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New principles for Nowa – possible implications

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On 1 January 2020, Norges Bank will become the administrator of the Norwegian Overnight Weighted Average (Nowa). In that connection, Norges Bank has adopted new principles for calculating and publishing Nowa.¹

The new principles for calculation entail some changes in the definition and data of Nowa. At the same time, there are new minimum requirements for data and a new calculation method on days with insufficient data. In this paper, we shed light on how the changes may potentially affect volume, level and volatility of Nowa. Our calculations suggest that Nowa will change little on most days. The biggest difference will be on days with insufficient transaction data.

It is important to point out that the dataset used to estimate new Nowa in this article is not identical with the data that will be used in calculating Nowa from 1 January 2020. Nowa will then be based on transaction data reported on Norges Bank's RPD (money market data reporting) form.² However, these transaction data have a very limited history. To ensure sufficient data, we have utilised data from Norges Bank's settlement system (NBO). These data may deviate somewhat from RPD data. The results in this article should therefore be interpreted only as an indication of how the new principles for calculation will affect Nowa.

The article is structured as follows: Section 1 contains background information on Nowa and alternative reference rates. In Section 2, we explain briefly the data we have used to calculate the possible effects the new principles will have on Nowa. In Section 3, we compare the effect of the new principles with today's Nowa.

1. Background: Nowa and reference rates

Nowa was established in 2011 at the request of Norges Bank after the liquidity management system was changed from a floor to a quota system (Norges Bank, 2014). Nowa is currently the only overnight interest rate in the Norwegian money market and measures the rate on unsecured loans from a selection of banks, also called the Nowa panel banks. The Nowa rules have till now been stipulated by Finance Norway, while Norges Bank has been the calculation agent. From 1 January 2020, Norges Bank will take over administrative responsibility for Nowa.

In line with the international work on reference rates, Norges Bank took the initiative in 2018 to establish a working group to find an alternative Norwegian

¹ See Norges Bank's Nowa website for more information: <https://www.norges-bank.no/en/topics/liquidity-and-markets/nowa/>

² The RPD form and other information about reporting of money market data can be found on the Norges Bank website: <https://www.norges-bank.no/en/topics/liquidity-and-markets/money-market-data/>

krone reference rate.³ After considering a number of alternatives, the Working Group for Alternative Reference Rates in NOK (2019) published a report concluding that a reformed version of today's Nowa should be the alternative reference rate for the Norwegian krone.

At the same time as the working group made the recommendation, it also asked Norges Bank to assess a number of aspects of this rate in connection with Norges Bank's becoming the administrator of Nowa from 1 January 2020. The working group asked Norges Bank to look at the data, criteria for sufficient data and calculation method in the event of insufficient data. The working group asked Norges Bank to assess the aspects of a new Nowa that would enable it to serve as the best option for an alternative reference rate and satisfy IOSCO's criteria for reference rates. Now that the principles for calculating and publishing Nowa are being changed, Norges Bank has sought to take this into account.

2. Data and method

Since September 2019, banks that are active in the Norwegian money market have reported daily money market data on the RPD form to Norges Bank. The new Nowa rate will be based on transactions contained in these data. However, since data gathering began in autumn 2019, historical transaction data for comparisons of the new and former calculation methods are limited. We have therefore tried to find other data sources that capture overnight transactions between banks that are active in the Norwegian money market. One approach is to use data from Norges Bank's settlement system (NBO).

The method we use to separate unsecured interbank loans from other NBO transactions, the Furfine filter, is described further in the appendix. Other analyses indicate that this method is reliable, but it is important to point out that on some days, an erroneously identified individual transaction will have a considerable impact on results. The NBO data may indicate, for example, that alternative data would be used to calculate new Nowa on a day when the regular data should have been used.

