
Developments in the Danish Bond Market since 1970

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INTRODUCTION AND SUMMARY

The Danish bond market has changed radically since 1970.

At that time it almost exclusively comprised mortgage-credit bonds. Today mortgage-credit bonds and government securities make up 2/3 and 1/3, respectively, of the total bond market in Denmark.

Until the mid-1970s callable annuity bonds dominated the Danish bond market. This pattern changed with the renewed issue of serial-loan bonds by the central government. In 1983 the central government introduced bullet issues, and since then the percentage of bullet loans has been increasing. This trend reflects the central-government borrowing strategy, as well as the popularity of adjustable-rate loans from the late 1990s. Today the circulating volume of bonds comprises callable annuity bonds and uncallable bullet issues, with an overweight of the latter.

The total krone duration in the Danish bond market has declined since mid-1999. This is attributable to the changed composition of the circulating volume of mortgage-credit bonds, in that the proportion of adjustable-rate bonds has increased, and to the development in interest rates, which has reduced the krone duration of the callable mortgage-credit bonds.

ISSUING AND BORROWING ACTIVITY IN THE BOND MARKET

The central government and the mortgage-credit institutes are the principal issuers of Danish bonds.¹ The first domestic Danish government bond loan was raised in 1785.² In the following years the issue of government bonds increased, and the growing turnover resulted in regular bond quotations on Københavns børs (the Copenhagen exchange) in

¹ Special institutions (including KommuneKredit and Danish Ship Finance), government-guaranteed entities (e.g. A/S Storebælt) and private enterprises are also significant issuers of bonds.

² The first Danish government-bond loan was raised in Amsterdam in 1757, cf. Statistics Denmark, *Statistical Reports no. 24 – Credit-Market Statistics* (in Danish), 1969.

1810. Some 10 years after the issue of the first domestic Danish government bond, the first mortgage-credit loan was arranged in Denmark. After the fire of Copenhagen in 1795 there was a need to reconstruct a large number of the destroyed buildings. Consequently, the first Danish mortgage-credit institute, Kreditkassen for Husejere i Kjøbenhavn (the Credit Fund for Houseowners in Copenhagen), was established in 1797. With the Constitution of 1849 freedom of association became a statutory right, and in 1850 the first Danish mortgage-credit act was passed.¹

The framework for the mortgage-credit market has changed radically over the years, partly as a result of increased legislative liberalisation, partly as an element of economic policy, e.g. as an instrument of adjustment. Among other things, this has entailed a much higher degree of concentration, so that there are now only 7 Danish mortgage-credit issuers left, compared to 25 in the early 1970s. Box 1 outlines the development in the Danish bond market. The Appendix includes definitions of a number of bond-market concepts.

The Danish bond market as a percentage of GDP grew strongly up to the mid-1980s and then stabilised, cf. Chart 1. Until the late 1970s the Danish bond market almost exclusively comprised mortgage-credit bonds. Subsequently, the issue of government securities increased significantly, and these two groups now dominate the bond market in Denmark, accounting for around 2/3 and 1/3, respectively, of the outstanding volume of bonds.

The shift is mainly attributable to the considerable government deficits in the late 1970s and up until the mid-1980s, which entailed an equivalent central-government borrowing requirement. The circulating volume of government securities therefore increased significantly in this period. In 1989-97 the government balance was negative once again, resulting in growth in the volume of government securities.

The circulating volume of mortgage-credit bonds has increased steadily since 1970. Among other things, this reflects a higher pledgeable value. In addition, amendments to mortgage-credit legislation have had a major impact on the issuance activity, cf. Box 1. Liberalisations have thus been a significant factor contributing to the households' increased borrowing from mortgage-credit institutes, to some extent at the cost of bank loans.

In the latter half of the 1990s adjustable-rate loans were reintroduced in the Danish mortgage-credit market. Unlike traditional callable annuity loans, adjustable-rate loans are financed via uncallable bullet bonds

¹ See Michael Møller and Niels Chr. Nielsen, *200 Years of Mortgage Credit in Denmark* (in Danish), 1997.

