

RISK-FREE RATE TERM STRUCTURES APPLICABLE FOR THE VALUATION OF TECHNICAL PROVISIONS OF THE NEPALI INSURANCE SECTOR UNDER A RISK-BASED FRAMEWORK AMENDMENT TO THE METHODOLOGY

Version 02.00

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Introduction

- 1. The NIA approved on Mangsir 25, 2080 (December 11, 2023) the methodology for the derivation of the risk-free interest rate term structures applicable for the valuation of the technical provisions of the Nepali insurance sector under a risk-based framework (hereinafter, *the Nepali RFR curves*).
- 2. The following properties of the RFR methodology are considered relevant, though some trade-off among the properties is unavoidable:
 - To the extent possible, the calculation should be based on financial information derived from deep, liquid and transparent markets for the relevant fixed-income instruments¹. This does not exclude the application of appropriate adjustments where relevant for the purpose expressed above;
 - The RFR curve should reflect the yield that can be earned on a risk-free basis. Therefore, appropriate adjustments to the observed market interest rates are possible;
 - The methodology should be reliable and financially robust, including the quality of the sources of the inputs and assumptions. This feature does not exclude the application of sensible approximations for the sake of simplicity and pragmatic reasons;
 - The methodology should avoid the artifitial volatility of financial markets, especially in longer terms where extrapolation methods are necessary;
 - The methodology should remain stable, with no expected changes in the short-medium term, though keeping a continuous monitoring of its appropriate functioning especially in exceptional circumstances;
 - Easy operation (e.g. continuity, smoothness of spot and forward rates, etc.);
 - Full transparency for interested stakeholders;
 - Replicable and pragmatic, which among other conditions requires access to the inputs of the methodology with adequate frequency;

The international practices consider either government bonds or interest rates swaps (in particular, overnight swaps) as financial instruments useful to derive a risk-free curve, provided they have a deep, liquid and transparent market for short, medium and long-term tenors.



- The methodology should provide incentives for those insurers and reinsurers applying a good risk management, therefore promoting a level playing field, transparency and appropriate risk management behaviours;
- The methodology does not interfere or create unjustified inconsistencies with sound risk management practices regarding interest rate risks;
- The methodology should prevent procyclical behaviour, protecting the policy holders' interests and the financial stability of Nepal; and
- Where decisions or components of the methodology should be made or applied under material uncertainty, the methodology shall deliver an adequate level of prudence while providing an economic picture of the solvency position of the insurer or reinsurer based on a total balance sheet approach.
- 3. Since its implementation, the functioning of the methodology to calculate *the Nepali RFR curves* has been satisfactory, not having identified any aspect of the calculations where the experience provided evidence for a change.
- 4. Nevertheless, amending the source of the inputs to the methodology is unavoidable because the original source providing the inputs for the calculations has discontinued the publication of some inputs, and therefore it is necessary to look for another provider of the inputs.
- 5. Two additional amendments are introduced trying to complete and simplify the current methodology, though keeping in essence its original design.
- 6. Summing up, the amendments developed in this paper refer to the three following points:
 - □ The data provider of the inputs to the methodology,
 - □ The number of terms of the liquid part of the yield curves,
 - $\hfill\square$ The deletion of the mechanism to remove the short-term volatility.



Amendments to the methodology.

Change in the source of the inputs of the methodology.

- 7. Up to December 2024, the methodology relied on the risk-free information monthly published by EIOPA with reference to the end of each month according to the Gregorian calendar.
- 8. From January 2025 onwards EIOPA has discontinued the publication of essential data (mainly the risk-free curves for India, Malaysia and Thailand), while continuing the publication of the information for China, Hong Kong and USA.
- 9. An approach where part of the information is obtained from EIOPA and the other part from another source is not considered appropriate, both in terms of simplicity and to avoid inputs with heterogenous methodologies.
- 10. Therefore, this document suggests obtaining the interest rate curves of the six countries considered in the methodology from a single source.
- 11. There are several data providers with general recognition that can replace the EIOPA inputs used in the Nepali risk-free process so far.
- 12. NIA does not deem appropriate to carry out an autonomous process to select a data provider. Instead, it is considered the best option to use the same provider as other supervisory institutions for similar purpose.
- 13. An immediate option is selecting the same the data source than EIOPA for its riskfree rates process. This approach provides better continuity among the previous and the new methodologies and benefits of the long experience of EIOPA in the selection of data providers.
- 14. According to this reasoning, below step 1 specifies the data provider and the relevant identifiers of the inputs needed to run the Nepali risk-free rates process.

Interest rates from 1 to 10-year terms (instead of the current 1 to 5 years).

