



ISLAMIC FINANCIAL SERVICES BOARD

EXPOSURE DRAFT: TN-2

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

*Comments on this Exposure Draft should be sent
to the IFSB's Secretariat not later than 21 June 2016
at email ifsb_sec@ifsb.org or facsimile +603-91951405*

21 March 2016

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. Osamah Shaker - Saudi Arabian Monetary Agency (*until 31 January 2016*)
H.E. Dr. Ahmed Abdulkarim Alkholife – Saudi Arabian Monetary Agency (*until 31 March 2015*)

Deputy Chairman

Mr. Mu'jib Turki Al Turki – Qatar Central Bank (*from 7 April 2013*)

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 El-Sayed Fayed (<i>from 18 November 2011</i>)	Central Bank of Egypt
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. Waleed Al-Awadhi (<i>from 2 April 2015</i>)	Central Bank of Kuwait
Mr. Talal Al Zemami (<i>from 27 March 2014</i>)	Capital Market Authority 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 (from 2 April 2015)	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. Ethan Goh Cheng Hing (until 7 January 2016)	Monetary Authority of Singapore
Dr. Badreldin Gorashi Mustafa (from 7 April 2013)	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. Ahmet Bicer (from 27 March 2014)	Central Bank 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. 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**

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

CHAIRMAN

Mr Tarek Hesham Fayed – Central Bank of Egypt

Deputy Chairman

Mr Arafat Al Fayoumi – Central Bank of Jordan

Members*

Mr. Torsten Wezel	International Monetary Fund
Mr. Muhammad Umair Husain	Islamic Development Bank
Mr. Mohammad Muzahidul Anam Khan (until 3 August 2015)	Bangladesh Bank
Mr. Abdul Hye (from 4 August 2015)	Bangladesh Bank
Mr. Mohammad Fayez AISadek	Central Bank of Bahrain
Dr. Dadang Muljawan	Bank of Indonesia
Dr. Ronald Rulindo	Indonesia Deposit Insurance Corporation
Ms. Aulia Fitria Yustiardihi (until 28 July 2015)	Indonesia Financial Services Authority
Ms. Artarini Savitri (from 29 July 2015)	Indonesia Financial Services Authority
Dr. Hossein Sedghi	Central Bank of the Islamic Republic of Iran
Ms. Najlah Al-Barrak	Central Bank of Kuwait
Mr. Zachary Thor Meng Teck	Bank Negara Malaysia
Mr. Khirul Ezar Mohd Khir	Bank Negara Malaysia
Mr. Salim Ahmed Said Al Jahwari	Central Bank of Oman
Ms. Lubna Redha Said Al Lawati	Central Bank of Oman
Dr. Mian Farooq Haq	State Bank of Pakistan
Ms. Rizwana Riffat	State Bank of Pakistan
Mr. Abdullah Ahmed Ali Al-Binali	Qatar Central Bank
Dr. Ahmed Isa Aldarwish	Saudi Arabian Monetary Agency
Mr. Elhadi Salih Mohamed	Central Bank of Sudan
Mr. Ahmet Deryol	Central Bank of the Republic of Turkey

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

ISLAMIC DEVELOPMENT BANK *SHARĪAH* COMMITTEE*

Chairman

Sheikh Dr Hussein Hamed Hassan

Deputy Chairman

Sheikh Dr Abdulsattar Abu Ghuddah

H.E. Sheikh Abdullah Bin Suleiman Al-Mani'	Member
Sheikh Mohammad Ali Taskhiri	Member
Sheikh Muhammad Taqi Al-Usmani	Member

***In alphabetical order**

SECRETARIAT, ISLAMIC FINANCIAL SERVICES BOARD

Mr. Jaseem Ahmed	Secretary-General
Mr. Zahid ur Rehman Khokher	Assistant Secretary-General
Mr. Carel Oosthuizen	Consultant
Professor Dr Simon Archer	Consultant
Mr. Erdem Oz	Member of the Secretariat, Technical and Research
Mr. Syed Faiq Najeeb	Member of the Secretariat, Technical and Research

Table of Contents

Section 1: Background	1
1.1. Introduction.....	1
1.2. Objectives.....	3
1.3. Scope of Application	4
Section 2: Basic Requirements for Conducting Stress Tests.....	6
2.1 Governance Framework of Stress Tests	6
2.2 Data Needs for Stress Tests	9
2.3 Asset Quality Review	11
2.4 Types of Stress Tests	12
2.5 Scope of Stress Tests.....	13
2.6 Approaches to Stress Tests	14
Section 3: Solvency Stress Tests	16
3.1 Introduction.....	16
3.2 Risk Specificities of IIFS.....	17
3.3 Stress Designs and Satellite Models	19
3.4 Stress Test Models	22
3.4.1 Credit Risk.....	23
3.4.2 Market Risk.....	27
3.4.3 Operational Risk: Sharī'ah Non-Compliance.....	30
3.5 Review and Analysis of the Results	32
3.5.1 Sensitivity Analysis	32
3.5.2 Scenario Analysis	34
3.6 Role of RSAs and Critical Considerations	35
Section 4: Liquidity Stress Tests	37
4.1 Introduction.....	37
4.2 Liquidity Risk of IIFS	38
4.3 Liquidity Stress Scenarios.....	41
4.4 Liquidity Stress Test Models	47
4.5 Review and Analysis of the Results	49

Section 5: Recent Developments in Stress Tests	54
5.1 Integrated Liquidity and Solvency Tests	54
5.2 Network Contagion and Second-round Effect Analysis	55
5.3 Cross-border Macro Stress-testing	59
5.4 Summary	60
APPENDICES	61
A.1 Supervisory Data Collection Template	61
A.2 Stress Testing Shocks and Scenario Designs	65
A.3 Stress Testing Definitions	74

ABBREVIATIONS

AQR	Asset quality review
AT1	Additional Tier 1
BCBS	Basel Committee on Banking Supervision
CAR	Capital adequacy ratio
CEBS	Committee of European Banking Supervisors
CET1	Common Equity Tier 1
CMT	Commodity <i>Murābahah</i> transactions
CPIFR	Core principles for Islamic finance regulation
DCR	Displaced commercial risk
ECAI	External credit assessment institution
HQLA	High-quality liquid assets
HTM	Held-to-maturity
IAH	Investment account holders
ICAAP	Internal capital adequacy assessment process
ICFA	Implied cash flows analysis
ICIS	Islamic collective investment scheme
IFSB	Islamic Financial Services Board
IFSI	Islamic financial services industry
IIFS	Institutions offering Islamic financial services
IMF	International Monetary Fund
LCR	Liquidity coverage ratio
NPF	Non-performing financings
NSFR	Net stable funding ratio
PSIA	Profit-sharing investment account
RPSIA	Restricted profit-sharing investment account
RSA	Regulatory and supervisory authority
RWA	Risk-weighted assets
SLOLR	<i>Sharʿah</i> -compliant lender of last resort
SNCI	<i>Sharʿah</i> non-compliant income
SNCR	<i>Sharʿah</i> non-compliance risk
T2	Tier 2
TN	Technical note on stress testing
UPSIA	Unrestricted profit-sharing investment account

Section 1: Background

1.1. Introduction

1. Financial institutions across the globe faced significant challenges during the recent 2008–9 Global Financial Crisis. Declining capital ratios, plummeting equity prices, government takeovers of failing financial institutions, and subsidies by the public sector have been norms rather than special cases in many developed economies. The recent past well illustrated the importance of stress tests not only as a risk management tool and key component of financial stability analysis, but also as a crisis management tool.

2. Stress tests offer a means of trying to discern the impact of a systemic or tail event. They have a number of important benefits as a supervisory tool. From a microprudential perspective, they provide a structured means for institutions offering Islamic financial services (IIFS) and regulatory and supervisory authorities (RSAs) to assess not only whether a particular financial institution holds enough capital, but also whether it is able rapidly and accurately to determine its risk exposures. From a macroprudential perspective, the use of common scenarios allows RSAs to learn how a particular risk, or combination of risks, might affect the banking system as a whole. It provides RSAs with the ability to implement pre-emptive measures before problems assume crisis proportions. The role of stress tests became evident in the US Supervisory Capital Assessment Program, as well as in European stress test exercises that were used to assess the required level of capital backstops to prevent institutional failures.

3. Stress testing has become a tool widely used by IIFS and RSAs to: (i) identify financial sector vulnerabilities; (ii) influence and support policy decisions affecting the financial system and individual institutions; and (iii) support and guide financial institutions' own risk management. Regulatory stress tests have become a central tool for enhancing the resilience of the banking system.

4. Stress testing is one of the key risk management tools for financial institutions and is an important part of the supervisory assessment under Basel II's Pillar 2. It plays a particularly important role in the following aspects of risk management:

- providing *forward-looking* assessments of risk;

- overcoming *limitations* of models and historical data, with particular reference to *low-frequency, high-impact events*;
- feeding into capital planning procedures, including the *internal capital adequacy assessment process* (ICAAP) and liquidity planning procedures;
- facilitating the development of risk mitigation or contingency plans *across a range of stressed conditions*; and
- various aspects that concern corporate governance, including:
 - informing the setting of an institution's *risk tolerance*; and
 - supporting *internal and external communications* with regard to the above.

