealer has to choose the platform on which it will be evaluated relative to its market making obligations.

1. The conditions are available at the website www.government-debt.dk.

Dealers in the central government's Commercial Paper programmes

Table 4.2

Dealer in ECP	Dealer in USCP
Bank of America Merrill Lynch	Bank of America Merrill Lynch
Barclays Bank	Barclays Bank
Citibank	J.P. Morgan
Credit Suisse	
Deutsche Bank	
ING	
UBS	

5

RE-LENDING AND GOVERNMENT GUARANTEES

The central government provides re-lending and government guarantees to a number of government-owned companies. Re-lending and government guarantees contribute to better borrowing terms for the companies due to the central government's high credit rating.

PURPOSE OF RE-LENDING AND LOAN GUARANTEES

A number of government-owned companies may raise loans directly from the central government, re-lending, or raise government-guaranteed loans, cf. Table 5.1.

Due to the central government's high credit rating, re-lending and government-guaranteed loans give the companies access to cheaper funding than loans without guarantees. Re-lending and government loan guarantees derive from the political wish to support certain projects. The majority of the loans are issued to government-owned companies involved in large infrastructure projects. Purposes and frameworks for the companies' borrowing are laid down by law. As a main rule, the companies that may raise government-guaranteed loans or have access to re-lending pay an annual commission of 0.15 per cent of the loan value to the government.

An alternative to re-lending and government-guaranteed loans are public private

Companies with access to re-lending or loan guarantees Table 5.1

	Re-lending	Government-guaranteed loans
DR (Danish Broadcasting Corporation)	X	
DSB (The Danish State Railways)		X
EKF (Danish Export Credit Agency)	X	
Energinet.dk	X	
Femern	X	X
Femern Landworks	X	X
The Financial Stability Company	X	
The Metro Company	X	
The Danish North Sea Fund	X	
SSI (Statens Serum Institut)	X	
The Great Belt Bridge	X	X
Sund & Bælt Holding	X	X
CPH City and Port Development	X	
Øresund Landworks	X	X
Øresundsbro Konsortiet		X

Note: X indicates that the company has access. The table includes companies whose loan guarantee is administered by Danmarks Nationalbank on behalf of the central government.

partnerships (PPP), where project design, establishment, operation, maintenance and often funding as well are encompassed by one contract between a public provider and a private contractor. So far, the use of PPP in Denmark has been limited.

RE-LENDING

Re-lending means that loans are raised directly from the central government. The loan proceeds are paid from the central government's account, and the resulting financing requirement is met via current issuance in the government's key on-the-run issues.[1] The companies pay interest and redemptions to the central government. The terms and conditions basically mirror those for domestic government bonds, so that coupon rates, interest-payment dates and redemption dates for re-lending correspond to the characteristics of existing government bonds.

The companies may raise re-lending in fixed-rate government bonds in Danish kroner with maturities of 2-10 years.[2] In addition, Energinet.dk, the Metro Company and Øresund Landworks may also raise re-lending in the government bond maturing in 2039. These companies are characterised by being involved in projects with long investment horizons, and re-lending at long maturities may enable them to obtain a better relationship between the duration of their debt portfolios and their fixed assets. The Danish Export Credit Agency, EKF, also has access to re-lending with a serial redemption profile and a maturity of up to 21 years. Moreover, in 2013 Energinet.dk was granted access to re-lending in the inflation-indexed government bond.

When a company requests re-lending, the price of the loan is fixed so that it matches the current market price of the corresponding government bond.[3]

RE-LENDING IN 2013

Re-lending by the central government in 2013 amounted to kr. 27.6 billion, cf. Table 5.2. The average maturity of new re-lending in 2013 was seven years. Re-lending was granted mostly in the first part of the year and in November when existing re-lending expired. Re-lending in the bond maturing in 2039 was granted close to or in connection with the auction of the bond. This reflects, in particular, that issuance in the 2039 bond was limited and that issuance in the other government securities cannot be used to the same extent to hedge re-lending in the 2039 bond.

The outstanding volume of re-lending rose by kr. 8.7 billion in 2013 to kr. 98.2 billion, or just under 20 per cent of the central-government debt. The increase was mainly attributable to EKF's financing of the Export Lending Scheme and the Metro Company's borrowing for expansion of the Copenhagen Metro with a city ring. Just under half of the outstanding re-lending will mature before 2018, cf. Chart 5.1.

BILATERAL LOANS TO ICELAND AND IRELAND

In 2010, Denmark granted a bilateral loan to Iceland. At end-2013, the outstanding debt for the loan to Iceland was 199 billion euro. The borrowing conditions were determined in cooperation with the other Nordic countries that also granted bilateral loans. Iceland is to pay redemptions on the loan as from December 2018, and the loan must be redeemed by 2021. The rate of interest on the loan is 3-month Euribor plus 2.75 percentage points.

In November 2010, the EU member states and the IMF granted Ireland an 85 billion euro loan facility. Together with Sweden and the UK, Denmark has committed itself to a bilateral loan facility. In 2013 Ireland received the third and fourth disbursements of the bilateral loan

1 Re-lending is part of the consolidated market risk management of the central-government debt, cf. Chapter 6.

2 Financial Stability Company also has access to re-lending with maturities of down to one month.

3 The rate of interest on re-lending outside the central government's on-the-run issues, e.g. re-lending to EKF, is based on the zero-coupon curve for Danish government securities, thus reflecting the central government's borrowing terms.

Re-lending in 2013

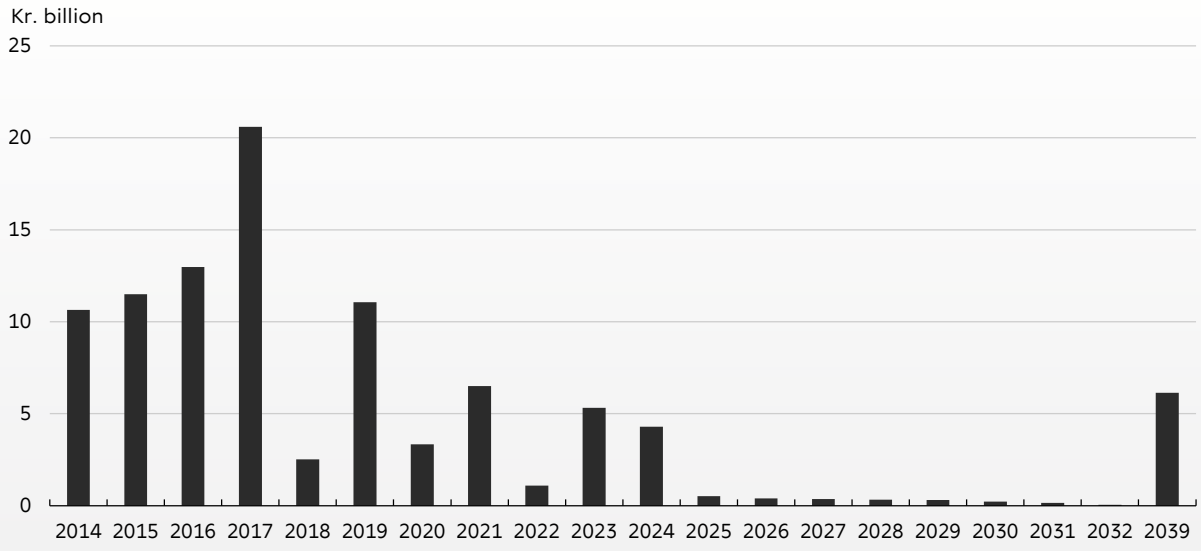
Table 5.2

Kr. billion, nominal value	Portfolio end-2012	Borrowing in 2013	Redemptions in 2013	Portfolio end-2013
DR (Danish Broadcasting Corporation)	3.5	1.6	1.8	3.3
Danish Ship Finance	8.9	-	1.6	7.3
EKF (Danish Export Credit Agency)	10.5	5.4	1.0	14.8
Energinet.dk	11.9	2.1	1.4	12.6
Femern	0.8	0.3	-	1.1
Femern Landworks	0.2	0.3	0.1	0.4
The Financial Stability Company	13.5	10.3	10.9	12.9
The Metro Company	2.9	2.3	-	5.2
SSI (Statens Serum Institut)	0.4	-	-	0.4
The Great Belt Bridge	13.4	0.4	-	13.8
Sund & Bælt Holding	0.4	0.1	-	0.5
CPH City & Port Development	11.6	2.4	2.2	11.8
Øresund Landworks	8.8	1.1	-	9.8
Loan to Ireland	1.5	1.5	-	3.0
Loan to Iceland	1.5	-	-	1.5
Total	89.6	27.6	19.0	98.2

Note: Redemptions include premature redemptions. Value of portfolio as of end-2013. Since the Danish North Sea Fund had no re-lending in 2013 it is not included in the table.

Re-lending redemptions

Chart 5.1



Note: Redemptions in years when no government bonds mature are due to special re-lending schemes to Danish Ship Finance and EKF. Moreover, many government-owned companies have also had access to re-lending expiring in years when no government bonds mature (synthetic re-lending).

Loan guarantees administered by Danmarks Nationalbank on behalf of the government Table 5.3

Kr. billion	Portfolio end-2012	Portfolio end-2013
DR (Danish Broadcasting Corporation)	0.9	0.9
The Danish State Railways	5.9	6.2
Femern	-	-
Femern Landworks	-	-
The Great Belt Bridge	13.0	11.2
Sund & Bælt Holding	0.0	0.0
Øresund Landworks	2.6	1.6
Øresundsbro Konsortiet	18.2	16.4
Total	40.6	36.4

Note: The numbers are inclusive of guaranteed swaps. Two companies in the Danish State Railways were merged in 2013. In this connection loan guarantees to the Danish State Railways were confirmed. Loans issued by Øresundsbro Konsortiet are guaranteed by the Danish and Swedish government with joint and several liability.

facility from Denmark. Ireland thus made full use of the loan facility from Denmark of kr. 400 billion euro. Each disbursement has a maturity of 7.5 years at a rate of interest corresponding to 3-month Euribor + 1 percentage points.

GOVERNMENT GUARANTEES

For loans with government guarantee, the central government guarantees payment of interest and redemptions on the companies' loans raised in the private market. Given the central government's credit rating, a government guarantee enables the company to raise loans in the private market at lower interest rates than would have been the case for loans without government guarantee.

The interest rate on government-guaranteed loans will normally be higher than that on the central government's own issuance even though the credit risk is the same for the investor. This reflects that investors typically demand compensation for the lower liquidity in the companies' issuance compared with government issuance.

Government guarantees may entail losses, and market participants typically factor in guarantee commitments in their assessments of sovereign credit ratings. The OECD, the IMF and the World Bank have formulated best practices for managing government guarantees, e.g. that government guarantees should be published regularly in addition to conventional debt compilations.[4]

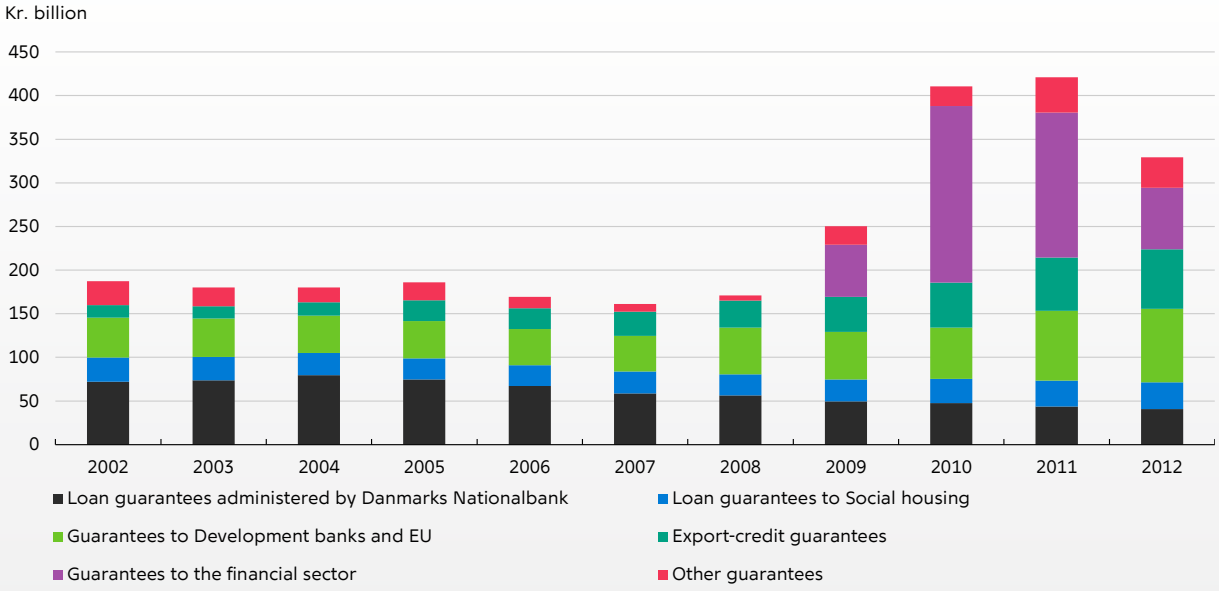
In 2013, Danmarks Nationalbank provided government guarantees on behalf of the central government for new loans to Øresundsbro Konsortiet for kr. 1.6 billion and the Danish State Railways for kr. 2.9 billion. At end-2013, Danmarks Nationalbank administered government loan guarantees on behalf of the central government amounting to kr. 36 billion, which is kr. 4 billion lower than in 2012, cf. Table 5.3.

COMPARISON OF GOVERNMENT LOAN GUARANTEES AND RE-LENDING

Loan guarantees and re-lending are equivalent with regard to purpose and risk for the central government, but their respective impacts on the central government's financing requirement and debt diverge. Loan guarantees have no impact on the financing requirement and

4 Cf. http://treasury.worldbank.org/bdm/htm/guidelines_publicdebt.html.

Central-government guarantees Chart 5.2



Note: The numbers are exclusive the general government guarantee in Back Package I, which was adopted in October 2008 and expired in September 2010. Numbers for 2013 will be published in spring 2014 with Governments Accounts 2013. Compared to the Government Accounts, re-lending to EKF and Danish Ship Finance are not included in the numbers.
Source: Government Accounts for the years 2002-12 and own calculations.

central- government debt. Since re-lending is financed via issuance of government securities, it increases the central government's financing requirement. This supports the scope for building up liquid series of government securities. Re-lending increases the central-government debt since re-lending to the companies is not offset, cf. Chapter 3. In recent years, the government-owned companies have tended to fund their debt via re-lending rather than government-guaranteed borrowing. This has increased the central-government debt, but not the central government's total exposure.

THE CENTRAL GOVERNMENT'S OTHER GUARANTEE COMMITMENTS

The central government also issues guarantees not administered by Danmarks Nationalbank. An aggregate list of the central government's total guarantee commitments is available in the notes to the Government Accounts.[5] The total volume of government guarantees at end-2013 will be published in the spring of 2014 with the Government Accounts. At end-2012, Danish government guarantees totalled just under kr. 330 billion or 18 per cent of GDP, cf. Chart 5.2, of which individual government guarantees to banks and mortgage banks accounted for kr. 66 billion. In 2013 outstanding individual government guarantees to banks and mortgage banks were reduced to kr. 5.2 billion.[6] The total volume of government guarantees at end-2013 is thus expected to be lower than in 2012.

GUIDELINES FOR BORROWING BY THE COMPANIES

Government guarantees and re-lending result in government exposure to the companies' ability to pay. The companies' Executive Boards and Boards of Directors are responsible for funding, including borrowing and management of market risk.

Companies with access to re-lending and government guarantees administered by

5 Cf. http://www.oes-cs.dk/bevillingslove.

6 As of end-July 2013, cf. www.finansielstabilitet.dk.

Danmarks Nationalbank are subject to general guidelines for borrowing laid down in agreements between the relevant ministry, the Ministry of Finance, Danmarks Nationalbank and the individual company, as well as in a list of eligible loan types prepared and maintained by Danmarks Nationalbank, cf. Box 5.1. The aim is to ensure that the companies do not assume financial risks that the central government itself will not assume. Once a year, the companies' auditors inform the management whether the company's procedures regarding the loan portfolio are appropriate in terms of controls. The auditors must provide Danmarks Nationalbank with confirmation of this.

Acceptable loan types for companies with access to re-lending and loan guarantees Box 5.1

The list of eligible loan types sets out the general guidelines for borrowing by the companies that have access to re-lending or government-guaranteed loans administered by Danmarks Nationalbank on behalf of the central government. The guidelines are based on the companies' consolidated approach to risk management of their assets and liabilities. It is the responsibility of the companies to lay down a financing strategy that contains rules for all financial transactions in relation to borrowing and risk management by the company. The list of eligible loan types is based on the following criteria:

Government loan guarantee
- Loan types must be customary, i.e. known and used in the market by reputed borrowers
- Loans must be built up from simple elements that make them transparent.

Re-lending operations
- The companies have access to re-lending based on the re-lending list, which, as a starting point, comprises all fixed-rate government bonds in Danish kroner with maturities of 2-10 years.
- The companies may redeem re-lending prematurely as a result of changes in their funding structures.

Risk-management requirements
- The currency exposure of the loan portfolio should, as a general rule, be limited to euro (or Swedish kronor in the case of Øresundsbro Konsortiet).
- Only plain vanilla swaps may be concluded
- The counterparties are subject to minimum credit rating requirements
- Swaps are only transacted with counterparties who have concluded collateral agreements (CSA) regarding the market value of swaps.

6

MARKET RISK

The duration of the central government debt portfolio has been high since 2008, and the annual refinancing volume is low. This reflects a number of strategic choices, including maintaining a large balance on the central government's account, financed by selling long-term bonds. The robust debt structure means that rising interest rates will be passed through very slowly to the central government's interest costs.

The strategy for 2014 aims at a high share of long-term issuance in order to maintain a low refinancing volume. The central government does not plan to conclude any new interest-rate swaps, since the expected cost savings are currently assessed to be moderate. Furthermore, due to the low long-term interest rates, the high duration of the issuance can be obtained at a low level of interest costs. At the same time, the risk of concluding interest-rate swaps in which the central government pays a floating interest rate is considered to be asymmetrical, because the short-term interest rates cannot decline notably from the current level around zero.

For 2014, the central government's interest-rate risk is managed within a target band of 11.5 years ± 1 year for the average duration of the government debt calculated without discounting.

Duration of government debt sub-portfolios, end-2013 Table 6.1

	Market value, kr. billion	Macaulay duration, years	Duration without discounting
Liabilities:			
Domestic debt	752.2	7.3	9.1
Foreign debt[1]	73.9	-0.6	-0.8
Pledging of collateral for swaps[2]	3.6	0.0	0.0
Assets:			
The funds' portfolios of bonds	109.9	4.6	5.0
Re-lending	108.4	5.1	6.0
Balance on central government's account	162.0	0.0	0.0
Total government debt adjusted for re-lending	449.4	9.7	11.8

Note: For a fixed-rate bond, the Macaulay duration is the weighted average maturity of the cash flows. The weights are given by the present value of each cash flow divided by the market value of the bond. For duration without discounting, the weights are the nominal value of each cash flow divided by the sum of all cash flows at nominal value.
Source: Own calculations.

1. Foreign debt includes portfolio interest-rate swaps in euro. Hence, the duration may be negative.
2. Since the market value of swaps with two-way collateral service agreements is positive for the central government, and the counterparties consequently pledge collateral by way of cash deposits, part of the balance on the central government's account is offset by an obligation linked to the pledging of collateral on the swap portfolio.

Indicators of the interest-rate and refinancing risk of the government debt Box 6.1

For a given portfolio structure, interest costs may rise due to an increase in the general level of interest rates (interest-rate risk) and/or isolated extraordinary increases in the Danish spread to a risk-free interest rate (refinancing risk). The latter also covers extreme cases in which there is no market access. The risk of having to refinance debt at an unusually high rate of interest can be seen as part of the interest-rate risk, but it is often considered separately. One reason is that absence of market access or extraordinarily high increases in the central government's funding costs may have considerable real economic consequences in addition to the purely financial effects of higher interest rates.[1]

A number of indicators are used in the ongoing management of market risk on the central-government debt with the purpose of considering the debt structure from different angles. The most important indicators are stated below.

Indicators of interest-rate risk focus on the consolidated government debt portfolio[2]:

- Macaulay duration: The weighted time to the cash flows of the portfolio. The weights are the present values of the individual cash flows' shares of the total market value of the entire portfolio.
- Duration without discounting: The weighted time to the payments of the portfolio. The weights are the nominal values of the individual cash flows' shares of the total nominal value of the portfolio's cash flows. This is equivalent to the average time to refixing of all cash flows compiled at nominal value. Calculated without discounting, the duration is not affected by interest-rate fluctuations over time.
- Interest-rate fixing broken down by maturity segments: The interest-rate fixing is the amount in kroner for which a new, unknown rate of interest is to be fixed, cf. Box 6.3. Duration is a summary measure, but unlike interest-rate fixing, it does not indicate the share of debt for which a new, unknown rate of interest is to be fixed in each year or the distribution on maturity segments.

Indicators of refinancing risk[3] focus on the liability side of the portfolio[4]:

- Maturity profile: Redemptions and coupon payments broken down by year of maturity.
- Average term to maturity (ATM): The weighted term to maturity of principal and coupon payments. Coupon payments are included, as it constitutes a liability for the central government in line with maturity of principal. If coupon payments were not included, a zero coupon bond and a coupon bond would have the same average term to maturity.
- Short-term refinancing volume: The sum of redemptions and interest payments on bonds and redemptions of T-bills over the next 12 months.

1. Cf. Guidelines for Public Debt Management, IMF and World Bank, 2003, see http://treasury.worldbank.org/bdm/htm/guidelines_publicdebt.html.
2. Calculating duration of the consolidated portfolio only makes sense when the central government debt (net debt) is significantly higher than zero. As a result of the central government's considerable holdings of short-term assets, the overall duration of the government debt is substantially higher than the duration of the liabilities.
3. The mentioned indicators of refinancing risk are published monthly at www.statsgaeld.dk under the menu option Risk Management.
4. The focus is mainly on domestic liabilities. At the end of 2013, foreign debt made up almost 10 per cent of total liabilities.

FOCUS OF MARKET RISK MANAGEMENT

The overall objective for the government debt policy is to achieve low long-term borrowing costs, while taking the degree of risk into account. Market risk management focuses on interest-rate and refinancing risk on the assets and liabilities of the government debt portfolio. The portfolio comprises domestic and foreign debt, swaps, assets in government funds, re-lending and the central government's account at Danmarks Nationalbank, cf. Table 6.1.

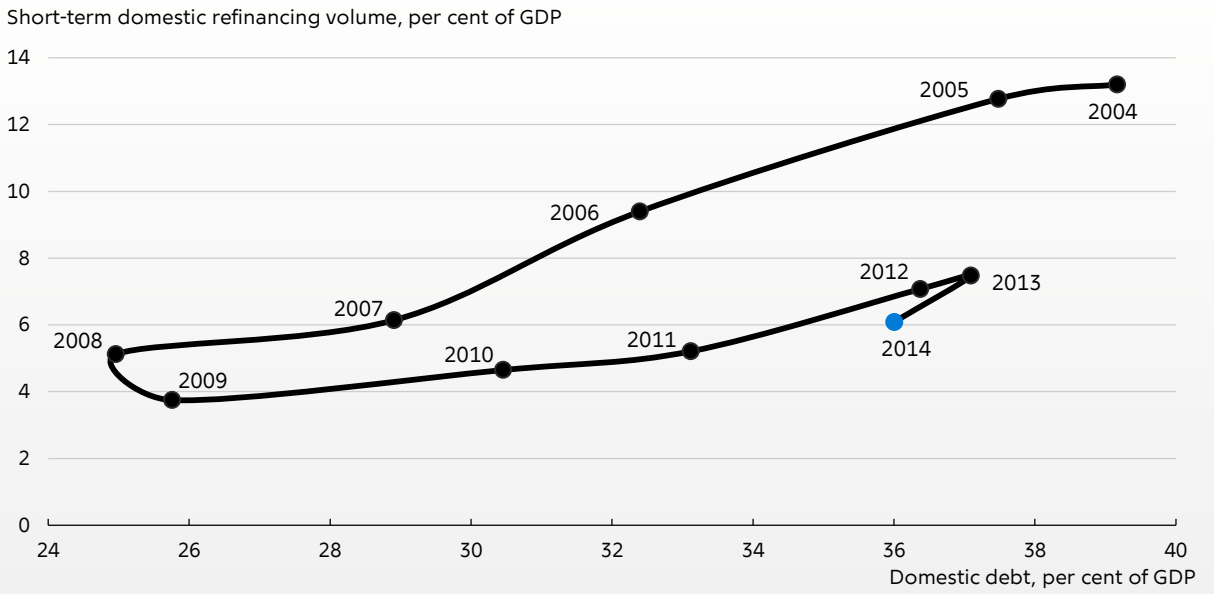
The core element is the risk of higher interest costs, analysed using indicators of interest-rate and refinancing risk for the existing debt portfolio, cf. Box 6.1, and by medium-term projections of the debt structure and the interest costs based on a number of technical assumptions.[1]

MARKET RISK MANAGEMENT IN 2013

The duration of the central-government debt portfolio continues to be long, due to the large share of long-term issuance in recent years and the sizeable liquidity reserves maintained in the form of the balance on the central govern-

1 It is also relevant to include the correlation between the central government's interest costs and other budget items. For example, increased interest costs are less of a problem for the government if they go hand in hand with improved public finances. In practice, this correlation is difficult to model, however, as it requires a simultaneous model for the yield curve, the macro economy and central-government finances.

Domestic debt and short-term domestic refinancing volume Chart 6.1



Note: The short-term domestic refinancing volume as a percentage of GDP is the sum of redemptions and interest payments on domestic government securities (bonds and T-bills) over the coming 12 months, calculated at the beginning of the year, relative to nominal GDP in the previous year. Domestic debt is calculated here as the nominal value of domestic government bonds and T-bills at the beginning of the year.

ment's account at Danmarks Nationalbank. As a result of these strategic choices, the central government has been able to keep its exposure to rising interest rates at a low level.

Without discounting, the average duration of the government debt was 11.6 years in 2013, while the average Macaulay duration was 9.6 years. At the beginning of 2013, the target for the average duration without discounting was 12 years ± 1 year.

MODERATE REFINANCING RISK DESPITE INCREASED DEBT

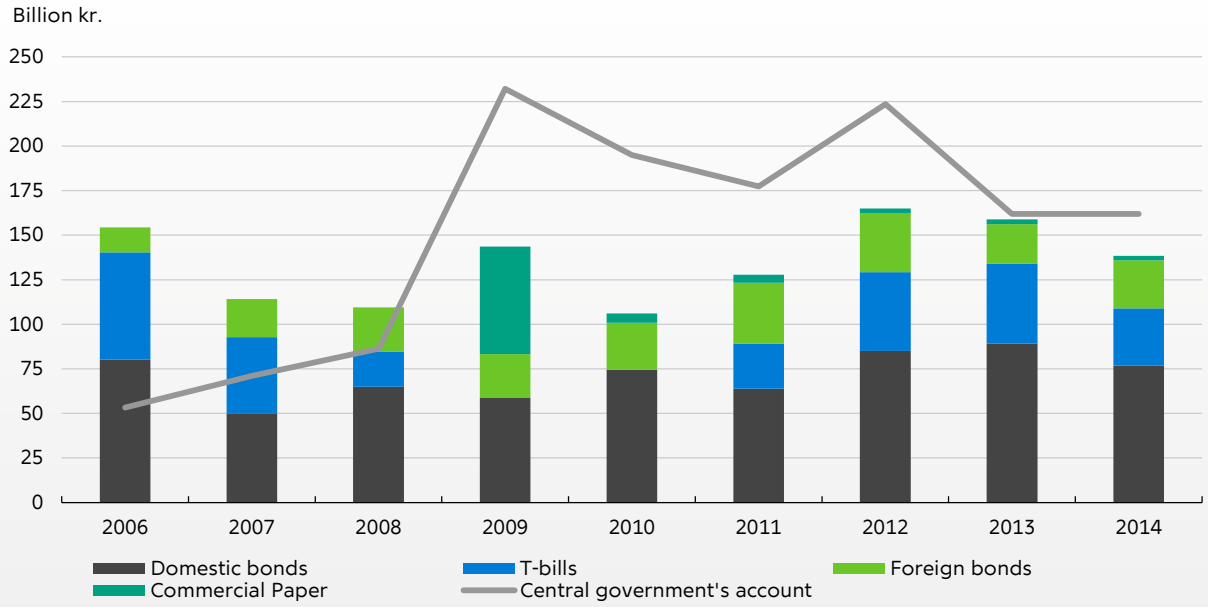
The large share of long-term issuance meant that the average term to maturity for the central government's domestic liabilities in 2013 was maintained at a high level of around 9 years. The long average term to maturity contributed to keeping the short-term domestic refinancing volume at a moderate level in recent years despite growing debt, cf. Chart 6.1. This should be viewed in the light of the large share of long-term issuance in recent years and the reduction of the outstanding amount of the T-bill programme in 2013.

