Methods of applying the RFR and selected rules for calculating compound rates

Document of the National Working Group for benchmark reform

Methods of applying the RFR and selected rules for calculating compound rates

This document is for reference and educational purposes. It describes in detail selected methods of calculating the RFR-based interest rate and compound rates which have been indicated as recommended, in relation to each group of products and clients, in the recommendations prepared by the Banking Products, Leasing and Factoring Stream of the National Working Group (NWG) for benchmark reform.

An integral part of this document is the spreadsheet titled 'Methods of applying the RFR and selected for calculating compound rates in banking products', which includes practical examples of calculation of RFR-based interest flows in banking products.

All capitalised terms included herein (except for proper nouns) have been defined in the Glossary[1] prepared for the purposes of the NWG's activities in the wording valid as at the date of publication of this document.

This documents explains the Backward-looking rate use conventions:

- Lookback with Observation Period Shift, according to which the Reference Period Start Date and the Reference Period End Date are independently shifted by the defined number of Business Days backwards relative to the Interest Period Start Date and the Interest Period End Date, respectively. In this convention, the calculation of the compound rate uses Weights for O/N interest rates observed in the shifted Reference Period.
- Last Reset, according to which the Reference Period, from which the historical values of O/N interest rates used to determine the interest rate of a given current Interest Period come, covers the previous Interest Period.

For the Lookback with Observation Period Shift convention, three methods of determining interest flows in a financial instrument have been described:

- Method 1 – based on the use of returns from the published RFR Compound Indices.
- Method 2 – based on the use of RFR indices and the Cumulative Compounded Rate.
- Method 3 – based on the use of RFR indices and the Non-Cumulative Compounded Rate.

The entire document is composed of the following parts:

1. The use of the RFR to calculate daily interest,
2. The use of the RFR to calculate interest using the Lookback with Observation Period Shift convention,
3. The use of the RFR to calculate interest using the Last Reset convention,
4. Commentary on the examples presented in the enclosed spreadsheet.

[1] https://www.knf.gov.pl/knf/pl/komponenty/img/NGR_Slownik_pojec_81426.pdf

1. The use of the RFR to calculate daily interest

The approach – as referred to in the recommendations for overdraft and bank accounts for retail client and business client based on the O/N interest rate – envisages a direct use of the RFR benchmark provided and published by the Administrator. The values of that benchmark increased by the Spread Adjustment and the margin component provide the basis for calculating daily interest due for O/N Interest Periods[2].

The amount of interest due for the

a) i O/N Interest Period may be described using the following formula

$$Interest_i = K_i * (r_i + CAS + margin) * \frac{n_i}{365}, \quad (1)$$

b) the entire Interest Period may be described using the following formula

$$Interest = \sum_{i=1}^{M} Interest_i, \quad (2)$$

where:

$Interest_i$ – the amount of interest due for the i O/N Interest Period in a given Interest Period,

$Interest$ – the total amount of interest due in the Interest Period,

i – the ordinal number of the O/N Interest Period in a given Interest Period,

r_i – the value of the RFR benchmark used to calculate the amount of interest due in the i O/N Interest Period, published on the day which marks the start date of a given O/N Interest Period,

n_i – the number of calendar days in the i O/N Interest Period. If an O/N Interest Period starts on a day between Monday and Thursday, then n_i = 1 (provided there are no Non-Business Days). For an O/N Interest Period which starts on a Friday, n_i = 3 (provided there are no Non-Business Days). If there are Non-Business Days, the value increases by 1 for each Non-Business Day following a given day until the end date of the period,

K_i – the principal balance amount in the i O/N Interest Period,

CAS – the Spread Adjustment corresponding to the tenor of WIBOR,

$margin$ – the margin component applicable to overdraft,

M – the number of O/N Interest Periods in a given Interest Period (equal to the number of Business Days in the Interest Period).