- 15. To reduce the reliance on the extrapolation methodology, it is proposed to extend the liquid part of the yield curves, expanding the current 1 to 5 years interest rates observed in the financial markets, to the use of 1 to 10-year interest rates, where available, for each of the six interest rates curves used in the calculations.
- 16. This option helps to reduce the divergences among the Nepali RFR curves and the market information that insurers apply in their risk management, though appropriate attention should be paid to those tenors lacking deep, liquid and transparent pricing.



Deletion of the mechanism to remove the short-term volatility.

- 17. In the previous methodology, input data were provided with reference to each end of month of the Gregorian calendar. Therefore, there were a delay of around 15 days with the end of month of the Nepali calendar.
- 18. Such delay of calendars opens the door to the following situation

Let's take the case where the interest rates at the end of month X (Gregorian calendar) have materially changed compared to the previous month. Those interest rates are applied to the subsequent end of month in the Nepali calendar (X+ 15 days).

It might be that the interest rates at the end of month X+1 (Gregorian calendar) have reverted the material change of the previous month. This would mean that Nepali insurance market would be exposed to an undesirable volatility to a certain extent related to the calendar overlaps.

- 19. To avoid this effect a corrective mechanism was introduced, labelled as the *adjustment to remove the short-term volatility (STVA)*.
- 20. Since end-Poush 2081 (January 2025) onwards it is possible to download data inputs exactly referred to the end of month of the Nepali calendar. Therefore, the STVA lacks sense anymore.
- 21. Furthermore, retaining the STVA might create a divergence among the information of the Nepali RFR process and the information that insurers apply in their risk management. Additionally, it has not been necessary to trigger the STVA in most of the monthly calculations carried out since the implementation of the original methodology.
- 22. Eventually, the removal of the STVA allows to publish the Nepali risk-free rates curves 15 days earlier. This will help insurers and reinsurers to submit the QRRT RBC templates within the 90-days deadline set out in paragraph (57) Annexure III of the Risk-Based Capital and Solvency Directive (2081) (applicable for financial years ending after Ashad-end 2083).



- 23. The three amendments referred above do not impact on the design of the original methodology to derive the *Nepali RFR curves*, which continues being based on the following three steps:
 - firstly, to consider the liquid part of an internationally accepted source providing the risk-free interest rate term structures for India and for the other five countries considered in the methodology,
 - secondly, to assess the relevant adjustment to the liquid part of the Indian risk-free rates curve, considering the differences among the Indian and the Nepali economies,
 - thirdly, to extrapolate the adjusted Nepali risk-free interest rates, beyond the last tenor of the liquid part.
- 24. The purpose of this approach is to:
 - Produce a valuation of the technical provisions that is adequate to ensure with a high degree of confidence the transfer of the portfolio of insurance contracts of the (re)insurer to another reinsurer, considering that the buyer might be in any of the countries of the regional area with a sufficient relationship with Nepal; and
 - Satisfy the desirable properties listed above, though having in mind the limitations described and that some trade-off among the properties is unavoidable.
- 25. NIA is fully aware that it is necessary a timely monitoring of the appropriateness of the methodology in case of material changes in the economic environment (for example, a material departure of the Nepali features regarding interest rates from the Indian interest rates, compared to the current situation).

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Overview of the amended Nepali risk-free rates methodology.

26. The methodology to derive the Nepali risk-free interest rates after the three amendments introduced in this paper may be summarized in the following five steps.

Step 1. Obtaining the risk-free curves from a financial data provider.

27. The following table shows the Refinitiv® identifiers that EIOPA has used to obtain the spot risk-free curves for the six countries considered in the Nepali risk-free methodology². The inputs retrieved correspond to mid interest rates.