A significant element in the assessment of the central government's overall refinancing risk is its portfolio of short-term assets. At the beginning of 2014, the balance on the central government's account was more than sufficient to cover all domestic and foreign redemptions and interest payments for one year ahead, cf. Chart 6.2.

THE CENTRAL GOVERNMENT'S INTEREST-RATE SWAP PORTFOLIO IS DECREASING

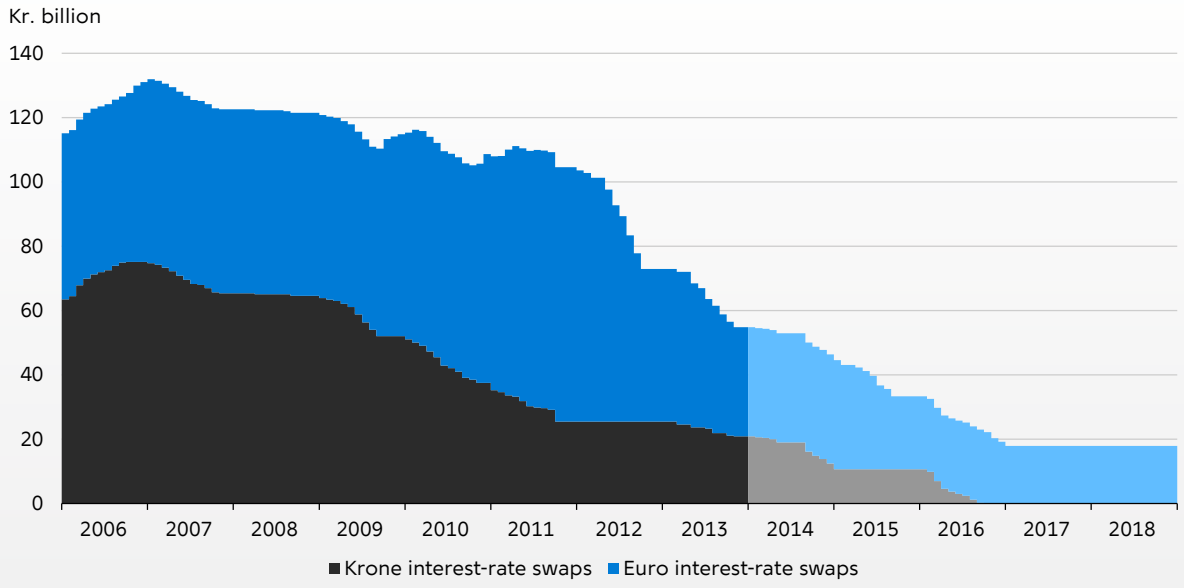
The central government has reduced its exposure to unsecured money-market interest rates, which determine the variable payments for outstanding interest-rate swaps in the portfolio, cf. Chapter 7. This has included terminating outstanding swaps and concluding opposite swaps, in which the central government receives a variable, unsecured money-market interest rate and pays a fixed interest rate. Viewed in isolation, this has increased the duration of the central-government debt, which was in line with the strategy of issuing debt with a long duration without offsetting the duration effect by concluding new interest-rate swaps.

Short-term refinancing volume and the central government's account, beginning of the year Chart 6.2



Note: The short-term refinancing volume is the sum of redemptions and interest payments, including swaps, over the next 12 months, calculated at the beginning of the year. At the beginning of 2009 and 2010, the central government's account was adjusted by kr. 26 billion and kr. 16 billion, respectively, because most of the Social Pension Fund's purchases of mortgage bonds were not settled until January.

The central government's portfolio interest-rate swaps, notional value Chart 6.3



Note: The projection of outstanding interest-rate swaps assumes that no changes are made to the swap portfolio. The notional value of opposite swaps, in which the central government receives a variable, unsecured money-market interest rate and pays a fixed interest rate, is included with a negative sign. Hence, the chart shows a netted outstanding volume.

Including ordinary expiry of swaps, the notional outstanding volume (net) on the central government's interest-rate swap portfolio was reduced by around kr. 18 billion in total, amounting to approximately kr. 55 billion at end-2013, cf. Chart 6.3.[2]

2 'Net' indicates that the notional principals on the opposite swaps are included in the total notional holdings with a negative sign.

STRATEGY FOR MARKET RISK MANAGEMENT IN 2014

The interest-rate sensitivity of the debt portfolio is affected by a number of strategic decisions, including buy-back, issuance and swap strategies. In 2014, the strategy is to issue bonds predominantly in the long maturity segments. All other things being equal, this means that the interest-rate sensitivity for the central-government debt will, also in the coming years, be substantially lower than before the financial crisis. This section describes why the central government does not plan to conclude interest-rate swaps to reduce the duration in 2014. This assessment is made on the basis of the current interest-rate environment and the existing debt structure. Major interest-rate changes may lead to an adjustment of the swap strategy.

WHY DOES THE CENTRAL GOVERNMENT USE INTEREST-RATE SWAPS?

There are two basic reasons why it may be advantageous for the central government to conclude interest-rate swaps, in which the central government pays a variable interest rate and receives a fixed interest rate. The first reason is that the central government in some periods can achieve expected cost savings; the second involves the option of reducing the short-term variation in interest costs by ensuring a better match between interest-rate exposure on assets and liabilities, cf. below.

CAN SAVINGS CURRENTLY BE EXPECTED FROM REDUCING THE DURATION?

If government yields are currently assessed to contain a substantial term premium, this might call for conclusion of interest-rate swaps to reduce the duration and hence the expected interest-rate costs, cf. Chapter 9.[3] The drawback of such a reduction of the duration period is a partially greater interest-rate risk.

Due to the current unusually low level of long-term interest rates, debt with low interest-rate risk for the central government can be issued at a historically low level of interest rates. The low long-term interest rates also indicate that the current term premium is most likely not high. The 10-year Danish bond yield was around 2.0 per cent at end-2013, cf. Chart 6.4. A substantial term premium at this level reflects the expectation that the short-term nominal interest rates will be significantly less than 2 per cent on average over the coming 10 years. Given the ECB's medium-term objective of price stability (annual inflation below, but close to 2 per cent), such levels for the short-term interest rate would correspond to a long period of negative short-term real interest rates. The low level of the 10-year yield seems to indicate that the term premium is limited.

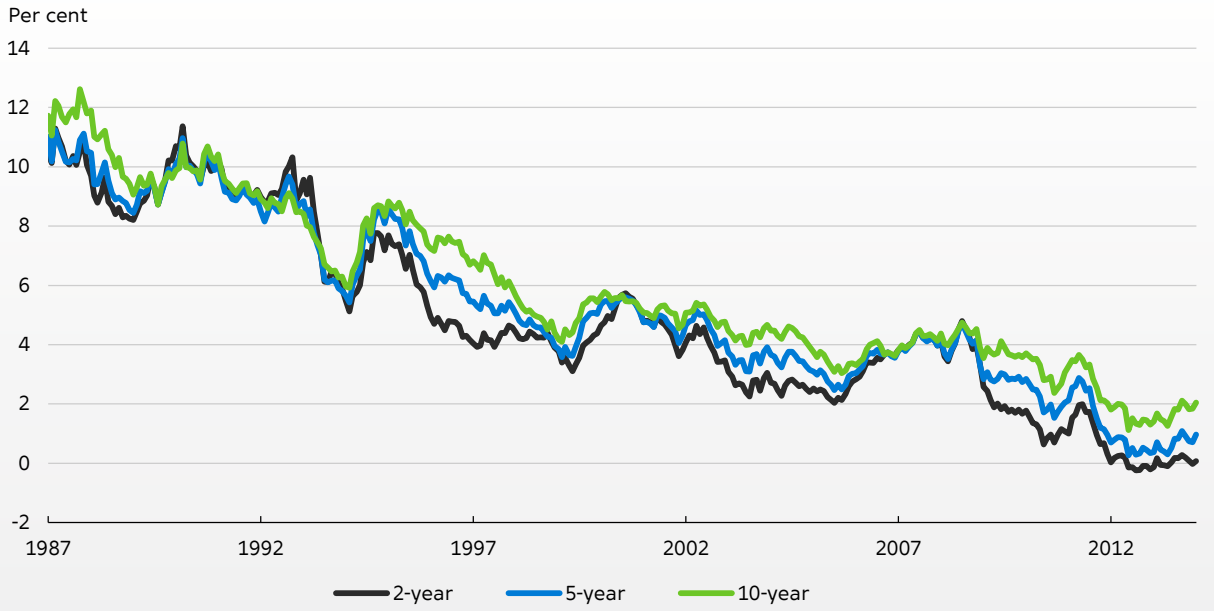
According to our own model estimates based on a dynamic, stochastic interest-rate model (the three-factor Arbitrage-Free Nelson-Siegel (AFNS) model), the term premium is at a moderate level, cf. below. Analyses of term premia in other countries based on other models are in line with the assessment of the term premium of Danish government bond yields in recent years, cf. Chapter 9.

ANALYSES IN THE COST-AT-RISK MODEL

The above argumentation indicates that in the current interest-rate environment, the conclusion of new interest-rate swaps, in which the government receives a fixed rate of interest, is associated with some reduction of the expected interest costs. Analyses in the Cost-at-Risk (CaR) model quantify the effect on expected costs and on costs in tail scenarios of concluding swaps in 2014. This section demonstrates that, according to the model, costs savings could be expected from doing so, but that it would be at the cost of a stronger increase in interest costs in the tail scenarios. It should be noted that the model does not capture instrument risk, meaning that developments in government yields and swap rates with the same terms to maturity may diverge.

3 Use of interest-rate swaps allows decoupling of the portfolio's overall interest-rate sensitivity from the issuance strategy, thus making it possible to reduce the duration without increasing the refinancing volume. This decoupling is associated with instrument risk, however, including the risk of diverging developments in government yields and swap rates.

Danish government bond yields 1987-2013 Chart 6.4



Note: Monthly observations. Zero-coupon rates.
Source: Bloomberg, Nordea Analytics and Danmarks Nationalbank.

Simulated future yield curves

The distribution of the central government's future interest costs is analysed by simulating 5,000 scenarios for the Danish government yield curve towards 2023. This is based on a stochastic, dynamic term structure model of the AFNS class, which is estimated on historical data for the period 1988-2013. The AFNS class is described in the special-topic chapter "Interest-Rate Models for Cost-at-Risk Analysis" in *Danish Government Borrowing and Debt, 2010*.

In the mean scenario, the 2-year zero coupon yields rise from a level of around 0.1 per cent today to approximately 2.1 per cent at end-2023, cf. Chart 6.5 (left).[4] The confidence interval for the 2-year yield in 2023 (95-per-cent level) ranges from -0.8 per cent to 5 per cent. The model does not capture that the sample space for the future short-term interest rates is currently asymmetrical as a result of these rates being close to the "zero lower bound".[5] This is seen by the fact that the model attributes a significant probability to scenarios in which the 2-year yield is negative for many years. In the entire projection period, the 95 per cent confidence interval spans 2-year yields of as little as -1 per cent. It is a well-known problem for this type of model when yields are close to zero.[6]

In the mean scenario, the 10-year yield, cf. Chart 6.5 (right), is projected to rise from approximately 2.0 per cent today to 3.2 per cent at end-2023.

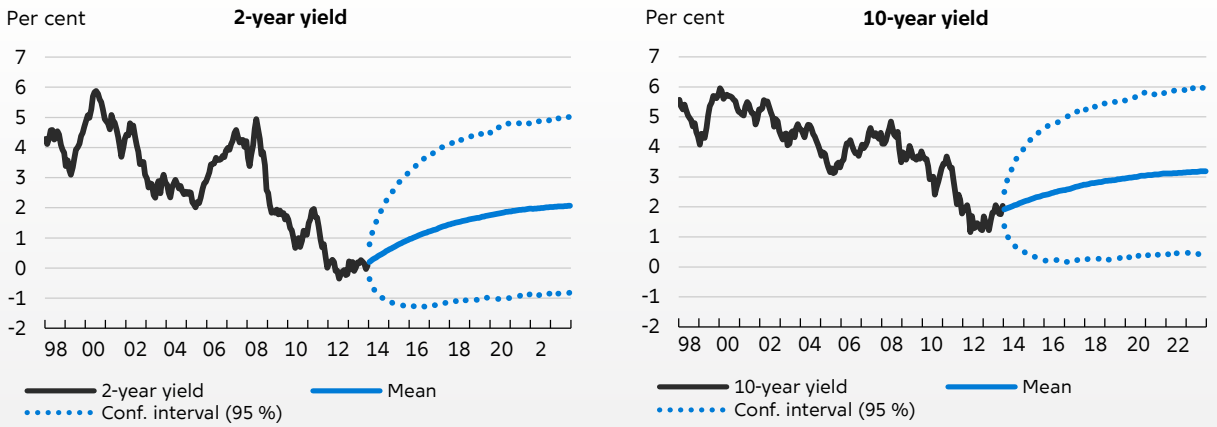
The 10-year term premium of the model – calculated as the difference between the present 10-year yield of approximately 2 per cent and the model based expectation of the average short-term yields over the next 10 years of 1.1 per cent – currently amounts to approximately 90 basis points, cf. Chart 6.6. In the equilibrium of the model, the 10-year term pre-

4 In the estimation of the model, the restriction has been imposed that the long-term equilibrium level of the very short-term yield is minimum 2 per cent. At the current level of interest rates, this restriction is binding.

5 The model does not allow for investors having the option of holding cash as an alternative to earn negative interest. Holding large cash amounts entails costs, however, implying that short-term yields may fall well below zero.

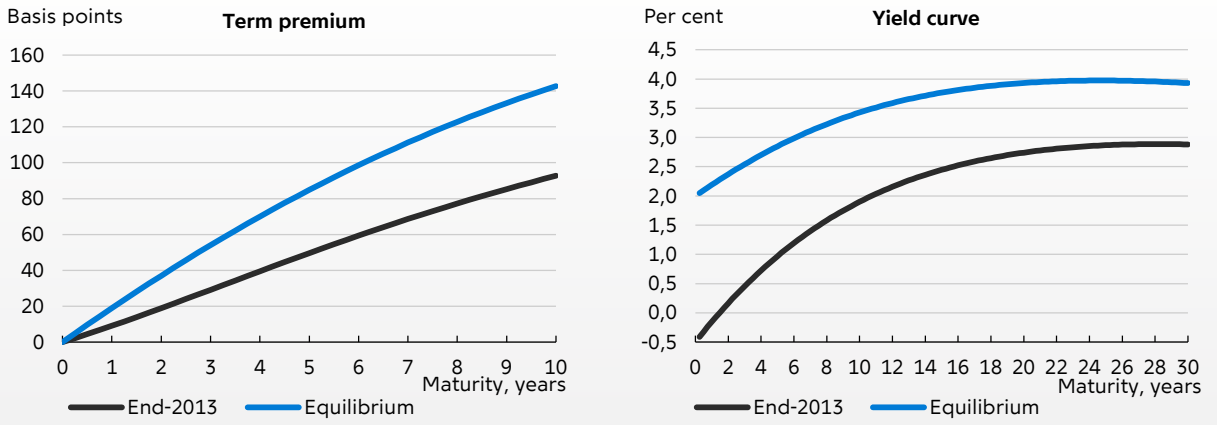
6 Cf. e.g. Christensen and Glenn D. Rudebusch (2013), *Modelling yields at the zero lower bound: Are shadow rates the solution?*, Working Paper, Federal Reserve Bank of San Fransisco, December 2013.

Projection of Danish government yields Chart 6.5



Note: Projections from an AFNS interest-rate model estimated on the basis of monthly data from the period 1998-2013 (N=192). The confidence band has been calculated on the basis of 5,000 scenarios.
Source: Ministry of Finance and own calculations.

Term premium and yield curve, model equilibrium and current estimates Chart 6.6



Note: Based on an AFNS interest-rate model estimated on the basis of monthly data from the period 1998-2013 (N=192). The confidence band has been calculated on the basis of 5,000 scenarios.
Source: Own calculations.

mium is approximately 140 basis points, which is more or less in accordance with the average difference between 10-year and short-term US government yields in the post-war period.[7]

It should be noted that all estimates of term premia are subject to considerable uncertainty, including that the choice of estimation period affects the results, and that the "lower zero bound" enhances the uncertainty regarding model based expectations of future short rates. But the overall picture – that the term premium is currently lower than before, but higher than at the beginning of 2013 – is found to be robust.

Simulated interest costs in the CaR model

The CaR model provides distributions of future interest costs based on the simulated interest-rate scenarios from the interest-rate model and a number of technical assumptions about the debt portfolio, cf. Box 6.2. Chart 6.7 shows interest costs in the mean scenario and confidence intervals (95 and 99 per cent levels). In the mean scenario, interest costs are 0.7-0.8

7 Cf. e.g. Expected Returns, Ilmanen (2003), Chapter 9, 2011, Wiley Finance.

Technical assumptions in the baseline scenario of the projection Box 6.2

The projection of the central government's debt structure is based on a number of assumptions:

- The scenario for the primary balance and GDP towards 2023 mirrors the Ministry of Finance's projections.
- Expected re-lending based on the government-owned companies' reports in connection with Budget Outlook 3, December 2013.
- Maintaining the outstanding volume of the T-bill programme at year-end of kr. 30 billion.
- The existing interest-rate swap portfolio is kept until maturity, and no new swaps are concluded.
- Annual foreign issuance of up to kr. 10 billion in the 3-year maturity segment.
- Balance of the account at end-2013: kr. 157 billion.[1]
- Gradual reduction to approximately kr. 100 billion, partly as a result of the reduction of outstanding foreign loans.
- Issuance in bonds generally meets the issuance requirement according to a 20-10-60-10 distribution. In practice, the account will normally be used to smooth out fluctuations in the issuance requirement between the years. Future smoothing out between the years is not modelled here.
- Absence of instrument risk: It is assumed that there is no risk of swap rates and government yields with the same term to maturity diverging.

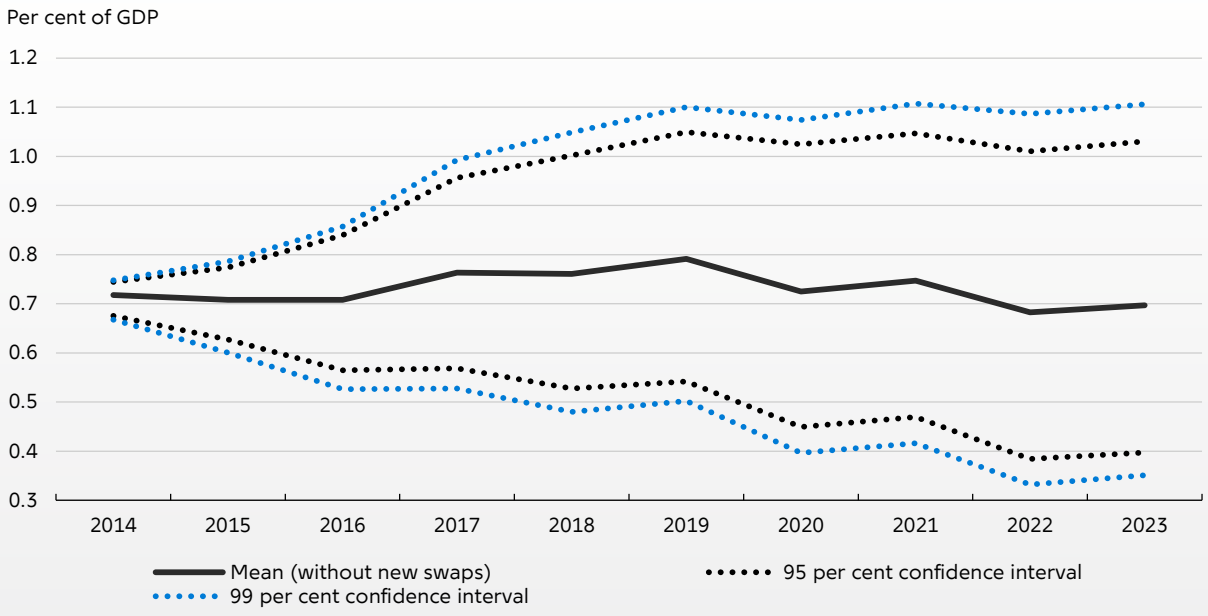
1. Excluding the funds' balances.

per cent of GDP towards 2023. The risk on net interest costs from the development in interest rates is minor. In the 97.5th percentile of the distribution of interest costs (top black curve), these never exceed 1.1 per cent of GDP over the period.

Distribution of interest costs on conclusion of new interest-rate swaps

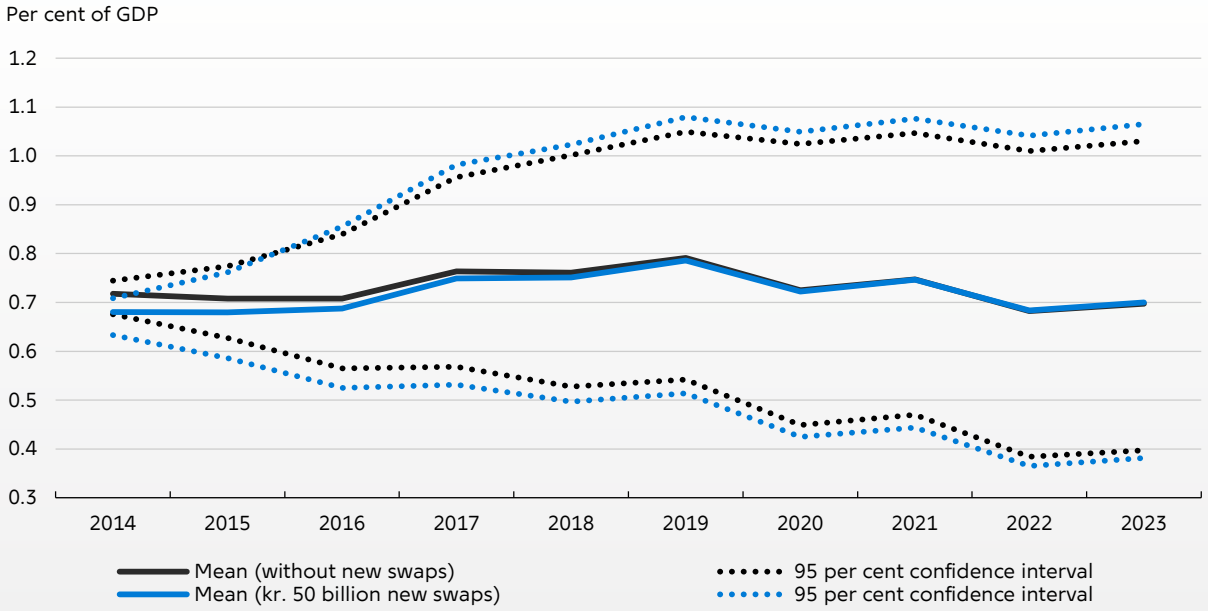
Chart 6.8 illustrates the distribution of the simulated interest costs under the assumption that 10-year Eonia interest-rate swaps, in which the central government will pay the variable interest, will be concluded in 2014 for a notional amount of kr. 50 billion. As seen, minor savings are achieved in the first years, which are expected to be partially offset towards the end of the period. The total expected savings over the entire period reflect the positive term premium currently dictated by the interest-rate model, cf. above. Concluding interest-rate swaps increases the simulated variance (the risk) in the future

Distribution of simulated future interest costs Chart 6.7



Note: Distribution of net interest costs for 5,000 interest-rate scenarios.
Source: Ministry of Finance and own calculations.

Distribution of interest costs with and without conclusion of new swaps in 2014 Chart 6.8



Note: Distribution of net interest costs for 5,000 interest-rate scenarios. The distribution indicated by blue lines is based on the assumption of 10-year Eonia interest-rate swaps being concluded for a notional amount of kr. 50 billion in 2014 (and no new swaps concluded after that), while the black lines assume that no swaps are concluded throughout the period.
Source: Ministry of Finance and own calculations.

net interest costs. The reason is that conclusion of swaps increases that part of the debt for which a new, unknown rate of interest is to be fixed in later years. So after 2016, the interest costs in the 97.5th percentile (upper blue curve) are higher when interest-rate swaps for a notional amount of kr. 50 billion are concluded. Viewed in isolation, concluding interest-rate swaps for a notional amount of kr. 50 billion will reduce the average duration without discounting in 2014 by approximately 0.6 years.

NEGATIVE SHORT-TERM INTEREST-RATE FIXING NOT A PROBLEM AT PRESENT

Even when the term premium is considered to be absent, there may be potential for conclusion of interest-rate swaps in order to reduce the short-term variation in interest costs. For any given duration, the portfolio may be composed in such a way as to render the central government particularly exposed to specific points on the yield curve.

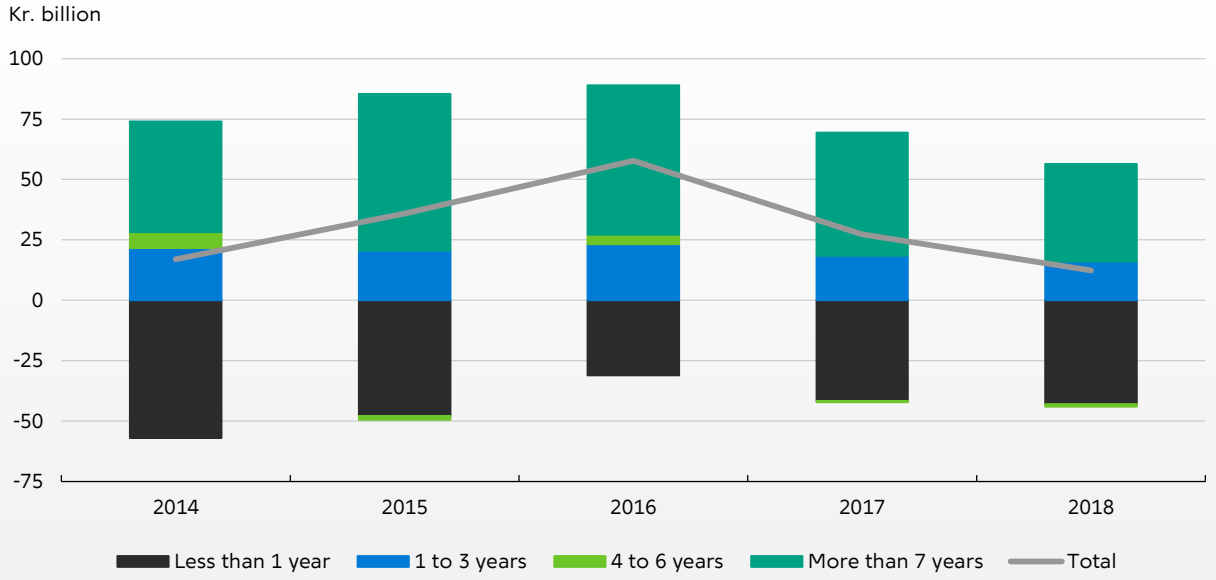
The central government is expected to have considerable negative short-term interest-rate fixing (see box 6.3) in 2014, cf. Chart 6.9. This reflects that the short-term liabilities (variable legs of portfolio interest-rate swaps, variable-rate foreign loans and average outstanding volume of T-bills, approximately kr. 100 billion in total) are expected to amount to around kr. 50 billion less than the average balance on the central government's account. This means that with a view to matching short-term assets and liabilities there is potential for conclusion of new interest-rate swaps. However, the current very low short-term interest rates mean that the risk of increasing net interest costs for the central government due to lower interest income from negative short-term interest-rate fixing is very limited.[8]

The interest-rate fixing is projected on the basis of a number of technical, primarily statistical, assumptions, cf. e.g. Box 6.2, that are not fine-tuned for the individual future years. This may give rise to technical variations in interest-rate fixing between years that can be reduced by management of the government debt policy.

