



ISLAMIC FINANCIAL SERVICES BOARD

USER GUIDE FOR TN-2

**TECHNICAL NOTE ON STRESS TESTING FOR
INSTITUTIONS OFFERING ISLAMIC FINANCIAL
SERVICES (IIFS)**

JUNE 2017

ABOUT THE ISLAMIC FINANCIAL SERVICES BOARD (IFSB)

The IFSB is an international standard-setting organisation which was officially inaugurated on 3 November 2002 and started operations on 10 March 2003. The organisation promotes and enhances the soundness and stability of the Islamic financial services industry by issuing global prudential standards and guiding principles for the industry, broadly defined to include banking, capital markets and insurance sectors. The standards prepared by the IFSB follow a lengthy due process as outlined in its Guidelines and Procedures for the Preparation of Standards/Guidelines, which involves, among others, the issuance of exposure drafts, holding of workshops and, where necessary, public hearings. The IFSB also conducts research and coordinates initiatives on industry-related issues, as well as organises roundtables, seminars and conferences for regulators and industry stakeholders. Towards this end, the IFSB works closely with relevant international, regional and national organisations, research/educational institutions and market players.

For more information about the IFSB, please visit **www.ifsb.org**.

TECHNICAL COMMITTEE

Chairman

Mr. Mu'jib Turki Al Turki – Qatar Central Bank (*from 12 April 2016*)
Mr. Osamah Shaker - Saudi Arabian Monetary Authority (*until 31 January 2016*)
H.E. Dr. Ahmed Abdulkarim Alkholifey – Saudi Arabian Monetary Authority (*until 31 March 2015*)

Deputy Chairman

Mr. Tarek Fayed – Central Bank of Egypt (*from 12 April 2016*)
Mr. Mu'jib Turki Al Turki – Qatar Central Bank (*until 11 April 2016*)

Members*

Mr. Haseeb Ullah Siddiqui (<i>from 30 March 2012</i>)	Islamic Development Bank
Mr. Lotfi S. Zairi (<i>until 31 March 2015</i>)	Islamic Corporation for the Insurance of Investment and Export Credit (ICIEC)
Mr. Hussain Ali Sharaf (<i>until 31 March 2015</i>)	Central Bank of Bahrain
Mrs. Ebtisam Al Arrayed (<i>from 2 April 2015</i>)	Central Bank of Bahrain
Mr. Chowdhury Md. Feroz Bin Alam (<i>until 22 September 2015</i>)	Bangladesh Bank
Mr. Abu Farah Md. Nasser (<i>from 23 September 2015</i>)	Bangladesh Bank
Ms. Mahani Mohsin (<i>until 31 March 2015</i>)	Autoriti Monetari Brunei Darussalam
Ms. Rashidah Sabtu (<i>from 2 April 2015</i>)	Autoriti Monetari Brunei Darussalam
Mr. Tarek Fayed (<i>until 11 April 2016</i>)	Central Bank of Egypt
Dr. Agusman (<i>until 12 March 2015</i>)	Bank Indonesia
Dr. Dadang Muljawan (<i>from 13 March 2015</i>)	Bank Indonesia
Mr. Edy Setiadi (<i>until 31 March 2015</i>)	Indonesia Financial Services Authority
Mr. Ahmad Buchori (<i>from 2 April 2015</i>)	Indonesia Financial Services Authority
Mr. Morteza Setak (<i>until 1 April 2015</i>)	Central Bank of the Islamic Republic of Iran
Mr. Hamidreza Ghaniabadi (<i>from 2 April 2015</i>)	Central Bank of the Islamic Republic of Iran
Dr. Ali Saeedi (<i>from 13 March 2015</i>)	Securities and Exchange Organization, Iran
Mr. Arafat Alfayoumi (<i>from 27 March 2014</i>)	Central Bank of Jordan
Mr. Talal Al Zemami (<i>until 1 April 2015</i>)	Capital Market Authority of Kuwait
Mr. Waleed Al-Awadhi (<i>from 2 April 2015</i>)	Central Bank of Kuwait
Mr. Bakarudin Ishak (<i>until 31 March 2015</i>)	Bank Negara Malaysia
Mr. Mohd Zabidi Md. Nor (<i>from 2 April 2015</i>)	Bank Negara Malaysia
Mr. Zainal Izlan Zainal Abidin (<i>from 30 March 2012</i>)	Securities Commission Malaysia
Dr. Lhassane Benhalima (<i>from 2 April 2015</i>)	Bank Al-Maghrib

