Recommendation on the application of the WIRON index in issues of floating-rate debt securities

Document of the National Working Group for benchmark reform

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(Draft)

This Recommendation has been prepared by the Bonds Stream of the National Working Group for benchmark reform (NWG) based on analyses and discussions of experts conducted until 30 September 2022. The Recommendation consists of two reasoned recommendations on the rules for calculating interest payments and two annexes: the description of the recommended convention and the alternative convention, and a comparative analysis of the selected conventions. The recommendations are not obligatory and they may be applied freely, considering the specific aspects of each debt security issuances. This Recommendation aims to provide financial market entities with the best practices for applying the WIRON index to the calculation of interest payments for floating-rate debt securities. This Recommendation may be supplemented with further recommendations in the future.

Recommendation 1.
For the purpose of interest payments calculation for floating-rate debt securities, it is recommended that compounded WIRON index is applied using 5-business-day lookback with observation period shift (hereinafter: 'shift').

Recommendation 2.
The calculation of interest payments according the recommended 'shift' convention should be performed as a quotient of the WIRON Compound Index value from the end and from the beginning of the observation period.

Justification:
1. As regards various conventions for calculating interest payments, applied or applicable to floating-rate debt securities, the recommended 'shift' convention offers the best balance of sought-after features, i.e. economical appropriateness, being understandable to the user, and adequacy to the market infrastructure.
2. The other conventions are not recommended for general use, although they may be applied in certain cases, due to their specific nature or as simplified conventions in a transition period. An example may be the 'last reset' convention, which, on one hand, requires only minor adaptation of the market infrastructure but, on the other hand, generates interest rate risk in connection with the use of historical interest rate values instead of the current interest rate index values.
3. The calculation of interest payments according to the recommended 'shift' convention may be done using two mathematically equivalent methods: by compounding the WIRON (calculating the compounded interest) over a defined observation period, or by calculating the quotient of the WIRON Compound Index values from the end and from the beginning of the observation period. The second method is better in terms of being understandable to the user and less exposed to calculation errors.

Description of selected conventions for calculating compounded rates

The RFR-based conventions for defining interest payments may be divided into two main types:

- **forward-looking** – which take into account expectations as to the level of future market values of interest rates and allow to define an interest payment before the beginning of the interest period,
- **backward-looking** – which are based solely on past realised RFR values.

The following types of backward-looking conventions may be distinguished in terms of time of determining an interest payment:

- **in arrears** – where the interest payment is determined at or before the end of the interest period,
- **in advance** – where the interest payment is determined at or before the beginning of the interest period,
- **interest rollover/mixed** – a part of the interest payment is determined at the beginning of the interest period, and the adjustment – resulting from the difference to the RFRs realised during the period – is determined at the end of the period. This additional interest payment is made with a certain, fixed delay (e.g. equal to the entire next interest period) – such conventions have been rejected by all foreign working groups due to being impractical.

1. The recommended convention: lookback with observation period shift

To calculate a compound rate using to the 5-business-day lookback with observation period shift, as referred to in recommendation 1 of the Recommendation, the following formula is applied:

$$\left[\prod_i \left(1 + \frac{RFR_i \times n_i}{365} \right) - 1 \right] \times \frac{365}{d}$$
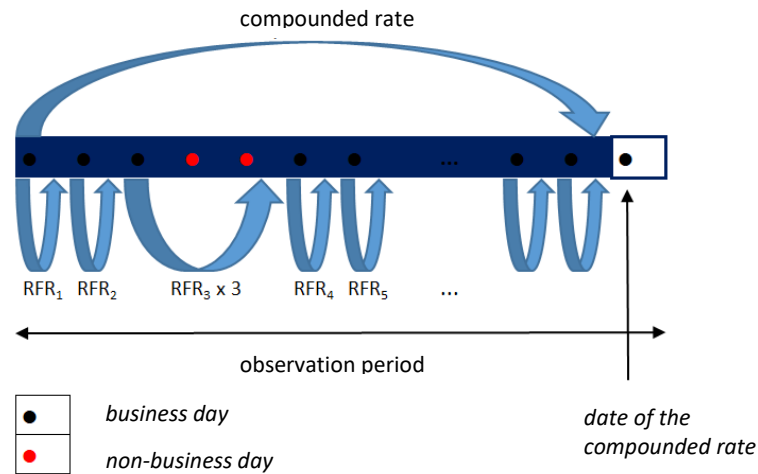
where:

i – each business day in the observation period (excluding[1] the last day of the period)

