Danish mortgage debt and systemic risk from rising interest rates

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Ben Wainfan

Denmark's stable and efficient mortgage system, combined with over a decade of low interest rates and accommodative tax policies, has enabled Danish borrowers to accumulate Europe's highest debt-to-income ratio. With interest rates and debt servicing costs rising, Danish borrowers, particularly the most leveraged ones, face financial challenges that may affect the economy and society for years to come. This article explores the implications of rising interest rates and offers policy solutions to protect the most vulnerable from overindebtedness.

Overview of the Danish mortgage system

Since its inception, the Danish mortgage system has been considered one of the most stable, transparent, sophisticated, and effective models for the financing of residential and commercial properties. The system utilizes a covered bond model where mortgage credit institutions (MCIs), specialized and heavily regulated lenders that are restricted to mortgage activities, fund mortgages through the proceeds of covered bond sales without taking deposits. All new loans are exclusively funded by the issuance of mortgage bonds of equal size, cash flow, and maturity characteristics. This differs from other European mortgage systems, which fund around 15% of loans through these bonds (Finance Denmark, 2021). The Danish covered bond market is four times the size of its government bond market and the second largest in Europe with more than $380B in bonds outstanding (Nykredit Markets, 2020).

Proceeds from bond sales are subsequently passed to the borrower, and, similarly, interest and principal payments are passed directly to investors holding mortgage bonds (International Monetary Fund [IMF], 2007). For example, if a borrower takes out a 30-year loan at a fixed rate of 2%, the MCI would fund this loan by issuing bonds with a 30-year maturity and 2% coupon. The matching of bond and mortgage loan characteristics is referred to as the matching principle. This principle is applied to every mortgage, even those with shorter maturities or adjustable rates. Throughout the life of the loan, a borrower makes principal and interest payments to the MCI, which transfers these funds to the bond investors. These institutions profit by charging a margin on the loan, taking a percentage of the debt outstanding to cover administrative costs, expected future losses, return requirements on the capital that funds the loans, and capital buffer requirements. This margin is paid by the borrower throughout the loan term. If interest rates fall and payments from borrowers decrease, MCIs pass along these same low payments to bondholders (Finance Denmark, 2021).

While MCI performance is directly sheltered from interest rate fluctuations, it is subject to credit risk. If a borrower is unable to make payments, the mortgage bank is still required to fulfill the remaining payments to bondholders. This helps shield bond purchasers from credit risk and incentivizes MCIs to evaluate the loans they issue. To mitigate this credit risk, MCIs assess borrowers on their net worth, income, and sensitivity to interest rate movements (Larsen, 2018). This assessment, however, is a binary one aimed at determining whether a borrower is creditworthy. Creditworthy borrowers are typically offered a standard range of rates and term options (Kjeldsen, 2004). This contrasts with a system like that of the United States where credit assessment is nonuniform and rates may differ significantly for the same term loan based on where the borrower sits on the spectrum of creditworthiness (Danish National Bank [DNB], 2021).

The Danish mortgage system also differs from most other European countries, which subscribe to a universal banking system. Universal banks' operations can include a wide variety of services, such as commercial banking, investment banking, wealth management, and insurance. European universal banks can take deposits and finance loans from a variety of sources, the vast majority coming from customer deposits and self-financing. Danish MCIs are restricted to mortgage-related activities, where loans are purely funded through covered bonds sales (Finance Denmark, 2021).

Key financial products

Mortgage banks offer three general types of mortgages: fixed-rate mortgages (FRMs), adjustable-rate mortgages (ARMs), and floating-rate mortgages. FRMs are typically 30-year loans with a predetermined rate for their lifetime. ARMs, which also fall in the long-term category, are funded by short-term bonds that mature between one and ten years. When the underlying bullet bonds funding an ARM mature, they are replaced by newly issued bonds, with a new coupon rate. The coupon rate of the newly issued bonds determines the loan interest rate for subsequent periods until the next bullet bond issuance, occurring every three to five years. Floating-rate mortgages, despite also being funded by bullet bonds, differ from ARMs due to their more frequently changing loan rates that typically move every three or six months. The floating rate typically tracks the interest rate paid between banks for overnight loans, updated daily (Finance Denmark, 2021).