5. **Stress testing for risk management is one of the most underdeveloped areas within the Islamic financial services industry (IFSI).** Stress tests should be conducted on all material aspects and in relation to extreme but plausible scenarios, with special attention to the position and impact of the investment account holders (IAHs). 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 the stress testing must be conducted in IIFS.

6. **The credit, market and operational risk profiles of Islamic financial instruments do not correspond exactly to those of conventional financial instruments.**¹ In addition to these risks, an IIFS is, or may be, exposed to other risks, such as *Sharī'ah* non-compliance risk, rate of return risk and equity investment risk, which need to be taken into account by an IIFS in its stress testing. In view of an IIFS's limited access to short-term and high-quality *Sharī'ah-compliant* funding (as is currently the case in the market), due consideration must be given to liquidity stress tests.

7. IFSB-13: *Guiding Principles on Stress Testing for Institutions offering Islamic Financial Services* is intended to complement the existing international stress-testing frameworks² (which were developed with conventional banking in mind), by taking into consideration the specificities of IIFS, and to contribute to the soundness and stability of the IFSI and the financial sector as a whole. IFSB-13 followed a principles-based approach and includes guidance on the basic

¹ See IFSB-1: *Guiding Principles of Risk Management for Institutions (other than Insurance Institutions) offering only Islamic Financial Services (IIFS)*.

² In particular, two seminal documents dealing with stress testing have been published in response to the financial crisis. In May 2009, the Basel Committee on Banking Supervision (BCBS) published its *Principles for Sound Stress Testing Practices and Supervision*; and in August 2010 the Committee of European Banking Supervisors (CEBS) issued its *CEBS Guidelines on Stress Testing*. The BCBS document sets out 15 "principles" for banks and six for supervisors, while the CEBS document contains 17 "guidelines" for banks and five for supervisors.

elements that a stress test framework in IIFS and RSA should incorporate. However, IFSB-13 did not provide technical guidance on how to conduct the stress tests in practice.

8. **During the development of and public consultation on IFSB-13, the need for detailed guidelines on the operationalisation of IFSB-13 was emphasised.** It was agreed to address the technical details of stress testing in due course in a separate IFSB Technical Note.

9. The proposed Technical Note on Stress Testing (TN) was incorporated within the work plan outlined in the Islamic Financial Services Board's (IFSB's) *Strategic Performance Plan 2012–2015*. The IFSB Council approved the development of the TN for IIFS and the forming of a Task Force for this purpose during its 23rd meeting in Doha, Qatar, on 10 December 2013.

1.2. Objectives

10. The aim of stress tests is for IIFS and RSAs to assess the IIFS' ability to withstand adverse financial and economic shocks, and to enable an RSA to evaluate the potential impact of such a shock on its jurisdiction's financial stability. RSAs also use stress tests as a supervisory tool to encourage IIFS to build and maintain adequate capital and liquidity buffers and put in place risk mitigation plans aimed at a range of adverse conditions. The complexity of stress tests can vary depending on the level of aggregation, including at the portfolio level, institution level and group level, and at the aggregate level for an entire financial system.

11. There are numerous types of stress tests. Different stress tests serve different purposes and are relevant under varying circumstances (See the summary provided in section 2.4.) While this TN does not intend to cover all aspects of stress testing, it has been prepared with the following objectives in mind:

- a. to facilitate the design and simulation of solvency and liquidity stress tests for IIFS, including providing guidance on establishing macrofinancial links, running scenarios of various assumptions and stress parameters;
- b. to highlight the specificities of risk exposures in IIFS and how they need to be captured in stress-testing exercises; and
- c. to provide stylised numerical examples of IIFS stress tests under different shock scenarios.

12. **It is intended that the proposed TN would be used by IIFS and RSAs as guidance in developing, conducting and assessing stress testing.** Though the IFSI includes banking,

capital market and *Takāful* sectors, the scope of this TN is limited to the banking sector only³ and covers both institutional-level (i.e. tests used by institutions to assess their risk tolerance and capital level) and industry-wide⁴ stress tests (i.e. those used by RSAs as a supervisory tool for financial stability analysis stress testing).

13. The TN addresses multiple types of risk 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, equity risk in equity investment portfolios, market risk on assets held, foreign exchange risk, rate of return risk, liquidity risk and operational risk (including *Sharī'ah* non-compliance risk).

1.3. Scope of Application

14. **The TN is primarily intended to serve as a benchmark for IIFS and RSAs to conduct stress testing.** RSAs may extend the application of this TN to Islamic “window” operations⁵ that are self-contained, or to other IIFS that fall within their jurisdictions. The scope and application of the TN is subject to the adoption of other applicable IFSB Standards and Guiding Principles – in particular, IFSB-12: *Guiding Principles on Liquidity Risk Management for IIFS*; IFSB-13: *Guiding Principles on Stress Testing for IIFS*; and IFSB-16: *Revised Guidance on Key Elements in the Supervisory Review Process of IIFS*.

15. **The TN also complements IFSB-17: *Core Principles for Islamic Finance Regulation (Banking Segment) (CPIFR)*, which provides a set of Core Principles** – along with the associated assessment methodology – for the regulation and supervision of the IFSI, taking into consideration the specificities of the IIFS in the banking segment, the lessons learned from the financial crisis, and complementing the existing international standards, principally the *Core*

³ Other segments such as capital markets and *Takāful* should be addressed separately, taking into account their specificities.

⁴ The term “industry-wide” refers to all eligible Islamic banks in a jurisdiction and their data aggregated together for stress-testing purposes. This TN makes use of this term, as opposed to “system-wide”, in relation to stress tests, since most jurisdictions operate a dual banking framework where conventional and Islamic banking systems run parallel to each other. An issue legitimately arising here is whether RSAs need to stress test Islamic banks as an aggregate (*industry-wide and excluding conventional banks*) separately in dual banking jurisdictions. This is further discussed in section 3.6.

⁵ IFSB-16 defines “Islamic windows” as part of a conventional financial institution (which may be a branch or dedicated unit of that institution) that provides both fund management (investment accounts) as well as financing and investment that are *Sharī'ah* compliant. Thus, these windows are potentially self-contained in terms of *Sharī'ah*-compliant financial intermediation, as the funds generated are invested in *Sharī'ah*-compliant assets.

Principles for Effective Banking Supervision issued by the Basel Committee on Banking Supervision (BCBS).

16. In IFSB-17, “CPIFR 9: Supervisory techniques and tools”, Essential Criterion No. 4 mentions review of the outcome of stress tests undertaken by the IIFS as a supervisory tool used to regularly review and assess the safety and soundness of IIFS and the banking system. Essential Criterion No. 5 further adds that the supervisory authority, in conjunction with other relevant authorities, seeks to identify, assess and mitigate any emerging risks across IIFS and to the banking system as a whole, potentially including conducting supervisory stress tests (on individual IIFS or industry-wide).

17. “CPIFR 14: Treatment of investment account holders (IAHs)” states that the supervisory authority requires that stress testing conducted by the IIFS should take account of the risks associated with investment accounts and the position of IAHs as providers of risk-absorbent funds. Similarly, “CPIFR 17: Risk management process” states that the supervisory authority requires IIFS to adopt forward-looking stress-testing programmes commensurate with their risk profile and systemic importance, as an integral part of their risk management process.

18. Stress tests are also mentioned in various other Core Principles (CPIFR 18, CPIFR 19, CPIFR 21, CPIFR 23, CPIFR 24, CPIFR 25, CPIFR 26 and CPIFR 27). In this regard, the TN serves as an important benchmark for both IIFS and RSAs to conduct appropriate stress tests.

Section 2: Basic Requirements for Conducting Stress Tests

19. Stress-testing tools have some basic requirements and important limitations, which should be fully considered when planning a stress-testing regime. These considerations enable stress-testing exercises to become more reliable and more effective. An effective stress-testing framework relies on five elements:

1. Determination of the objective/s of the stress testing (in general and in relation to the specific exercise in mind).
2. Selection of meaningful stress scenarios, which can be hypothetical, or based on historical experience or on simulation of risk factors.
3. Translation of those stresses as (first-round) impacts on the financial performance income statement and financial position of the IIFS.
4. Assessment of the stress-testing results and generation of remedial actions.
5. Taking the results into account in management decision-making.

A further refinement would be to take second-round effects into account as well.

20. These major elements require a strong governance framework, good-quality economic and financial data, and the adoption of an appropriate methodology within the relevant scope outlined for stress tests.

2.1. Governance Framework of Stress Tests

21. **Strong governance and effective controls are necessary to ensure the stress-testing activities are functioning as intended.** Board and top management commitment to and involvement in stress testing sends the necessary signal that stress testing is taken seriously and is an important management tool. Strong governance and effective controls help the IIFS to perform stress-testing activities containing core elements, from clearly defined stress-testing objectives to recommended actions. Proper governance and controls over stress testing not only confirm that stress tests are conducted in a rigorous manner, but also help to ensure that those stress tests and their outcomes are subject to an appropriately critical eye.