Country	India	China	Hong Kong	Malaysia	Thailand	United States	
	IN1YNDOIS	CNYQM7RIRS=	HKDQM3HIRS=	0#MYXZ=R	THBOIS=	USDSROIS=	
Market	OIS	Swap	Swap	Government	OIS	OIS	
Coupon Frequency	Coupon 1		4	0	4	1	
Tenor	Reuters RIC						
1Y	IN1YNDOIS=	CNYQM7R1Y=	HKDQM3H1Y=	MYGOV1YZ=R	THB1YOIS=	USDSROIS1Y=	
2Y	IN2YNDOIS=	CNYQM7R2Y=	HKDQM3H2Y=	MYGOV2YZ=R	THB2YOIS=	USDSROIS2Y=	
3Y	IN3YNDOIS=	CNYQM7R3Y=	HKDQM3H3Y=	MYGOV3YZ=R	THB3YOIS=	USDSROIS3Y=	
4Y	IN4YNDOIS=	CNYQM7R4Y=	HKDQM3H4Y=	MYGOV4YZ=R	THB4YOIS=	USDSROIS4Y=	
5Y	IN5YNDOIS=	CNYQM7R5Y=	HKDQM3H5Y=	MYGOV5YZ=R	THB5YOIS=	USDSROIS5Y=	
6Y	IN6YNDOIS=	CNYQM7R6Y=	HKDQM3H6Y=	MYGOV6YZ=R	THB6YOIS=	USDSROIS6Y=	
7Y	IN7YNDOIS=	CNYQM7R7Y=	HKDQM3H7Y=	MYGOV7YZ=R	THB7YOIS=	USDSROIS7Y=	
8Y	IN8YNDOIS=	CNYQM7R8Y=	HKDQM3H8Y=	MYGOV8YZ=R	THB8YOIS=	USDSROIS8Y=	
9Y	IN9YNDOIS=	CNYQM7R9Y=	HKDQM3H9Y=	MYGOV9YZ=R	THB9YOIS=	USDSROIS9Y=	
10Y	IN10YNDOIS=	CNYQM7R10Y=	HKDQM3H10Y=	MYGOV10YZ=R	THB10YOIS=	USDSROIS10Y=	

Disclaimer. The data provider mentioned in this methodology has neither assured nor assumed any responsibility about the appropriateness of the data mentioned in this document for the purpose of deriving the Nepali risk-free interest rate curve.

The disclaimer also applies to the numeric examples reflected in this document.

² In the case of India, Malaysia and Thailand the RICs identifiers shown in the table are those that EIOPA used until the discontinuance of the publication of their risk-free interest rates curves from January 2025 onwards.

Step 2. Deriving the complete liquid part of the zero-coupon spot riskfree rates curves.

- 28. Most of the spot risk-free curves reflected in the table above are withcoupon curves. Therefore, it is necessary the calculation of the financially equivalent zero-coupon curves.
- 29. Furthermore, it is likely that some tenor for some countries may not be provided due to the lack of reliable pricing for such tenors. In that case, it is also necessary an interpolation.
- 30. For the sake of simplicity, the Smith-Wilson methodology is applied for both the calculation of the zero-coupon curves and the interpolation. That methodology carries out both calculations at once, and is the one applied in step 4 to extrapolate the liquid part of the Nepali risk-free curve, beyond the last term observable in the financial markets (LOT)³.
- 31. For the only purpose of this step, the following extrapolation parameters are adopted for all countries:
 - □ The last observable term (LOT) is the 10-year tenor (if not provided, the nearest downwards tenor). Therefore, the liquid part of the curves is assumed to be from 1 to 10 years.
 - □ The convergence point is notionally set at 30-years term (thus with a convergence period of 20 years),
 - □ The long-term forward rate (LTFR) is notionally set for each country as the nearest quarter upwards to the last observable forward rate in the liquid part of the curve. This assumption has a mere operational role, because it does not impact on the outcomes considered for the following steps.

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³ An excel file developing the Smith-Wilson methodology can be found at EIOPA webpage (link → <u>https://www.eiopa.europa.eu/document/download/1b602326-956a-434a-ad05-0a3143f37122 en?filename=22.11.2015 Smith-Wilson%20risk%E2%80%8B-free%20interest%20rate%20extrapolation%20tool.xlsb</u>



For example, if the LOT is the 10-years tenor and the forward rate 9 to 10 years is 6,13%, the UFR will be $6.25\%^4$.

NIA is aware that for its own essence the LTFR is expected to be stable and change smoothly in time. Therefore, NIA does not intend to express any assessment when applying this notional and merely operational approach to amount the LTFR.

Step 3. Adjustment of the base reference to the Nepali economy.

- 32. The original design of this step is maintained, with the only exception of using the 1 to 10 years tenors, instead of the 1 to 5 years considered up to now.
- 33. In mathematical terms the calculations might be expressed as

$$RFR_{Nepal}(t) = RFR_{India}(t) - P(t) * \frac{\sum Spread_{India}^{k}(t)}{4}$$

where

- (t) means tenors 1 to 10,
- (k) refers to the magnitudes of the zero-coupon spot risk-free curves for China, Hong Kong, Malaysia, Thailand and USA, excluding in each tenor the country with the highest absolute spread,
- *P(t)* means the portion of the average spread to adjust for interest rate of tenor (t). It is considered that *P(t)* = 0,20 for t = {1...10} provides a plausible estimation of the adjustment,
- Spread^k_{India}(t) means for each tenor (t) the five spreads of each of the five currencies used as secondary reference compared to the Indian OIS zero coupon spot interest rates. For each tenor the country with the highest absolute spread will be excluded. For example, for the 5 years term and China,

Spread
$$_{China}^{India}(5y) = RFR_{India}(5y) - RFR_{China}(5y)$$
.