For borrowers, ARMs and floating-rate mortgages generally offer lower rates than their FRM counterparts. However, this initial affordability comes with the cost of future uncertainty stemming from fluctuations in interest rates as well as changes in the money market, central banking, and macroeconomic conditions. In response to this additional risk, lending standards are tightened for those looking to acquire an ARM or an interest-only mortgage (IOM). IOMs are loans of a fixed or adjustable rate where borrowers have to pay interest only on the borrowed amount for a period up to ten years. Borrowers can exclusively qualify for an ARM or IOM if they also qualify for a 30-year FRM with a rate exceeding the current market level (Finance Denmark, 2021).

Once lending arrangements have been reached, the Danish system offers borrowers attractive prepayment and refinancing schemes. Because loans are funded entirely by covered bonds, borrowers can prepay their mortgages by purchasing the outstanding bonds at par or market value. This option is particularly attractive during times of rising interest rates, where the market prices of previously issued bonds fall as new bonds enter the market with higher, more appealing rates. Borrowers with FRMs and ARMs can repurchase related covered bonds at par at any time, whereas those with floating-rate mortgages are able to repurchase their debt only during a rate restructuring and at prearranged prices, typically 100% to 105% of the bond's price. Denmark is unique in allowing prepayment on all mortgages. In most countries, repayment is not always an option and can incur penalties as much as 10% of the principal. Borrowers can also change debt obligations by refinancing loans (Finance Denmark, 2021).

Mortgage loans under the Danish covered bond system offer borrowers transparent and relatively low prices compared to other European mortgage systems. A borrower's rate is directly dependent on the coupon rate of its underlying bond whose coupon is publicly accessible through stock exchanges. If a borrower is looking to finance their house with a 30-year FRM, they can easily determine the baseline rate for their loan by looking up the coupon rate for 30-year covered bonds. From a pricing perspective, Danish mortgages have been shown to be more attractive compared to those from other covered bond and universal bank systems around the world (Finance Denmark, 2021).

Stability and security in the Danish mortgage market

No MCI has ever defaulted on a covered bond, and there has not been a late payment to an investor since the 1930s (Finance Denmark, n.d.). Even in periods of turbulent markets like the 2008 global financial crisis or the COVID-19 pandemic, MCIs, without government intervention, were able to sell billions of dollars in covered bonds, support the housing market, and help borrowers with lending practices that are forgiving, such as expanded credit facilities, IOM periods, and payment holidays (Finance Denmark, 2021).

Oversight from the Danish Financial Supervisory Authority has a large role in establishing the mortgage system's stability. MCIs are required to report their market risk to the agency each quarter, a process that includes several stress tests evaluating the institution's ability to withstand interest rate changes, exchange rate volatility, hedging, and liquidity risks. MCIs can only extend a loan that is worth no more than 80% of the assessed value of a residential property, helping to limit the severity of potential losses. This measurement is called the loan-to-value (LTV) ratio. The Danish Financial Supervisory Authority also sets strict benchmarks for the lending of IOM, capital buffers, overall lending growth, refinancing operations, and share of high LTV ratio loans (Danske Bank, 2016). These provisions, in addition to preferential rights for investors on MCI capital and one of the fastest default timelines in Europe, make Danish covered bonds incredibly safe investments, thereby earning the highest possible credit ratings from international agencies (Enoch et al., 2013).

Indebtedness and the current macroeconomic situation

The stability, affordability, safety, and transparency of the Danish mortgage system are rightfully admired on a global scale. However, this success comes at a cost: remarkable overindebtedness. Danish households have the largest debt-to-income ratio of any European country, at 2.5. The European average is less than 1. Residential mortgages account for 82% of all household debt in Denmark, making the fluctuations of interest rates, debt servicing costs, and the mortgage market massively influential to the health of the Danish consumer (Scope, 2021). As of 2020, an average of 26.4% of a Dane's disposable income was spent on debt servicing costs, the third highest value in the EU trailing only Greece with 36.6% and Germany (Europe's largest covered bond market) at 29.7% (Eurostat, 2020). These metrics correspond to the average Danish household, yet over 350,000 (10%) homeowners spend more than a third of their income servicing their debt (Bech et al., 2021).