We have not used data from NBO to estimate today's Nowa in this article. Today's Nowa is based on the daily reports from each panel bank that have been used to calculate Nowa since the interest rate was established. Each bank reports total lending volume and the volume-weighted interest rate on these transactions in the overnight market. On days when there are no overnight market trades, banks report an estimate of the interest rate at which they would have lent.

We evaluate the effect of the new principles for calculation of Nowa by comparing the development in volume, the number of active banks, level and volatility for today's Nowa and the new version of Nowa from 30 September 2011 – 31 October 2019. We evaluate both days where regular and alternative data are used. Similar studies were done in connection with reforming and establishing reference rates abroad (see for example ECB (2018) and Finance Denmark (2019)).

³ The working group consists of representatives of Norwegian banks and foreign branches. Norges Bank is the secretariat and has observer status along with Finance Norway. See the working group's website for more information: <https://www.norges-bank.no/tema/markeder-likviditet/arbeidsgruppe-arr/>

3. How will Nowa be affected by the new principles?

Table 1 illustrates the difference between today's Nowa rules⁴ and Nowa calculated with the new principles. Our calculations suggest that on most days, there will not be considerable differences between today's Nowa and new Nowa, but new Nowa will on average be marginally lower than today's Nowa. On days with little turnover or too small a number of active banks, however, new Nowa will be more stable and closer to the policy rate than today's Nowa. This is expanded on below.

Table 1 Today's Nowa rules and the new principles for calculating Nowa

	Today's Nowa	New Nowa
Definition	Interest rate on unsecured loans from Nowa panel banks to other banks.	Interest rate on unsecured loans between banks active in the Norwegian overnight market.
Calculation method	Volume-weighted average.	Volume-weighted average.
Data	<ul style="list-style-type: none"> Daily reporting of <i>all loans from</i> the 11 panel banks with transaction volume and volume-weighted average interest rate. Transactions with volume below NOK 25 million omitted from reporting. 	<ul style="list-style-type: none"> Transaction data reported daily. Only unsecured loans <i>between</i> the 20 banks. Transactions below NOK 10 million omitted from the calculation.
Minimum required data	<ul style="list-style-type: none"> At least three banks report loans in the market and total reported volume more than NOK 250 million. 	<ul style="list-style-type: none"> At least three banks have lent, at least three banks have borrowed, and total transaction volume more than NOK 1 billion.
Contingency method	Actual loans are supplemented by estimates from panel banks with the highest turnover over the past five days, so that all together there are data from six banks. Nowa is estimated as an unweighted average of interest rate estimates and reported interest rates.	Nowa is calculated as a weighted average of any transactions for reporting date T and transactions included in Nowa for the previous reporting date (T-1), where the interest rate is adjusted for changes in the policy rate, if any.
Time of publication	Same day, after Norges Bank's settlement system closes (4:35 pm)	9:00 am the following day ⁵

3.1. Data

Today's Nowa includes only loans from one of the Nowa panel banks to other banks. The Nowa panel consists of eleven of the largest banks in Norway. In the future, when Nowa will be based on transactions from the banks that report daily data to Norges Bank, it can include loans from banks other than only today's panel banks.

