Consultation

# Changes in the the regulatory framework for SWESTR

April 2024

# Consultation on changes to the regulatory framework for calculating SWESTR

This document describes the changes in the regulatory framework for SWESTR that the Riksbank considers necessary to make SWESTR more useful as a reference rate in financial contracts. The purpose of this consultation is to gather the views of financial institutions, other financial market participants and other stakeholders.

Responses to this consultation should be submitted to the Riksbank via remiss.referensranta@riksbank.se or sent to "Sveriges Riksbank, 103 37 Stockholm" by 25 April 2024. Please state reference number 2024-00452.

A summary of the responses received will be compiled and published on www.riksbank.se.

Thank you for your participation.

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# 1 Summary of the proposals in the consultation

The Riksbank's dialogue with market participants and other stakeholders shows that the unpredictability of the year-end effect in SWESTR prevents them from using SWESTR as a reference rate in financial contracts. To increase the predictability of SWESTR around the turn of the year, the Riksbank intends to change the alternative calculation method and the robustness requirements for the SWESTR reference rate.

This means that the Riksbank will regard smaller transaction volumes than at present as robust, which in turn means that alternative calculation methods for calculating SWESTR will be even less likely than at present. In addition, the Riksbank intends to introduce *one* new alternative calculation method that applies to all banking days of the year instead of the two alternative calculation methods that the Riksbank currently applies. The new method will give more weight to the transactional basis of SWESTR on the day in question. In addition, the Riksbank intends to exclude the SWESTR values for the last banking day of the year from the calculation basis if the alternative method is used the following day, i.e. on the first banking day of the new year. This means that a significantly different SWESTR value for the end-of-year day will never affect the SWESTR value for the first day of the year.

The Riksbank's stress tests show that the new alternative calculation method will reduce SWESTR’s deviation compared with the normal calculation method. This applies especially to the end-of-year day.

The Riksbank intends to implement these changes to the regulatory framework for SWESTR in the third quarter of 2024 and assesses that they can contribute to promoting the use of SWESTR in financial contracts.

# 2 Proposals

The Riksbank proposes that the regulatory framework for SWESTR be amended as follows:

The robustness requirement for the volume of transactions is reduced, a new alternative calculation method replaces the two current ones and the year-end day is not considered a business day if SWESTR is calculated using the alternative method on the first business day of the year.

The amendments are proposed to apply from 1 October 2024.

## 2.1 Summary of the Riksbank's proposals

To make SWESTR more useful as a financial reference rate and to promote the transition from Stibor T/N, the Riksbank proposes the following:

### Amendment of robustness requirements

One of the three robustness requirements is reduced. The total transaction volume requirement before trimming the transaction dataset is reduced from SEK 6 billion to SEK 2 billion. This reduces the likelihood that the alternative calculation method will be used to calculate SWESTR.

### New alternative calculation method

When the robustness requirements are violated and an alternative calculation method is used, the Riksbank wants to reduce the deviation from what the normal calculation method would entail for the SWESTR value. It is therefore proposed to replace the two current alternative calculation methods with *one* new alternative calculation method. The new method allows the current day's transaction data to have a greater impact than in the current alternative methods.

### Management of the end-of-year day

In future, the end-of-year day will *not* be regarded as a business day when calculating SWESTR for the first day of the year. Thus, there is no longer a risk that a very divergent SWESTR value on the turn of the year will have an impact on the following days.

## 2.2 Entry into force

The Riksbank proposes that all proposals in this consultation enter into force during the third quarter of 2024.

# 3 Background to the The Riksbank's proposals

In recent years, many countries have switched from so-called IBOR rates to transaction-based reference rates. In Sweden, the work to develop a transaction-based reference rate began in 2017 in the Alternative Reference Rate Working Group (AGAR). As a result, the Riksbank started publishing the transaction-based interest rate SWESTR for Swedish kronor in September 2021, and this has since coexisted with STIBOR. Since the autumn of 2022, the Riksbank and the Swedish Bankers' Association's working group have been working towards a transition from STIBOR T/N to SWESTR. However, the transition is not going fast enough, especially when compared to developments outside Sweden. A contributing factor is considered to be the uncertainty at the turn of the year. As banks adjust their deposits to minimise the basis of calculation (balance sheet) for resolution fees and bank tax, SWESTR may have a very different value on the year-end date. In addition, market participants find it a problem that there is uncertainty about which calculation method will be used. Moreover, a deviating SWESTR value risks reflecting on SWESTR in the days after the end of the year. The Riksbank has therefore seen a need to review the regulatory framework for SWESTR and find a solution that promotes its use. This work started in June 2023 when the Riksbank announced a survey to gather views from market participants.

## 3.1 A switch to SWESTR from STIBOR T/N is desirable

### Transition to transaction-based reference rates abroad

Reference rates play an important role in the financial system, as they serve as benchmarks for the pricing of financial contracts. Therefore, they must be fair and inspire high levels of confidence. London-based LIBOR, euro-based EURIBOR and Swedish STIBOR have been around for a long time, but in recent years they have begun to be replaced by transaction-based reference rates.

The reason for this is that the risk of manipulation in the so-called IBOR rates has been highlighted following the LIBOR scandal in 2012. Since then, several international initiatives have been taken to strengthen the confidence and reliability of reference rates. The International Organisation of Securities Commissions, *IOSCO*, has been providing general principles on how to calculate benchmarks since 2013. *The Financial Stability*

*Board (FSB)*[1] was previously responsible for monitoring the use and development of reference rates. As of 2024, the Bank for International Settlements (BIS/Markets Committee) has taken over this responsibility. As early as 2013, the FSB recommended a reform of IBOR rates and recognised the need to develop alternative and fully transaction-based reference rates. For Sweden and other EU countries, the FSB recommendation has led to legislation at the EU level.

Most central banks have taken on the responsibility of publishing transaction-based reference rates. In the euro area, the ECB has been publishing the euro short-term rate (€STR) since 2019, the US Federal Reserve publishes SOFR and the UK Bank of England has been publishing SONIA since 2018. Norway has NOWA and Denmark has DESTR.

## The Riksbank started publishing SWESTR in September 2021

The Riksbank started publishing SWESTR on 1 September 2021, after a test period that began on 27 January 2021. SWESTR, unlike STIBOR T/N, is transaction-based, but is also an overnight rate that is also based on deposit rates instead of lending rates like STIBOR. Furthermore, the range of counterparties is much broader for SWESTR than for STIBOR. The ECB, the Bank of England and the Danish central bank, have also chosen to use overnight deposits with a wider range of counterparties than just a selection of banks. The main reason is that transactions from the broader money market tend to show good and relatively stable transaction volumes, even in times of financial market turmoil. To summarise, the definition of SWESTR is similar to that of, for example, the euro, the British pound and the Danish krone.

However, if SWESTR is to become the dominant reference rate on the market for Swedish kronor, adjustments are required on the financial markets, such as a transition to SWESTR as the reference rate in swap contracts. As in the case of reference rates for other currencies, SWESTR aims to also be used in financial contracts with longer maturities.

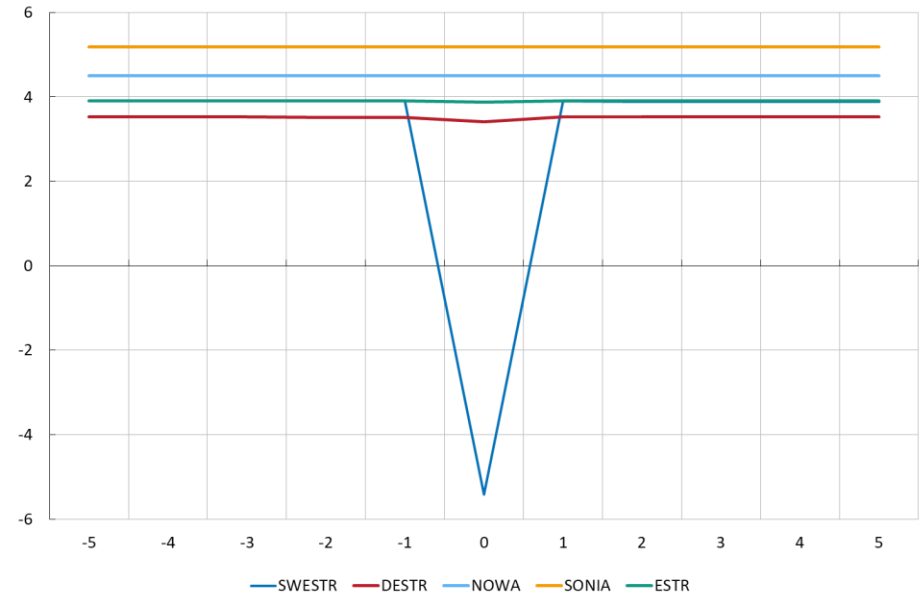
## Transition has been slower in Sweden than abroad

So far, the transition from STIBOR to SWESTR has been slower in Sweden than corresponding transitions to transaction-based reference rates outside Sweden. A partial explanation for this is the uncertainty of market participants about the calculation method used at the turn of the year and thus the uncertainty about the resulting SWESTR values. In this context, it can be noted that the year-end effect is significantly larger in Sweden than in other comparable countries (Diagram 1).

[1] The Financial Stability Board is an international body (G20) that supervises and issues recommendations and regulations concerning the global financial system.