THE STRUCTURE OF THE DANISH BOND MARKET SINCE 1970

Box 1

- 1970:** Mortgage-credit reform: The maximum term to maturity for mortgage-credit loans is reduced to 30 years, whereby 30-year fixed-rate callable annuity bonds become the dominant financing option¹; one-tier mortgaging is introduced, entailing a higher degree of concentration among mortgage-credit institutes.
- 1975:** The central government resumes the issue of fixed-rate serial-loan bonds.²
- 1976:** The central government resumes the issue of fixed-rate Treasury notes (redeemed as bullet loans); in connection with special mortgage credit for new owner-occupied housing, mortgage-credit institutes may offer adjustable-rate loans financed via 1- to 5-year uncallable bonds amortised as bullet loans.
- 1980:** Mortgage-credit reform: General option to raise cash loans (repealed in 1985), including adjustable-rate loans; the quota for mortgage-credit loans for residential properties is repealed.
- 1982:** Financing of mortgage-credit loans via index-linked bonds is introduced (mainly uncallable bonds redeemed according to the serial-loan principle).
- 1983:** The central government introduces fixed-rate bullet government-bond loans.
- 1984:** The central government introduces variable-rate bullet government-bond loans (issuing ceases in 1990).
- 1986:** Mixed loans a requirement in connection with e.g. change of ownership and construction of new owner-occupied housing (part of the Potato Package of Economic Measures). Loans are thus financed via a combination of callable annuity and serial-loan bonds.
- 1988:** Serial-loan bonds are no longer included in the central government's on-the-run issues.
- 1989:** Mortgage-credit reform: Freedom to establish new mortgage-credit institutes.
- 1990:** The central government introduces Treasury bills as zero-coupon bonds.
- 1992:** Access to free mortgaging within 80 per cent of the value for owner-occupied housing via mixed loans with maturities of up to 30 years.
- 1993:** 30-year annuity loans for owner-occupied housing are reintroduced.
- 1996:** The mortgage-credit institutes reintroduce adjustable-rate loans, primarily financed via the issue of uncallable fixed-rate bullet bonds with maturities of 1 to 11 years (adjustable-rate bonds).
- 2003:** Introduction of mortgage-credit loans with deferred amortisation for up to 10 years, financed via traditional fixed-rate callable bonds or adjustable-rate bonds.

Note: For acts of Parliament, the year is the year of adoption, not the year of implementation.

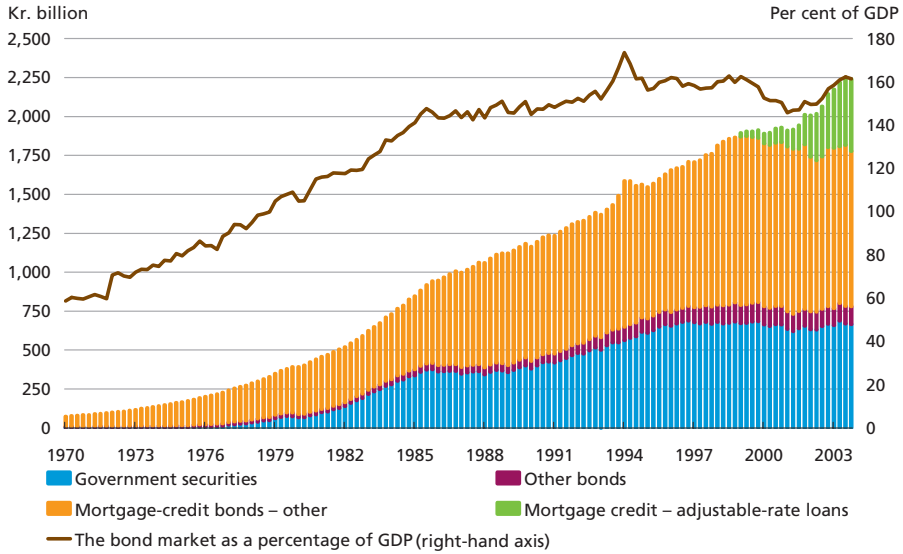
Source: Various editions of annual reports from the Association of Danish Mortgage Banks, the Mortgage-Credit Act, Danish Government Borrowing, Danish Government Borrowing and Debt, and Report and Accounts, Danmarks Nationalbank.

¹ In the period analysed, uncallable annuity bonds constitute a limited percentage of the total Danish bond market.

² Government securities (government bonds, Treasury notes and Treasury bills) are uncallable.