22. While the form of governance and controls over stress-testing activities will vary across RSAs and IIFS, there are some general principles, expectations and recommendations that RSAs

and IIFS can follow. The principles in IFSB-13 must be applied by IIFS and RSAs to ensure strong governance in stress tests.

23. An IIFS must embed stress testing in the organisation and perform such tests as a regular feature of its business. Whenever an IIFS performs stress testing, it must do so to sound stress-testing standards, irrespective of whether it performs it on an ad hoc basis, as part of a particular programme, or as a regular feature of its management of the business. An IIFS must clearly fix responsibility for stress testing, allocate appropriate resources, have an organisational structure focused on stress testing which defines roles and responsibilities and reporting lines, and ensure compliance and hold people accountable for executing the stress-testing policy. An effective management information system will contain time-series and other relevant information; ensure the flow of stress-testing results to senior management, who will review and make interventions as necessary; and, overall, constitute a database for future reference.

24. Senior management, in consultation with the board of directors, should establish a comprehensive, integrated and effective stress-testing exercise that fits into the broader risk management objectives. Senior management should maintain internal summaries of test results, which should be available to the board and RSA, which document the nature and extent of the IIFS's stress-testing activities and outcomes, as well as proposed follow-up actions.

25. Stress testing can also be used to consider the effectiveness of an IIFS's *Sharī'ah-compliant* risk mitigation techniques for various risk types over their respective time horizons, such as to explore what could occur if expected mitigation techniques break down during stressful periods. Stress test results should inform management's analysis and decision-making related to business strategies, limits, capital and liquidity, risk profile and other aspects of risk management, consistent with the IIFS's established risk appetite.

26. Senior management should ensure that stress-testing activities are updated in the light of new risks, better understanding of the IIFS's exposures and activities, new stress-testing techniques, updated data sources, and any changes in its operating structure and its internal and external environments. A stress-testing development should be iterative, with ongoing adjustments and refinements to better calibrate the tests to provide current and relevant information. In addition, management should review stress-testing activities on a regular basis to confirm the general appropriateness of, among other things, the validity of the assumptions, the severity of the tests, the robustness of the estimates, the performance of any underlying models, and the stability and reasonability of the results. In addition to conducting formal, routine stress

tests, management should ensure that the institution has the flexibility to conduct new or ad hoc stress tests in a timely manner in order to address rapidly emerging risks and vulnerabilities.

27. Outlining stress-testing policies in a documented form is an important part of stress-testing programmes. These policies should:

- a. describe the overall purpose of stress-testing activities;
- b. articulate consistent and sufficiently rigorous stress-testing practices across the entire institution;
- c. indicate roles and responsibilities of various functions, including controls over external resources used for any part of stress testing (such as vendors and data providers);
- d. describe the frequency and priority with which stress-testing activities should be conducted;
- e. outline the process for choosing appropriately stressful conditions for tests, including the manner in which scenarios are designed and selected;
- f. include information about validation and independent review of stress tests;
- g. provide transparency to third parties (and especially the RSA) for their understanding of an IIFS's stress-testing activities;
- h. indicate how stress test results are used and by whom, and outline instances in which remedial actions should be taken; and
- i. be reviewed and updated as necessary to ensure that stress-testing practices remain appropriate and keep up to date with changes in market conditions, the institution's products and strategies, its risks, exposures and activities, its established risk appetite and industry stress-testing practices.

28. In addition to having clear and comprehensive policies, an IIFS should ensure that its stress tests are documented appropriately, including a description of the types of stress tests and methodologies used, test results, key assumptions, limitations and uncertainties, and suggested actions. Documenting stress tests takes time and effort, so IIFS and RSAs should provide incentives to produce effective and complete documentation.

29. Another key element of governance over stress testing is validation and independent review. Stress-testing governance should incorporate validation or other types of independent

review to ensure the integrity of stress-testing processes and results. In general, validation and independent review of stress-testing activities should be conducted on an ongoing basis, not just as a single event.

30. The overall governance framework of stress tests should also encourage IIFS to:
- a. explore more thoroughly the vulnerabilities of their current exposures and future business plans;
 - b. make decisions that better integrate their business and capital planning;
 - c. improve their contingency planning; and
 - d. inform and enhance their existing stress-testing framework.

31. From the RSAs' point of view, developing stress-testing capacity is a crucial part of the governance of stress tests. RSAs must develop the appropriate capacity and ability to undertake stress-testing exercises of the Islamic financial system. RSAs should integrate stress testing into their macro- and microprudential analytical work as an additional tool for financial stability analysis and/or as early warning indicators.

32. RSAs must also have sufficient expertise to provide advice to IIFS in terms of their internal stress-testing exercises, as well as their remedial capital and liquidity adequacy measures, as and when needed based on the stress test results. The governance framework for RSAs must stipulate guidelines on the frequency of stress-testing exercises that are to be conducted (either top-down or bottom-up) throughout a financial year and the reporting channels to be utilised to transmit the results to the concerned authorities/senior management of IIFS. The governance framework must incorporate the time horizons to be considered in the stress-testing exercises, allowing for a sufficient time frame to enable policymakers to undertake pre-emptive remedial measures to prevent any untoward failures of the Islamic financial system.

2.2. Data Needs for Stress Tests

33. The quality of the stress test depends materially upon the scope and quality of available data and the selection of an applicable methodology. The availability of data could influence the assumptions and models used to develop scenarios, estimate the size of the shocks and manipulate the data. Lack of appropriate data too often is a major challenge for Islamic finance-specific stress-testing exercises, and this is particularly so in jurisdictions where IIFS have been established only recently.

34. Premised on the above, **this TN provides a generalised data template** for use by IIFS and RSAs to collect necessary data in order to support their stress-testing exercises (see Appendix A1). **IIFS and RSAs need to formalise and thereafter regularly update their data collection** to fill the information gap and enhance their understanding of IIFS risks.

35. For modelling the impact of external shocks on an IIFS's balance sheets in stress tests, reliable macroeconomic and financial data should be used in econometric models to quantify the historical relationship between shocks to selected macroeconomic variables and, for example, non-performing financings (NPFs) in asset portfolios exposed to credit risk.⁶

36. RSAs need to collect the required data from IIFS at regular intervals. While there will always be information asymmetry between RSAs and IIFS, the data collection should be formalised to fill the information gap and to enhance the RSAs' understanding of the risks faced by individual IIFS. In addition, data collection creates strong incentives for an IIFS to develop internal processes that allow for better aggregation across different systems and to provide sufficiently detailed data about its risk profile, business model, and financial position and performance. An IIFS's information technology (IT) resources should be commensurate with its risk profile and systemic importance.

37. **Where data is lacking or insufficient, both IIFS and RSAs need to explore relevant data proxies for stress tests.** The proxies may be derived internally by an IIFS from other assets that possess similar risk characteristics, or externally through industry benchmarking. IIFS must document comprehensively relevant information regarding such proxies, including the characteristics, rationale for the use, source and any known limitations thereof.

38. **When use of proxies is not a meaningful solution, expert judgments concerning the nature and extent of shocks on IIFS' financial statement components may be canvassed.** For example, when granular data on financing classifications and NPFs of each asset class/portfolio is not available, it may be useful to obtain an expert judgment based on some qualitative criteria to assess the impact of a macroeconomic shock on the specific/aggregate NPFs of the Islamic banks/system as a whole.

39. A balanced approach must be taken to stress testing. "Overreach" can do more harm than good. When capacity is low, resources are limited, data is lacking or insufficient, and the

⁶ Section 3.3 provides guidance on possible econometric techniques for modelling risk impacts from shocks on IIFS' balance sheets.

regulatory framework is inadequate, there is a risk that a stress-testing exercise may cause undue consternation, leading to inappropriate decisions that undermine confidence and credibility.

2.3. Asset Quality Review

40. An asset quality review (AQR) is a review of the key characteristics of assets, including their underlying collateral. Inter alia, data quality, recoverability, valuation, classification, collateral valuation and provisioning are assessed in an AQR. The detailed financing file review aims to identify data quality problems that need to be resolved prior to use of the data for stress-testing purposes. Where the data quality problems are not satisfactorily resolved prior to use of the data for stress-testing purposes, a decision needs to be made as to whether it is still meaningful to proceed with the particular test despite the problems. Where it is decided to proceed with a stress-testing exercise, notwithstanding such problems, the stress test results need to be interpreted in the light of the consequent implications and limitations that such problems imply, and adequate disclosure must be made of the relevant issues. An AQR is a highly recommended exercise and typically precedes a stress test. If conducted, AQR-adjusted values should be the point of departure for the stress test.

41. AQR is one of a number of important elements that increase the reliability of stress tests. **RSAs conduct AQRs at a business or portfolio level to ensure that IIFS' asset valuations reflect expected asset performance, and to identify risks to asset performance that need to be reflected in IIFS' capital requirements.** More specifically, RSAs use AQRs to ensure that, within the constraints of accounting rules, adequate provisions⁷ are held against assets held at amortised costs.