**Diagram 1. SWESTR and foreign reference rates at year-end 2023/2024**

Percentage points



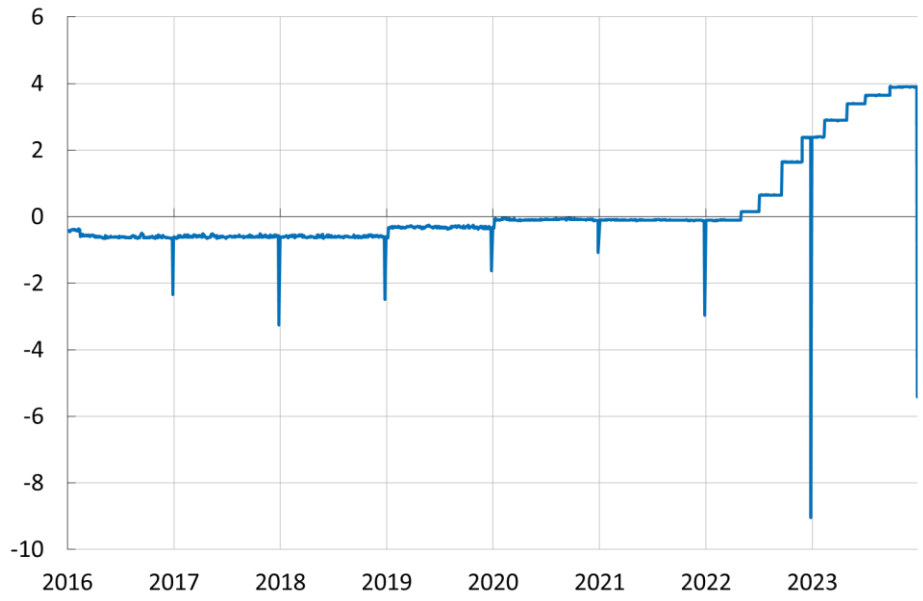

Note. The x axis indicates the number of days before and after the last day of the year, which is labelled 0.

Source: The Riksbank, ECB, Bank of England, Danmarks Nationalbank and Norges bank.

Why this is the case is not entirely clear. One reason could be that the size of the resolution fee is not as predictable in Sweden as in other countries. Another reason may be that Sweden, unlike other European countries, has a special bank tax in addition to the resolution fee. A further possible explanation could be that competition between banks is greater outside of Sweden. Finally, the absence of a year-end effect in the euro area could be partly explained by the fact that banks that potentially offer lower interest rates disappear from the €STR base, as 25 per cent of the lowest (and highest) interest rates are excluded when calculating the €STR.

Regardless of the reason for the deviation in SWESTR at the turn of the year, the Riksbank assesses that the circumstances are preventing a transition from STIBOR to SWESTR.

**Diagram 2. SWESTR, daily values 2016-2023. Per cent**




Source: The Riksbank

## 3.2 The current regulatory framework makes the transition to SWESTR difficult

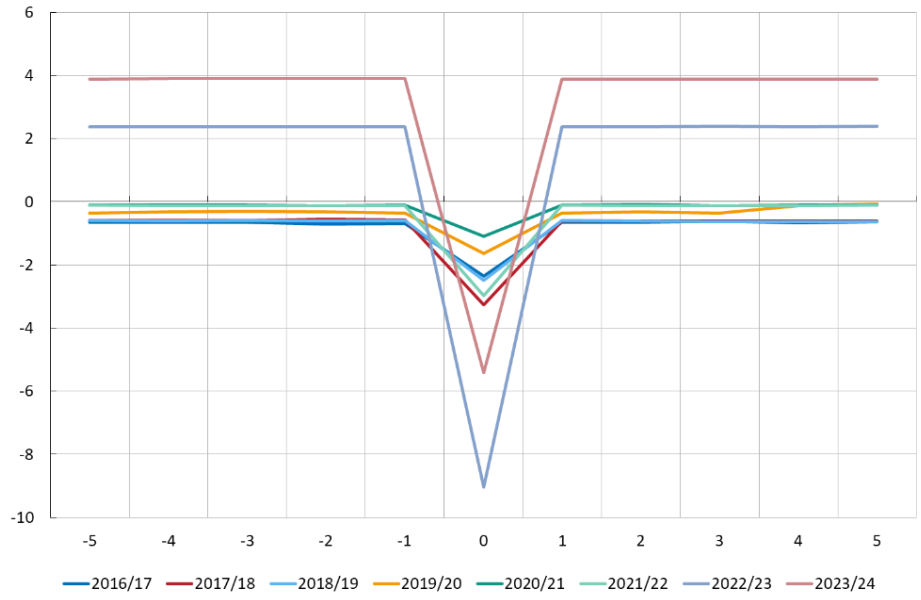
### Banks can handle low year-end interest rates, but not uncertainty about methodology

Since the Riksbank began publishing SWESTR in September 2021, the reference rate has been used sparingly as a base in, for example, derivative contracts. Market participants have expressed the view that the very divergent SWESTR values on the year-end date are an obstacle to using it as a reference rate (Diagram 2). This situation is perceived as manageable but the uncertainty about the calculation method that will be used at the year-end is seen as a major problem. As the normal and alternative calculation methods result in very different outcomes for the SWESTR value, it is difficult to assess in advance what level SWESTR will be at the end of the year.

The difficulty in assessing the calculation method used for SWESTR is due to the fact that it is difficult to know whether or not the robustness requirements of the calculations will be met. If these robustness requirements are *not* met, it means that one (of the current two) alternative calculation method for SWESTR is used.

**Diagram 3. SWESTR at the last eight year-ends**

Percentage points




Note. The x axis indicates the number of days before and after the last day of the year, which is labelled 0.

Source: The Riksbank

If an alternative calculation method is used for the *year-end date*, this currently means that the actual transaction rates have a very small impact on the SWESTR value. This is because the alternative method uses a weighted average of transactions on the current day and the two previous days. Similarly, an anomalous value on the year-end day could spread to the SWESTR value on *the following two days* if the robustness requirements are breached on either of those days. In the extreme case, a divergent value on the year-end day would have a full (100%) impact on the SWESTR value on the two following days. This could happen, for example, if an alternative calculation method is used due to a *technical error*.

The risk of these scenarios being realised hampers the use of SWESTR as a reference rate, according to the responses received by the Riksbank in consultations with banks and banking industry bodies. However, it has emerged that a majority of the banks can cope with a sharply divergent SWESTR at the turn of the year if only it is more predictable. The predictability would then lie in the fact that banks' deposit rates fall in line with their marginal costs for resolution fees and bank taxes (i.e. in line with the SWESTR quotes for the last business day of the year in recent years). However, the banks find it problematic that there is a high degree of uncertainty as to whether these deposit rates will actually be reflected in the year-end value. Similarly, it is problematic that the year-end SWESTR value risks spilling over to the values of the following two days, as described above.

However, both these risks can materialise if the SWESTR framework's alternative calculation methods need to be used (due to a non-robust calculation basis or technical error). This could happen if money market turnover falls so sharply over the year-end

that robustness requirements are breached. Both the year-end value and the values of the following days thus risk being unrepresentative of the interest rates represented in the transaction dataset.

## 3.3 The Riksbank has examined the year-end effect

### Survey by the Riksbank

In September 2023, the Riksbank conducted a survey among banks and other market participants to find out how they view the year-end problems. However, the survey did not provide any clear guidance. Indeed, an overwhelming majority of respondents to the survey felt that the year-end effect and its causes are known, even if it is difficult to predict its size. But it is also worth noting that only half of the respondents considered that the year-end problems had a negative impact on the use of SWESTR as a reference rate. At the same time, some argued that SWESTR should be defined differently for the last day of the year to completely eliminate the year-end effect. Others saw it as possible to cope with a significantly lower reference rate at the year-end, but uncertainty about where the rate would end up had to be reduced. There was no clear majority in favour of one or the other solution. However, the Riksbank's summarising assessment is that enough respondents saw problems with SWESTR around the turn of the year, which prevents a transition to SWESTR from STIBOR T/N.

### Consultation of the Swedish Bankers' Association

In parallel with the Riksbank's survey, the Swedish Bankers' Association has consulted its members to get an idea of what they consider necessary for a transition from STIBOR T/N to SWESTR. The vast majority of respondents felt that SWESTR in its current form is not suitable for use in financial contracts, due to the uncertainty associated with the year-end. The Swedish Bankers' Association's conclusion is that a large group of respondents want to see a change before switching to SWESTR from STIBOR T/N. A majority of the participants in the Swedish Bankers' Association's working group who responded to the consultation considered that the year-end effect should be addressed "by adjusting robustness requirements and/or an alternative calculation method". Only one bank considered instead that a redefinition of SWESTR should be made for the year-end date, to completely avoid the year-end effect in SWESTR.

Based on the Riksbank's survey of possible solutions to address the year-end problems, the Riksbank's proposals are presented below.

# 4 The Riksbank's proposals

The Riksbank proposes lowering the limit for when the transaction volume is considered robust from SEK 6 billion to SEK 2 billion. This reduces the likelihood that an alternative calculation method will be used to calculate SWESTR particularly on the year-end day. Moreover, it is proposed to replace the two current alternative calculation methods with *one* new alternative method. The new method means that the deviation from the normal calculation method will be smaller when the alternative method has to be used. Together, these measures help to reduce the uncertainty as to whether or not the alternative method will be used and ensure that, if the alternative method is used, the SWESTR value will be based to a greater extent on the current day's transactions. In addition, the Riksbank intends to change the regulatory framework for SWESTR so that the year-end date does not affect the SWESTR value on the day after the year-end.

Altogether, these measures are assessed to facilitate and increase the incentives for a transition from STIBOR T/N to SWESTR.

## 4.1 Proposal to amend robustness requirements

**Reduced resilience requirements should favour shift to SWESTR**

Based on historical transaction data, the likelihood that the transaction datasets will not fulfil the robustness requirements and that an alternative calculation method will therefore have to be used is assessed as low. The robustness requirements have not been breached at any point since SWESTR began to be published in September 2021. Nor have they been breached if a fictitious SWESTR is calculated on real transaction data between 2016 and 2021.[2]. However, the likelihood of breaching the robustness requirements could be reduced *further* by lowering the requirements, and this could favour a shift to SWESTR.