DEVELOPMENT IN THE BOND MARKET

Chart 1



Note: Nominal values at the end of January, April, July and October (to avoid an impact from the refinancing activities in December). Index-linked bonds are stated at the indexed value. Government securities comprise government bonds, Treasury notes and Treasury bills. Government bonds denominated in foreign exchange have been excluded. "Other bonds" comprise e.g. issues by special institutions, government-guaranteed entities and private enterprises. Data for adjustable-rate loans are available from January 1999 onwards. The observations for January and April 1994 illustrate a massive wave of conversions.

Source: Statistics Denmark and Danmarks Nationalbank.

with short maturities, known as adjustable-rate bonds.¹ At end-2003 the volume of adjustable-rate loans was kr. 498 billion, of which kr. 85 billion was denominated in euro, equivalent to around 1/3 of total mortgage-credit lending.

The surge in the volume of adjustable-rate loans since 2000 is mainly attributable to an increasing positive spread between long-term and short-term interest rates, which initially makes adjustable-rate loans cheap. In addition, the economic situation is generally perceived to be stable.²

Since October 2003 mortgage-credit institutes have been able to offer loans with deferred amortisation for up to 10 years. Statistics from the Association of Danish Mortgage Banks show that deferred-amortisation loans constituted almost 57 per cent of gross lending for owner-occupied housing and summer cottages in the 4th quarter of 2003. Practically all deferred-amortisation loans are financed via adjustable-rate bonds.³

¹ 2000 saw the introduction of adjustable-rate loans as bond loans based on uncancellable variable-rate annuity bonds with a typical maturity of 4-5 years.

² A general discussion of these topics can be found in Anders Møller Christensen and Kristian Kjeldsen, Adjustable-Rate Mortgages, Danmarks Nationalbank, *Monetary Review*, 2nd Quarter 2002.

³ Record lending in 2003 – mortgage-credit lending exceeds half a trillion! (in Danish), the Association of Danish Mortgage Banks, *press release*, 27 January 2004.

Owing to the new loan types, the proportion of adjustable-rate bonds in the Danish bond market is rising at the cost of conventional callable mortgage-credit bonds with long maturities. This means that the financial structure of the Danish real-property market now resembles that of the euro area to a higher degree than previously. In Europe the Danish mortgage-credit market is only exceeded by the German one in absolute volume terms. In GDP terms the Danish mortgage-credit market is among the largest in the world.

The bond market by selected types

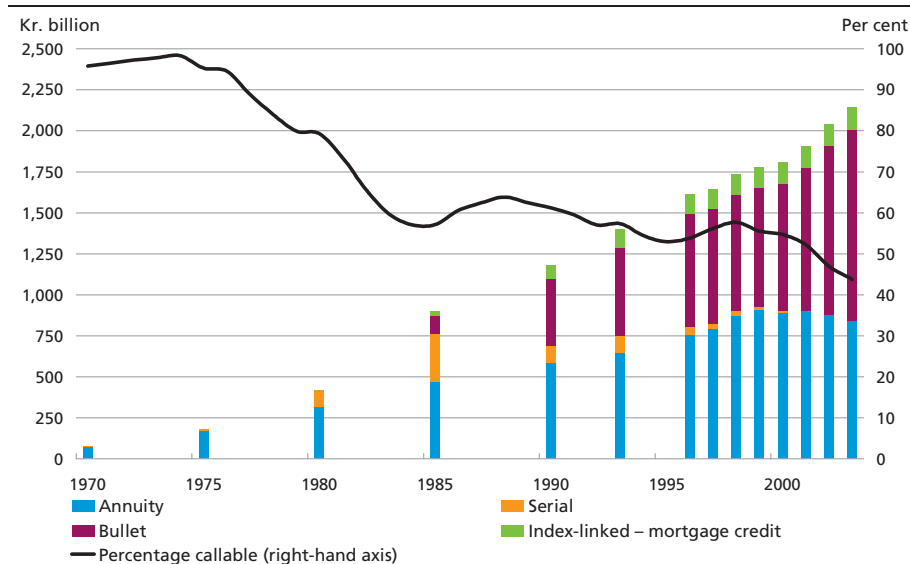
The Danish bond market was previously dominated by callable annuity bonds, whereas the present circulating volume of government and mortgage-credit bonds primarily comprises callable annuity bonds and uncallable bullet loans, with an overweight of the latter, cf. Chart 2.

From 1975 until the beginning of the 1980s most government bonds were issued as fixed-rate serial loans. In 1983 bullet government bonds were introduced. In the following years serial loans were phased out in favour of bullet loans, and from 1988 the former ceased to be part of the central government's on-the-run issues.