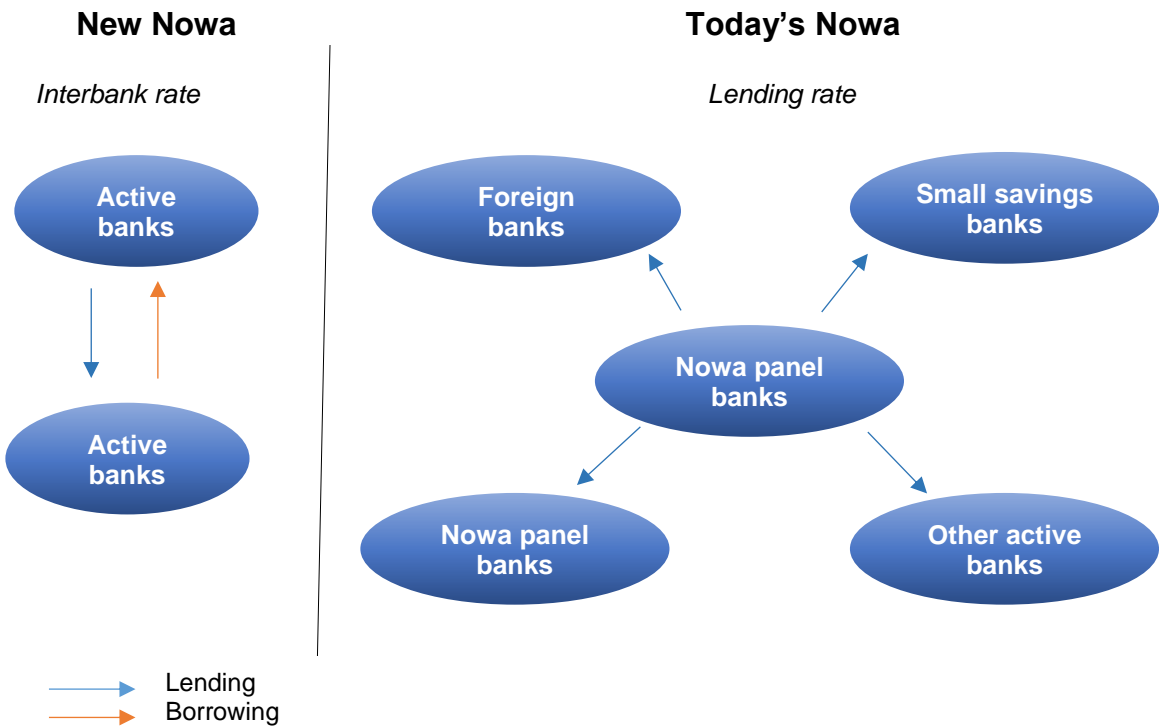
⁴ Today's rules for Nowa are available at Finance Norway's website: <https://www.finansnorge.no/contentassets/76c75430a66548cd9d6740cea6fb55f6/download/nowa-rules2.pdf>

⁵ In a transitional period between 2 January 2020 and 1 March 2020, Nowa will be published at 1:00 pm.

Today, Nowa is intended to express the interest rate on unsecured loans *from* Nowa panel banks to other banks, without any further delimitation of “other banks”. In the new principles for calculating Nowa, the interest rate is defined as the interest rate on unsecured loans *between* banks that are active in the Norwegian overnight market. This means that loans from Nowa banks to eg foreign banks or smaller Norwegian banks that do not submit daily reporting to Norges Bank will no longer be a part of the calculation basis.

This means that loans from all the banks that report to RPD today will be included in Nowa, while today we only include loans from the Nowa panel banks. At the same time, only loans to the same banks are included in the interest rate (Chart 1).

Chart 1. The changes in base data that result from the new principles for calculation



Volume

When we compare the volumes for today's Nowa with Nowa calculated with new principles, there are on average minimal differences, even though average turnover is slightly higher with the new principles (Chart 2 and Table 2).

However, the data also indicate potentially large differences in turnover volume on particular days (Table 2). One possible explanation is that the interest rates are based on slightly different sets of transactions, as explained above, and this can have a substantial impact on some days. We also cannot eliminate the possibility that the Furfine filter erroneously identifies transactions as interbank loans, leading to over- or underestimation of the volume. Owing to limitations of the data, it is not possible to determine the exact cause of the differences, but over time our estimates imply that the volumes should be quite similar.

