

PARAMETA SOLUTIONS INTEREST RATE SWAP VOLATILITY INDEX FAMILY METHODOLOGY

EFFECTIVE DATE 1st August 2023
Version 1.0

Version	Approved by	Date approved	Summary of changes
1.0	Product Acceptance Forum	August 2023	Initial Draft



Contents

1. INTRODUCTION	3
2. GOVERNANCE	3
3. ERRORS	5
4. METHODOLOGY	5
5. CONSULTATION PROCESS	6
6. MARKET DISRUPTION	6
7. COMPLAINTS.....	6
8. OVERVIEW OF THE INDICES.....	7
9. INDICES	8
10. INPUT DATA	9
11. INDEX CALCULATIONS & DETERMINATIONS	9
12. EXPLANATION OF HOW ESG FACTORS ARE REFLECTED IN THE KEY ELEMENTS OF THE INDEX METHODOLOGY	11
13. DISCLAIMER	12

1. INTRODUCTION

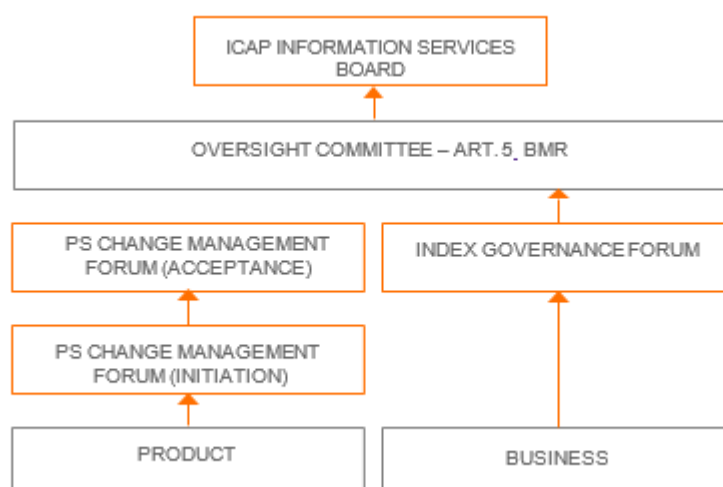
- 1.1 Parameta Solutions trading as ICAP Information Services Limited (“Parameta Solutions” or “Administrator”) develops, calculates and publishes indices. Such indices may also be licensed for use by third parties.
- 1.2 This methodology is split into three parts (a) the governance section which is an overall framework for all indices; (b) the specific details relating to the particulars for an index and (c) disclosures and disclaimers.
- 1.3 The indices are calculated and published by ICAP Information Services Limited (“Index Calculation Agent”). The Index Calculation Agent is responsible for compiling and calculating the index pursuant to and on the basis of this methodology.
- 1.4 Indices are published via various data vendors under licence from Parameta Solutions. Each vendor determines whether they will distribute/display the index via their respective information systems.
- 1.5 For further information regarding the indices including licensing and distribution, please contact findoutmore@parametasolutions.com

PART ONE

2. GOVERNANCE

2.1 OVERVIEW

- 2.1.1 Parameta Solutions has in place a "Three Lines of Defence" model, enabling close cross-monitoring of the governance process - this being business, compliance/risk and audit who all have a key role in ensuring that Parameta Solutions meets its regulatory requirements. The over-arching governance is complimented by the Oversight Committee. The Oversight Committee can escalate to the Parameta Solutions Board if required.



2.2 OVERSIGHT COMMITTEE

- 2.2.1 The Oversight Committee is appointed by the Administrator to review the integrity of the indices, in accordance with the Oversight Committee Terms of Reference.
- 2.2.2 The Administrator is responsible for appointing the chairman and secretary of the Oversight Committee.
- 2.2.3 The Oversight Committee provides independent oversight of, and challenge to the Administrator on all aspects of the index determination process. Its responsibilities include:
 - 2.2.3.1 reviewing the index definition and methodology at least annually
 - 2.2.3.2 determining and keeping under review the Terms of Reference for the Oversight Committee
 - 2.2.3.3 reviewing and approving the agenda and minutes of the Oversight Committee
 - 2.2.3.4 considering internal or external audits commissioned by the Oversight Committee and monitoring the implementation of any identified remedial actions
 - 2.2.3.5 overseeing any changes to this methodology and being able to request the Administrator to consult on such changes
 - 2.2.3.6 reviewing and approving procedures for cessation of the indices, including any consultation about a cessation
 - 2.2.3.7 overseeing any third party involved in the provision of the index, including calculation or dissemination agents.