RFR_i – the value of the WIRON index corresponding to day i

n_i – number of calendar days for which RFR_i (weight) in the observation period – Monday to Thursday= 1, Friday = 3 (provided there are no public holidays)

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[1] To determine the observation period, a convention has been adopted where the last day of the period is not considered in the calculation of the compound rate – thus the last value of the WIRON index used in the formula is taken from the business day directly preceding the last day of the observation period.

d – the duration of the observation period $= \sum_i n_i$ (expressed in calendar days; excluding the last day of the period)

In relation to the interest period, the start date and end date of the observation period are shifted independently backward by $n = 5$ business days:
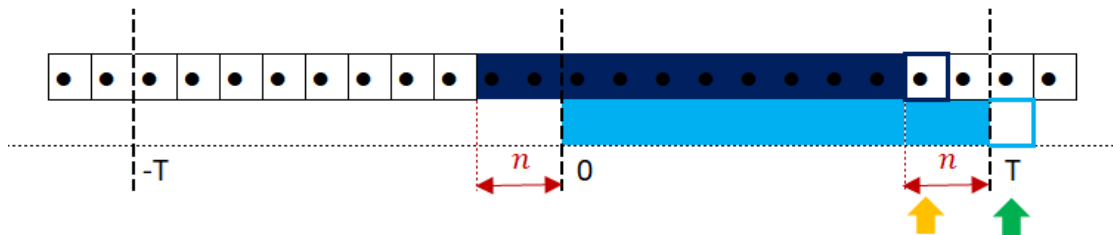
where:

		observation period
		interest period
	0	start date of the interest period
	T	end date of the interest period/start date of the next period
	-T	start date of the previous interest period
		payment determination date
		date of the interest payment

The recommended shift, in addition to the fact that it allows for determination of the interest payment 5 business days before the date of making the payment, also minimises the negative impact related to such shift if the form of a change in the duration of the observation period (which normally should coincide with the interest period).

Compound index

The above-described compound rate may also be calculated using the compound index – according to the convention referred to in recommendation 2 of the Recommendation – using the following formula:

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$$\left(\frac{CI_y}{CI_x} - 1\right) \times \frac{365}{d}$$

where:

(x, y) – observation period

CI_x – the value of the WIRON Compound Index at the beginning of the observation period

CI_y – the value of the WIRON Compound Index at the end of the observation period

d – the duration of the observation period $= y - x$ (expressed in calendar days; excluding the last day of the period)

CI_t stands for the present value of initial investment CI_0 capitalised on each business day by the value of each WIRON index thereafter:

$$CI_t = CI_0 \times \prod_{i=0}^{t-1}\left(1 + \frac{RFR_i \times n_i}{365}\right) \quad dla \quad t > 0$$

where:

i – each business day from the initial date 0 to the business day directly preceding the date of the index t

RFR_i – the value of the WIRON index corresponding to day i

n_i – the duration of the effective period RFR_i applies in the observation period (1 day for most Mondays-Thursdays, or 3 days for most Fridays, except in the case of holidays)

compound index


date of the compound rate
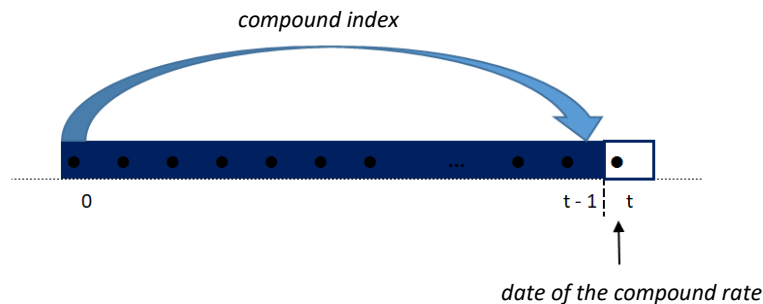
In general, the calculation of the compound rate using the compound index is (mathematically) equivalent to the calculation of the compound RFR (calculation of compound interest) over a specific observation period. In practice, however, there may be differences between those two calculations. The differences result from rounding – both for the purpose of publication of the index, and as a result of the application of a compounding algorithm in the software used.

