
Mortgage Credit in the USA and Denmark

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The US mortgage-credit system resembles the Danish system in a number of ways, but the two systems also differ considerably in terms of structure and function. This becomes evident in periods with high conversion activity as seen in recent years due to the low interest rates. The wave of conversions in 2002 had a strong impact on volatility in the US bond market – both in terms of mortgage-credit and government bonds – whereas no corresponding effects were seen in Denmark. The problems experienced by the US mortgage-credit system in 2002 led to increasing interest in the pros and cons of the various types of market-based mortgage-credit systems. This articles describes the US system in relation to the Danish system.

THE US AND DANISH MORTGAGE-CREDIT SYSTEMS

The US and Danish mortgage-credit systems offer borrowers relatively cheap and more flexible financing of real property than those of most other countries. In absolute terms, the US mortgage-credit market is far bigger than the Danish market, but as Table 1 illustrates, both markets are very large, relatively speaking.

THE US AND DANISH MORTGAGE-CREDIT MARKETS		Table 1
End-2003	USA	Denmark
Mortgage-credit bonds issued	kr. 30,774 billion ¹	kr. 1,392 billion
Daily turnover in mortgage-credit bonds	kr. 1,314 billion ¹	kr. 12 billion
Total mortgage credit as a ratio of GDP	81 per cent	101 per cent
The households' debt as a ratio of disposable income	112 per cent	192 per cent
Number of institutions offering mortgage credit for owner-occupied housing	7,771	4
Ratio of owner-occupied housing	68 per cent	59 per cent

Note: Assuming an exchange rate of kr. 6 to the dollar.

Source: Frankel et al. (2004).

¹ Q3 2003.

OBTAINING A MORTGAGE IN THE USA

Box 1

In addition to the usual loan costs, the borrower must bear the costs for:

- Assessment: An independent agency must assess the value of the property.
- Credit assessment: The borrower must present a personal credit-assessment certificate.
- Building survey: The borrower must arrange a survey of the property.
- Private mortgage insurance: If the down payment is less than 20 per cent of the property price, the bank may require that a private mortgage insurance policy is taken out on the payments due. The insurance is typically terminated when the aggregate redemptions are so large that the mortgageable value exceeds 20-25 per cent.
- Title search fees: Since there is no central registration system, it is necessary to determine the legitimate owner of the property, and whether the property has been pledged as collateral for other loans.
- Title insurance: The borrower must take out an insurance policy against errors in the title search.

Source: How Mortgages Work, <http://money.howstuffworks.com>.

Obtaining a mortgage

Mortgage credit is provided by many thousands of banks and savings banks ("thrifts") in the USA, known as "originators". As Box 1 shows, a borrower in the USA must contact a number of institutions before a mortgage can be obtained. In Denmark, it can be obtained directly from the mortgage-credit institute after payment of registration fees, a fee for arrangement of the loan and regular fees throughout the term of the loan. In addition, the Danish land registration system comprises a central register of the mortgages on the individual residential properties. This is not the case in the USA, and consequently the buyer must ensure that there are no other mortgages on the property. Personal credit assessment is necessary in order to obtain a mortgage under the US system since personal bankruptcy in the USA is a state matter, not a federal matter. Most lenders require a debt-to-income ratio of "28/36". A maximum of 28 per cent of the monthly income before tax may be used for servicing mortgage debt, and a maximum of 36 per cent may be used for servicing the borrower's total debt (mortgage credit and other debt). If these limits are exceeded, the lender will require a larger down payment, e.g. payment of "discount points", cf. Box 2.

Under the Danish mortgage-credit system, the rate of interest does not depend on the borrower's status. A borrower is assessed to be creditworthy or not creditworthy, and the degree of creditworthiness does not affect the interest rate for the loan. As Box 2 shows, this is not the case under the US system. Here it is possible for the borrower to reduce the interest rate for the loan via a larger down payment. In addi-

DISCOUNT POINTS

Box 2

In addition to an ordinary down payment, the US system operates with so-called discount points. One point is 1 per cent of the principal of the loan. By paying points it is possible for the borrower to reduce the interest rate for the loan. The correlation between the number of discount points and the interest rate for the loan is adjusted according to supply and demand. The table below shows an example of the correlation between the number of points and the interest on a 30-year loan. "Conforming loans" are loans within the maximum limit set by the US Government Sponsored Enterprises, while "jumbo loans" are loans exceeding this maximum, cf. the section on issuance of bonds.¹

