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Functional Specification

Tenor Calculator

Version 5 : FINAL

March 2019

Preface

Change History

Date	Type	Version	Author	Revision Details
22 Nov 2018	Draft	1	Simon Wiltshire	Initial Version
29 Nov 2018	Draft	2	Simon Wiltshire	Following comments from Andy Hughes
06 Dec 2018	Draft	3	Simon Wiltshire	Following comments from the Product Committee: remove Start Date Adjusted from input attributes.
18 Mar 2019	Draft	4	Simon Wiltshire	Updated to include Error Messages, Calculation Basis and Audit Trail functionality.
11 Jun 2019	Final	5	Simon Wiltshire	Updated Error Message.

1 Executive Summary

- This document aims to provide the DSB development team with a description of a new component that will provide standard term of contract value and unit based on an effective date and expiry date following the rules defined by ESMA.
- The Change Request Process should be considered as a living document that will evolve as knowledge of the service and environment develops over time.
- Any feedback or queries in relation to DSB Change Request process should be directed to secretariat@ANNA-DSB.com

Contents

2 Introduction

2.1 Document Purpose

This document aims to provide the DSB development team with sufficient information to be able to develop the changes to the DSB system included herein.

2.2 Background

Based on competent authorities (CAs) observations and request for clarification from market participants, ESMA observed inconsistencies in data provided in IR Term of Contract (Field 41) compared to the definition of this field specified in RTS 23 of the MiFID II regulations.

ESMA noted that according to the provision of the relevant TS, IR Term of Contract (field 41) might be better served if it were populated with the term of the contract.

In order to support this guidance, the DSB will include two attributes in the templates for Rates products where the underlying asset is non-financial – Term of Contract Value and Term of Contract Unit. In addition, the DSB will provide a utility that will accept an input of Effective Date and Expiry Date and will return the two Term of Contract attributes following the calculations defined by ESMA in their MiFIR Data Reporting Q&A document (p28):

https://www.esma.europa.eu/sites/default/files/library/esma70-1861941480-56_qas_mifir_data_reporting.pdf

The utility defined in this document aims to support this calculation but is also designed to support other tenor period calculations as they are defined by other regulatory bodies, associations or institutions.

3 Change Summary

3.1 Scope

This specification defines the Term of Contract Calculation following the method specified by ESMA in the MiFIR Data Reporting Q&A document (p28).

3.2 Requirements

The template defined in this document need to be able to support the following functionality for all the in-scope products:

- **Independent Utility** The DSB will provide an independent utility that will support the calculation of a Term of Contract from the input of two dates.
- **ESMA Calculation** In the first instance, the only calculation available through the utility will be based on the text included in the ESMA MiFIR Data Reporting Q&A document footnote on page 28 – reproduced below:

> *The population of term for field 41 has a limitation in the format since only integers may be used. Therefore the following approach is to be taken: 1) If the contract duration fits a standard term, the standard term should be populated in field 41. This approach requires starting with the largest term unit and working downwards: - If the duration is a whole number of years, that value should be populated in field 41. - If the duration is a whole number of months (based on actual dates not notional 30-day month), that value should be populated in field 41. - If the duration is a whole number of weeks, that value should be populated in field 41. - If none of the above applies, the correct number of days should be populated in field 41. 2) When it is not possible to populate field 41 (term of the contract) with the correct number of days due to the restriction of a maximum of 999 days, an investment firm should calculate the duration of the contract in the next major unit (i.e. weeks) using a standard week of 7 days. If this still exceeds the maximum number of weeks to populate (i.e. 999 weeks) then calculate in the next major unit (i.e. months) using the number of days in the actual month referred in the term/tenor. The remainder can then be calculated based on a standard 30 day month. E.g. if the remainder is >=15 days, then round up and if the remainder is <15 then round down.*
>
> *Example: A contract has a term of 19 years 11 months and 6 days = 19*12 + 11 months with remainder of 6 days, which is rounded down. Therefore, the term is 239 months.*

