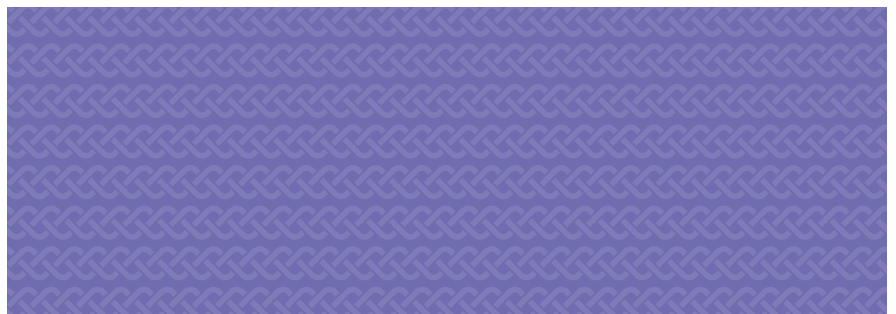




Discussion Paper

Supporting Risk-Free Rate transition through the provision of compounded SONIA

February 2020





BANK OF ENGLAND

February 2020

Supporting Risk-Free Rate transition through the provision of compounded SONIA

A Discussion Paper

This Discussion Paper includes illustrative calculations, based on published SONIA data, which are intended only to show how the proposed compounding products could work, and should not be used for any other purpose. The proposed methodology may change before it is finalised, including in response to comments made during this process.

Executive summary

The Bank of England and the Financial Conduct Authority are working closely with market participants to support the use of SONIA – the Sterling Overnight Index Average – as the predominant interest rate benchmark in sterling financial markets as markets transition away from LIBOR.

In order to accelerate the adoption of SONIA as a reference rate in sterling markets, the Bank is seeking views from sterling market participants on:

- the Bank’s intention to publish a daily **SONIA Compounded Index**. This is intended to support the use of SONIA in a wide range of financial products by simplifying the calculation of compounded interest rates; and
- the usefulness of the Bank publishing a simple set of compounded **SONIA Period Averages**, which would give users easy access to SONIA interest rates compounded over a range of set time periods. As the set periods used to generate such averages cannot always align with those currently applied in products referencing SONIA, the Bank is seeking to establish whether there is market consensus on how to define the relevant time periods. The Bank is inviting comment on the options presented in this paper, after which it will decide whether it would be helpful to publish such averages.

SONIA reflects the average of interest rates that banks pay to borrow overnight, unsecured sterling cash on a given day. SONIA plays a critical role in sterling markets. It is widely used as a reference rate to determine the interest payable on a range of floating rate instruments. For instance, it underpins the Overnight Indexed Swap (OIS) market, with a notional value of outstanding contracts exceeding £13 trillion, and is used as the basis for valuation of a wide range of other products.

Products that currently use SONIA as a reference rate typically pay interest on a periodic basis (e.g. every 6 or 12 months). The interest due is calculated as a ‘compound average’ of the individual overnight SONIA rates across the period. The resulting interest rate is equivalent to a rolling overnight loan over the same period of time, but without the operational overhead of daily cash flows. This calculation is long established as the basis for the OIS market, but requires a large number of data points and may not be familiar to some non-financial end users, including many corporates.

In order to support and accelerate the widespread adoption of SONIA as a reference rate for products such as loans, the Bank intends to provide a simple means for users to work out the compound interest due on products without performing calculations using each day’s underlying SONIA rate.

The Bank intends to publish a SONIA Compounded Index, which is a number representing the returns from a rolling investment earning interest each day at the SONIA rate. The change in this index between any two dates could be used to calculate the interest rate payable on a SONIA product over that period. This is consistent with the approach taken by the Federal Reserve Bank of New York and the forthcoming publication of its SOFR Index.

Subject to feedback, publication of the SONIA Compounded Index is anticipated to commence by end-July 2020, with a more precise date to be communicated in 2020 Q2.

In addition to the SONIA Compounded Index, the Bank is considering whether – and, if so, how – to publish daily a simple set of SONIA Period Averages. These could directly provide the interest rate payable over specific periods of time (i.e. the compounded rate over the last X days or months).

This approach has the merit of further reducing the calculations that most users will have to perform, making it an even simpler way of getting compound rates than using the SONIA Compounded Index. However, that convenience comes at a cost. It is not possible to generate a simple set of period averages that will always reflect precisely the same time periods as currently used in products which reference SONIA. These small differences in how time periods are defined would lead to differences in the calculation of interest. For example, a loan referencing a period average and an OIS hedge paying coupons on the same frequency will not always have identical interest period, reducing the effectiveness of the hedge.

The Bank is seeking feedback from sterling market participants on the potential usefulness of publishing these rates and on preferred conventions for calculating them if taken forward.

In particular, participants should consider whether they are willing to accept such a trade-off between the added simplicity of an easily accessible set of period averages; and the potential inconsistency if they also use products that have adopted different approaches.

Were the Bank to publish a set of period averages, we would require a market consensus on how to define the relevant time periods. The Bank's current view is that failure to reach consensus on such conventions would undermine the potential benefits of publishing SONIA Period Averages, and is therefore likely to lead it to opt not to publish such averages.

Responses to the questions posed in this paper are invited by 9 April 2020.