Chart 2 Data for today's Nowa and new Nowa. Thirty-day moving average. In millions of NOK

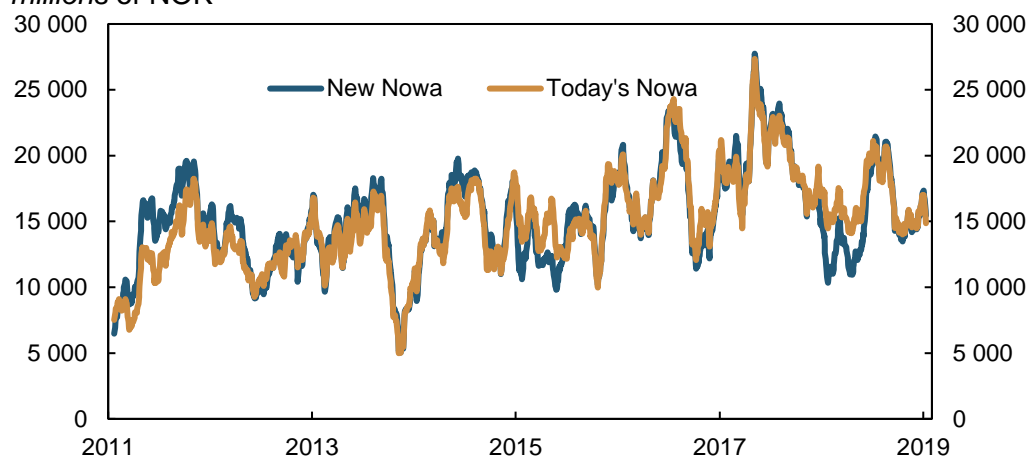


Table 2 Comparison of volume for today's Nowa with new Nowa. Days when neither today's Nowa is estimated nor new Nowa uses alternative data.

	Average	Min.	Max.	Standard deviation
<i>Volume (in millions of NOK)</i>				
Today's Nowa	15 165	370	44 564	7 278
New Nowa	15 317	1 175	48 885	7 371
Difference (new Nowa – today's Nowa)*	152	-21 651	20 098	3 112
<i>Number of banks</i>				
Today's Nowa	5	3	10	1
New Nowa, lenders	6	3	15	2
New Nowa, borrowers	6	3	12	2

* The max. (min.) difference is the largest (smallest) difference between the volume in new Nowa and today's Nowa.

Number of active banks

The change in the data can lead to a potential change in the number of banks behind transactions included in Nowa. As mentioned above, the number of possible banks on the deposit side is reduced to only banks active in the overnight market. Today the number of banks on the deposit side can encompass any type of bank. At the same time, the number of possible banks on the lending side increases.

Table 2 indicates that the number of banks active on the lending side will increase. For today's Nowa, an average of five banks have reported loans, but this would increase to six with the new method. This makes sense, as the number of banks on the lending side increases. Increasing the number of banks on the lending side may help to make the interest rate more robust and reduce the likelihood of having to use the alternative data. At the same time, it is important to point out that the Nowa panel banks will continue to be the main lenders behind the transactions that Nowa will be based on. The NBO-data indicate that banks that are active in the overnight market but that are not in the Nowa panel today have accounted for only 6 percent of lending volume.

The new calculation of Nowa makes it possible to measure the number of banks active each day on the deposit side. Today, Nowa panel banks submit their quotes with total volume and the volume-weighted average interest rate

on their transactions. It is thus impossible to know how many banks that are active on the borrowing side. At the same time, the number of *possible* deposit takers is limited with new Nowa. This probably means fewer, but more homogeneous banks on the deposit side.

Interest rate level and volatility

On when neither the current nor the new minimum requirements for the number of banks and volume are breached, the differences between today's Nowa and new Nowa would be minimal. Table 3 shows that Nowa estimated with the new principles would on average be around two basis points below the policy rate, while today's Nowa has been one basis point below the policy rate. In their evaluation of the Furfine filter, Akram, Fevolden and Smith (2018) find a similar systematic discrepancy between today's Nowa and an overnight rate based on the basis of NBO transactions.⁶

There are a number of possible explanations for this discrepancy. Today's Nowa can contain transactions between Nowa banks and foreign banks or small savings banks that do not have an account in Norges Bank or that use another bank as its settlement bank. It is likely that such market participants may be paying a somewhat higher interest rate on their loans than banks that are active in the overnight market on a regular basis. These transactions will not be part of the data of the new Nowa. Another reason may be Nowa panel banks' rounding of the volume-weighted interest rates banks quote. A third explanation may be errors and shortcomings in the Furfine filter or panel banks' Nowa quotations.