8 The interest on the central government's account mirrors the current-account rate, which is zero at present.

Central government's interest-rate fixing on maturity segments (without new swaps)

Chart 6.9



Note: The chart shows the development in interest-rate fixing based on a technical projection of the debt. The development in total interest-rate fixing is primarily dependent on the development in the central government's gross financing requirement and the strategy for financing this, see also Box 6.3.
Source: Own calculations.

Interest-rate fixing

Box 6.3

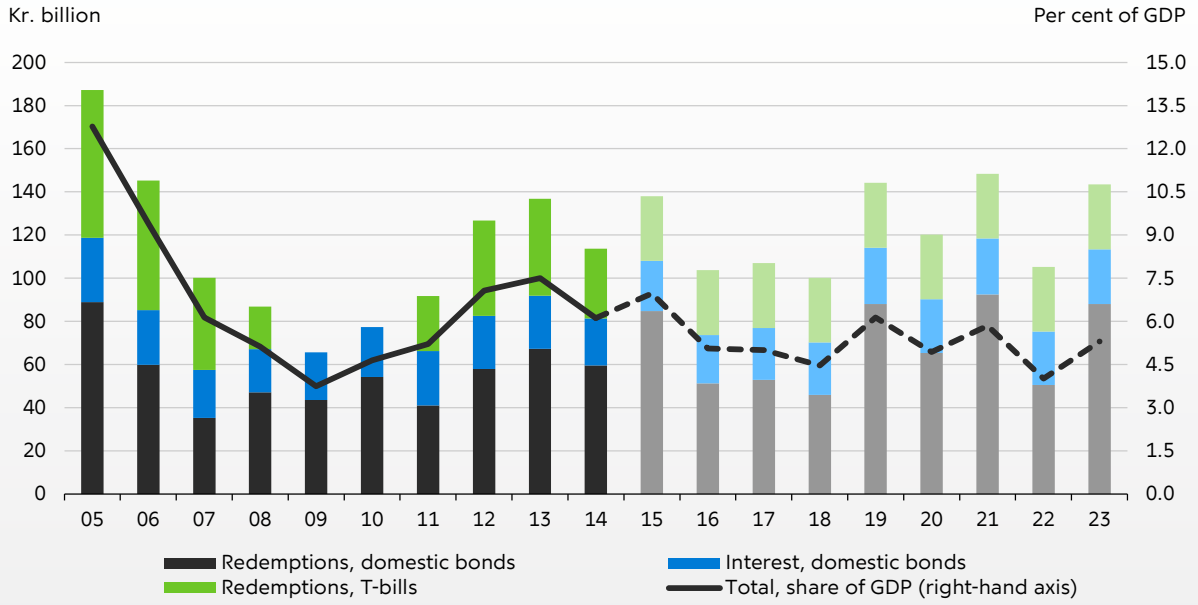
Interest-rate fixing is the amount in kroner for which a new, unknown rate of interest is to be fixed. For a pure fixed-rate bond portfolio, the interest-rate fixing corresponds to the expected volume of new issuance in the respective maturity segments in the individual years. Interest-rate fixing is calculated as interest-rate fixing for liabilities less interest-rate fixing for assets. Hence, negative interest-rate fixing in a maturity segment means that interest-rate fixing for the assets exceeds interest-rate fixing for the liabilities.

- Interest-rate fixing for liabilities comprises the year's issuance of government bonds, the average outstanding volume of T-bills and the average holdings of interest-rate swaps on which a variable rate of interest is paid.
- Interest-rate fixing for assets comprises the average balance on the central government's account at Danmarks Nationalbank, the funds' net placement needs1, the year's new re-lending and conclusion of new interest-rate swaps where a fixed rate is received.

Interest-rate fixing is broken down into different maturity segments. Short-term interest-rate fixing applies to maturities of less than one year. It primarily includes the balance of the central government's account, the average outstanding volume of T-bills and the notional principal of the total portfolio of interest-rate swaps. In addition, interest-rate fixing is divided into the maturity segments from 1-3 years, 4-6 years and more than 7 years. This breakdown thus corresponds to the distribution of the central government's key on-the-run issues.

1. The funds' net placement needs are negative if the year's transfers to ministries exceed the year's interest income and redemptions.

Short-term domestic refinancing volume, 2005-23 Chart 6.10



Note: The bars indicate redemptions and interest payments in the following year, calculated at the beginning of the year. The right-hand axis shows the total domestic redemptions and interest payments as a percentage of nominal GDP in the previous year.
Source: Ministry of Finance and own calculations.

PROJECTION OF THE RISK PROFILE OF THE CENTRAL GOVERNMENT DEBT

This section shows how the short-term domestic refinancing volume and the pass-through from higher interest rates to the central government's interest costs develop in the baseline scenario underlying the CaR analysis.

CONTINUED LOW REFINANCING VOLUME

The projection of the central government's debt and interest costs shows that the short-term domestic refinancing volume is kept at a relatively low level of less than kr. 150 billion throughout the projection period, cf. Chart 6.10. The average is just under kr. 125 billion. This corresponds to around 5 per cent of GDP from 2016 onwards, which is in line with the period 2007-08, when domestic debt as a share of GDP was approximately 10 percentage points below the level in the projection.

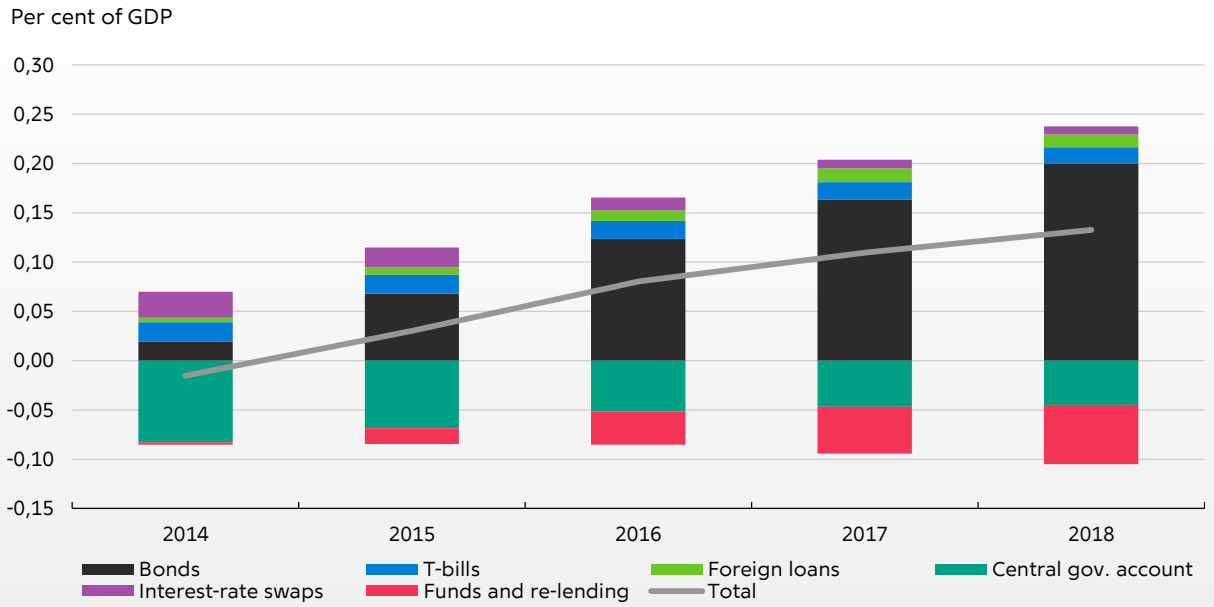
SLOW PASS-THROUGH FROM INTEREST-RATE INCREASES TO INTEREST COSTS

The vulnerability of the central government to interest-rate increases is very low, cf. Chart 6.11. The grey line shows how a permanent increase of 100 basis points at the beginning of 2014 (all maturities) will affect the central government's future interest costs. The increase in interest costs is shown as a percentage of GDP, indicating the deterioration of the government budget balance which is attributable to the effect of higher interest rates.

The bars in the chart show the breakdown of the total effect by the individual portfolio elements: domestic bonds and T-bills, foreign loans, central government's account, interest-rate swaps and funds and re-lending.

It is seen that the (net) pass-through from interest rates is around zero in 2014, rising to approximately 0.15 per cent of GDP in 2018. The low and slow pass-through can be ascribed to the low debt ratio and the high duration of the

Pass-through of a 100 basis point increase in interest rates at the beginning of 2014 Chart 6.11



Note: Increase in interest rates of 1 percentage point for all maturities.
Source: Ministry of Finance and own calculations.

portfolio. The pass-through from an increase in the current-account rate (dark green bars) declines slightly in step with the gradual reduction of the balance of the central government account in the baseline scenario. Similarly, the pass-through from interest-rate swaps (purple bars) declines as the portfolio of interest-rate swaps is reduced, reflecting the decision not to conclude any new interest-rate swaps in the current situation. The chart also shows that an increasing share of the pass-through from the bonds (black bars) is neutralised via higher interest income from the bond portfolios in government funds and from outstanding re-lending (red bars) as a result of an increase in outstanding re-lending in the projection.

The chart emphasises that a negative interest-rate/debt spiral is unlikely to be triggered by the government debt portfolio as long as the deficits do not deteriorate markedly. Moreover, the low and slow pass-through ensures that even in that situation there will be time to make the necessary fiscal adjustments.

CONCLUSION ON THE STRATEGY FOR MARKET RISK MANAGEMENT IN 2014

The issuance strategy for 2014 keeps the refinancing risk for the central-government debt at a low level. The central government does not plan to conclude interest-rate swaps to reduce the duration of the portfolio. This reflects the following assessments:

- The expected additional costs (term premium) of issuing debt with a long rather than a short duration are assessed to be moderate. Our own model estimates of the term premium in the Danish government yield curve indicate that the premium is higher than last year, but remains low compared with previous years. The analyses in the Cost-at-Risk model show that cost savings can be expected from concluding new interest-rate swaps, but that it would be at the cost of higher risk. Moreover, the above analyses do not allow for instrument risk, meaning that developments in government yields and swap rates with the same terms to maturity may diverge.
- Due to the low long-term yields, the high duration of the issuance can be obtained at a low level of interest expenses. The risk of concluding interest-rate swaps is also considered to be asymmetrical. This reflects the fact that the central government's maximum annual gain from concluding interest-rate swaps to reduce the duration is limited to the current level for the 10-year Eonia swap rate of approximately 1.8 per cent. This gain is obtained if, immediately after conclusion, the floating interest rate in the swap falls to and remains at 0 per cent in the subsequent 10 years. On the other hand, the potential loss may be significantly higher.
- Nor does the current situation require new interest-rate swaps to ensure a better match between the central government's interest-rate fixing for the its assets and liabilities, although the central government's short-term interest-rate fixing is expected to be negative in the coming years. This reflects that short-term interest rates are currently close to zero, so the risk of higher interest costs as a result of declines in short-term interest rates is very small.

The target for the average duration without discounting in 2014 is set at 11.5 years +/- 1 year. Due to the uncertainty about the volume and timing of the revenue from the restructuring of capital pension taxation, the development in the duration is uncertain. This reflects that additional revenue from the restructuring of capital pension taxation will not lead to changes in the targets for issuance in 2014. Hence, any additional revenue from the restructuring of capital pension taxation will increase the balance in 2014 and pass directly through to the duration. Furthermore, any major increases in the assessed term premium may cause the central government to conclude new interest-rate swaps in order to reduce the duration.

7

THE CENTRAL GOVERNMENT'S USE OF SWAPS

The central government uses swaps to manage the interest-rate and exchange-rate risks on the debt portfolio. At end-2013, the swap portfolio consisted of 164 swaps with a total principal value of kr. 94 billion. In 2013, the swap portfolio was reduced by kr. 26 billion due to the expiry and termination of interest-rate and currency swaps. At end-2013, the market value of the central government's swap portfolio was positive for the central government by almost kr. 6 billion. Since the counterparties pledge collateral for the market value, the credit exposure totalled kr. 0.8 billion.

In 2013, the central government initiated a switch from one-way to two-way collateral agreements, CSAs. At the onset of 2014, approximately half the central government's counterparties have switched to the new two-way agreements. The negotiations with the remaining counterparties continue in 2014.

WHY DOES THE CENTRAL GOVERNMENT USE SWAPS?

The central government has used swaps for more than 30 years. Swaps are an integral part of the debt portfolio and are used to manage interest-rate and exchange-rate risks. This enables the central government to separate its issuance strategy from its risk management and hedge exchange-rate risks in connection with loans in foreign currencies other than euro.

Interest-rate swaps can be used to adjust the duration of the government debt portfolio, allowing the adoption of an issuance strategy irrespective of the desired duration.

When the central government raises foreign loans in currencies other than euro, the foreign-exchange exposure on interest payments and repayments is converted into euro. This is done via currency swaps in which the central government exchanges principal and interest payments with a counterparty, cf. Box 7.1.

The central government only uses simple (plain vanilla) interest-rate and currency swaps and report all swap transactions and details about the existing swap portfolio, ensuring openness about the central government's use of swaps and the implications for the debt portfolio.

SWAP PORTFOLIO AND TRANSACTIONS

At end-2013, the total principal value of the central government's swap portfolio was kr. 94 billion, cf. Chart 7.1. Since 2009, the swap portfolio has been reduced significantly due to the expiry of interest-rate swaps and repayments on foreign loans to which currency swaps are linked. The central government has not entered into interest-rate swaps since mid-2011 due to the low level of interest rates and a moderate expected gain on interest-rate swap transac-

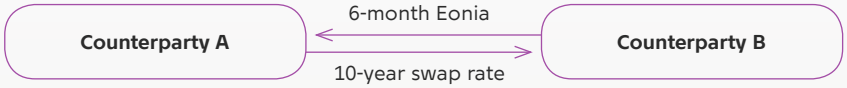
Swaps

Box 7.1

A swap is a bilateral agreement between two parties to exchange a series of future payments. The agreement specifies among other things the principal, the currency and the period for which the interest payments are to be calculated. The central government uses interest-rate and currency swaps.

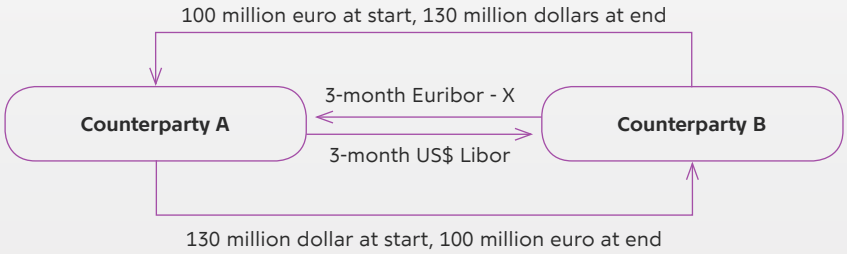
Interest-rate swap

An interest-rate swap is normally an exchange of fixed interest payments for variable interest payments, cf. the illustration. The parties to an interest-rate swap do not exchange principals. The principal of an interest-rate swap is only used to determine the size of the payments on the individual payment dates. The variable leg is typically fixed on the basis of a money-market interest rate, e.g. 6-month Eonia. The interest rate on the fixed leg is called the swap rate and is normally fixed so that the market value of the swap is zero at the time of settlement.



Currency swap

A currency swap is an exchange of principals and variable interest payments in two currencies, cf. the illustration. The principal is exchanged at the transaction and expiry of the swap and takes place at the spot rate prevailing at the time of transaction. Over the lifetime of the swap, the counterparties pay interest on the principal they have received. Typically, a 3-month money-market interest rate in the relevant currencies is used. A spread is normally deducted on the one leg (basis swap spread "X"), so that the market value of the swap is zero at the time of the transaction. When the central government uses currency swaps, one or more interest-rate swaps are typically linked to these to match the payments on the issued loan.



tions in the recent years. The central government's interest-rate swap portfolio is shown in Table 7 in the Appendix of Tables.

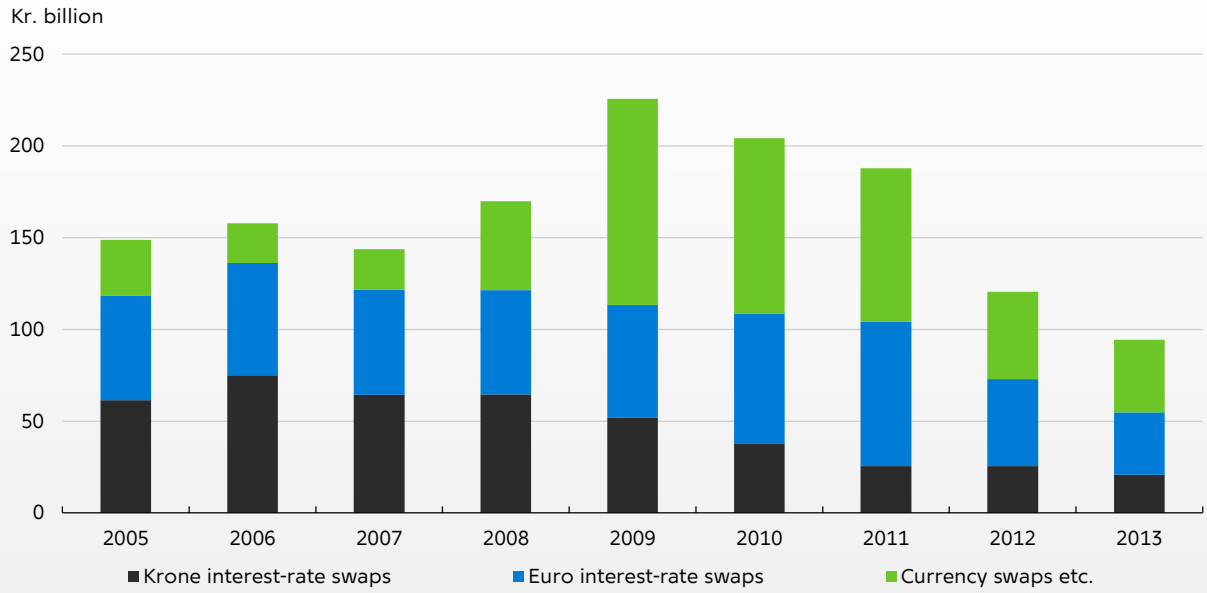
At the time of transaction of a swap, the market value is zero, but over time it may become either positive or negative for the central government, depending on the development in interest and exchange rates. At end-2013, the market value of the swap portfolio was positive for the central government by almost kr. 6 billion, which was primarily attributable to interest-rate swaps, cf. Table 7.1. The central government uses interest-rate swaps to reduce the duration of the debt portfolio. This means that the central government pays a variable short-term interest rate and receives a fixed long-term interest rate. The market value of the interest-rate swap portfolio thus increases when interest rates fall.

In connection with foreign borrowing in 2012-13, the central government concluded part of the related currency swaps with Danmarks Nationalbank, corresponding to a total principal value of kr. 12 billion. Hence, the central government has delivered dollars directly to Danmarks Nationalbank's dollar reserve, while at the same time converting both the central government's and Danmarks Nationalbank's exchange-rate risk into euro. At end-2013, the market value was positive for Danmarks Nationalbank by kr. 0.7 billion, mainly due to an appreciation of the euro against the dollar. The central government's currency swaps and the loans related to these are shown in Table 6.2 in the Appendix of Tables.

SWITCH TO INTEREST-RATE SWAPS BASED ON CITA AND EONIA RATES

Up to the financial crisis, interest-rate swaps, under which the variable payments are de-

Principal of the central government's swap portfolio Chart 7.1



Note: The principal value is measured at end-year. Currency swaps etc. covers swaps linked to loans in foreign currency, DKK-USD swaps in connection with re-lending to Danish Ship Finance and DKK-EUR/EUR-DKK swaps.

termined by a 6-month uncollateralised money-market interest rate, were standard in the interest-rate swap market. The central government's existing interest-rate swaps have likewise been concluded with variable interest payments based on 6-month Cibor or Euribor.

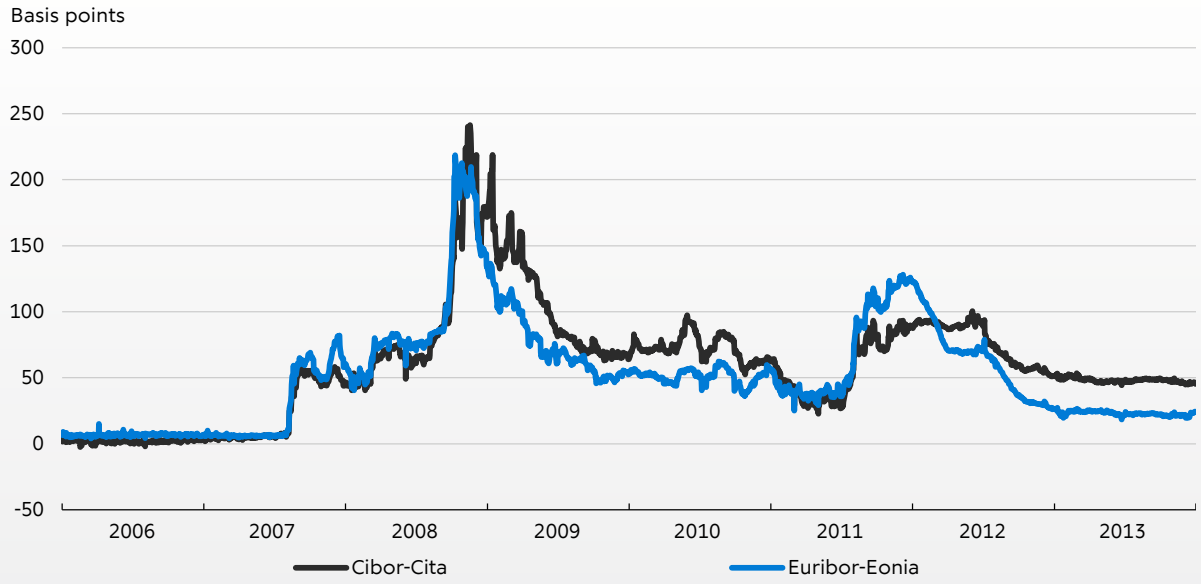
During the financial crisis and the sovereign debt crisis, the spread between uncollateralised and collateralised money-market interest rates widened significantly, cf. Chart 7.2. Since then, interest-rate swaps with the variable interest payments being determined by a very short-

Central-government swap portfolio, end-2013 Table 7.1

Kr. billion	Number of swaps	Principal	Market value
Interest-rate swaps for duration management[1]			
Interest-rate swaps in kroner	76	21.0	1.6
Interest-rate swaps in euro	57	41.5	4.1
Swaps related to foreign loans[2]			
Concluded with private banks	5	11.6	0.5
Concluded with Danmarks Nationalbank	2	12.2	-0.7
Other currency swaps			
From kroner to euro and euro to kroner	1	1.5	0.0
From kroner to dollar related to re-lending[3]	23	6.4	0.2
Total	164	94.1	5.7

1. Interest-rate swaps in kroner and euro concluded in connection with duration management of government debt.
2. Includes both interest-rate and currency swaps.
3. In connection with re-lending to Danish Ship Finance

Spreads between money-market interest rates Chart 7.2



Note: Rates of interest on 6-month loans.
Source: Bloomberg and own calculations.

term money-market interest rate, such as Cita or Eonia, have gained ground. Cita and Eonia reflect the banks' overnight credit risk, while 6-month Euribor and Cibor reflect the banks' 6-month credit risk.

Going forward, the central government will only conclude interest-rate swaps from long-term to short-term interest rates, where the short-term interest rate is determined by the very short-term money-market interest rates. These very short-term money-market interest rates correlate more strongly with government yields than 6-month money-market interest rates do. Therefore, interest-rate swaps based on very short-term money-market interest rates reduce the central government's instrument risk and offer a better match between the interest rates on assets and liabilities of the central government.

The strategy is not to conclude interest-rate swaps in 2014, cf. Chapter 6.

REDUCTION OF EXPOSURE TO UNCOLLATERALISED MONEY-MARKET INTEREST RATES

The spreads between Cibor and Cita and between Euribor and Eonia were low in most of 2013, paving the way for a reduction of the exposure to longer-term uncollateralised money-market interest rates at low costs. In 2013, the central government, therefore, initiated a reduction of the exposure by terminating existing interest-rate swaps or by entering into opposite swaps in which the variable payments are identical to the payments of existing swaps, cf. Box 7.2. This resulted in a minor increase in the duration of the government debt portfolio, which was in keeping with the market risk management strategy.

In 2013, five euro interest-rate swaps with a total principal value of 500 million euro and one interest-rate swap in kroner with a principal value of kr. 200 million were terminated. In connection with the termination, the counterparties have transferred the market value of the terminated swaps of kr. 0.5 billion to the central government. Viewed in isolation, this reduced the central government's interest costs in 2013, which, however, will be offset by similarly high-

Methods for reducing the central government's exposure to uncollateralised money-market interest rates

Box 7.2

Termination of existing swaps

The simplest method for reducing the exposure to uncollateralised money-market interest rates is to terminate existing interest-rate swaps. The contract is terminated and the market value is exchanged between the parties. Since the market value of all interest-rate swaps is currently positive for the central government, termination will involve that the counterparties must transfer the market value to the central government. Therefore, the termination of swaps will provide the central government with a short-term income, which will be offset by correspondingly higher net interest costs in subsequent years.

Entering into opposite swaps

Entering into opposite interest-rate swaps, under which the central government receives a variable interest rate and pays a fixed interest rate, can eliminate the exposure to uncollateralised money-market interest rates. The reason is that the interest payments on the existing swap and the new swap are identical. Thereby, the variable payments of the two swaps are netted and the central government receives the net difference between the fixed legs of the two interest-rate swaps.

Entering into basis swaps

Combined with the existing interest-rate swaps, entering into basis swaps, under which the central government receives Euribor/Cibor and pays Eonia/Cita, can provide the central government with final exposure in Eonia or Cita. This will reduce the central government's exposure to the credit element of the uncollateralised money market considerably, as Eonia/Cita interest rates reflect the overnight credit risk (as opposed to six months) and offer a better match between the interest rates on assets and liabilities of the central government.

er interest costs in the years ahead. In addition, four opposite euro interest-rate swaps with a total principal value of 500 million euro were concluded. All in all, the central government reduced its exposure to uncollateralised money-market interest rates by kr. 7.7 billion in 2013.

CREDIT RISK MANAGEMENT OF THE SWAP PORTFOLIO

Credit risk is the risk of a financial loss as a consequence of a counterparty's default on its payment obligations. A swap with a positive market value is an asset for the central government and exposes the central government to the counterparty's ability to pay.