42. The AQR typically comprises three key phases, namely:

- a. **Portfolio selection**, to determine the universe that will be subjected to stress testing and to ensure a comprehensive review of assets, thus avoiding overlooking high-risk assets.
- b. **Execution** (the most complex phase), which involves, inter alia, data integrity validation, sampling, on-site reviews of files, valuation, collectability assessment,

⁷ From a banking perspective, "provisions" are funds set aside by the bank to cover expected and/or recognised assets' impairments on financing portfolios.

measurement of legal and operational risks, collateral valuation, and the recalculation of provisions and risk-weighted assets (RWAs).

- c. **Collation**, which includes a final consistency exercise to ensure the comparability of results across all portfolios for all IIFS.

There should be a strict process with prescribed guidelines and harmonised definitions in order to achieve consistent results.

43. AQRs should take place regularly as part of both the routine supervisory process and the ICAAP process at an institutional level. Reviews of individual IIFS' assets are conducted periodically and occur at different times for each IIFS, although specifically prior to a stress-testing exercise. Deeper reviews might include discussions with IIFS' management, use of specialist staff, and examinations of individual financing files. The approach taken to an AQR should reflect the level of risk and complexity of the assets concerned. More intense reviews should be conducted on asset portfolios that can materially affect an IIFS's resilience, that are complex and inherently difficult to value, or that appear highly susceptible to losses. Thematic reviews of particular groups of assets are also conducted, often in response to a specific risk or concern, covering multiple IIFS simultaneously.

2.4. Types of Stress Tests

44. Stress tests can be performed at different levels of aggregation of financial data – for instance, **at a portfolio level** within the balance sheet of an IIFS; **at the overall balance sheet level** in a single IIFS; at the (banking or financial) group level; or **at the level of a jurisdiction's entire financial system**, aggregated as a whole. The former are known as micro- or institution-level stress tests, while the latter are termed macro- or system-wide stress tests.

45. **Institution-level stress tests** are designed to assess the resilience of an individual IIFS (or specific portfolios within an IIFS) to adverse shocks in the macroeconomy. The tests are run mainly by an individual IIFS for the purposes of institutional risk management and/or regulatory compliance. An RSA may also undertake institution-level stress tests to identify the weaker IIFS in its jurisdiction in order to initiate necessary remedial measures against flagging institutions to prevent their failure.

46. **System-wide tests** are designed to assess the resilience of an entire financial system as a whole, as opposed to individual institutions only. System-wide stress tests are conducted by

RSAs as well as regional and international organisations (e.g. the International Monetary Fund's (IMF's) Financial Sector Assessment Programs, the European Banking Authority's EU stress-testing exercises, and so on). Macro stress test results enable an RSA pre-emptively to initiate policies in order to prevent the failure of a banking sector should an extreme, yet plausible, macroeconomic shock materialise.

47. Stress tests generally are aimed at assessing the resilience of an individual IIFS (in institution-level tests) or the entire Islamic financial system (in industry-wide stress tests⁸) from a solvency perspective. **Following lessons learned from the Global Financial Crisis, liquidity stress tests and integrated liquidity–solvency stress tests have gained relevance.** The experience of the Global Financial Crisis illustrated that liquidity and funding risks are critical risk factors that can lead to bank insolvency and failure.

48. Reverse stress testing can be conducted by RSAs and IIFS to help them consider scenarios beyond normal business expectations and challenge common assumptions about performance and risk mitigation strategies. This is a method under which the IIFS assumes a specific adverse outcome, such as suffering losses to cause a breach in regulatory capital ratios, and then deduces the types of events that could lead to such an outcome. Having identified such scenarios, RSAs and IIFS can consider how likely those conditions are, make contingency plans, or take other steps to mitigate the identified risks.

2.5. Scope of Stress Tests

49. Appropriate stress-testing coverage is important, as stress-testing results could give a misplaced sense of comfort if certain portfolios, exposures, liabilities or business-line activities are not included in the exercise. It underscores the need to document clearly each stress test, including what is covered, or not covered, in each test. Effective stress testing should be applied at various levels in the institution, including at the business lines level, portfolio level and specific risks level. In addition, it should be applied on an enterprise-wide level. In some cases, stress testing can also be applied to individual exposures or instruments.

50. In case of a moderate to low risk profile, less complex IIFS could confine themselves to simple stress tests. These may be run relatively quickly, with the results used by the management

⁸ See footnote 4. In this TN, industry-wide stress tests are introduced as an exercise on aggregated values of the Islamic banking sector only. The results enable RSAs to identify any weaknesses or potential vulnerabilities to plausible extreme shocks in this Islamic financial sub-system.

body to form a view of the impact of a given variable, or a set of a small number of variables, on the risk profile, financial condition and performance of the IIFS under exceptional, but plausible, adverse movements. Stress testing of IIFS should be calibrated considering the greater complexity of their business activities (e.g. *Shari'ah*-compliant hedging instruments), and taking account, for instance, of volatility.

51. Stress testing should capture the interplay among different exposures, activities and risks, and their combined effect, though stress testing several types of risks or business lines simultaneously may prove operationally challenging. An IIFS should aim to identify concentrations and common risk drivers across risk types and business lines that can affect it adversely – including those not readily apparent during more benign periods.

52. Stress testing should be conducted over various relevant time horizons to adequately capture both those conditions that may materialise in the near term and adverse situations that take longer to develop.

53. **No single stress-testing method or model is perfectly suited for all financial systems or every IIFS.** An important challenge for an IIFS or an RSA is to ensure that appropriate stress tests are applied.

54. The stress tests framework should require the performance of several activities and exercises, and not rely merely on a single test or type of test. Every stress test has limitations and relies on assumptions. Expert judgment should complement the use of stress-testing models. Policymakers must integrate expert judgment in the stress-testing process to ensure relevance, reasonableness and logic. Where stress tests identify potential vulnerabilities in a particular IIFS or the financial sector, IIFS management and policymakers must follow up with relevant remedial measures to address these vulnerabilities.

2.6. Approaches to Stress Tests

55. **Approaches to stress testing should be expected to vary.** Stress testing adds its greatest value when it is organised, executed and used in ways that take into account the unique characteristics, operating environment and management style of the IIFS.

56. **“Stress testing” refers to many different methods and applications, including transaction stress testing, portfolio stress testing, enterprise stress testing and reverse**

stress testing. An IIFS can use a variety of stress test methods to evaluate financing portfolio risk and the potential impact on earnings and capital based on its unique risk profile.

57. **An IIFS's stress-testing framework should be commensurate with the size, nature, complexity and sophistication of its risk profile and business activities.** In general, a more sophisticated or complex IIFS should use a combination of sensitivity analysis and scenario tests (or any other appropriate concept) to capture all aspects of risks. This would require more resources to implement, whereas a less complex IIFS offering "plain vanilla" products normally requires less-sophisticated approaches and models, which are less resource intensive.

58. **IIFS are encouraged to explore, design and develop their own stress test(s) that are most appropriate and effective for their business environment and profile, to be conducted regularly.** There is no single best approach or methodology. The RSA should weigh in on the relative strengths and weaknesses of different approaches and methodologies under different circumstances.

Section 3: Solvency Stress Tests

3.1. Introduction

59. Solvency stress tests are designed to assess the **resilience of individual banks, a (banking or financial) group, and/or the banking sector as a whole, to extreme, yet plausible, shocks** in a financial system. In **institution-level stress tests**, the balance sheets of individual IIFS are subjected to stress tests for the primary purpose of gauging the possible impact on solvency (i.e. capital ratios) of extreme shocks in the financial system. The results enable the concerned RSAs to initiate remedial measures against any institution that is at risk of financial distress (going concern) or, in the worst case, insolvency (gone concern).⁹ In **system-wide stress tests**, the exercise is on aggregated values across the banking sector **variables**, and the results enable RSAs to identify any weaknesses or potential vulnerabilities to plausible extreme shocks in the financial system. In **industry-wide stress tests**, the exercise is on aggregated values across the Islamic banking sector variables, and the results enable RSAs to identify any weaknesses or potential vulnerabilities to plausible extreme shocks in the Islamic financial sub-system.

60. In general, an effective stress-testing framework should be applied at various levels, including within an individual IIFS, on business lines, portfolios and risk types, as well as on an enterprise-wide, group-wide, system-wide and (possibly) industry-wide basis. In many cases, **stress testing may be more effective at the business line and portfolio levels**, as a higher level of aggregation may cloud or underestimate the potential impact of adverse outcomes on an IIFS's financial condition. Each stress test should be tailored to the relevant level of aggregation, capturing critical risk drivers, internal and external influences, and other key considerations at the relevant level.

61. This TN incorporates *Shari'ah*-compliant contracts' risk specificities when conducting stress tests on an IIFS. The approach involves evaluating the various risk exposures of an IIFS, segregated by the contractual relationships of the balance sheet components. The rationale for such an approach is to account for the specificities of an IIFS's risks arising from the different contracts (elaborated on in section 3.2) and to enable IIFS stress-testing models to capture the interplay among different exposures, activities and specific IIFS risks, and their combined effects.