Contents

Executive summary	1
1 Introduction.....	4
1.1 Use of SONIA in financial contracts	4
1.2 The role of the Bank.....	5
1.3 Structure of this paper	6
1.4 Next steps	6
1.5 Use of data	7
2 A SONIA Compounded Index	8
2.1 A SONIA index	8
2.2 Calculation methodology	9
2.3 Calculating compounded SONIA rates from the index	10
2.4 Publication	11
2.5 Compatibility with offsets between interest and reference periods	11
2.6 Implementation	12
3 SONIA Period Averages.....	13
3.1 Defining unique reference periods	13
3.2 Possible reference period start date conventions.....	14
3.3 A possible calculation methodology	16
3.4 Access and implementation.....	16
Annex 1 – Worked example of calculating compounded SONIA rates	17
Annex 2 – List of questions	18

1 Introduction

1 SONIA (the Sterling Overnight Index Average) is a measure of the rate at which interest is paid on sterling short-term wholesale funds in circumstances where credit, liquidity and other risks are minimal.¹ It is based on actual transactions and reflects the average of the interest rates that banks pay to borrow unsecured sterling cash overnight from other financial institutions.

2 The Bank has been the administrator of SONIA since 2016, and implemented reforms to its methodology in April 2018 to strengthen the benchmark by broadening its market coverage to ensure it is as robust and representative as possible.²

3 In April 2017 the Working Group on Sterling Risk-Free Reference Rates (RFRWG) selected SONIA as the markets' preferred near risk-free interest rate benchmark (RFR) for use in sterling derivatives and relevant financial contracts.³ Since then the RFRWG has been working with the UK authorities (the Bank and the Financial Conduct Authority (FCA)) to encourage a transition from LIBOR to SONIA as the predominant interest rate benchmark in sterling financial markets.

4 The need for a transition to SONIA arises from fundamental weaknesses in LIBOR, in particular the very limited volume of underlying transactions. Continued reliance on LIBOR has been identified as a financial stability risk by the Bank's Financial Policy Committee (FPC).⁴ The Bank and the FCA are therefore working closely with market participants through the RFRWG to encourage an orderly and timely transition to SONIA. The intention is that sterling LIBOR will cease to exist after the end of 2021 and market participants should plan on removing dependence on these rates before then. Transition away from LIBOR is also underway in other jurisdictions.

5 On 16 January 2020 the RFRWG released a set of priorities and an updated roadmap for sterling market transition in 2020, to ensure sufficient progress is made ahead of the end of 2021.⁵ These include a target to cease, by end-Q3 2020, the issuance of sterling LIBOR-based cash products maturing beyond 2021. On the same day the Bank and FCA and released a joint letter to major banks and insurers supervised in the UK in support of these objectives. This letter set out the initial expectations of the Prudential Regulation Authority and FCA of firms' transition progress during 2020, including in relation to the Q3 target set by the RFRWG, and highlighted the FPC's close monitoring of the steps being taken. The steps proposed by the Bank in this paper are intended to support the achievement of this target.

1.1 Use of SONIA in financial contracts

6 Financial businesses and institutions already use SONIA in a variety of ways. For example, to calculate the interest paid on swap transactions and sterling floating rate notes (FRNs).

7 Products that currently use SONIA as a reference rate typically pay interest on a periodic basis (e.g. every 6 or 12 months). The interest due is typically calculated as a 'compound average' of the individual overnight SONIA rates across the period. The convention in sterling markets for averaging

¹ SONIA is the trademark of the Bank of England.

² www.bankofengland.co.uk/-/media/boe/files/news/2018/april/sonia-reform-implemented.pdf

³ The RFRWG is a private sector industry group supported by the Bank of England and FCA. For more on the RFRWG's work see www.bankofengland.co.uk/markets/transition-to-sterling-risk-free-rates-from-libor

⁴ www.bankofengland.co.uk/-/media/boe/files/financial-policy-summary-and-record/2019/december-2019.pdf

⁵ www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/rfr/rfrwgs-2020-priorities-and-milestones.pdf

SONIA is to use a daily compounding approach.⁶ The resulting interest rate is equivalent to a rolling overnight loan over the same period of time, but without the operational overhead of daily cash flows. This averaging process also has the benefit of smoothing out any idiosyncratic changes in market rates on individual days during the period. Annex 1 provides a worked example of this.

8 As part of its 16 January 2020 publications, the RFRWG released a report from a cross-market Term Rate Use Case Task Force, comprised of both lenders and borrowers, who reviewed the applicability of compounded SONIA for use across a wide range of cash products.⁷ A broad-based consultation and analysis conducted by the Task Force showed that a simple rate, based on overnight SONIA compounded in arrears, can give the desired cash flow certainty for approximately 90% of sterling LIBOR loans (by value). Feedback also confirmed this approach is operationally achievable and provides greater consistency with the basis for pricing interest rate hedges.

9 The calculation of compounded SONIA is already the established basis for the OIS market and has more recently been adopted by the sterling FRN market. But it requires a number of data points to calculate and may be less accessible to a broader range of end users outside of financial markets. For example, to calculate the compounded interest rate for a three month period requires approximately 60 data points, creating practical obstacles to widespread adoption among non-financial end users such as corporates looking to access and manage borrowing and hedging products.

