

# STAFF MEMO

## Nibor, Libor and Euribor – all IBORs, but different

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Arne Kloster and Olav Syrstad

*This memo takes a closer look at what lays behind different benchmark interest rates. Particular emphasis is put on how the different practices for quotation can explain why Nibor's risk premium has on average been higher than the premiums in USD Libor and Euribor.*

Key: Benchmark rates, risk premia, IBOR, FX swaps, money market.

## 1. Introduction

“IBOR” means Inter Bank Offered Rate. These four letters are common for the term reference rates in many countries around the world. In Norway, the term reference rate is Nibor. In the euro area it is Euribor and in the US it is Libor.

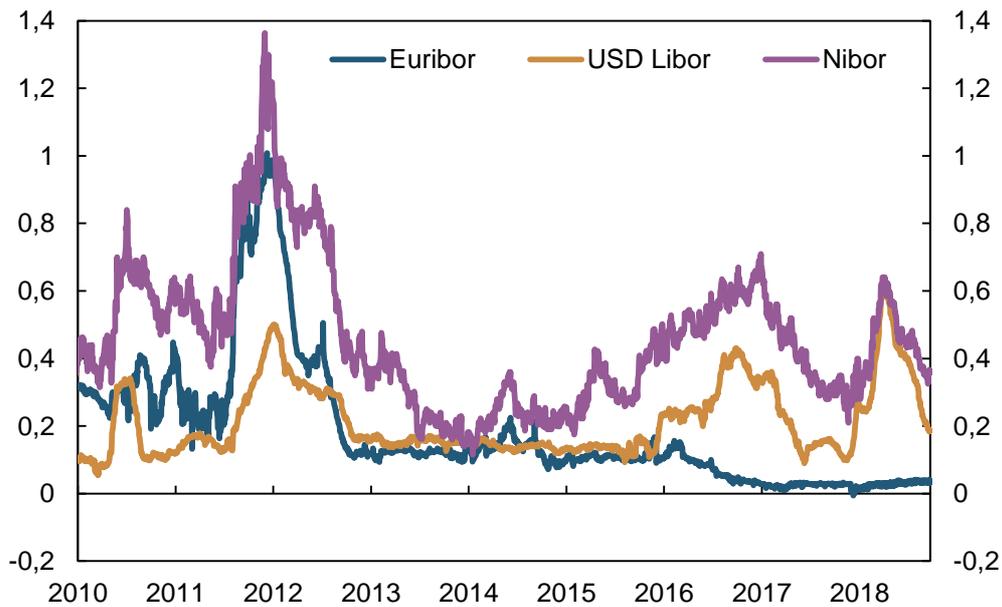
In general, IBORs can be decomposed into two factors: the expected average level of the short-term (overnight) rate and a risk premium. The expected average of the overnight rate is closely linked to the central bank's key policy rate, and thus reflects expected monetary policy over the relevant horizon. The risk premium can potentially reflect several things. One element is the credit risk associated with the panel of banks quoting the rates. Another is the liquidity premium that expresses the scarcity or abundance of money market credit in that particular currency over that particular horizon. For instance, in a situation where unconventional monetary policy has supplied large amounts of reserves to the banking system, the liquidity premium in the money market will normally fall. In addition, the premium will reflect the regulatory cost associated with the money market loan. For instance, as IBOR rates refer to unsecured interbank loans, the rates should entail the cost of capital for a bank incurred by providing such a loan to another bank.

The risk premium can be measured by subtracting the expected level of the overnight rate from the IBOR rate. The expected level of the overnight rate is expressed by OIS-rates. An OIS is an interest rate swap, where daily payments of a reference overnight rate (like Fed Funds or EONIA) are exchanged for a fixed rate over a certain period. The OIS-rate is the fixed leg of such a swap, and expresses the expected overnight rate over the chosen horizon.