Dr. Yakubu A. Umar (until 24 July 2015)	Central Bank of Nigeria
Mr. Muhammad Wada Mu'azu Lere (from 25 July 2015)	Central Bank of Nigeria
Dr. Talmiz Usman (from 2 April 2015)	National Insurance Commission, Nigeria
Mr. Yavar Moini (until 30 September 2015)	State Bank of Pakistan
Mr. Ghulam Muhammad Abbasi (from 1 October 2015)	State Bank of Pakistan
Mr. Thamer AlEssa (from 26 January 2016)	Saudi Arabian Monetary Authority
Mr. Ahmed Ali Al Mamari (until 1 April 2015)	Capital Market Authority of Oman
Mr. Ethan Goh Cheng Hing (until 7 January 2016)	Monetary Authority of Singapore
Mr. Alan Teo (from 12 April 2016)	Monetary Authority of Singapore
Dr. Badreldin Gorashi Mustafa (until 16 August 2015)	Central Bank of Sudan
Mr. Mehmet Siddik Yurtcicek (until 15 September 2015)	Banking Regulation and Supervision Agency of Republic of Turkey
Mr. Abdurrahman Cetin (from 16 September 2015)	Banking Regulation and Supervision Agency of Republic of Turkey
Mr. Bircan Akpinar (until 31 March 2015)	Capital Market Board of Turkey
Mr. Eser Sagar (from 2 April 2015)	Capital Market Board of Turkey
Mr. Ahmet Bicer (from 27 March 2014)	Central Bank of Republic of Turkey
Mr. Khalid Omar Al-Kharji (from 13 April 2009)	Central Bank of the United Arab Emirates
Mr. Prasanna Seshachellam (until 31 March 2015)	Dubai Financial Services Authority, United Arab Emirates

***In alphabetical order of the country the member's organisation represents**

SECRETARIAT, ISLAMIC FINANCIAL SERVICES BOARD

Mr. Zahid ur Rehman Khokher	Assistant Secretary-General
Mr. Syed Faiq Najeeb	Member of the Secretariat, Technical and Research

Table of Contents

ABBREVIATIONS	iv
SECTION 1: INTRODUCTION	1
1.1 Background.....	1
1.2 Objectives	1
SECTION 2: STRESS TESTING THE ISLAMIC BANKING SECTOR	3
2.1 Macrofinancial Linkages.....	3
2.2 Shock Designs.....	4
2.3 Credit Risk Stress Testing.....	5
2.4 Market Risk Stress Testing	7
2.5 Rate of Return Risk (Banking Book) Stress Testing	9
2.6 Scenario Analysis Stress Testing.....	11
2.7 Liquidity Risk Stress Testing.....	12
SECTION 3: CONCLUSION	14
REFERENCES	15
DEFINITIONS	16

ABBREVIATIONS

AT1	Additional Tier 1
CAR	Capital adequacy ratio
CET1	Common Equity Tier 1
DCR	Displaced commercial risk
HQLA	High-quality liquid assets
ICAAP	Internal capital adequacy assessment process
ICFA	Implied cash flows analysis
IFSB	Islamic Financial Services Board
IFSI	Islamic financial services industry
IIFS	Institutions offering Islamic financial services
LCR	Liquidity coverage ratio
NPF	Non-performing financings
NSFR	Net stable funding ratio
PSIA	Profit-sharing investment account
RRRBB	Rate of return risk in the banking book
RSA	Regulatory and supervisory authority
RWA	Risk-weighted assets
T2	Tier 2
TN-2	IFSB Technical Note 2 on Stress Testing for Institutions offering Islamic Financial Services

SECTION 1: INTRODUCTION

1.1 Background

1. On 14 December 2016, the Council of the Islamic Financial Services Board (IFSB) in its 29th Meeting, held in Cairo, Egypt, approved the adoption of IFSB TN-2: *Technical Note on Stress Testing for Institutions offering Islamic Financial Services (IIFS)*.

2. The Technical Note on Stress Testing for IIFS (TN-2) aims to provide regulatory and supervisory authorities (RSAs) and market players in the Islamic banking industry with the appropriate technical guidance to develop, conduct and assess stress tests. The document addresses multiple types of risks and their interrelated effects on the overall financial position and performance of the portfolio, institution, group or system. These risks include, but are not limited to, credit risk within financing portfolios, market risk on assets held, foreign exchange risk, liquidity risk and rate of return risk, as well as aspects of Sharī'ah non-compliance risk.

3. A key feature of TN-2 is that it incorporates risk specificities of Sharī'ah-compliant contracts when conducting stress tests on an Islamic bank. This approach involves evaluating various risk exposures experienced by an IIFS, which are segregated by the contractual relationships of the balance sheet components. In this regard, TN-2 provides **five basic stress test templates**: one each for conducting credit, market and liquidity risk assessments, one for rate of return risk, and a scenario analysis template that combines credit and market risk stress tests. The proposed basic stress test templates provide the flexibility of having stress test results analysed and assessed across three levels: the portfolio level, the institution-level and the aggregate industry-wide level.

4. The IFSB Council, while approving TN-2 in its 29th Meeting, requested the IFSB Secretariat also to prepare, in due course, a "User Guide" to facilitate the use and implementation of the stress-testing templates provided in TN-2. Accordingly, the IFSB Secretariat included preparation of this User Guide in its Work Plan for 2017.

1.2 Objectives

5. The User Guide for TN-2 intends to complement the main technical note while providing additional guidance on use of the five stress-testing templates. Hence, the scope and qualifications of TN-2 are also applicable to this User Guide.

6. In particular, the User Guide does not attempt to cover all known methodologies of stress testing. The steps proposed in this User Guide constitute a well-known mechanism for conducting both industry-wide and institution-level stress testing. RSAs and IIFS are encouraged to explore, design and develop their own stress test(s) that are technically more

advanced and appropriate for their economic and financial environment and jurisdiction complexity.