Compound rates for pre-defined terms

An alternative to independent calculation is the use of compound rates for pre-defined terms published by GPW Benchmark – but only and exclusively where each day of the observation period resulting from a given convention coincides precisely with the respective day of the observation period of the pre-defined rate. The method of determining that period for pre-defined rates calculated by

GPW Benchmark – as described in the documentation made available by the administrator – is as follows:

- the first day of the period is the business day falling T months before the date of compound rate t set according to the 'modified preceding' convention
- the last day of the period is the date of compound rate t, and according to the convention the RFR for that day is not considered for compounding purposes

Compound rates for a pre-defined term

Date of the compound rate
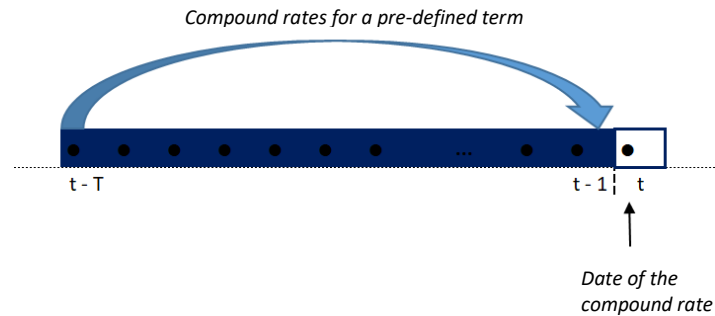
The very calculation of values of such compound rates by GPW Benchmark is done using the same classical formula described above.

2. Alternative conventions

'In arrears' conventions

Plain arrears

In general, to determine an interest payment for a given interest period, interest rates that 'economically correspond' to that period should be used, which in the case of compound rates naturally leads to a convention whose observation period coincides with the relevant interest period:
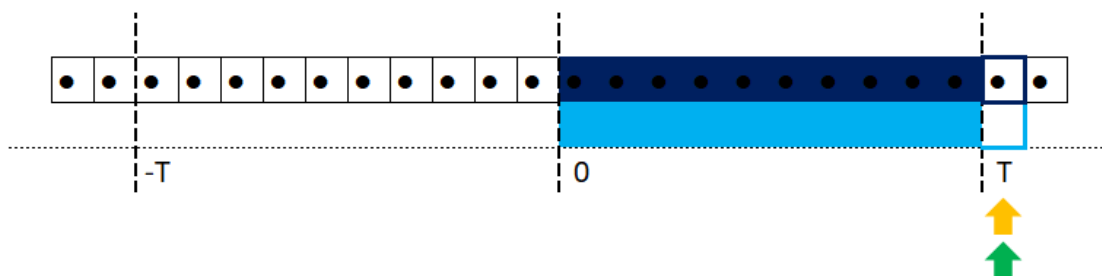
Then, due to usually delayed publication of the RFR, the interest payment may only be determined on the last[2] day of the interest period (corresponding to the first day of the next period and to the date of the interest payment), which in practice usually prevents it from being made in an effective and timely manner.

Lookback with observation period lag

The start date and end date of the observation period are shifted independently backward by n business days in relation to the interest period, and the weights for the RFRs observed in that shifted period are defined on the basis of the (non-shifted) interest period. In other words, the compound

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[2] the last RFR considered to calculate the compound rate will be published on the last day of the interest period

rate for a given interest period is calculated using RFR values 'delayed' by n business days but keeping the corresponding weights from that period:

$$\left[\prod_i \left(1 + \frac{RFR_{i-n} \times n_i}{365}\right) - 1\right] \times \frac{365}{d}$$

where:

i – each business day in the <u>interest</u> period (excluding the last day of the period)
RFR_i – RFR for week i
n_i – number of calendar days for which RFR_i applies in the interest period (1 day for most Mondays-Thursdays, or 3 days for most Fridays, except in the case of holidays)
d – the duration of the <u>interest</u> period $= \sum_i n_i$ (expressed in calendar days; excluding the last day of the period)

Lookback with observation period shift

Lookback with observation period lag
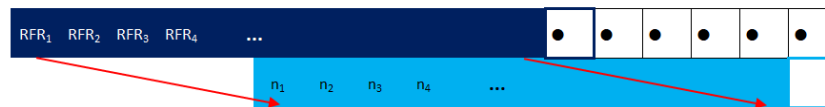
To minimise the negative effect in the form of inconsistency of the rate with its corresponding weight, $n = 5$ business days is usually recommended.