Mote that the level of the LTFR has no effect in the final outcomes, because only the liquid part is considered for the following steps and the Smith-Wilson methodology preserves the zero-coupon interest rates observed in the market in that liquid part of the yield curve, regardless the convergence period and the LTFR. Regarding the interpolation of the interest rates in the liquid part of the curve, the impact of the LTFR and convergence period is not material, as a general rule.



- 34. It is also retained the application of a cap to prevent an inappropriate volatility⁵ derived from a material increasing of spreads of the risk-free interest rates of the currencies used as secondary references to the Indian risk-free interest rates. NIA deems that under current market conditions it is appropriate to maintain the original cap of 75 basis points (0,75%) in absolute terms⁶.
- 35. After the introduction of the cap proposed above, the formula to calculate the Nepali zero coupon RFR curve becomes as follows for each term $(t) = \{1...10\}$:

when
$$\frac{\sum Spread_{India}^{k}(t)}{4} < 0$$

 $RFR_{Nepal}(t) = RFR_{India}(t) + \min(cap(t); -P(t) * \frac{\sum Spread_{India}^{k}(t)}{4})$

otherwise

$$RFR_{Nepal}(t) = RFR_{India}(t) + \max(-cap(t); -P(t)*\frac{\sum Spread_{India}^{k}(t)}{4})$$

where cap(t) = 75 basis point for $t = \{ 1...10 \}$.

Having these properties in mind, the 75 bp level was estimated at the end of FY 2080/2081 based on the evidence available at that date.

More precisely, during calendar year 2080 and the first two months of calendar year 2081, the average spreads correction moved in the range 45 bp to 63 bp for all 1 to 10 years tenors.

The additional experience gained during calendar year 2081 shows that the average spreads correction has moved in the range 54 bp to 65 bp for all 1 to10 years tenors.

Consequently, the 75 bp cap has not been activated, which matches the expectations since during calendar year 2081 there has been no market disruption.

At the same time the level of the referred correction is sufficiently near the cap, in such a manner that the cap will be activated in case of major disruptions of market spreads among the risk-free curves considered in the methodology.

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⁵ At international level there are some precedents setting caps, floors or corridors for the adjustments to the risk-free curve used as reference. For example, in the case of the European Union the credit risk adjustment has a corridor of 10-35 basis points.

⁶ The appropriate functioning of the cap means that it is activated only under exceptional unfavourable scenarios, while in normal market conditions it is not triggered.



36. The following table compares the liquid part of the Nepali risk-free interest rates curve calculated with the original methodology (column 'Previous') and the same liquid part calculated with the amended method as described in this paper. The table refers to the last date available before the discontinuance of EIOPA inputs.

30-08-2081	Previous	New	Diff
1	5,871%	5,794%	0,077%
2	5,613%	5,526%	0,087%
3	5,563%	5,482%	0,082%
4	5,547%	5,474%	0,073%
5	5,551%	5,479%	0,071%
6	5,556%	5,490%	0,066%
7	5,558%	5,503%	0,055%
8	5,559%	5,515%	0,045%
9	5,560%	5,524%	0,036%
10	5,560%	5,533%	0,026%

37. The last column provides evidence of the smooth transition from the original methodology to the new method described in this document. Annexure 1 below reflects the outcomes provided by the amended methodology.

Technical comments.

- 38. Firstly, note that the derived curves will not necessarily be around the 6 per cent flat rate that was used to discount technical reserves as per the Nepali insurance regime in force before the introduction of the RBC framework. At a future point in time the curve may be materially above or below the 6 per cent, depending on how the different inputs to the methodology evolve.
- 39. Therefore, the valuation of technical provisions would be materially lower (or higher) than the valuation with a flat 6 per cent discount rate. This feature is inherent in a risk-based framework, as it is intended to reflect market movements and developments.
- 40. Secondly, note that a decrease in the Indian risk-free curve is not necessarily mirrored in the Nepali risk-free curve. The change in the Indian risk-free curve may be partially offset (or may be exacerbated) depending on how evolve the risk-free curves of the other five countries considered, and hence the corresponding



spreads to the Indian curve. And similarly in the case of an increase in the Indian risk-free curve.

- 41. Thirdly, note that the adjustment formulated above (parameter P = 0.20) is understood to include a prudent currency risk adjustment. Thus, it is not necessary to add any explicit adjustment for this reason. The explicit insertion of such adjustment, further than increasing the complexity of the method, would trigger a calibration challenge difficult to solve under current market conditions.⁷
- 42. NIA is conscious that this approach has room for evolution when the extreme limitations currently existing in the Nepali financial markets for fixed-income instruments fade away. In the meantime, the approach of this document is considered to satisfy to a sufficient degree the goal and properties elaborated at the beginning of this document.

