Nibor

What's up with Nibor?

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Almost all secured and unsecured bonds rates and loans in Norwegian kroner are linked to Nibor. Despite it being the most important Norwegian interest rate, at times it seems to live a life of its own, detached from domestic events. The central bank has on several occasions expressed its frustration with the volatility in Nibor fixings. In this report, we look at potential drivers for Nibor, delve into the USD money market and explain why Nibor and Stibor are two completely different animals, despite having more or less the same banks in their submission panels.

The framework

The first Nibor was published in March 1986, as the market needed some common ground for the growing number of interest rate swaps, forward rate agreements and FX swaps. The Norwegian framework was based on USD Libor, which had officially been introduced the previous year.

Nibor is meant to reflect the rate a bank would charge to lend money unsecured to another leading bank for various tenors. Both the banks that contribute and the tenors have changed over the years. Currently, there are six banks on the panel and the tenors are 1 week and 1, 2, 3 and 6 months. Nibor is calculated as the average of the panel bank's submissions on a daily basis, after the highest and lowest rates have been removed for each tenor.

The responsibility for Nibor has also shifted several times. It currently lies with NoRe, a subsidiary of Finance Norway, the industry organisation for the financial sector. It has issued a set of rules and principles for the panel banks. There is also a steering group, a compliance committee and a monitoring body to ensure that submissions and calculations are made according to the rules.

The reality

Increased attention on and regulation of counterparty risk has led to a substantial fall in unsecured lending between banks in the wake of the financial crisis. For most currencies, submissions to *ibor are therefore derived from transactions in other markets using corrections and models to mimic the behaviour of unsecured lending. Since the Norwegian market offers few alternative short-end rate products, Nibor has for some time been computed using foreign money market rates converted to Norwegian kroner via the FX swap market. This methodology is now the standard way to calculate Nibor, as described in the rules governed by NoRe.

There is currently work underway, administered by Norges Bank, to establish an alternative reference rate in Norwegian kroner. This is part of an initiative by the G20 Financial Stability Board; similar projects are being undertaken in many other countries. The working group in Norway aims to present the alternative rate early next year and to have an operating benchmark by the end of 2020. After that, there will be a substantial transition period to ensure that the new benchmark is robust and to give time to convert existing agreements from Nibor. So, we expect Nibor to be around for some years to come.

For more details on NoRe, see www.referanserenter.no/english

A summary of Norges Bank's views

Norges Bank has issued several publications about Nibor over the past few years. These publications have represented their authors' own views, but they still give a valuable view into the central bank's thinking about Nibor. The aftermath of the euro crisis in 2011-12 and several Libor rigging scandals have given food for thought on the functioning of the interbank rate in Norway. Norges Bank's view is important since it has direct implications for Norway's future depo rate path. If Nibor is expected to stay at a high spread to depo, the need to raise rates is lower, as the Nibor rate is more important for the economy.

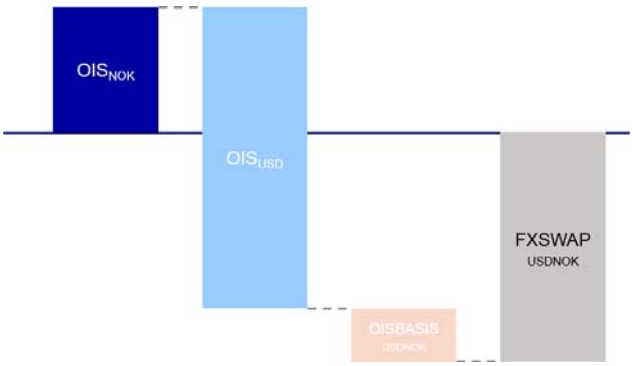
The change to the Kliem dollar rate after the financial crisis has been a major issue	A major theme in the Norges Bank's analyses is the changing nature of the implied dollar rate used to compute Nibor following the financial crisis. Prior to 2008, all unsecured dollar rates were equal. It was a generally held view that, after the crisis, the dollar rate used by domestic US banks understated the actual interbank funding costs for the Nibor panel banks, and that the broker Carl Kliem's dollar rate (basically the cost of European banks' unsecured interbank funding in USD) was a better fit. One of the main issues was that the implied dollar rate in Nibor during the euro crisis in 2011-12 was too high since it was based on the European banks' credit risk and did not account for the lower risk of the Norwegian banks. It was thus thought that Nibor was overstated in this period and that a Norwegian-based interbank rate would have avoided this issue.
Nibor left at the mercy of the FX swap market	The authors of the Norges Bank reports point out additional Nibor issues, the first being the construction itself. As there are no actual unsecured interbank transactions, Nibor is constructed as the funding cost in US dollars swapped to Norwegian kroner. The setup is similar for many other countries' *ibor rates, but it usually also comes with an obligation to give an estimate of the best unsecured lending rate, or in some instances also an obligation to lend a limited amount at these rates. As there is no link to a domestically traded rate of similar characteristics, Nibor is left at the mercy of the FX swap market.
The lack of alternative rates leaves Nibor open to manipulation	They have also pointed out that it is very hard to benchmark Nibor to market expectations about the future path of Norges Bank depo rates since there is no Norwegian OIS (overnight index swap) market and only a very limited repo market. In Sweden, for instance, Stibor can at any time be measured against the Stina OIS rate. It is theoretically easier for Nibor to be manipulated. Norges Bank found no evidence that any rigging had occurred, but did see issues related to the construction.
Very loose link between credit spreads and Nibor	A supplementary problem is the small number of banks on the Nibor panel, which means a stronger exposure to rates submitted from one bank compared to those interbank rates with more panel banks. The submitted rates are meant to reflect the underlying credit fundamentals and so one would expect to find a correlation between the panel banks' credit spreads and their Nibor submissions. However, Norges Bank's analyses did not find any evidence of this. One possible reason might be the currency swap construction. Regardless of the underlying reasons, this is a problem as it may lower the market players' confidence in Nibor's ability to reflect credit risk.
Alternative rates are needed for Nibor to function better	They suggest the way forward for the construction of a solid Nibor is an alignment of Nibor towards the Stibor construction, meaning the panel banks provide their best estimate for funding costs in Norwegian kroner when submitting their Nibor fixings. Additionally, establishing an OIS market in Norway would be an important step, since it would add to the confidence in Nibor. These things should reduce Nibor volatility and provide stronger confidence in the most important Norwegian benchmark rate.