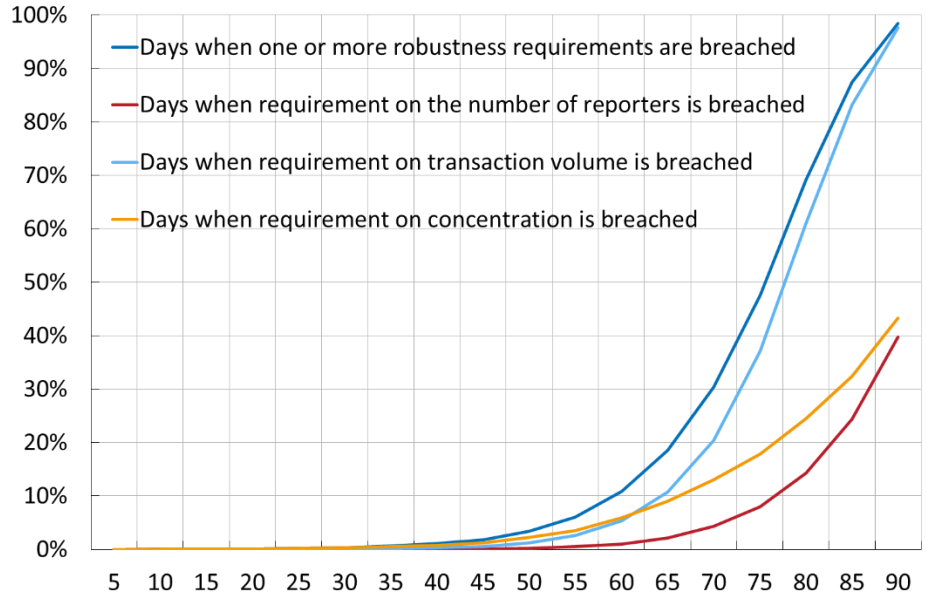
The history thus indicates that on an average banking day there is a low probability of a breach of robustness requirements. The stress tests conducted by the Riksbank show the same thing. The Riksbank has simulated scenarios where the transaction volumes on each banking day were 0-90 per cent lower than the actual levels during the period 2016-2023 (see also Appendix 5.1).

For example, if the reported transaction volumes since 2016 had been 40 per cent lower than in reality, the robustness requirements would only have been breached for less than 1 per cent of the year's banking days, i.e. 2-3 days (Diagram 4). If one looks

[2] On one occasion an alternative calculation method was used due to a technical error (25 January 2023).

individually at the robustness requirement for the total *transaction volume*, the same stress test (40 per cent lower transaction volumes) would mean that the requirement level of SEK 6 billion would have been breached on less than 0.24 per cent of the days of the year. This means that such a breach of the robustness requirement cannot be expected even once per year.

**Diagram 4. Percentage of days in the year when the robustness requirements would be breached if transaction volumes were to fall 0-90 per cent. Per cent.**



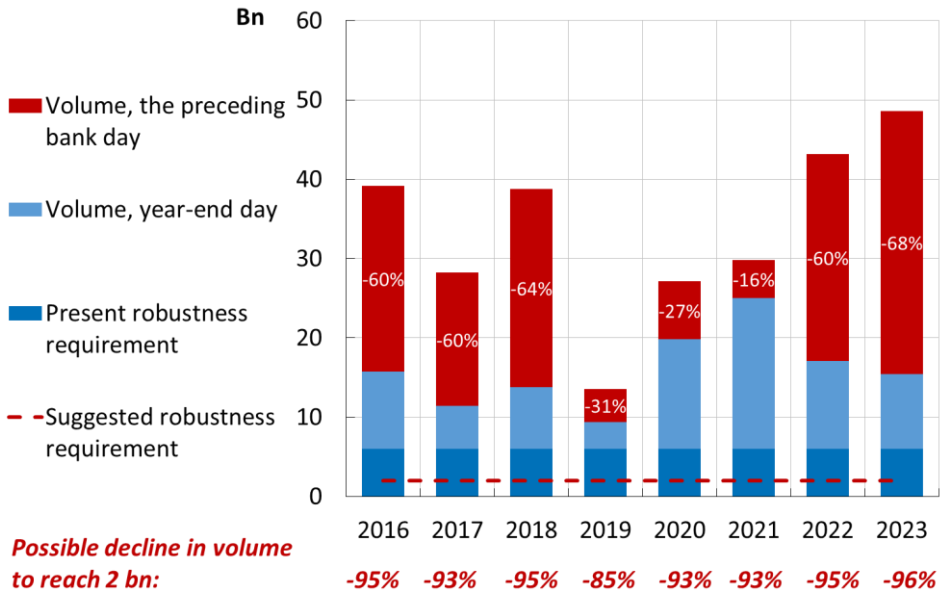

Note. The x axis shows how much the historical transaction base is stressed, i.e. how much transaction volumes are allowed to fall (%) from actual levels.
Source: The Riksbank

## Transaction volumes decrease at the turn of the year

However, the risk of broken robustness requirements varies from day to day. In this study, it has been of particular interest to look at what happens on the year-end day, as transaction volumes are already declining significantly. Over the past eight years, they have decreased by 31-68 per cent on the year-end day, compared to the day before (Diagram 5). The risk of a breach of resilience requirements is thus higher on this day than on other days of the year.

Despite this, the quality of the transaction data has in most cases been far from breaching the robustness requirement of a transaction volume of SEK 6 billion. In some years the margin has been smaller, however, most notably in 2019, when the total transaction volume was SEK 9.4 billion. This means that an additional 36 per cent drop in volume would have resulted in a breach of the robustness requirement.

**Diagram 5. Transaction volumes on the penultimate and final day of the year. SEK billion**

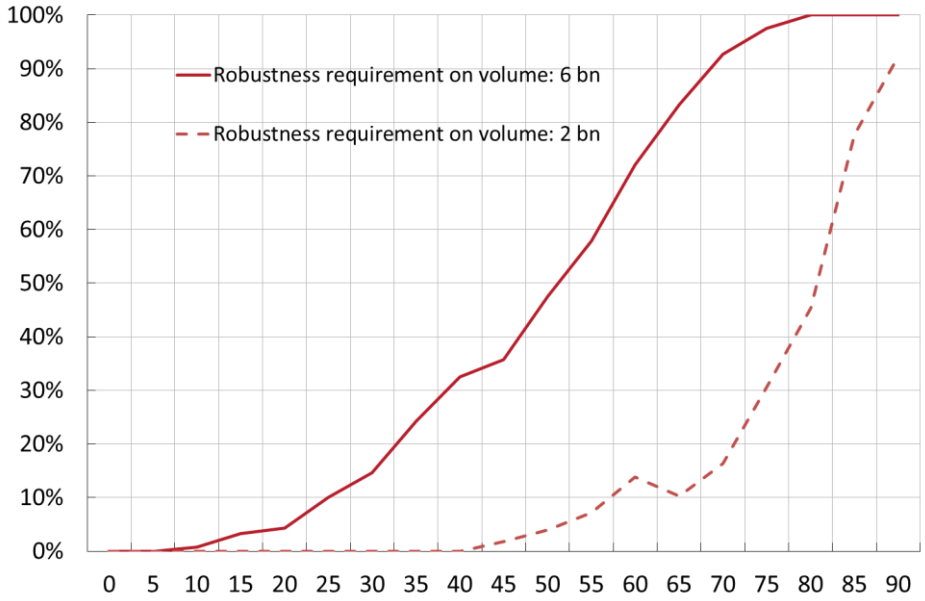



Source: The Riksbank

## Reduced transaction volume requirement reduces the risk of a broken robustness requirement

According to the Riksbank's stress tests, conducted *only* for year-ends, the transaction volume requirement (SEK 6 billion) is expected to be breached in around 33 per cent of cases if, for example, transaction volumes at year-ends were to be 40 per cent lower than historical outcomes (Diagram 6). If the robustness requirement for authorised transaction volume had instead been SEK 2 billion in the same period, there would have been no risk of breaching the robustness requirement (Diagram 6). In other words, a lower robustness requirement for the volume of transactions would significantly reduce the risk of a breach of the robustness requirements at the turn of the year and an alternative calculation method therefore needing to be used.

**Diagram 6. Probability (%) that the volume robustness requirement is breached on a year-end day if transaction volumes fall by 0-90 per cent.**




Note. The x axis shows how much the historical transaction base is stressed, i.e. how much transaction volumes are allowed to fall (%) from actual levels.

Source: The Riksbank

## The volume requirement is proposed to be lowered from SEK 6 billion to SEK 2 billion

Overall, it is considered most appropriate to lower the robustness requirement for the total transaction volume (before trimming)[3]. The current requirement is that this volume must amount to at least SEK 6 billion for the transaction base to be considered robust. This currently means that an alternative calculation method for SWESTR must be used if the transaction volume is lower than SEK 6 billion. The Riksbank proposes that the transaction volume requirement be reduced to SEK 2 billion.

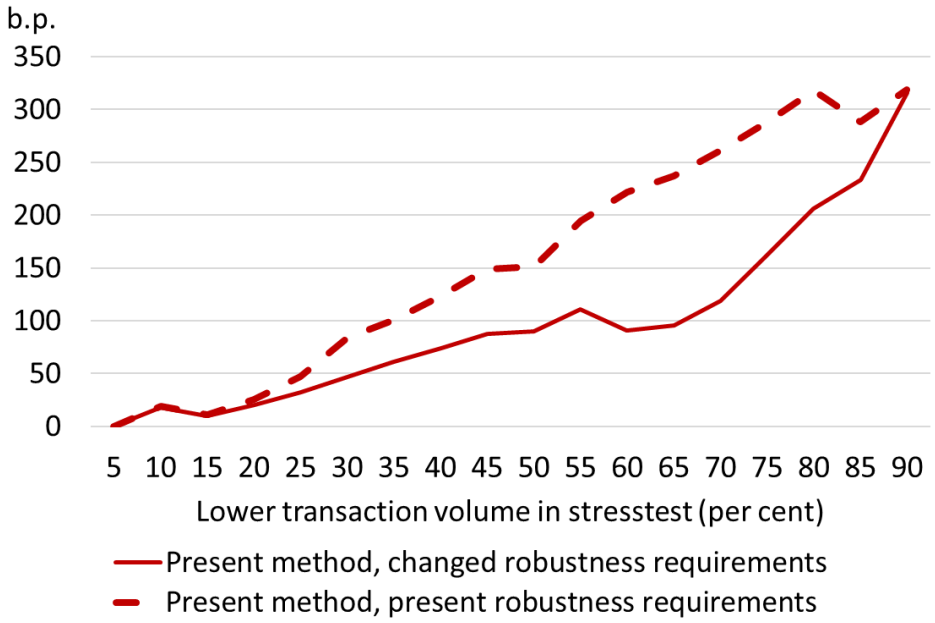
The main reason for the proposal is thus to eliminate the risk of having to use an alternative calculation method at the year-end. This is the day when the volume of transactions tends to fall markedly. It is true that too low a minimum accepted transaction volume requirement could lead to SWESTR not being sufficiently representative of the underlying market. However, the proposed volume requirement is deemed sufficiently high to meet the requirements of robustness and representativeness for SWESTR. Moreover, the risk of manipulation of SWESTR remains low, as the robustness requirements regarding the number of reporters and the maximum concentration on a single reporter are maintained. In this context, it can be noted that the transaction dataset for e.g. the ECB's reference rate €STR does not have a requirement for the overall transaction volume.