The IBOR rate and the OIS contain the same expectations about the evolution of the overnight rate. Thus, subtracting the OIS from the IBOR rate, for instance using three month maturities on both, will return a measure of the risk premium in the (three month) IBOR rate. Chart 1

below shows the evolution of risk premiums in three month USD Libor, Euribor and Nibor<sup>1</sup> since 2009. Several observations can be made. The levels are different. In some periods the risk premiums are highly correlated, in others they are not. The risk premium in Nibor has on average been substantially higher than in USD Libor and Euribor. From the beginning of 2010 throughout June 2018, the average premium in Nibor was 46 basis points. This is considerably higher than the corresponding premiums for USD Libor and Euribor, at 21 and 19 basis points respectively.

*Chart 1: Risk premiums in USD Libor, Euribor and Nibor. January 2010 – June 2018. Per cent.*



Sources: Bloomberg and Norges Bank

In order to understand why the risk premiums in these three reference rates differ so much, it is necessary to understand how the respective banking panels arrive at their quotes. This is in fact quite different, meaning that these rates do not refer to the same kind of transactions, although their definitions are similar and they are all called IBOR.

This memo takes a closer look at what lays behind these rates. Particular emphasis is put on how the different practices for quotation can explain why Nibor's risk premium has on average been higher than the premiums in USD Libor and Euribor.

## 2. The general problem with IBORs

Unsecured term interbank reference rates all have one common problem: They are meant to represent rates on transactions that are

<sup>1</sup> As no OIS-market exists in Norway, the Nibor risk premium in Chart 1 is based on Norges Bank's assessment of Norwegian expected overnight rates.

virtually non-existent. Available data and surveys show that unsecured interbank lending is heavily concentrated in the shortest maturities, like overnight. Very little unsecured interbank lending goes on in maturities of three and six months, see ICE (2016)<sup>2</sup> for the case of USD Libor and ECB (2015) for Euribor.<sup>3</sup> This was the case even before the financial crisis, and the trend has been reinforced since then. This means that the banks submitting IBORs must rely on rates from other markets with similar characteristics, on their subjective judgement or a combination of the two. The current effort in many countries to produce nearly risk-free alternative reference rates must be seen in this context.

### 3. USD Libor

Since 1998, Libor has been defined by the panel banks' daily answer to the following question:

*“At what rate could you borrow funds, were you to do so by asking for and then accepting interbank offers in a reasonable market size just prior to 11 am?”*

This question is posed in a way that defines Libor as an interbank offered rate. However, recognizing the fact that interbank term transactions are rare, the administrator of Libor, ICE Benchmark Administration Limited (IBA), has laid out a roadmap for the transition of Libor to a new “waterfall methodology”. This methodology entails a new output statement for Libor:

*“A wholesale funding rate anchored in LIBOR panel banks' unsecured transactions to the greatest extent possible, with a waterfall to enable a rate to be published in all market circumstances”.*

The term “waterfall” refers to the ordering of inputs for the submissions into three levels. To the extent available, panel banks should base their submissions on Level 1 input, which are “eligible wholesale, unsecured funding transactions”. If no such eligible transactions were made, submissions should be transaction-derived (Level 2). That means utilizing time-weighted historical eligible transactions adjusted for market movements, and linear interpolation. If neither Level 1 nor Level 2 inputs are available, panel banks should base their submissions on expert judgement (Level 3).

One important feature of the new methodology is that the eligible transactions are no longer limited to interbank loans. The eligible transactions are rates paid by banks on unsecured term deposits, as well as fixed rates paid on primary issuances of commercial paper (CP) and certificates of deposits (CD). The major part of CP and CD funding comes from investors outside the banking system, like money market funds and non-financial corporations. Rates paid by banks on CP/CD

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<sup>2</sup> Roadmap for ICE LIBOR (2016) published by ICE Benchmark Administration