Estimating NOK OIS

Since Nibor is a lending rate in Norwegian kroner, the central bank overnight depo rate is important. When we discuss the drivers for Nibor, we will look at the impact beyond the expectations for the overnight rate. Since there is no overnight index swap (OIS) market in Norwegian kroner, there is no way to know exactly what the market expects from the Norges Bank depo rate going forward and we must therefore rely on estimates.

Expectations for the future path of depo rates should be reflected in the FX swap market. If we assume that the 1W NOK OIS rate is similar to the Norges Bank depo rate, we can calculate the 1W USDNOK OISbasis using the relationship in the diagram below. Furthermore, we assume that the difference in 3M and 1W USDNOK OISbasis is purely driven by USD and similar to the difference in EURUSD OISbasis for the same tenors. Using this, we can compute the 3M OIS rate (see below). The resulting OIS rate is not very compelling though, showing huge spikes in volatility towards year- and quarter-ends.

THE RELATIONSHIP BETWEEN FX SWAP AND OIS RATES



Source: Nordea

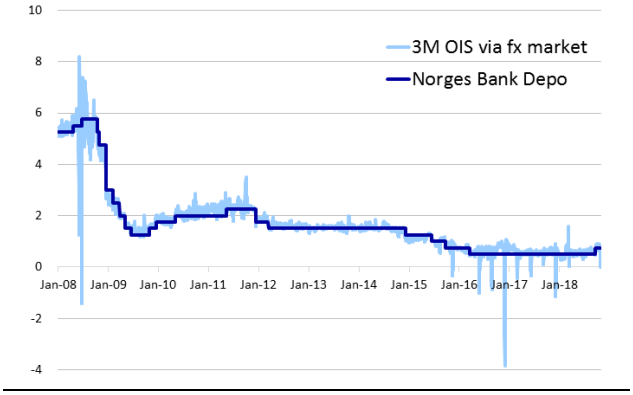
THE FORMULA FOR ESTIMATING 3M NOK OIS

$$OIS^{3M}_{NOK} = FXSWAP^{3M}_{USDNOK} + OIS^{3M}_{USD} + OISBASIS^{3M}_{USDNOK}$$
$$= FXSWAP^{3M}_{USDNOK} + OIS^{3M}_{USD} + OISBASIS^{1W}_{USDNOK} + OISBASIS^{3M}_{USDNOK} - OISBASIS^{1W}_{USDNOK}$$
$$\approx FXSWAP^{3M}_{USDNOK} + OIS^{3M}_{USD} + OISBASIS^{1W}_{USDNOK} + OISBASIS^{3M}_{EURUSD} - OISBASIS^{1W}_{EURUSD}$$

with

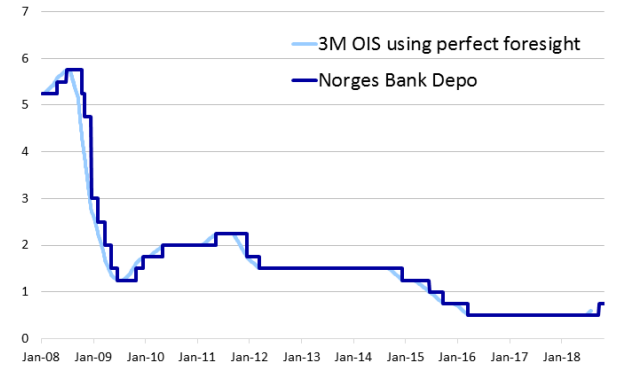
$$OISBASIS^{1W}_{USDNOK} = FXSWAP^{1W}_{USDNOK} + OIS^{1W}_{USD} - OIS^{1W}_{NOK}$$
$$\approx FXSWAP^{1W}_{USDNOK} + OIS^{1W}_{USD} - DEPO_{NOK}$$