2.3 BUSINESS FORUMS

2.3.1 The PS Change Management Forum ("PS CMF") is responsible for the approval to initiate new products and the approval of new products.

2.3.2 Index Governance Forum ("IGF") is responsible for (a) overseeing the provision of the index operationally and with respect to the methodologies; and (b) supporting the Oversight Committee.

3. ERRORS

3.1 Whilst the indices are governed by a set of rules that are set out in this methodology and are intended to be comprehensive, it is possible that errors, ambiguities or omissions to occur.

3.2 In such circumstances, Parameta Solutions shall:

3.2.1 follow the process outlined in its Errors Policy

3.2.2 endeavour to resolve such ambiguity, error or omission using Expert Judgment and may, in consultation with the IGF, propose amendments to this methodology to reflect the resolution of such ambiguity, error or omission

3.2.3 assess the potential impact such change may have on Stakeholders in accordance with its Cessation and Transition Policy. Any such decision to consult with Stakeholders shall be considered by the Index Governance Forum and Oversight Committee

3.2.4 detail in the Benchmark Statement a summary of the specific procedures for dealing with errors in input data or in the determination of the index, including when a re-determination of the index is required.

4. METHODOLOGY

4.1 Parameta Solutions may at any time undertake a periodic (and in any event annual) review of the indices in circumstances where, for example, the index is no longer representative of the economic reality or the relevant market. The IGF shall consider the findings following any such periodic review of an index or index family (as the case may be). In the event a change to an index is needed, this shall be handled in accordance with the Cessation and Transition Policy.

4.2 Each index is subject to an initial approval and periodic review. Approval of this methodology is determined by the Benchmark Design Policy and the Terms of Reference (for new methodologies) and the Cessation & Transition Policy and IGF (for reviews). Each terms of reference set out the process for nominating and removing persons involved in reviewing and approving the methodology guides.

4.3 In the event material changes are needed to this methodology, Parameta Solutions will assess the potential impact of such changes on stakeholders and (if it believes necessary) consult with stakeholders as set out below. The Oversight Committee may direct Parameta Solutions to consult on changes to this methodology with stakeholders or the wider market. The IGF will then approve any material amendments to this methodology before publication. Following approval, Parameta Solutions shall notify stakeholders of its determination to amend any methodology. Such notification shall where reasonable detail the proposed changes in the control sheet of this methodology.

4.4 In the event Parameta Solutions has determined a possible cessation of an index is necessary, it shall prepare documentation to the IGF and Oversight Committee which will include but is not limited to (a) why cessation is deemed appropriate; (b) if a consultation is required and (c) if there is a suitable alternative identified by Parameta Solutions.

5. CONSULTATION PROCESS

5.1 Where Parameta Solutions determines a consultation is needed:

- 5.1.1 The IGF and the Oversight Committee will approve the contents of the consultation and the set of users and other stakeholders to which it should be distributed. The consultation will include as a minimum the key elements of the methodology Parameta Solutions believe will be affected by the proposed material change. The consultation will be available on the Parameta Solutions website.
- 5.1.2 Consultations will usually run for no less than 4 weeks, however, Parameta Solutions reserves the right to determine the most appropriate consultation period (including a shorter window for feedback) taking into consideration factors such as the complexity of the matters within the consultation.
- 5.1.3 Once the consultation period has closed, the results of the consultation and recommendations from the analysis are presented to the IGF and the Oversight Committee.
- 5.1.4 The final approval of a cessation, transition or the methodology change is made by the IGF. Following approval, Parameta Solutions shall notify stakeholders of its determination to terminate or amend this methodology. Such notification shall detail (where reasonable) the proposed changes.

6. MARKET DISRUPTION

- 6.1 Potential illiquidity, market disruption, unavailability of a pricing source may impact the ability to publish an index and delay and/or suspension or discontinuance of an index may result. In the case of extraordinary events or periods of market disruption, information about the event and the impact on the indices will where reasonably practicable and proportionate be posted on the Parameta Solutions website and disseminated through client channels.

7. COMPLAINTS

- 7.1 Parameta Solutions has a publicly available Complaints Policy. All complaints are investigated by a person not directly involved with the index calculation and dissemination. Information related to complaints will be stored in a restricted access area and kept for a period of upto 5 (five) years following the date when the complaint was first lodged. Complaints can be submitted at benchmarkqueries@parametasolutions.com.