CORRELATION BETWEEN DISCOUNT POINTS AND INTEREST PAYABLE

Discount points in per cent	Per cent	Interest payable, per cent
<i>"Conforming loans"</i>	<i>"Jumbo loans"</i>	
1.470	-	6.750
1.360	-	6.875
0.870	-	7.000
0.380	-	7.125
-0.110	1.920	7.250
-0.600	0.013	7.375
-1.090	0.795	7.500
-1.500	0.325	7.625
-1.920	-0.145	7.750
-2.330	-0.520	7.875
-	-0.830	8.000
-	-1.150	8.125
-	-1.365	8.250

¹ Stanton and Wallace (1997).

tion, the credit assessment has a significant impact on the effective yield. There may be a significant difference between the interest payable on a 30-year loan by a highly creditworthy person and a less creditworthy person.

Overall, borrowing is presumably more expensive under the US system than under the Danish system, but pricing of the individual elements of a mortgage is more transparent. In addition, the individual institutions offering the services described in Box 1 compete in terms of fees. Under the Danish system, each loan conversion has hitherto required re-registration and payment of a new registration fee. Under the US system, registration only takes place once, i.e. when the house is bought. Consequently conversions, etc. do not entail registration fees. The borrower must, however, be able to prove that no other mortgage has been taken out on the house, e.g. in connection with non-payment of taxes. In Denmark the balance principle, to which the mortgage-credit institutes are subject, entails a close relationship between the mortgages

provided and the bonds issued. The US institutions are not subject to a balance principle, and consequently they can provide more flexible loans. However, the linking of the loan to the underlying bonds under the balance principle means that Danish borrowers can purchase the underlying bonds and use them to redeem the loan and thus manage their debt more actively. Change of ownership is also facilitated.

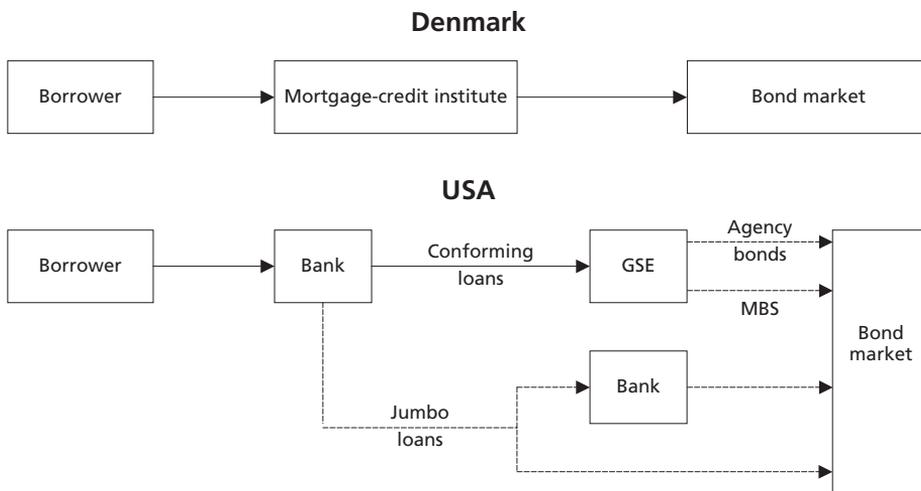
Fixed-rate loans are callable, but since there is no direct link between the loans and the bonds issued, cf. below, the loans cannot be prematurely redeemed via purchases in the market as in Denmark. This means that whenever a borrower wishes to terminate a loan, it must be redeemed at par. Under the Danish system, borrowers can manage their debt more actively since Danish homeowners with fixed-rate loans can always buy up the underlying bonds at market price. When interest rates increase, Danish homeowners therefore benefit from a decrease in the value of the debt corresponding to the fall in bond prices. If interest rates rise, borrowers under the Danish system may reduce their outstanding debt on the loan by redeeming the loan and at the same time refinancing it by issuing higher-yield bonds, i.e. upward conversion. A possible future decline in interest rates can then be used to reduce payments on the loan while the outstanding debt is reduced via the upward conversion. As stated in Frankel et al. (2004), Danish borrowers make use of this option when interest rates go up. The option to redeem the debt at the market price of the underlying bonds also means that if a rise in interest rates entails lower house prices, the mortgageable value of owner-occupied housing is protected because the market value of the debt falls correspondingly.¹

Since US borrowers can only redeem their loans at par, they cannot reduce their debt via upward conversion. Moreover, the loans must be redeemed at par when the house is sold. The homeowners' mortgageable value is therefore not protected if interest rates go up and property prices fall at the same time.