ESTIMATING OIS FROM THE FX SWAP IS VOLATILE, %



Source: Bloomberg and Nordea

USING PERFECT FORESIGHT, WE GET A NAIVE, SMOOTH OIS, %



Source: Bloomberg and Nordea

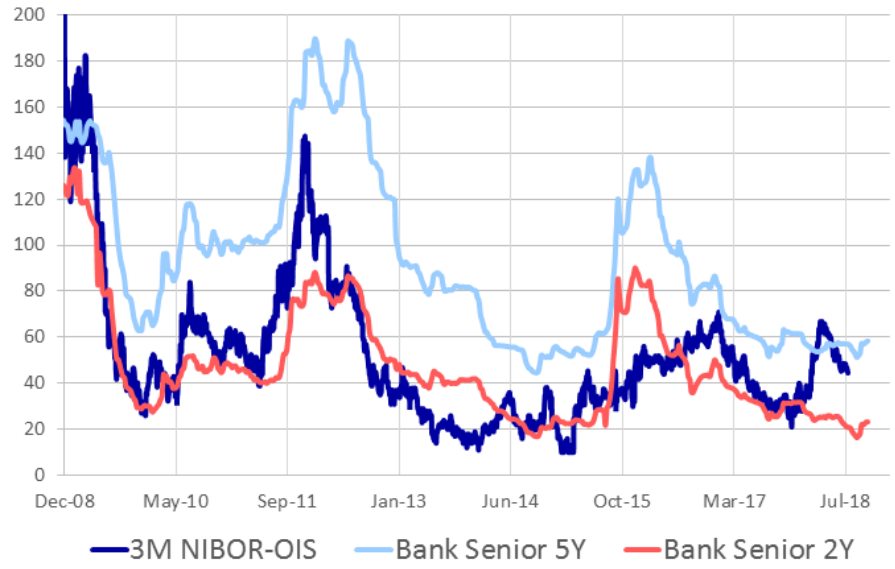
If we instead assume that the market knows the future actions of the central bank with perfect foresight, we can in hindsight find the 3M OIS rate. This is cheating, of course, but it does give a much smoother path for the OIS rate.

Choosing between the FX swap based model and the perfect foresight one, we opt for the latter. Deriving OIS rates from the FX swap introduces extra volatility, which does not reflect market expectations. As we will be concentrating on the period after 2012, we would rather accept some margin of error in the periods around the few rate changes.

Is Nibor a function of bank funding costs?

Since Nibor is supposed to reflect what banks are charging for lending to each other, credit spreads on banks' senior bonds should be highly correlated to the Nibor-OIS spread. We do find that these spreads are related in a market crisis situation, but not in normal times. Also, this relationship has broken down recently, with big swings in Nibor not reflected in credit spreads and vice versa.

THE LINK BETWEEN CREDIT SPREADS AND NIBOR HAS BEEN WEAK LATELY, BP



Source: Bloomberg and Nordea

Since it is hard to argue that Nibor fully reflects banks' unsecured funding rates, we must look elsewhere. The obvious place is the FX market.

Nibor and the FX swap

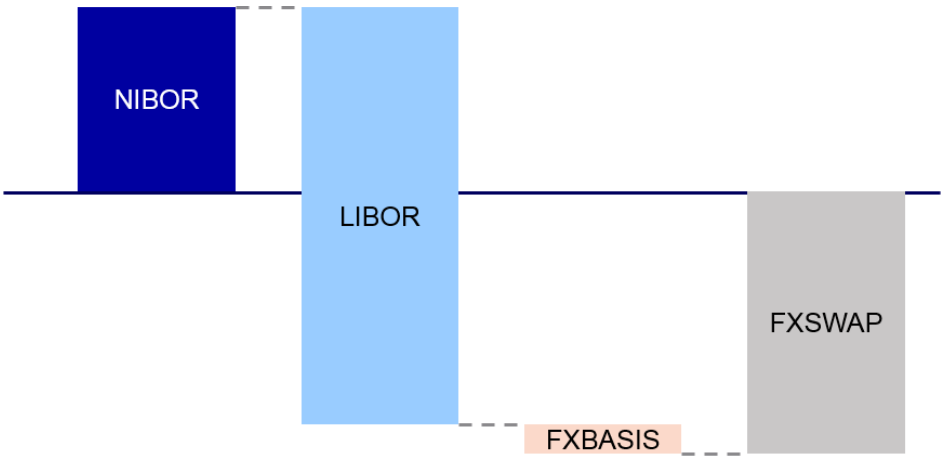
Since Nibor submissions are calculated as a foreign money market rate converted to Norwegian kroner using the FX swap market, it makes sense to look at FX swap for clues about the Nibor-OIS spread. We focus on the period after 2015, when Basel III was in full effect on the banks' balance sheets.

Basis is an important element in the FX swap

Just as the FX swap is a reflection of the difference in OIS rates plus an OIS basis element, the most common way is to express the FX swap is as the difference in *ibor rates plus an *ibor basis. From here on, we will refer to the *ibor basis as the FX basis.

The size of the FX basis is a reflection of the demand for FX swaps in a given direction. Again, this is driven by demand for FX hedging and the cost of banks' balance sheets that back the trade. Changes in regulation can have a huge impact on the basis swap, as can the relative attractiveness of the fixed income markets. Prior to the financial crisis, banks were lightly regulated and the cost to take on extra risk was low. Small amounts of FX basis therefore tended to be arbitraged away by banks; that has not been the case since 2008. The currently rule of thumb is that a big US bank would need 60 bp of FX basis before engaging in pure FX basis arbitrage as they would need to back the trade with 6% equity with a 10% ROE.