PART TWO

8. OVERVIEW OF THE INDICES

- 8.1 This section provides an overview of the methodology for the Parameta Solutions Interest Rate Swap Volatility Index Family (the "IRSV") set out in section 8 below.
- 8.2 The IRSV index family provides an indicative measure of the "forward looking" or "expected" volatility of swap rates at various tenors and time horizons derived from the interest rate swaptions market. The IRSV has indices which cover the Euro and Sterling swap markets quoted in EUR and GBP respectively. The indices are calculated and published for days where both (a) the ICAP IRO Desk publish swaption prices (in the respective market) and (b) banks are open for business in the UK.
- 8.3 Interest rate swaptions are defined as options that grant the owner the right to enter into an interest rate swap on an agreed future date, this swap can be a fixed rate receiver or a fixed rate payer. Each swaption is characterised by:
- a) an expiry date, being the date on which the option expires;
 - b) a swap tenor, being the length or period of the interest swap;
 - c) an option type, receiver, payer or straddle (a straddle is combination of a payer and receiver swap with the same strike rate and expiry); and
 - d) the strike rate, being the fixed interest rate of the swap.
- 8.4 Each index is derived from readily available indicative mid-market interest rate swaption pricing data comprising for each expiry and tenor combination;
- a) At-the-money ("ATM") prices (ATM is where the option strike rate is the prevailing forward swap rate for the option expiry date);
 - b) ATM implied volatility (the market expected volatility); and
 - c) Out-of-the-money ("OTM", or "skew") prices (OTM is where the option strike rate is higher or lower than the prevailing forward swap rate).
- 8.5 Further details of the input data are set out in Section 9.
- 8.6 An index is calculated for each expiry and tenor of the input data resulting in a single consolidated implied volatility value per day. The IRSV is therefore an indicative measure of expected volatility and does not necessarily represent the level at which any trade has or could be executed in the future.
- 8.7 A detailed list of the index names and the economic reality they represent, is provided in section 8.

9. INDICES

9.1 The following shall consist of the indices in relation to IRSV.

Swap Market (CCY)	Option Expiry (E in years)	Swap Tenor (T in years)	Index Name	Calculation Times
GBP	1	5	Parameta Solutions 1Y5Y GBP IRS Volatility Index	5pm UK Time
GBP	1	10	Parameta Solutions 1Y10Y GBP IRS Volatility Index	5pm UK Time
GBP	5	5	Parameta Solutions 5Y5Y GBP IRS Volatility Index	5pm UK Time
GBP	5	10	Parameta Solutions 5Y10Y GBP IRS Volatility Index	5pm UK Time
GBP	10	5	Parameta Solutions 10Y5Y GBP IRS Volatility Index	5pm UK Time
GBP	10	10	Parameta Solutions 10Y10Y GBP IRS Volatility Index	5pm UK Time
EUR	1	5	Parameta Solutions 1Y5Y EUR IRS Volatility Index	5pm UK Time
EUR	1	10	Parameta Solutions 1Y10Y EUR IRS Volatility Index	5pm UK Time
EUR	5	5	Parameta Solutions 5Y5Y EUR IRS Volatility Index	5pm UK Time
EUR	5	10	Parameta Solutions 5Y10Y EUR IRS Volatility Index	5pm UK Time
EUR	10	5	Parameta Solutions 10Y5Y EUR IRS Volatility Index	5pm UK Time
EUR	10	10	Parameta Solutions 10Y10Y EUR IRS Volatility Index	5pm UK Time

9.2 Each index is intended to represent “the expected volatility of <T> year <CCY> swap rates over the next <E> year(s) derived from the Input Data” where T, CCY and E are taken from the first three columns above as indicated in the column headings. For example, the intended “economic reality” for the Parameta 1Y5Y GBP IRS Volatility Index is “An indication of the expected volatility of 5 year GBP swap rates in over the next 1 years’ time derived from the Input Data.

10. INPUT DATA

10.1 The IRSV uses as input data, the available indicative mid-market levels of interest rate swaptions from the ICAP Interest Rate Options Desk ("ICAP IRO desk") as at 16.15pm (UK Time) (Input Data).

10.2 The Input Data is created by the ICAP IRO Desk who provides broking services in interest rate options products denominated in both G10 and EM currencies. The Input Data is indicative swaption mid-market levels created by the ICAP IRO Desk to facilitate the desk's regular broking activities and provide the desk's indicative view of current mid-market ATM levels based on expert judgement and reports of orders and trades and is not created for the purpose of determining the index.

10.3 The ICAP IRO Desk follow screen principles which govern how it updates the interest rate swaption mid-market levels and includes chronology of priority of input data and exclusions¹. The screens are based on the principle that each market displays sufficient underlying liquidity that relationships between prices need only to be updated when observable changes have occurred evidenced through new prices or trades. Where there are no new trades or orders, the ICAP IRO Desk maintains volatilities in line with recent history and will refresh prices based on changes in other pricing parameters. Skews are calibrated separately based on market observations.