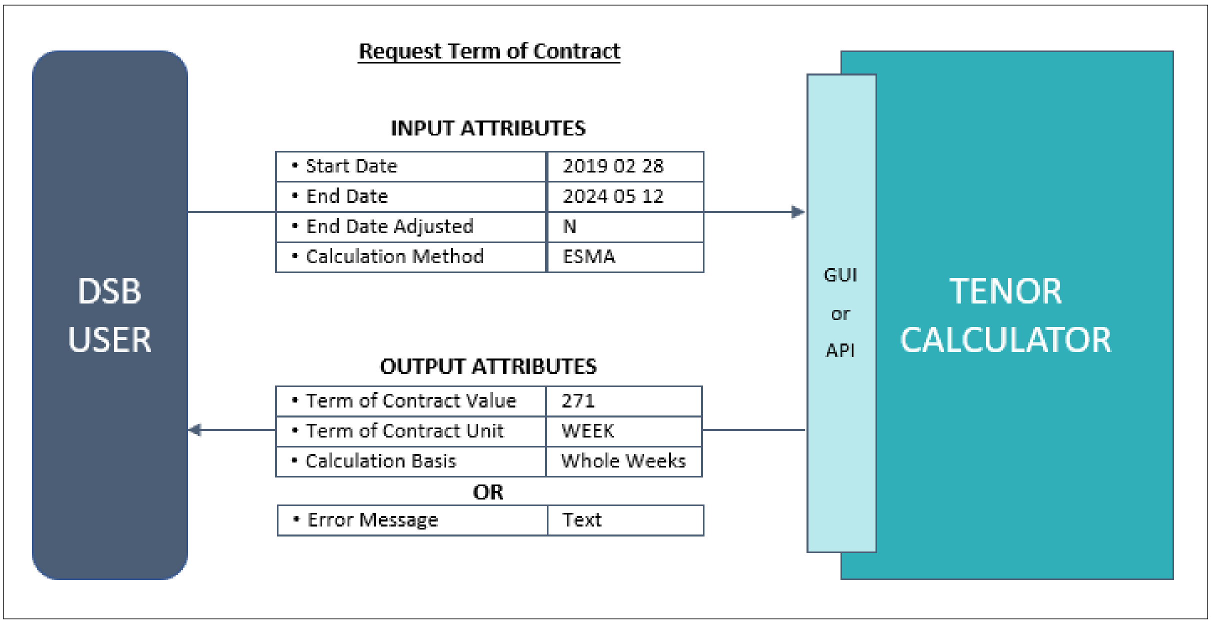
- **Future Growth** The Tenor Calculation utility will be designed and built with the expectation that further calculations will be supported in future versions.
- **Calculation Basis** The Tenor Calculation utility will ensure that the requestor is able to identify the method used when calculating the result.
- **Input Rejection** If the input message contains incorrect / invalid data, an error message will be returned.

- **Audit Trail** The Tenor Calculation utility will ensure that all requests for a Term of Contract are recorded in a searchable audit log. The audit record will contain the input parameters, output attributes, date and time and any indication of requestor (id, location etc) that is available.

4 Proposed Solution

4.1 Summary

The DSB will create a utility that allows a requestor to input an Effective Date (Start Date) and an unadjusted Expiry Date (End Date) and to receive a Term of Contract value based on these dates using the calculation defined by ESMA in the previously linked Q&A document.



INPUT ATTRIBUTES

• Start Date	2019 02 28
• End Date	2024 05 12
• End Date Adjusted	N
• Calculation Method	ESMA

OUTPUT ATTRIBUTES

• Term of Contract Value	271
• Term of Contract Unit	WEEK
• Calculation Basis	Whole Weeks

OR

• Error Message	Text

- **Input Values** In order to allow for future growth the utility will accept a Start Date, an End Date, flags indicating whether the end date is adjusted and the calculation method to be used. In the first instance, the utility will only support the ESMA calculation using an unadjusted end date, but this may be expanded as other tenor calculations are published. None of the input values will be defaulted.
- **Calculation** The tenor calculation will be defined in a number of sections – validation of the input values, setting the variable values, calculating the principal results, rounding the results so that conform with the output format (max 3 characters).
- **Output Values** If the calculation is successful, the utility will return a Term of Contract Value, a Term of Contract Unit and a Calculation Basis. If the input data is invalid, an error message will be returned.