The credit exposure on the individual counterparty is calculated as the market value, which is positive for the central government, of the individual counterparty's swap portfolio less the collateral provided by the counterparty. In order to reduce the credit risk, the central government receives collateral for the market value of the swap portfolio. At end-2013, the credit exposure was kr. 0.8 billion, cf. Chart 7.3, which is slightly less than the year before.

The central government's credit exposure has been reduced markedly over the past 15 years, cf. Chart 7.4. In 1999-2000, one-way collateral agreements contributed to reducing the central government's credit exposure. The agreements include a rating-dependent threshold value, entailing that the counterparties must pledge collateral when the market value exceeds the threshold value. Continuous downgrades of the central government's swap counterparties have increased the counterparties' collateral and contributed to reducing the central government's credit exposure.

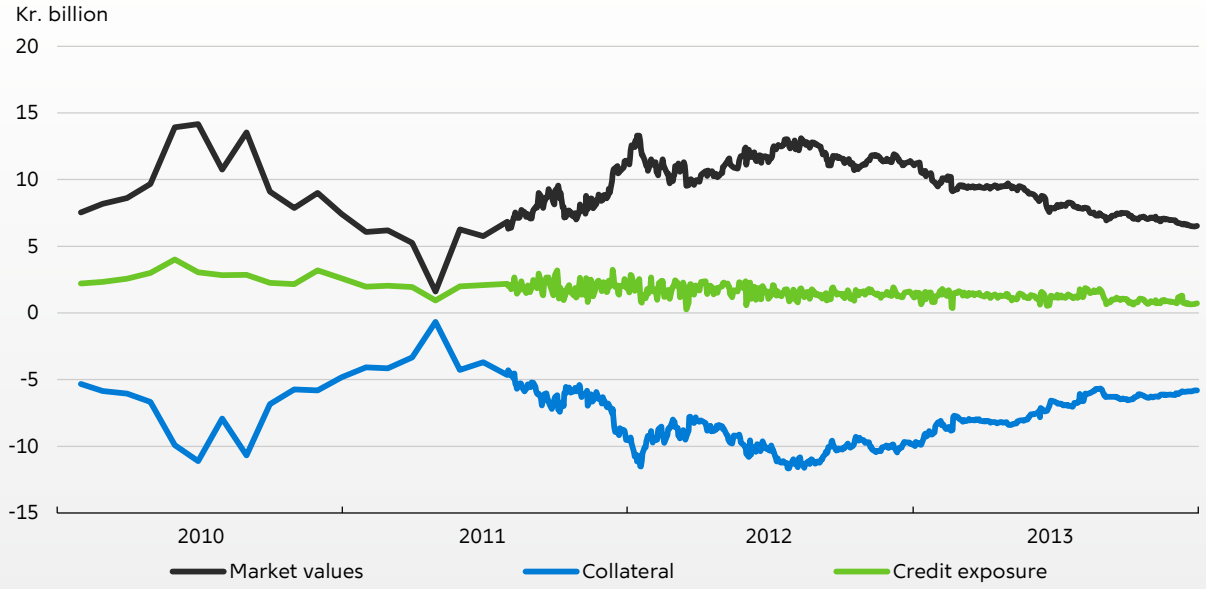
In 2013, the central government embarked on negotiations with all active swap counterparties for new CSAs in which the rating-dependent threshold values are replaced by zero values. This has further reduced the credit exposure. The total exposure is expected to be reduced to close to zero when all active counterparties have been switched to the new two-way collateral agreements.

INTRODUCTION OF TWO-WAY COLLATERAL

In 2013, the central government entered into new two-way collateral agreements, CSA, with a large number of the central government's counterparties. Negotiations with the remaining counterparties will continue in 2014. Higher financing costs for banks and new regulation of the financial sector entail that by switching to two-way collateral the central government

The central government's credit exposure in connection with swaps

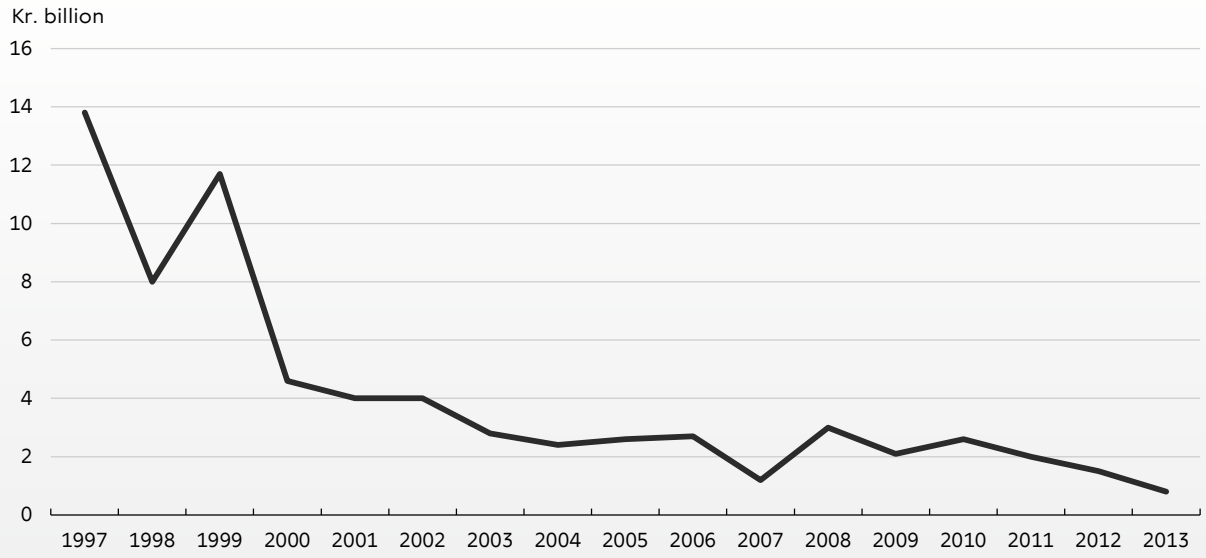
Chart 7.3



Note: Pledged collateral from counterparties is included with a negative sign. Monthly observations up to August 2011 and subsequently daily observations. The market value has been calculated exclusive of cross-currency swaps concluded with Danmarks Nationalbank.

Central government credit exposure against collateral since 1997

Chart 7.4



Note: The central government entered into collateral swap agreements in 1999-2000.

can obtain more favourable conditions when entering into swaps. Further, the central government's switch to two-way collateral is in keeping with the new European swap market regulations.

Existing swaps will be transferred to the new agreements. The market value of the swap portfolio is positive for the central government, and there is only limited likelihood that the central government will pledge collateral to the majority of the counterparties in the next few years.

For the negotiations on the new agreements, the central government has standardised the contents of the agreements, cf. Box 7.3, in order to facilitate the administration of the agreements and to ensure that all counterparties compete on equal terms.

CENTRAL GOVERNMENT'S RULES FOR ENTERING INTO SWAPS

The new two-way collateral agreements contain a threshold value of zero, entailing that the counterparties pledge collateral for the entire market value, thereby limiting the potential losses in connection with the default of a counterparty to the day-to-day changes in market value.

The central government has fixed minimum requirements for the credit quality of the counterparties in order to mitigate the risk of default by a counterparty. The rules entail that:

- The counterparty must be rated by at least two out of three of the following rating agencies: Moody's, S&P and Fitch Ratings.
- The rating must be at least A-/A-/A3. If the company has obtained three ratings, the middle rating is applied.
- Counterparties with a rating of at least BBB/BBB/Baa2 can be accepted if the counterparty is resident in a country with a rating of at least AA/AA/Aa2.
- A two-way collateral agreement must be concluded.
- The credit exposure is diversified by entering into swaps with various counterparties.
- The ISDA agreements concluded with the counterparties must contain a rating trigger to ensure that swaps with the counterparty can be terminated if the rating falls below a certain level (BBB-).

Main features of the central government's ISDA[1]- and CSA-agreements

Box 7.3

All the central government's counterparties have received the same draft for an ISDA agreement and a CSA. Basically, the agreements contain the following features. In the case of some counterparties, the conditions may have been slightly changed during the negotiations.

Main features of concluded ISDA agreements:

- Updated to 2002 version
- Governed by English law
- Rating trigger at BBB-/Baa3 (Investment grade)

Main features of concluded CSAs:

- Two-way obligation to pledge collateral.
- Only accepted collateral is a cash deposit of kroner.
- The pledged collateral accrues interest at the Danish T/N (Tomorrow/Next) rate. The interest rate may be negative.
- Threshold value of zero, i.e. full collateral for the market value.
- Minimum transfer amount of kr. 500,000.
- Existing swaps will be transferred from the old agreements.

1. International Swaps and Derivatives Association.

SPECIAL-TOPIC SECTION

8

LIQUIDITY IN DANISH GOVERNMENT SECURITIES

Liquidity can be defined as the ability to make large transactions at low costs – rapidly and at any time. If liquidity is low, it is expensive for investors to trade, which will ultimately reduce the price of the assets traded. So a liquid government bond market is important as it can contribute to lower borrowing costs for the central government.

This chapter analyses liquidity in the market for Danish government bonds. The overall conclusion is that liquidity is high for all maturity segments. Liquidity is particularly high for bonds with short remaining maturity, a large outstanding volume and benchmark status. It is also seen that liquidity varies over time and deteriorates at times of strong market turmoil. However, this applies to the vast majority of assets, so it should be emphasised that even in periods of heightened uncertainty investors have been able to trade Danish government bonds at relatively low costs. Although liquidity is to a large extent determined by exogenous factors, the government can contribute to a liquid market via its choice of issuance strategy and market structure design.

This chapter initially describes the advantages of high liquidity. This is followed by a more detailed definition of the concept of liquidity, which forms the basis for the empirical analysis of liquidity in the market for Danish government bonds. Finally, the chapter discusses how the government can further support liquidity in the market.

WHY IS LIQUIDITY IMPORTANT?

A well-functioning and liquid government debt market is important as it contributes to lower costs and lower refinancing risk for the central government. At the same time, high liquidity supports an efficient financial system. The direct and indirect advantages of a liquid market for government securities are described below.

DIRECT ADVANTAGES: LOWER COSTS AND LOWER RISK FOR THE CENTRAL GOVERNMENT

High liquidity reduces investors' return requirements, thereby helping to keep average government borrowing costs down. In addition, high liquidity allows the central government to issue larger volumes without paying a special liquidity premium at times when the issuance requirement increases unexpectedly, e.g. because of a financial crisis.

A liquid market for government securities can also contribute to reducing the central government's refinancing risk. Typically, high liquidity is necessary in order to issue in the longer maturity segments, as investors run a greater risk of having to sell the assets before they mature. So if long-term bonds are to be issued without any significant additional costs, it is important that investors expect high future liquidity, as this affects the sales costs at a later date.

INDIRECT ADVANTAGE:
A MORE EFFICIENT FINANCIAL SYSTEM

A well-functioning market for government securities with high liquidity contributes to a more efficient financial system. Consequently, the government yield curve is often used as a benchmark for pricing other financial instruments, such as corporate bonds and interest-rate derivatives. A liquid market for government securities, with issuance of both short- and long-term bonds, gives a smooth and continuous yield curve, which contributes to efficient pricing in the rest of the financial market. At the same time, a liquid government yield curve improves the information content about market expectations of future interest-rate and inflation levels.

Since government securities are often used as collateral in connection with repos, high liquidity is also important for a well-functioning interbank market. Sharp pricing of government bonds reduces uncertainty about their collateral value, thereby contributing to a more efficient money market. A well-functioning money market is important for financial stability and also supports efficient transmission from policy interest rates to money-market interest rates and on to the real economy.

DEFINITION OF LIQUIDITY

If investment in an asset entails costs, this will affect the price that investors are willing to pay. The costs linked to trading an asset depend on the liquidity of the asset, which thus becomes a key concept for both investors and issuers. At the same time, investors take into account the risk that the liquidity of the asset will deteriorate, as this will increase subsequent trading costs.

In other words, the liquidity of the asset and the risk that this liquidity will deteriorate influence the price of the asset. Against this background, the concepts of liquidity and liquidity risk are defined in more detail in the following two sections.

LIQUIDITY

Generally speaking, an asset can be said to be liquid if the market in which it is traded is continuous and efficient.[1] Continuity entails that it is always possible to effect large transactions. Efficiency entails that it is always possible to trade small orders at prices very close to the fundamental value of the asset.

So liquidity can be defined as the ability to make large transactions at low costs – rapidly and at any time. This means that the concept of liquidity includes three dimensions related to time, volume and costs, respectively. In practice, the liquidity of an asset is therefore often analysed on the basis of price tightness (cost dimension), depth (volume dimension) and resiliency and degree of immediacy (time dimension).

- Price *tightness* expresses the cost of effecting a small transaction.
- Price *depth* expresses the degree to which large orders can be executed in the market.
- Price *resiliency* expresses how fast temporary order shocks are neutralised in the market.
- *Immediacy* expresses how fast a transaction can be effected.[2]

In other words, an asset is liquid if the market in which it is traded is characterised by a narrow spread between bid and ask prices and large depth. At the same time, it must be possible to effect transactions fast, and prices must be robust to order shocks.

1 The literature provides no universal definition of liquidity, but a common feature of the various definitions is that liquidity is linked to the cost of an immediate transaction. The definition in this chapter is based on Black (1971), Kyle (1985), Grossman and Miller (1988), Danmarks Nationalbank (2003) and Harris (2003).

2 As trading on electronic trading platforms has become increasingly automated, immediate trading has become the standard. However, this is not necessarily the case in over-the-counter markets, where government bonds are mainly traded, as execution of transactions may involve searching costs.

Reasons for illiquidity[1]

Box 8.1

Basically, the degree of illiquidity is determined by the costs of providing liquidity and the market power of liquidity providers (e.g. market makers) vis-à-vis customers. Five of the most characteristic reasons are described below.

Direct costs: Payroll costs, IT investments and capital costs
Liquidity providers have various overheads such as payroll costs and IT infrastructure investments. To be a market maker, it is also necessary to have a certain amount of capital, which entails capital costs. Consequently, increased capital requirements may have a negative impact on liquidity if it becomes more expensive for liquidity providers to hold investment assets.

Indirect costs: Adverse selection
If some investors have private information about the true value of an asset, this can be converted into gains by trading at the liquidity provider's prices. Since such investors trade only when the market price does not reflect the true value of the asset, the liquidity provider will incur systematic losses when trading with better informed investors. These losses must be covered by trading with investors who have access to general market information only. Hence, the bid-ask spread will increase with the degree of asymmetric information among market participants.

Indirect costs: Inventory risk
Liquidity providers typically aim to maintain a certain inventory of the asset in which liquidity is supplied. The optimum inventory level can be seen as a trade-off between the risk of going short in the asset (i.e. having a negative inventory) and the costs of holding an unnecessarily large inventory. By adjusting bid and ask prices, liquidity providers can typically influence the inflow of new orders so that the desired inventory is maintained in the long term. However, at times incoming orders may be concentrated on either the buy or sell side, thereby having a lasting effect on the inventory level. For example, this may be the case during periods of market turmoil or as a result of adverse selection. In such situations, the liquidity provider may either accept a less-than-optimum inventory level or adjust the portfolio by trading in the market. Since both alternatives involve costs, the bid-ask spread will increase with the inventory risk.

Indirect costs: Funding constraints
The liquidity provider's inventory of assets is typically funded via leveraging. If funding opportunities are good, this gives the liquidity provider the option to quote prices in many different assets and for large volumes. If funding opportunities deteriorate (e.g. because of an increased haircut on pledging of collateral), this means that the liquidity provider must divest part of the portfolio. Typically this is done at prices below the fundamental value of the assets, so that the liquidity provider incurs a loss. Losses make it more expensive to provide liquidity, and hence the bid-ask spread widens with the risk of funding constraints.

Market power: Searching costs
In many markets, including the bond market, trading does not take place at a centralised marketplace, but primarily as bilateral bargaining between two market participants. An investor wishing to trade therefore has to identify a counterparty through a search process. When a counterparty has been identified, the investor may trade at the price quoted or continue in search of a better price. Since the search process is costly, investors tend to accept a discount. This gives the counterparty a certain bargaining power that can be used to increase the bid-ask spread. Consequently, the bid-ask spread will be wider compared with a situation where investors have full transparency in relation to the prices quoted by liquidity providers.

1. Adverse selection is described in Glosten and Milgrom (1985). Inventory risk is described in Garman (1976). Funding constraints are described in Brunnermeier and Pedersen (2009). Searching costs in over-the-counter markets are described in Duffie, Gârleanu and Pedersen (2005).

In practice, the liquidity of an asset will never be perfect, and hence trading will entail costs.[3] Basically, this is because there are costs linked to supplying liquidity. For example, a liquidity provider, such as a market maker, may incur losses when trading with investors who have access to private information on the fundamental value of an asset. Such losses must be covered via trading with investors without private information, who are therefore offered a wider bid-ask spread. A number of the most characteristic reasons for illiquidity are described in Box 8.1.

3 Basically, trading costs can be broken down into exogenous and endogenous trading costs. Exogenous trading costs relate to the direct costs of a transaction (e.g. brokerage and taxes). Endogenous trading costs relate to the value loss arising because the asset is traded at a price that deviates from its fundamental value (typically expressed as a positive bid-ask spread). Liquidity studies typically focus on the endogenous trading costs, which are also in focus in this chapter.

LIQUIDITY RISK

Besides the current liquidity of an asset, investors are also interested in its future liquidity level. If liquidity deteriorates when the investor needs to trade, costs will increase. The risk of higher costs in connection with a sale at a later date means that investors are exposed to *liquidity risk*.[4]

The need to trade typically arises in periods of market turmoil, during which investors lose income from other sources and therefore need to divest assets. If an asset can be sold without any notable loss during such periods, this is of great value to investors. Hence the price of an asset can be expected to decline as the degree of liquidity risk rises.[5]

US and German government bonds are often used as examples of assets with low liquidity risk as they function as safe havens during periods of elevated market uncertainty. Investors are willing to pay an additional premium for such assets in the expectation that they can be divested without much loss of value at times when liquidity is in high demand.

DATA BASIS FOR LIQUIDITY ANALYSES

Estimation of liquidity depends on the market information available. Basically, a distinction is made between pre- and post-trade information.

PRE-TRADE INFORMATION

Pre-trade information provides the most true and fair picture of liquidity in a market since liquidity dimensions such as price tightness and depth can be observed directly from the order book. This makes it possible to measure liquidity at any time, irrespective of whether trading has taken place. Compared with post-trade information, which typically focuses on actual transaction prices, pre-trade information also includes information on the liquidity level when trading is not taking place, e.g. due to unfavourable prices or lack of depth.

To illustrate pre-trade information in the market for Danish government securities, Chart 8.1 shows the development in the quoted bid-ask spread and the related depths on the MTS Denmark trading platform.[6] Generally speaking, liquidity has been highest in the 2-year maturity segment, which has had the narrowest bid-ask spread and the largest depth. It should also be noted that liquidity typically deteriorates during periods of elevated market uncertainty, as seen in connection with the collapse of Lehman Brothers in 2008 and the European debt crisis in 2011.

Pre-trade information is available for only a limited share of the transactions in the market for Danish government bonds as most trading takes place over-the-counter.[7] Consequently, the analysis of liquidity in the market for Danish government bonds is performed on the basis of post-trade information.

POST-TRADE INFORMATION

The empirical analysis of liquidity in the secondary market for Danish government bonds is based on post-trade information from the MiFID transaction reports, cf. Box 8.2. The analysis covers the period from November 2007, when reporting of transactions began, until July 2013.

For all analyses, outstanding bonds are broken down by remaining maturity. Since the on-

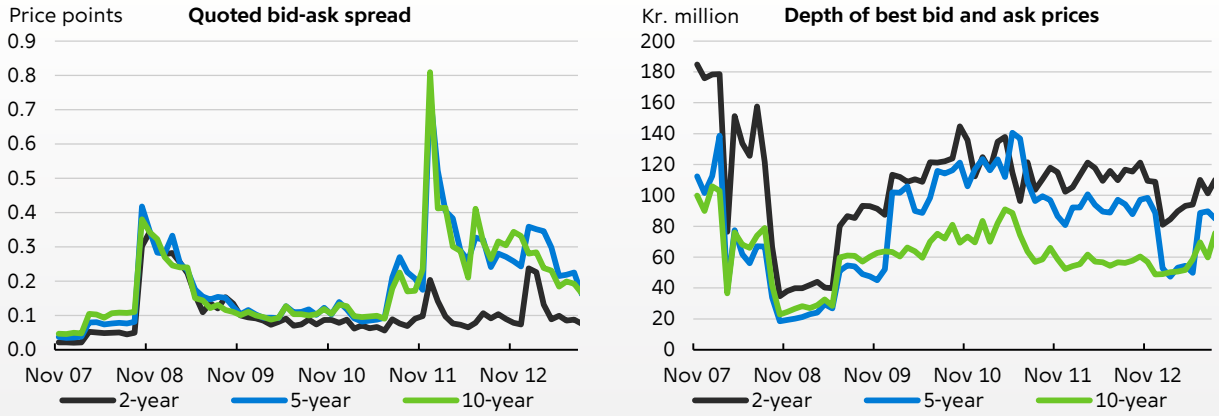
4 Standard portfolio theory implies that only systematic risk (i.e. non-diversifiable risk) influences the price of an asset. In principle, only the systematic part of the liquidity risk on government bonds should therefore have an impact on their price. The underlying assumption is that the significance of asset-specific liquidity risk (unsystematic liquidity risk) can be eliminated by holding a sufficiently broad portfolio. However, it is doubtful whether this applies to the market for high-rated government bonds as the number of issuers is limited.

5 Acharya and Pedersen (2005) expand the CAPM to include liquidity risk and demonstrate that the liquidity risk premium can be decomposed. The three liquidity risk components relate to covariation between the liquidity of the individual asset and of the market portfolio, covariation between the return on the individual asset and the liquidity of the market portfolio and covariation between the liquidity of the individual asset and the market return, respectively. Based on equity return data for the period 1962-1999, the authors find the latter effect to be dominant, i.e. most of the risk premium reflects whether the individual asset is illiquid when the market return is low.

6 Trade information from MTS Denmark is used since the central government's price-quoting system takes place on this trading platform.

7 Pre-trade prices exist continuously in the secondary market, but are not registered systematically in over-the-counter markets in the same way as on electronic trading platforms.

Quoted tightness and depth for benchmark bonds Chart 8.1



Note: Based on time-weighted bid-ask spreads and depths for benchmark bonds. Market depth is an expression of the sum of transaction sizes for the best bid and ask prices. Monthly median values are shown for the period November 2007 to July 2013.
Source: MTS Denmark and own calculations.

the-run issues have typically focused on the 2-, 5- and 10-year maturity segments, the analysis applies these segments.[8] The 30-year maturity segment has been filtered out as systematic issuance in this segment has not taken place throughout the period under review.[9] In addition, the inflation-linked bond has been filtered out, since it was not introduced until 2012 and furthermore belongs to another asset class than nominal bonds.

Prior to the analysis, data was filtered to target the data basis at the purpose of the analysis and to minimise misreporting. Since the analysis focuses on how institutional investors experience liquidity in Danish government bonds, retail transactions have been filtered out. The data filtering is specified in Table 8.A.1 in the Appendix.

Description of MiFID data Box 8.2

The MiFID Directive[1] entails that since November 2007 all investment firms and credit institutions in the EU have had an obligation to report securities transactions to the national supervisory authorities. Transactions in Danish government bonds to which at least one party is such an institution are therefore reported to the Danish Financial Supervisory Authority on an ongoing basis.

Using these transaction reports, a data set has been constructed for the analysis, comprising information about the size, price and time of transactions in government bonds from November 2007 to July 2013. Since all bonds have unique ISINs in the MiFID reports, it is straightforward to add further trading information about the outstanding volumes and maturities of the bonds sourced from the Securities Statistics. In the data set used, all transactions have been anonymised so that the analyses do not focus on counterparty level.

1. Directive 2004/39/EC of the European Parliament and of the Council, Article 25(3) and (4).

Descriptive statistics

Table 8.1 provides descriptive statistics for the three maturity segments. The following is worth highlighting:

- The outstanding volumes are largest for the 2- and 5-year maturity segments. This is because the maturity of long-term bonds will at some point become sufficiently short for them to be included in the 2- and 5-year segments. At the same time, 10-year series are built up from zero and hence have a lower outstanding volume at first.
- Turnover is highest in the 10-year maturity segment. The higher turnover reflects a much larger number of transactions in 10-year bonds, while the transaction size is

8 The maturity segments have been defined as bonds with the following remaining maturities: 2-year: 1 to 3½ years, 5-year: 3½ to 7½ years, 10-year: 7½-13½ years.

9 The 30-year maturity segment is limited to 7'2024 and 4.5'2039. 7'2024 was opened in 1994 and issued until 1999. 4.5'2039 was opened in November 2008.

Descriptive statistics Table 8.1

Average per month	2-year	5-year	10-year
Per maturity segment			
Number of bonds	2.6	2.5	2.1
Time to maturity (years)	2.3	5.4	9.3
Outstanding volume (kr. billion)	155	149	101
Number of transactions[1]	217	236	393
Turnover (kr. billion)	28	22	37
Transaction volume, average (kr. million)	125	86	93
Transaction volume, median (kr. million)	72	49	50
Per bond in maturity segment			
Outstanding volume (kr. billion)	61	61	60
Number of transactions[1]	87	101	214

Note: The data period runs from November 2007 to July 2013. The average transaction volume is given by the average nominal value of a transaction in a given maturity segment. A similar calculation has been used to find the median. Turnover has been calculated as the market value of transactions in a given month.

1. All transactions with a nominal value of less than kr. 10 million have been filtered out in order to focus on institutional transactions. Hence, the total number of transactions is higher than reported here, cf. Table 8.A.1 in the Appendix.

in line with – or smaller than – that of the 2- and 5-year segments. The reason for the large number of transactions could be that investor interest is typically centred on the 10-year maturity segment.

- The average transaction size is somewhat above the median for all maturity segments. This reflects the particularly large transactions effected from time to time.

ESTIMATION OF LIQUIDITY DIMENSIONS

Liquidity in the secondary market for Danish government bonds is estimated using the methodology described in Table 8.2. In this context it should be emphasised that there is a natural overlap between the various liquidity measures, as they cover more than one liquidity dimension in practice. For example, the price impact measure includes information on both price tightness and depth and will therefore correlate with the effective bid-ask spread. However, this does not mean that the four liquidity measures are perfect substitutes, as also demonstrated by a principal component analysis later in this chapter.[10]

1) PRICE TIGHTNESS

For many investors, price tightness is the most important liquidity dimension since it expresses the cost of immediately executing a small transaction. When liquidity is analysed on the basis of post-trade information, price tightness is often estimated using Roll's measure of the effective bid-ask spread.

The illustration in Box 8.3 shows that the effective bid-ask spread was lowest for the 2-year maturity segment and highest for 10-year bonds. This is primarily an indication that it is more risky to supply liquidity in long-term bonds due to the higher market risk. But for a short period following the collapse of Lehman Brothers, the bid-ask spread was higher for the 2-year maturity segment than for the longer segments. This could be because pressures

10 In an extensive literature survey, Vayanos and Wang (2012) conclude that illiquidity can be modelled on the basis of two components. The first component can be expressed by Roll's measure of the effective bid-ask spread, while the second component can be expressed by Amihud's measure of the price impact of transactions. It is concluded that these two components are fundamentally different and relate to different dimensions of liquidity.

Estimation of liquidity dimensions Table 8.2

Dimension	Question to be answered	Liquidity measure
1) Price tightness	How wide is the spread between the best bid and ask prices?	Roll's measure of the effective bid-ask spread
2) Price depth	To which extent is trading possible at the best prices?	Price impact of transactions
3) Price resiliency	How fast are prices restored after an order shock?	Trading activity (number of transactions and trading volume)
4) Liquidity risk	How great is the uncertainty about the future liquidity level?	Variation in tightness and depth measures

on the Danish krone during this period had a greater impact on short-term securities, which are to a greater extent used for temporary placement of liquidity.