Calendar day lookback

The observation period is shifted backward by n calendar days. That option requires the setting of (synthetic) RFRs also for non-business days, which in turn makes the weights unnecessary – in that case, each RFR has weight 1. The 'classical' formula is therefore simplified to the following one:

$$\left[\prod_i \left(1 + \frac{RFR_i \times 1}{365}\right) - 1\right] \times \frac{365}{d}$$

where:

i – each <u>calendar</u> day in the observation period (excluding the last day of the period)
RFR_i – RFR for week i
d – the duration of the observation period (expressed in calendar days; excluding the last day of the period)

To maintain the consistency with the classical convention based on business days, synthetic RFRs for non-business days may be set using one of the two contemplated methods:
- through linear interpolation of compound indices from the days before and after a given non-business day,

- through decomposition of the RFR from the day before a given non-business day.

The equivalent of the recommended shift by $n = 5$ business days is the shift by $n = 7$ calendar days. In addition to undisputed benefits related with the simplified calculations, formulas, the use of calendars for each currency, this option is characterised by a variable number of business days between the date of determining the interest payment and the date of making the payment.
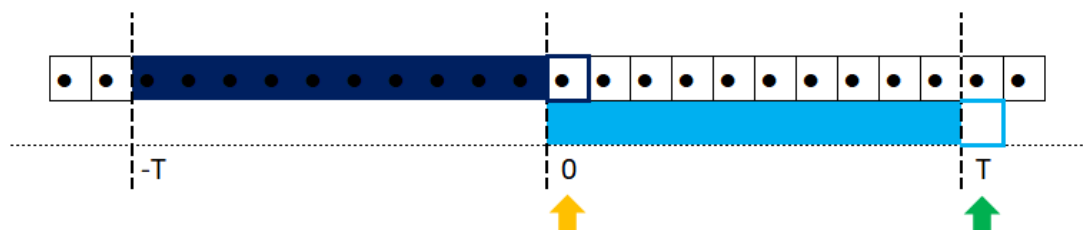
Lockout
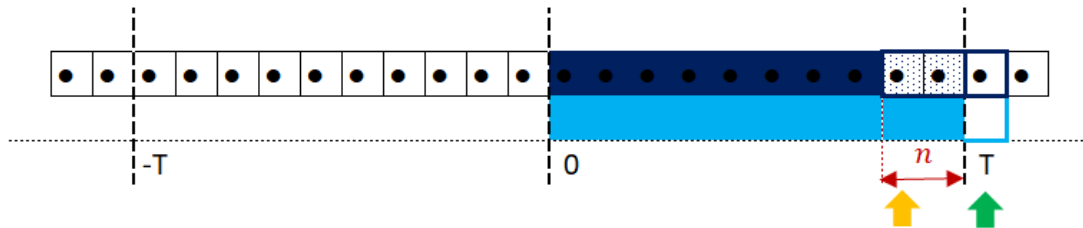
An interest payment is determined for n business days before it is executed, with the last n business days of the interest period being taken as the value of the RFR on the date the payment is determined, which is called in simple terms „freezing" the value of the rate.

'In advance' conventions

Last reset

The observation period covers the previous interest period in place of the given (current) interest period. The interest payment can be determined as early as on the first day of the given interest period, while the undoubted defect of this convention is the use of historical values of the RFR. However, considering the entire lending period in the case of long term loans with a defined schedules of principal and interest payments, the difference to the plain convention in the form of the 'missing' last interest period may be measured (with already developed derivatives market) and consider as an 'constant mark-up'.

Last recent
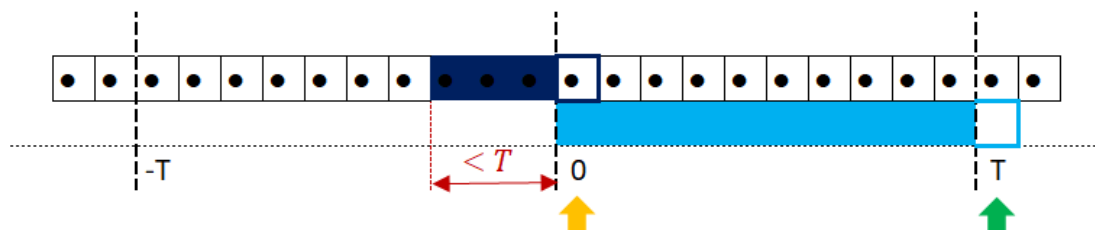
The observation period covers the last (short) part of the previous interest period, so compared to the 'last reset' method, more recent values of the RFRs are used, but the length of the observation

period is not maintained. Such solution has been applied in the Commission Implementing Regulation on the designation of a replacement for 6-month and 12-month CHF LIBOR tenors, where a compounded rate for a 3-month period has been designated.