In addition to the features that promote high leverage, accommodating tax laws also encourage high household debt. Approximately 33% of mortgage payments under 50,000kr and 25% of payments above this are tax deductible. Other sizable, covered bond markets such as Germany, Ireland, Spain, and the UK have no mortgage interest deductibility (MID). Furthermore, capital gains on owner-occupied dwellings are tax exempt. In Germany and Spain, capital gains taxes on the transfer of assets reach up to 25% (PwC, 2023). These policies, in addition to nearly a decade of low interest rates, incentivize borrowing by simultaneously reducing its costs and increasing the rewards of leverage (IMF, 2021).

The startling degree of Danish leverage is important given recent macroeconomic and monetary policy developments in the Eurozone. Inflation in the EU reached 10.7% in October 2022, an all-time high more than five times the European Central Bank (ECB) medium-term target rate of 2% (Amaro, 2022). Denmark posted a 10.1% year-over-year inflation rate in October, a four-decade high (Wienberg, 2022). Due to high food and energy prices and lingering supply chain delays, the IMF expects global prices to remain high (Kammer, 2022). To dampen inflation among member states, the ECB has raised rates to 2.5% as of January 2023, the highest since 2009. Given the unprecedented scope of the issue, ECB rates will continue to rise with another 0.5% hike planned for March 2023 (Reid, 2023).

ECB policy moves have strong implications on Danish monetary policy. Since 1982, the DNB has utilized a fixed exchange rate strategy, a policy framework whose sole goal is to keep the Danish krone in a stable relationship to the euro (DNB, n.d.). In theory, an increase in the ECB benchmark inflation rate will cause the euro to appreciate, a product of the increased return investors would be able to earn by storing money in the associated financial system. To keep the exchange rate stable, the DNB must increase their own benchmark rate to appreciate the krone to levels within a set range or currency band in relation to the euro. The current situation has matched theory closely as the DNB has increased rates to 2.1% as of February of 2023, the highest level since 2009 (Skydsgaard, 2023).

The implications of rising rates on Danish borrowers

To fully understand the consequences of rising interest rates, the DNB conducted a sensitivity analysis in 2021 to explore the impact a 1% increase in rates would have on Danish borrowers' income (defined as the debt service–to–income [DSTI] ratio) and balance sheets (defined as the debt-to-assets ratio). While most Danes would experience a modest worsening of their cash flows and balance sheets, groups of borrowers with ARM mortgages, low net wealth, low income, limited savings, or riskier housing assets would be severely exposed to DNB policy changes (Bech et al., 2021).

A 1% increase in interest rates is estimated to result in a $1750 increase in average annual debt servicing costs for Danish households. From a cash flow perspective, they found that most households were minimally exposed to rate hikes, with this increase in annual cost resulting in a negligible increase in spending for approximately a third of their 1.3-million-person sample. However, over 100,000 households in the sample had a cash flow sensitivity more than seven-times greater than the median level. Households with FRMs were naturally least sensitive to rate movements, whereas those with interest-only ARMs were most sensitive from a cash flow perspective. Households with low to negative net wealth, lower income, and lower-than-median savings had higher than average cash flow sensitivities. Considering that highly indebted households are more likely to choose IOMs due to their initially lower costs, these sensitivities frequently overlap (Bech et al., 2021). Overall, a 1% rate hike will cause 25% of households to spend an additional 5.5% of their after-tax income on debt servicing costs. Nearly 10% of households—350,000 families—will be forced to spend an extra 14.5% of their income on servicing debt (DNB, 2021).