Issuance of bonds

Under the Danish system, the mortgage-credit institutes issue bonds on the basis of the loans granted. Under the US system, the banks may choose to handle mortgage-credit loans as other loans or to resell them. The bank granting the mortgage-credit loan may also choose to bundle several loans and issue a security, known as a Mortgage-Backed Security, MBS, where the yield comprises the payment flows received from the borrowers. These securities are sold in the bond market. The US system

¹ This only applies to fixed-rate loans, see Christensen and Kjeldsen (2002).



Note: The broken-line arrows indicate a choice on the part of the institution. For instance, the bank providing a mortgage-credit loan may choose to keep a jumbo loan on the balance sheet, resell it to another bank, or issue an MBS itself.

makes a clear distinction between "conforming loans" and "jumbo loans". Loans up to a certain limit, in 2004 333,700 dollars, are called conforming since they can be resold to the so-called Government Sponsored Enterprises, GSE, see below. GSEs enjoy a number of advantages, and consequently the vast majority of loans below the limit are sold to GSEs. Loans exceeding the limit, i.e. jumbo loans, are either kept on the balance sheet, resold or bundled in a bond. Issuance of bonds is illustrated in Chart 1. The credit risk on the underlying loans is typically split into tranches, the bank bearing the risk on the extreme part of the loan. In addition, there are a number of independent institutions selling credit-loss insurance for mortgage-credit loans. Since jumbo loans cannot be resold to a GSE, the interest payable by the borrower on these loans is higher than for conforming loans.

Government Sponsored Enterprises, Fannie Mae and Freddie Mac

During the depression in the 1930s it was very difficult for middle- and low-income families to obtain mortgage-credit loans from banks in the USA. The US government therefore decided to set up an institution to purchase mortgage-credit loans up to a certain limit from banks so that they would be willing to grant loans. Fannie Mae¹ was set up in 1938.

¹ The Federal National Mortgage Association.

The other major GSE, Freddie Mac¹, was hived off from Fannie Mae in 1970. In this connection both enterprises, also known as agencies, went public. There are also a number of smaller GSEs in the USA, including Ginnie Mac, which primarily buy up loans from small enterprises. The main purpose of the GSEs is to ensure a well-functioning market for mortgage-credit bonds and thus to give US homeowners access to the cheapest possible financing. The institutions cannot directly offer mortgage-credit loans, but may only purchase mortgage-credit loans from private banks and issue bonds.² The institutions are subject to a number of provisions, ensuring, *inter alia*, that borrowers in less developed areas of the USA also have access to mortgage credit.

Fannie Mae and Freddie Mac buy up mortgage-credit loans up to the limit for conforming loans. These loans are either kept on the balance sheet or resold as MBSs in the bond market. Fannie Mae and Freddie Mac bear the credit risk on all the loans. The MBSs receive the cash flow from the underlying mortgage-credit loans, and the investors therefore bear the market risk, primarily the conversion risk. The MBSs are not standardised like the Danish mortgage-credit bonds, but vary greatly in size and composition. Loans that are not resold as MBSs are financed via issues of so-called agency bonds. These are ordinary corporate bonds and have completely different characteristics from the mortgage-credit bonds. For instance, they are often non-callable. The purpose is to provide opportunistic bond issues tailored to the requirements of the investors at the time of issue in order to minimise financing costs. In addition to the credit risk the institutions therefore bear considerable market risk on the assets, namely conversion risk on the mortgage-credit loans not resold as MBSs.

All GSEs enjoy a number of benefits in relation to the private banks. The capital requirement is only 2.5 per cent for Fannie Mae and Freddie Mac, while the capital requirement for private banks is 4 per cent for mortgage-credit loans. GSEs are exempt from certain taxes and a number of fees for e.g. supervisory authorities. Public authorities are empowered to lend them up to 2.25 billion dollars in case of problems. In addition, they have a number of other advantages over the private banks. Even though they are private corporations, investors perceive them to have an implicit government guarantee, *inter alia* because they have access to public loans, and they are deemed to be "too big to fail". In other words, the investors believe that the institutions are so large

¹ The Federal Home Loan Mortgage Corporation.