⁹ Total eligible capital for IIFS is the sum of Tier 1 and Tier 2 capital. Tier 1 capital consists of Common Equity Tier 1 (CET1) and Additional Tier 1 (AT1). Together with CET1, AT1 capital is considered as "going concern" capital, which absorbs losses while the IIFS is solvent. T2 capital is considered to be "gone concern" capital, which absorbs further losses in the case of non-viability of the IIFS, and thus helps to protect the current account holders and other creditors, as well as the IAHs, of the IIFS.

62. The proposed template in this TN provides the flexibility of having stress test results analysed and assessed across three levels in one Excel sheet: at a portfolio level, at an institution-level and at the aggregate industry-wide level. (A similar aggregate approach would be used at the system-wide level.) It is important to capture stress effects across all three levels of financial data aggregation, since relying on one (e.g. only a system-wide stress test) can give a false sense of comfort that the financial sector is resilient, although an institutional-level test may identify an IIFS likely to face financial distress/insolvency.

63. The proposed template provides some initial guidance on stress tests for an IIFS. RSAs 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.

3.2. Risk Specificities of IIFS

64. In conducting stress tests, it is important for IIFS to understand and take account of the implications for risk management arising from the differences between their operations and balance sheet structures and those of conventional banks.

65. Islamic financial instruments are exchange-based (*Murābahah*, *Salam* and *Istisnā`*, which are based on the sale or purchase of an asset; and *Ijārah*, which is based on selling the usufruct of such an asset), profit- and loss-sharing or profit-sharing and loss-bearing¹⁰ (*Mushārah* and *Muḍārah*), or *Sukūk* (securities) and investment portfolios and funds that may be based on the above assets.

66. In the case of the **exchange-based instruments**, the IIFS's gross return is the spread between the cost of the asset to the IIFS and the amount that can be recovered from selling or leasing it. Such instruments may therefore involve exposure to market (price) risk in respect of the asset, as well as credit risk in respect of the amount due from the counterparty. This is a unique feature in the case of IIFS, as market risk arises together with credit risk in the context of *Sharī'ah*-compliant financing operations, giving rise to what may be termed "market risk in the banking book".¹¹

¹⁰ In the case of *Muḍārah*, it is profit-sharing and loss-bearing, as only the capital-contributing party bears financial loss.

¹¹ For instance, in *Salam* financing, the IIFS, having paid the purchase price of the subject matter in advance of its delivery, is exposed not just to the credit risk (potential default) of the counterparty but also to the price risk of the subject matter to be delivered.

67. In the case of **profit- and loss-sharing¹² contracts** (*Mushārah* and *Muḍārah*) used for financing purposes, an IIFS is exposed to the risk of losing part or all of its capital as a result of operating losses suffered by the enterprise or a fall in the value of its assets. Exposure to such a risk of capital impairment on financing assets is a specific type of credit risk that does not involve contractual default. Likewise, such exposures are dealt with under credit risk, except in the case of investments (normally short-term) in assets for trading purposes, which are dealt with under market risk.

68. In addition to the traditional banking risks (such as credit risk, market risk and liquidity risk), **IIFS are also exposed to other specific risks** (e.g. *Sharʿah* non-compliance risk, equity investment risk and rate of return risk) as outlined in IFSB-1. The specific risk factors that should be considered by IIFS in their stress-testing programme, depending on their relevance and applicability, include the following: (i) credit risk for *Sukūk*, for real estate financing, and for other exposures; (ii) market risk for equities, *Sukūk*, real estate investment, foreign exchange and other exposures; (iii) investment risk for *Muḍārah* and *Mushārah* exposures; (iv) liquidity risk; (v) rate of return risk; and (vi) operational risk, including *Sharʿah* non-compliance risk and reputational risk. IIFS also need to be mindful of default and legal risk (i.e. legal risk arising from the interaction between a *Sharʿah* contract and civil law, particularly relevant to the issuance of certain *Sukūk*). Such specific risks should be well captured particularly in stress-testing scenarios, and in IIFS-wide stress testing as a whole.

69. An IIFS should also include in its stress-testing programme the specific scenarios to account for the various perspectives of profit-sharing investment accounts (PSIAs).¹³ Many IIFS get a significant part of their funding from **unrestricted PSIAs (UPSIAs), which are commingled** with those financed by the IIFS' own funds and current accounts, etc. While in principle unrestricted IAHs bear the credit and market risks arising from the assets financed by their funds, shocks to these assets cannot be ignored, as they are likely to have repercussions for the IIFS, such as displaced commercial risk (DCR). In contrast, **restricted PSIAs (RPSIAs) are separately managed funds** that are not commingled with other funds of the IIFS. Shocks to the assets of these funds will generally not have the same repercussions as shocks to those of UPSIAs. This indicates a need for specific stress-testing scenarios to be included in the stress-testing

¹² See footnote 10.

¹³ While the term *PSIA* is in common use, investment accounts also have features of loss absorbency. Hence, it is more appropriate to refer to *Muḍārah*-based investment accounts as profit-sharing and loss-bearing investment accounts, and to *Mushārah*-based investment accounts as profit- and loss-sharing investment accounts.

methodologies to account for the various perspectives of PSIAs and their treatment by IIFS in practice.

70. Given the specificities of IIFS, as part of an overall stress-testing programme an IIFS should aim to take account of specific elements in the programme. **Hence, the approach of stress testing to be applied to the IIFS's operations may differ from that applied to conventional banks.** IIFS should perform stress testing on specific portfolios covering, inter alia, consumer credit portfolios (i.e. *Murābahah* and *Ijārah* consumer financing), home purchase financing portfolios (whether by *Murābahah*, *Ijārah* or diminishing *Mushārahah* contracts), real estate (including investment and financing), commodity *Murābahah* transactions, and equity investments (i.e. *Muḍārabah* and *Mushārahah* investments). Consideration should be given to changes in correlations between risks that the IIFS identifies for a given portfolio.

3.3. Stress Designs and Satellite Models

71. The impact on an IIFS's balance sheet on account of macroeconomic stress is assessed by estimating the relationship between macroeconomic variables and the IIFS's risk components. Solvency stress test models require identification of appropriate risk elements in an IIFS's balance sheet and income statement in order to quantify the potential impact from adverse disturbances in the macroeconomy. The risk components of an IIFS's financial statements are inextricably linked with the performance of the macroeconomy. For instance, balance sheet items at risk from macroeconomic disturbances include held securities, *Mushārahah*/*Muḍārabah*-based project investments, financed assets and real estate assets. On the other hand, income statement items at risk include cost of funds, provisions for non-performing financing, impairments of financing or real estate assets, and so forth.

72. **Macroeconomic stress designs are formulated on the basis of historical data and/or expert judgment on extreme, yet plausible, conditions** in future or may even be established by using externally provided parameters (e.g. stress scenarios given by the European Banking Authority). The time horizon for scenario designs may be between one and three years into the future, describing hypothetical sets of conditions designed to assess the strength of IIFS and their resilience to adverse economic environments. The time horizon needs to be selected by the RSAs, balancing between the need to fully capture credit losses that gradually materialise over time and the possibility of larger estimation errors entailed by longer time horizons.

73. The guiding principle for RSAs on extreme, yet plausible, stress scenarios may include shock events that have a probability of occurrence ranging between 1% and 5%; or those that are in line with or worse than historical worst, or even taking examples from recent episodes of financial crisis. At times, reverse stress tests may also be conducted that aim to identify the extreme shock scenarios that have the potential to cause a financial system failure in the concerned jurisdiction. In general, RSAs and IIFS must subject portfolios/balance sheets to a series of stress scenarios, which could include past periods during which substantial disturbances occurred, expert judgments on extreme yet plausible conditions in future, and externally provided parameters.

74. **The relationship between macroeconomic variables in scenario designs and the IIFS's risk components in financial statements is estimated using econometric models,** designed either by the RSAs or by the risk management function of the IIFS. **These econometric models (termed “satellite models”)** estimate 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 designed.

75. The satellite models may be designed to capture the impact on single-risk factors or to incorporate co-movement in multiple risk factors. In a single-risk factor model, the satellite model will capture the impact of a macroeconomic shock scenario on one particular risk. For example, credit risk is the most common risk factor modelled by linking the probability of default (PD) and loss given default (LGD) parameters to macroeconomic variables (or at times to credit ratings frameworks). **This is generally known as sensitivity analysis of risk parameters.** Among the commonly employed techniques used to estimate this relationship are vector auto-regression (VAR), vector error-correction model (VECM), autoregressive distributed lag (ADL) and even ordinary-least-squares (OLS) regressions. Furthermore, panel regression techniques (e.g. dynamic panel modelling with fixed effects) are also widely used.¹⁴

76. On the other hand, **multivariate models may estimate the impact from macroeconomic shock scenarios on multiple risk factors of IIFS financial statements simultaneously** (e.g. credit and market risk parameters) in a process generally termed “**scenario**

¹⁴ Each econometric technique has its own specific requirements in terms of data quality, modelling structure and programming conduit, while also attracting certain statistical limitations. RSAs need to understand the specific technical needs of each technique and, accordingly, utilise methodologies that best suit their modelling capabilities while also deriving meaningful and statistically significant estimations.

analysis". These tests require complex and large structural econometric or dynamic stochastic general equilibrium (DSGE) models.¹⁵

77. All models rely on historical data of the concerned variables and risk components in the IIFS balance sheet to estimate this relationship. In an event where there are imperfections in data (e.g. on account of reliability issues or when the historical time-series of the concerned variables is short), a Bayesian model averaging approach may be used¹⁶ to develop the satellite model equations. Such an approach is particularly useful for modelling banks' risk parameters when there are data imperfections, as it allows for more predictor variables (ideally capturing all relevant ones) in explaining the dynamics of a dependent variable and ideally will result in projections that are more robust compared to those of a single equation.¹⁷ In other instances, **data proxies or expert judgments are used to account for data imperfections**, as highlighted in section 2.2.