7. Furthermore, TN-2 templates adopt a one-time horizon (i.e. Year 1) for conducting the stress tests and discussing the results. Hence, correspondingly, the User Guide facilitates stress testing for this time horizon. This is indicative only for illustration purposes, and RSAs and IIFS are encouraged to conduct stress tests over multiple time periods and as required by regulations (e.g. a three- to five-year period for internal capital adequacy assessment process [ICAAP]) to achieve a longer time-period assessment of capital and liquidity adequacy.

8. Section 2 provides some additional guidelines for using the five stress-testing templates set out in TN-2.

SECTION 2: STRESS TESTING THE ISLAMIC BANKING SECTOR

2.1 Macrofinancial Linkages

9. The first step is the identification of macroeconomic stress determinants of Islamic banking industry performance – that is, establishing the macrofinancial linkages between Islamic banking-sector financial indicators and macroeconomic indicators. This relationship is estimated using econometric models (termed “satellite models” – see TN-2, section 3.3, for elaboration).

10. In traditional finance literature, a number of studies¹ have attempted to identify and discuss the appropriate set of variables (indicators) that should be used in establishing this relationship. The most commonly employed macroeconomic determinants are: gross domestic product (GDP) growth, interest rate, inflation, unemployment, exchange rate, stock price index, exports, balance of payments, foreign direct investment and measures of broad money supply, among others. For the banking-sector financial indicators, the most studied indicator is non-performing loans followed by total assets, credit/loans growth, liabilities/funding structure, non-interest expense, operating profit before taxation, and net interest income, among others. Studies also include in the model bank-specific variables such as asset size and sectoral concentration in financing in order to capture bank-specific interactions between macroeconomic factors and financial variables.

11. Studies specific to Islamic banking macrofinancial linkages with the macroeconomy are relatively scarce, possibly due to the lack of sufficient data and the technical nature of this subject matter. One seminal research paper² on this aspect attempts a preliminary empirical study on the macroeconomic stress determinants of the Islamic banking industry’s financial indicators. In the absence of granular Islamic banking financial statements data, the study focuses on broader industry-wide stress determinants and vulnerabilities.

12. The financial model specification in the above research is as follows:

$$y_{i,t} = f(x_{i,t}) + error_{i,t}$$

where i denotes the Islamic banking-sector variable of a particular sample country and t denotes the time period (e.g. 2008). The list of x independent variables in this model includes the macroeconomic determinants of each dependent variable y – that is, the Islamic banking-sector variables.

¹ For instance, see Gizycki (2001); Clair (2004); Gerlach et al. (2005); Festic and Beko (2008); Bohachova (2008); Costeiu and Neagu (2013); Morley (2016); and others. Full bibliographical details are available in the references list at the end of this report.

² See IFSB, *Islamic Financial Services Industry Stability Report 2017*, Chapter 4, Section 4.1.

13. The above study considers the following list of macroeconomic variables in its model: GDP growth, interest rate, inflation rate, unemployment rate, exchange rate, stock price index, plus two additional variables – real estate prices and oil price – as it is widely understood that the Islamic banking sector in some markets, particularly in the Gulf Cooperation Council, has strong exposures to these two economic subsectors.

14. The stress tester needs to develop an appropriate satellite model for estimating the extent of impact (or stress) on the IIFS's financial statement items (e.g. equity investment losses, credit loss provisions, and so on) due to changes in the macroeconomic variables that are included in the shock scenarios. For instance, the model specified in paragraph 12 is one such example and can be modified to capture intra-country variations based on bank-by-bank level data.

15. If access is available to granular data, the stress tester should ideally explore the heterogeneity in impact from a shock across different financing and assets portfolios of Islamic banks based on their underlying Sharī'ah-compliant economic structures (e.g. *Murābahah* financing portfolio, *Ijārah* assets lease portfolio, *Sukuk* held in the banking book, etc.). This will enable the stress tester to gauge the relevant sensitivity to particular shocks of Islamic banks' assets by Sharī'ah-compliant contracts. For instance, *Salām*-based commodity financing is likely to be more sensitive than other financing portfolios during events of commodity price shocks. Similarly, real-estate prices may have more relevance to the sensitivity of *Istisnā'*- and *Ijārah*-based home financing and lease portfolios. The various Sharī'ah-compliant contracts also attract their own set of Sharī'ah rules, particularly in terms of resolution and insolvency processes – although the legal systems in some jurisdictions may not currently recognise these differences in relation to the rights and responsibilities of the contracting parties.

16. The estimated coefficients from the satellite models in this step will feed into the stress-testing templates to capture the impact from the designed shocks.

2.2 Shock Designs

17. The next step is the designing of appropriate shocks that will create a disturbance in the macroeconomic indicators, leading to stress in the Islamic banking industry's performance. TN-2 has provided relevant guidance in relation to this (see TN-2, section 3.3, for elaboration). In general, macroeconomic stress designs are formulated on the basis of historical data and/or expert judgment on extreme, yet plausible, conditions in future. Alternatively, they may be established by using externally provided parameters (e.g. stress scenarios given by a national or regional financial markets authority or relevant international organisations).

18. In TN-2, a number of shock scenarios are presented for discussion and illustrative purposes, including decline in GDP growth, increase in unemployment rate, depreciation of the exchange rate, a fall in house prices, etc.

19. The stress tester needs to adopt an appropriately designed shock scenario based on the relevant guidelines provided in TN-2 and based on their local economic and financial environment.