10.4 For each respective index (currency, option expiry and underlying swap tenor) the following input data is sourced from the ICAP IRO desk:

- Swaption at-the-money (ATM) mid-price premium
- Swaption ATM Normal Volatility
- Swaption skew mid-price premia data across the following payer and receiver strikes 1000, 500, 400, 300, 200, 150, 100, 75, 50, 25, 12.5²

10.5 The Input Data is readily available through Bloomberg and other data providers.

10.6 The Input Data is subject to a number of validation and tolerance checks by Parameta Solutions, as well as checks to flag spurious data where possible. Input Data is also corroborated systematically against other data sources.

11. INDEX CALCULATIONS & DETERMINATIONS

11.1 Parameta Solutions will perform all calculations, determinations and adjustments ("Calculations") in relation to the indices. Parameta Solutions will not have any responsibility for errors made in good faith or omissions in Calculations or other actions provided in this methodology. No discretion is exercised in the calculation of the indices.

11.2 The Calculations of the indices shall be in accordance with this methodology.

11.3 The IRSV indices are calculated at 5pm UK Time on days where both (a) the ICAP IRO Desk publish swaption prices, and (b) banks are open for business in the UK.

11.4 An index is calculated for each combination of option expiry ep and underlying swap tenor up:

- Option expiries (ep): 1Y, 5Y and 10Y.
- Underlying Swap Tenor points(up): 5Y and 10Y.

¹ Further details of the screen principles which determine the construction of the mid-market levels which form the Input Data are available on request

² Prior to December 2020 a narrower set of strikes was used for the EUR and GBP indices.

11.5 Each index is calculated from a set of at-the-money (ATM) and specified out-of-the-money (OTM) strikes for this combination of option expiry and tenor.

11.6 The index calculation methodology is based on the research of Mele & Obayashi (2015)³ which provides a theoretical foundation for measuring interest rate swap volatility based on the model-free fair value of variance swap contracts for forward swap rates.

The index of basis point swap-rate volatility $IRSV^{bp}$ for an option expiry tenor e_p , underlying swap tenor up combination is calculated as the square root of the annualised variance swap price (P^{bp}).

$$IRSV^{bp}(t, u_p, e_p) = 100^2 x \sqrt{\frac{P^{bp}(t, u_p, e_p)}{e_p - t}}$$

The fair price of a variance swap at time t is approximated from the ATM swaption straddle price and a discrete set of OTM receiver and payer swaption prices (input data from the ICAP IRO desk):

$$P^{bp}(t, u_p, e_p) \approx \frac{2}{PVBP_t(u_p, e_p)} \left(\sum_{n=1}^N Premium(K_n, u_p, e_p) \cdot w_n \right)$$

Where:

$Premium(K_n, u_p, e_p)$ is the call or put premium (or the ATM straddle premium divided by 2)

K is the strike price

$PVBP_t(u_p, e_p)$ is the price value of a basis point at time t of swap tenor up starting at e_p

N is the count of discrete OTM receiver and payer swaptions used in the approximation + 1 for the ATM Straddle

w_n is the average distance between neighbouring strikes (except for the smallest and largest strikes where this is the distance from the adjacent strike):

$$w_n = \begin{cases} K_1 - K_0 & n = 0 \\ \frac{K_n - K_{n+1}}{2} + \frac{K_n - K_{n-1}}{2} & n > 0 \text{ or } n < N \\ K_n - K_{n-1} & n = N \end{cases}$$

and the swaption premia $Premium(K_n, u_p, e_p)$ are ordered by relative strike such that $K_i < K_j$ for $i < j$.

³ Mele, Antonio & Obayashi, Yoshiki. (2015). Interest Rate Swaps. 10.1007/978-3-319-26523-0_3