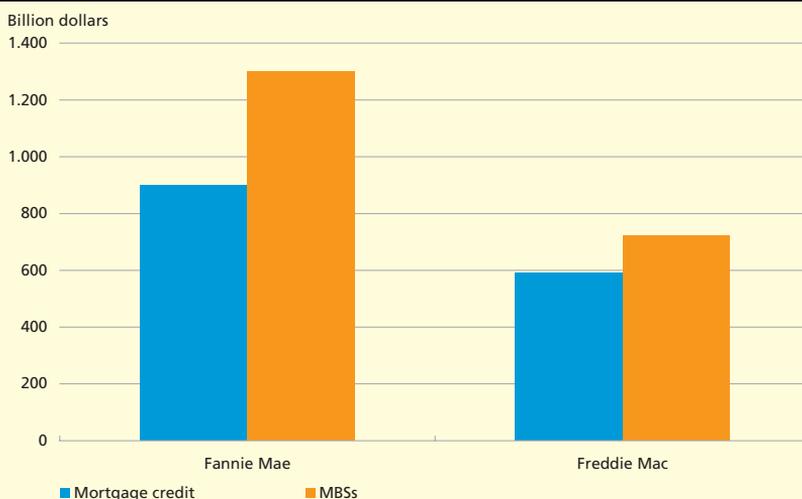
² "The Congress declares that the purposes of this title are to establish secondary market facilities for residential mortgages ..." (excerpt of the charter adopted by the US Congress when Fannie Mae was established in 1938, www.fanniemae.com).

FINANCING AND HEDGING OF MORTGAGE CREDIT IN THE USA

Box 3

As the Chart shows, Fannie Mae has financed mortgage credit totalling approximately 2,200 billion dollars and Freddie Mac approximately 1,300 billion dollars. More than 40 per cent is kept on the balance sheet, and the conversion risk is thus borne by the enterprises. The enterprises bear the credit risk for the loans kept on the balance sheet, as well as the loans underlying the MBSs, i.e. the credit risk on loans totalling more than 3,500 billion dollars. Both enterprises have a core capital ratio of just over 3 per cent.

MORTGAGE CREDIT AND ISSUED MORTGAGE-BACKED SECURITIES 2003



Note: Since Freddie Mac's accounts are still being revised, the end-2002 figures are shown for Freddie Mac.
Source: www.fanniemae.com, www.freddie.mac.com.

The institutions bear the interest-rate risk, i.e. the conversion risk, on the loans kept on the balance sheet. This means that periods with falling interest rates and thus large conversion activity as seen from the autumn of 2001 to the summer of 2003, as well as periods with significantly increasing interest rates, lead to considerable unrest in the US bond markets. Fannie Mae and Freddie Mac hedge the conversion risk on mortgage credit via derivatives and by purchasing and selling US government bonds. The non-callable government bonds are purchased when interest rates are falling, since the rising prices for these bonds limit the institutions' losses on conversion of mortgage-credit loans. Government bonds are sold when interest rates are rising. The general interest-rate falls and increases are reinforced by Fannie Mae and Freddie Mac's operations due to their size.¹

¹ See e.g. Louise Mogensen, Market Dynamics at Low Interest Rates, Danmarks Nationalbank, *Monetary Review*, 1st Quarter 2002, Recent Economic and Monetary Trends, Danmarks Nationalbank, *Monetary Review*, 4th Quarter 2002, International Monetary Fund, *Global Financial Stability Report*, September 2003.

and important to the financing of owner-occupied housing in the USA that the government will bail them out in case of problems. The investors see the more relaxed capital requirements as an expression of this implicit government guarantee, cf. White (2001).

The more relaxed requirements and the implicit government guarantee are deemed to enable the GSEs to issue bonds with a yield that is around 40 basis points lower than for bonds issued by private banks, cf. Passmore, Sparks and Ingpen (2001). Whether these lower financing costs benefit the borrowers or the shareholders of Fannie Mae and Freddie Mac is difficult to say. The results in Passmore (2003) show that the borrowers do not derive the full benefit of the lower financing costs since some of the advantages fall to the shareholders.