2.3 Credit Risk Stress Testing

20. The credit risk stress-testing template of TN-2 envisages a jurisdiction with a total of five Islamic banks in columns C to G [IIFS 1, IIFS 2 ... IIFS 5]. These are then aggregated into the broader financial sector in column B. These columns may be modified as necessary by the stress-testing expert to incorporate the specific number of IIFS in their respective jurisdiction.

21. Table 1 in the template shows the breakdown of financing components and assets held in the banking book of the IIFS. The stress tester may modify these to suit the types of assets held and the financing undertaken by the IIFS in their jurisdiction, based on the local laws and regulatory guidelines.

22. The regulatory capital in row 52 is currently based on total regulatory capital. For jurisdictions that have implemented Basel III/IFSB-15, this will be the combination of CET1 + AT1 + T2 capital. The stress tester may modify this as necessary – for instance, if the jurisdiction is currently implementing Basel II/IFSB-2 Capital Guidelines, or if it focuses on Tier 1 Capital only for stress-testing purposes, the constituent figures in this row may be modified accordingly.

23. The same guidelines also apply to rows 54 and 56, which report the consolidated risk-weighted assets (RWA) and the resulting capital adequacy ratio (CAR). The CAR row adopts a green colour signal if the ratio is above the regulatory threshold; in this case, the total capital ratio is above 8%. Otherwise, a red colour signal indicates that the particular IIFS has failed the stress test and the post-shock regulatory capital is below the hurdle rate.

24. TN-2's credit risk stress-testing template has currently incorporated three credit shocks, in rows 58, 122 and 184. The template evaluates stress on the IIFS capital through increases in non-performing financings (NPF) due to macroeconomic shocks. The stress tester may modify these as appropriate, including adding additional shock scenarios by introducing new rows below as necessary.

25. The blue boxes in the stress-testing template require inputs from the stress tester to govern the impact from shocks. These include the estimated coefficients from step 1 (see

subsection 2.1) between the shocked macroeconomic variable (e.g. unemployment) and the NPF of the various financing and assets portfolios in the banking book – for instance, applicable to rows 62–66 in credit shock 1 in the stress-testing template.

26. The stress tester will also need to input the level of provisioning required for the additional NPFs expected to be incurred by the bank – for instance, applicable to row 75 in credit shock 1. In general, the increased provisioning is absorbed by the IIFS, either in its annual profit and loss account (which acts as a first line of defence before losses hit common equity), or, in the case of deficit (i.e. there is insufficient annual profit to absorb the provisions), in part in its common equity (which acts as a second line of defence before a bank is at risk of Common Equity Tier 1 [CET1] insolvency and triggers loss absorption by Additional Tier 1 [AT1], and then Tier 2 [T2] instruments).³ During stress events, the likelihood of profitability is very low, and hence the ultimate impact from credit losses provisioning is likely to be on regulatory capital. However, if the stress tester wishes to introduce a profit and loss account balance prior to reduction in regulatory capital, they may do so by introducing the necessary rows in the template.

27. The increased provisions reduce the value of the RWA,⁴ as well as the regulatory capital. This also raises the issue of the effect of provisions on the CAR – namely, the regulatory capital in the numerator and the RWA in the denominator. While the increase in provisions will automatically have a 100% impact on eligible regulatory capital,⁵ the template makes a simplifying assumption that the average risk weight across the whole financing portfolio is at 100%, and hence the reduction in the amount of the RWA (i.e. the denominator of the CAR) due to the increase in provisions is also at 100%.⁶ Users can readily change the various assumptions made in the TN (including this 100% impact on RWA) by adjusting the numbers in the blue boxes in the respective rows, where applicable.

28. An additional consideration is the presence of profit-sharing investment accounts (PSIA) and whether the jurisdiction in question treats these as loss-bearing accounts or otherwise. There are three possible regulatory treatments concerning PSIA, with different impacts for the credit risk stress-testing exercise:

³ The actual treatment will depend upon the accounting methods/standards as applied in various jurisdictions.

⁴ Only the specific portfolio provisions reduce the value of RWA; general provisions cannot be deducted from RWA.

⁵ The deductions will be from Tier 1 Capital [CET1 + AT1] as long as the IIFS remains a “going concern”. However, in the event of a “gone concern”, T2 capital also stands eligible to absorb losses. See footnote 9 in TN-2 for further details.

⁶ In reality, different Sharī'ah-compliant contracts are likely to have different risk weights, ranging from as low as 0% to as high as 400%, depending upon their economic substance, credit ratings (if applicable) and corresponding regulatory treatments. The impact on RWA will also vary should the perceived riskiness of the portfolios change in the light of the stress scenarios and economic shocks (see paragraph 82 of TN-2).

- i. A jurisdiction may treat PSIA as deposits with no loss-absorbing capacity; hence, potential losses on portfolios funded by PSIA will be borne by the IIFS. As a result, the stress tester will include these portfolios in the stress-testing template just like any other financing portfolio. In the stress-testing template, credit shocks 1 and 2 are aligned with this approach.
- ii. A jurisdiction may treat PSIA as investment accounts with full loss-absorbing capacity; under such conditions, the IIFS is not liable for losses except in the event of negligence or misconduct, and provisions for these will be covered under operational risk. As a result, the stress tester will not include these portfolios in the credit risk stress-testing template.
- iii. A jurisdiction may treat PSIA as partially risk absorbent, and the regulatory framework will incorporate the use of the IFSB regulatory alpha.⁷ The stress tester will duly need to incorporate this partial risk absorbance for the portfolios funded by the PSIA and recognise the share of credit risk losses the IIFS is predicted to absorb during stress events. In the stress-testing template, credit shock 3 is aligned with this approach.