THE VARIOUS COMPONENTS OF THE USDNOK FX SWAP, AS OF SEPTEMBER 2018



Source: Nordea

Using the above connection, we can derive the Nibor-OIS spread from the FX swap

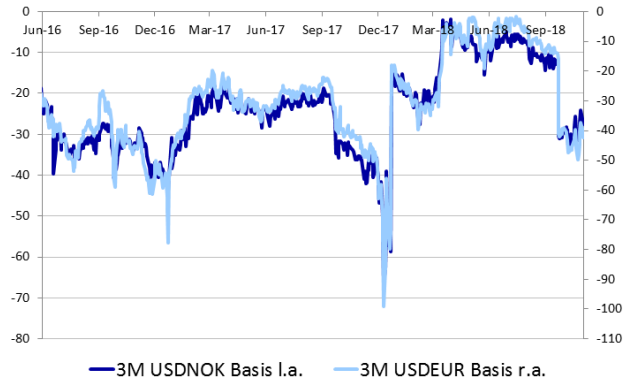
$$NIBOR = LIBOR + FXSWAP_{USDNOK} - FXBASIS_{USDNOK}$$

$$NIBOR - OIS_{NOK} = [LIBOR - OIS_{USD}] - FXBASIS_{USDNOK} + \underbrace{[FXSWAP_{USDNOK} - OIS_{NOK} + OIS_{USD}]}_{OISBASIS_{USDNOK}}$$

Since both the USDNOK FX basis and the OIS basis are dependent on Nibor, we need to find a way to estimate these.

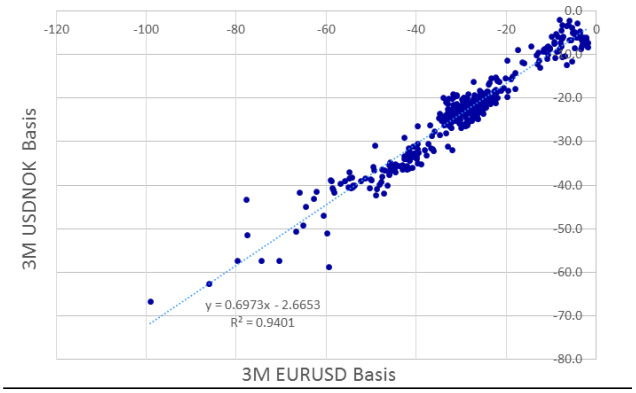
As all FX swaps are traded via USD, we start by looking at fitting the USDNOK FX basis with the mother of all FX basis: EURUSD.

USDNOK AND EURUSD FX BASIS ARE CLOSELY LINKED, BP



Source: Bloomberg and Nordea

THE USDNOK FX BASIS IS 2/3 OF THE EURUSD BASIS, BP



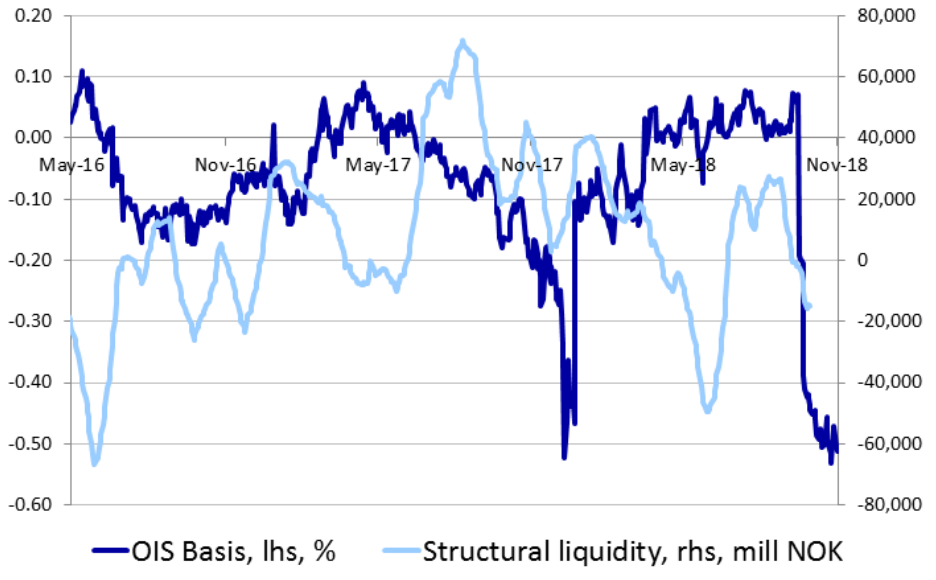
Source: Bloomberg and Nordea

As can be seen from the charts above, the EURUSD FX basis does a very good job of explaining the USDNOK FX basis and we need look no further.

OIS basis is not tied to changes in Norwegian structural liquidity

The candidate for estimating the OIS basis is not as obvious. For our first attempt, we look at the changes in structural liquidity in the Norwegian banking system. Norges Bank aims to keep bank liquidity at NOK 35bn, but since the Norwegian government holds its bank accounts at the central bank, large tax payments and the issuance and redemptions of government bonds create sizeable changes in the liquidity of the commercial banking system. Norges Bank makes forecasts for these changes and tries to neutralise the effect by adding or subtracting liquidity via short deposits and loans. Banks approach the upcoming changes in structural liquidity differently, some taking the upcoming liquidity operations into their LCR ratios, and others not. Only the larger domestic banks have access to these liquidity operations, so one could argue that the changes in structural liquidity should impact Nibor, giving it a lift when liquidity is tight. However, as we can see from the chart below, this has not been the case lately.