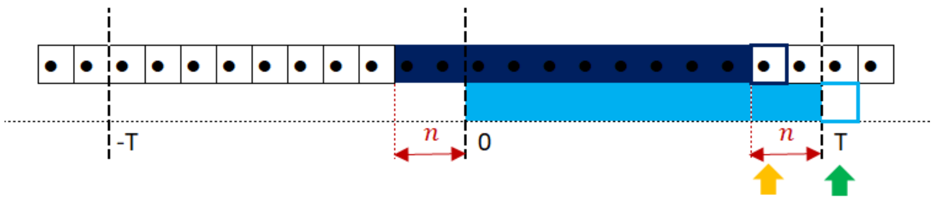
If an overdraft or a bank account for a retail and corporate client bears interest at a floating interest rate other than the O/N Interest Rate, the value of the benchmark r_i in the above formula must be

[2] The O/N Interest Period means a period running from a given Business Day to the next Business Day, composed of calendar days running from the start date of that period (including the start date of the period) until the day preceding the end date of that period (the next Business Day).

replaced with the relevant Compound Rate following from the terms of conversion of a given financial contract. Where applicable, contractual terms may require adjustment.

2. The use of the RFR to calculate interest using the Lookback with Observation Period Shift convention

The approach – as referred to in the recommendations for credit/loans other than overdraft for corporate client, and factoring products – envisages shifting the Start Date and End Date of the Observation Period (Reference Period) by a defined number of Business Days (up to five) backwards relative to the Interest Period Start Date and the Interest Period End Date (the same number of Business Days of the shift for the start date and the end date of the period), assuming that the Interest Period Start Date and the Interest Period End Date are Business Days. This convention uses Weights for RFR interest rates observed in the shifted Reference Period:



where:

Reference Period
Interest Period
0 Interest Period Start Date
T Interest Period End Date / Start date of the next Interest Period
-T Start date of the previous Interest Period
Payment determination date
Interest payment date

Shifting the Observation Period by a defined number of Business Days (up to five), in addition to allowing for the determination of the interest payment a defined number of Business Days before the date of making the payment, also minimises the negative impact related to such shift in the form of a change in the duration of the Observation Period[3].

If the Interest Period Start Date and the Interest Period End Date are Business Days, there is no need to apply any additional assumption as to the number of days of the Observation Period shift. To achieve that for the contracts where the Interest Period Start Date and the Interest Period End Date are set as a series of dates falling on the *i* day of the month and in a certain month that day is not a Business Day, then the Interest Period Start Date and the Interest Period End Date may be shifted to the next Business Day (this also applies to cases where the Interest Period Start Date or the Interest Period End Date falls on the end of the month, with a proviso that if the Interest Period End Date falls on the end of the month and such day is not a Business Day, then the shift may be done backwards to the last preceding Business Day).

Alternatively, if the Interest Period Start Date or the Interest Period End Date is a Non-Business Day, it is necessary to properly adjust the shift of the observation date for the first O/N Interest Period. The operating algorithm has been described in Chapter 4 in the comment on Example #2.2.

[3] As a general rule, the Observation Period should coincide with the Interest Period because the former would then best reflect the economic reality for a given Interest Period. However, in this case the interest payment would be known only at the Interest Period End Date.

Three methods of determining the amount of interest flows in a financial instrument may be indicated for the set compound rate calculation convention (e.g. Lookback with Observation Period Shift):

- Method 1 – based on the use of returns from the published RFR Compound Indices – using the RFR Compound Index,
- Method 2 – based on the use of RFR indices and the (annualised) Cumulative Compounded Rate[4],
- Method 3 – based on the use of RFR indices and the Non-Cumulative Compounded Rate[5]; sequential calculation of interest in each O/N Interest Period based on a given (annualised) RFR index.

Using the Lookback with Observation Period Shift convention with a Cumulative Compounded Rate does not require any other adjustment for instruments in which principal remains fixed within an Interest Period (e.g. for bonds). For credit, due to possible changes in the principal in the Interest Period (e.g. prepayments) and the use of 'weights' from the shifted Reference Period (depending on weekends and public holidays in the Reference Period), the standard formulas for calculating the Compound Rate may lead to discrepancies between Methods 1–3. In the 'shift' method, the sum of weights in the Reference Period and the Interest Period may differ, which may lead to a discrepancy in the settlement of the prepayment between Methods 1–3.

Methods 1–3 allow the reflection of the actual status of interest charged for each day of the ongoing Interest Period, taking into account a potential change in the principal balance, assuming that the interest accrued by the time of the change in the principal balance (e.g. the event of prepayment) is settled proportionally (to the change in the principal balance) at the time of principal prepayment. The formulas and examples described below provide for such assumptions.