12. EXPLANATION OF HOW ESG FACTORS ARE REFLECTED IN THE KEY ELEMENTS OF THE INDEX METHODOLOGY

ITEM 1. Name of the benchmark administrator.	ICAP Information Services Limited
ITEM 2. Type of benchmark or family of benchmarks. <i>Choose the relevant underlying asset from the list provided in Annex II to Commission Delegated Regulation(EU)2020/1816.</i>	Other
ITEM 3. Name of the benchmark or family of benchmarks.	Parameta Solutions Interest Rate Swap Volatility Indices
ITEM 4. Does the benchmark methodology for the benchmark or family of benchmarks take into account ESG factors?	No
<p>ITEM 5. Where the response to Item 4 is positive, please list below, for each family of benchmarks, those ESG factors that are taken into account in the benchmark methodology, taking into account the ESG factors listed in Annex II to Delegated Regulation (EU) 2020/1816.</p> <p>Please explain how those ESG factors are used for the selection, weighting or exclusion of underlying assets. The ESG factors shall be disclosed at an aggregated weighted average value at the level of the family of benchmarks.</p>	
(a) List of environmental factors considered:	Selection, weighting or exclusion:
(b) List of social factors considered:	Selection, weighting or exclusion:
(c) List of governance factors considered:	Selection, weighting or exclusion:
<p>ITEM 6. Where the response to Item 4 is positive, please list below, for each benchmark, those ESG factors that are taken into account in the benchmark methodology, taking into account the ESG factors listed in Annex II to Delegated Regulation (EU) 2020/1816, depending on the relevant underlying asset concerned.</p> <p>Please explain how those ESG factors are used for the selection, weighting or exclusion of underlying assets.</p> <p>The ESG factors shall not be disclosed for each constituent of the benchmark, but shall be disclosed at an aggregated weighted average value of the benchmark.</p> <p>Alternatively, all of this information may be provided in the form of a hyperlink to a website of the benchmark administrator included in this explanation. The information on the website shall be easily available and accessible. Benchmark administrators shall ensure that information published on their website remains available for five years.</p>	
(a) List of environmental factors considered:	Selection, weighting or exclusion:
(b) List of social factors considered:	Selection, weighting or exclusion:
(c) List of governance factors considered:	Selection, weighting or exclusion:
Hyperlink to the information on ESG factors for each benchmark:	
ITEM 7. Data and standards used	
(a) Data input	
(i) Describe whether the data reported, modelled or sourced internally or externally	
(ii) Where the data are reported, modelled or sourced externally, please name third party data provider.	
(b) Verification and quality of data. Describe how data are verified and how the quality of that data is ensured.	
(c) Reference standards Describe the international standards used in the benchmark methodology.	
Date on which information has been last updated and reason for the update:	

PART 3

13. DISCLAIMER

©2023 ICAP Information Services Limited. All rights reserved. Parameta Solutions is a registered trademark of ICAP Information Services Limited. This document and all the information contained in it, including without limitation all text, data, graphs, charts (collectively, the "Information") is the property of ICAP Information Services Limited or its subsidiaries or affiliated companies (collectively "Parameta"), or its licensors or information providers. The Information may not be stored in any database or retrieval system, reproduced, modified, reverse-engineered or disseminated in any form or by any means or, without prior written permission from Parameta.

The Information is provided solely for information purposes only and should not be relied on for any purpose. To the fullest extent permitted by law, neither Parameta or nor their respective directors, officers, employees, partners, licensors or information providers will be liable for any errors or for any loss from use of, or inability to use, the Information. It is not possible to invest directly in an index. Parameta does not make any recommendation to buy, sell or hold any security, financial product or other investment vehicle or trading strategy ("Investment Product") that is based on, linked to, or provides an investment return related to the performance of, an index (an "Index-linked Investment").

Parameta does not issue, sponsor, endorse, market, offer or express any advice or opinion in relation to any Investment Product. Parameta makes no assurance that an Index-linked Investment will accurately track any index or provide positive investment returns. Index returns do not represent the results of actual trading of any Investment Product. Parameta does not provide investment advice. Any decision to invest in any Index-linked Investment should not be made in reliance on the Information; prospective investors are strongly advised to take specific tax, legal and financial advice.

The Information is provided on a "as is" basis. To the fullest extent permitted by law, neither Parameta, nor their respective directors, officers, employees, partners, licensors or information providers make any claim, prediction, warranty or representation whatsoever, expressly or impliedly, either as to the results to be obtained from the use of any index or the fitness or suitability of any index for any particular purpose for which it might be used. In no circumstances may the Information be used for any purpose that would cause it to become a benchmark for the purposes of the Regulation (EU) 2016/1011 (Regulation on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds) (the "EU Benchmarks Regulation") and the UK version of Regulation (EU) 2016/1011 as onshored via the European Union (Withdrawal) Act 2018 (the "UK Benchmarks Regulation") whether by the Information being referenced in a financial instrument, financial contract or investment fund or otherwise without an executed licence in place with Parameta Solutions. ("Prohibited Use").



GET IN TOUCH

For further information, please visit us at:

parametasolutions.com

Or contact us on:

EMEA: +44 (0)207 200 7600

Americas: +1 877 639 7300

APAC: +65 6922 1129

Sales: findoutmore@parametasolutions.com

Support: operations@parametasolutions.com