[3] When determining SWESTR, 12.5 per cent of the highest and 12.5 per cent of the lowest interest rates are excluded (trimmed) from the transaction base.

## Considerations in the proposal for a revised robustness requirement

It is important that SWESTR is representative, gives confidence and is very difficult to manipulate. Based on these requirements, the Riksbank has investigated which change to the robustness requirements is most effective.

**Diagram 7. Alternative 1 (Riksbank's proposal): reduction of the transaction volume requirement. Mean deviation (basis points) between alternative and normal calculation method, when the transaction volume requirement is reduced from SEK 6 to 2 billion. Year-end day.**




Note. The x axis shows how much the historical transaction base is stressed, i.e. how much transaction volumes are allowed to fall (%) from actual levels.

Source: The Riksbank

### Alternative 1 (Riksbank's proposal): reduction of the transaction volume requirement

With the *current alternative calculation method*[4] and a robustness requirement on the transaction volume of 6 billion, it can be expected that SWESTR quotes would on average have deviated 150 basis points from the normal calculation method if the transaction volumes would have been 40 per cent lower than they have been historically (Diagram 7). With a lower transaction volume requirement, SEK 2 billion, the robustness requirements would be breached less frequently and the alternative method would be used less often. This would mean that the expected deviation from the actual SWESTR quotes would have been, on average, around 90 basis points at the end of the year (i.e. 150-90 = 60 basis points lower than under the current robustness requirements).

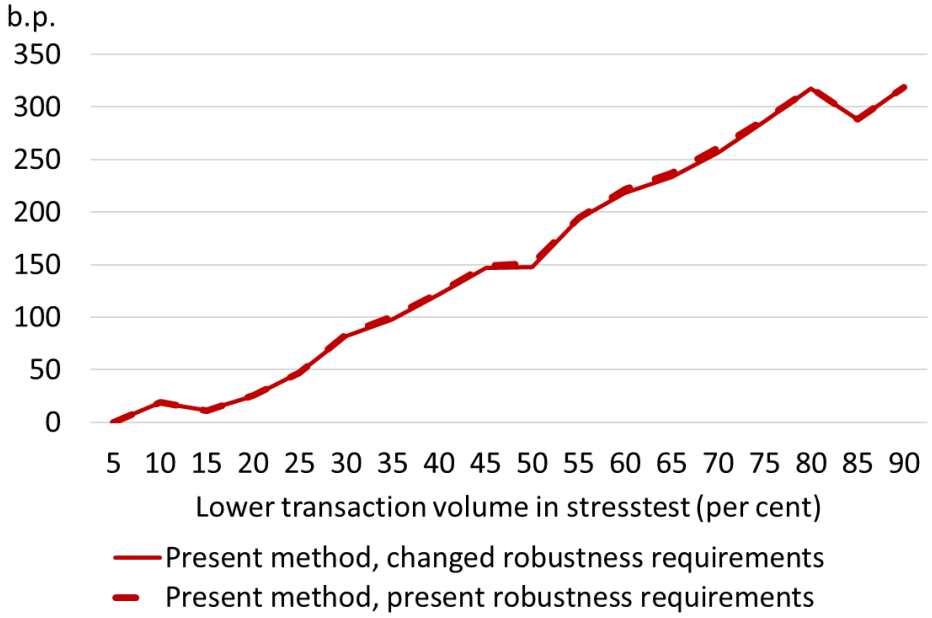
[4] That is, an average of the transaction rates for the current day and the two previous business days.

A reduction in the volume requirement has also been emphasised by the Swedish Bankers' Association as the most reasonable robustness requirement to change. The Working Group for Alternative Interest Rates (AGAR) has also previously (2019) proposed that the robustness requirement should be set at SEK 2 billion. However, it should be noted that AGAR's calculations were based on a more limited set of transactions than those included in SWESTR.

**Alternative 2: Reducing the requirement for the number of reporters**

The requirement regarding the number of reporters is the robustness requirement that has come closest to being broken at the end of a year. Reducing this requirement from 3 to 2 reporters could thus be a way to avoid the need to use an alternative calculation method. However, stress tests show that the average interest rate differential between the alternative and the normal calculation method does not change significantly under such a measure (Diagram 8).[5] Moreover, there are good reasons for *not* accepting only two reporters. This makes SWESTR less representative and increases the risk of manipulation.

**Diagram 8. Mean deviation (basis points) between alternative and normal calculation method, when the number of reporters requirement is reduced from 3 to 2.**




Note. The x axis shows how much the historical transaction base is stressed, i.e. how much transaction volumes are allowed to fall (%) from actual levels.

Source: The Riksbank.

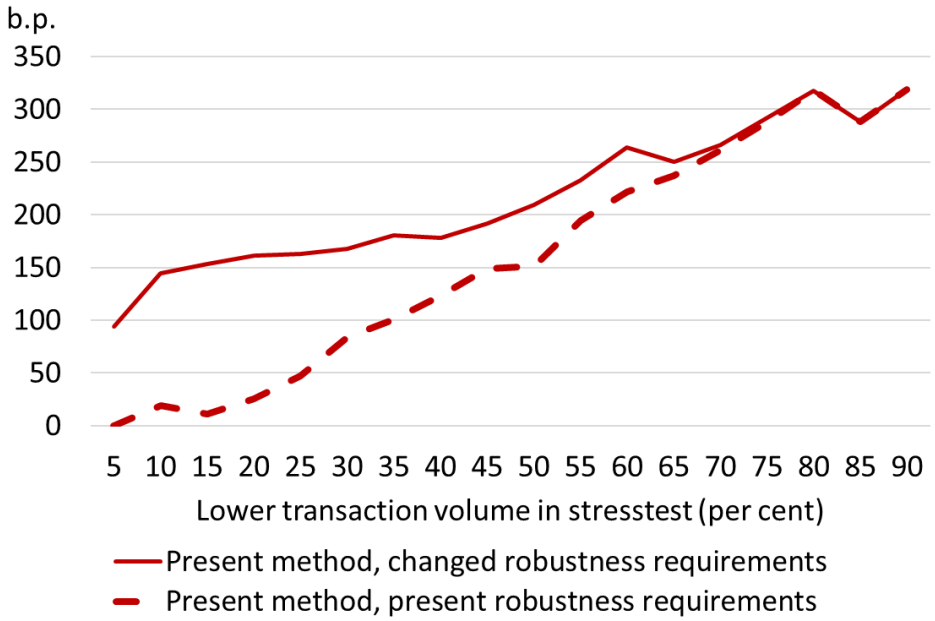
[5] The reason why the change in Figure 4 (with and without a change in robustness requirements) is so small is that even with the current robustness requirements there is a deviation when the volume starts to fall, which at low stress levels is mainly due to the concentration requirement being broken.

**Alternative 3: reducing the number of reporters combined with stricter concentration requirements**

If the requirement regarding the number of reporters is lowered, the risk of manipulation could be reduced if one of the other robustness requirements is simultaneously strengthened, namely the concentration requirement, i.e. the proportion of transaction volumes a reporter is allowed to account for. For example, the concentration requirement could be tightened from 75 per cent to 55 per cent.

However, the Riksbank's stress tests show that the expected interest rate deviation between the alternative and normal calculation method would probably increase rather than decrease, even with minor falls in transaction volumes. The interest rate deviations would thus be larger than if the robustness requirements were not changed at all (Diagram 9). In other words, the measure would be *ineffective*.

**Diagram 9. Mean deviation (basis points) between alternative and normal calculation methods, when the number of reports requirement is changed from 3 to 2 and the concentration requirements is lowered from 75 to 55 per cent.**




Note. The x axis shows how much the historical transaction base is stressed, i.e. how much transaction volumes are allowed to fall (%) from actual levels.

Source: The Riksbank

## 4.2 Proposal to change the alternative calculation method

**Alternative method that is more transaction-based is proposed**

Lowering the robustness requirement as proposed reduces the likelihood that an alternative calculation method will have to be used. If the robustness requirements are

nevertheless breached, calculation using an alternative method may cause the SWESTR value to deviate significantly from the value provided by the normal calculation method. The Riksbank therefore proposes that the two current alternative calculation methods be replaced by *one* method that allows the current day's transactions to be reflected to a greater extent. This measure is proposed to apply to all banking days during the year. However, the change is expected to have minimal effects on banking days other than the end-year day.

The proposed alternative calculation method is intended to be used both when the robustness requirements are breached and when there is no calculation basis due to technical errors. In practice, this means that in the event of technical failures, the transaction dataset of the previous business day is fully utilised.

## Risk of non-representative SWESTR with current alternative methods

*The current alternative method* involves determining SWESTR as an average of the current day and the two previous business days. For example, if the transaction data were to imply values of +4, +4 and -5 per cent respectively during the last three days of the year, this would mean the following:

(1) That the *normal calculation method* (i.e. unbroken robustness requirements) gives a SWESTR value of -5.0 per cent on the last day of the year (column A, Table 1).

(2) That the *alternative calculation method* (after breaching robustness requirements) for the year-end SWESTR value (as well as on any day) would be based on a three-day average, with the year-end day accounting for only one third of the weight. SWESTR would thus be set at +1.0 per cent on the last day of the year ([4+4+(-5)]/3). This would imply a difference of 6 percentage points compared to the value using the normal calculation method (column A, Tabell 1).