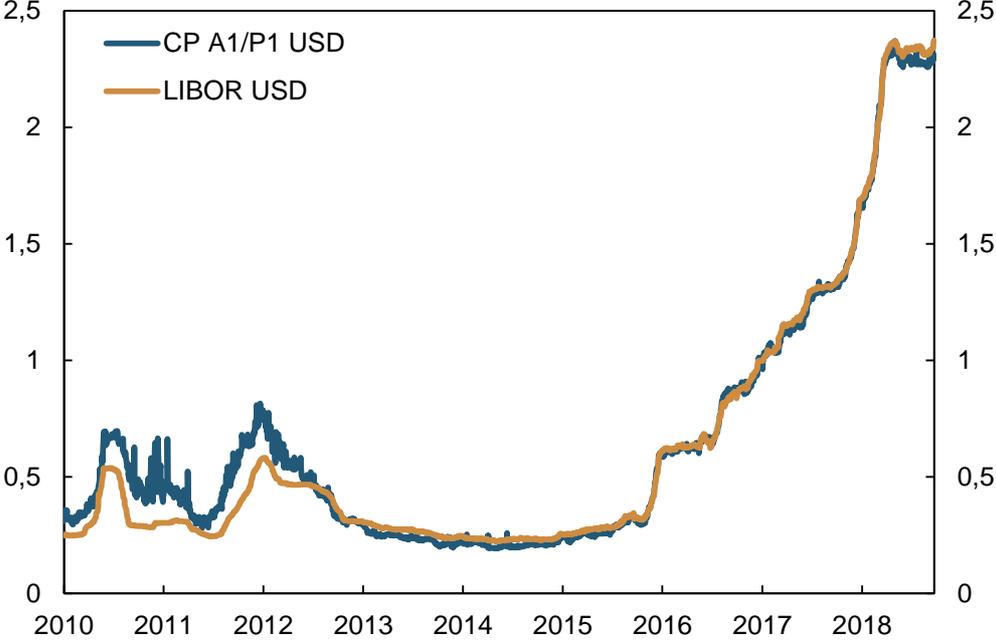
<sup>3</sup> Euro Money Market Survey (2015) published by the European Central Bank

funding are not interbank rates and cannot necessarily be seen as offered rates like in the current definition of Libor. Hence, the “IBO” part of the abbreviation Libor will no longer apply. In general, funding rates from counterparties outside the banking system are likely to be somewhat lower than rates on interbank loans. The reason is that money market funds and corporations that supply funding to banks via CP/CD are not subject to the same regulatory requirements as a bank lending to another bank. Thus, all else equal, the price of funding from outside the banking system will be somewhat cheaper than interbank funding.

IBA expects the transition to the new waterfall methodology to be completed by no later than the first quarter of 2019. However, USD Libor already looks very similar to the rates paid for CP-funding by highly rated banks, see Chart 2.

Chart 2 shows that in recent years, the 3-month USD Libor has closely followed the rate on 3-month commercial paper issued by the best rated banks (A-1/P-1). During 2011-12, Libor was in fact lower than the corresponding commercial paper rates. This observation must probably be seen in light of the sovereign debt crisis in the euro area. Many of the banks in the US CP market are European, and their perceived credit risk among buyers of commercial paper rose during the crisis. This increased uncertainty was not reflected in Libor to the same extent.