Table 3 Comparison of the level and stability of today's Nowa with Nowa based on new principles on days when neither rate breaches the minimum requirements for volume and number of banks.

	Today's Nowa	New Nowa
<i>Level – Spread against policy rate (bps.)</i>		
Average	-0.83	-2.07
Maximum	85	32
Minimum	-25	-8
<i>Stability - spread against policy rate</i>		
Maximum day-to-day change (bps.)	86	37
Annualised volatility (bps.)	0.21	0.11
Number of days with pronounced changes*	15	16

*Days with pronounced changes are defined here as days when the change in the difference against the policy rate is greater (less) than the average difference plus (minus) two standard deviations.

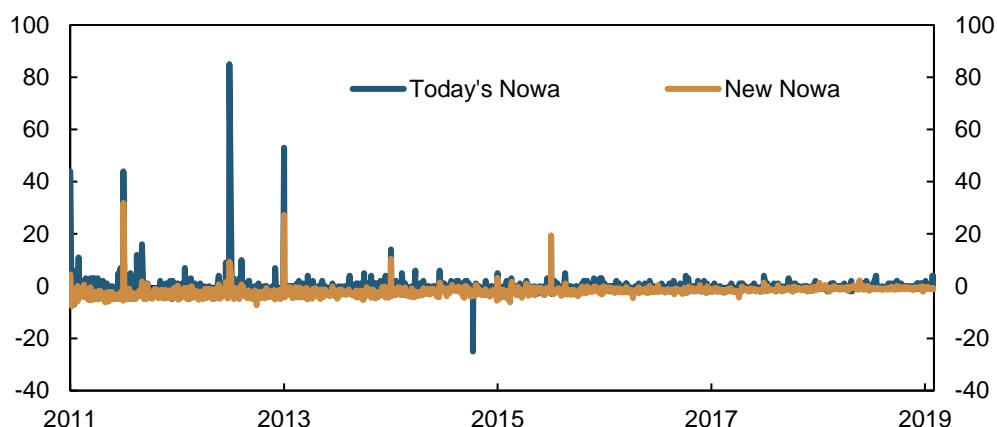
It should also be noted that the new principles seem to make Nowa more stable than when using today's method for calculation. The new Nowa shows nearly half the volatility of today's Nowa and substantially lower maximum day-to-day change. It makes sense that this interest rate will be more stable, given

⁶ Note that the overnight rate calculated by Akram et al. (2018) includes transactions between more banks than new Nowa will. It does not include transactions where the interest rate is calculated according to the 360-day year day count convention because these are mainly transactions with foreign banks, but it does include loans to and from small savings banks that will not be part of the data when new Nowa is calculated. These banks account for a relatively small part of the transaction volume.

that the data used by new Nowa consist of transactions between more homogeneous market participants than today's Nowa.

As Chart 3 shows, today's Nowa was considerably more volatile in the period 2011-2015, also on days without alternative data. Today's Nowa has become more stable in the past few years. If we compare the volatility of today's Nowa and new Nowa between 2016 and today, the difference is considerably smaller: today's Nowa's spread against the policy rate has an annualized volatility that is only 0.015 basis points higher than new Nowa. It is therefore likely that there will not be any immediate changes in volatility on days with sufficient market activity after the turn of the year 2019/2020.

Chart 3 Spread against the policy rate on days when today's Nowa was not estimated and new Nowa would not have used alternative data. Basis points



3.2. Minimum activity requirements

The minimum requirements for volume and number of banks will also be changed with new Nowa. Under the current rules, Nowa will be estimated if the volume is below NOK 250 million or if fewer than three panel banks have made loans. The new principles will require at least three banks to have been active on the deposit side and at least three banks to have been active on the lending side. Moreover, the minimum requirement for total volume is revised upward to NOK 1 billion.