Across all bond series, the spread has averaged around eight basis points. In other words, the effective bid-ask spread is somewhat narrower than the quoted bid-ask spread in the interdealer market. This could indicate that investors on average achieve a better price than the quoted bid-ask spread.[11]

In addition, developments in the effective bid-ask spread show that liquidity has been lowest during periods of heightened market uncertainty. Basically, this is because liquidity providers (such as market makers) incur a greater risk of losses by offering to trade with other investors at fixed prices during such periods, e.g. due to increased risk of adverse selection and funding constraints, cf. the discussion of the reasons for illiquidity in Box 8.1. To compensate for larger expected losses, liquidity providers widen the bid-ask spread.

In this context, it is interesting to note that liquidity in the 2-year maturity segment does not seem to have been affected by the European sovereign debt crisis. The reason could be that Danish government bonds with low duration were in high demand as safe havens for investors during that period.

11 Estimation of Roll's measure of the effective bid-ask spread is conditional upon a number of assumptions, cf. Box 8.3. Breach of these assumptions may lead to estimation errors, which typically means that Roll's measure underestimates the actual effective bid-ask spread.

2) PRICE DEPTH

Whereas price tightness is an expression of cost per liquidity unit, price depth can be seen as an expression of the volume that can be traded at a given price. So for investors wishing to trade large volumes, price depth is an important liquidity dimension.

When the market depth cannot be observed directly, it can be estimated on the basis of the price impact of transactions. The underlying intuition is that if transactions affect the market price only to a limited extent, prices are characterised by large depth.

The illustration in Box 8.4 shows that the depth has been greatest in the 2-year maturity segment. It is also seen that the depth decreased during periods of strong market turmoil. The same pattern was found in Roll's measure of the effective bid-ask spread, so there seems to be a high degree of correlation between price tightness and depth.

3) PRICE RESILIENCY

Besides tight prices and large depth, a liquid market is characterised by a high degree of price resiliency. This means that prices are rapidly restored after order shocks. For example, a large order often causes the bid-ask spread to widen. This means that the true value of the asset is to a lesser extent reflected in prices. If prices have a high degree of resiliency, new liquidity will soon flow into the market, and the spread will narrow to the level seen before the order shock. In that case, the effect of an order shock is only temporary.

Liquidity dimension 1: Estimation of price tightness

Box 8.3

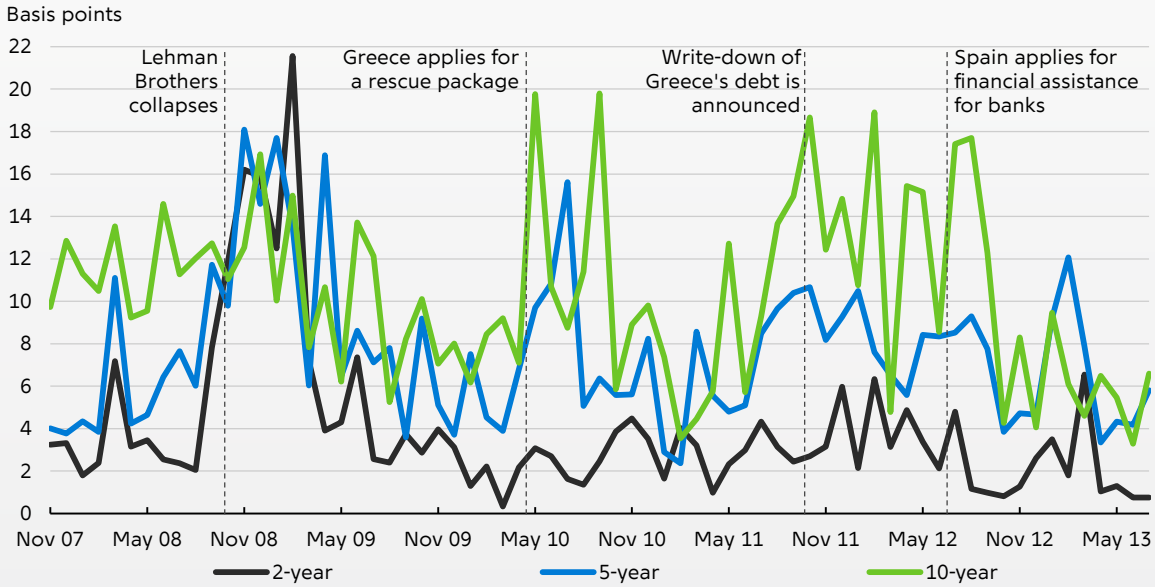
Price tightness has been estimated using Roll's measure of the effective bid-ask spread. It is calculated on the basis of the negative covariation between two subsequent price changes (i) on a daily basis (t) for each bond (k):

$$Roll_{k,t} = 2\sqrt{\max[-\mathrm{cov}(\Delta p_{k,t,i}, \Delta p_{k,t,i-1}), 0]}$$

The underlying intuition is that the traded prices will fluctuate between a set of constant bid and ask prices. This means that the size of the observed price changes can be used to estimate the non-observable effective bid-ask spread. Large price changes are linked to a wide bid-ask spread, which is reflected in a high numerical value of the covariation between price changes.

Two strong assumptions behind this measure are that all investors have the same information about the value of the asset and that inventory risk is of no significance to the liquidity provider. In practice, these assumptions are too strong, as this means that the inflow of new orders has no significance for bid and ask prices. Consequently, Roll's model typically underestimates the size of the bid-ask spread.

Effective bid-ask spread



Note: Price tightness has been estimated using Roll's measure of the effective bid-ask spread measured in basis points of the transaction's market value. A daily measure is calculated for each bond. For each bond, a monthly measure has been calculated as the median of the daily measures. For each maturity segment, a monthly measure has been calculated as the average of the monthly median values for the bonds that relate to the maturity segment in question.
Source: Roll (1984) and own calculations.

This third dimension of liquidity is often overlooked, partly because resiliency is more complex to estimate than tightness and depth. In markets with detailed pre-trade information, price resiliency can be estimated as the speed at which the order book is restored after a shock.[12] This approach is less suited for over-the-counter markets, including the market for Danish government bonds, and hence resiliency must be estimated in another way. A possible approximation is to use trading activity as an expression of price resiliency. The background is that price changes caused by order shocks can be expected to subside rapidly if the asset is traded frequently. Conversely, order shocks may have a more lasting price impact if

12 Empirical literature on the estimation of price resiliency is relatively modest considering the volume of literature on estimation of price tightness and depth. Dong, Kempf and Yadav (2007) estimate the resiliency of US equity prices using an error-correction model and find that the number of transactions and trading volume are significant estimators of price resiliency.

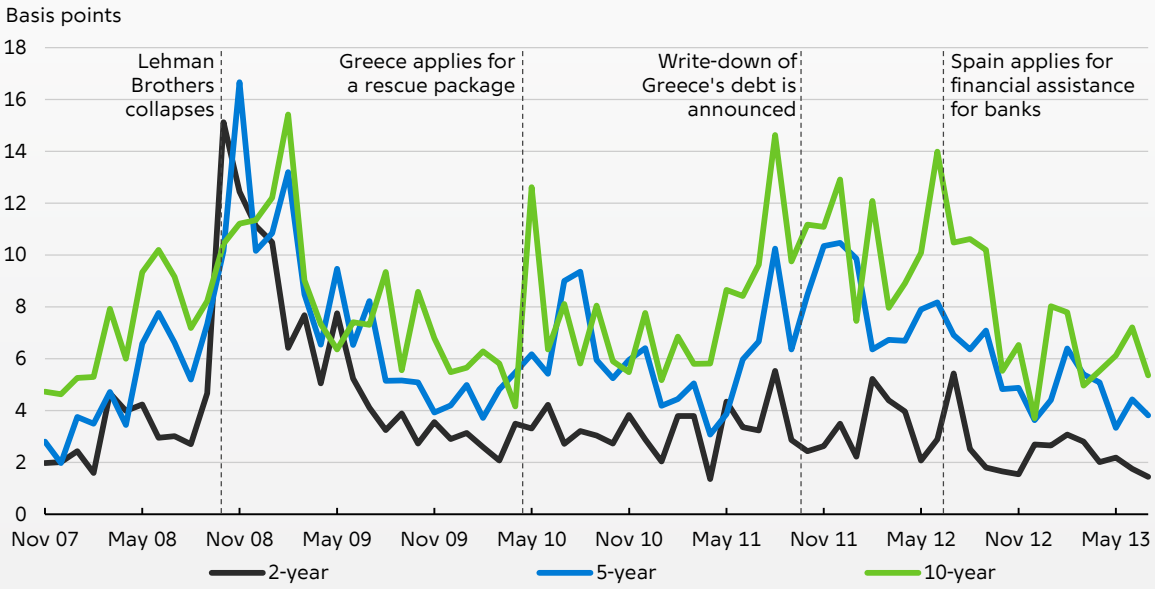
Liquidity dimension 2: Estimation of price depth

Box 8.4

When the price impact of transactions is used as a liquidity measure, it is often adjusted for transaction size. This is because large transactions are assumed to have a stronger impact on the price. However, in the market for Danish government bonds no positive correlation has been found between price impact and transaction size, cf. Box 8.A.1 in the Appendix.[1] The reason may be that investors trading large volumes have bargaining power that allows them to obtain better prices than smaller investors. Consequently, no adjustment is made for transaction size, and the price impact of a transaction is estimated as the numerical percentage change in the traded price (PI) for bond (k) on day (t) for transaction (i).

$$\text{Price impact: } PI_{k,t,i} = \frac{|P_{k,t,i} - P_{k,t,i-1}|}{P_{k,t,i-1}} \times 100$$

Price impact of transactions



Note: Price depth has been estimated on the basis of the price impact of transactions, not adjusting for transaction size. Transactions must be on the same day so as to avoid, as far as possible, price impacts that are attributable to new market information. For each bond, a daily measure is first calculated as the median of price impacts on that day. Then a monthly measure per bond is calculated as the median of the bond's daily measures. For each maturity segment, a monthly measure has been calculated as the average of the monthly median values for the bonds that relate to the maturity segment in question.

1. Dick-Nielsen, Gyntelberg and Sangill (2012) and Dick-Nielsen, Gyntelberg and Lund (2013) also conclude that the price impact in the Danish market for government and mortgage bonds is approximately constant for all transaction sizes. In some periods, the price impact is estimated to be slightly declining as the transaction size increases.

the asset is traded less frequently.[13]

Box 8.5 shows that there is no clear pattern in trading activity during periods of market turmoil. The reason may be that increased uncertainty is linked to two opposite trading effects. On the one hand, investors typically have a greater need to adjust their portfolios when market uncertainty increases, leading to more trading activity. But on the other hand, increased uncertainty also means that it becomes more expensive to trade as the costs of supplying liquidity rise, cf. the discussion of the reasons for illiquidity in Box 8.1. Hence, the net effect can be either positive or negative.[14]

13 Taking Box 8.A.1 in the Appendix as the point of departure, the previous section described how the price effect from transactions is constant across transaction sizes in the market for Danish government bonds. Consequently, large transactions do not affect prices more than smaller transactions do, which can be expected to support high price resiliency.

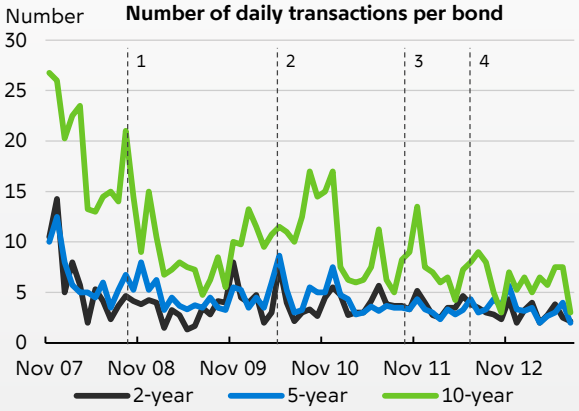
14 In addition, it is likely that increased capital requirements have led to less interdealer trading and more direct trading with end-investors. Other things being equal, this will reduce overall trading activity.

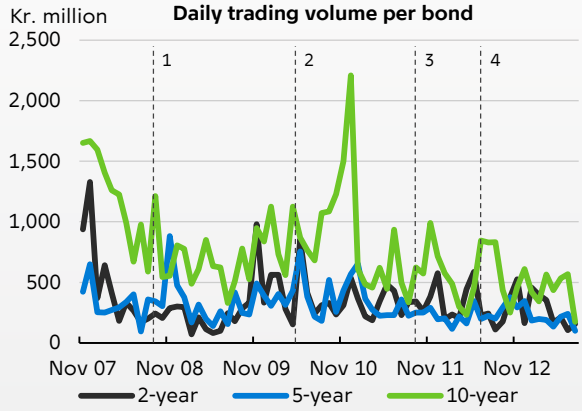
Liquidity dimension 3: Indicators of price resiliency

Box 8.5

The number of daily transactions and the daily trading volume are used as indicators of trading activity in the market for Danish government bonds. Naturally, there is considerable correlation between these two measures, as a large number of transactions typically goes hand in hand with a large trading volume. But at the same time, the two measures complement each other. For example, a large trading volume may be distributed on few transactions. In that case, prices are not necessarily characterised by high resiliency, as it typically requires a steady flow of transactions to restore prices after a shock.

Trading activity





Note: The vertical columns indicate periods of strong market uncertainty due to the following events: (1) Lehman Brothers collapses, (2) Greece applies for rescue package, (3) write-down of Greece's debt is announced, and (4) Spain applies for assistance for banks. Monthly median values have been calculated for each bond. An average of the monthly median values for each bond has been used as an expression of the average monthly value.

4) LIQUIDITY RISK

Liquidity risk is an important liquidity dimension as it is an expression of the risk that trading at some future point will involve more costs than initially assumed. The variation in the current liquidity measures of price tightness and depth can be used to approximate liquidity risk.[15] The reason is that high uncertainty about the current level of liquidity can be expected to have a close correlation with high uncertainty about the future level of liquidity.

Chart 8.2 shows that liquidity in Danish government bonds has fluctuated most in times of strong market turmoil. This can be interpreted to mean that the liquidity risk has been highest when uncertainty in the markets has been greatest. In these periods, liquidity is also low, cf. above. So high liquidity risk typically goes hand in hand with low liquidity, as also concluded in many other empirical studies.

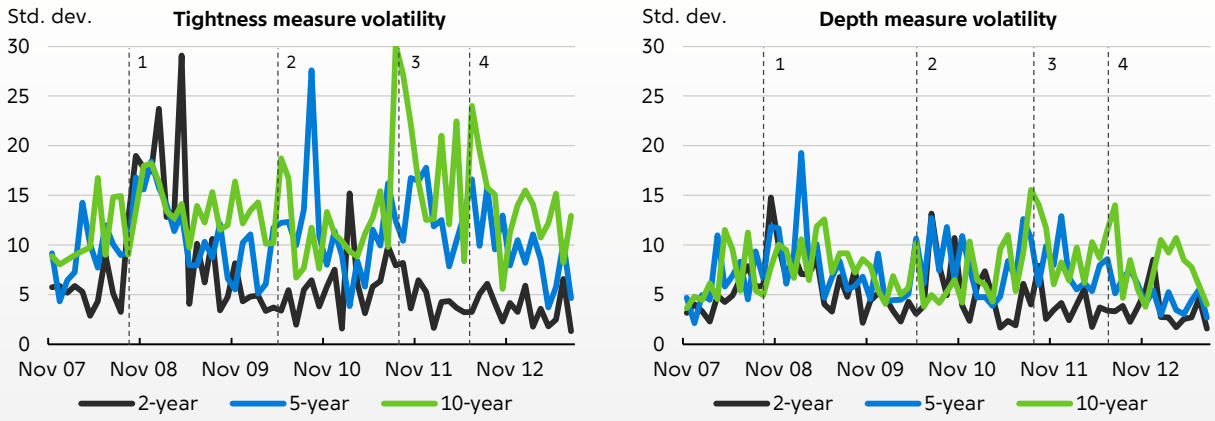
15 Variation in liquidity measures is used as an expression of liquidity risk in several academic studies, see e.g. Dick-Nielsen, Feldhütter and Lando (2012).

COMMON COMPONENTS OF LIQUIDITY

The graphical illustrations of the various liquidity measures in the preceding section indicate a certain degree of correlation between these measures. For example, tight prices are typically linked to large depth and low liquidity risk. However, the correlation is not perfect, and the liquidity measures seem to contribute individually to explaining the overall liquidity of the asset.

This is confirmed by the principal component analysis in Box 8.6, which shows that the first principal component explains most of the variation in the liquidity measures of price tightness, depth and liquidity risk. The second principal component can primarily be attributed to the measure of price resiliency, explaining more than 90 per cent of the variation in this liquidity measure. This result emphasises that price resiliency is an important dimension of liquidity that differs materially from the two better known liquidity dimensions, tightness and depth.

Liquidity dimension 4: Estimation of liquidity risk Chart 8.2



Note: The vertical columns indicate periods of strong market uncertainty due to the following events: (1) Lehman Brothers collapses, (2) Greece applies for rescue package, (3) write-down of Greece's debt is announced, and (4) Spain applies for assistance for banks. Liquidity risk has been approximated using the standard deviations for the tightness and depth measures (Roll's effective bid-ask spread in basis points and the price impact of transactions in basis points, respectively). For each bond, the monthly standard deviations have been calculated for the tightness and depth measures. The average of the monthly standard deviations expresses the average variation across all bonds for a given maturity segment.

PUTTING THE LIQUIDITY LEVEL INTO PERSPECTIVE

The average cost of trading Danish government bonds has been 3-6 basis points of the transaction's market price, cf. Table 8.3.[16] This level seems low, considering that a 5-year Danish government bond has yielded an average effective return of 2.2 per cent (220 basis points) p.a. during the same period.

To put liquidity in the market for Danish government bonds into perspective, it might be interesting to compare the results with similar analyses in other government bond markets. However, this is not easy as the number of surveys is limited. Furthermore, the results may not be directly comparable as they are sensitive to the choice of estimation period, data cleaning method, etc. With these caveats in mind, Table 8.3 indicates that the market for Danish government bonds is less liquid than the US and German markets but at the same level as the market for Italian government securities.

POSSIBLE EXPLANATIONS FOR THE LEVEL OF LIQUIDITY

In the following, it is examined whether there are systematic differences in liquidity across bonds based on three characteristics: (i) outstanding volume, (ii) remaining maturity and (iii) benchmark status. In summary, the results show that bonds are more liquid if the outstanding volume is large, the remaining maturity is short and the bonds have benchmark status, cf. Table 8.4. The background to the results can be explained by the following:

- **A large outstanding volume increases the liquidity supply:** A large outstanding volume means that more investors can potentially act as liquidity providers in the market. This sharpens competition to supply liquidity, which should result in a larger supply and better prices for investors. In the analysis this is reflected in a narrower bid-ask spread and more robust prices for bonds with a large outstanding volume. In this context it is worth noting that the liquidity risk is greater for bonds with a large outstanding volume. A possible explanation is that bonds with a large outstanding volume are traded

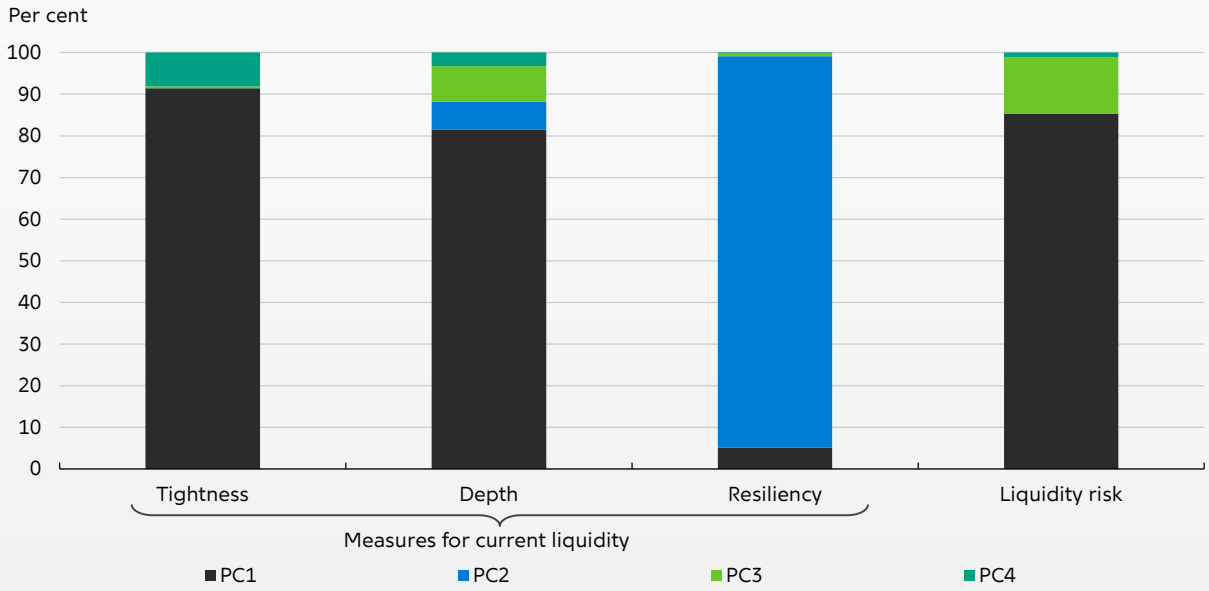
16 The effective bid-ask spread shows the cost of an immediate purchase and sale of an asset. So the cost of one transaction (e.g. a purchase) is given by half of the effective bid-ask spread, in the case of Danish government bonds averaging 6.9/2 = 3.35 basis points of the transaction value.

Principal component analysis of liquidity measures

Box 8.6

The degree to which the individual liquidity measure contains information not captured by the other measures can be analysed e.g. via a principal component analysis. In such an analysis, the observed variation in the liquidity measures can be related to developments in a number of non-observable underlying factors (principal components), which are mutually uncorrelated. The principal components are constructed in such a way that the first principal component explains as much as possible of the variation in the liquidity measures. The second principal component explains as much as possible of the remaining variation in the liquidity measures not explained by the first principal component and so on and so forth.[1]

Explanation of aggregate variation in liquidity measures



Note: The chart shows the part of the aggregate variation in the individual liquidity measures explained by the individual principal components. Tightness is defined using Roll's effective bid-ask spread. Depth is defined as the price impact of a transaction. Resiliency is defined on the basis of an aggregate variable reflecting the number of transactions per bond and the daily trading volume per bond. Liquidity risk is defined on the basis of an aggregate variable reflecting the variation in the tightness and depth measures. All variables are standardised with a mean value of zero and a standard deviation of 1.

1. Christensen and Ejsing (2013) provide a more detailed description of principal component analyses in connection with common components of the government yield spread to Germany.

more intensively, so that changes in market sentiment are reflected more rapidly in the prices of these bonds.

- **Short-term bonds fluctuate less in value:** In general, it is more risky to supply liquidity in assets that fluctuate strongly in value. One of the reasons is that high volatility increases the risk of trading with investors who possess more information about the fundamental value of the asset. It is to be expected that liquidity providers operate with a wider bid-ask spread and lower trading depths to compensate for the increased risk linked to supplying liquidity in risky assets. In the analysis this is reflected in wider bid-ask spreads and lower depths for bonds with long remaining maturities (i.e. long duration).[17] At the same time, the liquidity risk is greater, presumably because the liquidity level is more sensitive to changes in the level of uncertainty among investors. All the same, it should be noted that trading activity is higher for bonds with long remaining maturities, which may indicate greater resiliency.

17 Copeland and Galai (1983) model liquidity as a (very short) option offered by liquidity providers to investors wishing to trade on the spot. Since the value of the option increases with the volatility of the asset, liquidity providers will operate with a wider bid-ask spread for assets with a long duration, as the trading option for these assets has a greater risk of going in-the-money.

Comparison of liquidity across countries Table 8.3

Government bond market	Period	Effective bid-ask spread, basis points	Price impact of transactions, basis points
Denmark	**2007 (Nov.) – 2013 (Jul.)**	**6.9 (2.9)**	**5.8 (2.2)**
USA	1997 (Jan.) – 2000 (Mar.)	2.4 (0.6)	0.5 (0.1)
Germany	2006 (Jan.) – 2008 (Sep.)	2.9 (1.0)[1]	- [2]
Italy	2011 (Jun.) – 2012 (Nov.)	8.0 (14.0)	5.8 (4.0)
Selected EU countries	2008 (Jan.) – 2012 (Jun.)	39.6[3]	8.9[3]

Note: Figures in brackets denote the estimated standard deviation. Results for the USA, Germany and Italy are based on Fleming (2003), Pelizzon et al. (2013) and Ejsing and Sihvonen (2009), respectively. Results for selected EU member states are based on EBA (2013). "Selected EU member states" are those with a credit rating of at least Aa3 (Moody's) or AA- (S&P and Fitch).
Source: Fleming (2003), Pelizzon et al. (2013), Ejsing and Sihvonen (2009), EBA (2013) and own calculations.
1. Only quoted bid-ask spreads are available. Typically transactions take place between the best bid and ask prices, so the value stated may overestimate the effective bid-ask spread.
2. No data is available for price impact.
3. The values have been calculated by adjusting for the effect of including countries classified as "ECAI 1", which are those with credit ratings of Aa3/AA- or higher. The high level of the effective bid-ask spread can to some extent be explained by the fact that the measure is calculated across trading days, which increases the risk that new information may affect the measure. The standard deviation for the results is not stated as it is not reported for the subgroup of ECA1 countries.

- **Benchmark status contributes to higher liquidity:** For the key maturity segments, the central government defines a benchmark bond. Liquidity in benchmark bonds can be expected to be higher than in equivalent bonds without benchmark status. One of the reasons is that benchmark bonds tend to be on-the-run issues, which results in more trading in the secondary market.[18] At the same time, market making obligations are stricter for benchmark series than for other bonds. In the analysis, these two factors are reflected in a narrower bid-ask spread and more robust prices for bonds with benchmark status. In addition, the liquidity risk is also lower for benchmark bonds.

Finally, it should be noted that the relatively low explanatory power indicates that liquidity is affected by a great many exogenous factors not included in the regression analysis.

WHAT DOES THE CENTRAL GOVERNMENT DO TO SUPPORT LIQUIDITY?

Many of the factors affecting liquidity are beyond the influence of Government Debt Management, but as the analysis above shows, there are areas where specific initiatives can improve liquidity.[19] Broadly speaking, these initiatives relate to choice of issuance strategy and activities to improve the market structure.

ISSUANCE STRATEGY

The issuance strategy aims to minimise the central government's long-term borrowing costs, while taking the degree of risk into account. Among other things, this is done by ensuring maximum demand for Danish government securities. Three key elements in this connection are choice of maturity segment, instrument type and communication strategy.

18 Several articles in the literature analyse price differences between on-the-run issues and comparable off-the-run issues. On-the-run issues are typically traded at a higher price, which can be attributed to their higher liquidity. See e.g. Krishnamurthy (2002).

19 The most important factors beyond the influence of Government Debt Management are sound public finances, stable monetary policy and appropriate regulation. All the exogenous factors have an indirect impact on liquidity. For example, uncertainty about the central government's ability to pay (credit risk) will make government bonds more risky. This has a negative impact on liquidity, as greater volatility makes it riskier to supply liquidity.