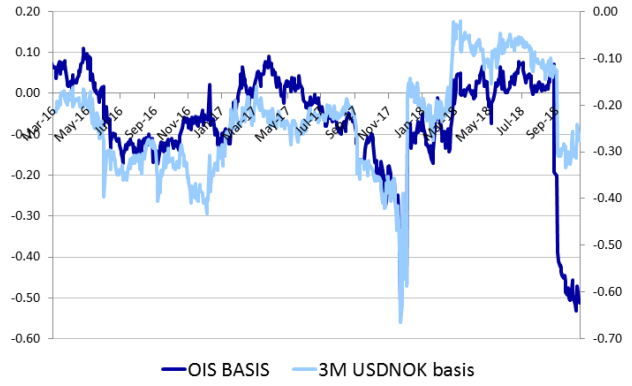
CHANGES IN BANK LIQUIDITY ARE NOT IMPORTANT FOR THE OIS BASIS



Source: Bloomberg and Nordea

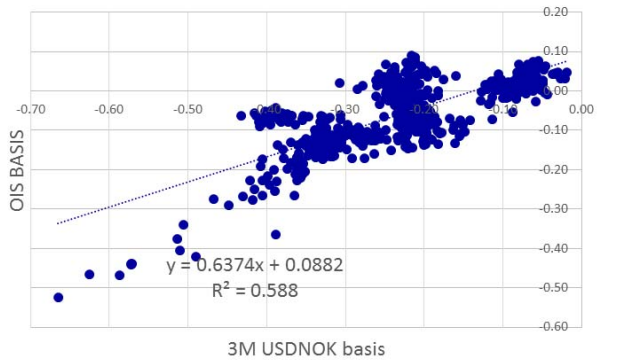
Recognising that seasonal patterns in the OIS basis look similar to the FX basis, it is tempting to try this as the next candidate.

SIMILAR SEASONAL PATTERN IN FX BASIS AND OIS BASIS, %



Source: Bloomberg and Nordea

DECENT LINK BETWEEN THE FX BASIS AND OIS BASIS, %



Source: Bloomberg and Nordea

While the correlation between the USDNOK FX basis and OIS basis is not perfect, it is good enough for our purposes, without having to make seasonal adjustments or carry out regression analysis on a number of parameters.

Putting it all together, we arrive at the following model for Nibor-OIS:

$$NIBOR - OIS_{NOK} = [LIBOR - OIS_{USD}] - FXBASIS_{USDNOK} + OISBASIS_{USDNOK}$$

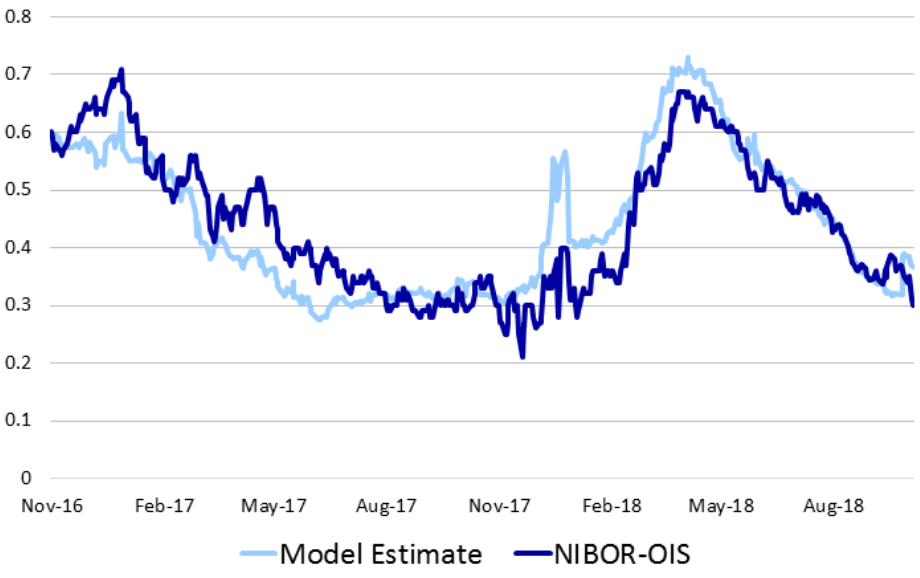
$$\approx [LIBOR - OIS_{USD}] - \frac{2}{3} FXBASIS_{EURUSD} + 0.6 * FXBASIS_{USDNOK}$$

$$\approx [LIBOR - OIS_{USD}] - \frac{2}{3} FXBASIS_{EURUSD} + 0.4 * FXBASIS_{EURUSD}$$