This document does not prevent market participants from applying different, individually agreed methods, as necessary for the purpose of risk management and considering the capacity of IT systems.

2.1. Method 2: Annualised Cumulative Compounded Rate

Method 2 based on the calculation of the Cumulative Compounded Rate consists in calculating the Cumulative Compounded Rate at the end of the Interest Period, which is then applied to the whole Interest Period. This allows the calculation of interest due for the whole Interest Period using one Compound Rate.

According to the Lookback with Observation Period Shift, the Annualised Cumulative Compounded Rate (ACR) is calculated according to formula

$$ACR = \left[\prod_{i=1}^{M} \left(1 + \frac{r_i * n_i}{365}\right) - 1\right] * \frac{365}{d}, \quad (3)$$

where:

[4] To be understood as an interest rate for a given date of the Interest Period calculated cumulatively by accumulating the RFR, taking into account capitalisation of interest from the start date of that period until that date.

[5] To be understood as an annualised O/N interest rate calculated as a difference of the (deannualised) Cumulative Compounded Rate from a given day and the (deannualised) Cumulative Compounded Rate from the preceding day. A deannualised Compounded Rate means an interest rate expressed on a basis of less than one year based on the cumulative number of calendar days from the Interest Period Start Date.

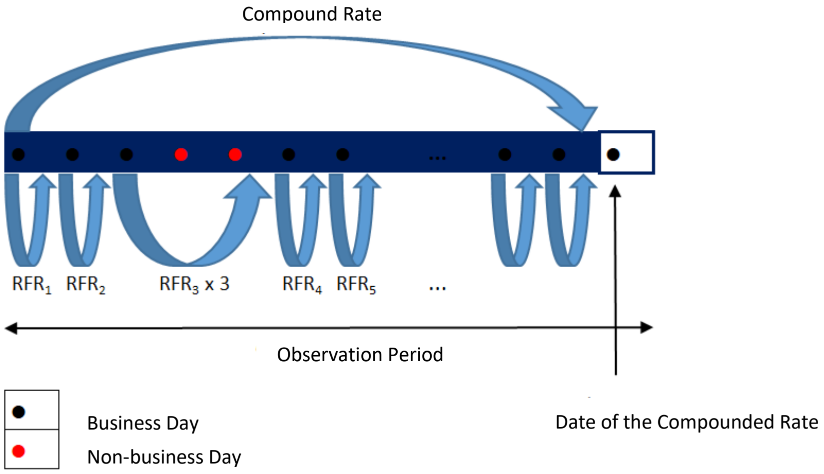
ACR – the RFR-based Annualised Cumulative Compounded Rate, calculated as a value rounded to the fifth decimal place, where the rounding applies to an interest rate expressed in %,

r_i – the value of the RFR benchmark for the i O/N Interest Period. In the case of an Observation Period Shift, the value of the RFR is taken with a shift by a selected parameter of the number of days in relation to the start date of a given O/N Interest Period (with the maximum shift by 5 Business Days) and then it is the value of the RFR benchmark for the *i* O/N Reference Period,

n_i – the number of calendar days in the i O/N Reference Period,

d – the number of calendar days in a given Reference Period (excluding the last day of that period), $\mathrm{d} = \sum_{i=1}^{M} \mathrm{n_i}$,

M – the number of O/N Interest Periods in a given Interest Period (equal to the number of Business Days in the Interest Period).



The value of interest due for a given Interest Period is calculated using the following formula

$$Interest = K * (ACR + CAS + margin) * \frac{o}{365}, \tag{4}$$

where:

$Interest$ – the total amount of interest due in a given Interest Period,

CAS – the Spread Adjustment corresponding to the tenor of WIBOR,

$margin$ – the margin component,

K – the principal balance amount being the basis for calculating the amount of interest due in a given Interest Period,

o – the number of calendar days in a given Interest Period (excluding the last day of that period).

2.2. Method 3: Annualised Non-Cumulative Compounded Rate

The second method of calculating the value of interest is to use the Non-Cumulative Compounded Rate (NCR). With appropriate transformation, using a series of ACRs (defined in Chapter 2.1, calculated throughout a given Interest Period), this method allows the calculation of Annualised Non-Cumulative Compounded Rates on each day of the Interest Period. This is why this method allows the calculation of a daily Compound Rate, which enables the calculation of the daily amount of interest.