10 As the transition to SONIA progresses – and in particular reflecting the markets’ Q3 target to cease issuance of sterling LIBOR-based cash products maturing beyond 2021 – there is a greater premium on the ability of all participants in sterling markets, including non-financial end users, being able to understand and use SONIA-referencing products.

11 There have been a number of private sector initiatives to simplify the calculation of compounded rates. Nevertheless, feedback to the Bank from a range of market participants and trade associations suggests that users are seeking a single, trusted ‘golden source’ – ideally from the administrator of SONIA – from which compounded rates can be calculated. This would complement, and act as a cross-check to, rates provided by commercial providers

1.2 The role of the Bank

12 As SONIA’s administrator, we believe the Bank can help to simplify the calculation of interest on a standardised basis through the publication of an official source of compounded SONIA data. This official source of data could complement, underpin and cross-check private sector initiatives aimed at providing solutions tailored to users’ specific needs.

13 In considering what the Bank could publish, we have taken into account two design principles:

- Simplicity – any measures produced should be few in number, easily understood and capable of unambiguous application; and
- Wide utility – any measures produced should be usable by a wide range of stakeholders across different parts of the economy.

⁶ For example the International Swaps and Derivatives methodology for compounding overnight rates in swap contracts: www.isda.org/a/EHmEE/Supplement-number-55-to-the-2006-ISDA-Definitions.pdf

⁷ www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/rfr/use-cases-of-benchmark-rates-compounded-in-arrears-term-rate-and-further-alternatives.pdf

14 This paper sets out the Bank’s proposed approach to publishing a daily “**SONIA Compounded Index**” to provide a simple means of calculating compounded SONIA rates over any given period.

15 In addition to a SONIA Compounded Index the Bank is considering whether – and, if so, how – to publish daily a simple set of “**SONIA Period Averages**”. These could provide easy to access measures of the interest rate payable on a compounded basis over specific periods of time. But that added simplicity comes at a cost: period averages cannot be produced without some divergence away from existing market practice for defining relevant interest periods.

16 Given this trade-off, the Bank is seeking feedback on the potential usefulness of publishing period averages, and whether there is sufficient market consensus on the conventions underpinning such rates, before deciding whether to take them forward. Without sufficient consensus the publication of period averages could lead to further fragmentation, failing to meet the ‘wide utility’ design principle.

Glossary of terms used in this discussion paper

SONIA	The overnight interest rate benchmark administered by the Bank of England
Compounded SONIA rate	The interest rate due over a given period, calculated by compounding daily SONIA rates using a standard calculation
SONIA index	A series of daily data that represent the returns from a rolling unit of investment earning compound interest at the SONIA rate each day. The index the Bank intends to publish would be called the ‘SONIA Compounded Index’.
SONIA Period Average	A published compounded rate applicable to a specified period of time (e.g. 30 days, or 6 months), made available on a daily basis.
Business day	A day on which SONIA is published: every day Monday to Friday that is not a UK Bank Holiday.
Interest period	The period over which interest accrues for each interest payment.
Reference period	The period of time over which SONIA rates are observed to calculate the compounded rate. This is frequently the same as the interest period, but can be offset by a number of days to create visibility of cash flows ahead of the interest payment date.

1.3 Structure of this paper

17 Section 2 discusses the methodology the Bank intends to adopt for calculating the SONIA Compounded Index, how it could be used and proposed policies in relation to publication of the data.

18 Section 3 discusses how SONIA Period Averages could be constructed and seeks market feedback on which approach should be adopted if the Bank were to produce them.

1.4 Next steps

19 The questions the Bank would like specific feedback on are highlighted throughout the relevant sections of this paper. Respondents should provide answers to any questions by visiting the online survey page at: <https://app.keysurvey.co.uk/f/1470161/3959/>.

20 Responses and feedback are requested by 9 April 2020.

21 If you have any general queries relating to this consultation, please email the Bank at:

benchmarkadministration@bankofengland.co.uk

22 Following receipt of responses, the Bank intends to provide its final view on the design of the SONIA Compounded Index and its approach to producing SONIA Period Averages during Q2 2020. A key factor that the Bank will consider when deciding whether to publish SONIA Period Averages is whether feedback to this discussion paper shows there to be sufficient market consensus on which convention to adopt. The Bank's current view is that failure to reach consensus on conventions would undermine the potential benefits of publishing SONIA Period Averages, and is therefore likely to lead it to opt *not* to publish them.

23 Subject to the feedback to this discussion paper, the Bank anticipates commencing publication of the SONIA Compounded Index by end-July 2020.

1.5 Use of data

24 By responding to this discussion paper, you provide personal data to the Bank of England (the Bank). This may include your name, contact details (including, if provided, details of the organisation you work for), and opinions or details offered in the response itself.

25 Your response to this discussion paper is being sought to inform our work as a central bank, both in the public interest and in the exercise of our official authority. We may use your details to contact you to clarify any aspects of your response.

26 We will retain all responses for the period that is relevant to supporting ongoing policy developments and reviews. To find out more about how we deal with your personal data, your rights or to get in touch please visit www.bankofengland.co.uk/legal/privacy.