78. The estimated coefficients of the risk parameters, derived from the modelling exercise, may be cross-checked for validity and consistency by comparing with similar historic estimations or peer estimations (either of a peer country or blocs).

79. The **solvency of an IIFS** may be assessed by the use of **the capital adequacy ratio (CAR)**, which is calculated as eligible capital over risk-weighted assets, as well as by the **leverage ratio** introduced in Basel III (Tier 1 capital over total exposures), and as adopted by IFSB-15. The impact on the numerator in each case will be based on credit costs and net losses, subtracted from IIFS capital. The methodology of calculating credit losses may be varied and includes models based on non-performing financing ratios and provisioning rates, or may use the PD and LGD framework to calculate expected losses.

80. The denominator of the CAR consisting of RWA may also be varied; an RSA may mandate an increase in RWAs for portfolios facing increased risks/losses, or the RWAs may remain constant throughout the stress-testing time horizon. **The CAR is assessed against the hurdle rate¹⁸ of the minimum capital requirement of IIFS** in a jurisdiction, which will typically reflect

¹⁵ See footnote 14.

¹⁶ As applied in the general top-down satellite model of the European Central Bank.

¹⁷ European Central Bank, *A Macro Stress Testing Framework For Assessing Systemic Risks in the Banking Sector*, Occasional Paper Series, No. 152 (2013).

¹⁸ The hurdle rate is set as the minimum capital requirement to judge the resilience of IIFS and may include total, Tier 1 and Common Equity Tier 1 (CET1) capital ratios. Typically, CET1 hurdle rates range from 4% to 7%, Tier 1 hurdle rates range from 4% to 8%, and total capital hurdle rates range from 8% to 11%. Should an IIFS fall under the category of systemically important bank (SIB) or domestic-systemically important bank (D-SIB), the RSA may require the IIFS to hold additional capital conservation buffers (CCB) or charges, and the hurdle rate for these institutions may accordingly be adjusted upwards.

BCBS and IFSB-15 guidelines. For the leverage ratio,¹⁹ the minimum value set by both the BCBS and IFSB-15 is 3%.²⁰

81. **The solvency ratio of an IIFS is compared against the regulatory hurdle rate.** If the solvency ratio exceeds the hurdle rate, the IIFS capitalisation level has survived the stress-testing exercise. In an event when the solvency ratio falls below the hurdle rate, the regulator may initiate remedial action – for example, by notifying the senior management and board of directors of the IIFS to raise additional capital.

82. In terms of IIFS exposures to be examined in the stress-testing exercise, **the entire financing book, including off-balance sheet items, cross-border financing exposures and consumer exposures**, may be subjected to shocks to examine the impact on regulatory capital from potential losses. Off-balance sheet items under the standardised approach will be converted into **credit exposure equivalents through the use of credit conversion factors (CCF)**. The RSA may undertake to include some exemptions (e.g. overseas financing exposures through subsidiaries) as deemed appropriate.

83. For a capital adequacy framework for IIFS and, specifically, guidelines on RWAs for different IIFS products, off-balance sheet items and so on, RSAs may refer to IFSB-15.²¹

3.4. Stress Test Models

84. In this TN, satellite models are designed to capture solvency stress impact on single-risk factors (credit risk and market risk) from three macroeconomic shock events:

- **Macroeconomic Shock 1:** Recession has led to an extremely weakened domestic economic activity – domestic GDP contracts by 2 percentage points.
- **Macroeconomic Shock 2:** Due to weakened domestic economic activity and internal political turmoil, a prominent external credit assessment institution (ECAI) has cut the country's sovereign rating by two notches (BBB to B).

¹⁹ See IFSB-15, paragraph 77, for a detailed leverage ratio definition in Islamic finance.

²⁰ This value stands true at the time of drafting this TN. However, the value of the leverage ratio may be revised by both the BCBS and IFSB in line with new developments and studies on this subject matter. Hence, the minimum requirements stated in this TN will accordingly change from time to time, in line with new standards and guidelines issued by the relevant international standard-setting bodies. These requirements should therefore be interpreted accordingly.

²¹ IFSB-15: *Revised Capital Adequacy Standard for IIFS*, December 2013.

- **Macroeconomic Shock 3:** Expectations of interest rate increases by the US Federal Reserve and tapering in its monthly bond-buying programme – local currency depreciates against a basket of international currencies.

85. The impact from the shocks on the respective credit and market risk portfolios is then transformed as an impact on regulatory capital ratios of five sample IIFS.²² The post-shock regulatory capital ratios are then compared against the minimum total capital hurdle ratio of 8%. The respective credit and market risk portfolios and the impact from various shocks are discussed in sections 3.4.1 and 3.4.2.

3.4.1. Credit Risk

Credit Shock 1

86. Macroeconomic Shock 1 is assumed to have produced a **credit shock 1, by *Sharī'ah*-compliant contracts, where the unemployment rate in the local economy increases to 25% of the workforce** and causes a substantial increase in the NPFs of IIFS financing portfolios. Satellite models, incorporating focus variables of unemployment of 25% and GDP decline of 2% (in addition to other control macroeconomic variables), derive the results shown in Table 1 for an increase in NPFs across various IIFS portfolios (the dependent variables in the models) segregated by *Sharī'ah*-compliant contracts.

Table 1: Modelled Increase in NPFs (%) – Credit Shock 1

<i>Murābahah (collateralised)</i>	25%
<i>Commodity Murābahah (unsecured)</i>	50%
<i>Salam</i>	10%
<i>Ijārah Muntahia Bittamleek (IMB)</i>	20%
<i>Operating Ijārah</i>	30%

87. The increase in NPFs requires IIFS to undertake **additional provisioning by 30%**²³ for each of the portfolios. This increased provisioning **is absorbed by the IIFS, either in its annual**

²² The dataset is hypothetical.

²³ This is an assumed figure for provisioning on the increase in NPFs. Different portfolios should have a different percentage of provisioning, depending upon the underlying mix of assets and their riskiness. For simplicity, here it is assumed that a flat 30% rate of provisions will be applied on the absolute amounts of the respective increase in NPFs.

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 CET1 insolvency and triggers loss absorption by AT1, and then T2 instruments).²⁴ During stress events, the likelihood profitability is very low, and hence the ultimate impact from credit losses provisioning is likely to be on regulatory capital.

88. The increased provisions reduce the value of the RWA²⁵ as well as the regulatory capital. This TN makes an assumption that the **full increase in provisions is subtracted** from the **eligible regulatory capital**,²⁶ and that the impact from various financing portfolios on RWAs is a constant 100%.

89. Furthermore, Macroeconomic Shock 1 is also assumed to have produced a **credit shock 1A**, where anticipated returns on equity exposures (*Mushārah / Muḍārah* investments) and held-to-maturity (HTM) *Sukūk* in the banking book are reduced, with increased risk of losses, and require a substantial increase in the level of provisioning held against such non-payment risks. Satellite models, incorporating a focus variable of GDP decline at 2% (in addition to other control macroeconomic variables), and/or expert judgments based on past trends, produce the results shown in Table 2 for the appropriate level of provision needed to offset risks of non-income flows from banking book exposures.

Table 2: Modelled/Estimated Provisioning of Book Value (%) – Credit Shock 1

<i>Equity Position in Banking Book</i>	13%
<i>Sukūk HTM in Banking Book</i>	5%

90. The increase in level of provision required will reduce the value of the RWA as well as the regulatory capital held. This TN makes an assumption that the **increase in provisions will have a 100% impact on regulatory capital, while the impact on RWA from *Mushārah / Muḍārah* equity exposures is at 135%²⁷ and from the HTM *Sukūk* portfolio at 100%.**²⁸

²⁴ The actual treatment will depend upon the accounting methods/standards as applied in various jurisdictions.

²⁵ Only the specific portfolio provisions reduce the value of RWA; general provisions cannot be deducted from RWA.

²⁶ The deductions will be from Tier 1 capital as long as the IIFS remains a “going concern”. However, in an event of a “gone concern”, Tier 2 capital also stands eligible to absorb losses. See footnote 9 for further details.

²⁷ Based on the Supervisory Slotting Method, where the supervisory category is “Satisfactory”.