*Chart 2: Libor and USD CP/CD rates. January 2010 – September 2018. Per cent.*



Sources: Thomson Reuters and Bloomberg

## 4. Euribor

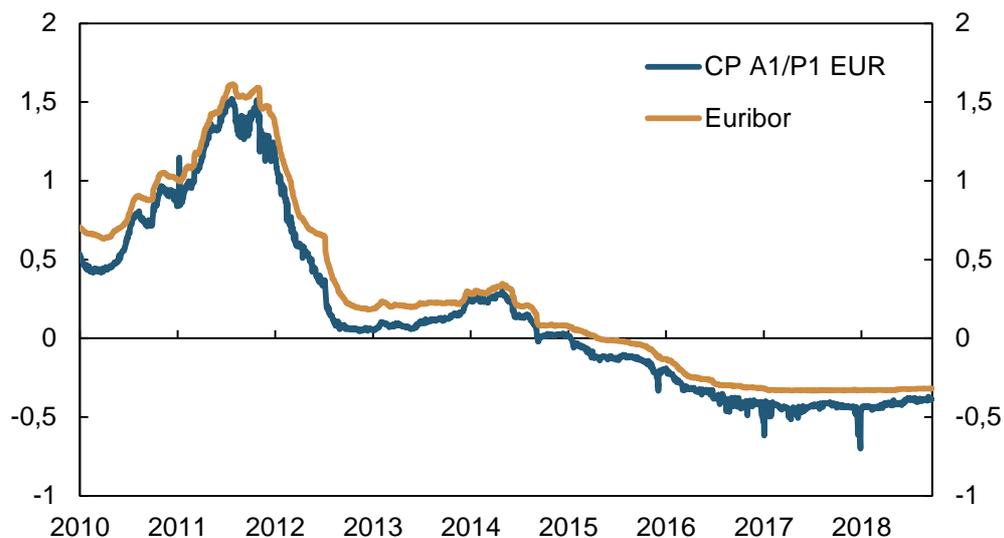
Euribor was created with the introduction of the euro in 1999. Currently 20 banks provide their daily submissions to EURIBOR according to the following definition:

*Euribor is defined as the rate at which euro interbank term deposits are offered by one prime bank to another prime bank within the EMU zone, and is calculated at 11:00 am (CET) for spot value (T+2).*

Euribor is thus defined as an interbank rate. In contrast to US Libor it is not only an interbank rate in name, but also quoted as one. Chart 3 below shows the same as Chart 2, only for the euro area: The difference between 3-month Euribor and the rate on 3-month commercial paper in euro issued by highly rated European banks. As discussed above, differences in regulatory costs should imply that interbank rates are somewhat higher than comparable rates on banks' borrowing from non-banks. As can be seen from Chart 3, this is the case for Euribor. The difference is not constant over time. Variation may be due to many factors, like shifts in the demand-supply balance in the CP-market that are not transmitted one-for-one to Euribor. On average since 2011, the spread between 3-month Euribor and the corresponding CP-rate has been 12 basis points. A simple back-of-the-envelope calculation substantiates such a spread. An interbank loan is subject to 20 per cent risk weight in Basel III. Assuming 10 per cent capital requirement and 10 per cent required return on equity, the required spread on top of the borrowing cost is 20 basis points ( $0.2 \cdot 0.1 \cdot 0.1$ )

Since unsecured term lending transactions between banks are rare, the panel banks' Euribor submissions must to a large extent be based on expert judgement. Panel banks' submissions reflect what they believe the rates on eligible interbank lending transactions would have been, if they had taken place. This judgement is likely to be informed by rates on traded products in other markets like CP, CD and OIS, adjusted appropriately to reflect interbank term offered rates.

Chart 3: EURIBOR and CP/CD rates. January 2010 – September 2018. Per cent.



Sources: Thompson Reuters and Bloomberg

Acknowledging the decline in interbank activity, the administrator of Euribor, the European Money Market Institute (EMMI), has launched a program of Euribor reform. An important part of this has been to move from a quote-based methodology to a transaction-based methodology for Euribor. To assess whether a seamless transition from a quote-based to a transaction-based methodology would be feasible, the EMMI ran a so-called pre-live verification program from September 2016 to February 2017. During this period, the EMMI calculated a transaction-based rate based on collected data. In order for a seamless transition to be feasible, the level and volatility of the transaction-based rate would have to be similar to the level and volatility of Euribor. In May 2017, the EMMI presented the outcome of the pre-live testing. It concluded that the level and volatility of the transaction-based rate differed too much from the quote-based Euribor to allow a seamless transition. This conclusion is mirrored by the different behavior of the three month Euribor and corresponding rate on banks' borrowing via commercial paper in Chart 3 above.