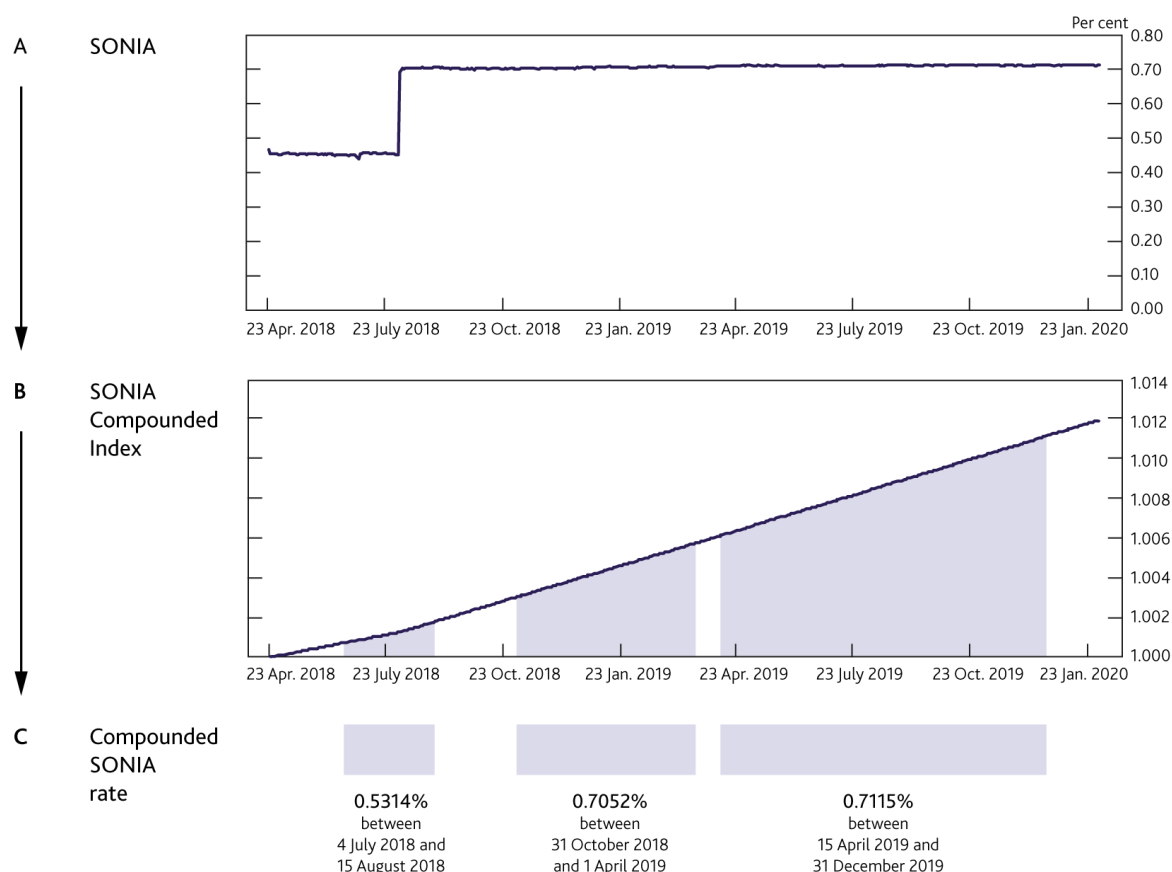
27 Information provided in response to this discussion paper, including personal information, may be subject to publication or disclosure to other parties in accordance with access to information regimes including under the Freedom of Information Act 2000 or data protection legislation, or as otherwise required by law or in discharge of the Bank's functions.

28 The Bank envisages publishing responses to the questions in this paper in anonymised form and a list of respondents. If you would prefer not to be named in that list, please specify this in your response. By responding to the paper, you accept that the Bank may publish your feedback in anonymised form. Please indicate if you regard all, or some of, the information you provide as confidential. If the Bank receives a request for disclosure of this information, we will take your indication(s) into account, but cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system on emails will not, of itself, be regarded as binding on the Bank of England.

2 A SONIA Compounded Index

2.1 A SONIA index

29 Conceptually, this index is equivalent to a series of daily data representing the returns from a rolling unit of investment earning compound interest each day at the SONIA rate. The change in this Index between any two dates can be used to calculate the interest rate payable over that period as illustrated in the below diagram.⁸



30 Along with being simple and having wide utility, the three main benefits of such an index would be:

- **Ease** – the index would make it easier to calculate compounded SONIA interest rates, requiring only two data points compared to one for each day in the reference period;
- **Reduction of uncertainty** – the index would use a consistent and standard set of conventions, for example relating to the rounding of data used in the calculation process, reducing the scope for confusion over different calculation methodologies, and making reconciliation between users simpler; and
- **Flexibility** – the index would provide end-users with the flexibility to calculate the compounded rate for any combination of start and end dates and any maturity.

⁸ Andrew Hauser's speech: *Turbo-charging sterling LIBOR transition: why 2020 is the year for action – and what the Bank of England is doing to help* (www.bankofengland.co.uk/speech/2020/andrew-hauser-isd-sifma-amg-benchmark-strategies-forum-2020) contains a similar diagram. Both reflect the same underlying data, but use different examples to illustrate the flexibility of the SONIA Compounded Index.

31 These benefits would also help end-users to understand, compare and reconcile the interest payments they are charged; and help infrastructure providers develop simpler, more scalable internal processes and reduce operational risks associated with manual inputs.