Relationship between bond characteristics and liquidity Table 8.4

Liquidity measures	Constant	Outstanding volume, kr. billion	Remaining maturity, years	Benchmark, yes=1, no=0	R^2
1. Price tightness (effective bid-ask spread, bps.)	8.197*** (1.374)	-0.051** (0.020)	1.460*** (0.143)	-1.920** (0.917)	0.18
2. Price depth (price impact of transactions, bps.)	2.355*** (0.414)	0.001 (0.006)	0.650*** (0.043)	-0.254 (0.277)	0.32
3a. Price resiliency (daily trading volume per bond, kr. million)	52.797 (45.219)	1.367** (0.656)	42.337*** (4.737)	190.273*** (30.346)	0.25
3b. Price resiliency (daily number of transactions per bond)	0.544 (0.524)	0.016** (0.008)	0.630*** (0.055)	2.165*** (0.352)	0.31
4a. Volatility of tightness measure (standard deviations)	9.485*** (1.345)	-0.030 (0.020)	1.695*** (0.140)	-2.574*** (0.897)	0.22
4b. Volatility of depth measure (standard deviations)	2.373*** (0.527)	0.019** (0.008)	0.536*** (0.055)	-0.116 (0.352)	0.17

Note: Calculations have been made across all bonds on the basis of monthly median values. *, ** and *** denote that the estimated parameter differs from 0 at a significance level of 10, 5 and 1 per cent, respectively. Figures in brackets are standard errors.

- **Issuance is concentrated in key maturity segments:** Issuance is concentrated in the 2-, 5- and 10-year maturity segments, which are considered to be the most important segments internationally. This ensures a sufficiently large outstanding volume in the individual series, which increases trading and liquidity, cf. Table 8.4 above.
- **Issuance is concentrated on a small number of instrument types:** Most issuance takes place in fixed-rate bullet loans, as it is important not to operate with too many different bond types. However, supplementary issuance takes place in an inflation-linked series with a view to increasing the investor base.[20]
- **Transparency reduces investor uncertainty:** Investors appreciate initiatives that reduce uncertainty in the market. Consequently, the central government is open in its communication about issuance requirements and dates. This provides greater predictability for market participants compared with a situation with opportunistic issuance.

MARKET STRUCTURE

The structure of the market in which government bonds are traded affects their liquidity. The central government can support the market for government securities by issuing via auctions, using primary dealers, offering securities lending facilities and buying back securities.

- **Sale by auction supports large transactions**: The central government primarily issues bonds via auctions. The auction principle is uniform pricing, which means that the winning bids are met at the cut-off price.[21] This allows investors to purchase large volumes without directly affecting the market price, which supports a liquid secondary market.

20 Liquidity is typically lower for inflation-linked bonds than for comparable nominal bonds, cf. Chapter 10 of Danmarks Nationalbank (2013). Viewed in isolation, this means that it is more expensive to issue inflation-linked bonds rather than nominal bonds. But this additional cost should be offset against the advantages of issuing inflation-linked bonds, such as a broader investor base and a lower budget risk. At the same time, a positive inflation risk premium may reduce the relative costs of issuing inflation-linked bonds compared to nominal bonds.

21 If large bids are received, the government may opt for allocation on a pro-rata basis, which means that bids at the cut-off price are not fully met.

- **Primary dealers ensure ongoing price quotation:** The central government's primary dealers have an obligation to quote prices in the secondary market. This allows other market participants to monitor price developments and trade at known prices.
- **Securities lending facilities support market making:** The central government's and SPF's securities lending facilities allow primary dealers to borrow government bonds against a fee. This makes it possible for primary dealers to supply liquidity in securities that they do not necessarily hold.
- **Buy-backs contribute to trading in on-the-run issues:** When the central government buys back off-the-run issues, this supports liquidity in on-the-run issues. At the same time, buy-backs allow investors to distribute the central government's redemption payments over the year, which should result in stable demand for government securities.

CONCLUSION

A liquid market for government securities is important as it contributes to low borrowing costs and low refinancing risk for the central government. At the same time, sharp pricing of government bonds supports an efficient financial system.

Liquidity can be defined as the ability to make large transactions at low costs – rapidly and at any time. Trading costs depend on price tightness, depth and resiliency, as well as the risk that liquidity will deteriorate in the future. Whether a market is liquid basically depends on whether it is risky for liquidity providers to offer other investors to trade, and on their market power vis-à-vis customers.

The empirical analysis of liquidity in the market for Danish government bonds shows that liquidity is high, particularly for bonds with a large outstanding volume, short remaining maturity and benchmark status. The analysis also shows that liquidity varies over time and deteriorates when market uncertainty peaks. However, this applies to the vast majority of assets, so it should be emphasised that even in periods of heightened uncertainty investors have been able to trade Danish government bonds at relatively low costs.

Broadly speaking, the central government can influence liquidity via its choice of issuance strategy and market structure design. Concrete initiatives include transparent market communication, issuance in key maturity segments and use of primary dealers to ensure ongoing price quotation and boost investor interest.

LITERATURE

Acharya, Viral V. and Lasse H. Pedersen (2005), Asset pricing with liquidity risk, *Journal of Financial Economics*, Vol. 77, No. 2, 375–410.

Black, Fischer (1971), Towards a fully automated exchange, Part I, *Financial Analyst Journal*, Vol. 27, No. 4, 28-35.

Brunnermeier, Markus K. and Lasse H. Pedersen (2009), Market liquidity and funding liquidity, *The Review of Financial Studies*, Vol. 22, No. 6, 2201-2238.

Christensen, Nicolaj Hamann and Jacob Wellendorph Ejsing (2013), Decomposing government yield spreads into credit and liquidity components, Danmarks Nationalbank, *Monetary Review*, 1st Quarter, Part 2.

Copeland, Thomas E. and Dan Galai (1983), Information effects on the bid-ask spread, *Journal of Finance*, Vol. 38, No. 5, 1457-1469.

Danmarks Nationalbank (2003), Danish Government Borrowing and Debt 2002.

Danmarks Nationalbank (2013), Danish Government Borrowing and Debt 2012.

Dick-Nielsen, Jens, Peter Feldhütter and David Lando (2012), Corporate bond liquidity before and after the onset of the subprime crisis, *Journal of Financial Economics*, Vol. 103, No. 3, 471-492.

Dick-Nielsen, Jens, Jacob Gyntelberg and Thomas Sangill (2012), Liquidity in government versus covered bond markets, Danmarks Nationalbank, *Working paper No. 83*.

Dick-Nielsen, Jens, Jacob Gyntelberg and Jesper Lund (2013), From funding liquidity to market liquidity: Evidence from Danish bond markets, *CBS working paper*.

Dong, Jiwei, Alexander Kempf and Pradeep K. Yadav (2007), Resiliency, the neglected dimension of market liquidity: Empirical evidence from the New York Stock Exchange, *Working paper*.

Duffie, Darell, Nicolae Gârleanu and Lasse H. Pedersen (2005), Over-the-counter markets, *Econometrica*, Vol. 73, No. 6, 1815–1847.

EBA (2013), *Report on appropriate uniform definitions of extremely high quality liquid assets (extremely HQLA) and high quality liquid assets (HQLA) and on operational requirements for liquid assets under Article 509(3) and (5), CRR*, 20 December.

Ejsing, Jacob W. and Jukka Sihvonen (2009), Liquidity premia in German government bonds, *ECB Working paper series*, No. 1081, August.

Fleming, Michael J. (2003), Measuring treasury market liquidity, *Federal Reserve Bank of New York Economic Policy Review*, 83-108, September.

Garman, Mark B. (1976), Market microstructure, *Journal of Financial Economics*, Vol. 3, No. 3, 257-275.

Glosten, Lawrence R. and Paul R. Milgrom (1985), Bid, ask and transaction prices in a specialist market with heterogeneously informed traders, *Journal of Financial Economics*, Vol. 14, No. 1, 71-100.

Grossman, Sanford J. and Merton H. Miller (1988), Liquidity and market structures, *Journal of Finance*, Vol. 43, No. 3, 617-37.

Harris, Larry (2003), Trading and exchanges: Market microstructure for practitioners, *Oxford University Press*.

Krishnamurthy, Arvind (2002), The bond/old-bond spread, *Journal of Financial Economics*, Vol. 66, No. 2-3, 463–506.

Kyle, Albert S. (1985), Continuous auctions and insider trading, *Econometrica*, Vol. 53, No. 6, 1315-1335.

Pelizzon, Loriana, Marti G. Subrahmanyam, Davide Tomio and Jun Uno (2013), The microstructure of the European sovereign bond market: a Study of the Euro-Zone Crisis, *Working paper*.

Roll, Richard (1984), A simple implicit measure of the effective bid-ask spread in an efficient market, *Journal of Finance*, Vol. 39, No. 4, 1127-39.

Vayanos, Dimitri and Jiang Wang (2012), Theories of liquidity, *Foundations and Trends in Finance*, Vol. 6, No. 4, 221–317.

APPENDIX

Cleaning data sets Table 8.A.1

Step	Filter	Background	Number of observations in data set: Before filter	After filter	Change
1	T-bills, inflation-linked bond, 7'2024 and 4.5'2039 are filtered out.	The analysis focuses on fixed-rate bullet loans in the 2-, 5- and 10-year maturity segments.	396,979	323,643	73,336
2	Retail transactions are filtered out.	Transactions with a nominal value of less than kr. 10 million are filtered out.	323,643	133,441	190,202
3	Repo transactions are filtered out.	Repo transactions are a way of providing collateralised loans and hence do not represent pure trading.	133,441	94,792	38,649
4	Adjustment for duplicated reporting of interdealer transactions.	Both legs of interdealer transactions are reported.	94,792	74,476	20,316
5	Transactions without Securities Statistics information are filtered out.	Securities Statistics information is necessary in order to classify bonds (e.g. in terms of remaining maturity).	74,476	74,124	252
6	Transactions with Danmarks Nationalbank are filtered out.	Transactions with Danmarks Nationalbank as the counterparty are filtered out. Transactions in connection with auctions in the primary market are filtered out.	74,124	71,841	2,283
7	Misreporting is filtered out.	Transactions are filtered out if one or more of the following applies: • The traded price is below 50 or over 200 kroner. • The traded price deviates by 5 price points from the previous traded price. • The traded price deviates by more than 1 per cent from the highest or lowest price in Bloomberg. • The nominal value of the transaction is unrealistically high (e.g. exceeds the outstanding volume in the series). • The traded price is reported in another currency than Danish kroner.	71,841	61,897	9,944
8	Trading in securities with a remaining maturity of less than one year is filtered out.		61,897	58,363	3,534

Price impact of transactions relative to transaction size

Box 8.A.1

To examine whether the price impact of transactions depends on the transaction size, a number of regressions have been performed across all bonds:

$$Price\ impact_i = \alpha_i + \beta_i \times transaction\ size_i + \varepsilon_i \ ,$$

where (i) refers to the (i)'th interval for transaction sizes.

Across all transaction sizes, there is a weak negative correlation between transaction size and price impact, cf. the table below. This means that large transactions have a smaller price impact.[1] A possible explanation to this pattern could be that investors wishing to trade large volumes have a certain bargaining power with liquidity providers and are therefore able to obtain better prices than smaller investors. However, a more detailed analysis shows that the negative correlation between transaction size and price impact applies only to small transactions (kr. 10-25 million interval). For larger transactions there is no linear relationship between transaction size and price impact.

This result deviates from most other empirical studies, which typically find that the price impact increases with the size of the transaction. For example, this correlation is the basis for the well-known Amihud illiquidity measure. Since the price impact in the market for Danish government bonds is more or less constant for all transaction sizes, a liquidity measure is applied that does not scale the price impact relative to the transaction size.

Regression analysis of price impact from trades

Trade size intervals, kr. million	Beta	Standard errors	P value	Number of observations
10 - 25	-0.079***	0.021	0 per cent	10,165
25 - 50	-0.019	0.015	22 per cent	8,368
50 - 100	0.008	0.008	32 per cent	7,616
100 - 250	-0.001	0.003	82 per cent	5,145
250 - 500	0.001	0.003	71 per cent	2,328
500<	0.005	0.004	21 per cent	167
All trade sizes	-0.002***	0.001	0 per cent	33,789

Note: *, ** and *** denote that the estimated parameter differs from 0 at a significance level of 10, 5 and 1 per cent, respectively.

1. Dick-Nielsen, Gyntelberg and Sangill (2012) and Dick-Nielsen, Gyntelberg and Lund (2013) also conclude that the price impact in the Danish market for government and mortgage bonds is approximately constant for all transaction sizes. In some periods, the price impact is estimated to be slightly declining as the transaction size increases.

9

IMPLICATION OF TERM PREMIA FOR THE CENTRAL GOVERNMENT AS ISSUER

The advantage of issuing bonds with high duration is that the variation in interest costs over time is low. This advantage should be weighed against the typical higher expected costs of issuing long-term rather than short-term bonds. The expected additional cost of issuing long-term rather than short-term bonds is referred to as the term premium.

This chapter outlines prevalent theories about the existence of a term premium, taking Danish market conditions as the point of departure. Based on estimations in a dynamic stochastic term structure model on Danish government yields, term premium fluctuations over the last 15 years are illustrated. The assessment of the term premium is an important input in the decision regarding the duration of the central-government debt. The current level of the term premium is assessed to be moderate, which is part of the explanation why the central government is currently maintaining a long duration of the central-government debt.

TERM PREMIUM BACKGROUND INFORMATION

The term premium for a given term, T, can be defined as the difference between the current level of the observable yield at the given term and the current *expected* (geometric) average of short-term yields over the given term:

$$Term\ premium_{t,T} = (1+yield_{t,T}) - \left(\prod_{i=0}^{T-1}(1+E_t(short\text{-}term\ yield_{t+i}))\right)^{\frac{1}{T-t}}$$

where $E_t(\ldots)$ denotes the short-term yield at time $t+i$ that is expected at time t.

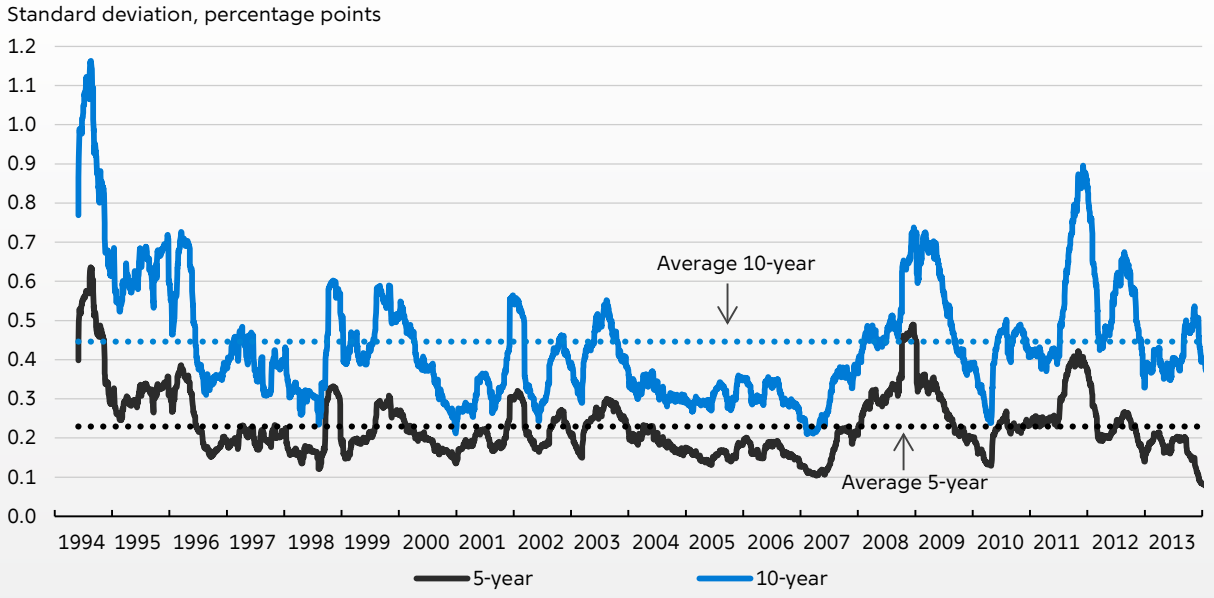
If the central government assesses that the term premium is positive, this entails, other things being equal, that issuance of long-term rather than short-term bonds will involve expected additional costs for the central government.

In this context, it is important not to confuse term premia, as defined above, with the two related concepts: steepness of the yield curve and realised excess return. For instance, a steep yield curve does not necessarily mean that the term premium is positive; the yield curve may simply reflect expectations of a future rise in yields. A key difference between the three concepts is that term premia cannot be observed directly and therefore need to be estimated, while the steepness of the yield curve and realised excess returns can be observed directly.[1]

The following two sections describe the background to the existence of term premia. The review is based on the pure expectations hypothesis. Acceptance of this hypothesis implies that the term premium is zero, since the observed yields in that case purely reflect

1 The definition of term premium in this chapter is based on Ilmanen (2011), which provides a detailed review of term premia. It should be noted that the literature has various definitions of term premia.

Variation in returns on Danish government bonds Chart 9.1



Note: The return on day *t* for a bond with *n* years until maturity is calculated as in Campbell, Sunderam and Viceira (2013): $return_{n,t} = n \bullet par\ yield_{n,t} - (n - 1/264) \bullet par\ yield_{n,t+1}$. Standard deviations of daily returns are calculated on a three-month rolling window.
Source: Campbell, Sunderam and Viceira (2013), Bloomberg and own calculations.

expectations of future yields. The expectations hypothesis relies on two key assumptions:

- **Risk neutrality**: Investors focus exclusively on the expected return and require no compensation for fluctuations in asset value over time.
- **Absence of maturity preferences**: Investors have no preferences as regards different maturities, and consequently bonds with different maturities are perfect substitutes.

In practice, these two assumptions are too strong, entailing that observed yields reflect more than expected interest-rate movements. Against this backdrop, the following two sections examine how breaches of the two assumptions – i.e. presence of risk aversion and maturity preferences – may lead to a term premium.

COMPENSATION FOR RISK

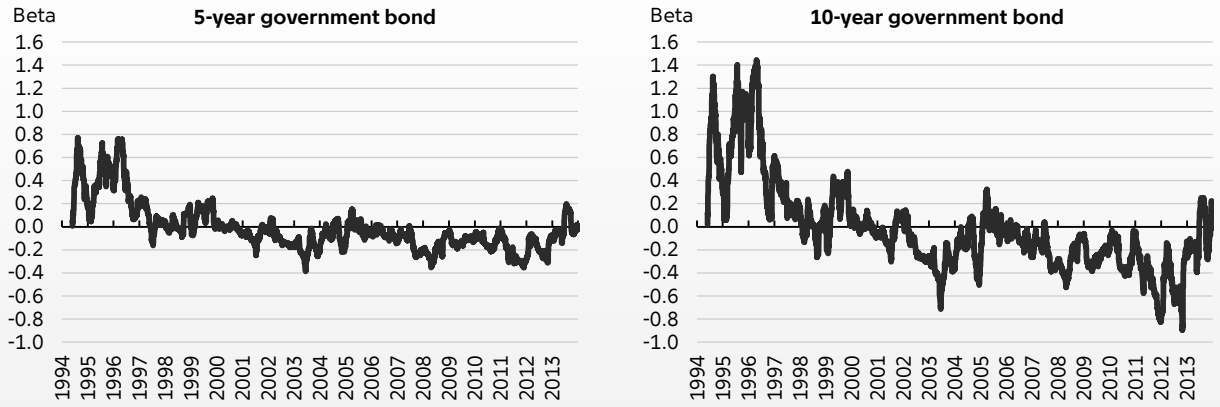
Given that the value of a government bond varies over time, investment in government bonds is subject to risk. This is relevant for risk-averse investors, who will require a supplement to the risk-free interest rate to invest in a risky asset. If the compensation for risk varies for different maturities, this will affect the term premium.

The value of long-term bonds generally varies more than the value of short-term bonds due to higher market risk.[2] This is reflected in the return on 10-year Danish government bonds, which has varied more than the return on 5-year bonds over the last 20 years, cf. Chart 9.1.

Although long-term bonds vary more in price than short-term bonds, this does not necessarily mean that investors will require a higher yield to invest in long-term bonds. The primary reason is that investors' perception of risk varies. For instance, a pension fund typically needs duration to hedge its liabilities and when the risk of assets and liabilities is considered from an asset-liability management (ALM) perspec-

2 Nominal bond investors are exposed to a range of risks, including interest-rate risk. Interest-rate risk may be decomposed into real interest-rate risk and inflation risk. The effect of fluctuations in the real interest rate and inflation rate increases with the duration of the bond, entailing that the interest risk also increases with the duration of the bond.

Relationship between bond and equity returns Chart 9.2



Note: The procedure for calculating the market beta of bonds follows the method used in Campbell, Sunderam and Viceira (2013). Beta is defined as covariance(bond return, market return)/variance(market return) and is calculated as a rolling three-month value. The bond return for day t for a bond with n years until maturity is calculated as $return_{n,t} = n \bullet par\ yield_{n,t} - (n - 1/264) \bullet par\ yield_{n,t+1}$. The market return is calculated as the daily log return on the Danish C20 stock index.
Source: Campbell, Sunderam and Viceira (2013), Bloomberg and own calculations.

tive, long-term bonds may therefore appear less risky than short-term bonds.

Moreover, the price fluctuations of an asset should not be seen in isolation, but in relation to economic developments. The reason is that risk-averse investors prefer assets that yield a high real return when the economy is weak and other important assets (such as equities) deliver a modest or even negative return. If market participants expect an economic downturn to coincide with a higher bond price, investment in bonds may be used as a hedge against recession. In that case, risk-averse investors will be willing to pay a premium on bonds, since the return is expected to be high when investors value it most.

The relationship between bond returns and the state of the economy can be estimated by using stock market developments as an indicator of the state of the real economy.[3] Based on this approach, it is seen that the return on Danish government bonds has been both pro- and countercyclical over the past 20 years, cf. Chart 9.2. In recent years, the bond return has been mainly countercyclical, reflecting that bonds have been yielding positive returns when the economy has been weak.[4] Accordingly, risk-averse investors are likely to have seen Danish government bonds as a hedge against a deterioration in the economy.[5]

Relationship between risk and term premia

Whether long-term bonds are seen as more risky than short-term bonds is significant when it comes to the term premium. If investors with a natural need for long-term bonds, such as pension funds, make up a large proportion of the market, this may lead to lower long-term yields, thereby reducing the term premium and making it relatively less expensive for the central government to issue long-term bonds.

3 Consumption-based CAPMs define the systematic asset risk as the covariance between asset returns and investors' marginal utility of consumption. The marginal utility of consumption depends on the aggregate wealth in an economy. The literature has used a variety of indicators when attempting to analyse the state of the real economy, see e.g. Cochrane (2005) for a review of the literature in this field. The development of a full consumption-based CAPM is beyond the scope of this chapter, and therefore the return on a stock index is used as an approximation for the state of the economy.

4 Several factors affect the relationship between bond and market returns. A factor often cited is the sign of the inflation risk premium. The inflation risk premium can be negative if inflation tends to decline in economic downturns. In that case, the purchasing power of the return on a nominal bond will be high when valued most by investors. This will typically be the case when cyclical fluctuations are driven mainly by demand rather than supply shocks, cf. Chapter 10 in Danmarks Nationalbank (2013).

5 It should be emphasised that realised returns do not necessarily reflect investors' ex-ante expectations of the relationship between bond and market returns. In other words, a negative realised beta does not necessarily imply that investors have been willing to pay a risk premium on the asset in question.

Relationship between risk and term premia Table 9.1

The term premium is …	… if the bond return is expected to be …	Background
Low (i.e. it is less expensive to issue long-term)	Countercyclical (negative market beta)	Long-term bonds increase more in value than short-term bonds in economic downturns.
High (i.e. it is more expensive to issue long-term)	Procyclical (positive market beta)	Long-term bonds decrease more in value than short-term bonds in economic downturns.

Moreover, the expected cyclicality of bond returns affects the term premium. If bond returns are expected to be countercyclical – in this chapter denoted by a negative market beta – risk-averse investors will be willing to pay a premium on long-term bonds, since these bonds provide a better hedge per krone invested. Other things being equal, this will be reflected in a lower term premium. If, on the other hand, bond returns are expected to be procyclical – denoted by a positive market beta – this will lead to a higher term premium.

Table 9.1 summarises the expected relationship between term premia and the cyclicality of bond returns.

MATURITY PREFERENCES

Investors may have a preference for investing in bonds within a specific maturity segment. This intuition forms the basis of the market segmentation theory, which implies that a relationship does not necessarily exist between short-term, medium-term and long-term yields.[6] Thus, observed yields are no perfect signal of expected future yields, and, in that case, the yield curve will be affected by term premia.

Insurance and pension companies are examples of investors with a typically higher willingness to pay for long-term bonds than many other investors due to their natural need for duration. If these investors account for a large proportion of the market, changes in their investment choices may affect relative bond prices and, thereby, term premia. At the same time, this means that regulatory changes in the insurance and pension sector may affect the slope of the yield curve. This was evidenced in connection with the latest change in the discount curve in 2012, which immediately resulted in a steeper yield curve, cf. Box 9.1.[7] To the extent that the change in the discount curve did not substantially affect expectations of future short-term yields, this affected the term premium directly.

TERM PREMIA IN DANISH GOVERNMENT BONDS

The financial markets, including the market for Danish government securities, are continuously affected by fluctuations in supply and demand, risk factors, investor preferences, etc. The sections above explain how various factors can individually affect the size of the term premium. As already mentioned, this premium is not observable, but requires forecasts of future yield developments.[8]

One approach to estimating future yields is to look at historical patterns, spanning from the use of simple historical averages to more

6 Under the market segmentation theory, there is no substitutability between different maturity segments, see Culbertson (1957). This entails that each maturity segment is a limited market in which yields are determined by supply and demand. In this context, the term premium is defined as a function of the supply-demand ratio between individual maturity segments. A milder version of the market segmentation theory is the *preferred habitat* theory, which acknowledges some degree of substitutability between bonds maturing close to each other, see Modigliani and Sutch (1966).

7 In a study of the regulation of the UK pensions sector Greenwood and Vayanos (2010) find that a legislative amendment in 2004 increased the pension sector's need for long-term bonds, which contributed to flattening the slope of the yield curve.

8 Projections of yields based on implied forward rates correspond to accepting the pure expectations hypothesis and, by definition, provide no information on term premia.

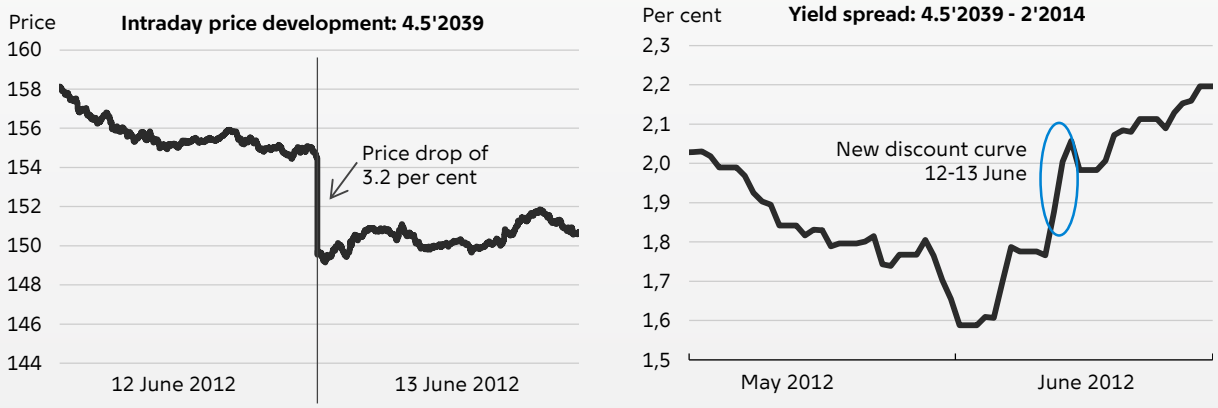
Regulatory changes within the insurance and pension sector may affect long-term yields Box 9.1

Regulation of the insurance and pension sector is aimed at ensuring that insurance and pension companies are able to meet future obligations. This entails that the value of liabilities must equal the value of assets. A discount curve is used for determining the value of insurance and pension liabilities. It follows, that a pension company can minimise fluctuations in solvency by investing in assets whose value follows the discount curve. This also means that changes in the discount curve could lead to changes in insurance and pension companies' investment strategy.