4.2 Assumptions

The tenor calculation process defined in the next section applies the following assumptions to the algorithm documented in the ESMA Q&A footnote:

- **Whole Years** Years are based on matching month and day (eg: 20/10/2018 to 20/10/2028).
- **Whole Months** Months are based on matching days (eg: 20/10/2018 to 20/11/2028).
- **Whole Weeks** Weeks are based on matching weekdays (eg: TUES to TUES).
- **Whole Days** If none of the above applies, the number of Days will be calculated.

- **Overflow Weeks** If the number of Days is greater than 999, the weeks will be calculated by dividing the number of days by 7 and rounding up and down on partial weeks.
- **Overflow Months** If the number of Weeks is greater than 999 the months will be calculated by using a whole months plus a remainder number of days for the rounding. Eg:

*10/10/2018 to 20/11/2039 is 21 Years (21*12) + 1 Month + 10 days (round down) = 253 MNTH.*

*10/10/2018 to 30/11/2039 is 21 Years (21*12) + 1 Month + 20 days (round up) = 254 MNTH.*

*10/10/2018 to 5/11/2039 is 21 Years (21*12) + 0 Month + 26 days (cross month/round up) = 253 MNTH.*

- **Overflow Years** If the number of Months is greater than 999 years will be calculated by dividing the Overflow Months by 12 and rounding up and down on partial Months.
- **Negative Tenor** If the Expiry Date < Effective Date (End Date < Start Date), reject request (result cannot be negative).
- **Identical Dates** If the Expiry Date = Effective Date (End Date = Start Date), reject request (result cannot be zero).
- **Maximum Value** If the difference between Effective Date and Expiry Date (End Date, Start Date) is more than 999 Years, reject request.

5 Tenor Calculation

5.1 Input Values

The utility will accept the following attributes as input:

- **StartDate** A valid date in the format {YYYYMMDD}
- **EndDate** A valid date in the format {YYYYMMDD}
- **EndDateAdjusted** Boolean {Yes, No}
- **CalculationMethod** Char (10). Enumerated list. Valid values: {ESMA}

The above attributes are mandatory. If the input values do not conform with the above rules, reject input message.

If the incorrect attributes are input:

- ○ ***Error Message*** *"Invalid input attribute(s) : &FieldName…"*

If incorrect values are input (against correct attributes):

- ○ ***Error Message*** *"Invalid input value(s) : &FieldName…"*

The following steps are to be performed if the user selects a Calculation Method of "ESMA" and an End Date Adjusted of "No".

5.2 Set Variable Attributes

The following values will be used in the ESMA Calculation Method logic.

- **Set StartDay** Extract and store the day (DD) value from StartDate.
- **Set StartWeekday** Calculate and store the number of the weekday from the StartDate (where Sunday = 1, Monday = 2 etc.).
- **Set StartMonth** Extract and store the month (MM) value from the StartDate.
- **Set StartYear** Extract and store the year (YYYY) value from the StartDate.
- **Set StartMonthDay** Concatenate StartMonth and StartDay.
- **Set StartMonthCount** Set to (StartYear * 12) + StartMonth.
- **Set EndDay** Extract and store the day (DD) value from the EndDate.
- **Set EndWeekday** Calculate and store the number of the weekday from the EndDate (where Sunday = 1, Monday = 2 etc.).
- **Set EndMonth** Extract and store the month (MM) value from the EndDate.
- **Set EndYear** Extract and store the year (YYYY) value from the EndDate.

- **Set EndMonthDay** Concatenate EndMonth and EndDay.
- **Set EndMonthCount** Set to (EndYear * 12) + EndMonth.

5.3 Input Validation

- **Date Comparison** If EndDate is less than or equal to the StartDate, reject input message.
  - ***Error Message*** *“Invalid Input: Effective Date must be greater than Expiry Date.”*
- **Maximum Tenor Years** If EndYear – StartYear is greater than 1000, reject input message.
  - ***Error Message*** *“Invalid Input: Input Dates exceed maximum input range of 999 Years.”*

5.4 Calculation Process

- **Whole Years** If StartMonthDay = EndMonthDay set TermOfContractValue to EndYear – StartYear and TermOfContractUnit to “YEAR”.