As a way forward, the EMMI now plans to introduce a hybrid methodology for Euribor. The EMMI recognizes that the level of liquidity in the unsecured money market is currently not consistently sufficient to base the Euribor calculation solely on transactions. In a consultation paper published in March 2018, the EMMI asked market participants for feedback on the proposed hybrid methodology. In short, the suggested hybrid methodology has many similarities to the waterfall structure for Libor described above. It is suggested to follow a hierarchical approach, where inputs to Euribor submissions are divided into three levels, ranging from real-time eligible transactions to panel banks' judgement. Eligible transactions include unsecured, fixed rate, cash deposits from banks and a range of non-bank financial institutions, as well as funds obtained from all counterparties via commercial paper and certificates of deposits.

## 5. Nibor

As discussed above, Libor and Euribor differ somewhat in terms of their content. When turning to the Norwegian reference rate Nibor, things become even more different. As will be explained below, Nibor not only reflects the cost of funding from money markets. Nibor rates also seem to take into account the alternative yield on such funds when swapped to a different currency and deposited there. This practice makes Nibor fundamentally different from Libor, Euribor and many other reference rates, and has contributed to a higher risk premium on average.

However, the definition of Nibor is similar to those of other IBORs. According to the guidelines set by the administrator, NoRe “...banks’ Nibor submissions must reflect the interest rates that they would charge on lending in NOK to a leading bank that is active in the Norwegian money and foreign exchange markets.”

In practice, Nibor has traditionally been derived from interest rates on USD, and still is. As explained in NoRe’s guidelines, the use of a foreign rate is due to the fact that the volume of unsecured loans in the Norwegian money market is small, with the exception of the very shortest maturities. Most liquidity distribution, in volume terms, takes place via the foreign exchange market.

This means that banks borrow and lend NOK-liquidity through FX-swaps, mainly with USD as collateral. In such a swap, two counterparties exchange NOK for USD today (spot), with an agreement to reverse the exchange in, say, 3 months, at a specified forward exchange rate. The difference between the spot and forward exchange rate determines the implicit interest rate differential in the swap.

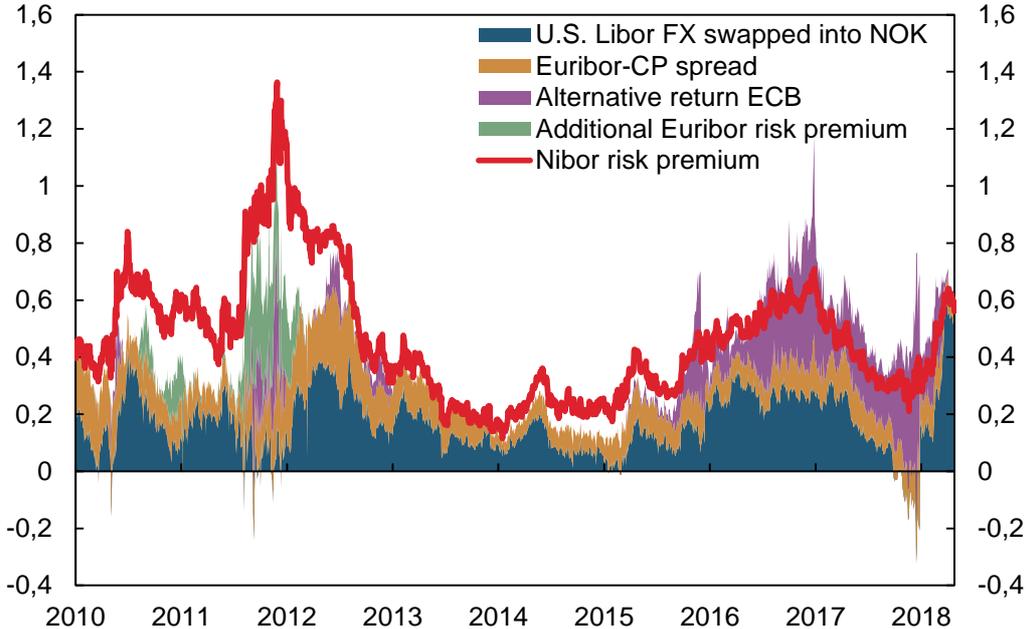
Nibor thus stems from a USD interest rate, and is “translated” to NOK via the implicit interest rate differential between NOK and USD in the FX-swap market. The implicit interest rate differential in the FX-swap is anchored to the differential between expected overnight rates in Norway and the US, as overnight rates reflect actual borrowing and lending opportunities in the two currencies. However, the anchor is not firm. Covered interest rate parity need not hold exactly between expected overnight rates. As explained in further detail in Rime, Schrimpf and Syrstad (2017), deviations between the interest rate differential implied by the FX-swap market and the OIS rates may arise as a result of relative scarcity of money market credit in NOK and USD.