Step 4. Extrapolation of the liquid part of the Nepali risk-free curve.

- 43. The experience does not show any evidence to amend the original methodology, with the only change of considering as liquid part the 1 to 10 years tenors. Therefore, the extrapolation parameters applied in this step are:
 - □ Type of curve: Zero coupon spot curve.
 - □ Last observed term (LOT): 10-years tenor, which means that extrapolation starts from 11-years tenor (inclusive),
 - □ Convergence point: 30 years, which means a convergence in 20 years.
 - □ Long term forward rate (LTFR or UFR): A LTFR/UFR of 5.50 per cent has been applied at fiscal year-end 2080/2081 (first application of the Risk-Based Capital and Solvency Directive). This initial level will be reduced annually by 10 basis points during the period 2081/82 to 2084/85 NP, until it reaches 5.00 per cent at financial year-end 2085/86 NP.

To avoid material cliff-effects, the calculations that NIA carries out to regularly publish the level of the Nepali risk-free interest rates shall considered a linear monthly reduction of the LTFR.

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⁷ Refer to item 8 of the EIOPA methodology on risk-free interest rates (<u>https://www.eiopa.europa.eu/tools-and-data/risk-free-interest-rate-term-structures en)</u> as an evidence of the complexity that may have an estimation of the currency risk adjustment.



44. The extrapolation shall be carried out with the excel tool publicly available up to now in the EIOPA web page related to risk-free interest rates term structures (see its link in the footnote to step 2 above).

Step 5. Public disclosure of the Nepali risk-free interest rates.

45. NIA intends to continue the quarterly publication (Nepali calendar) of the Nepali zero-coupon spot risk-free interest rates, as soon as possible after each quarterend. In this way insurers/reinsurers may monitor the development of the risk-free interest rates and anticipate the relevant risk management actions.

Additional remarks.

- 46. The lack of market information and usable fair valuation practices in the Nepali financial sector makes necessary to develop a specific methodology to derive *the Nepali risk-free interest rate curve*.
- 47. The amendments to the original methodology introduced in this document have a quite limited scope and preserve the desirable properties for a risk-free interest rate term structure applicable to the valuation of technical provisions of insurance obligations in the Nepali insurance market.
- 48. Nevertheless, a continuous open and intensive dialogue between NIA and the industry, especially life insurers, is necessary to monitor that the methodology remains appropriate, bearing in mind the consequences of the risk-free rates methodology both at entity and macroeconomic level and on policy holders' rights.
- 49. This document considers that it is relevant to stick to a risk-free interest rate methodology that:
 - provides a reliable picture of the interest rate risks that the insurer or reinsurer is exposed due to the asset-liability timing mismatch,
 - bears in mind that risk managers and supervisors need to base their decisions on real world,
 - keeps in mind that artificial mechanisms in the methodology would likely be incompatible with the ORSA goals,
 - preserves the risk-free interest rate methodology stable and traceable, therefore providing certainty on this aspect to the risk management of insurers and reinsurers, and
 - meets to the possible extent the other properties listed in the introduction.



Admissible spreads for the valuation of assets with predefined cash flows expressed in Nepali rupees.

Methodology.

- 50. For solvency purposes, where an asset with predefined cash flows expressed in Nepali rupees lacks reliable market prices observed in deep, liquid and transparent financial markets, the spreads derived according to the methodology described below are admissible to carry out a mark-to-model valuation of that asset. In case of existing reliable market prices, the mark-to-model valuation cannot be applied. The term '*predefined*' means that there is no option embedded in the asset and the amount and timing of the cash flows are certain.
- 51. The non-stressed spreads have initially been based on the Indian corporate spreads published by EIOPA (more precisely the Indian '*fundamental spreads*').
- 52. Since EIOPA has discontinued the publication of the fundamental spreads for India, a proxy of the Indian spreads is calculated as a multiple of the simple average of the fundamental spreads from 1 to 10 years as published by EIOPA for China with reference to the end of each month (EIOPA excel file PD_CoD, sheet 'CNY', ranges W11:AC20 and W51:AC60).
- 53. The multipliers referred above are calibrated to achieve a continuity of the fundamental spreads previously published for India. Furthermore, the multipliers have a floor 1.00, considering that there is no robust evidence justifying that it is prudent to allow for Nepali spreads lower than the Chinese spreads.

Multipliers applied to transform EIOPA fundamental spreads for China into non-stressed Nepali fundamental spreads according to the credit quality of the counterpart.