Even though the underlying data will also change, the new minimum requirements appear to lead to more frequent use of alternative data. Through the entire period, today's Nowa was estimated 45 times. In the same period, alternative data for new Nowa would have been used 62 times.⁷ It is also worth noting that this difference has varied over time. In 2012, today's Nowa was estimated more frequently than new Nowa would have been. In all other years, new Nowa would have been calculated using alternative data as frequently or more frequently than today's Nowa was estimated (Chart 4). With both today's Nowa and new Nowa, it is the requirement for number of banks that is most often breached, not the minimum volume (Chart 5).⁸

⁷ Note that new Nowa and today's Nowa would not necessarily have been estimated on the same days owing to changes in the underlying data.

⁸ In the period 30 September 2011 to 31 October 2019, there are only five instances when new Nowa would have been estimated several days in a row.

Chart 4 Number of days on which today's Nowa or new Nowa would be estimated based on alternative data

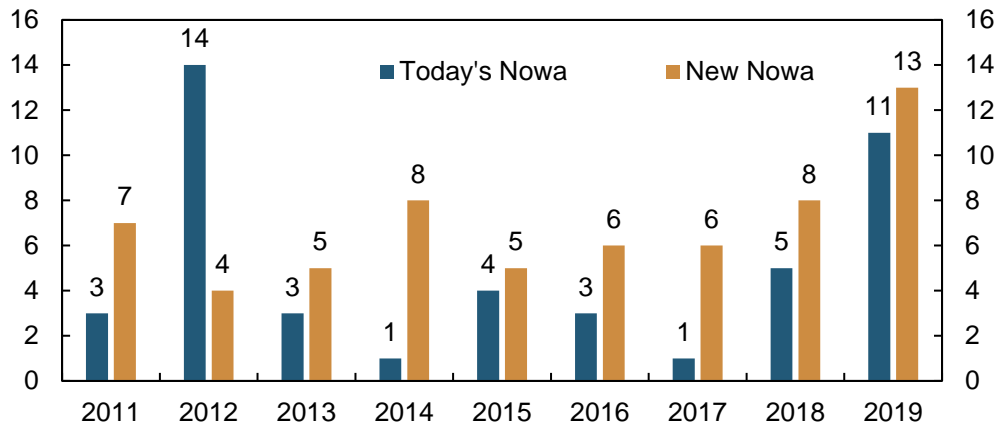
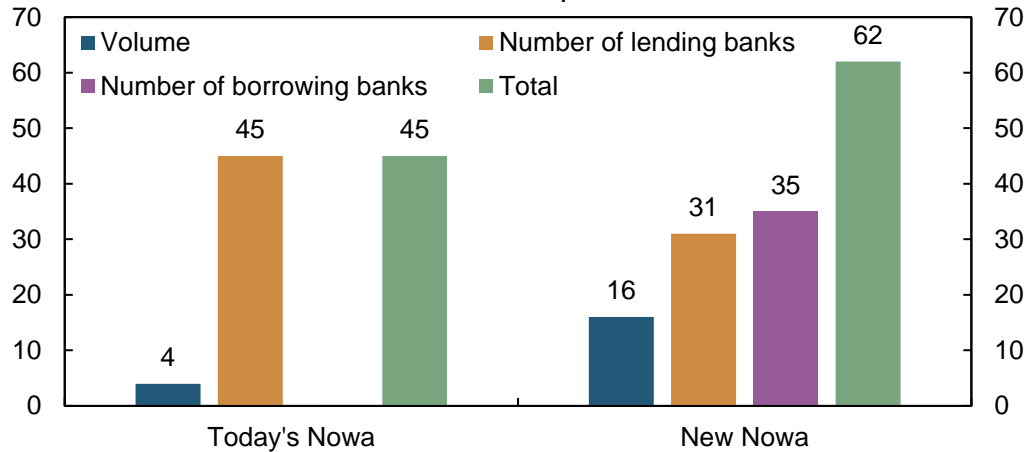