The construction of Nibor as an FX-swap rate does not in itself determine what kind of rate Nibor is. That depends on which foreign rate the panel banks choose to use as an input. If the panel banks choose to use USD Libor as input, Nibor would in effect display the cost of raising unsecured NOK-funding via the US CP/CD market. If banks had used a US repo-rate as input, it would indicate the price of obtaining secured NOK-funding via the US repo market. They could

also in principle have used any other country’s IBOR swapped to NOK, and Nibor would inherit the properties of that particular IBOR.

The US money market is the most active in the world, and many of the banks in the Nibor-panel obtain a significant part of their short-term funding from this market. Most of the Nibor banks have the highest short-term credit rating (A-1/P-1). This implies that USD Libor swapped to NOK provides a reasonable expression of the marginal cost of short-term NOK funding for the Nibor banks. In fact, Nibor was derived as USD Libor swapped to NOK up until the autumn of 2008.

*Chart 4. The risk premium in NIBOR and its components. January 2010 – June 2018. Per cent.*



Sources: Norges Bank, Bloomberg and Thompson Reuters

The blue area in Chart 4 shows the risk premium in USD Libor swapped to NOK, i.e. what the risk premium in Nibor *would have been, had it been based on USD Libor*. This is substantially lower than the observed Nibor-premium (red line). However, as discussed above, USD Libor is closer to a CP/CD rate than an interbank offered rate. In order to account for this, in line with the definition of Nibor, an extra premium should be added to reflect the balance sheet cost associated with interbank lending. In the Nibor guidelines, the distinction between borrowing and lending is explicitly addressed. It is stated that: “A spread is added to the swapped borrowing rate, so that the bank’s Nibor submission as best possible reflects the interest rates that the bank would charge for unsecured lending in NOK to a leading bank that is active in the Norwegian money and foreign exchange markets.”

In Chart 4, this is approximated by the orange area, which is simply the difference between Euribor and the euro commercial paper rate depicted in Chart 3. This measure is by no means perfect, but it reflects European banks’ assessment of the price difference between CP/CD borrowing and interbank lending.

In parts of the sample, the sum of the blue and the orange area line up pretty well with the observed NIBOR-premium. In 2013, the deviation was very small, and it was moderate in early 2010 and in the first part of 2014. However, looking at the full sample from 2010 to 2018, the NIBOR-spread is most of the time significantly higher than the level indicated by USD CP/CD funding costs plus an interbank spread. It seems highly unlikely that this discrepancy can be explained by variations in the interbank spread, since that would imply variations of more than 100 basis points.

The purple area in Chart 4 illustrates the “alternative yield approach” that seems to be applied by the Nibor-banks. Once USD funds has been obtained from the US CP/CD markets, the panel banks may ask how the return on these funds can be maximized through term lending, without taking additional risk. One potential use of the USD funds is to convert them to EUR in the FX-swap market and deposit them at the ECB’s deposit facility. All of the Nibor panel banks have access to the ECB’s deposit facility, so it is fully feasible for them to do this. This transaction would earn the (risk-free) deposit rate at the ECB plus the implicit interest rate differential between USD and EUR in the FX-swap. The purple area in Chart 4 shows the return that can be obtained by this trade.