29. Based on the above, the stress tester needs to duly adjust the credit risk stress-testing templates to suit their specific needs and conditions.

2.4 Market Risk Stress Testing

30. The market risk stress-testing template of TN-2 envisages a jurisdiction with a total of five Islamic banks in columns C to G [IIFS 1, IIFS 2 ... IIFS 5]. These are then aggregated into the broader financial sector in column B. These columns may be modified as necessary by the stress-testing expert to incorporate the specific number of IIFS in their respective jurisdiction.

31. The beginning rows of the template consist of all exposures and assets that face market risk. Since these items are marked-to-market values, they would not have provisions held. A difference is in recording of the foreign exchange risk exposure in the trading book (see rows 21–24 in the market risk template); for each foreign currency instrument and exposure, the difference is taken between the long and short positions of the IIFS to arrive at the net spot position that is exposed to exchange rate risk. A deficit in the net position of the IIFS foreign currency exposure in the trading book will lead to losses in local currency terms and require the IIFS to absorb these losses. The stress tester may modify these to include

⁷ See footnotes 37, 38 and 39 in TN-2.

any other assets held in the trading book, as well as other types of exposures that are prone to capital charge from a market risk perspective.

32. The regulatory capital in row 26 is currently based on total regulatory capital. For jurisdictions that have implemented Basel III/IFSB-15, this will be the combination of CET1 + AT1 + T2 capital. The stress tester may modify this as necessary – for instance, if the jurisdiction is currently implementing Basel II/IFSB-2 Capital Guidelines, or if it focuses on Tier 1 Capital [CET1 + AT1] only for stress-testing purposes, the constituent figures in this row may be modified accordingly. The same guidelines also apply to rows 28 and 30, which report the consolidated RWA and the resulting CAR. The CAR row adopts a green colour signal if the ratio is above the regulatory threshold; in this case, the total capital ratio is above 8%. Otherwise, a red colour signal indicates that the particular IIFS has failed the stress test and the post-shock regulatory capital is below the hurdle rate.

33. TN-2's market risk stress-testing template has currently incorporated four market shocks, in rows 32, 53, 72 and 85. The template evaluates stress on the IIFS capital through decline in market values of exposed assets due to macroeconomic shocks. The stress tester may modify these as appropriate, and may add additional shock scenarios by introducing new rows below as necessary.

34. The blue boxes in the stress-testing template require inputs from the stress tester to govern the impact from shocks. These include the estimated coefficients from step 1 (see subsection 2.1) between the shocked macroeconomic variable (e.g. sovereign ratings) and corresponding change in market values of the exposed assets – for instance, applicable to rows 35–37 in market shock 1 in the stress-testing template.

35. The decrease in market values of exposed assets will require the IIFS to absorb these losses, either in its annual profit and loss account (as a first line of defence) or, in the case of insufficiency, in its common equity (as a second line of defence).⁸ During stress events, the likelihood of banking sector profitability is very low and, hence, the ultimate impact from trading book losses is on regulatory capital. However, if the stress tester wishes to introduce a profit and loss account balance prior to reduction in regulatory capital, they may do so by introducing the necessary rows in the template.

36. The stress tester will also need to make an assumption regarding the impact on regulatory capital from the decline in market values of exposed assets (e.g. applicable to row 44 in market shock 1), and also regarding the impact on RWA which will usually be based on

⁸ The actual treatment will depend upon the accounting methods/standards as applied in various jurisdictions.

the risk weights of the respective portfolios in the trading book (e.g. applicable to rows 45 and 46 in market shock 1).

37. An additional consideration is the presence of PSIA and whether the jurisdiction in question treats these as loss-bearing accounts or otherwise. There are three possible regulatory treatments concerning PSIA, with different impacts for the market risk stress-testing exercise:

- i. A jurisdiction may treat PSIA as deposits with no loss-absorbing capacity; hence, potential losses on portfolios funded by PSIA will be borne by the IIFS. As a result, the stress tester will include these portfolios in the stress-testing template just like any other market-risk prone portfolio. In the stress-testing template, market shocks 1, 2 and 3 are aligned with this approach.
- ii. A jurisdiction may treat PSIA as investment accounts with full loss-absorbing capacity; under such conditions, the IIFS is not liable for losses except in the event of negligence or misconduct, and provisions for these will be covered under operational risk. As a result, the stress tester will not include these portfolios in the market risk stress-testing template.
- iii. A jurisdiction may treat PSIA as partially risk absorbent, and the regulatory framework will incorporate the use of the IFSB regulatory alpha.⁹ The stress tester will duly need to incorporate this partial risk absorbance for the portfolios funded by the PSIA and recognise the share of credit risk losses the IIFS is predicted to absorb during stress events. In the stress-testing template, market shock 4 is aligned with this approach.

38. Based on the above, the stress tester needs to duly adjust the market risk stress-testing templates to suit their specific needs and conditions.