Chart 5 Number of times one minimum requirement was breached⁹



3.3. Contingency method

If there is too little volume or too few banks that are active on a particular day, new Nowa must be calculated on the basis of alternative data. Nowa will then be calculated as a volume weighted average of the interest rate on transactions on the reporting day and the interest rate on the transactions that were included in Nowa on the previous reporting day, adjusted for any changes in the key policy rate.

By comparison, today, the panel banks report their estimates of the interest rate they *would have* lent at if there are not enough transactions to calculate Nowa. Estimated Nowa is based on reports from the panel banks that over the past five banking days have reported the largest turnover to Norges Bank, so that in total there are either interest rates from actual transactions or estimates available from six banks. Nowa is then calculated as an unweighted average of interest rate estimates and actual transactions. Inclusion of estimates of the interest rate banks would have lent at have resulted in volatility in Nowa on estimate days, particularly at year- and quarter-ends. At such times, banks

⁹ The number of active borrowing and lending banks does not necessarily have to be equal because one bank can borrow to or lend from several different counterparties.

often show little willingness to make unsecured loans and therefore estimate very high interest rates.

The new principles imply that new Nowa will be considerably more stable than today's Nowa on days when alternative data are used (Chart 6). Today's Nowa has on average been 29 basis points higher than the policy rate on days when Nowa is estimated. Our estimations imply that the new Nowa would on average have been two basis points lower than the policy rate on days when the alternative calculation method would have been used.

Even on days when new Nowa would have been estimated, but today's Nowa would not have been, the data indicate that new Nowa would have been closer to the policy rate than today's Nowa. Because the data and definition have changed somewhat and the minimum requirements for volume and number of banks are also changed, the alternative data would not have been used on the same days for both interest rates. Table 4 shows that the average spread against the policy rate is still substantially lower on all days, regardless of whether it is new Nowa, today's Nowa or both that breach the minimum requirements for volume and number of banks.

Chart 6 Spread against the policy rate; today's Nowa and new. Includes days when with us of contingency method. Basis points

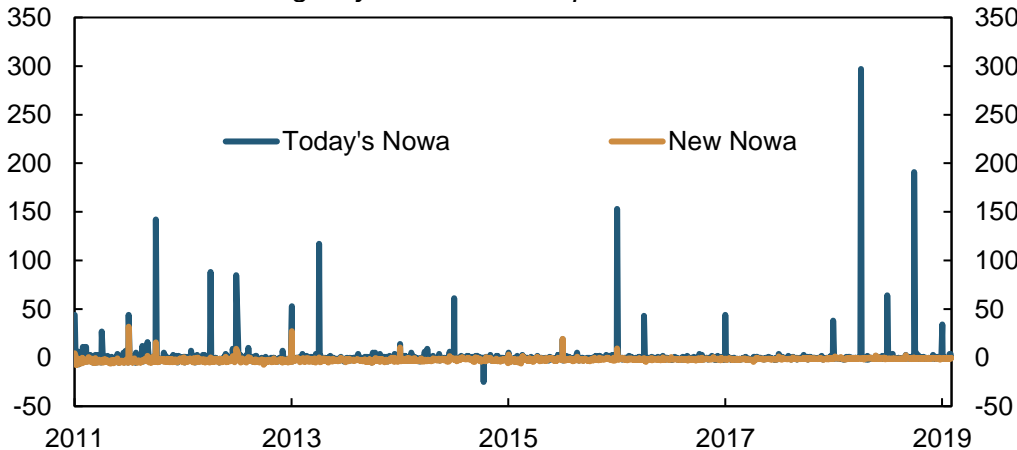


Table 4 Average spread against the policy rate on days when either today's Nowa or new Nowa uses alternative data.