1	2	3	4	4 (5)(5)		5(7)			
Financial corporates									
2,25	1,75	1,45	1,10	1,00	1,00	1,00			
Non-financial corporates									
2,60	2,00	1,70	1,40	1,00	1,00	1,00			

54. Annex 2 shows the continuity of the spreads of the previous methodology with the proxy to Indian spreads based on these multipliers applied to Chinese spreads.



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- 55. The admissible spreads to apply at the end of each month according to the Nepali calendar will be based on the last PD_CoD published by EIOPA (approx. 15 days earlier than the end of month of the Nepali calendar)⁸.
- 56. The simple average spreads are calculated separately for financial institutions and for non-financial corporates, and within each of them for different credit quality classes.
- 57. For the sake of simplicity, the relevant average spread according to the type of entity and its credit quality class is applied to all cash flows of the asset.
- 58. Stressed spreads shall apply to the valuation of assets in the two scenarios considered for the calculation of the capital requirement corresponding interest rates risk. The stressed spreads are calculated by increasing/decreasing the non-stressed spreads in 30 per cent.
- 59. The 30 % is the stress set out for the central tranche of maturities (4 to 7 years) in paragraph (44) Annexure III of the Risk-Based Capital Directive (2081).
- 60. NIA will regularly publish the admissible spreads for the valuation of assets with predefined cash flows expressed in Nepali rupees spreads.

EIOPA publications of fundamental spreads refer to the end of each month of the Gregorian calendar, which have a gap of 15 days approximately with the Nepali calendar.

Having in mind the smooth evolution of spreads (as shown in Annex 2), the impact on the spreads of such time gap is negligible. Therefore, for the sake of simplicity and objectivity it is not considered relevant to introduce any mechanism to tackle with the gap.



Examples of application.

Example of application of the stressed spreads for an asset with a single predefined fixed cash flow.

- 61. Let's consider a scenario where the non-stressed risk-free interest rate for the 3years term is 5.70 per cent. Let's also consider a non-traded non-financial asset with a single cash inflow at 3 years term and belonging to asset class 4. Let's also consider that the spread applicable for non-financial assets of credit quality class 4 is 1.352 per cent.
- 62. The non-stressed solvency valuation of that asset (i.e. the valuation to reflect in the solvency balance sheet, template 02.01_BS) may be calculated with a mark-to-model approach, discounting the cash flow of the asset with a discount rate equal to:

Note that for simplicity the spread 0.01352 applies to all maturities.

63. The upwards stressed solvency valuation of that asset (i.e. one of the two valuations to carry out to calculate the capital requirement regarding interest rate risk) may be calculated with a mark-to-model approach, discounting the cash flow of the asset with a discount rate equal to:

 $[1 + (0.0570 \times 1.55 + 0.01352 \times 1.30)]^{-3}$.

Regarding the risk-free component of the formula above, (0.0570×1.55) note that the stress set out for a 3-years term is 55 per cent (paragraph (44) Annexure III of the Risk-Based Capital and Solvency Directive).

Regarding the spread component of the formula above, (0.01352×1.30) , given that the spreads are calculated as a single average of 1 to 10 years terms, for the sake of simplicity a uniform 30 per cent spread stress is applied to all spreads and maturities.

64. The downwards stressed solvency valuation of that asset (i.e. the other valuation to carry out to calculate the capital requirement regarding the interest rate risk) may be calculated with a mark-to-model approach, discounting the cash flow of the asset with a discount rate equal to:

 $[1 + (0.0570 \times (1 - 0.55) + 0.01352 \times (1 - 0.30)]^{-3}.$



Example of application of the spreads published by the NIA for the mark-tomodel valuation of assets with several predefined fixed cash flows.

- 65. Let's consider a scenario where the non-stressed risk-free interest rate for the 2years term is 5.42 per cent and for the 8-years term is 5.97 per cent. Let's also consider that the insurer owns a non-traded financial asset belonging to credit quality class 5 and providing two predefined fixed cash inflows at 2- and 8-years term, and that NIA spreads for such financial asset and credit quality is 2.30 per cent. Note that for simplicity the spread 2.30 per cent applies to all maturities.
- 66. The methodology means that the corporate interest rates curve to apply for the valuation of the financial asset described above is obtained as a parallel shift upwards of the Nepali risk-free curve. The amount of the shift depends on whether the counterpart is a financial or non-financial entity and on its credit quality.
- 67. Considering all above, the non-stressed solvency valuation of that asset (i.e. the valuation to reflect in the solvency balance sheet, template 02.01_BS) may be calculated with a mark-to-model approach, discounting the 2- and 8-years term cash flows of the asset with the following discount rates respectively:

 $[1 + (0.0542 + 0.0230)]^{(-2)}$ and $[1 + (0.0597 + 0.0230)]^{(-8)}$

68. The upwards and the downwards stressed solvency valuations of that asset (the two valuations to carry out to calculate the capital requirement regarding interest rate risk) may be calculated with a mark-to-model approach, by applying the following formula:

Note that assets whose valuation is dependent on the level of interest rates and credit spreads, are exposed on the one hand to default risk (captured in the credit risk module, paragraphs 35 to 40 of the Risk-Based Capital and Solvency Directive 2078) and on the other hand to adverse changes of value due to the level and volatility of the credit spreads over the risk-free interest rates term structures. The latter risk may be material and is captured in the market risk module, interest rates risk submodule, by stressing the credit spreads in the manner described in this item.