The use of Method 3 allows the reflection of status of interest charged for each day of the ongoing Interest Period, taking into account a potential change in the principal balance[6] resulting from the disbursement of another credit/loan tranche or early repayment (prepayment) in the ongoing Interest Period.

For credit/loan other than overdraft for corporate client and factoring products, the recommended method of calculating interest payments is the approach using the Annualised Non-Cumulative Compounded Rate (Method 3).

The starting point for the calculation of the Non-Cumulative Compounded Rate (subject to the application of an Observation Period Shift) is a series of ACRs calculated according to formula

$$ACR_i = \left[\prod_{j=1}^{i} \left(1 + \frac{r_j * n_j}{365}\right) - 1\right] * \frac{365}{tn_i}, \tag{5}$$

which uses the same designations as in formula (3) and

tn_i means a cumulative number of calendar days from the first day of the Reference Rate (including that date) to the i O/N Reference Period (excluding the last day of that period).

Then, the Deannualised Cumulative Compounded Rate is calculated for each i O/N Interest Period according to formula

$$UCR_i = ACR_i \cdot \frac{tcn_i}{365}, \tag{6}$$

where:

tcn_i means a cumulative number of calendar days from the first day of the Interest Period (including that day) to the i O/N Interest Period (excluding the last day of that period).

Then, the Annualised Non-Cumulative Compounded Rate is calculated according to formula

$$NCR_i = (UCR_i - UCR_{i-1}) \cdot \frac{365}{cn_i}, \tag{7}$$

where:

$i = \{2,3,4, \ldots\}$ means subsequent O/N Interest Periods; for i = 1 the following is assumed: NCR_1 = $ACR_1 = r_1$,

UCR_i – the RFR-based Deannualised Cumulative Compounded Rate for the period from the i Business Day in the Interest Period,

ACR_i – the RFR-based Annualised Cumulative Compounded Rate falling on the i O/N Interest Period (i.e. the Cumulative Compound Rate for the period from the first to the i Business Day in the Interest Period),

cn_i – the number of calendar days in the i O/N Interest Period,

[6] Providing that the interest accrued by the time of the change in the principal balance (e.g. resulting from the event of prepayment) is settled proportionally (to the change in the principal balance) at the time of principal prepayment.

NCR_i – the RFR-based Annualised Non-Cumulative Compounded Rate.

The amount of interest due for a given Interest Period is calculated using the following formula

$$Interest = \sum_{i=1}^{M} K_i * (NCR_i + CAS + margin) * \frac{cn_i}{365} \tag{8}$$

where:

$Interest$ – the total amount of interest due in a given Interest Period,

cn_i – the duration of NCR_i (number of calendar days in the *i* O/N Interest Period),

K_i – the principal balance amount for the i O/N Interest Period,

CAS – the Spread Adjustment corresponding to the tenor of WIBOR,

$margin$ – the margin component,

M – the number of O/N Interest Periods in a given Interest Period (equal to the number of Business Days in the Interest Period).

2.3. Method 1: Compound Index

An equivalent method of calculating the RFR-based Compound Rate uses the RFR Compound Index according to the following formula:

$$ACR_i = \left(\frac{CI_i}{CI_{i_0}} - 1\right) \cdot \frac{365}{tn_i} \tag{9}$$

where:

(i_o, i) – the Observation Period from day i_0 to day i, which is delayed by the parameter of the number of days of the shift in relation to the Interest Period (with the maximum shift by 5 Business Days),

CI_{i_0} – the value of the RFR Compound Index published by the Administrator, from the beginning of the Observation Period,

CI_i – the value of the RFR Compound Index published by the Administrator, from the end of the Observation Period,

tn_i – the number of calendar days from the Reference Period Start Date (including that date) to the i day of the Reference Period (excluding the last day of that period).

If M means the number of O/N Interest Periods in a given Interest Period (equal to the number of Business Days in the Interest Period), then $ACR = ACR_M$. To calculate it, the value is rounded to the fifth decimal place, where rounding applies to an interest rate expressed in %.