$$\approx [LIBOR - OIS_{USD}] - \frac{1}{4} FXBASIS_{EURUSD}$$

Nibor-OIS is mostly a function of the US money market and the EURUSD FX basis

A MODEL BASED ON USD RATES AND FX BASIS DOES A GOOD JOB AT EXPLAINING NIBOR,%



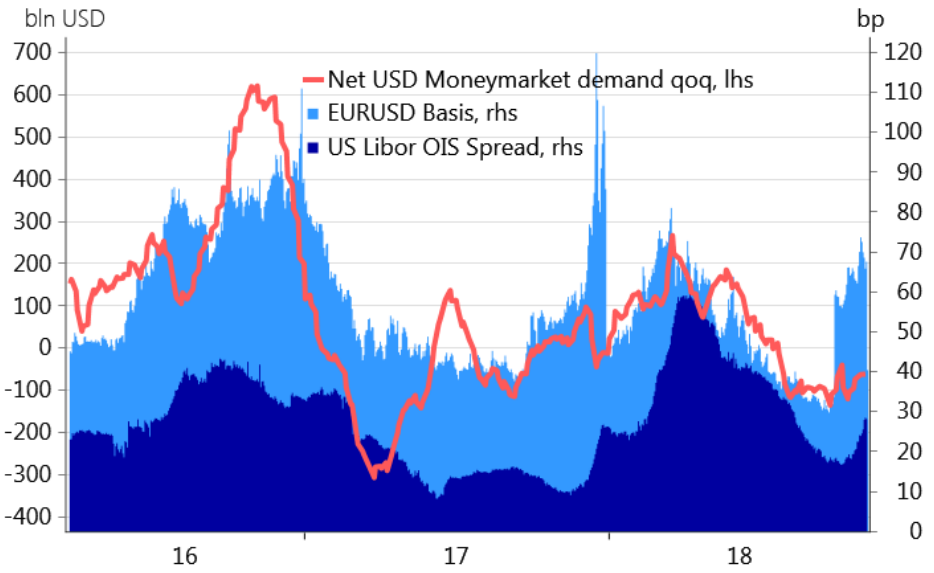
Source: Bloomberg and Nordea estimates

The US money market

Since we have concluded that Nibor-OIS is mainly a function of the USD Libor and the EURUSD FX basis, we should look at what drives these two markets.

Since Basel III was fully implemented in 2015, the swings in Libor-OIS and the USD-tied FX basis have been highly dependent on supply and demand in the US money market. The added importance of keeping balance sheets trim over year-end has also given rise to huge spikes in the cost of FX basis in the fourth quarter.

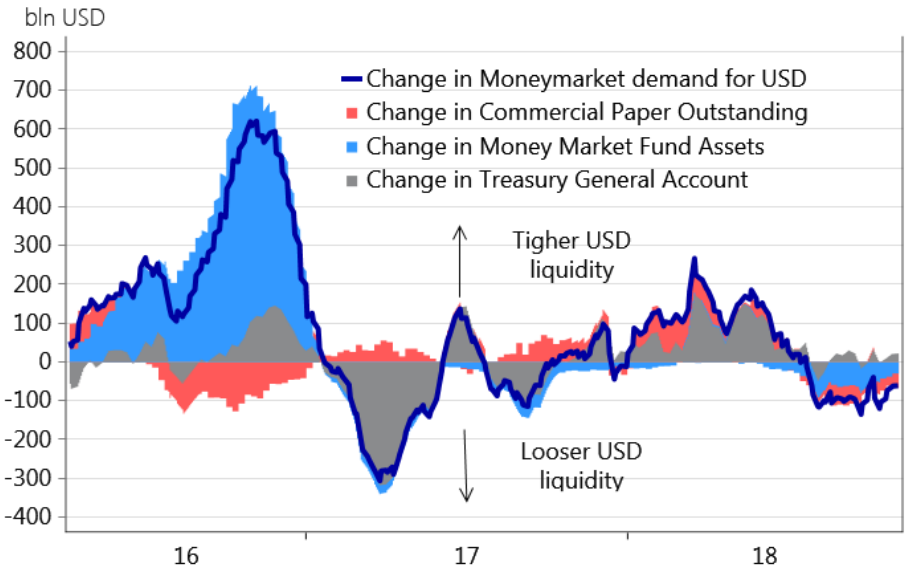
US MONEY MARKET RATES AND FX BASIS ARE DRIVEN BY SUPPLY AND DEMAND CHANGES



Source: Macrobond and Nordea

Looking behind the numbers in supply and demand for money market funds, the biggest events have been the money market fund reform and the debt ceiling episodes.

FACTORS BEHIND CHANGES IN MONEY MARKET DEMAND



Source: Macrobond and Nordea

The money market fund reform in 2016 took almost USD 1,000bn of funding away from the market, mainly impacting foreign banks operating in the US. They turned to the FX market to maintain their USD funding, taking advantage of cheap funding in their

home market. The added demand for FX swaps had a huge impact on USD FX basis and also impacted Nibor-OIS via the reaction function discussed on the previous page.

The story behind Libor-OIS in 2018 is threefold. At the start of the year, the most important driver was the build-up of the cash buffer by the US Treasury. As in Norway, the Treasury keeps its cash outside of the banking system, so when it increases its accounts, it is in effect draining the commercial banks, who then have to increase their market funding, which bids up the money market rate. Secondly, Trump's tax reform gave new incentives to large US corporates for their piles of cash. Before 2008, international companies such as Apple and Microsoft kept their foreign profits outside of US tax borders to avoid taxation. These funds were heavily invested in medium-term US bank bonds. Following the tax reform, these funds would be taxed anyway, and could therefore be applied for share buybacks, investments and acquisitions. As an effect, US banks lost large bond investors and had to increase their commercial paper funding programmes to make up for the loss, bidding up Libor as a result.

Since Libor-OIS and EURUSD FX basis seem to be dependent on the change in money market demand, rather than the level, the effect from the treasury cash build-up and the tax reform faded in Q2, causing Libor-OIS to fall back. The third effect then kicked in as money market funds were coming back in vogue. A large part of US bank accounts is still stuck at a zero perfect rate and as the US money market rate crept higher with the increases in the Federal Funds rate, more and more clients decided that the pickup in interest rates justified the extra mark-to-market risk. As the Fed continues to hike rates, the pickup will increase and lead to larger flows into funds, making it easier and cheaper for banks to fund themselves, driving down Libor.

The end of the US debt ceiling suspension in March next year will force the Treasury to more or less empty its cash buffer, flooding the market with close to USD 200bn in the last weeks of February, pushing down Libor as a result. If the unlikely should happen and US politicians reach a deal on the debt ceiling before March, the Treasury can stay pat and Libor will be unaffected.