Comparative analysis of selected conventions for defining interest rate

	lag 5bd	*shift 5bd*	*calendar 7+cd*
Variable number of business days from the rate announcement date to the payment settlement date	Keeps the period (expressed in business days) from the RFR publication date to the payment settlement date (5bd).	Keeps the period (expressed in business days) from the RFR publication date to the payment settlement date (5bd).	Does not keep the period (expressed in business days) from the RFR publication date to the payment settlement date (for 7cd, that will be from 3bd to 5bd). Depending on the arrangement of public holidays, the case where the number of days on which we know the rate 3 business days before the interest payment date may apply to 2 to 7 settlement days in a given calendar year. - It has been tentatively confirmed that considering the banking processes and the process on the part of KDPW and GPW, it will be possible to apply convention 'calendar 9cd' or a longer one. 8cd will probably be achieved. However, the implementation of the '7cd' convention will require further changes in the banking and non-banking infrastructures, whose feasibility in this moment is not confirmed (the processes on the part of the issuer/calculation agent would need to be executed on the rate publication date, and on the part of KDPW on 3bd or, alternatively, 1bd and 2bd, respectively) - There is a risk of statutory introduction of another public holiday, which would increase the number of non-business days over the next 7 calendar days to more than 4. In practice, only new public holidays at the end of the year and in early May will be problematic. Unfortunately, the risk of materialisation of such event cannot be estimated. [repetition of the idea expressed in the first paragraph].
Negative daily interest with positive interest rates in the 'shift 5bd' convention	Does not lead to the calculation of negative daily interest with positive interest rates.	Could lead to the calculation of negative daily interest with positive %. (In general, material differences in the number of business days in the observation period and interest period lead to increased variability of interest calculated). - In consequence, the variability of valuations is increased in situations with a certain calendar, which may be an incentive for entering into transactions that use that effect. - Systems would need to be adapted to the occurrence of negative daily interest.	Does not lead to the calculation of negative daily interest with positive %.
Availability of compound indices	Separate compound indices required for lag=5bd (or further ones for other lags). - no arrangement has been made with GPWB on the calculation of such indices.	The indices are made available by GPWB.	Requires that the administrator (or bank) calculate synthetic RFRs and indices for non-business days. - GPWB declares its intention to publish such rates retrospectively, on the nearest business day (an alternative option, currently not supported by GPWB, is the publication of rates and indices on a daily basis). During consultation, the method for setting rates and indices for non-business days was also selected. - minor inconvenience might occur due to the rounding of implied rates for non-business days.
Compliance with the OIS standard for WIRD	Non-compliant: for OIS, there is not lag, and the settlement is after 2bd, plus non-compliance of weights. - Non-standard derivative transactions may be executed in the 'lag5bd' convention in clearing chambers. - For all the conventions under assessment, it must be noted that there is no need to ensure full compliance with the standard convention for the OIS market. Minor cases of non-compliance of the conventions under assessment will not have a material impact on the hedging of positions or on Hedge Accounting. However, customers' specific needs that require full compliance of the underlying instrument and hedging instrument may be satisfied without entering the inter-bank market (such a case requires the conclusion of a bilateral bank-customer/counterparty transaction, in particular the adaptation of systems at least on the bank's part). Finally, one could assume that with the development of RFR-based instruments market, basis swap instruments will be created to address the market's needs.	Non-compliant: for OIS, there is no lag, and the settlement is after 2bd. - Non-standard derivative transactions may be executed in the 'shift 5bd' convention (relevant definitions are provided in the ISDA documentation). The clearing chambers do not settle such transactions, it could be assumed that they will do so in the future (also, Stream 2 in the OIS WIRON specification provides for such convention as an optional one). - For all the conventions under assessment, it must be noted that there is no need to ensure full compliance with the standard convention for the OIS market. Minor cases of non-compliance of the conventions under assessment will not have a material impact on the hedging of positions or on Hedge Accounting. However, customers' specific needs that require full compliance of the underlying instrument and hedging instrument may be satisfied without entering the inter-bank market (such a case requires the conclusion of a bilateral bank-customer/counterparty transaction, in particular the adaptation of systems at least on the bank's part). Finally, one could assume that with the development of RFR-based instruments market, basis swap instruments will be created to address the market's needs.	Non-compliant: for OIS, there is no lag, and the settlement is after 2bd. - The start date of a transaction's 'observation period' may coincide with a non-business day, which makes entering into hedging transactions more difficult (1:1) - Currently it is not possible to enter into non-standard derivative transactions in the 'calendar' convention or there are no clear prospects for implementation (there are no appropriate definitions in the ISDA documentation and no information is available about plans for their implementation; no settlement in the clearing chambers, and the providers of K+, Murex systems have not so far seen any demand for implementation of such convention and they do not offer it). - It should be assumed that the choice of the 'calendar' convention for PLN will involve the need for further lobbying in favour of implementation of that convention in the ISDA documentation, in clearing chambers, in front office systems, and similar infrastructure of the interest rate derivatives. - For all the conventions under assessment, it must be noted that there is no need to ensure full compliance with the standard convention for the OIS market. Minor cases of non-compliance of the conventions under assessment will not have a material impact on the hedging of positions or on Hedge Accounting. However, customers' specific needs that require full compliance of the underlying instrument and hedging instrument may be satisfied without entering the inter-bank market (such a case requires the conclusion of a bilateral bank-customer/counterparty transaction, in particular the adaptation of systems at least on the bank's part). Finally, one could assume that with the development of RFR-based instruments market, basis swap instruments will be created to address the market's needs.
Adaptation of banking systems and non-banking infrastructure	Supported by K+ and Murex, but may require upgrading or purchase of an additional licence. - For all the conventions under assessment, it is necessary to adapt the non-banking infrastructure (on the part of the NWG: to conduct effective talks, negotiations and arrangements with infrastructure owners as to the required changes and harmonisation of time limits for the implementation and for the reform). The non-banking infrastructure includes: bloomberg, refinitiv - (calculators for debt securities valuation), systems used by investors, depositaries and issuers (recording, measurement, accounting), trading systems (bondspot, catalyst, bloomberg, refinitive), clearing chambers (KDPW CCP, LCH).	Supported by K+ and Murex, but may require upgrading or purchase of an additional licence. - For all the conventions under assessment, it is necessary to adapt the non-banking infrastructure (on the part of the NWG: to conduct effective talks, negotiations and arrangements with infrastructure owners as to the required changes and harmonisation of time limits for the implementation and for the reform). The non-banking infrastructure includes: bloomberg, refinitiv - (calculators for debt securities valuation), systems used by investors, depositaries and issuers (recording, measurement, accounting), trading systems (bondspot, catalyst, bloomberg, refinitive), clearing chambers (KDPW CCP, LCH).	The providers of K+, Murex systems have not so far seen any demand for implementation of such convention and they do not offer it; the choice of the 'calendar' convention will involve the need for development 'on request' (either for each of the banks that will be using those systems, or for the NWG). - For all the conventions under assessment, it is necessary to adapt the non-banking infrastructure (on the part of the NWG: to conduct effective talks, negotiations and arrangements with infrastructure owners as to the required changes and harmonisation of time limits for the implementation and for the reform). The non-banking infrastructure includes: bloomberg, refinitiv - (calculators for debt securities valuation), systems used by investors, depositaries and issuers (recording, measurement, accounting), trading systems (bondspot, catalyst, bloomberg, refinitive), clearing chambers (KDPW CCP, LCH). The general level of preparedness of the non-banking infrastructure for the use of the 'calendar 7+cd' convention seems relatively lowest.