In Denmark, the discount curve has been changed on several occasions. Most recently, in June 2012, it was decided to extrapolate the discount curve after the 20-year point towards a fixed forward rate of 4.2 per cent, reflecting the current proposal under Solvency II.[1] At the time of the announcement, this was equivalent to easing of the discount curve, which reduced insurance and pension companies' regulatory hedging requirements, e.g. in the form of long-term government bonds.

The easing of the discount curve had a direct impact on the price of the central government's long-term bond, the 4.5'2039, which fell by more than 5 price points between 12 and 13 June, cf. chart below (left). The result was a steeper yield curve, since short-term yields were affected only to a small extent. To the extent that the change in the discount curve did not substantially affect expectations of future short-term yields, this affected the term premium directly.

Effect of new discount curve



Note: The intraday price development has been calculated based on the time-weighted mid-price on the MTS Denmark trading platform between 9 am and 5 pm. Announcement of the new discount curve was made on 12 June after market closing.
Source: MTS Denmark, Bloomberg and own calculations.

1. The Solvency II Directive, which is expected to be finally adopted in 2016, aims to build a single regulatory framework for insurance companies in the EU. A main component of the legislation is that insurance companies' liabilities must be valued at market value and be offset by assets.

complex dynamic and stochastic term structure models in which model parameters are estimated on the basis of historical data. Regardless of the approach, all projections of yield curves – and thus assessments of term premia – are uncertain. Therefore, firm conclusions should not be drawn about the exact size of term premia. On the other hand, the central government inevitably takes positions on the yield curve through its issuance, buy-back and swap strategies. These transactions (implicitly) involve a trade-off between expected costs and risks.[9]

ASSESSMENT OF THE TERM PREMIUM BASED ON A TERM STRUCTURE MODEL

For estimations of future yield curves to be used in assessment of the trade-off between costs and risk for the central-government debt, see Chapter 6, the central government uses a dynamic stochastic term structure model, cf. Box 9.2. The model-based term premium is estimated on the basis of Danish central-government yields during the period 1998-2013 using the following approach:

1. Estimation of the equilibrium level of short-term yields and the speed of adjustment towards this level. The model is estimated using a Kalman filter.

9 In this context, risks are variations in interest-rate costs, while costs are expected additional costs for long-term rather than short-term issuances.

The term structure model used

Box 9.2

A dynamic stochastic term structure model, belonging to the Arbitrage-Free Nelson-Siegel (AFNS) class, cf. Chapter 8 in Danmarks Nationalbank (2013)[1], is used to simulate future interest-rate scenarios, e.g. for Cost-at-Risk analyses. The dynamic element ensures consistency in the projection of yield curves, while the stochastic element enables the assignment of probabilities to future interest-rate scenarios and observance of simulated distributions. The type of interest-rate model relevant for risk-management purposes is different from models used for pricing and hedging of interest-rate derivatives (typically forward-rate models or market models). For risk-management purposes, the desired characteristics of an interest-rate model are, inter alia, that the covariance between interest rates in various maturity segments and the volatility in individual maturity segments reflect the historically observed uncertainty. Moreover, the yield curve should fluctuate around a mean level (mean reversion) in order to avoid exploding interest rates. Reflections on the choice of interest-rate model are described e.g. in the Chapter 11, Danmarks Nationalbank (2011).

How is the term premium measured in the term structure model?

Term premia can be measured in various ways, for instance as *return premia, forward premia and yield premia,* cf. Kim and Orphanides (2007). The return premium is the expected additional return on holding a multi-period coupon bond for one period of time relative to the current one-period spot rate. The forward premium is the difference between the forward rate at a given point in time and the expected future spot rate at that time. The yield premium is the expected excess yield obtained from buying and holding a *T*-year bond until maturity relative to rolling over a short-term bond for *T* years. Although the definitions vary, they express the same basic idea – i.e. that the return on long-term bonds can be expected to deviate from the return on short-term bonds. In this chapter, the term premium is referred to as a yield premium.

For any point in time, *t*, the current *T*-year term premium (calculated in discrete time relative to the one-period yield) is given by:

$$Term\ premium_{t,T} = (1 + yield_{t,T}) - \left(\prod_{i=0}^{T-1} (1 + E_t(short\text{-}term\ yield_{t+i})) \right)^{\frac{1}{T-t}}$$

where $E_t(\ldots)$ denotes the short-term yield at time *t+i* that is expected at time *t*. This expectation is derived from the term structure model.

Model and estimation uncertainty

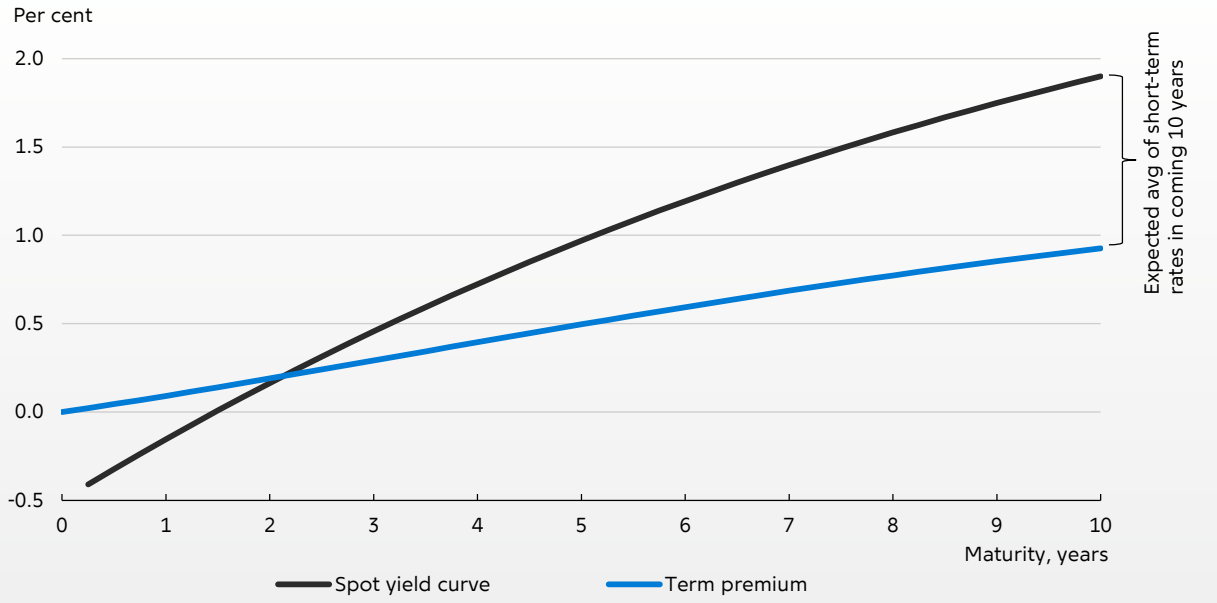
Any projection of future interest-rate movements is subject to high uncertainty. Estimation of term structure models is sensitive to the model specification, initial parameters and estimation period. For the estimation period it applies that, on the one hand, a long estimation period is desirable to achieve more accurate estimation of the model parameters. On the other hand, the model is used primarily for forward-looking purposes and, therefore, it is essential that no major structural differences exist between the estimation and projection periods. For instance, the inflation risk appears to be considerably lower in the coming period than it was in the 1980s. Another problem of extending the estimation period far backwards is that the Danish central government's credit rating was lower in earlier decades than it is currently. To the extent that the credit-risk premium is increasing in maturity, this will mean, for instance, that estimated long-term yields are higher in the model's equilibrium than can be expected looking forward.

1. See also Christensen, Diebold and Rudebusch (2011).

2. Expectations of future short-term yields are calculated using the observed current short-term yield along with the equilibrium level and speed of adjustment estimated above.
3. The 10-year term premium is derived as the difference between the observed 10-year yield at time *t* (spot rate) and the model based expected (geometric) average of short-term yields for the next 10 years. The same approach is adopted for other maturity segments.

At any time, the model can estimate a zero-coupon yield curve, which is generally close to the observed zero-coupon rates, and a term premium can be derived. The current zero-coupon yield curve can be decomposed into expectations of future yields and term premia, cf. Chart 9.3. At the end of 2013, the model estimate of the 10-year term premium was approximately 90 basis points. The term premium can be seen as the estimated annual additional costs of issuing 10-year government bonds rather than rolling over short-term government securities over the coming 10 years. The difference between the 10-year zero-coupon yield and the 10-year term premium thus reflects expectations of the average short-term yield over the coming 10 years.

Model-generated yield curve and term premium, end-2013 Chart 9.3



Source: Bloomberg, Nordea Analytics and own calculations.

Chart 9.3 also illustrates the point that the steepness of the yield curve does not necessarily indicate anything regarding the size of the term premium; it may simply reflect expectations of a future rise in yields, cf. the expectations hypothesis described earlier.

Based on the estimated term premia at each point in time for various maturities, time series may be composed of the premium for various maturity segments, e.g. the 10-year point, cf. Chart 9.4. It is seen that, over the period observed, the term premium displays a high degree of variation. While the 10-year term premium is estimated at just over 200 basis points in the early 2000s, it fell back to close to the estimated model equilibrium in the mid-2000s. Although it reversed in late 2013, the premium has been considerably lower in recent years than in previous years.

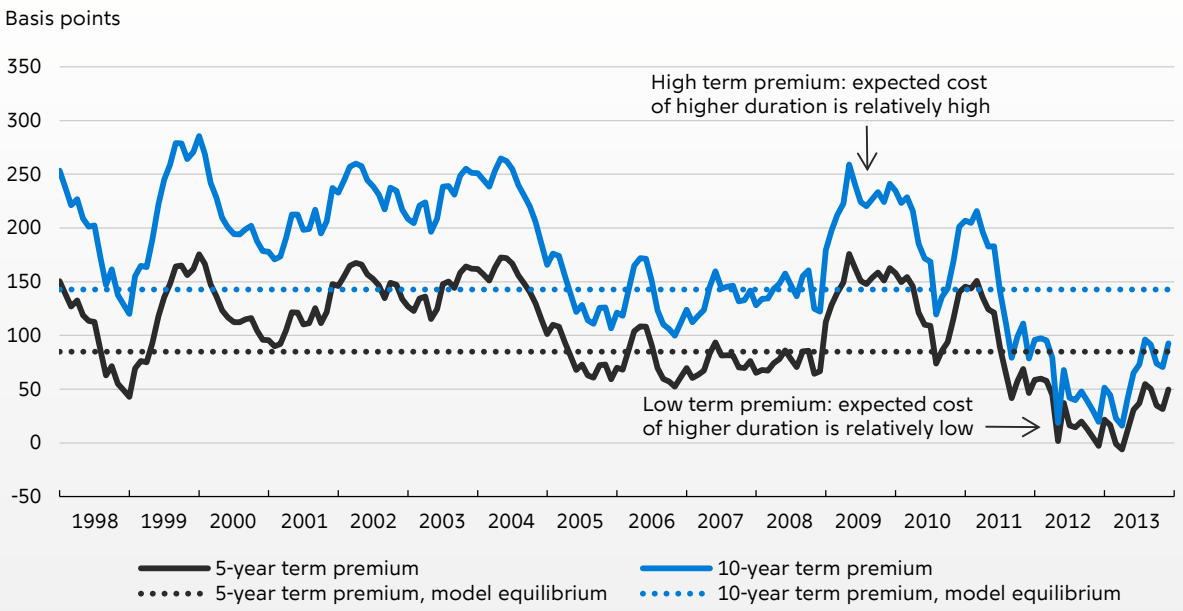
The development in the term premium can be attributed to several factors. As a case in point, it is likely that the relatively steep increase in the term premium over the turn of the year 2008/2009 was brought about by investors' perception of increased risk, including liquidity and interest-rate risk, when investing in long-term rather than short-term Danish bonds. At the same time, supply-side effects may also have contributed to a higher term premium during this period, reflecting higher central-government financing requirements.

In recent years, the term premium has been low, which could be because of monetary-policy measures, including forward guidance. These measures have focused on reducing uncertainty about future developments in yields. Greater certainty in respect of future yields reduces investors' requirements for compensation for investing in long-term bonds, which could contribute to a lower term premium.

OTHER SOURCES FOR ASSESSMENT OF TERM PREMIA

As described above, decomposition of the yield curve into expectations of future yields and term premia is subject to great uncertainty. Therefore, it may be useful to supplement the model-based assessment of the term premium with a broader perspective. Examples could include comparisons of the assessments of term premia by other institutions, based on other models and countries, but also surveys

Development in estimated term premium in Danish government zero-coupon yields, 1998-2013 Chart 9.4



Note: The chart shows the development of term premium in the period 1998-2013 in the 5- and 10-year maturity segments, based on estimation of the term structure model over the *entire* period 1998-2013. This means, for instance, that the estimated premium in 2001 is based on data for the period 1998-2013.
Source: Bloomberg, Nordea Analytics and own calculations.

of market participants' forecasts of future yields.

For example, analyses conducted by the NY Fed[10] and the BIS[11] conclude that the rise in 10-year US government bond yields in the 1st half of 2013 was attributable mainly to higher term premia and not expectations of steep increases in the short-term yield. Other analyses also find increases in term premia in 2013 for a number of European countries, including the UK, Germany, Norway and Sweden.[12] In most of these countries, the increases in term premia started from negative levels in 2012. Thus, mid-2013, term premia across countries were assessed to be considerably lower than the levels seen in recent decades.

These assessments are essentially in line with Danmarks Nationalbank's own model estimates of the movement in the term premium on Danish government bonds in recent years, cf. Chart 9.4, although the term premium on government yields is estimated to be slightly higher in Denmark than in the countries mentioned above.

TERM PREMIA AND THE CENTRAL-GOVERNMENT DEBT POLICY

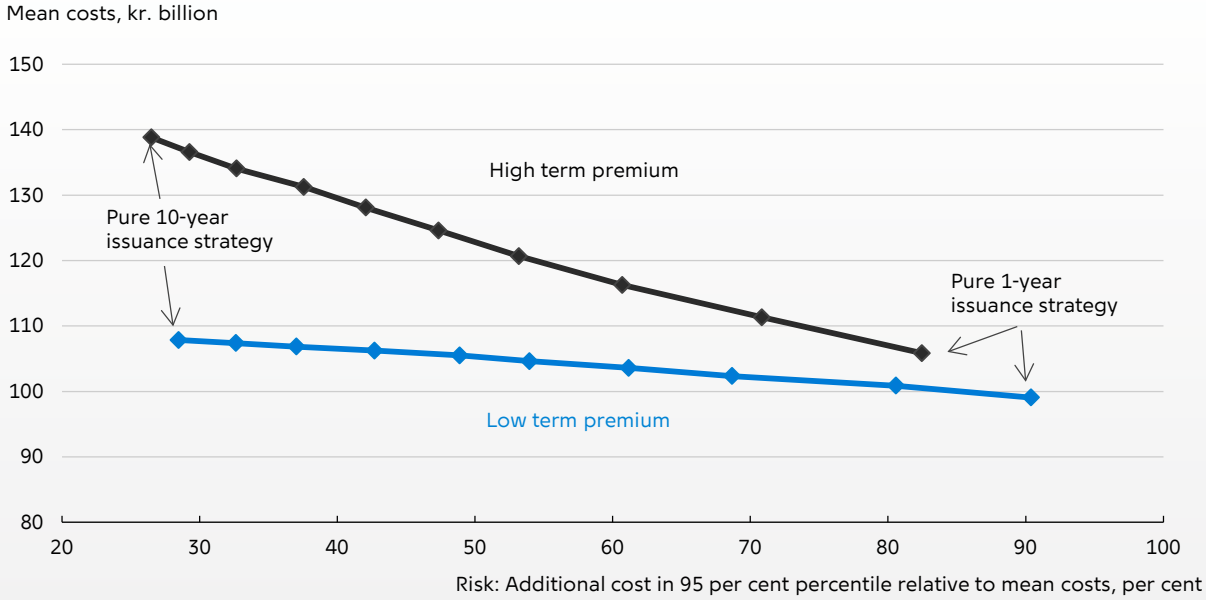
The size of term premia affects the trade-off between the expected costs and risk associated with various issuance and swap strategies. When the term premium is assessed to be high, a given reduction of the interest-rate risk for the central government, e.g. by increasing the maturities of issuances, will be associated with high expected additional costs. This is reflected in the slope of the black curve in Chart 9.5, where a reduction of the interest-rate risk corresponds to movements from the right-hand side towards the left along the black curve. Conversely, when the term premium is assessed to be low, a given reduction of the interest-rate

10 Adrian and Fleming (2013).

11 BIS (2013).

12 Saravelos (2013).

Implication of term premium for the trade-off between expected costs and risk Chart 9.5



Note: On the y-axis, the next 10 years' expected total interest costs (mean costs) of a stylised steady state debt portfolio of kr. 500 billion for various issuance strategies is shown. As a risk metric, the ratio of interest costs in the 97.5th percentile of future interest costs to interest costs in the mean scenario is shown on the x-axis. Two different interest-rate environments are considered – one with a high term premium and one with a low term premium. For purposes of simplicity, simulations in a Vasicek model are used here. The dots from the right-hand side to the left-hand side mark issuance strategies with rising duration.
Source: Own stylised calculations.

risk will be associated with low expected additional costs. This is reflected in the slope of the blue curve in Chart 9.5, which is less steep than the slope of the black curve. If, say, the term premium is assessed to be zero, this means that long-term and short-term issuances are subject to the same *expected* costs. This speaks in favour of issuing debt with high duration, as the interest-rate risk for the government is considered to be low.

For a given preference for the trade-off between expected costs and risk, the size of the term premium thus plays a key role in the central-government's issuance and swap strategies for individual years. In practice, the central government separates its issuance strategy from management of the interest-rate risk on the central-government debt via interest-rate swaps, cf. Chapter 7.

The estimated term premium on Danish government yields has been low in recent years. This is a key part of the reason why, in recent years, the central government has been issuing debt with high duration without reducing this by means of interest-rate swaps, cf. also Chapter 6.[13]

In this context, it should be mentioned that the very low level of interest rates also means that the low interest-rate sensitivity has been maintained at a – in a historical perspective – low absolute level of interest costs. Moreover, low long-term interest rates mean that the maximum realised additional costs of high duration on issuances are limited by the fact that short-term interest rates cannot feasibly go much lower than zero for an extended period of time. Conversely, realised gains on high duration rather than low may become substantially higher if short-term interest rates rise to, say, 5 per cent over the coming years.

13 In the design of the central-government debt policy, assessments of term premia are interesting only ex ante – i.e. from a forward-looking perspective. Evaluation of any additional costs of a given issuance strategy ex post is very difficult, since, in principle, this requires knowledge of interest-rate expectations at all historical times. For instance, "unexpectedly" low additional costs calculated ex post may simply reflect considerably higher short-term interest rates than expected ex ante following a shock to the economy.

LITERATURE

Adrian, Tobias and Michael Fleming (2013), The recent bond market selloff in historical perspective, *Federal Reserve Bank of New York Liberty Street Economics Blog*, August.

BIS (2013), *Quarterly Review*, September.

Campbell, John Y., Adi Sunderam and Luis M. Viceira (2013), Inflation bets or deflation hedges? The changing risks of nominal bonds, *Working paper*.

Christensen, Jens H. E., Francis X. Diebold and Glenn D. Rudebusch (2011), The affine arbitrage-free class of Nelson-Siegel term structure models, *Journal of Econometrics*, Vol. 164, No. 1, 4-20.

Cochrane, John H. (2005), Financial markets and the real economy, *Foundations and Trends in Finance*, Vol. 1, No. 1, 1-101.

Culbertson, John M. (1957), The term structure of interest rates, *The Quarterly Journal of Economics*, Vol. 71, No. 4, 485-517.

Danmarks Nationalbank (2011), *Danish Government Borrowing and Debt 2010.*

Danmarks Nationalbank (2013), *Danish Government Borrowing and Debt 2012*.

Greenwood, Robin and Dimitri Vayanos (2010), Price pressure in the government bond market, *American Economic Review*, Vol. 100, No. 2, 585–590.

Ilmanen, Antti (2011), Expected returns: an investor's guide to harvesting market rewards, *John Wiley & Sons*.

Kim, Don H. and Athanasios Orphanides (2007), The bond market term premium: what is it, and how can we measure it?, *BIS Quarterly Review*, June.

Modigliani, Franco and Richard Sutch (1966), Innovations in interest rate policy, *American Economic Review*, Vol. 56, No. 1/2, 178-197.

Saravelos, George (2013), The world's most expensive asset class, *Deutsche Bank Markets Research*, September.

APPENDICES

MAIN PRINCIPLES OF THE MANAGEMENT OF GOVERNMENT DEBT

The management of the government debt, as well as related tasks, is carried out by Government Debt Management at Danmarks Nationalbank on behalf of the Ministry of Finance. The Minister of Finance holds the overall and political responsibility for central-government borrowing and debt, including relations with the Folketing (Parliament).

OBJECTIVES

The overall objective of the government debt policy is to cover the central-government financing requirement at the lowest possible long-term borrowing costs, while taking the degree of risk into account. Furthermore, the aim is to facilitate the central government's access to the financial markets in the longer term and to support a well-functioning domestic financial market. The objectives of Denmark's government debt policy are in accordance with international standards.[1]

The market turmoil in recent years has emphasised the importance of ensuring government access to the capital markets. This is mainly achieved via a transparent and flexible issuance policy and continuous presence in the financial markets. The management of the Government Debt in Denmark is focused on maintaining a low refinancing risk by meeting the financing requirement well in advance, ensuring a large investor base and holding substantial liquidity reserves.

STRUCTURE OF GOVERNMENT DEBT MANAGEMENT

The Minister of Finance is authorised by law to raise government loans, cf. Box A.1, and has the overall and political responsibility for central-government borrowing and debt, including relations with the Folketing (Parliament).

In most countries, the government debt is managed by the Ministry of Finance or a designated government debt management office. In Denmark, these tasks are undertaken by Government Debt Management at Danmarks Nationalbank on behalf of the Ministry of Finance. Tasks and organisation correspond to those of government debt management offices in other countries. The distribution of responsibilities is specified in the *Agreement on the division of work in the area of government debt between Danmarks Nationalbank and the Ministry of Finance*.[2]

As part of managing central-government borrowing and debt, Government Debt Management administers re-lending and government guarantees and the assets of the three government funds: the Social Pension Fund,

1 Guidelines for Public Debt Management: http://treasury.worldbank.org/bdm/pdf/PDM_Guidelines_2001_english.pdf

2 The agreement is available at www.governmentdebt.dk.

Act on the authority to raise loans on behalf of the central government Box A.1

Under the Danish Constitution, debt can be issued by the central government on a statutory basis only. The statutory basis for central-government borrowing is set out in the *Act on the authority to raise loans on behalf of the central government*[1], which authorizes the Minister of Finance to raise loans on behalf of the central government for a maximum of kr. 2,000 billion. This amount is the upper limit for domestic and foreign gross debt. In connection with current debt management, the Minister of Finance is moreover authorized to enter into swap agreements and other financial transactions. The central government's costs of borrowing, i.e. interest costs and capital losses on issues and buy-backs, must be appropriated under the annual finance acts.

1. Act no. 1079 of 22/12/1993 as amended, www.governmentdebt.dk.

SPF, the Advanced Technology Foundation[3] and the Fund for Better Working Environment and Labour Retention. The framework for management of the assets of SPF is laid down in the *Regulations governing the management of the Social Pension Fund*.[4] Tasks concerning the management of the assets of the Advanced Technology Foundation and the Fund for Better Working Environment and Labour Retention as well as the tasks related to re-lending and government guarantees are laid down in separate agreements.

The functions of Government Debt Management are divided into front, middle and back offices, cf. Box A.2. Separation of functions and clear procedures reduce operational risks and ensure a clear distribution of responsibilities. This facilitates internal control. The placement of the tasks at Danmarks Nationalbank makes it easier to monitor interaction between government debt policy, monetary policy and financial stability. This is consistent with the IMF's recommendations (Stockholm principles).[5]

The middle office formulates the government debt policy and prepares proposals for borrowing strategies and risk management. The middle office also lays down guidelines for the front office with regard to issuances, buy-backs and swap transactions in accordance with the agreed strategies. Moreover, the middle office lays down the framework for the individual auctions and undertakes the overall administration of foreign borrowing, re-lending and government guarantees and participates on the SPF Board and in the financing group for subsidised housing.

The front office is responsible for the operational element of the government debt policy within the framework of the monthly guidelines. This comprises issuance of government securities, including holding of auctions, buy-backs, securities lending and swap transactions. It also determines market terms for re-lending.

The back office settles payments concerning central-government debt, including servicing of debt and swaps. The Government Debt Accounting prepares the national accounts together with the Ministry of Finance.

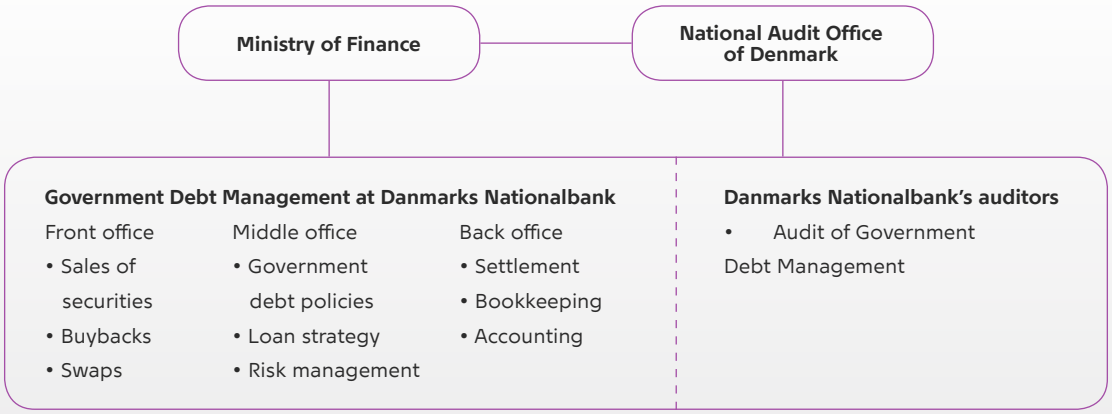
The government debt area is audited by Danmarks Nationalbank's auditors on behalf of Rigsrevisionen (the national audit office of Denmark). Danmarks Nationalbank's auditors ascertain that the government debt accounts give a true and fair view, i.e. that they are without significant errors and omissions. In addition, Rigsrevisionen may assess whether the government debt is managed in an appropriate way. The results of its investigations are published at www.rigsrevisionen.dk

3 On 3 October 2013, the Parliament agreed to establish the Danish National Innovation Foundation. As part of the agreement, the funds from the Danish Council for Strategic Research, the Advanced Technology foundation and the Danish Council for Technology and Innovation will be transferred to the new fund. The Danish National Innovation Foundation is expected to be fully established by 1 April 2014.

4 *Regulations governing the management of the Social Pension Fund* are available at www.governmentdebt.dk.

5 Guiding Principles for Managing Sovereign Risk and High Levels of Public Debt, http://www.imf.org/external/np/mcm/Stockholm/principles.htm.