These circumstances and the problems seen in the summer of 2002, cf. Box 3, combined with a revision of the accounts from recent years by Freddie Mac¹, have led to considerable public interest in the activities of the GSEs in the USA. In a speech before Congress², the Chairman of the Federal Reserve Board, Alan Greenspan, expressed concern over the impact of Fannie Mae and Freddie Mac's high degree of leverage on financial stability. In addition, he expressed concern about the low level of capital held by the institutions to cover both credit and conversion risks.³

MORTGAGE-CREDIT SYSTEMS AND FINANCIAL STABILITY

As the only mortgage-credit systems in the world, the US and Danish systems offer long-term, fixed-rate callable mortgage-credit loans for financing of real property. These two systems thereby offer borrowers a broad range of options to reduce the risk on housing loans. The lack of access to long-term, fixed-rate financing is seen as a major factor explaining the uncertainty prevailing in the private mortgage market in the UK, cf. Miles (2004).

The problems in the US mortgage-credit system have raised the question of which system is the more expedient one in terms of financial stability. Under the US system, conversion risk is concentrated on a few, systemically important institutions, whereas under the Danish system the balance principle means that the conversion risk is distributed on a broad range of investors. As a result of the fixed-exchange-rate policy Danish investors also to a large extent use the far larger euro market to hedge the market risk on Danish mortgage-credit bonds.⁴ Consequently, the investors' hedging of the conversion risk on Danish mortgage-credit bonds has no substantial effect on the Danish bond market. Since US

¹ Freddie Mac had applied income smoothing to its accounts in order to achieve steady earnings growth. Subsequently Freddie Mac has had to restate its accounts, see www.freddiemac.com.

² The Federal Reserve Board, Testimony of Chairman Alan Greenspan, 24 February 2004.

³ Fannie Mae has announced that the difference in duration for assets and debt will now be kept below 6 months, www.fanniemae.com. With equity capital of only 3.2 per cent this will, however, still entail considerable interest-rate risk on the equity capital.

⁴ See Frankel et al. (2004).

borrowers must redeem their loans at par when selling their houses, demographic factors have a far greater impact on the calculation of the degree of conversion, etc. for US mortgage-credit bonds. Models for predicting payments on US mortgage-credit bonds therefore require considerably more information than corresponding models for Danish mortgage-credit bonds. The credit risk of both US and Danish mortgage-credit institutes is limited to the loan-to-value ratio of maximum 80 per cent of the value of the owner-occupied home.

Even though investors perceive the GSEs to have an implicit government guarantee, the spread between mortgage-credit and government bonds is the same as in Denmark. The reason is that it is more complicated to predict payments on US bonds and that Danish mortgage-credit bonds are far more standardised in terms of size, etc. than the US bonds, cf. Frankel et al. (2004).

There have been recent initiatives to establish a pan-European mortgage-credit system in order to integrate and extend mortgage credit in the EU. The European Mortgage Finance Agency has proposed the establishment of a system like the US system with a private agency acting as a sort of pan-European "Fannie Mae", purchasing mortgage-credit loans and issuing bonds.¹ The Danish model has been deselected since the banks behind the initiative find that incurring an interest-rate risk should be a major source of income for such an institution. Mexico is setting up a mortgage-credit system modelled on the Danish system with a view to preventing the mortgage-credit institutions from incurring market risks.

Conclusion

The US and the Danish mortgage-credit systems both give homeowners access to long-term, flexible and relatively cheap housing financing. The differences between the two systems reflect the fact that they were established in very different circumstances. The Danish system is based on the tradition of forming associations and was established by private initiative. The US system was established during the depression in the 1930s when the government had to step in to ensure access to housing financing for middle- and low-income families. The Danish balance principle means that Danish mortgage-credit institutes do not bear the risk in relation to the borrowers' conversion options. The Danish mortgage-credit borrowers obtain relatively cheap and flexible financing of their homes in that Danish mortgage-credit loans are standardised. This means that bonds issued by the mortgage-credit institutes to finance the

¹ See e.g. The Banker, January 2004.

loans become sufficiently liquid for investors to find Danish mortgage-credit bonds attractive. In comparison with the US system, the Danish system is more robust when faced with conversion waves in connection with falling interest rates. This is attributable to the balance principle and the circumstance that investors purchasing Danish mortgage-credit bonds can hedge the interest-rate risk in the far larger euro market. Denmark's fixed-exchange-rate policy vis-à-vis the euro means that such hedging is relatively cheap.

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