From a balance sheet perspective, almost 98% of households will experience some worsening in their debt-to-assets ratio as a result of 1% rate hike. As before, households with lower bank deposits, income, and net wealth as well as those with adjustable-rate IOMs were severely sensitive to policy movements. Balance sheet sensitivity was concentrated among urban areas, particularly Copenhagen, home to a larger number of ARMs and more speculative housing assets that respond more sensitively to rate movements. With respect to age, in both the cash flow and balance sheet analysis, younger (around 30 years old) first-time home buyers were most sensitive to rate movements due to their increased leverage and limited savings (Bech et al., 2021).

ARMs, leverage, and consumption

Given the repeated resilience of the Danish mortgage system in times of crisis, it is unlikely that this stability will suddenly wane in the coming years of monetary tightening. However, young, highly indebted, low-net-wealth, and adjustable-rate IOM–holding borrowers stand to be substantially impacted by an increase in interest rates. Nearly 3.5 million Danes own homes (Denmark Home Ownership, 2022). Just half of households hold predictable FRMs; 40% have ARMs for all their mortgage debt, with 24% of these households using riskier IOMs (Bech et al., 2021).

While rate hikes hit households' disposable income and balance sheet at the micro level, they materialize at the macro level through a reduction in consumption, a measure many highly indebted households are forced to endure to avoid falling into arrears (Bech et al., 2021). This reduction in consumption drastically differs depending on leverage. The results of an IMF sensitivity analysis investigating the impact of a 1% increase in borrowing rates found that it would decrease average annual household consumption by nearly 1% and GDP by 0.4%. Households with a debt-to-income (DTI) ratio greater than four (over 450,000 of households) had a median consumption reaction approximately double the average amount (IMF, 2022).

Concerningly, households with ARMs are considerably more indebted than the average household, having median DTI levels 1.3-times larger than their FRM-holding counterparts (IMF, 2022). Similarly, there are over 200,000 households that hold IOMs whose loans exceed a 60% LTV ratio (Systemic Risk Council, 2021). Both groups are extra sensitive to rate increases given their type and quantity of debt. Given the lump sum required to repurchase covered bonds, it is unlikely that the most vulnerable of Danes are able to repurchase their debt outright, even at reduced market prices. Additionally, the speed at which borrowing costs have risen (as outlined in the next section) complicates the refinancing process.

Effects of additional rate hikes and the Danish wealth defense

What makes the issue of rising interest rates even more serious is the pace and magnitude at which they have taken place. Each sensitivity analysis referenced in this article only considers the impact of a 1% increase in rates. However, from September 2022 to February 2023, the DNB has raised their benchmark rate more than 2%, with the average ARM rate increasing over 3.1% (Finance Denmark, 2023). Given the unprecedented inflation rate in the euro area, there is a significant likelihood that these rates rise even further. While it is uncertain whether the damage to household income, balance sheets, and consumption and the associated hit to GDP will materialize linearly after the first 1% hike, it can reasonably be assumed that this larger than modeled jump will magnify the previously mentioned adverse effects.

One of the most common rebuttals to the charge of overindebtedness and the concern of rising interest rates revolves around exceptional Danish wealth. To evaluate this claim, not only must the absolute value of household wealth be considered but also the illiquid nature of it. Danish households are the richest in the EU, with average household net financial wealth nearly three times the EU average (McKeever, 2021). They also boast average financial assets more than double the EU average. However, roughly half of household wealth is stored in real estate. Of the remaining financial assets, 50% is stored in life insurance and pension plans, meaning just 25% of household wealth is stored in liquid financial assets (Scope, 2021).

Models from the DNB indicate that interest rate increases throughout the past year will, even when considering the effects of inflation, dampen housing prices by 6% through 2023, resulting in substantial hits to household balance sheets (DNB, 2022). Rate hikes, in addition to their impact on the housing market, also affect another key aspect of Danish wealth: pensions. The state Danish pension fund ATP, covering 5.4 million members, lost $8B in the first half of 2022 alone because of interest rate spikes, wiping out the 17.9% return it earned in 2021 by more than twofold (Baker, 2022). The pension sector has lost approximately $105B in the first three quarters of 2022, around half of which stems from poor covered bond performance (DNB, 2022). Danish pension funds are one of the largest purchasers of covered bonds, owning nearly 25% of the outstanding stock (IMF, 2022). The interconnectedness of the mortgage market and pension funds is expected to result in nearly half of Danes with market-rate pensions seeing a decrease in pension payments in 2023 (Fixsen, 2022). With three quarters of Danish wealth inaccessibly stored in real estate and pensions and with these assets set to take a significant hit in the near future, it seems quite inaccurate to say that household wealth enables Danes' borrowing habits and protects them from rising interest rates.