2.5 Rate of Return Risk (Banking Book) Stress Testing

39. The rate of return risk in the banking book (RRRBB) stress-testing template of TN-2 envisages a jurisdiction with a total of five Islamic banks in columns C to G [IIFS 1, IIFS 2 ... IIFS 5]. These are then aggregated into the broader financial sector in column B. These columns may be modified as necessary by the stress-testing expert to incorporate the specific number of IIFS in their respective jurisdiction.

40. The RRRBB stress-testing template in TN-2 is an earnings-based measure using gap analysis between rate-sensitive assets and rate-sensitive liabilities. The stress tester will need

⁹ See footnotes 37, 38 and 39 in TN-2.

to aggregate all rate-sensitive assets and liabilities by maturity buckets, as done in rows 6–18 in the RRRBB stress-testing template.

41. The net impact on the income of an IIFS due to a shift in benchmark rates¹⁰ will depend upon the gap between rate-sensitive assets and rate-sensitive liabilities. For example, in a scenario of an increase in benchmark rates with a pre-existing negative gap (with rate-sensitive liabilities exceeding rate-sensitive assets) the outcome will be a negative impact in the income of an IIFS. Rows 26–31 in the stress-testing template calculate this rate-sensitive gap by maturity buckets, based on inputs by the stress tester in rows 6–18.

42. The regulatory capital in row 20 is currently based on total regulatory capital; for jurisdictions that have implemented Basel III/IFSB-15, this will be the combination of CET1 + AT1 + T2 capital. The stress tester may modify this as necessary – for instance, if the jurisdiction is currently implementing Basel II/IFSB-2 Capital Guidelines, or if it focuses on Tier 1 Capital [CET1 + AT1] only for stress-testing purposes, the constituent figures in this row may be modified accordingly. The same guidelines also apply to rows 22 and 24, which report the consolidated RWA and the resulting CAR. The CAR row adopts a green colour signal if the ratio is above the regulatory threshold; in this case, the total capital ratio is above 8%. Otherwise, a red colour signal indicates that the particular IIFS has failed the stress test and the post-shock regulatory capital is below the hurdle rate.

43. The stress tester will need to input the assumption regarding the estimated shift in benchmark rate in the blue box in row 34. This is a simplifying assumption where a shift in a single benchmark rate of return indicator is assumed to capture the impact on returns, on average, across all assets and liabilities exposed to RRRBB.

44. Row 36 will then provide the results concerning the impact on net income of the IIFS based on the rate-sensitive gap and the shift in the benchmark rate. For instance, in the event of a negative gap between rate-sensitive assets and liabilities, an upward shift in benchmark rates will result in a net increase in the total amount needed to pay the IIFS' fund providers.

45. This increased amount is absorbed by the IIFS in its annual profit and loss account, or, in the case of deficit (i.e. there is insufficient annual profit to absorb the increased returns payable to fund providers), in part in its common equity.¹¹ During stress events, the likelihood of profitability is low; hence, the ultimate impact from increased returns to fund providers is likely to be on regulatory capital. However, if the stress tester wishes to introduce a profit and

¹⁰ Benchmark rates may include interest rates and/or non-interest rate measures (e.g. commodity prices, inflation rates, etc.).

¹¹ The actual treatment will depend upon the accounting methods/standards as applied in various jurisdictions. Furthermore, regulatory capital would be reduced only if the rate of return mismatch resulted in a loss.

loss account balance prior to reduction in regulatory capital, they may do so by introducing the necessary rows in the template.

46. Capital adequacy post-rate of return shock is then provided in row 40, where a green colour signal indicates that the IIFS's CAR has survived the particular stress test.

2.6 Scenario Analysis Stress Testing

47. The scenario analysis stress-testing template is linked to the credit and market risk stress-testing templates of TN-2. Hence, details such as number of Islamic banks and aggregated industry-wide data will correspond to the entries in the former two stress-testing templates. Any modifications in relation to such in the former will require the stress tester to make corresponding changes in the scenario analysis template.

48. The stress tester will also need to make entries for regulatory capital and RWA in rows 4 and 6. The CAR row (e.g. in row 8) adopts a green colour signal if the ratio is above the regulatory threshold; in this case, the total capital ratio is above 8%. Otherwise, a red colour signal indicates that the particular IIFS has failed the stress test and the post-shock regulatory capital is below the hurdle rate.

49. The scenario analysis stress-testing template combines the respective credit and market risk stress events from particular shocks in order to assess the survival of the IIFS under study. For instance, row 10 selects macroeconomic shock 1 from TN-2 and then considers the resulting credit shock 1 and market shock 1 in rows 11–13 and 15–17, respectively. The entries in these rows are linked to the credit risk and market risks stress-testing templates. Hence, the rows will automatically fill up, capturing the results in the credit and market risk stress-testing templates. In the event that this link is broken, the stress tester will need to re-establish the link manually by ensuring that the correct file path is traced to the credit and market risk stress-testing templates.

50. Currently, the scenario analysis template incorporates two macroeconomic shocks in rows 10 and 25, respectively. The stress tester may introduce more rows as necessary to add more macroeconomic shocks. The template also currently hits the regulatory capital directly with losses from the credit and market stress events – for instance, in row 19 for macroeconomic shock 1. The stress tester may wish to introduce a profit and loss account balance prior to reduction in regulatory capital, which acts as a first line of defence. However, during stress events, the likelihood of banking sector profitability is very low and, hence, the ultimate impact from trading book losses is on regulatory capital.