²⁸ The various assumptions made in the TN are readily changeable by users by adjusting the numbers in the blue boxes in the respective Excel sheets.

91. The post-shock CAR across the Islamic banking sub-system²⁹ and by individual IIFS and specific portfolios (by contracts) can be analysed in the “**Credit Risk**” **Excel sheet** attached.

Credit Shock 2

92. Macroeconomic Shock 1 is assumed to have produced a **credit shock 2 – by sector**, where the **house price index in the local economy declines by 40%**, causing a substantial increase in the NPFs of IIFS financing by sectors. This exercise allows the stress-testing team to select different shocks to economic sectors and observe how each IIFS would be impacted, depending on the relative size of the banks’ credit exposures to these sectors. Satellite models, incorporating focus variables of house price index declining by 40% and GDP decline at 2% (*in addition to other control macroeconomic variables*), derive the results shown in Table 3 for increase in NPFs across various IIFS portfolios (*the dependent variables in the models*) segregated by sectors.

Table 3: Modelled Increase in NPFs by Sector (%) – Credit Shock 2

<i>Manufacturing</i>	20%
<i>Home Financing</i>	70%
<i>Infrastructure</i>	15%
<i>Financial</i>	30%
<i>Other</i>	25%

93. The increase in level of provision required will reduce the value of the RWA as well as the regulatory capital held. This TN makes an assumption that the **increase in provisions will have a 100% impact on regulatory capital, while the impact on RWA for all sectors is 100% with the exception of home financing, which will have become riskier**. The home financing portfolio now attracts a higher capital charge and, hence, the impact on RWA reduction from provisioning is lowered to 80%.³⁰

²⁹ The Islamic banking sub-system comprises aggregated individual IIFS data within a dual system. In this case, a legitimate question that arises is whether RSAs need to stress test Islamic banks as an aggregate (*industry-wide and excluding conventional banks*) separately in dual banking jurisdictions. This question is discussed further in section 3.6.

³⁰ The extra 20% RWA value not offset will leave a higher exposure amount on home financing, thus indicating the need for a higher capital charge.

94. The post-shock CAR by sector (IIFS industry-wide) and by individual banks and specific portfolios (by sector) can be analysed in the “**Credit Risk**” **Excel sheet** attached.

Credit Shock 3

95. Macroeconomic Shock 1 is also assumed to have produced a **credit shock 3 – financing portfolio funded by unrestricted PSIA**,³¹ where the **unemployment rate in the local economy increases to 25% of the workforce** and causes a substantial increase in the NPFs of IIFS financing portfolios funded by UPSIA. This exercise allows the stress-testing team to analyse how the credit risks on portfolios funded by UPSIA have an impact on regulatory capital. **The jurisdiction in question allows smoothing of profits to UPSIA holders and makes use of an alpha factor of 0.5.**³²

96. Satellite models, incorporating focus variables of unemployment at 25% and GDP decline at 2% (*in addition to other control macroeconomic variables*), produce the results shown in Table 4 for an increase in NPFs across various IIFS portfolios (*the dependent variables in the models*) segregated by *Shari’ah*-compliant contracts.

Table 4: Modelled Increase in NPFs (%) – Credit Shock 3

<i>Murābahah (collateralised)</i>	25%
<i>Commodity Murābahah (unsecured)</i>	50%
<i>Salam</i>	10%
<i>IMB</i>	20%
<i>Operating Ijārah</i>	30%

³¹ For simplicity, the assumption made here is that portfolios funded by UPSIA are segregated from others that are self-funded by IIFS own funds and/or current and savings accounts. In practice, UPSIA funds may be commingled with other funds and in such cases the respective shares of such portfolios that are funded by UPSIA and by other funds will need to be taken into account.

³² Supervisory authorities should assess the extent of risks borne by PSIA and reflect these assessments in the computation of capital adequacy for IIFS in their jurisdiction. The main challenge facing IIFS and their supervisors in this connection is to assess the risk-sharing level between IIFS’ own capital (shareholders’ funds) and that of the UIAH. The proportion of RWAs that needs to be included in the CAR to cater for the transfer of risk from UIAH to IIFS is denoted by “alpha”. The supervisory assessment of how an IIFS manages the risk–return mix of PSIA would determine the alpha factor, with a value of alpha near zero reflecting an investment-like product with the investor bearing the commercial risk, while a value of alpha close to 1 would reflect a deposit-like product with the depositor effectively bearing virtually no commercial risk. PSIA could also be positioned anywhere along a continuum between these two cases, depending upon the extent of investment risks actually borne by the IAH. The IFSB issued GN-4 (*Guidance Note on the Determination of Alpha in the CAR for IIFS*) in March 2011, which outlines a methodology for estimating the value of alpha to be used in the supervisory discretion formula in calculating the CAR of IIFS.

97. The increase in NPFs requires IIFS to undertake **additional provisioning by 30%** for each of the portfolios. The increased provisioning requirements will reduce the value of the RWA as well as the regulatory capital. This TN makes an assumption that the **full increase in provisions is subtracted** from the **eligible regulatory capital**, and that the **impact from various financing portfolios on RWAs is a constant 100%**.

98. **Based on an alpha factor of 0.5, the impact on regulatory capital and RWA due to increased provisioning is 50%.**³³ The post-shock CAR across the Islamic banking system and by individual IIFS and specific portfolios (by contracts) can be analysed in the “**Credit Risk**” Excel sheet attached.

3.4.2. Market Risk

Market Shock 1

99. Macroeconomic Shock 1 is assumed to have produced a **market shock 1 – severe deflation in local economy**, where the **producer price index in the local economy declines by 30%** and causes a material decline in the market values of IIFS assets in the trading book, available for sale (AFS) or available for lease (AFL), and *Salam* commodities receivable. Satellite models, incorporating focus variables of producer price index – declined by 30% – and GDP declined by 2% (*in addition to other control macroeconomic variables*), derive the results shown in Table 5 for decrease in market values across the following inventory (*the dependent variables in the models*).

Table 5: Modelled Decrease in Market Prices (%) – Market Shock 1

<i>Murābahah Inventory</i>	15%
<i>Salam Commodities</i>	35%
<i>Ijārah Assets</i>	20%

100. **The decrease in market prices of assets in trading book portfolios will require the IIFS to absorb these losses, either in its annual profit and loss account (as a first line of**

³³ See IFSB-15, section 3.4.5.

defence) or, in the case of insufficiency, in its common equity (as a second line of defence).³⁴ 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. This TN makes an assumption that the **change in market values in the trading book will have a 100% impact on regulatory capital, while the impact on RWA from *Murābahah* AFS and *Ijārah* AFL is at 187.5% and that from *Salam* commodities³⁵ is at 225%.**

101. The post-shock CAR across the Islamic banking system and by individual IIFS can be analysed in the “**Market Risk**” Excel sheet attached.

Market Shock 2

102. Macroeconomic Shock 2 is assumed to have produced a **market shock 2 – *Sukūk* risk in trading book**, where the **benchmark rate on five-year *Ijārah Sukūk* increases by 100bps** and causes a substantial decline in the market values of IIFS *Sukūk* investments held in the trading book. Satellite models, incorporating focus variables of benchmark *Sukūk* yield – increased by 100bps – and sovereign ratings downgrade from BBB to B (*in addition to other control macroeconomic variables*), lead to the results shown in Table 6 for a decrease in market values across IIFS *Sukūk* and ICIS³⁶ portfolios (*the dependent variables in the models*).

Table 6: Modelled Decrease in Market Values (%) – Market Shock 2

<i>Sukūk</i>	30%
ICIS	15%

103. The decrease in fair/market values requires the IIFS to **absorb these losses**. This TN makes an assumption that the **change in market values in the trading book will have a 100% impact on regulatory capital, while the impact on RWA from *Sukūk* is at 50% and from ICIS at 150%.**

104. The post-shock CAR across the Islamic banking system and by individual IIFS can be analysed in the “**Market Risk**” Excel sheet attached.

³⁴ The actual treatment will depend upon the accounting methods/standards as applied in various jurisdictions.

³⁵ As per IFSB-15, *Salam* exposures with parallel *Salam* are accorded a 225% risk weighting for capital charge.

³⁶ Islamic collective investment schemes (ICIS) are a structured financial scheme where investors have pooled their capital contributions in a fund that is established and managed in accordance with *Sharī'ah* rules and principles. For more details on the ICIS concept, please refer to IFSB-6.

Market Shock 3

105. Macroeconomic Shock 3 is assumed to have produced a **market shock 3 – foreign exchange risk in trading book**, where the **local currency to US dollar depreciates by 40%** and causes a substantial change in local currency terms when analysing the net position of IIFS to foreign currency exposures held in the trading book.

106. 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. This trading book loss will reduce the value of the RWA as well as the regulatory capital. This TN makes an assumption that the impact from the trading book loss from exchange rate adjustments on both RWA and regulatory capital is at 100%.

107. The post-shock CAR across the Islamic banking system and by individual IIFS can be analysed in the “**Market Risk**” **Excel sheet** attached.