The amount of interest due for an Interest Period is calculated using the following formula

$$Interest = K * (ACR + CAS + margin) \cdot \frac{o}{365} \tag{10}$$

where:

$Interest$ – the total amount of interest due in the Interest Period,

CAS – the Spread Adjustment corresponding to the tenor of WIBOR,

$margin$ – the margin component,

K – the principal balance amount being the basis for calculating the amount of interest due in the Interest Period,

o – the number of calendar days in a given Interest Period (excluding the last day of that period).

The result of the approach in question is the RFR-based Annualised Cumulative Compounded Rate. The method based on the Compound Index represents therefore an alternative to formula (3), described in Chapter 2.1

2.4. Rounding precision

For instruments which allow the use of the RFR and the RFR Compound Index to calculate interest flows, it is necessary to specify the method of calculating the final amount of interest in a given Interest Period (e.g. for credit/loan other than overdraft for corporate client, Method 3 is recommended, based on the use of the Annualised Non-Cumulative Compounded Rate) and agree on appropriate rounding precision that will minimise discrepancies between the method of interest calculation using the RFR (the method based on the Cumulative and Non-Cumulative Compounded Rate) and the RFR Compound Index.

One should bear in mind the following practical assumptions:

- WIRON is calculated and presented as a value rounded to the third decimal place (where rounding applies to an interest rate expressed in %).
- WIRON Compound Index is expressed in index points and rounded to the eighth decimal place[7].
- Considering accounting rules, the value of interest due and the value of interest flows should be expressed in PLN and rounded to the second decimal place.
- There are systemic limitations related to floating-point precision of a system or tool which calculates interest for a financial instrument which interest may affect the calculation results.

As a general rule, the above-mentioned Methods 1–3 are mathematically equivalent, but in practice, considering the above-described limitations, there will almost always be differences in the amount of interest calculated. The absence of rounding at the level of calculation of the value of interest due does not mean that the above-mentioned Methods 1–3 give identical results with the above-mentioned limitations.

Introducing appropriate rounding precision at the level of interest calculation is necessary and allows to reduce differences that may occur between Methods 1–3 in practice.

Method 1 or 2 may be used by approximating interest values resulting from Method 3. In such case, it is recommended to use the ‘7 d.p.’ rounding precision (that is precision to the fifth decimal place where rounding applies to the value of a rate expressed in % or, equivalently, precision to the seventh decimal place if rounding applies to a numerical value) at the level of calculation of the ACR parameter. Such level of rounding precision guarantees the best concurrence in the calculation of interest between the three methods being considered.

[7] At the time when this document is being prepared, the Administrator ceased to provide and publish the WIRON Compound Index. The examples presented in the spreadsheet use historical data and maintain the assumption regarding the presentation precision to the eighth decimal place for calculations based on the WIRON Compound Index.

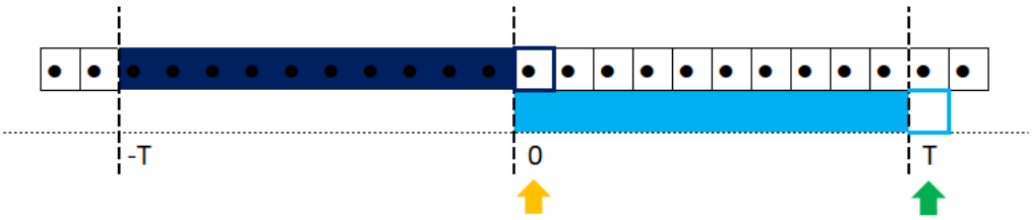
2.5. Floor

For banking products in which an interest rate floor is applied, unless specified by a contract or rules, the decision regarding the manner of applying the floor is made by institutions individually, considering the business and systemic solutions currently in place.

3. The use of the RFR to calculate interest using the Last Reset convention

The standard definition of the Last Reset convention envisages that the Reference Period from which historical values of O/N Interest Rates derive is equivalent to the previous Interest Period. In practice, the Last Reset convention should be used taking into account the specific features of a given contract, in particular the provisions concerning the structure of interest rate or updated values of the rate. A particular case is where the Reference Period is not equivalent to the period of the pre-defined term Compound Rate published by the Administrator (which follows from the specific manner of compounding those rates in terms of how the Administrator determines the first day of the Reference Period of the compound rate). For the purpose of this document and the enclosed spreadsheet, it is assumed that the definition of *Last reset* covers the Reference Period which is characterised by the same duration as the adopted Interest Period (e.g. 1M) and ends n days before a given Interest Period. Such an assumption allows the definition of *Last reset* to be used also where the Compound Rates published by the Administrator are applied.