Until the mid-1980s the Danish mortgage-credit market was dominated by fixed-rate annuity loans with long maturities. However, with the

GOVERNMENT SECURITIES AND MORTGAGE-CREDIT BONDS BY SELECTED LOAN TYPES

Chart 2

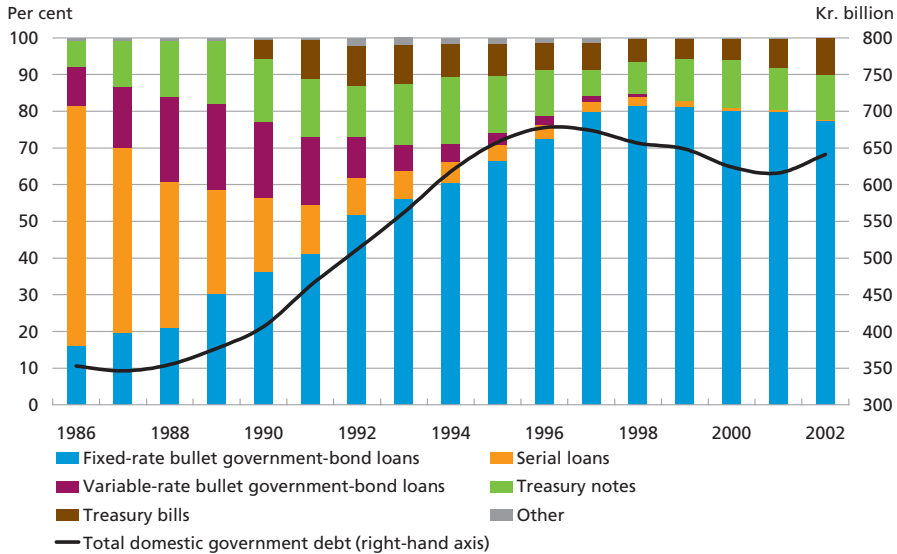


Note: Estimated nominal values at end-October. "Percentage callable" is estimated on the basis of loan types, excluding index-linked bonds. Index-linked bonds are stated at the indexed value. Government bonds denominated in foreign exchange have been excluded.

Source: Copenhagen Stock Exchange, Nordea Analytics and Danmarks Nationalbank.

DOMESTIC GOVERNMENT DEBT BY SECURITY TYPES

Chart 3



Note: Nominal value at end-December. Foreign-exchange swaps in 2001-02 totalling kr. 21 billion have been excluded. "Other" comprises e.g. premium bonds. In 1984, 5- and 10-year variable-rate bullet government-bond loans with quarterly interest adjustment were introduced. Issues of these bonds ceased in 1990, and today all variable-rate government-bond loans have been redeemed.

Source: Danmarks Nationalbank.

Potato Package of Economic Measures in 1986 mixed loans became compulsory, leading to issues of serial loans in the mortgage-credit market. In 1993 it once again became possible for mortgage-credit institutes to provide loans solely based on annuity bonds.

The ratio of callable to uncallable bonds has also changed since 1970. Owing to the issuance activity in government securities and, more recently, the emergence of adjustable-rate bonds, callable bonds as a percentage of the total market for government securities and mortgage-credit bonds has declined significantly in this period, cf. Chart 2.

In Denmark, government bonds are issued in the 5- and 10-year maturity segments, whereas Treasury notes¹ are issued with a maturity of 2 years. These maturity segments are also the internationally most important ones. These securities, along with Treasury bills², which are issued with maturities of up to 12 months, make up the central government's on-the-run issues. In line with the government borrowing structure in many

¹ Since considerable government deficits were envisaged, the sale of Treasury notes was resumed in 1976.

² In 1990 zero-coupon Treasury bills were introduced (i.e. the yield is the difference between issue below par and redemption at par).

other countries, the Danish domestic central-government debt today practically only comprises fixed-rate bullet loans (government bonds and Treasury notes) and Treasury bills, cf. Chart 3. The government borrowing structure has thus gradually been simplified.

By building up large liquid series the central government seeks to achieve a liquidity premium and thus lower borrowing costs.¹ The central-government borrowing strategy helps to make government securities attractive to both domestic and foreign investors.