Policy recommendations: limiting household overindebtedness

The problem of rising debt servicing costs is ultimately a symptom of a systemic issue: overindebtedness. The goal of any policy in this scenario is to contain excessive risk taking among the most rate-sensitive households without inflicting damage on healthy borrowers and the economy. Policy measures that sharply increase the cost of borrowing threaten the housing market by reducing buyers' ability to pay, overall loan demand, and household consumption. Danish policymakers have a variety of ways to discourage overindebtedness. They can reduce the LTV allowance, limit or eliminate MID, begin taxing capital gains, or restrict access to ARMs and IOMs. All of these measures reduce intense leveraging by increasing borrowing costs and complicating the borrowing process, but their associated short-term micro- and macroeconomic costs differ widely (Chen et al., 2020).

LTV and MID policies

An IMF analysis of deleveraging policies conducted in several advanced economies throughout the past two decades found that for countries with highly indebted households and little room to cut interest rates (a situation identical to Denmark's), LTV and MID reductions are associated with a significant near-term reduction in housing prices, GDP, and consumption. A 10% reduction in the maximum LTV ratio was estimated to cause a 1.1% reduction in GDP by triggering a 2.6% decline in housing prices and an even further reduction in borrowing capacity as borrowers have less valuable collateral for loans, limiting their consumption. The consumption, GDP, and housing price contractions are, respectively, four, three, and two times larger in high-debt countries like Denmark, which are more sensitive to monetary shocks (Chen et al., 2020).

The nationwide removal of MID similarly contributes to this negative feedback loop. Denmark's 1987 tax reforms, for example, which reduced MID more than 20%, resulted in seven years of low growth, high unemployment, record high foreclosures, falling housing prices, and heavy MCI losses (Finance Denmark, 2021). Theoretically, a gradual reduction of MID would avoid these problems, but the forward-looking nature of asset prices results in the immediate decrease of housing prices, sparking the cycle of borrowing, consumption, and output reduction (Chen et al., 2020).

When considering the implications of widely adopted LTV- and MID-related policies, it would be unreasonable to recommend their adoption under the recessionary environment Denmark is currently entering. Therefore, neither policy should be pursued until rates drop and growth increases. The same rationale can apply for other nationwide contractionary fiscal policy like the introduction of capital gains taxation.

Household-specific borrowing restrictions

If the purpose of policy recommendations is to buffer the most vulnerable of households without risking the health of the economy, it appears most reasonable to keep any immediate changes targeted at the 13% of households (450,000) with a DTI ratio above four. Currently, no lending restrictions consider a borrower's overall debt burden, what portion of their disposable income will be absorbed by the associated servicing costs (DSTI), or the value of liabilities with respect to their income (DTI). DSTI- and DTI-oriented mortgage lending restrictions were found to generate a similar reduction in household debt with low impact on output and negligible impact on asset prices. The implementation of borrowing restrictions on the top 13% of overindebted borrowers, as opposed to nationwide LTV and MID policies, results in a minor hit to housing prices and, by proxy, consumption and output. The following three policy recommendations target borrowers with a DTI ratio of over four and certain LTV characteristics (Chen et al. 2020). These solutions are predicated on DTI and LTV measurements, but the introduction of DSTI-based policies is possible.