**Tabell 1. SWESTR using normal and current alternative method. Per cent.**

| | | Year-end day -2 | Year-end day -1 | Year-end day (YE) |
|---|---|---|---|---|
| A | Interest rate according to transaction data | 4.0 | 4.0 | -5.0 |
| B | SWESTR normal method | 4.0 | 4.0 | -5.0 |
| C | SWESTR, current alternative method (YE). | 4.0 | 4.0 | 1.0 |
| D | SWESTR, proposed alternative method (YE). | 4.0 | 4.0 | -2.0* |

Note: *SWESTR outcomes according to conditions in examples presented in Figure 15. The outcome of the calculation with the proposed alternative method differs depending on which and by how much the robustness requirement(s) is breached.

## More transaction-based SWESTR with new alternative method

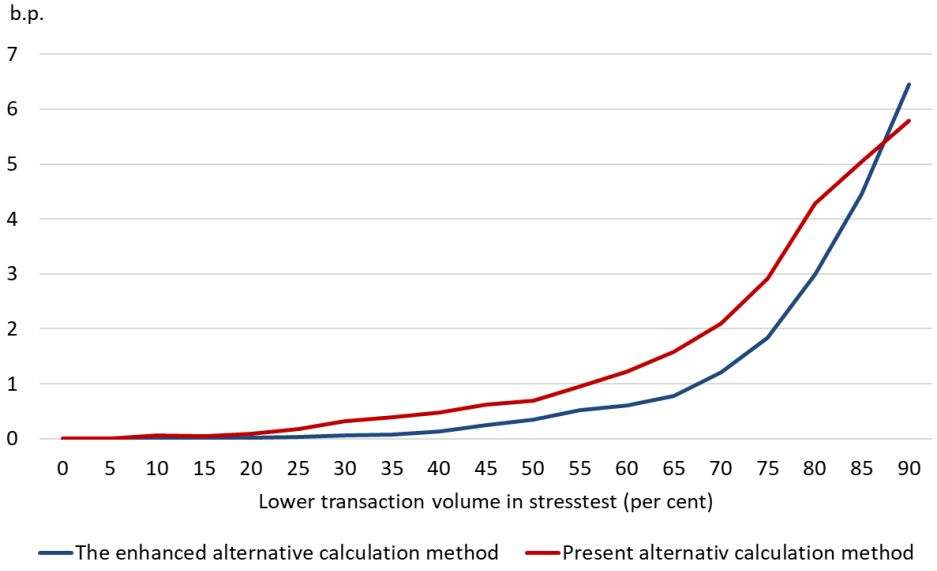
*The Riksbank's proposed alternative method (enhanced method)* means that the previous day's value is taken into account to a lesser extent than today, when the robustness requirement is not met on the current day. (See further Appendix 5.2). With this way of determining SWESTR, the alternative method would provide a SWESTR closer to the value provided by the normal method and SWESTR would thus become more transaction-based in the vast majority of cases (see column D, Table 1).

The Riksbank's stress tests show that the deviation from the result with the normal calculation method is much smaller with the proposed enhanced method than with the current alternative method. While the improvement with the new alternative method is very marginal for an average banking day of the year, the result for the year-end day is significant.

## Stress tests show that the expected outcome on an *average* day is only marginally affected by the enhanced method

The Riksbank's stress tests show that in a scenario where transaction volumes are allowed to fall by up to 50 per cent on all days of the year, SWESTR would on average be less than 1 basis point higher than has been the case during 2016-2023 (Diagram 10, red line). With the proposed enhanced method, this deviation would be even smaller.

**Diagram 10. Average deviation from normal calculation method for all banking days of the year (basis points).**




Source: The Riksbank

Transaction volumes can be allowed to fall by 70 per cent before the average deviation from the actual outcome is 1 basis point per day (Diagram 10, blue line). But the difference with the current alternative calculation method is still marginal. From a

perspective that takes into account *an average day*, there is no reason to consider a change in method.

## Expected outcome at year-end would be significantly affected, however

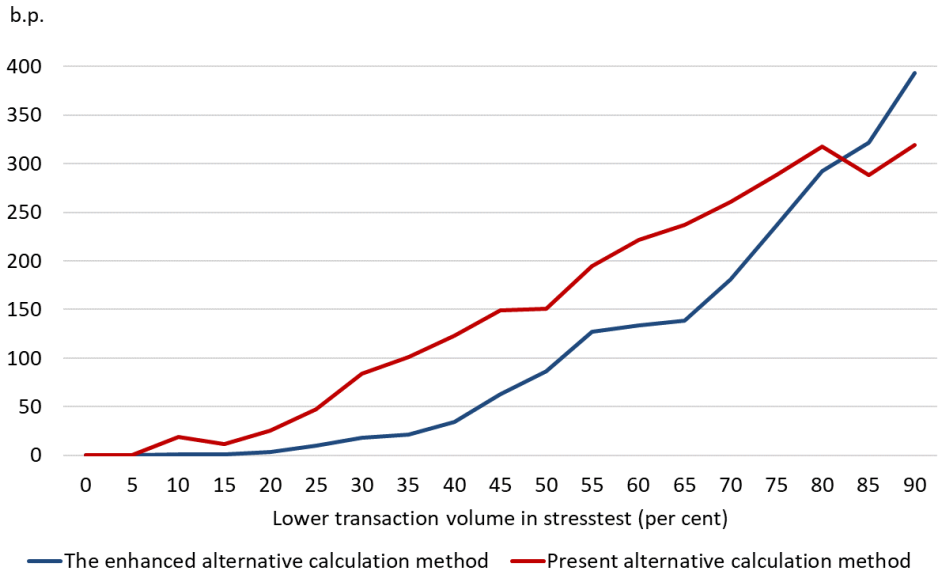
With the proposed enhanced method, transaction data will have a higher impact at the year-end if the robustness requirements are breached and an alternative calculation method is used. The Riksbank's stress tests show that the deviation from the actual SWESTR outcomes would have been smaller with the enhanced method during the test period 2016-2023 than with the current alternative method.

Under the current alternative calculation method, SWESTR would have had a value with a relatively large deviation from actual outcomes if transaction volumes had been lower. If transaction volumes are allowed to fall by, for example, 40 per cent from actual levels over the last eight year-end days, SWESTR would have deviated by about 140 basis points from the result under the normal calculation method (Diagram 11, red line).[6]

With the enhanced method, the same deviation becomes smaller. The expected average deviation is 90 points (Diagram 11, blue line). At virtually all levels of stress, the enhanced method gives more weight to the current day's interest rate values than the current alternative method. One exception is at *very high stress levels* (transaction volumes fall >80%). When the transaction dataset is so small, the enhanced method means that it takes into account records from the previous days to a *greater extent* than the current alternative method. Overall, however, one can expect a SWESTR value that is closer to a "normal" SWESTR calculated using the enhanced method.

[6] The stress tests (see Appendix) mean that both normal and alternative calculation method cases will be included in the outcome, which represents an expected average deviation from the normally calculated SWESTR.

**Diagram 11. Mean deviation from normal calculation method on year-end day (basis points).**



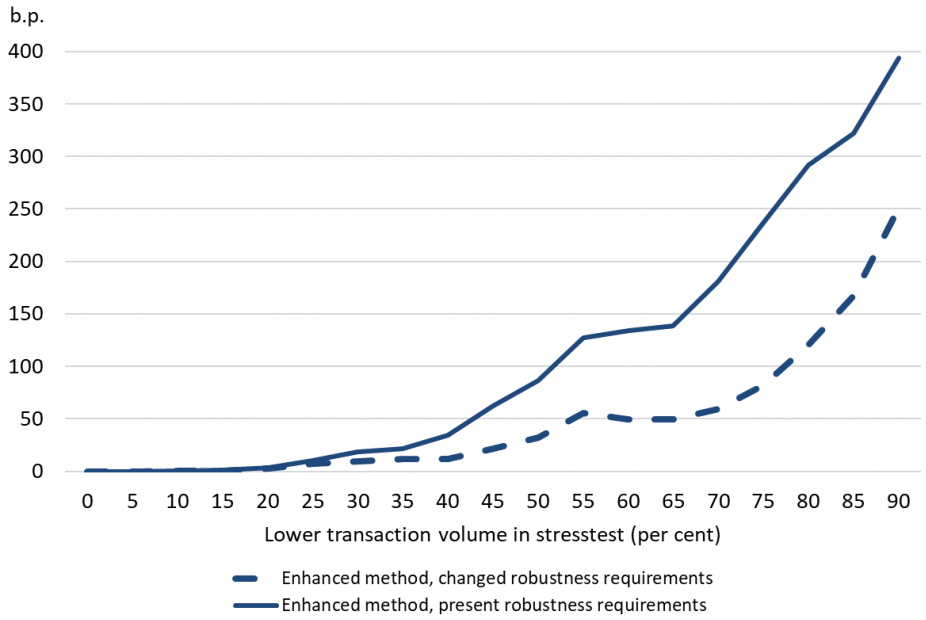

Source: The Riksbank

## The enhanced method is proposed together with a reduced robustness requirement.

The risk and size of a year-end deviation is reduced by the proposed alternative calculation method. However, the Riksbank assesses that the new alternative calculation method *is not* sufficient to prevent an excessively large deviation in the SWESTR value at the year-end.

The Riksbank therefore proposes a combination of a new calculation method and a reduced robustness requirement for the transaction volume, which means a smaller expected SWESTR deviation when the alternative method needs to be used. For example, the Riksbank's stress tests on the transaction dataset during 2016-2023 show that transaction volumes could fall by up to 70 per cent from historical levels without the deviation in SWESTR being more than around 50 basis points, i.e. half a percentage point (Diagram 12). While such a deviation is considerably larger than what can be accepted on an average day of the year, it is considerably smaller than what can be expected on the year-end day under the current SWESTR regulatory framework.