Functions of Government Debt Management Box A.2



RESPONSIBILITIES OF GOVERNMENT DEBT MANAGEMENT

Government Debt Management at Danmarks Nationalbank must ensure that the objectives of government debt policy are met. This is achieved by carrying out the tasks specified in *Agreement on the division of work in the area of government debt between Danmarks Nationalbank and the Ministry of Finance*. Government Debt Management undertakes the following responsibilities:

PREPARATION OF ISSUANCE STRATEGY AND ISSUANCE OF GOVERNMENT SECURITIES

- Preparation of issuance strategy on the basis of the government budget forecast from the Ministry of Finance.
- Issuance of domestic government securities to cover the central government's domestic financing requirement.
- Issuance of foreign government securities in order to maintain an adequate foreign-exchange reserve and to ensure the central government's market access.
- Supporting a well-functioning market for domestic government securities, e.g. through agreements with primary dealers in Danish government securities for ongoing price quotation (market making).
- Managing the central government's account in order to ensure a robust liquidity buffer.

RISK MANAGEMENT

- Analysis and management of market risk on the central-government debt portfolio. The risk on financial assets and liabilities of the government debt is managed on a consolidated basis.
- Credit risk management in connection with interest-rate and currency swaps.

MANAGEMENT OF GOVERNMENT FUNDS, RE-LENDING AND GOVERNMENT SECURITIES

- Management of the assets of the three government funds.
- Management of government guarantees and re-lending to government-owned companies.
- Administration of special lending, e.g. bilateral loans to other sovereign states.

ADVISORY SERVICES AND INTERNATIONAL COOPERATION

- Advising the Ministry of Finance concerning the central government's other financial risks, e.g. interest-rate risk in relation to the financing of subsidised housing.
- Advising ministries and agencies on financial regulation of importance for the government securities' market.
- Advising other government debt management offices.
- Participation in international cooperation in the area of government debt management, including in the OECD, the IMF, the World Bank and the EU.

CONTACTS WITH CREDIT RATING AGENCIES AND INVESTORS

- Contacts with credit rating agencies concerning the central government's credit rating.
- Information to investors on the government debt policy and financial and economic conditions.

STRATEGY AND FUNDING RULES OG GOVERNMENT DOMESTIC AND FOREIGN BORROWING

DETERMINATION OF STRATEGY

The strategy for management of central-government borrowing is agreed at quarterly meetings between the Ministry of Finance and Danmarks Nationalbank on the basis of a strategy proposal from Government Debt Management at Danmarks Nationalbank. The Ministry of Finance authorises Danmarks Nationalbank to implement the agreed strategy, including the central government's issuance strategy and risk management.

At the meeting in December, the strategy for the following year is determined. At the subsequent quarterly meetings, Government Debt Management reports on the implementation of the strategy and any adjustments of the overall strategy for the year are adopted.

The government debt strategy is announced to the market immediately after the meetings in June and December. The strategy is assessed on an ongoing basis in order to ensure the best possible fulfilment of the objectives, and to ensure that Danish government debt policy complies with international standards formulated by the OECD, the IMF and the World Bank.

The strategy for the management of the central government debt is organised within the frames of the domestic and the foreign funding rules.

DOMESTIC AND FOREIGN FUNDING RULES

The Danish government and Danmarks Nationalbank have agreed on funding rules for the distribution and volume of the central government's domestic and foreign borrowing. The funding rules describe the framework for central-government borrowing, laying down the overall principles warranted by the government debt policy. There are two sets of funding rules: domestic and foreign. Together they support the separation of fiscal and monetary policy.

Domestic funding rule

Under the domestic funding rule, the central government borrows in kroner to cover its financing requirement given by the current budget deficit and redemptions on the domestic debt.

Government Debt Management at Danmarks Nationalbank may continue to issue government securities even though the financing requirement for the year has been met. This increases the balance on the central government's account, enabling the central government to build up a liquidity buffer to cover any shocks to the financing requirement. At the same time it will contribute to prefunding of the borrowing requirement for the following year, thereby reducing the central government's refinancing risk.

Under the EU Treaty, the central government is not allowed to conduct monetary financing, and hence the central government's account at Danmarks Nationalbank must never show a deficit.[6]

Foreign funding rule

The central government raises foreign loans in order to maintain the foreign-exchange reserve and to maintain the central government's market access. The foreign funding rule determines that, as a general rule, the central government raises foreign loans equivalent to the redemptions on the foreign government debt.

If the foreign-exchange reserve decreases by more than what is deemed appropriate, it may be necessary for the central government – out of concern for the exchange-rate policy – to raise loans abroad in order to strengthen the

6 Cf. Article 123 of the EU Treaty.

foreign-exchange reserve. Conversely, it is possible to reduce the foreign government debt if there has been an unnecessarily large increase in the foreign-exchange reserve.

As borrowing in foreign currency is included directly in the foreign-exchange reserve, domestic liquidity is not affected by foreign borrowing.

The government primarily issues foreign debt in the form of bonds. In addition, the government may raise short-term foreign loans via its Commercial Paper, CP, programmes. This contributes to the central government's liquidity reserves and facilitates quick build-up of the foreign-exchange reserve. Issuance in the CP programmes takes place on an ongoing basis in order to maintain easy access to the market.

FURTHER INFORMATION ON THE CENTRAL-GOVERNMENT DEBT

An important element of government debt policy is to give market participants and the public information on the central-government borrowing strategy and borrowing requirement, as well as information of a more general nature on the framework for government debt management.
Information about government debt and Government Debt Management is available at www.governmentdebt.dk. In addition, information is regularly published via other sources.

APPENDIX OF TABLES

TABLES

Central-Government Debt, year-end 2003-13

Table 1

Kr. billion	2003	2004	2005
A. Loan			
Domestic debt			
- Fixed-rate bonds, nominal	480,874	480,590	440,351
- Inflation-linked bonds[1]	-	-	-
- Fisheries Bank bonds	-	-	-
- Lottery bonds	400	400	200
- Treasury notes	78,532	71,690	33,980
- Treasury bills	67,347	68,602	60,092
- Index-linked loans and loan package[2]	-	-	-
- Currency Swaps from kroner to euro (net)[3]	-16,200	-16,200	-15,456
- Currency Swaps from kroner to dollars	-	-524	-2,688
Domestic debt, total	610,953	604,558	516,479
Foreign debt[4]			
- in dollars	-	518	2,810
- in euro	83,861	83,370	87,833
- in other currencies and multi-currency	42	40	38
Foreign debt, total	83,903	83,929	90,681
Domestic and foreign debt, total	694,856	688,487	607,160
B. Collateral related to swaps[5]	-	-	-
C. Government deposits with the central bank[6]	-40,621	-57,559	-53,297
D. The Social Pension Fund, The Fund for Better Working Environment and Labour Retention and The Advanced Technology Foundation			
- Government Securities	-118,138	-120,799	-124,635
- Other Securities	-20,576	-16,065	-11,284
The three funds, nominal value, total	-138,714	-136,864	-135,919
Central-government debt, total (A+B+C+D)	515,521	494,064	417,944
Central-government debt, per cent of GDP	36.8	33.9	26.9

Note: A positive sign indicates a liability, a negative sign an asset.

1. Inflation-linked bonds are compiled as indexed value.
2. Loan transferred from the Mortgage bank of the Kingdom of Denmark.
3. Currency swaps from kroner to euro less currency swaps from euro to kroner.
4. Foreign loans are compiled after end-exposure.
5. Cash-collateral for the market value of the swap portfolio. A positive number means the counterparties net have posted collateral.
6. Deposits include deposits of the Government funds. For 2013, government deposits are measured as in the Danmarks Nationalbank's balance sheet.

Central-Government Debt, year-end 2003-13

Table 1

2006	2007	2008	2009	2010	2011	2012	2013
428,796	403,039	451,394	505,973	556,900	606,627	620,695	615,907
-	-	-	-	-	-	10,207	23,251
-	-	-	995	887	786	684	594
200	200	200	100	-	-	-	-
-	-	-	-	-	-	-	-
42,660	19,660	-	-	25,460	44,200	44,940	32,300
379	277	-	-	-	-	-	-
-12,755	-13,262	-11,662	-8,197	2,974	2,974	-1,490	-1,490
-4,862	-7,873	-10,423	-10,956	-9,808	-8,660	-7,512	-6,364
454,418	402,040	429,509	487,921	576,413	645,927	667,524	664,198
4,583	6,844	9,947	10,218	9,901	8,957	7,662	6,219
75,219	61,738	123,126	129,351	104,811	102,861	82,338	69,689
21	20	19	19	18	-	-	-
79,823	68,642	133,092	139,588	114,731	111,818	90,000	75,908
534,241	470,682	562,600	627,509	691,144	757,745	757,524	740,106
-	-	-	-	-	-	-	3,596
-70,958	-86,333	-258,131	-210,932	-177,282	-223,100	-161,991	-161,953
-125,111	-128,547	-98,604	-77,720	-75,511	-69,351	-70,859	-62,550
-9,535	-8,686	-9,643	-37,376	-52,075	-51,393	-37,902	-32,352
-134,646	-137,223	-108,247	-115,096	-127,587	-120,744	-108,761	-94,902
328,637	247,116	196,222	301,481	386,275	413,901	486,771	486,848
20.1	14.5	11.2	18.1	22.0	23.1	26.7	26.2

Note: A positive sign indicates a liability, a negative sign an asset.

1. Inflation-linked bonds are compiled as indexed value.
2. Loan transferred from the Mortgage bank of the Kingdom of Denmark.
3. Currency swaps from kroner to euro less currency swaps from euro to kroner.
4. Foreign loans are compiled after end-exposure.
5. Cash-collateral for the market value of the swap portfolio. A positive number means the counterparties net have posted collateral.
6. Deposits include deposits of the Government funds. For 2013, government deposits are measured as in the Danmarks Nationalbank's balance sheet.

Service on central-government debt[1] as of end-2013

Table 2.1

	Interest	Redemption	Total
2014	20.9	57.0	77.8
2015	20.0	83.6	103.7
2016	16.7	35.2	51.9
2017	16.3	51.9	68.1
2018	14.2	-0.8	13.4
2019	14.2	87.5	101.7
2020	10.7	-0.3	10.4
2021	10.7	92.4	103.2
2022	7.9	0.0	8.0
2023	7.9	88.0	95.9
2024	7.0	24.5	31.5
2025	5.3	0.0	5.3
2026	5.3	0.0	5.3
2027	5.3	0.0	5.3
2028	5.3	0.0	5.3
2029	5.3	0.0	5.3
2030	5.3	0.0	5.3
2031	5.3	0.0	5.3
2032	5.3	0.0	5.3
2033	5.3	0.0	5.3
2034	5.3	0.0	5.3
2035	5.3	0.0	5.3
2036	5.3	0.0	5.3
2037	5.3	0.0	5.3
2038	5.3	0.0	5.3
2039	5.3	117.8	123.1

1. Excluding T-bills. Including net interest payments on domestic interest-rate swaps. Krone payments to and from the central government in cross-currency swaps are included in the redemptions. The calculations of interest payments and redemptions on the inflation-linked bond assume annual inflation of 2 per cent until 2023.

Service on central-government foreign debt[1] as of end-2013

Table 2.2

	Interest	Redemptions	Total
2014	0.2	26.7	26.9
2015	-0.5	22.5	22.0
2016	-0.4	21.2	20.8
2017	-0.6	1.0	0.5
2018	-0.6	0.8	0.3
2019	-0.6	0.6	0.0
2020	-0.4	0.3	-0.1
2021	-0.2	0.1	-0.1

1. Excluding Commercial Papers. Including net interest payments on swaps. Payments in foreign currency to and from the central government in cross-currency swaps are included in the redemptions.

Central-government's net financing requirement and financing requirement, 2003-13

Table 3

Kr. billion	2003	2004	2005
Current, investment and lending budget	12.4	27.7	80.6
Re-lending of government loans	-0.8	-5.4	-3.2
Distributed capital losses on issue and due interest[1]	-0.7	0.5	-0.7
Other capital items[2]	-4.1	0.9	-0.9
Net cash balance	6.9	23.6	75.9
Net financing requirement (=-Net cash balance)	-6.9	-23.6	-75.9
Redemption on long-term domestic government debt[3]	106.3	100.0	118.7
Redemption on T-bills[4]	63.4	67.3	68.6
Domestic financing requirement[5]	162.8	143.7	111.4
Redemption on long-term foreign government debt[6]	17.1	15.5	7.0
Redemption on Commercial Paper[4]	0.0	0.0	0.0
Financing requirement	180.0	159.2	118.4

Source: Central Government Accounts. 2013 are based on Danmarks Nationalbank's end-year specification, which may differ from accounting figures.

1. Including capital losses on buy-backs.
2. Including e.g. movements in the central government' holdings, cf. Budget Outlook from the Ministry of Finance.
3. Including net purchases of bonds from the Government funds administered by Government Debt Management.
4. Corresponds to the outstanding amount at the end of the year before.
5. Deviations from actual domestic financing requirement are possible due to inter alia foreign re-lending.
6. Including net payments on cross-currency swaps.

Central-government's net financing requirement and financing requirement, 2003-13 Table 3

2006	2007	2008	2009	2010	2011	2012	2013
98.6	106.2	72.3	-29.8	-88.7	-33.1	-75.7	na
-12.4	-8.5	-13.5	-82.0	1.1	2.9	-7.7	na
-0.9	0.4	0.3	-1.3	-1.2	-1.7	-2.5	na
5.0	-15.3	-10.7	3.1	-4.9	1.7	4.3	na
90.2	82.8	48.3	-110.0	-93.7	-30.2	-81.6	0.0
-90.2	-82.8	-48.3	110.0	93.7	30.2	81.6	0.0
75.6	51.8	37.7	61.2	62.5	63.8	60.2	55.1
60.1	42.7	19.7	0.0	0.0	25.5	44.2	44.9
45.5	11.6	8.7	171.2	156.2	119.5	186.0	100.1
10.5	10.4	19.4	17.9	36.5	33.2	32.5	22.1
0.0	0.0	0.0	60.3	5.1	4.6	2.5	2.8
56.0	22.1	28.0	249.4	197.8	157.2	221.0	125.0

Source: Central Government Accounts. 2013 are based on Danmarks Nationalbank's end-year specification, which may differ from accounting figures.

1. Including capital losses on buy-backs.
2. Including e.g. movements in the central government' holdings, cf. Budget Outlook from the Ministry of Finance.
3. Including net purchases of bonds from the Government funds administered by Government Debt Management.
4. Corresponds to the outstanding amount at the end of the year before.
5. Deviations from actual domestic financing requirement are possible due to inter alia foreign re-lending.
6. Including net payments on cross-currency swaps.

Issuance of domestic central-government securities, 2013

Table 4.1

ISIN code	Coupon, per cent	Name	Issued from	Redemption date	Issuance, kr. million, nominal	Issuance, kr. million, market value
Government bonds						
DK0009922759	2.5	Bullet loan 2016	8 Feb 2011	15 Nov 2016	14,800	15,910
DK0009922403	4	Bullet loan 2019	20 Jan 2009	15 Nov 2019	180	217
DK0009922916	0.1	Index-linked 2023	24 May 2012	15 Nov 2023	12,550	12,684
DK0009923054	1.5	Bullet loan 2023	4 Sep 2012	15 Nov 2023	47,185	46,220
DK0009922320	4.5	Bullet loan 2039	11 Nov 2008	15 Nov 2039	2,920	4,156
T-bills						
DK0009814352	0	T-bill 2013 I	30 May 2012	1 Mar 2013	5,860	5,862
DK0009814436	0	T-bill 2013 II	30 Aug 2012	3 Jun 2013	9,340	9,343
DK0009814519	0	T-bill 2013 III	29 Nov 2012	2 Sep 2013	10,000	10,004
DK0009814782	0	T-bill 2013 IV	27 Feb 2013	2 Dec 2013	20,020	20,027
DK0009814865	0	T-bill 2014 I	30 May 2013	3 Mar 2014	21,040	21,047
DK0009814949	0	T-bill 2014 II	29 Aug 2013	2 Jun 2014	11,260	11,262

Note: The issuance at nominal value excludes indexation, while issuance at market value includes indexation at the time of issuance.

Issuance of foreign central-government securities, 2013

Table 4.2

ISIN code	Coupon, per cent	Name	Issued	Redemption date	Issuance, kr.million nominal[1]
Loan					
XS0921252465	0.375	1,500 million dollar-loan	17 April 2013	25 April 2016	8,568

1. The loan was swapped to 1,149 million euro with fixed interest rate. Loan amount after conclusion of swap to euro.

Concluded Interest-Rate Swaps, 2013

Table 5.1

Loan number	Issued	Redemption date	Currency	Principal amount, kr. million
1668	24 Jul 2013	24 Oct 2019	Euro	1,119
1695	23 Sep 2013	15 Mar 2020	Euro	1,119
1696	23 Sep 2013	3 Feb 2021	Euro	746
1698	26 Sep 2013	23 May 2021	Euro	746

Note: On all concluded interest-rate swaps the central-government pays a fixed rate and receives 6-month Euribor.

Termination of Existing Interest-Rate Swaps, 2013

Table 5.2

Loan number	Issued	Currency	Principal amount, kr. million
1065	9 Jul 2013	Euro	746
1484	9 Oct 2013	Euro	746
1468	11 Oct 2013	Euro	746
1454	30 Oct 2013	Euro	746
598	01 Nov 2013	Danish kroner	200
1440	28 Nov 2013	Euro	746

Note: On all terminated interest-rate swaps the central-government paid a floating rate and received a fixed rate.
The market value was exchanged at termination.

Central-government domestic debt as of end-2013

Table 6.1

Kr. million, nominal value	Outstanding amount end-2012	Issuance 2013	Redemptions 2013	Outstanding amount end-2013	Redemption date	ISIN code
Government bonds, fixed interest-rate						
Bullet loans						
5 per cent bullet loan 2013	67,264	-	67,264	-	15 Nov 2013	DK0009920894
2 per cent bullet loan 2014	59,500	-	-	59,500	15 Nov 2014	DK0009911833
4 per cent bullet loan 2015	87,300	-	2,604	84,696	15 Nov 2015	DK0009921439
2.5 per cent bullet loan 2016	21,470	14,800	-	36,270	15 Nov 2016	DK0009922759
4 per cent bullet loan 2017	52,870	-	-	52,870	15 Nov 2017	DK0009921942
4 per cent bullet loan 2019	87,870	180	-	88,050	15 Nov 2019	DK0009922403
3 per cent bullet loan 2021	92,495	-	-	92,495	15 Nov 2021	DK0009922676
1.5 per cent bullet loan 2023	12,625	47,185	-	59,810	15 Nov 2023	DK0009923054
7 per cent bullet loan 2024	24,431	-	-	24,431	10 Nov 2024	DK0009918138
4.5 per cent bullet loan 2039	114,845	2,920	-	117,765	15 Nov 2039	DK0009922320
Inflation-linked bonds						
0.1 per cent inflation-linked 2023[2]	10,207	13,044	-	23,251	15 Nov 2023	DK0009922916
Amortised loans						
4 per cent amortised loan 2017	24	-	5	19	15 Jun 2017[1]	DK0009902728
Perpetual						
5 per cent Dansk-Islandsk Fond 1918	1	-	-	1	Perpetual	•
Government bonds, fixed interest rate, total	630,901	78,129	69,873	639,158		
T-bills						
T-bill 2013 I	27,280	5,860	33,140	-	1 Mar 2013	DK0009814352
T-bill 2013 II	11,960	9,340	21,300	-	3 Jun 2013	DK0009814436
T-bill 2013 III	5,700	10,000	15,700	-	2 Sep 2013	DK0009814519
T-bill 2013 IV	-	20,020	20,020	-	2 Dec 2013	DK0009814782
T-bill 2014 I	-	21,040		21,040	3 Mar 2014	DK0009814865
T-bill 2014 II	-	11,260		11,260	2 Jun 2014	DK0009814949
T-bill, total	44,940	77,520	90,160	32,300		
Fisheries Bank of Denmark bonds						
8 per cent 2014	14	-	9	5	1 May 2014	DK0009603573
6 per cent 2016	11	-	3	8	1 May 2016	DK0009604035
7 per cent 2016	18	-	5	13	1 May 2016	DK0009603656
5 per cent 2019	357	-	51	306	1 Nov 2019	DK0009604621
5 per cent 2025	284	-	22	262	1 Nov 2025	DK0009604894
Fisheries Bank Bond, total	684	-	90	594		
Domestic government securities, total	676,526	155,647	160,123	672,050		
Swaps from kroner to euro	-1,490	-	-	-1,490		
Swaps from kroner to dollar	-7,512	-	-1,148	-6,364		
Central-government domestic debt, total	667,524	155,649	158,975	664,198		

1. May be redeemed by the central-government with three months' notice.
2. Issuance in the inflation-linked bond includes the index revalutation. Outstanding amount in the inflation-linked bond are measured at indexed nominal value year-end.

Central-government foreign debt as of end-2013

Table 6.2

ISIN code/loan no[1]	Coupon, per cent	Name	Redemption date	Nominal value, kr. million[2]
Loan				
NO0010490899	3,50	2009/14 Norwegian krone loan	17 Feb 2014	442.7
1215	3,50	2009/14 swap from Norwegian kroner		-442.7
•	var.	2009/14 swap to euro		416.3
XS0417728325	3,125	2009/14 euro loan	17 Mar 2014	20,888.8
XS0419327837	3,165	2009/14 Swedish kronor loan	31 Mar 2014	3,426.0
1229	3,165	2009/14 swap from Swedish kronor		-3,426.0
•	var.	2009/14 swap to euro		2,793.4
XS0784646829	0,625	2012/15 dollar loan	22 May 2015	9,472.2
1563	0,625	2012/15 swap from dollar		-9,472.2
•	0,148	2012/15 swap to euro		10,199.6
XS0546424077	1,75	2010/15 euro loan	5 Oct 2015	11,190.5
XS0605536613	2,75	2011/16 euro loan	16 Mar 2016	9,325.4
XS0921252465	0,375	2013/16 dollar loan	25 Apr 2016	8,119.1
1641	0,375	2013/16 swap from dollar		-8,119.1
•	0,006	2013/16 swap to euro		8,575.1
XS0642551773	3,125	2011/16 Swedish kronor loan	12 Jul 2016	2,297.9
1485	3,125	2011/16 swap from Swedish kronor		-2,297.9
•	var.	2011/16 swap to euro		2,242.3
Loan, total				65,631.3
Commercial Paper				
ECP-issuances[3]				2,019.7
USCP-issuances in dollar[3]				546.3
CP-issuances, total				2,566.0
Cross currency swaps in euro				
10045	var.	2009/14 swap from kroner	12 Mar 2014	1,492.1
Cross currency swaps in euro, total				1,492.1
Debt in euro, total				69,689.4

1. ISIN-codes are used for loans and loan number for swaps and Commercial-Paper issuances.
2. The outstanding amount as of 31 December 2013 is calculated to kroner on the basis of the following exchange rates as per 30 December 2013: euro = 746.03, Norwegian kroner = 88.54, Swedish kronor = 83.56 and dollar = 541.27.
3. A Forward Contract in Foreign-Exchange with Danmarks Nationalbank is attached to issues in dollars. At maturity the Kingdom of Denmark receives an amount in dollars, equivalent to the underlying loan, and pays the agreed amount in euro. The central-government's final exposure is therefore in euro.

Central-government foreign debt as of end-2013

Table 6.2

ISIN code/loan no[1]	Coupon, per cent	Name	Redemption date	Nominal value, kr. million[2]
Currency swaps in dollars				
20001	4.164	2004/16 swap from kroner	30 Jun 2016	55.7
20002	4.164	2004/16 swap from kroner	30 Jun 2016	55.8
20003	4.355	2005/17 swap from kroner	28 Jan 2017	74.9
20004	4.4875	2005/17 swap from kroner	10 Feb 2017	126.5
20005	4.497	2005/17 swap from kroner	11 Aug 2017	138.6
20006	4.66	2005/17 swap from kroner	20 Oct 2017	138.6
20007	4.7925	2005/17 swap from kroner	15 Dec 2017	154.3
20008	4.855	2006/17 swap from kroner	16 Nov 2017	147.9
20009	5.06	2006/18 swap from kroner	12 Apr 2018	166.3
20012	5.27	2006/18 swap from kroner	28 Aug 2018	278.3
20013	4.755	2006/18 swap from kroner	10 Nov 2018	278.3
20014	4.73875	2007/19 swap from kroner	10 Jan 2019	306.1
20015	4.671	2007/19 swap from kroner	26 Mar 2019	306.1
20016	5.1225	2007/19 swap from kroner	15 Jun 2019	321.5
20017	5.164	2007/19 swap from kroner	5 Sep 2019	350.8
20018	5.3875	2007/19 swap from kroner	14 Nov 2019	350.8
20020	5.315	2008/20 swap from kroner	29 Jan 2020	380.0
20021	3.745	2008/20 swap from kroner	25 Mar 2020	378.6
20022	3.78	2008/20 swap from kroner	5 May 2020	378.6
20023	4.18	2008/20 swap from kroner	22 Jul 2020	442.0
20024	4.144	2008/20 swap from kroner	14 Oct 2020	442.0
20028	2.539	2009/21 swap from kroner	23 Jan 2021	473.6
20029	3.585	2009/21 swap from kroner	17 Mar 2021	473.6
Debt in dollar, total				6,218.8
Central-government foreign debt, total				75,908.2

1. ISIN-codes are used for loans and loan number for Commercial-Paper issuances.
2. The outstanding amount as of 31 December 2013 is calculated to kroner on the basis of the following exchange rates as per 30 December 2013: euro = 746.03, Norwegian kroner = 88.54, Swedish kronor = 83.56 and dollar = 541.27.
3. A Forward Contract in Foreign-Exchange with Danmarks Nationalbank is attached to issues in dollars. At maturity, the Kingdom of Denmark receives an amount in dollars, equivalent to the underlying loan, and pays the agreed amount in euro. The central-government's final exposure is therefore in euro.

Central-government portfolio swaps as of end-2013

Table 7

	Krone interest-rate swaps		Euro interest-rate swaps
Termination year	Net exposure, kr. million	Net exposure, million euro	Net exposure, kr. million[1]
2014	8,500	-	-
2015	1,800	1,500	11,190
2016	10,600	475	3,544
2017	-	175	1,306
2018	-	-	-
2019	-50	650	4,849
2020	-	1,150	8,579
2021	-	593	4,424
Interest rate swaps, total	20,850	4,543	33,892

Note: Net exposure is calculated as the difference in principal between interest rate swaps in which the central-government receives a fixed rate and interest rate swaps in which the central-government pays a fixed interest rate. In all krone interest rate swaps the variable payments are calculated on basis of 6-month Cibor. In all euro interest-rate swaps the variable payments are calculated on basis of 6-month Euribor.

1. Converted to kroner on the basis of the following exchange rate as of 30 December 2013: euro = 746.0300

Kingdom of Denmark's rating in domestic currency

Table 8.1

	Moody's	Fitch Ratings	Standard & Poor's
1986, July	Aa		
1986, August	Aa1		
1986, November	Aaa		
1992, July			AAA
1995, October		AAA	
Current rating	Aaa	AAA	AAA

Note: Moody's Investors Service, Fitch Ratings and Standard & Poor's use the following ratings:
Moody's: Aaa, Aa, A, Baa, Ba, B, Caa, Ca and C.
For the categories Aa to Caa 1, 2 or 3 are used to indicate a status slightly better or worse within the category.
Fitch Ratings: AAA, AA, A, BBB, BB, B, CCC, CC, C, RD, and D.
For the categories AA to B a + or – are used to indicate a status slightly better or worse within the category.
Standard & Poor's: AAA, AA, A, BBB, BB, B, CCC, CC, C and D.
For the categories AA to CCC a + or – are used to indicate a status slightly better or worse within the category.

Kingdom of Denmark's rating in foreign currency

Table 8.2

	Moody's	Fitch Ratings	Standard & Poor's
1967, September	Aa		
1981, March			AAA
1983, January			AA+
1986, August	Aa1		
1987, March			AA
1991, October			AA+
1994, August		AA+	
1999, August	Aaa		
2001, February			AAA
2003, November		AAA	
Current rating	Aaa	AAA	AAA

Note: See the note in Table 8.1.