Danish authorities can implement DSTI- or DTI-based policies in several ways. First, they can increase the mandatory fixed period in an ARM. A similar policy had been implemented by Denmark in 2018, but it required that ARMs only be fixed for at least five years, a measure that should either be increased or dropped altogether in favor of barring those with sufficiently high liabilities from utilizing ARMs entirely. The recommendation to deny access to ARMs for borrowers with LTV ratios greater than 60% and DTI above four was proposed in 2021 but was rejected by the Danish government, a conclusion worth reconsidering (IMF, 2022). Second, authorities can decrease the 80% LTV ratio cap for borrowers above a certain DSTI or DTI threshold(s), a policy that would increase borrowing costs and limit sensitive borrowers' ability to overburden themselves. In the scenario where overindebted borrowers are allowed to access ARMs, LTV requirements can also be adjusted in addition to the introduction of a mandatory fixed period (IMF, 2022).

Third, even though IOMs make it easier to borrow by deferring full amortization payments and lowering debt service costs, they have several downsides. They create credit risk in the scenario where IOM holders are unable to make a deferred payment. Additionally, they expose them to a drop in housing prices should the value of their home drop to the point where its sale is insufficient to cover their mortgage, potentially leading to foreclosure. Since the end of 2020, the portion of IOMs has risen over 10%. Half of all loans given to new homeowners in 2021 deferred amortization, a value exceeding 66% in the urban areas of Copenhagen and Aarhus. To compound matters, about half of IOMs are extended to highly leveraged households with LTV ratios greater than 60% (DNB, 2021).

If the goal is to sustainably reduce risk and debt servicing costs among Denmark's most leveraged households, retroactively reducing the interest-only period is completely counterintuitive. If all households within the ten-year deferred amortization period were to suddenly switch to fully amortized loans, the percentage of those with a DSTI ratio greater than 40% would increase seven times. The ending of a deferred amortization period leads to, on average, a roughly $2000 reduction in consumption. The combination of this amortization-related shock and rising interest rates stands to drastically change the consumption habits of the most sensitive borrowers. Therefore, the optimal solution with respect to IOMs is not to shorten deferred amortization periods or retroactively negate their protections but to make sure their availability is reserved for the most creditworthy of borrowers moving forward (DNB, 2021).

Policy makers in Copenhagen and Aarhus have already denied access to IOMs based on household wealth levels, banning those with negative net wealth. First, these restrictions should be extended on a national DTI basis, excluding those above the four-times threshold. Second, these restrictions currently apply only to ARMs and should, for comprehensiveness, be extended to FRMs (IMF, 2022).

DTI-based restrictions serve to limit severe leverage among Denmark's most financially vulnerable population at a fraction of the macroeconomic cost of their alternatives, but they are not free of costs. The newly limited access to financing for the most leveraged Danes could complicate home ownership. As a result, the implementation of these policies should be accompanied by improvements to the Danish rental system in order to make rental housing affordable and accessible for those who may now be unable to purchase a home.

Conclusion

Policy action to combat Danish overindebtedness has long been delayed. These relatively near-term and targeted policy recommendations address the most financially sensitive citizens, yet the society at large remains vulnerable to the coming age of hawkish monetary policy. Once the expected recession is completed, Danish financial authorities should expand these restrictions to a progressively lower DTI threshold.

The implementation of DTI-based borrowing restrictions will be, like other contractionary fiscal policies, unpopular, inconvenient, and economically and socially restrictive. However, the continuation of the current levels of household debt, while not existentially threatening to the economy and its financial system, stand to substantially hinder millions of Danes. With this understanding, it is the regulators' responsibility to make the difficult decisions—to restrict access to unsafe leverage, protect citizens from their own risky behavior, and ensure the long-term success of the Danish economy and people.

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BEN WAINFAN graduated with highest honors and with honors in economics from Lehigh University in 2023 with a B.S. in economics from the College of Business. At Lehigh, Ben researched monetary policy models and their effects on US citizens from varying income brackets. He was co-head of the Thompson International Portfolio; a Technology, Research, and Communications Fellow; a Tauck Scholar; and an active member of several discussion clubs and student advisory councils. He was a recipient of the Nelson Leighton Bond Memorial Prize and the Eli Schwartz Prize in research economics. After graduation, Ben joined Bank of America as a debt capital markets analyst.