32 The Bank judges that publishing an index would accelerate more widespread use of compounded SONIA and support alignment with existing SONIA derivative products. While the Bank's proposed SONIA Compounded Index is designed to help simplify processes, its use would be optional and would serve as a complement to other available metrics and calculation tools in the market.

2.2 Calculation methodology

33 The Bank is mindful of the benefits of international consistency to support cross border business and reduce operational complexity. As such, the proposed methodology of the SONIA Compounded Index is consistent with the approach taken by the Federal Reserve Bank of New York in the design of its SOFR Index.⁹

34 The SONIA Compounded Index would measure the cumulative returns over time from earning interest of SONIA on a unit of investment, with the initial value set to 1.0000000000 on 23 April 2018. This was the day on which the Bank's 2018 reforms to the SONIA methodology were implemented.¹⁰ The index would be incrementally adjusted each business day thereafter to reflect the additional compound interest earned by reinvesting at that day's SONIA rate. As a result, the SONIA Compounded Index value on a given day would reflect the effect of compounding SONIA across all previous business days since 23 April 2018.

35 The SONIA Compounded Index would be calculated as:

$$SONIA\ Compounded\ Index_i = SONIA\ Compounded\ Index_{i-1} \times \left(1 + \frac{SONIA_{i-1} \times a_{i-1}}{365}\right)$$

Where:

- SONIA Compounded Index_i* = The index for date *i*, calculated and published on date *i* (*SONIA Compounded Index₁* = 1.0000000000 published on 23 April 2018)
- SONIA_{i-1}* = The SONIA rate for business day *i-1*, published on business day *i*,
- a_{i-1}* = The number of calendar days for which *SONIA_{i-1}* applies. This is equal to the number of calendar days between business day *i-1* and business day *i*

i represents a series of ordinal numbers representing each business day from 23 April 2018 onwards

36 As set out in the Sterling Money Market Code the standard day count convention for sterling markets is ACT/365.¹¹

37 An illustrative series of SONIA Compounded Index data, which should not be considered official published rates, are available on the Bank's website: www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/illustrative-sonia-compounded-index.

⁹ www.newyorkfed.org/markets/opolicy/operating_policy_200212

¹⁰ SONIA for 23 April 2018 was first published on 24 April 2018.

¹¹ See Annex 2: www.bankofengland.co.uk/-/media/boe/files/markets/money-markets-committee/uk-money-markets-code.pdf

38 The production of the SONIA Compounded Index would be governed as part of the Bank’s broader SONIA administrative arrangements. The Bank’s administration of SONIA has been designed to meet the standards of international best practice set out in the International Organization of Securities Commissions Principles for Financial Benchmarks. We have published our statement of compliance with these principles,¹² which we would update in due course to reflect the publication of the SONIA Compounded Index.

2.3 Calculating compounded SONIA rates from the index

39 To calculate the compounded SONIA rate for any reference period, the SONIA Compounded Index values for the start and end date of the reference period are combined in the following formula:

$$\text{Compounded SONIA rate between } x \text{ and } y = \left(\frac{\text{SONIA Compounded Index}_y}{\text{SONIA Compounded Index}_x} - 1 \right) \times \frac{365}{d}$$

Where:

x = start date of the reference period

y = end date of the reference period

d = the number of calendar days in the reference period

40 The below demonstrates how the SONIA Compounded Index was used to calculate the compounded SONIA rates shown in the diagram in section 2.1.

Start Date	SONIA Compounded Index	End Date	SONIA Compounded Index	Compounded SONIA rate for period
04/07/18	1.0008921593	15/08/18	1.0015041733	$\left(\frac{1.0015041733}{1.0008921593} - 1 \right) \times \frac{365}{42} = 0.5314\%$
31/10/18	1.0029876699	01/04/19	1.0059329909	$\left(\frac{1.0059329909}{1.0029876699} - 1 \right) \times \frac{365}{152} = 0.7052\%$
15/04/19	1.0062058623	31/12/19	1.0113056954	$\left(\frac{1.0113056954}{1.0062058623} - 1 \right) \times \frac{365}{260} = 0.7115\%$

41 The convention in the current SONIA referencing OIS market is the compounded SONIA rate used is a percentage number rounded to 4 decimal places at the end of the compounding calculation.¹³ The Bank judges that publishing the SONIA Compounded Index rounded to 10 decimal places provides the necessary level of detail in order to minimise differences between the results produced by compounding each individual SONIA rate published in the period and by those calculated from SONIA Compounded Index values. Annex 1 compares the calculation of a compounded SONIA rate using the standard formula versus the SONIA Compounded Index for illustrative purposes.