The approach – as referred to in the recommendations for mortgage credit and credit/loan other than mortgage credit/loan for retail client, credit/loan other than overdraft for corporate client, for credit cards and charge cards, as well as for leasing and factoring products – envisages that an interest payment is defined ‘in advance’: on or before the Interest Period Start Date. The Last Reset method is based on using historical values of the RFR index where the Reference Period is defined in the past (backwards) relative to the date of calculating the Compound Rate based on which interest rate for a given Interest Period is calculated



where:

- Reference Period (dark blue)
- Interest Period (light blue)
- 0 — Interest Period Start Date
- T — Interest Period End Date / Start date of the next Interest Period
- -T — Start date of the previous Interest Period
- (yellow arrow) Payment determination date
- (green arrow) Interest payment date

Using Last Reset requires setting the RFR-based Compound Rate in the Reference Period preceding the Interest Period. To that end, financial market entities may use

- Compound Rates for pre-defined backward periods, published by the Administrator, or
- perform their own calculation of the RFR-based Compound Rate.

3.1. Compound rates for pre-defined terms (Compound Rates)

Financial market entities may use Compound Rates for pre-defined backward-looking periods published by the Administrator and being part of a Compound Indices Family, made available by the Administrator. Compound Rates are published for tenors 1M, 3M and 6M.

The amount of interest due for an Interest Period is calculated using the following formula

$$Interest = K * (R + CAS + margin) * \frac{o}{365}, \quad (11)$$

where:

$Interest$ – the total amount of interest due in a given Interest Period,

R – the value of the Compound Rate from a Compound Indices Family (for tenors 1M, 3M or 6M),

CAS – the Spread Adjustment corresponding to the tenor of WIBOR,

$margin$ – the margin component,

K – the principal balance being the basis for calculating the amount of interest due in a given Interest Period,

o – the number of calendar days in a given Interest Period (excluding the last day of that period).

3.2. Rates compounded by financial market entities

Financial market entities may independently calculate RFR-based Compound Rates for any contractual period. For that purpose it is recommended to apply one of the methods described in parts 2.1, 2.2 or 2.3 hereof, assuming that the Observation Period covers the previous Interest Period in lieu of the current Interest Period.

4. Commentary on the examples presented in the enclosed spreadsheet

- **#0:** An example showing the differences between a simple rate and a compound rate based on a loan granted for a period of one week.
- **#1:** An example showing the recommended approach to overdraft and bank accounts for retail and corporate clients. Includes applications of the RFR to calculate daily interest.
- **#2:** An example showing the approach to credit/loan other than overdraft for corporate client and factoring products. The example shows the application of Methods 1–3 assuming that the Backward-looking rate convention is used (Lookback with Observation Period Shift). In that example, for each O/N Interest Period, the index value from the day preceding the last 5 Business Days is used. For each of Methods 1–3, there has been presented an algorithm for calculating the amount of interest due for the *i* Business Day and the amount of interest due by the *i* Business Day in a given Interest Period. The example also uses a hypothetical value of the Spread Adjustment.

  The calculation of interest payments according to the recommended Lookback with Observation Period Shift convention may be done using two mathematically equivalent methods: by compounding the RFR index (calculating the compounded interest) over a defined Reference Period (Method 2, Method 3), or by calculating the quotient of the values of the RFR Compound Index from the end date and from the end date of the Reference Period (Method 1). In practice, when considering the above-mentioned limitations, there will almost always be differences in the amount of interest calculated. The absence of rounding does not mean that the Methods give identical results with the above-mentioned limitations. To minimise differences in interest calculation, the example involves rounding at the level of calculation of the ACR. It should be noted that, on one hand, adopting lower rounding precision increases the differences between Methods 2 and 3 but, on the other hand, increasing the precision of rounding of the ACR increases the discrepancies between Methods 1 and 2.