2.7 Liquidity Risk Stress Testing

51. The liquidity risk stress test template operates slightly differently from the other templates and makes use of a number of tabs to support four modules of liquidity risk stress-testing analysis, including: (1) implied cash flows analysis (ICFA) (5 days and 30 days); (2) liquidity coverage ratio (LCR); (3) maturity mismatch analysis (MMA); and (4) net stable funding ratio (NSFR). The first tab in the template, “1. Method_Liquidity”, provides a description of each of these methods.

52. The second tab, “2. Input – IIFS Liquidity”, requires the stress tester to make entries of various assets and liabilities of IIFS that will serve as the underlying data to support the running of the four modules. The template envisages a jurisdiction with a total of five Islamic banks and an aggregated industry-wide Islamic banking sector. The stress tester may modify the template as necessary to incorporate the specific number of IIFS in their jurisdiction.

53. The stress tester will need to assess which fields are applicable to their jurisdiction and enter the relevant values. For instance, if a jurisdiction has not implemented Basel III/IFSB GN-6 regulations, then they may not make entries for data relevant for LCR and NSFR, and, hence, they may not conduct LCR and NSFR stress tests. The stress tester may also revise the list and types of liabilities/instruments applicable to their jurisdiction.

54. The third tab, “3. Assumptions”, is critical as the test assumptions guide the parameters to be adopted by the four modules in the liquidity stress analysis. For much of the LCR and NSFR test assumptions, these are based on predefined criteria in IFSB GN-6 and are built upon Basel III liquidity guidelines. It is not recommended to modify these assumptions unless the stress tester’s intention is to test the sensitivity of the deposits/liabilities.

55. The more important assumptions relating to the percentage outflow of funds are displayed in rows 8–58, as applicable. In this regard, estimated coefficients from step 1 (see subsection 2.1) between the shocked macroeconomic variable (e.g. unemployment) and outflow in various deposits/liabilities of the IIFS would be relevant. However, there is currently a challenge in such modelling, as data on liquidity crises are scarce, and data gaps are an issue for liquidity stress testing in general, and more so for Islamic banking. The stress tester will need to evaluate options available to input credible assumptions on percentage outflow of funds. When satellite models are not a feasible option, alternative approaches include using IIFS’ own estimates mostly based on historical evidence and expert judgments or regulatory guidance.

56. Appropriate entries in tabs 2 and 3 will ensure that corresponding calculations and tests take place in tabs 4 and 5, with final summary of results displayed in tab 6. Tab 4, “ICFA, LCR, MMA, NSFR”, carries out the liquidity stress tests based on inputs and assumptions

previously entered by the stress tester. In supporting the analysis in tab 4, calculations for each of the four modules take place in tab 5, "Calculation".

57. Tab 6, "Summary", provides the final results of the liquidity stress test for each of the four modules. Rows 8–29 provide results for ICFA for both 5-day and 30-day tests; rows 32–43 provide results for the LCR test; rows 45–53 for the MMA test; and, finally, rows 55–64 for the NSFR test.

SECTION 3: CONCLUSION

58. Stress-testing exercises are one of the core toolkits at the disposal of RSAs and financial institutions for identifying any increases in financial sector vulnerability. Stress testing has become a key regulatory requirement, at both the supervisory authority level and the institution level, in most countries that implement Basel II standards and above. It is also of utmost importance for the IFSI and is a key requirement in a number of IFSB standards, including IFSB-12, IFSB-15, IFSB-16 and IFSB-17, among others.

59. However, from the IFSI perspective, stress testing for risk management is an evolving area where much work at all levels, including by RSAs and market players, is required. Stress tests should be conducted on all material aspects and in relation to extreme but plausible scenarios, with special attention paid to the position and impact of the investment account holders. The asset side of the balance sheet of IIFS also varies from that of the conventional banks in a number of ways, which in turn has a direct impact on how stress testing must be conducted in IIFS.

60. The IFSB has issued two dedicated documents on stress testing of Islamic banks, namely IFSB-13 and TN-2. These guidelines are in direct response to the IFSI stakeholders' request for better guidance on stress testing of Islamic banks.

61. This User Guide provides some additional guidance for facilitating the use of the five stress-testing templates of TN-2 and should be used in conjunction with the main TN-2 document.

REFERENCES

- Bohachova, O. (2008), "The Impact of Macroeconomic Factors on Risks in the Banking Sector: A Cross-Country Empirical Assessment", *Discussion Paper 44*, Institute for Applied Economic Research (IAW): Germany
- Clair, R. (2004), "Macroeconomic Determinants of Banking Financial Performance and Resilience in Singapore", *MAS Staff Paper No. 38*, Monetary Authority of Singapore
- Costeiu, A. and Neagu, F. (2013), "Bridging the Banking Sector with the Real Economy: A Financial Stability Perspective", *Working Paper Series No 1592*, European Central Bank
- Festic, M. and Beko, J. (2008), "The Banking Sector and Macroeconomic Indicators: Some Evidence for Hungary and Poland", *Strokovni članki – Professional papers No. 5-6*, pgs. 118-125
- Gerlach, S., Peng, W., and Shu, C. (2005), "Macroeconomic conditions and banking performance in Hong Kong SAR: a panel data study", *BIS Papers No. 22*, Bank of International Settlements.
- Gizycki, M. (2001), "The Effect of Macroeconomic Conditions on Banks Risk and Profitability", *Research Discussion Paper 2001-06*, System Stability Department: Reserve Bank of Australia
- Morley, J. (2016), "Macro-Finance Linkages", *Journal of Economic Surveys*, Vol. 30, No. 4, pgs. 698–711

DEFINITIONS

The following definitions are intended to assist readers in their general understanding of the terms used in TN-2. The list is by no means exhaustive.