  Set Calculation Basis to “Whole Years”. Go to 5.5 Rounding Process.
- **Whole Months** If StartDay = EndDay set TermOfContractValue to EndMonthCount – StartMonthCount and TermOfContractUnit to “MNTH”.

  Set Calculation Basis to “Whole Months”. Go to 5.5 Rounding Process.
- **Whole Weeks** If StartWeekday = EndWeekday, set TermOfContractValue to (EndDate – StartDate) / 7 and TermOfContractUnit to “WEEK”.

  Set Calculation Basis to “Whole Weeks”. Go to 5.5 Rounding Process.
- **Whole Days** Set TermOfContractValue to (EndDate – StartDate) and TermOfContractUnit to “DAYS”.

Set Calculation Basis to “Whole Days”. Go to 5.5 Rounding Process.

5.5 Rounding Process

- **Valid TermOfContractValue** If TermOfContractValue is less than or equal 999, go to 5.6 Return Values.
- **Overflow Weeks** If TermOfContractUnit = “DAYS”, set TermOfContractValue to (EndDate – StartDate) / 7 with standard rounding (up and down) to 0 (zero) decimal places and TermOfContractUnit to “WEEK”.

  If TermOfContractValue is less than or equal 999: set Calculation Basis to “Overflow Weeks” and go to 5.6 Return Values.
- **Overflow Months** If TermOfContractUnit = “WEEK”, set the following values:
  - **PreviousMonth** Set to the number of the month before EndMonth (eg: if EndMonth = 4 (April), PreviousMonth = 3; if EndMonth = 1 (January), PreviousMonth = 12).
  - **LeapYear** If PreviousMonth = 2, set to 1 if EndYear is divisible by 4 except if it is divisible by 100 unless it is divisible by 400 otherwise set to 0.
  - **PreviousMonthDays** Using a table of month days (eg: January = 31, February = 28), set to the number of days in stored for PreviousMonth (including LeapYear adjustment).
  - **CalcDays** Set to EndDay – StartDay.
  - **CalcMonths** If CalcDays < 0, set to EndMonth – StartMonth – 1 else set to EndMonth – StartMonth.
  - **CalcYears** Set to EndYear – StartYear.
  - **AdjustedDays** If EndDay > StartDay, set to EndDay – StartDay else set to PreviousMonthDays – StartDay + EndDay.
  - **AdjustedMonths** If CalcMonths < 0, set to CalcMonths + 12 else set to CalcMonths.

○ **AdjustedYears**	If CalcMonths < 0, set to CalcYears – 1 else set to CalcYears.
○ **WholeYearMonths**	Set to AdjustedYears * 12.
○ **RoundedMonths**	If AdjustedDays < 15, set to 0 (zero) else set to 1.
○ **OverflowMonths**	Set to WholeYearMonths + AdjustedMonths + RoundedMonths.

Set TermOfContractValue to OverflowMonths and TermOfContractUnit to “MNTH”.

If TermOfContractValue is less than or equal 999: set Calculation Basis to “Overflow Months” and go to 5.6 Return Values.

- **Overflow Years** If TermOfContractUnit = “MNTH”, set TermOfContractValue to OverflowMonths / 12 with standard rounding (up and down) to 0 (zero) decimal places and TermOfContractUnit to “YEAR”.

  If TermOfContractValue is less than or equal 999: set Calculation Basis to “Overflow Years” and go to 5.6 Return Values else return the following rejection message:

  ○ ***Error Message*** *“Invalid Input: Input Dates exceed maximum input range of 999 Years.”*

5.6 Return Values

The following values will be returned if the above process has been successful:

TermOfContractValue	Max 3 Char Integer (ie: less than or equal to 999)
TermOfContractUnit	4 Char Enumerated Value {DAYS, WEEK, MNTH, YEAR}
Calculation Basis	Char. 50 Freeform Text

The following values will be returned if the above process has been unsuccessful:

Error Message Text	Char. 50 Freeform Text