¹² www.bankofengland.co.uk/markets/sonia-benchmark/sonia-statement-of-compliance-with-the-iosco-principles-for-financial-benchmarks

¹³ www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/statement-and-summary-of-responses-to-sonia-conventions-discussion-paper.pdf

2.4 Publication

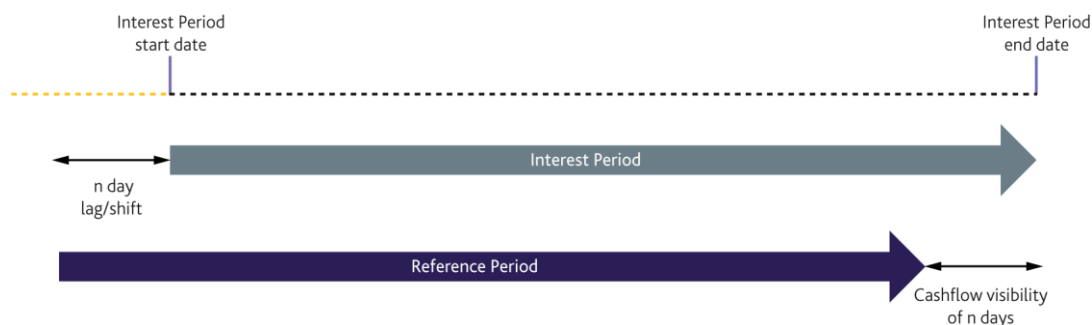
42 Publication of the SONIA Compounded Index would be aligned with existing processes for SONIA, and is expected to be covered by similar licensing arrangements.¹⁴

- The SONIA Compounded Index for a given London business day would be first made available to licensees at 09:00 on that business day.¹⁵ Bloomberg and Refinitiv, as existing named authorised redistributors of the SONIA benchmark, have confirmed they would also publish the SONIA Compounded Index, making it available to their clients, in the same way as SONIA.
- The SONIA Compounded Index would be made freely available via the Bank of England's Interactive Statistical Database by 10:00 on the business day after it is first published. Reproduction of these data in the Database are subject to the terms of the UK Open Government Licence,¹⁶ allowing and encouraging free and flexible data reuse.

43 Consistent with the republication policy for the SONIA benchmark,¹⁷ and reflecting that the primary input into the calculation of the index is SONIA, the SONIA Compounded Index would only be republished if either SONIA is republished, or an error is identified in the calculation of the index. Once the republication deadline of midday on the day that the index is first published has passed, no amendments would be made to the index under any circumstances.

2.5 Compatibility with offsets between interest and reference periods

44 To provide cash flow visibility ahead of interest payment dates, cash products based on compounded SONIA typically introduce a delay between the final relevant observation of SONIA and the payment date. This means that the reference period is 'offset' from the interest period.



45 One important feature of the proposed methodology for the SONIA Compounded Index is that each SONIA rate is weighted by the number of calendar days in the period it reflects. For example, the SONIA rate for a Friday has a weighting of 3 days when the following Monday is a business day.

¹⁴ See Section 3 of www.bankofengland.co.uk/markets/sonia-benchmark/sonia-key-features-and-policies

¹⁵ If a user had an interest period which started or ended on a non-good London business day, and wanted to reference the SONIA index, the contract would have to define a method of interpolation to calculate the SONIA index level for that non-good business day based on the index levels published on the adjacent good business days.

¹⁶ www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

¹⁷ See Section 6.1 of www.bankofengland.co.uk/markets/sonia-benchmark/sonia-key-features-and-policies

46 Use of the SONIA Compounded Index would be compatible with any product that uses an offset mechanism that preserves this relationship.¹⁸ This is commonly referred to as an ‘observational shift’ convention and has been used in US and Swiss RFR-referencing FRN markets, for example.

47 Products that apply conventions that do not preserve the above relationship would not be able to use the SONIA Compounded Index. An example is the ‘observational lag’ approach which has been commonly used in the SONIA FRN and SONIA securitisation markets to date.¹⁹ However, products with an offset mechanism which are incompatible with the proposed methodology for the SONIA Compounded Index could continue to use interest calculation processes that are not reliant on production of an index, in line with current practice.²⁰

2.6 Implementation

48 Subject to feedback received on this paper, the Bank anticipates it would commence publication of the SONIA Compounded Index by the end of July 2020. The Bank intends to confirm the precise go live date when publishing its response to feedback to this discussion paper in Q2 2020.

Question 1

Do you support the Bank producing a SONIA Compounded Index?

Question 2

Do you have any comments on the Bank’s proposed design of the SONIA Compounded Index?

¹⁸ Where each SONIA rate is weighted according to the number of days that apply in the reference period.

¹⁹ Where each SONIA rate is weighted according to the number of days that apply in the interest period.

²⁰ It is possible to construct an index using the observational lag convention, but a different index would be required for each potential length of lag. Publication of multiple indices is not seen as desirable as it would fail the ‘simplicity’ design principle. This is particularly true of the loan market where a variable length lag is considered more appropriate by the RFRWG.

3 SONIA Period Averages

49 The Bank's proposed SONIA Compounded Index offers a simple way for users to calculate a wide range of compounded SONIA rates, supporting the majority of SONIA's existing uses. The Bank is nevertheless aware that some market participants may prefer a *further* simplification. This could be achieved by publishing compounded rates that can be directly referenced in contracts.

50 In addition to the SONIA Compounded Index, the Bank is therefore considering whether – and, if so, how – to define and publish daily a set of 'SONIA Period Averages'. These would provide the interest rate payable over specific periods of time (i.e. the compounded rate over the last X days or months).

51 This approach has the merit of further reducing the calculations that most users would have to perform in order to know the relevant compounded rate. However, that convenience comes at a cost. As explained below, it is not possible to generate a simple set of period averages that will always reflect precisely the same reference periods as currently used in products which use SONIA.