Interest rate that breaches a minimum requirement	Number of days	Today's Nowa, average spread against policy rate (bps.)	New Nowa, average spread against policy rate (bps.)
Both*	12	69.3	4.9
Today's Nowa	31	13.6	-0.6
New Nowa	48	2.2	-0.4

* Days when both today's Nowa was estimated and new Nowa would have used alternative data.

4. Summary

The analysis in this paper indicates that on most days, there will be minimal differences between today's Nowa and Nowa calculated using the new principles that will become effective on 1 January 2020. It suggests that Nowa could be around one basis point lower on average than if today's Nowa rules had continued. Today's calculation method and the new principles try to measure the same thing: the interest rate on unsecured loans between banks in the overnight market. We therefore consider it to be a positive aspect of the reform that the differences between them are small.

The biggest change in the new principles will be the calculation of Nowa on days when alternative data are used. Because we move away from using estimates from the panel to using historical transaction data, the interest rate will be considerably more stable than before. The analysis indicates that alternative data will be used more often with the new principles.

NORGES BANK MEMO
NO. 3 | 2019

NEW PRINCIPLES FOR
NOWA – POSSIBLE
IMPLICATIONS

Appendix: NBO data and the Furfine filter

NORGES BANK MEMO
NO. 3 | 2019

NEW PRINCIPLES FOR
NOWA – POSSIBLE
IMPLICATIONS

Each day, many different kinds of payments are settled in NBO. Payments from households and businesses, foreign exchange trades and interbank loans are the most common. These payments are most often not tagged by type. They can therefore not be distinguished from each other. To estimate the interest rate on unsecured overnight loans, we need to be able to separate interbank loans from other transactions.

A frequently used method for separating unsecured interbank loans from central banks' settlement systems was first used Furfine (1999, 2001). This filter has been adapted to NBO data by Akram and Findreng (2017) and further evaluated by Akram et al. (2018). Our analysis is based on their filter specification.

The Furfine filter classifies two interbank transactions as an unsecured overnight loan if the amount transferred on one day (V_t) is a round number and if the amount returned on the following banking day (V_{t+1}) is equal to the amount transferred plus an amount that can correspond to an overnight interest payment. The implied interest rate, i , is then defined as follows:

$$i = \left(\frac{V_{t+1}}{V_t} - 1 \right) \times D$$

The implied interest rate may only have up to two or three decimal places that are not equal to zero, depending on the amount lent. D is the number of days in a year, either 360 or 365, depending on the day count convention used. An investigation conducted by Akram et al. (2018) among NBO participants showed that loans between banks that are members of NBO are usually made using the 365-day year day count convention, whereas loans with foreign counterparties were usually made using the 360-day year day count convention. We can thus separate loans with foreign counterparties by not including loans made using the 360-day year day count convention.

Akram et al. (2018) make the following assumptions for the Furfine filter:

- No banks borrow amounts less than NOK 1 million from one another.
- The implied interest rate may not have more than three decimal places when expressed as a percentage per year. That is, all loans follow the market convention for quoting interest rates.
- The implied interest rate may not be more than +/- 10 basis points from the key policy rate.

We have used the specification, but modified the last point so that at quarter- or year-ends or on days when today's Nowa was estimated, we allow very large deviations from the key policy rate.

Because there are scant data for activity in the interbank market, assessing whether the Furfine filter identifies the correct transactions can be a challenge. Akram et al. (2018) compared NBO data processed with the Furfine filter with survey reports for August 2015. According to the investigation, the Furfine filter identified all of the unsecured interbank loans correctly. They also compared the daily volume of transactions identified by the Furfine filter with the daily total volume reported by Nowa panel banks. They conclude that the Furfine filter is highly reliable.

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NORGES BANK MEMO
NO. 3 | 2019

NEW PRINCIPLES FOR
NOWA – POSSIBLE
IMPLICATIONS

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