DEVELOPMENT IN THE TOTAL KRONE DURATION SINCE 1999

A major consideration for bond investors is the interest-rate risk of the bond portfolio. The interest-rate risk of a bond can be expressed as the krone duration, cf. the Appendix.² The value of the krone duration of an individual bond series depends on the characteristics of the bond, including term to maturity, coupon and amortisation, but also on the yield curve and the development in the volume of the series. For callable mortgage-credit bonds the borrower's right of conversion must also be taken into account. If the callable mortgage-credit bonds are traded at or above par, the krone duration is typically very low.

The pattern of the total krone duration in the Danish bond market is affected by the structural change in the composition of the circulating volume of mortgage-credit bonds, i.e. a higher percentage of adjustable-rate bonds and a lower krone duration for the callable mortgage-credit bonds as a result of the course of interest rates, cf. Chart 4.

In the period 1999-2003 the total krone duration fell from kr. 100 billion to kr. 83 billion.³ In mid-1999 the krone duration for callable mortgage-credit bonds accounted for just over half the total krone duration. Four years later this percentage had decreased to just over one third. Even though adjustable-rate bonds constituted almost a third of the circulating volume of mortgage-credit bonds in 2003, they only contributed 8 per cent of the total krone duration. Typically these bonds have a maturity of only 1 year and thus a relatively low krone duration.

A large proportion of the krone duration for the callable mortgage-credit bonds is related to 30-year issues within the last 10 years.⁴ The

¹ For a more detailed description, see Danmarks Nationalbank, *Danish Government Borrowing and Debt 2002, 2003*.

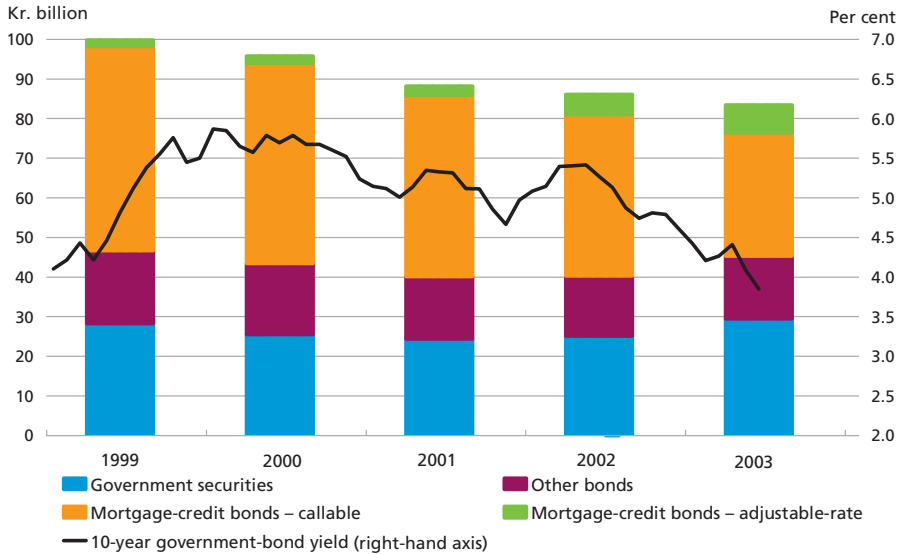
² For a detailed review of bond risks etc. see Danmarks Nationalbank, *Financial Management at Danmarks Nationalbank, 2004*.

³ The total krone duration at end-December 2003 was calculated at kr. 88 billion. This development is primarily attributable to an influx of 30-year mortgage-credit bonds with a coupon of 5 per cent maturing in 2035.

⁴ During the past 10 years, 30-year callable mortgage-credit bonds have been issued with coupons of 5, 6, 7 or 8 per cent. Depending on the time of issue, these securities mature in 2026, 2029, 2032 or 2035.

TOTAL KRONE DURATION BY BOND TYPES, AND THE 10-YEAR GOVERNMENT-BOND YIELD

Chart 4



Note: The krone duration is stated at end-June. The 10-year government-bond yield is shown on a monthly basis. "Other bonds" comprise e.g. index-linked bonds issued by mortgage-credit institutes and issues from special institutions, government-guaranteed entities and private enterprises. The krone duration for index-linked bonds is stated on the basis of the indexed value.

Source: Nordea Analytics, Danmarks Nationalbank and own calculations.

krone duration for these issues has fallen by just over a third, from kr. 36 billion to kr. 23 billion, and most of the krone duration is now related to 30-year mortgage-credit bonds with a coupon of 5 per cent, cf. Chart 5.