52 Small differences in how time periods are defined could lead to mismatches between products. For example, a loan referencing a period average and an OIS hedge paying coupons on the same frequency will not always have identical reference periods, reducing the effectiveness of the hedge. Defining the reference periods is therefore the most important design choice and is discussed in more detail below.

53 Publishing a large number of alternatives could risk undermining the very certainty that borrowers need. With that in mind, consistent with the 'simplicity' design principle, the Bank would only consider producing a limited set of averages: one for each of a small number of periods of time, each day.

54 The Bank is seeking feedback from sterling market participants on the potential usefulness of publishing period averages and on preferred conventions for calculating them if taken forward. In particular, participants should consider whether they are willing to accept the trade-off between the added simplicity of an easily accessible set of period averages; and the potential inconsistency if they also use products that have adopted different approaches.

55 Were the Bank to publish a set of period averages we would require sufficient market consensus on how to define the reference periods. The Bank's current view is that failure to reach consensus on such conventions could introduce further fragmentation and complexity undermining the potential benefits of publishing SONIA Period Averages; failing the 'wide utility' design principle. Given this, in the absence of a clear market consensus it is likely the Bank would choose not to publish period averages at this time.

3.1 Defining unique reference periods

56 To meet the Bank's 'simplicity' design principle there would need to be a single SONIA Period Average rate published for each period, each day. However, the Bank's analysis is that it would not be possible to base these on existing conventions for defining reference periods as they do not provide a unique mapping between all start and end dates.

57 To illustrate this issue, the table below shows the start and end date of a 'three month' interest period for three successive days. In this example, the "modified following" date convention, which is

commonly used in contracts, has been applied to identify the appropriate business day when the period would end, where this would otherwise fall on Christmas Day or Boxing Day.

58 In the “modified following” convention, if the interest period end date falls on a weekend or bank holiday, the end date rolls forward to the next business day; if the next business day falls in the next calendar month, the payment day rolls back to the preceding business day.

Start date	End date
Wed 25 Sep 2019	Fri 27 Dec 2019
Thu 26 Sep 2019	Fri 27 Dec 2019
Fri 27 Sep 2019	Fri 27 Dec 2019

59 While the start date is different in each example, the end date is the same. As a result the interest period for each is also different in length, and the compounded rate for each period would typically also be slightly different. This means that a (notionally) three month period average rate published on 27 December 2019 could therefore have three different conceivable values.

60 It is equally possible for a given start date to have multiple end dates, for example when an interest period roll date falls on a weekend.

61 For the Bank to be able to publish SONIA Period Averages, a convention would need to be adopted to define an unambiguous start date for each day the SONIA Period Average was published.

3.2 Possible reference period start date conventions

62 Reference periods typically used in sterling cash markets are (broadly) one, three and six months long. The Bank has identified three possible calendar conventions for defining the reference period start date relative to the end (publication) date. Illustrative examples are below.

Option 1 - Reference periods of exactly 30, 90 and 180 days.

- Start dates are exactly 30, 90 and 180 calendar days prior to the publication date, irrespective of whether it is a business day or not.
- If the start date falls on a non-business day, then the SONIA rate from the preceding business day is applied and pro-rated between the start date and the first business day of the period.

This option is consistent with the methodology adopted by the Federal Reserve Bank of New York for calculating SOFR averages.²¹

Option 2 - Reference periods of exactly 1, 3 and 6 months.

- Start dates are determined to be exactly 1 month, 3 months and 6 months prior to the publication date, i.e. a publication date of 15 March would have start dates of 15 February, 15 December, and 15 September respectively.
 - If the provisionally determined start date falls on a non-good calendar day, then the start date is moved to be the last calendar day of the month, for example ‘31 September’ becomes 30 September.
- If the start date falls on a non-London business day, then the SONIA rate from the preceding business day is applied and pro-rated between the start date and the first business day of the period.

²¹ www.newyorkfed.org/markets/opolicy/operating_policy_200212

Option 3 - Reference periods of 1, 3 and 6 months, adjusted to start on a business day.

The start dates of the reference period are generated using rules which ensure they always occur on business days and closely match the periods used for the 'Modified Following' calendar conventions.

Having identified all possible start dates corresponding to the publication date under the 'Modified Following' convention, a waterfall is applied to identify a unique start date for the reference period:

- i. For each publication date that has a unique start date when using the Modified Following calendar convention that start date is used.
- ii. If the publication date is the last business day of the month, the start date is the last business day of the relevant month.
- iii. For each publication date that has multiple start date possibilities when using the Modified Following calendar convention:
 - If there is an uneven number of possible start dates, the middle option is chosen.
 - If there is an even number of possible start dates, the earlier of the two dates surrounding the mid-point is chosen.
- iv. Otherwise, if there is no valid start date corresponding to the publication date, the start date is deemed to be exactly 1, 3, or 6 months prior to the publication date, adjusted as follows:
 - If the provisionally determined start date falls on a non-good business day, and the following business day is in the same month as the provisionally determined start date, then the start date is moved to the following business day.
 - If the provisionally determined start date falls on a non-good business day, and the following business day is in the following month to the provisionally determined start date, then the start date is moved to the previous business day.

This option is broadly analogous with the methodology provisionally adopted in Switzerland.²²

63 The table below provides illustrative examples of the reference periods for the three options. For ease, the tenor approximating to one month has been used.