<i>Alpha (α)</i>	A measure of the proportion of actual credit and market risk on assets financed by investment account holders' funds that is transferred to shareholders – that is, the displaced commercial risk. The parameter “alpha” is dependent on the supervisory authority’s directive in the jurisdiction in which the Islamic bank operates. The value of “alpha” varies from 0 to 1. GN-4 provides a methodology to estimate the value of “alpha” to be used when the supervisory discretion formula is applied in calculating the capital adequacy ratio of the Islamic bank.
Commodity <i>Murābahah</i>	A <i>murābahah</i> transaction based on the purchase of a commodity from a seller or a broker and its resale to the customer on the basis of deferred <i>murābahah</i> , followed by the sale of the commodity by the customer for a spot price to a third party for the purpose of obtaining liquidity, provided that there are no links between the two contracts.
Displaced commercial risk (DCR)	The situation where an institution acting as a <i>muḍārib</i> donates a part of its profit to the investment account holders in order to smooth the returns payable to them (see IFSB-1 for details).
<i>Hibah</i>	The payment of money or transfer of an asset to another party without a consideration.
<i>Ijārah</i>	A contract made to lease the usufruct of a specified asset for an agreed period against a specified rental. It could be preceded by a unilateral binding promise from one of the contracting parties. The <i>ijārah</i> contract is binding on both contracting parties.
Islamic window	That part of a conventional financial institution (which may be a branch or a dedicated unit of that institution) that provides both fund management (investment accounts) and financing and investment that are Sharī’ah-compliant, with separate funds. It could also provide <i>takāful</i> or <i>retakāful</i> services.
<i>Muḍārabah</i>	A partnership contract between the capital provider (<i>rabb al-māl</i>) and an entrepreneur (<i>muḍārib</i>) whereby the capital provider would contribute capital to an enterprise or activity that is to be managed by the entrepreneur. Profits generated by that enterprise or activity are shared in accordance with the percentage specified in the contract, while losses are to be borne solely by the capital provider unless the losses are due to misconduct, negligence or breach of contracted terms.
<i>Murābahah</i>	A sale contract whereby the institution sells to a customer a specified asset, whereby the selling price is the sum of the cost price and an agreed profit margin. The <i>murābahah</i> contract can be preceded by a promise to purchase from the customer.
<i>Mushārahah</i>	A partnership contract in which the partners agree to contribute capital to an enterprise, whether existing or new. Profits generated by that enterprise are shared in accordance with the percentage specified in the <i>mushārahah</i> contract, while losses are shared in proportion to each partner’s share of capital.
Parallel <i>Salām</i>	A second <i>salām</i> contract with a third party to acquire for a specified price a commodity of a known type, quantity and attributes, which corresponds to the specifications of the commodity in the first <i>salām</i> contract without the presence of any links between the two contracts.

Restricted investment accounts	Accounts whose holders authorise the investment of their funds based on <i>muḍārabah</i> or <i>wakālah</i> agency contracts with certain restrictions as to where, how and for what purpose these funds are to be invested.
Risk weighting	The assigning of a weight to particular assets or liabilities based on their risk profiles.
<i>Salām</i>	The sale of a specified commodity that is of a known type, quantity and attributes for a known price paid at the time of signing the contract for its delivery in the future in one or several batches.
Sharī'ah	The practical divine law deduced from its legitimate sources: the Qur'ān, <i>Sunnah</i> , consensus (<i>ijmā'</i>), analogy (<i>qiyās</i>) and other approved sources of the Sharī'ah.
Sharī'ah non-compliance risk	An operational risk resulting from non-compliance of the institution with the rules and principles of Sharī'ah in its products and services.
<i>Sukūk</i>	Certificates that represent a proportional undivided ownership right in tangible assets, or a pool of tangible assets and other types of assets. These assets could be in a specific project or specific investment activity that is Sharī'ah-compliant.
Unrestricted investment account	Accounts whose holders authorise the investment of their funds based on <i>muḍārabah</i> contracts without imposing any restrictions. The institutions can commingle these funds with their own funds and invest them in a pooled portfolio.
<i>Wadī'ah</i>	A contract for the safekeeping of assets on a trust basis and their return upon the demand of their owners. The contract can be for a fee or without a fee. The assets are held on a trust basis by the safekeeper and are not guaranteed by the safekeeper, except in the case of misconduct, negligence or breach of the conditions.
<i>Wakālah</i>	An agency contract where the customer (principal) appoints an institution as agent (<i>wakīl</i>) to carry out the business on his or her behalf. The contract can be for a fee or without a fee.