**Diagram 12. Mean deviation from normal calculation method on year-end day (basis points). With current and proposed robustness requirements.**

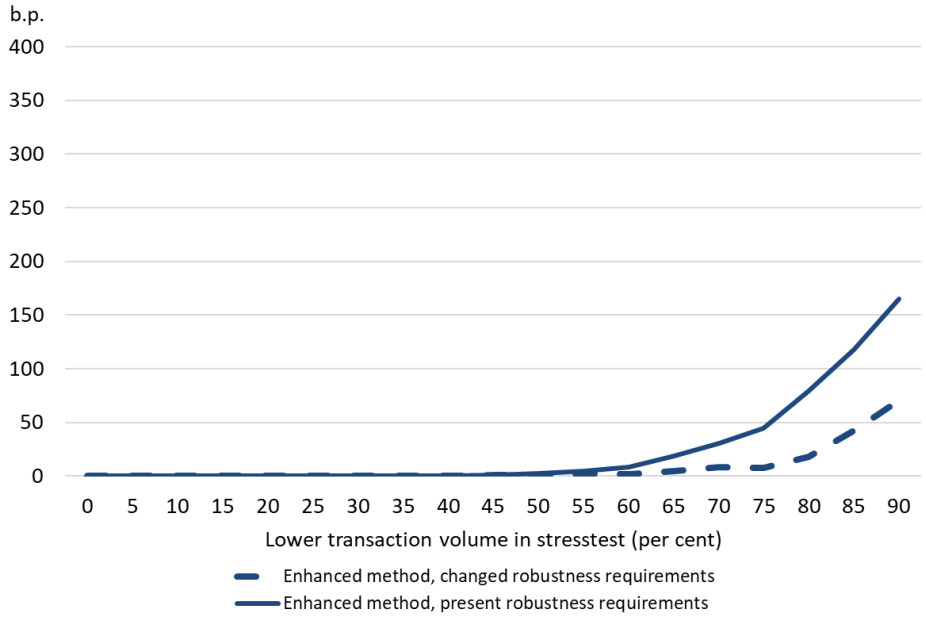



Source: The Riksbank

With the new *proposed alternative calculation method* together with a *reduced robustness requirement*, the expected deviation from the normal calculation method is considerably smaller than today. With the *current* alternative methodology and the *current* robustness requirements, the stress tests show that a 70 per cent drop in transaction volumes would imply an expected deviation of around 260 basis points at year-end, i.e. more than five times as much as with the proposed changes (around 50 basis points, as shown by the dashed line in the figure above).

The Riksbank's amendment also means that the *uncertainty* during the *first two days of the year* is significantly reduced (Diagram 13). However, this issue is addressed by the Riksbank's third proposal, see the following section (4.3).

**Diagram 13. Mean deviation from normal calculation method on year-end day (basis points). With current and proposed robustness requirements.**




Source: The Riksbank

## Considerations in the alternative calculation method proposed

### Different calculation methods evaluated

The study compares the current alternative calculation method with the enhanced method, but also with the calculation method used by the ECB (with volume-weighted averages in the case of the alternative method). However, the ECB's calculation method does not solve the problems of deviations and uncertainty around the turn of the year.

### The design of the enhanced method

When designing the enhanced method, the Riksbank has investigated the order in which the three robustness requirements are to be tested in order to take into account the previous day's value. The choice of order has consequences for *how much* of the previous day's transaction dataset is taken into account when the alternative method is used. The chosen model means that the number of reporters is evaluated first, followed by the concentration requirement and finally the volume requirement. In conclusion, the evaluations show that a different system has undesirable and arbitrary consequences.

## 4.3 Proposal for the management of the year-end day

### The year-end day is not regarded as a banking day ("skip")

The risk that a strongly deviating SWESTR value at the year-end will spread to the days after the turn of the year is considered an obstacle to a transition from STIBOR T/N to SWESTR. This is regardless of which method is used, the current one or the proposed one.

In a case where transaction volumes are completely missing, e.g. due to a technical failure, the year-end value would be fully effective the following day, regardless of whether the current or proposed alternative calculation method is used. The Riksbank considers this to be undesirable and therefore proposes that this problem be dealt with using the *"skip method"*.

The *skip method* involves not regarding the year-end day as a banking day in the alternative calculation method. When an alternative calculation method is used, the year-end day is not given any weight. Instead, the previous day's value is weighted. Thus, in the case of the enhanced method, the value from the day before the year-end day would be taken into account when calculating SWESTR for the first day of the year. The method thus solves the problem of the value on the year-end day spreading to subsequent days.

### Considerations in the proposal on the year-end day

The Riksbank believes that the skip method makes SWESTR more transaction-based, which is desirable. It could be argued that a disadvantage of the skip method is that it could be a tailor-made solution for the year-end. On the other hand, in general terms it can be regarded as unsatisfactory that the same method is not used every day of the year, which has been emphasised as important by the Swedish Bankers' Association's working group, among others. On the other hand, it may open up the possibility that someone believes that the Riksbank could later change the calculation conventions for other days. In this regard, it has sometimes been argued that such uncertainty would reduce the credibility of the reference rate. However, the Riksbank believes that this problem is minor.

# 5 APPENDIX

## 5.1 Method for the stress tests

### Stress tests with 40 repetitions per day and different falls in transaction volume

To assess whether the proposed alternative calculation method is better than the current one, we have evaluated it by stress testing with historical transaction data. The tests assume that the transaction volumes on each day of the period analysed have been lower than the actual outcome. As a result, the robustness requirements are breached more often. The more the transaction volume is allowed to fall on a given day in the stress test, the more likely it is that one of the robustness requirements will be breached.

With the remaining transaction base, a fictional SWESTR is calculated. If the robustness requirements are breached, an alternative calculation method is used, otherwise the normal one is used. This is in line with what happens in the real world and we get one value for a fictitious SWESTR for each day.

The outcome for the fictional SWESTR is then compared with what SWESTR would be valued at under the normal calculation method (with stressed data). Consequently, if the robustness requirements are not breached, the deviation is zero (0), as the normal calculation method has actually been used. However, if a breach of the robustness requirements has occurred and an alternative calculation method has been used, we get a deviation (difference in basis points).

If it is desirable for this deviation to be smaller on average, there are two parameters to change. Either one chooses an alternative calculation method that produces a smaller deviation or one reduces the likelihood of having to use an alternative method (i.e. by reducing the robustness requirements).

Thus, the stress tests involve stress testing the historical transaction dataset under different conditions. Both with different alternative calculation methods and with different hypothetical combinations of robustness requirements. Thus, the deviations can be compared with different sets of alternative calculation methods and robustness requirements.

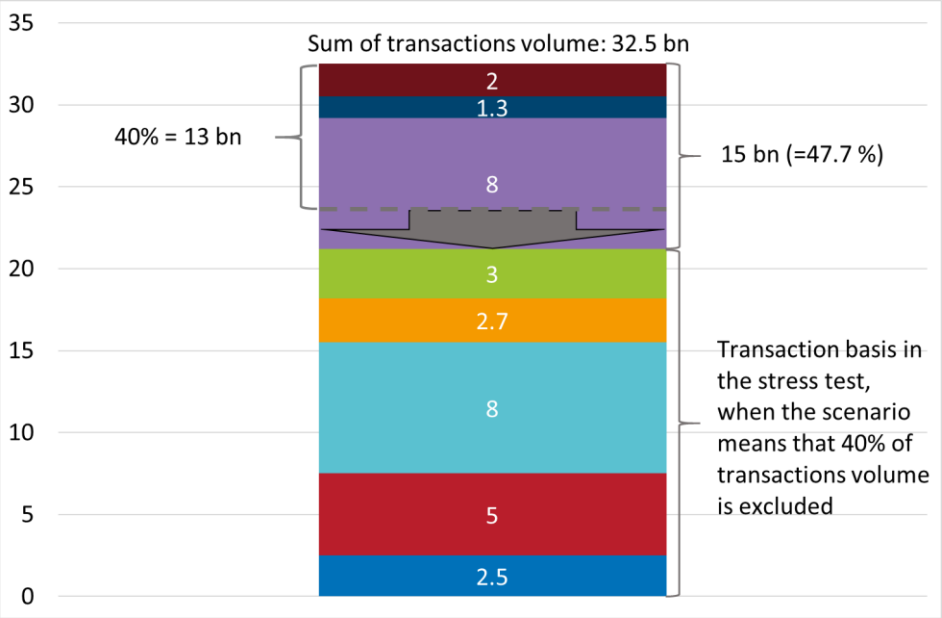
In practice, parts of the transaction volume are gradually excluded by putting all transactions on a specific day in a randomised order. After that, transaction by transaction is excluded in the order in which they are located until a certain percentage of the day's transaction volumes has been excluded. In the stress tests, 0 to 90 per cent of the transaction base has been excluded in intervals of five per cent (i.e. with 19 different outcomes): 0, 5, 10...90).

In cases where the transaction volume threshold to be removed falls *within* a transaction, the exclusion is extended to the whole of that transaction. SWESTR is then calculated on the remaining transaction base, using the appropriate method (alternative or normal).

Randomness means that the outcome can take several forms depending on how the transactions are organised. To get a reliable expected (average) result, we repeat the described process 40 times for each day and for each five per cent interval. Thus, to stress test *one* method in one day, we perform 760 calculations (40 x 19).

Figure 14 exemplifies how the transactions (in different colours) are randomly ordered and what remains as the transaction base when 40 per cent of the transaction volume is excluded. Due to the design of the stress tests, 47.7 per cent of the transaction volumes are excluded in this case.

**Diagram 14. Example of how transactions are randomly ranked in the stress tests. 8 transactions.**




Source: The Riksbank

**Workflow of the stress tests repeated 40 times for each day/stress level**

1. Transactions are ranked.
2. Transaction volume 0-90 per cent is excluded.
3. An adjustment is performed if the excluded volume breaks a transaction (image).
4. The remaining calculation basis is evaluated against the robustness requirements.
5. The calculation base is trimmed (-12.5 per cent from the top and bottom).
6. Depending on the result in point 4, the normal or alternative calculation method is used.

7. The result is a fictitious SWESTR value.
8. The fictitious SWESTR value is compared with what the interest rate would be using the normal calculation method on the same basis (same stress level).
9. Items 1-9 are repeated 40 times.
10. The mean value is calculated on 40 repetitions.

## Considerations regarding the evaluation method

An evaluation method of this kind should fulfil certain criteria. A basic requirement should be that it is possible to draw conclusions relevant to the future from the historical material (validity). In this respect, the scenario tested should be relevant and the measured result should be measured by a relevant variable (reliability).