Duration of the observation period	keeps the length of the interest period	Might not keep the length of the interest period (the start date and end date of the observation period are shifted independently backward by the same number of business days). - Adoption of shift=5bd or a multiple of 5ki minimises that effect with accuracy in regard to non-business days other than weekends.	Keeps the length of the interest period.
Weights for daily rates	Does not keep the weights for daily rates. - Adoption of lag=5BD or a multiple of 5ki minimises that effect, with accuracy in regard to non-business days other than weekends.	Keeps the weights for daily rates.	Keeps the weights for daily rates. - All weights equal 1 by definition, so they could not be considered at all – facilitation in communication and system implementation, - Ensure consistency in the calculation of interest for coupon periods that end on a non-business day ,
Other			- Simplifies the application of calendars for multi-currency transactions (as the number of calendar days is always the same, regardless of currency), provided that the 'calendar' convention is to be supported globally (in particular, RFRs would need to be published for non-business days in various currencies). - The outsider's problem: if 'calendar' convention does not spread and remains a local convention for issues in PLN, that will limit the number of investors and reduce market liquidity. - The pioneer's problem: the choice of the 'calendar' convention involves the need to adapt the banking and non-banking infrastructures (also for derivatives) to a much greater extent than for other, less popular conventions (for the NWG, this means the need to conduct effective talks, negotiations and arrangements with infrastructure owners as to the required changes and harmonisation of time limits for the implementation and for the benchmark reform for PLN).