From mid-1999 to mid-2002 mortgage-credit bonds with a coupon of 6 per cent maturing in 2026 and 2029 contributed most of the total krone duration. In this period, the extensive waves of conversions – in the form of bond purchases in the market¹ – in these securities led to a significant reduction in the circulating volume of bonds. This development contributed to the decline in the krone duration for 30-year securities in this period.

Throughout the period shown most 30-year mortgage-credit bonds with a coupon of 7 or 8 per cent were traded above par as interest rates declined (depending on coupon and maturity). This led to extraordinary redemptions. By mid-2003 this was also the case for 30-year bonds with a coupon of 6 per cent. As a result, the total krone duration has decreased. On the other hand, recent years' issuance of 5-per-cent bonds

¹ Cf. Ulrik Knudsen, Conversions of 30-Year Mortgage-Credit Bonds During the Last 10 Years, Danmarks Nationalbank, *Monetary Review*, 2nd Quarter 2003.

THE KRONE DURATION OF 30-YEAR MORTGAGE-CREDIT BONDS BY COUPON, AND THE 10-YEAR GOVERNMENT-BOND YIELD

Chart 5



Note: The krone duration is stated at end-June. The 10-year government-bond yield is shown on a monthly basis. A mortgage-credit model is used to determine the krone duration. Consequently the determination of the krone duration entails model uncertainty since the calculations are dependent on assumptions of e.g. the borrower's conversion behaviour. The value of the krone duration may therefore vary from model to model, depending on the model assumptions.

Source: Nordea Analytics, Danmarks Nationalbank and own calculations.

maturing in 2035 has increased the krone duration.¹ When a borrower converts high-yield callable loans into callable loans with a lower yield, this has a positive effect on the krone duration. However, if the new loans are adjustable-rate loans, the impact on the krone duration is limited.

The total krone duration is sensitive to changes in interest rates. For example, an increase in the level of interest rates by 0.5-1.0 percentage points would mean that 30-year mortgage-credit bonds with a coupon of 6 per cent were traded below par, depending on their maturity. This would reduce the risk of conversion and thus increase the krone duration.

¹ In the period shown the circulating volume of 30-year bonds increased by almost kr. 62 billion to kr. 627 billion. This increase comprised a reduction by kr. 128 billion in 30-year mortgage-credit bonds with a coupon of 6 per cent or more. On the other hand, the volume of 30-year bonds with a coupon of 5 per cent increased by kr. 190 billion, including growth of kr. 166 billion in bonds with a coupon of 5 per cent maturing in 2035 since the autumn of 2002.

APPENDIX

Bond-market concepts

Amortisation:

Annuity loan: Constant payments at regular intervals (higher instalments and lower interest payments over time).

Serial loan: Constant instalments at regular intervals (lower payments over time).

Bullet loan: Only interest is paid during the term of the loan - the principal falls due on the maturity date.

Mixed loans: Typically 60 per cent annuity loan and 40 per cent serial loan.

Callable: A loan is callable when it can be redeemed prematurely at par, in addition to purchases in the market of the callable bonds on which the mortgage-credit loan is based.

Uncallable: A loan is uncallable when it can only be redeemed prematurely by purchasing the bonds on which the mortgage-credit loan is based.

Bond loan: The borrower's principal is equal to the nominal value of the bonds on which the loan is based. The borrower's proceeds thus depend on the market value of the bonds at issue.

Cash loan: The borrower's principal is equal to the market value of the bonds issued. The capital loss to the mortgage-credit institute when selling the bonds is included in the cash-loan interest and is thus tax-deductible for private borrowers. In connection with premature redemption the borrower is tax liable for any capital gain.

Interest:

Fixed-rate loan: The rate of interest is unchanged throughout the term of the loan.

Adjustable-rate loan: Current adaptation of the rate of interest at fixed intervals.

Refinancing: The outstanding debt is fully or partially replaced by sale of new bonds.

Index-linked loan: The principal and the outstanding debt, and thus the payments, are regularly adjusted in accordance with the development in an agreed price index. Granted as a cash loan.

Nominal loan: Generic term for loans that are not index-linked. This is by far the most common – and the traditional – type of loan.

Krone duration: Expresses how much the market value of a bond holding marginally changes in kroner at a 1-percentage-point change in the yield curve.