### Relevance of the source material (historical data)

How successfully can conclusions be drawn from the historical transaction data? We can note that transaction volumes have increased in recent years. Although the stress tests involve the exclusion of a *portion* of transaction volumes, the robustness requirements are the same throughout the study period. This may mean that the probability of breaching the robustness requirements is overestimated, as, for example, a 50 per cent decrease in transaction volume puts less stress on the data as volumes have grown in recent years. On the other hand, real transaction volumes could also fall in the future. Several factors could lead to a decrease/increase in the volume of overnight loans in the coming years. For example, it matters how much overnight liquidity there is in the banking system, which in turn depends on the choices the Riksbank makes.

It should also be noted that we had five reporters in the fictitious transaction dataset in the period 2016-2019, while there are currently nine. This means that the breach of the robustness requirement for the number of reporters is likely to be overestimated, while this fact partly explains why total transaction volumes were lower in this period.

Overall, the transaction data over the period analysed are considered relevant.

### Relevance of the test parameter (reduction in transaction volume)

In terms of which scenario to test, the choice fell on reducing *transaction volumes*. An alternative might, for example, have been to reduce the number of reporters randomly or according to some decision rule when defining the stress tests. The choice to stress the data with falling transaction volumes was due to the fact that these have a natural link to the degree of financial stress, while the volume can be reduced continuously. If the choice had instead been made to reduce the number of reporters in the stress tests, the volume outcomes could have varied considerably. However, when transaction volumes are stressed, the number of reporters naturally decreases as more volume is excluded. The same applies to the concentration on one reporter.

It could be argued that, in reality, the number of reporters would fall faster as the transaction base decreases. Transactions are randomised in the evaluation process, which may not be realistic in a money market under financial stress. The transactions

could probably be concentrated faster to a small number of reporters. However, these alternatives were judged to be too arbitrary.

Moreover, it would be difficult to model how often technical failures could occur.

Overall, a reduction in transaction volumes is deemed to provide the most relevant outcome in the stress test scenarios.

**Relevance and reliability of the measurement variable (interest rate deviation)**

The choice of the evaluation measure for the different calculation methods, the interest rate deviation from the normal calculation method, is natural. The intention of the proposed change is to make the deviation in SWESTR more predictable and closer to what the normal calculation method would imply for the SWESTR values at year-end. The expected mean deviation is supposed to be smaller, which is what is measured. As the mean deviation based on all days of the year is less interesting, specific tests have been carried out only on the year-end days and only on the days after the year-end. One might think that the sample is too small to draw any conclusions (only eight year-ends), but we have found no other viable option.

Based on the assumption that the number of reporters may decrease faster than the stress tests allow (under increased stress with smaller transaction volumes), it could be argued that the mean deviation from the normal calculation method *de facto* may be larger than the stress tests show. This would be because a breach of the *reporting requirement* generally results in larger interest rate deviations with an alternative calculation method than a breach of the volume or concentration requirements.[7]

[7] Which depends on how the enhanced method is constructed. When one reporter is missing, one third is taken from the previous day; when two reporters are missing, two thirds are taken from the previous day.

## 5.2 Proposed alternative calculation method

### The enhanced method

The enhanced method refers to a volume-weighted average of the previous banking day's value $Swestr_{i-1}$ and today's value $Swestr_i$ calculated using the normal calculation method.

SWESTR with value day and business day $i$ is calculated using the alternative method according to the following formula:

$$Swestr_i^{Alt} = R_i + \sum_{k=0}^{1} \alpha_{i-k}(Swestr_{i-k} - R_{i-k})$$

where:

$i =$ an index representing the current host day for calculation.

$k =$ an index representing each value date for SWESTR

$Swestr_{i-k} = \begin{cases} Swestr_{i-k}\ calculated\ with\ normal\ calculation\ method, & k = 0 \\ \text{determined Swestr value for value day } & i-k,\ k > 0 \end{cases}$

$R_{i-k}$ = the Riksbank's policy rate for banking day $i-k$

$\alpha_{i-k} = \frac{v_{i-k}}{V} \in [0,1]$ is the weight of each value

$v_{i-k}$ = volume for value day $i-k$, see below how these are determined

$V = v_{i-1} + v_i$, total volume for the value days $i-1$ and $i$

**Special cases:**

- Special cases when no transactions exist, for example due to a technical error, $a_{i-1} = 1$ and $a_i = 0$are set, i.e. we reuse the previous value date entry.
- For $i =$ the first business day of the year, $i-1$ refers to the penultimate business day of the previous year.

More specifically, the $v_i$ transaction volume for host day is $i$ while $v_{i-1}$ is determined as follows:

$v_{i-1}$ = weight after sequential weighing to fulfil the robustness requirements for host day $i$. The following sequence applies:

1. $v_{Rapp,i} = \begin{cases} v_i \left(\frac{3-Number\ of\ reporters_i}{Number\ of\ reporters\ \ _i}\right), & 0 < Number\ of\ reporters < 3 \\ 0, & Number\ of\ reporters \geq 3 \end{cases}$

2. $v_{Konc,i} = \begin{cases} \frac{4}{3} v_{Max,i} - (v_i + v_{Rapp,i}), & \frac{v_{Max,i}}{v_i + v_{Rapp,i}} > \frac{3}{4} \\ 0, & \frac{v_{Max,i}}{v_i + v_{Rapp,i}} \leq \frac{3}{4} \end{cases}$

   where $v_{Max,i}$ is the volume of the largest reporter value day $i$.

3. $v_{Vol,i} = \begin{cases} 2mdr - (v_i + v_{Rapp,i} + v_{Konc,i}), & v_i + v_{Rapp,i} + v_{Konc,i} < 2mdr \\ 0, & v_i + v_{Rapp,i} + v_{Konc,i} \geq 2mdr \end{cases}$

$v_{i-1} = v_{Rapp,i} + v_{Konc,i} + v_{Vol,i}$

## Sequential weigh-in of the previous day's value

When the requirements for robustness in the calculation basis are not met, the enhanced method involves weighing the previous day's value as compensation. How much it is allowed to spill over into the current day's value depends on the quality of the transaction data. The weighing can be done in several steps as the robustness requirements are evaluated. Thus, the impact of the previous day's value is less than with the current alternative method (see algebraic expressions above).

(1) The first step involves weighting the previous day's interest rate with a weight corresponding to the degree to which the *first* robustness requirement of three reporters is not met. If *one* reporter is missing, the previous day's entry is weighted as "the missing third".

    In other words, the current day's transactions have a two-thirds impact and the previous day's value has a one-third impact (in practice, a 50 per cent volume weight is added).

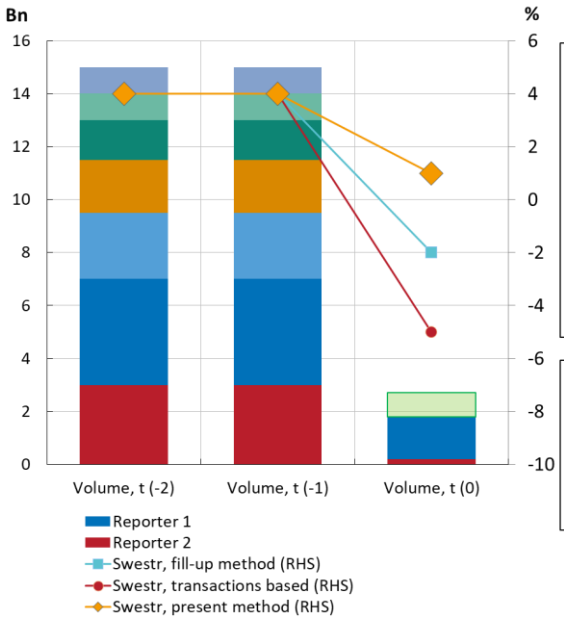
(2) It is then checked whether the next robustness requirement in the hierarchy is fulfilled. If no more than 75 per cent of the transactions are linked to a reporter, the previous day's value will not be considered further. However, if the requirement is *not* fulfilled, it is further weighted.

    Please note that the weighing of additional transaction data in this step takes into account the volume added in step (1). When transaction volume is added, the percentage distribution of transaction volume between reporters changes.

(3) Finally, it is tested whether the third robustness requirement is met, i.e. whether the total turnover for the reported volume is SEK 2 billion or more. If the requirement *is* met, the process ends here. However, if this requirement is *not* met, the previous day's entry is weighted again. For example, if the current day's turnover is 1 billion (including the added volume/weight in steps 1 and 2), the previous day's value is weighted with an additional 1 billion as weight.

When all robustness requirements are sequentially evaluated, the process is over and we have a fixed reference rate as a result. Diagram 15 below exemplifies how the calculations can be made.

**Diagram 15. Example of how SWESTR is calculated with the proposed alternative method**




| Example | Requirement | |
|---|---|---|
| **Number of reporters:** 2 | *3* | *too few!* |
| **Concentration:** 80% | *75%* | *too high!* |
| **Volume:** 1.8 bn | *2 bn* | *too small!* |

Just two reporters t (0) --> one reporter is added.

Reporter 1: 1.6 bn
Reporter 2: 0.2 bn Summa: 1.8 bn

1.8 bn/2 = 0.9 bn --> 0.9 bn is added ("reporter 3")

**New number of reporters:** *3* **OK!**
**New concentration:** 1.6/2.7 = *59%* **OK!**
**New volume:** 1.6 + 0.2 + 0.9 = *2.7 mdr* **OK!**

| **Transactions based rate (%):** | t (-2) | t (-1) | t (0) |
|---|---|---|---|
| | 3.9 | 3.9 | -4.2 |

**Present alternative method :** $\frac{4.0+4.0+(-5.0)}{3}$ = +1.0%

**New Swestr due to fill-up method:** $\frac{[0.9\ x\ 4.0]+[1.8\ x\ (-5.0)]}{(0.9+1.8)}$ = -2.0%

## 5.3 The current robustness requirements

The robustness requirements that currently exist in the regulations for SWESTR have already been thoroughly analysed.[8] The guiding principles in determining the robustness criteria are that the calculation basis should be representative of the underlying market, while avoiding the risk of manipulation. The criteria should also be low enough to avoid the alternative calculation method as far as possible. A balance between these principles is intended to create confidence in the reference rate.