Finally, the green area in Chart 4 represents the additional risk premium embedded in Euribor relative to USD Libor. This is calculated as the difference between the Euribor-OIS and Libor-OIS spreads and added only when this difference is positive. As can be gleaned from the chart, the measure is positive only during the European sovereign debt crisis.

As is evident from the chart, the extra potential return from an FX-swap/deposit in euros (purple area) was particularly large after 2015, when the ECB started its large scale asset purchases, or quantitative easing (QE). ECB’s QE has added a vast amount of euro reserves to the European banking system. For European banks, one potential use of excess reserves in euros is to convert them to USD in FX-swaps as a way to obtain funding for their USD assets. The increased supply of euro and demand for USD in FX-swaps affects the price in this market. Euro becomes cheaper relative to USD, meaning that the implicit interest rate differential between USD and euro increases. Thus, banks with access to funding in the US money market earn a high interest rate differential when swapping the USD to EUR. The price adjustment in the FX-swap market is likely to happen irrespective of actual flows. It is enough that market makers in FX-swaps anticipate the flows and adjust their prices to avoid becoming excessively long EUR/short USD. The other element in the transaction, ECB’s deposit rate, is set administratively according to monetary policy assessments, and is not sensitive to the amount of excess liquidity in EUR. In sum, covered interest rate parity does not hold between ECB’s deposit rate and the USD rate paid by the best rated banks in the commercial paper market. See Rime, Schrimpf and Syrstad (2017) for a more comprehensive

study of this phenomenon and an explanation of why this arbitrage can exist in equilibrium.

Why does this effect Nibor? When Nibor panel banks quote what they would charge for converting their USD to NOK and lend to another bank, they may take into account the alternative return of instead converting them to euro and lend to the ECB. A Nibor-bank could argue that it would not lend funds in NOK cheaper than this, as that would be the same as giving away the arbitrage opportunity to another bank. This way of determining the Norwegian reference rate does not necessarily mean that the Nibor-banks *actually do* the swap to euro. Nibor is a quoted rate, and not based on actual transactions. Still, it represents an option for the banks and seems to be taken into account in the quotes.

Adding the additional return of the FX-swap to euro (purple area) to the blue and orange area in Chart 4 helps considerably to fill the gap up to the actual Nibor-premium. The sum of the three components was even somewhat higher than the actual premium from mid-2016 onwards. This probably reflects that the panel banks do not quote Nibor mechanically, but apply some judgement when the implied premium becomes very high. This is possible since there is no obligation to actually lend at the quoted rate.

The period from 2010 to 2012 sticks out in Chart 4. During these years, the Nibor-spread was substantially higher than the sum of the components can explain, even when the additional risk premium in Euribor (green area) is added. First, the fact that Nibor printed even above the components that include the additional risk premium in Euribor indicates that the Nibor-quotes included the credit risk associated with European banks that markets priced in at the time. Moreover, the unexplained area can be attributed to the large response in the EUR/USD FX-swap market following the euro break-up risk. This lack of risk adjustment in NIBOR was discussed (and criticized) in Bernhardsen, Kloster and Syrstad (2014).

## 6. Concluding remarks

Since the Nibor-banks abandoned USD Libor as their starting point in 2008, the risk premium in Nibor has on average been higher than in most other IBORs. While other IBORs mainly reflect the cost of funding for banks, Nibor rates also seem to take into account the alternative yield on such funds in other currencies. In normal times, it should not be possible to obtain any additional yield without taking additional risk. However, over the last few years it has at times been possible due to the effect on FX-swap prices of quantitative easing in Europe and Nordic banks' favorable terms in US money markets.

It is not within the scope of this note to say whether this way of quoting a reference rate is right or wrong. Economically, the practice makes sense given that the alternative use of funds is in fact there. On the other hand, no other reference rates that we know of take such

considerations into account. Thus, the practice leads to differences between Nibor and other IBORs that may be difficult to understand. In periods when the risk premium in Nibor is elevated compared to other IBORs, it may falsely be interpreted as an element of heightened credit risk among the Nibor-banks.

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