69. Therefore, the upwards stressed solvency valuation will discount the 2- and 8years term cash flows of the asset with the following discount rates respectively:



 $\begin{bmatrix} 1 + (0.0542 \times (1 + 0.55) + 0.0230 \times (1 + 0.30))]^{-2}, \\ \begin{bmatrix} 1 + (0.0597 \times (1 + 0.15) + 0.0230 \times (1 + 0.30))]^{-8} \end{bmatrix}$

Regarding the risk-free component of the formulas above, note that the stress set out for a 2-years term is 55 per cent (paragraph (44) Annexure III of the Risk-Based Capital and Solvency Directive). And the stress set out in that legal provision for a 8-year terms is 15 per cent.

Regarding the spread component of the formula above, given that the spreads are calculated as a single average of 1 to 10 years terms, for the sake of simplicity a uniform 30 per cent spread stress is applied to all spreads and maturities.

70. And consistently, the downwards stressed solvency valuation will discount the 2and 8-years term cash flows of the asset with the following discount rates respectively:

 $\begin{bmatrix} 1 + (0.0542 \times (1 - 0.55) + 0.0230 \times (1 - 0.30))]^{-2}, \\ \begin{bmatrix} 1 + (0.0597 \times (1 - 0.15) + 0.0230 \times (1 - 0.30))]^{-8} \end{bmatrix}$



Annex 1. Nepali risk-free curve with the amended methodology.

- 71. The following tables show the liquid part of the Nepali risk-free curve obtained with the amended methodology for the last three months of calendar year 2081.
 - Columns 3 to 6 show the differences for each tenor and currency compared to the zero-coupon spot risk-free interest rates curve for India,
 - Column 'Average spread' shows the average of spreads for each tenor, excluding the maximum spread in absolute value for each row (i.e. the excluded observation may correspond to different currencies in each tenor),
 - Last column, green filled cells, shows the liquid part of the zero-coupon spot Nepali RFR curve (e.g., for tenor 1 in the first table, 5.212 = 5.757 – 0.545).