For the transaction dataset to be considered sufficiently robust at present:

- *the transaction dataset must amount to at SEK 6 billion*
- *at least three reporters shall have reported transactions*
- *no single reporter must account for more than 75 per cent of the total transaction volume.*

The robustness requirements refer to the transaction dataset before trimming (12.5 + 12.5 per cent)[9]

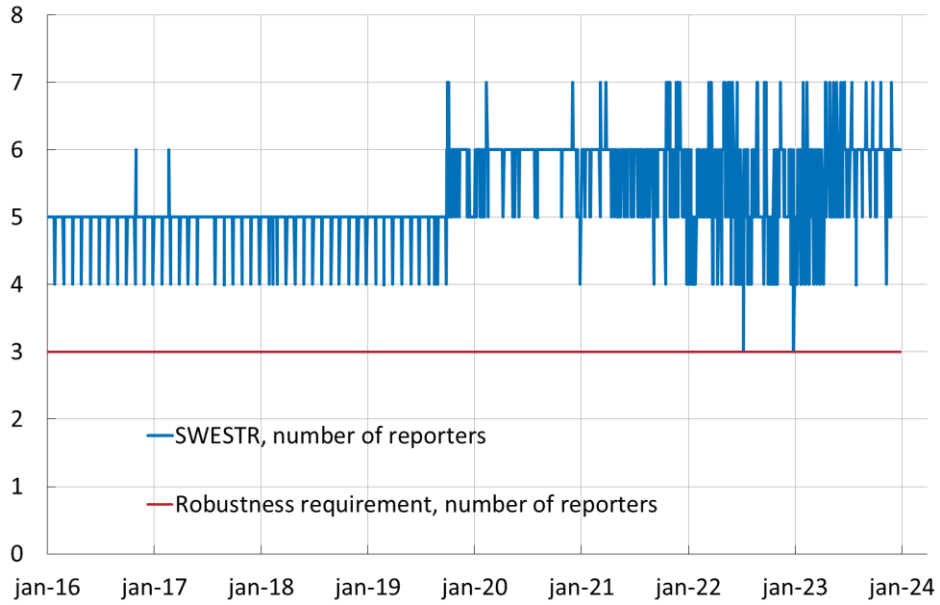
### Historical outcomes for the requirement on the number of reporters

The average number of reporters since the introduction of SWESTR has been 5.5. On two occasions, the requirement has approached the robustness requirement (Diagram 16).

[8] PM Definition of the Riksbank's reference rate 30 April 2020 "Carina, Jones, Mattias, Ruzica, Reimo, Vanessa"

[9] When determining SWESTR, 12.5 per cent of the highest and 12.5 per cent of the lowest interest rates are excluded (trimmed) from the transaction base.

**Diagram 16. Number of reporters and robustness requirements for reporters**

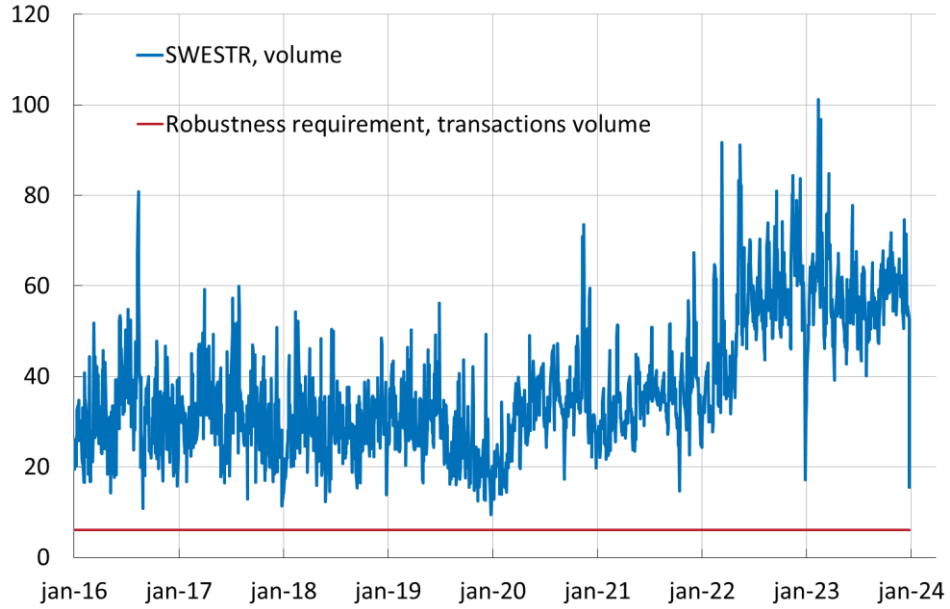



Source: The Riksbank

## Historical outcomes for the requirement regarding transaction volume

The robustness requirement for the total traded volume has often been far from the limit value but fell to a low of SEK 9.4 billion when the policy rate was zero per cent at the end of 2019. On average, turnover has been SEK 52 billion since SWESTR began publishing in September 2021 (Diagram 17).

**Diagram 17. Transaction volume and robustness requirements for transaction volume**

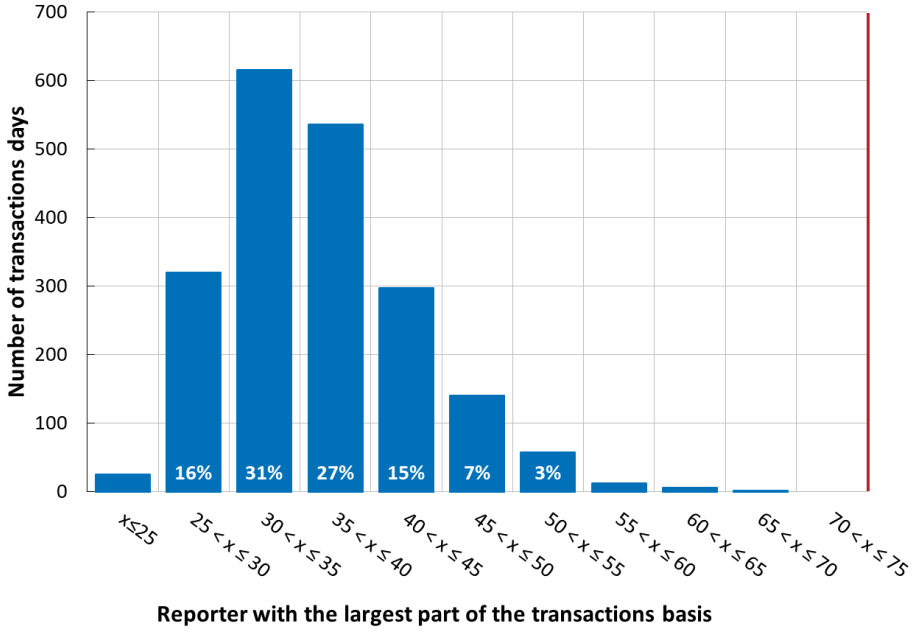



Source: The Riksbank

## Historical outcomes for the concentration requirement

The 75 per cent concentration requirement itself is rarely close to being breached. The highest score since 2016 is 69 per cent, while the average concentration has been 39 per cent since SWESTR was first published (Diagram 18).

**Diagram 18. Concentration on the counterparty with the highest transaction volume and concentration robustness requirements**

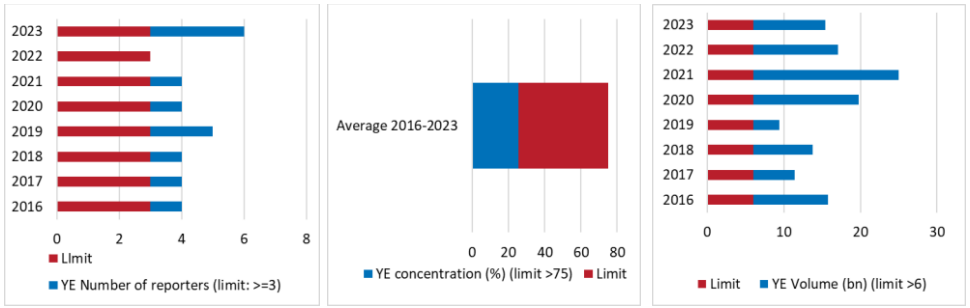



Source: The Riksbank

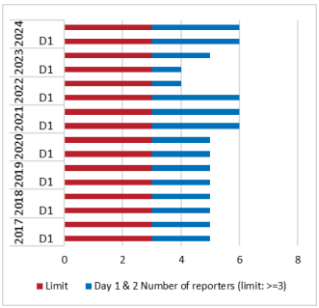
Note. Due to confidentiality reasons, this figure is presented with bars representing concentration ranges. This also applies to Figure 19, below.

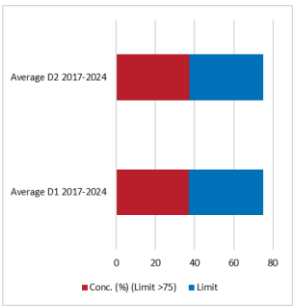
**Diagram 19. Robustness requirements outcomes around the turn of the year**

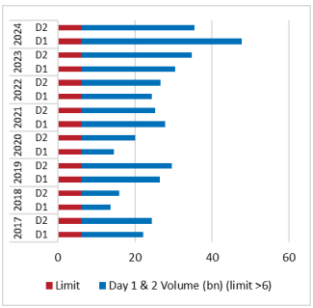
**Robustness requirements and outcomes during the year-end days**



**Robustness requirements and outcomes on the first and second day of the year**




## 5.4 Changes in regulations and policy documents for SWESTR

### Regulation for the administration of SWESTR (2023-01290)

3.4.1. Robustness requirements (change required)

3.5.3. Alternative calculation methods (amendment required)

### Information document SWESTR Comprehensive information on Sveriges Riksbank's framework for SWESTR

2.4 Robustness requirements (amendment required)

2.5. 3 Alternative calculation methods (amendment required)

2.8 Special rules for year-end (amendment required)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