Publication date (reference period end date)	Reference period start date		
	Option 1	Option 2	Option 3
Thu 19/12/19	Tue 19/11/19	Tue 19/11/19	Tue 19/11/19
Tue 31/12/19	Sun 01/12/19	Sat 30/11/19	Fri 29/11/19
Fri 31/01/20	Wed 01/01/20	Tue 31/12/19	Tue 31/12/19
Thu 06/02/20	Tue 07/01/20	Mon 06/01/20	Mon 06/01/20
Mon 17/02/20	Sat 18/01/20	Fri 17/01/20	Thu 16/01/20
Wed 26/02/20	Mon 27/01/20	Sun 26/01/20	Mon 27/01/20

Question 3

Do you think the Bank should produce SONIA Period Averages?

- If no, please explain why.
- If yes, which of the three options for determining the start date of the reference period do you prefer, and why?

²² www.six-group.com/exchanges/indices/data_centre/swiss_reference_rates/compound_rates_en.html

3.3 A possible calculation methodology

64 If consensus on the convention to calculate the start date of the reference period is achieved, and the Bank decides to proceed, the Bank envisages that SONIA Period Averages would be calculated using the formula in Section 2.3 above.

65 Consistent with the existing convention for rounding compounded SONIA in contracts, were the Bank to produce SONIA Period Averages, the published rates would be rounded to 4 decimal places.²³

Question 4

Do you agree with the suggested rounding of SONIA Period Averages to 4 decimal places (when in percentage points)?

3.4 Access and implementation

66 Were the Bank to produce a set of SONIA Period Averages, they would likely be covered by similar licensing arrangements as are currently in place for SONIA and published in a similar way to SONIA and the SONIA Compounded Index (see Section 2.4 above).

Question 5

Are there other changes that would make SONIA Period Averages more useful and, if so, please describe these in detail?

²³ www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/statement-and-summary-of-responses-to-sonia-conventions-discussion-paper.pdf

Annex 1 – Worked example of calculating compounded SONIA rates

The table below contains the SONIA rate and illustrative SONIA Compounded Index data for the period Monday 6 January 2020 to Monday 13 January 2020.

Publication date	SONIA value date	SONIA rate	Calendar days applicable	SONIA Compounded Index value date	SONIA Compounded Index
Mon 06/01/20	Fri 03/01/20	0.7110%	N/A	Mon 06/01/20	1.0114238727
Tue 07/01/20	Mon 06/01/20	0.7124%	1	Tue 07/01/20	1.0114436135
Wed 08/01/20	Tue 07/01/20	0.7120%	1	Wed 08/01/20	1.0114633436
Thu 09/01/20	Wed 08/01/20	0.7124%	1	Thu 09/01/20	1.0114830852
Fri 10/01/20	Thu 09/01/20	0.7123%	1	Fri 10/01/20	1.0115028243
Mon 13/01/20	Fri 10/01/20	0.7117%	3	Mon 13/01/20	1.0115619931

The calculations below illustrate how the compound rate for a loan drawn on Monday 6 January 2020 and repaid on Monday 13 January 2020 could be calculated using the currently used formula,²⁴ then using the SONIA Compounded Index.

$$\begin{aligned}
 \text{Compounded rate (using underlying SONIA)} &= \left[\prod_{i=1}^{d_o} \left(1 + \frac{SONIA_i \times n_i}{365} \right) - 1 \right] \times \frac{365}{d} \\
 &= \left[\left\{ \left(1 + \frac{0.007124 \times 1}{365} \right) \times \left(1 + \frac{0.007120 \times 1}{365} \right) \right. \right. \\
 &\quad \times \left(1 + \frac{0.007124 \times 1}{365} \right) \times \left(1 + \frac{0.007123 \times 1}{365} \right) \\
 &\quad \left. \left. \times \left(1 + \frac{0.007117 \times 3}{365} \right) \right\} - 1 \right] \times \frac{365}{7} \\
 &= 0.7121\%
 \end{aligned}$$

$$\begin{aligned}
 \text{Compounded rate (using the Index)} &= \left(\frac{SONIA \text{ Compounded Index}_{13/01/20}}{SONIA \text{ Compounded Index}_{06/01/20}} - 1 \right) \times \frac{365}{d} \\
 &= \left(\frac{1.0115619931}{1.0114238727} - 1 \right) \times \frac{365}{7} \\
 &= 0.7121\%
 \end{aligned}$$

²⁴ This example uses the International Swaps and Derivatives methodology for compounding overnight rates in swap contracts: www.isda.org/a/EHmEE/Supplement-number-55-to-the-2006-ISDA-Definitions.pdf

Annex 2 – List of questions²⁵

Question 1

Do you support the Bank producing a SONIA Compounded Index?

Question 2

Do you have any comments on the Bank's proposed design of the SONIA Compounded Index?

Question 3

Do you think the Bank should produce SONIA Period Averages?

- If no, please explain why.
- If yes, which of the three options for determining the start date of the reference period do you prefer, and why?

Question 4

Do you agree with the suggested rounding of SONIA Period Averages to 4 decimal places (when in percentage points)?

Question 5

Are there other changes that would make SONIA Period Averages more useful and, if so, please describe these in detail?

²⁵ See <https://app.keysurvey.co.uk/f/1470161/3959/>