	RFR curve	Spread zero-coupon spot risk-free Indian rates - zero-coupon spot RFR for each country						Nepal RFR curve	
	India	China	Hong Kong	Malaysia	Thailand	United States	Average spread	Adjustment	before STVA
20811230	3	14	25	36	47	58			
1	5,757%	4,290%	2,203%	2,612%	4,264%	1,822%	2,725%	-0,545%	5,212%
2	5,575%	4,189%	2,300%	2,348%	4,179%	1,867%	2,674%	-0,535%	5,040%
3	5,587%	4,201%	2,025%	2,273%	4,180%	1,904%	2,596%	-0,519%	5,068%
4	5,644%	4,236%	2,465%	2,243%	4,185%	1,931%	2,706%	-0,541%	5,102%
5	5,695%	4,277%	2,486%	2,212%	4,179%	1,942%	2,705%	-0,541%	5,154%
6	5,735%	4,291%	2,463%	2,175%	4,146%	1,937%	2,681%	-0,536%	5,198%
7	5,768%	4,287%	2,462%	2,140%	4,100%	1,929%	2,658%	-0,532%	5,237%
8	5,800%	4,288%	2,445%	2,111%	4,049%	1,922%	2,632%	-0,526%	5,274%
9	5,830%	4,286%	2,418%	2,087%	4,002%	1,914%	2,606%	-0,521%	5,309%
10	5,857%	4,280%	2,394%	2,114%	3,962%	1,904%	2,594%	-0,519%	5,338%
	RFR curve	Spread zero-c	oupon spot risk	-free Indian ra	tes - zero-coup	on spot RFR for	r each country		Nepal RFR curve
	India	China	Hong Kong	Malaysia	Thailand	United States	Average spread	Adjustment	before STVA
20811130									
1	6,115%	4,394%	2,308%	2,834%	4,318%	2,067%	2,882%	-0,576%	5,539%
2	5,899%	4,249%	2,316%	2,478%	4,189%	2,049%	2,758%	-0,552%	5,347%
3	5,902%	4,253%	2,398%	2,379%	4,187%	2,107%	2,768%	-0,554%	5,349%
4	5,935%	4,274%	2,466%	2,330%	4,193%	2,142%	2,783%	-0,557%	5,378%
5	5,963%	4,303%	2,499%	2,293%	4,174%	2,157%	2,781%	-0,556%	5,407%
6	5,993%	4,306%	2,522%	2,269%	4,177%	2,165%	2,783%	-0,557%	5,436%
7	6,020%	4,297%	2,532%	2,253%	4,109%	2,172%	2,767%	-0,553%	5,467%
8	6,044%	4,277%	2,528%	2,238%	4,046%	2,174%	2,747%	-0,549%	5,495%
9	6,064%	4,265%	2,516%	2,221%	4,002%	2,172%	2,728%	-0,546%	5,518%
10	6,080%	4,248%	2,503%	2,201%	3,968%	2,164%	2,709%	-0,542%	5,538%
	RFR curve	Spread zero-c	oupon spot risk	-free Indian ra	tes - zero-coup	on spot RFR fo	r each country		Nepal RFR curve
	India	China	Hong Kong	Malaysia	Thailand	United States	Average spread	Adjustment	before STVA
20811030									
1	6,354%	4,684%	2,469%	3,063%	4,352%	2,052%	2,984%	-0,597%	5,757%
2	6,108%	4,529%	2,328%	2,675%	4,216%	1,887%	2,776%	-0,555%	5,552%
3	6,098%	4,540%	2,371%	2,541%	4,216%	1,898%	2,756%	-0,551%	5,547%
4	6,123%	4,564%	2,427%	2,468%	4,222%	1,926%	2,761%	-0,552%	5,571%
5	6,146%	4,587%	2,471%	2,418%	4,200%	1,947%	2,759%	-0,552%	5,594%
6	6,168%	4,584%	2,495%	2,382%	4,159%	1,961%	2,749%	-0,550%	5,619%
7	6,187%	4,570%	2,499%	2,354%	4,126%	1,971%	2,737%	-0,547%	5,639%
8	6,199%	4,545%	2,488%	2,329%	4,076%	1,974%	2,717%	-0,543%	5,655%
9	6,208%	4,521%	2,472%	2,304%	4,018%	1,974%	2,692%	-0,538%	5,669%
10	6,216%	4,497%	2,457%	2,281%	3,964%	1,973%	2,669%	-0,534%	5,682%



Annex 2. Admissible spreads. Continuity of the previous and new methodologies.

72. Spreads for financial institutions. Spreads from 2081_09, inclusive, onwards are calculated with the amended methodology.

2080_12	0,740	0,862	1,038	1,489	2,305	4,382	5,398
2081_01	0,740	0,863	1,039	1,493	2,309	4,389	5,406
2081_02	0,739	0,862	1,038	1,487	2,303	4,375	5,392
2081_03	0,738	0,862	1,038	1,485	2,300	4,367	5,381
2081_04	0,738	0,861	1,037	1,484	2,297	4,360	5,369
2081_05	0,738	0,861	1,037	1,481	2,294	4,352	5,361
2081_06	0,738	0,861	1,037	1,479	2,290	4,342	5,363
2081_07	0,737	0,860	1,035	1,477	2,288	4,334	5,355
2081_08	0,737	0,860	1,034	1,476	2,284	4,324	5,351
2081_09	0,738	0,859	1,053	1,447	2,391	5,111	6,482
2081_10	0,738	0,859	1,048	1,441	2,387	5,099	6,639
2081_11	0,736	0,859	1,045	1,436	2,380	5,086	6,642
2081_12	0,736	0,856	1,045	1,436	2,377	5,074	6,633

73. Spreads for non-financial corporations. Spreads from 2081_09, inclusive, onwards are calculated with the amended methodology.

2081_02	0,689	0,805	0,877	1,056	1,784	2,609	10,386
2081_03	0,689	0,803	0,877	1,055	1,784	2,603	10,356
2081_04	0,689	0,803	0,876	1,052	1,781	2,597	10,328
2081_05	0,689	0,803	0,876	1,052	1,778	2,597	10,316
2081_06	0,689	0,803	0,876	1,052	1,776	2,599	10,351
2081_07	0,689	0,802	0,875	1,052	1,776	2,597	10,338
2081_08	0,689	0,802	0,874	1,051	1,773	2,598	10,342
2081_09	0,686	0,830	0,870	1,047	1,711	3,125	12,711
2081_10	0,684	0,828	0,867	1,044	1,705	3,130	12,721
2081_11	0,679	0,828	0,867	1,040	1,703	3,135	12,752
2081_12	0,676	0,826	0,865	1,040	1,701	3,135	12,742