More inflow to money market funds and a debt ceiling standoff would most likely keep Nibor-OIS on the low side in the first months of 2019.

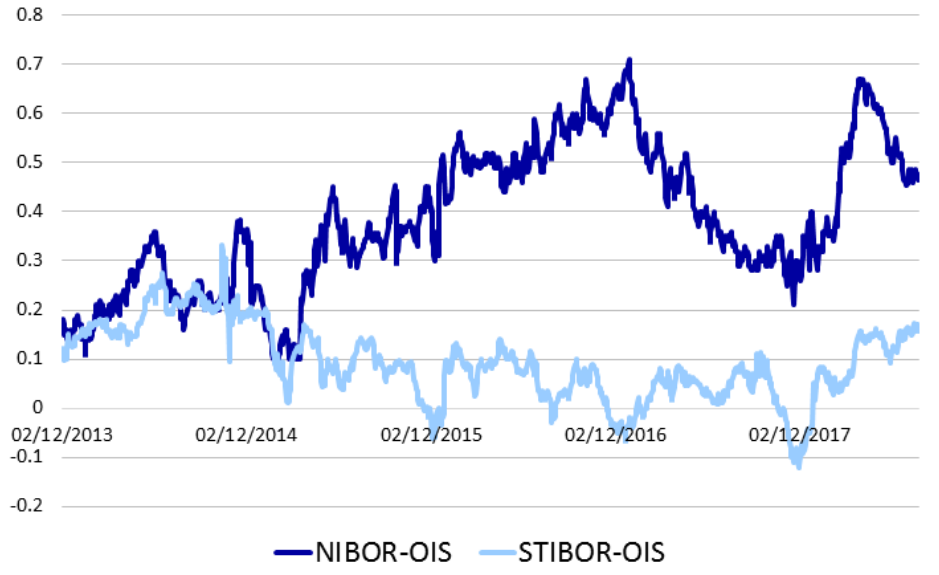
Why is Stibor so different From Nibor?

The definitions of Nibor and Stibor are pretty similar, and it is more or less the same banks on the *ibor panels in Norway and Sweden. So why do Nibor and Stibor react so differently to events in the USD Libor and FX basis markets?

While Nibor is defined as a fully FX swapped foreign money market rate, the Stibor banks are allowed to put up to 50% weight on foreign rates. The rest is based on local deposit rates. This difference can explain some of the difference, but far from all, as SEK deposit rates are heavily influences by the FX swapped rates.

Five of the six banks currently on the Nibor panel also submit their rates to Stibor, and there are only two banks in the Stibor panel that are not part of Nibor, so any changes in bank credibility should be reflected simultaneously in Nibor and Stibor. That is, however, not the case.

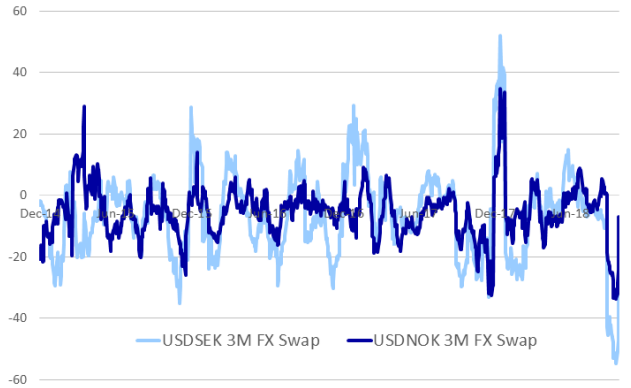
HUGE DIFFERENCES IN NIBOR AND STIBOR, %



Source: Bloomberg and Nordea

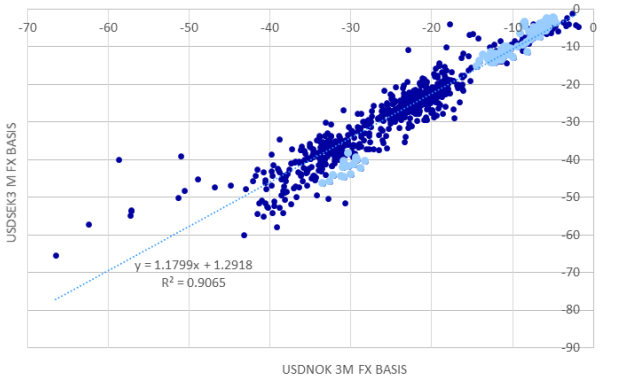
To understand why Nibor and Stibor behave so differently, the FX market is a good place to start. As the figure below shows, SEK FX swaps are much more volatile than the NOK ones, despite the fact that USDNOK and USDSEK FX basis are pretty similar, with a 90% correlation.