  The '7 d.p.' rounding precision (which means precision to the fifth decimal place, where rounding applies to the value of a rate expressed in % or, equivalently, precision to the seventh decimal place if rounding applies to a numerical value) minimises potential concurrence between the three methods being considered.

- **#2.1:** An example of a situation where interest flows calculated for a given O/N Interest Period according to the recommended Lookback with Observation Period Shift convention for the variant of Non-Cumulative Compounded Rate may take negative values (despite positive interest rates). Managing such cases may be very challenging in the systems used currently.
- **#2.2:** An example of a situation where the Interest Period Start Date or the Interest Period End Date falls on a Non-Business Day. To achieve concurrence of the methods, the observation period shift for the first O/N Interest Period must be properly adjusted. Managing such cases may be very challenging in the systems used currently. Then the problem can be solved by:
  - shifting the Interest Period Start/End Dates to Business Days, including applying the Modified Following Business Day Convention (considering the practice developed in other market, this is the preferred solution) – **an example of the method used is provided in sheet #2.2b;**
  - shifting the RFR index reading date according to the following mechanism:
    - If the Interest Period Start Date for which interest is calculated (O/N period start date) is a Business Day, then: Observation Date = O/N period start date – 5BD;

    - If the Interest Period Start Date for which interest is calculated (O/N period start date) is not a Business Day, then: Observation Date = O/N period start date – 6BD;
    - Regardless of whether the Interest Period End Date for which interest is calculated (O/N period end date) is a Business Day or a Non-Business Day = O/N period end date – 5BD.

    Example of the above mechanism is provided in sheet #2.2a

- **#2.3** An example of a situation where the absence of rounding at the level of the ACR causes a significant difference at the level of each flow over O/N periods and in the final value of interest due, between Method 1 and Method 2. The absence of rounding does not mean that the Methods give identical results with the limitations indicated in Chapter 2.4.
- **#2.4** An example of a situation where a lower than recommended rounding precision at the level of the ACR causes a significant difference at the level of each flow over O/N Interest Period and in the final value of interest due, between Methods 2 and 3 in relation to using Method 1 without rounding.
- **#2.5.** An example of a situation where a six-month Interest Period is defined. If rounding precision is maintained, an extension of the Interest Period does not increase the discrepancies between Methods 1–3 being considered.
- **#2.6:** An example of other possible variants of the Lookback with Observation Period Shift convention, addressing, in particular, issues related to prepayments and calculation of the value of interest due on Non-Business Days.

  The standard formulas for calculating RFR-based Compound Rates use, on each Business Day, in the interest horizon, a 'weight' whose value depends on the occurrence of weekends and public holidays. In the 'shift' method, the sum of weights in the Reference Period and the Interest Period may differ, which may lead to discrepancies in the settlement of the prepayment (resulting from the discrepancies between the number of days for which interest is calculated based on the weights from the shifted period and the number of days on which the loan was disbursed, and then prepaid or repaid). Those examples address this issue and consist in 'filling in' each calendar day with a rate (the 'Simple-Imputed Shift' method and the 'Compound-Imputed Calendar Shift' method), with a weight for each day equal to 1. The variants may better reflect economic reality in the case of prepayments. If systems and processes can be adapted to the illustrated methods that better reflect economic reality, that should be the approach of financial market entities. Furthermore, the examples shown in that part of the spreadsheet illustrate possible ways of calculating the value of interest due on Non-Business Days.

- **#3:** An example showing the application of the Backward-looking rate according to the Last Reset convention. The method recommended for mortgage credit and credit/loan other than mortgage credit/loan for retail client, credit/loan other than overdraft for corporate client, for credit cards and charge cards, as well as for leasing and factoring products. The example takes into account a hypothetical assumption that the Compound Rate is taken 2 Business Days before the Interest Period Start Date.
- **#4.1** and **#4.2:** Examples showing a comparison of selected methods of using the Backward-looking rate:
    - Base Case,
    - Lookback with a 5BD Observation Period Shift,
    - *Last reset*, assuming the use of the 1M Compound Rate published by the Administrator,

- *Last reset*, assuming the use of the 3M Compound Rate published by the Administrator,
- *Last reset*, assuming that the Observation Period covers the previous Interest Period in lieu of the current Interest Period

in the scenario of an interest rate hike (**#4.1**) and interest rate cut (**#4.2**), respectively.