ONE MONTH CHANGE IN IMPLIED INTEREST RATE DIFFERENCE, BP



Source: Bloomberg and Nordea

USDNOK AND USDSEK FX BASIS ARE VERY SIMILAR, BP

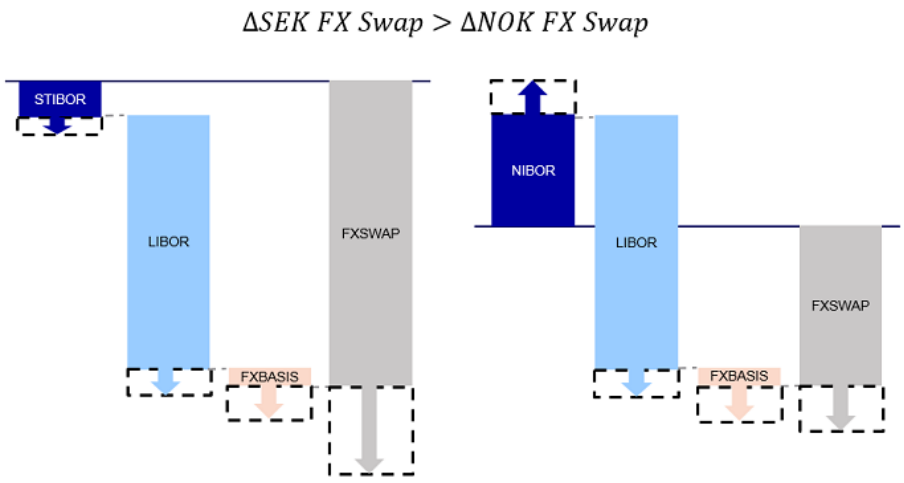


Source: Bloomberg and Nordea

Since the relationship between the local rate, USD Libor, FX basis and the FX swap is universal, the difference in FX swap volatility will impact local rate volatility.

A move in exogenous variables like Libor and FX basis has very different implications for Nibor and Stibor

DIFFERENCE IN FX VOLATILITY HAS IMPLICATIONS FOR REFERENCE RATES



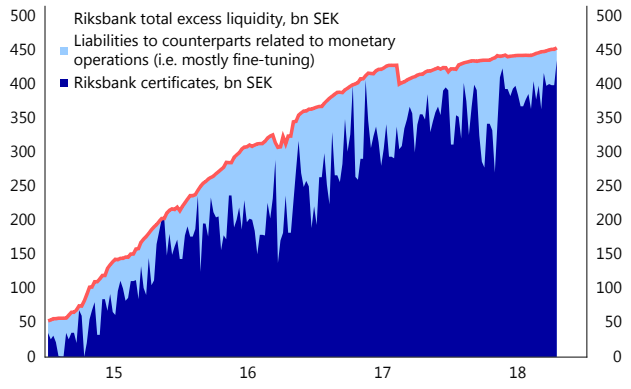
Source: Nordea

As we see from the figure above, a move in USD Libor or FX basis can generate totally opposite effects in Nibor and Stibor. While this explains the different behaviour, the next question is where the difference in FX swap volatility comes from. Why does the USDSEK FX swap move more than the USDNOK?

We find the answer by looking at the cash flows resulting from doing the FX swap. If USD Libor rates go up or the USD FX basis gets more expensive, you are not able to lend your expensive dollars in the FX swap versus NOK, since there is nowhere to park the NOK cash. Hence, you do not get the amount of trading needed to move the USDNOK FX swap. Norges Bank runs a very tight liquidity regime for the banks, aiming for only NOK 35bn of total deposits. Not even the largest banks can park more than NOK 4.8bn. With no money market and also no functioning repo market, partly due to the limited supply of government bonds, there is literally no parking space for Norwegian kroner unless you want to take on credit risk and buy a bond.

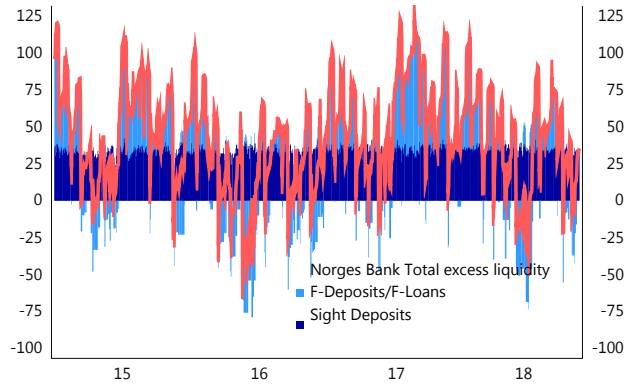
In Sweden, the picture is very different. QE by the Riksbank has ballooned the commercial banks holdings at the central bank to SEK 450bn, with a full allotment for certificates being offered at the weekly Riksbank certificate auctions. There is also a well-functioning repo market where you can park your SEK. With ample opportunities to deposit Swedish kronor without taking on credit risk, periods of expensive dollar create enough flow to reprise the USDSEK FX swap. As we have seen, this creates very different dynamics for Stibor than for Nibor.

ABUNDANT LIQUIDITY AT THE RIKSBANK, SEKbn



Source: Macrobond and Nordea

TIGHT LIQUIDITY FOR NORWEGIAN BANKS, NOKbn



Source: Macrobond and Nordea

Nibor – An American derivative

Norges Bank is rightly worried about the volatility in Nibor fixings and should not live under the illusion that it is in control under the current regime.

As we have seen, Nibor is very loosely linked to bank funding costs and the same banks are putting down very different reference rates compared to central bank rates in SEK and NOK.

Nibor-OIS is highly dependent on Libor-OIS and EURUSD FX basis, which hinges on US money market supply and demand. This is driven by tax reforms, bank regulation, fund reforms and debt ceiling standoffs. Hence, we can directly feel the impact of US politics on the Norwegian rates market. This was hardly the intention behind the creation of Nibor in 1986, but the (banking) world has changed a lot since then.

Work to find a suitable replacement for Nibor as a reference rate is currently in progress, but as long as Norges Bank keeps a tight lid on liquidity and there is no viable alternative to invest in NOK outside of the FX market, we believe the heat from the dominant US dollar market will be felt in the domestic NOK rates market.

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