Market Shock 4

108. Macroeconomic Shock 1 is also assumed to have produced a **market shock 4 – assets funded by UPSIA**, where the **benchmark rate on five-year *Ijārah Sukūk* increases by 100bps** and causes a substantial decline in the market values of IIFS *Sukūk* investments. It is assumed for simplicity that the total *Sukūk* and ICIS portfolio were funded by UPSIA; in case of commingling of funding for these investments, the respective shares would need to be taken into account. **This exercise allows the stress-testing team to analyse how the market risks on portfolios funded by UPSIA have an impact on regulatory capital.** The jurisdiction in question allows smoothing of profits to UPSIA holders and makes use of an alpha factor of 0.5.

109. Satellite models, incorporating focus variables of benchmark *Sukūk* yield – increased by 100bps – and sovereign ratings downgrade from BBB to B (*in addition to other control macroeconomic variables*), produce the results shown in Table 7 for decrease in market values across IIFS *Sukūk* and ICIS portfolios (*the dependent variables in the models*).

Table 7: Modelled Decrease in Market Values (%) – Market Shock 4

Sukūk
ICIS

30%
15%

110. The decrease in fair/market values requires IIFS to **absorb these losses**. Based on an alpha factor of 0.5, and assuming that no provisions for such losses have been made, the **trading book losses will have a 50%³⁷ impact on regulatory capital, while the impact on RWA from Sukūk is at 25% and from ICIS is at 75%.³⁸**

111. The post-shock CAR across the Islamic banking system and by individual IIFS can be analysed in the **“Market Risk” Excel sheet** attached.

3.4.3. Operational Risk: Sharī'ah Non-Compliance

112. Operational risk is defined by the BCBS as the risk of losses resulting from inadequate or failed processes, people and systems, or from external events. **In the IFSI, operational risk for IIFS has an added scope in the form of the losses resulting from Sharī'ah non-compliance and failure to meet their fiduciary responsibilities.** IFSB-1 categorises operational risk in Islamic banks into three main types: general risks, legal risks and Sharī'ah non-compliance risks. While general and legal risks for Islamic banks are similar but not limited to those of conventional banks, Sharī'ah non-compliance is a unique risk for Islamic banks.

113. The IFSB's standards on capital adequacy (IFSB-2³⁹ and IFSB-15,⁴⁰ the latter superseding the former) assign a capital charge similar to the Basel II and Basel III framework, respectively – namely, the basic indicator approach (BIA), (b) standardised approach (TSA), and (c) advanced measurement approach (AMA) – in which strategic and reputational risks were excluded because of the difficulty in measuring them. However, it is mentioned that RSAs can apply an additional capital charge to the IIFS if Sharī'ah non-compliance risk (SNCR) is deemed significant. Similarly, IFSB-16⁴¹ provides discretion to RSAs to impose additional capital charges for operational risk in order to cater for SNCR.

114. In terms of stress tests for IIFS, a specificity for operational risk would be accounting for such Sharī'ah non-compliance events and their potential impact on the profitability and capital

³⁷ Since the other 50% are to be borne by UPSIA holders – based on an alpha factor of 0.5.

³⁸ As the IIFS is required to assume 50% of the market risks on the portfolios funded by UPSIA, the market risk weights (RWs) on these portfolios and the corresponding regulatory capital requirements are also 50% of the original RWs and minimum capital required should the IIFS be 100% responsible for the risks.

³⁹ IFSB-2: *Capital Adequacy Standard for Institutions (other than Insurance Institutions) offering only Islamic Financial Services (IIFS)*, December 2005.

⁴⁰ IFSB-15: *Revised Capital Adequacy Standard for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]*, December 2013.

⁴¹ IFSB-16: *Revised Guidance on Key Elements in the Supervisory Review Process of Institutions Offering Islamic Financial Services (Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes)*, March 2014.

adequacy of the tested institution and/or financial sub-sector. However, for any meaningful operational risk stress tests encompassing SNCRs, **it is crucial to be able to identify the worst possible impact on capital adequacy and profitability of an IIFS due to a *Sharī'ah* non-compliance event.** Furthermore, the event should have been material enough to inflict a sizeable adverse impact on the IIFS's profitability and capital adequacy, thus justifying its consideration in the operational risk stress tests.

115. To clarify such considerations, the IFSB Secretariat, in partnership with the International Shariah Research Academy for Islamic Finance (ISRA), recently conducted a study⁴² on a sample of Islamic banks' across 11 countries to understand the extent of *Sharī'ah non-compliant income* (SNCI) as compared to an Islamic bank's total assets, total equity and total net income. The findings in this study reveal that **SNCI is not material enough to warrant additional capital requirements, and that current approaches used for calculating operational risk sufficiently cover the wider set of operational risks.** The level of the SNCI is negligible in most cases, and it should be noted that not all SNCR events result in financial loss because most can be rectified or purified without implications for capital adequacy.

116. Hence, premised on the above findings, **IIFS may continue to employ the traditional operational risk stress-testing mechanisms until such time as there are further developments.** In October 2014, the BCBS published its "Consultative Paper on Operational Risk: Revisions to the Simpler Approaches",⁴³ which suggests modifications to the existing framework for the calculation of capital charge for operational risk. This consultative paper offers a refinement to the proxy measure, as well as consideration of other factors such as the size and revenue of the bank. Nonetheless, RSAs have discretion to impose additional capital charges for operational risk as the authority deems fit, either collectively as a market or individually at the Islamic bank level.

⁴² IFSB-ISRA Joint Research Paper, "*Sharī'ah* Non-compliance Risk in the Banking Sector: Impact on Capital Adequacy Framework of Islamic Banks" (forthcoming).

⁴³ BCBS, "Operational Risk: Revisions to the Simpler Approaches", Consultative Paper, www.bis.org/publ/bcbs291.pdf, October 2014.

3.5. Review and Analysis of the Results

3.5.1. Sensitivity Analysis

117. The sensitivity stress tests conducted in Section 3.4 highlight some interesting results (summarised in Table 8 below).

Table 8: Summary of IIFS Capital Adequacy (%) Post Credit and Market Shocks

Shocks	All IIFS (Industry-wide)	IIFS 1	IIFS 2	IIFS 3	IIFS 4	IIFS 5
Credit Shocks 1 & 1A	7.7	7.6	7.6	7.7	8.1	7.4
Credit Shock 2	8.0	8.0	7.9	7.9	8.4	7.7
Credit Shock 3	8.2	8.3	8.1	8.2	8.6	8.0
Market Shock 1	8.2	8.3	8.0	8.1	8.6	8.0
Market Shock 2	7.5	7.8	7.3	6.4	8.2	7.4
Market Shock 3	8.3	8.3	8.1	8.3	8.7	8.2
Market Shock 4	8.0	8.1	7.8	7.4	8.5	7.8

Note: Hurdle rate = 8% total capital. Figures in red indicate CAR below the hurdle rate.

118. From an **industry-wide perspective**, the **Islamic financial sub-sector as an aggregate is able to withstand credit shocks 2 and 3**, while the total capital adequacy falls **below the hurdle rate in an event of credit shock 1 and 1A**. In particular, credit shock 3, which was stress-tested upon segregated assets funded by UPSIA, highlights how the **loss-absorbency features of investment accounts help to sustain better capital adequacy** for Islamic banks as compared to the conventional banks. Credit shocks 1 and 3 are identical in their macroeconomic magnitude. They differ to the extent that credit shock 1 was applied to portfolios assuming no risk-bearing by UPSIA, while credit shock 3 was applied assuming an alpha factor of 0.5 in relation to risk exposures of UPSIA.

119. From a market shock perspective, the Islamic financial sub-sector also appears **resilient**. In three instances (market shocks 1, 3 and 4), the industry-wide capital adequacy survives above the hurdle rate. **Only in market shock 2**, when stress hits the *Sukūk* market, does the Islamic financial sub-sector **capital adequacy fall below the hurdle rate**. **Reinforcing the loss-absorbency features of UPSIA, market shock 4 in fact survives the stress test**; market shock 4 is identical to market shock 2 and differs only to the extent that market shock 2 was applied on portfolios assuming no risk-bearing by UPSIA, while market shock 4 was applied assuming an alpha factor of 0.5 in relation to risk exposures of UPSIA.

120. When analysing results from an **institutional-level perspective**, a weak IIFS with capital adequacy falling below the hurdle rate is identified in more instances, **even when the Islamic financial sub-sector as an aggregate is identified as surviving the stress tests**. This enables RSAs to identify specific institutions that are financially vulnerable to macroeconomic adversities. In particular, **IIFS 2, 3 and 5 are the more vulnerable institutions as they fail capital adequacy stress tests in four out of seven shock events**. On the other hand, **IIFS 4 is identified as being most resilient, as it does not fail any shock event**.

121. From a **portfolio perspective**, by *Sharī'ah*-compliant contracts, **operating *Ijārah* and commodity *Murabahah* transactions appear to experience the highest rates of NPFs** and expose the respective IIFS to higher proportionate amounts of provisioning. These are mainly due to the **uncollateralised nature** of both these contracts. Commodity *Murābahah* is used by the IIFS to structure unsecured financing products for clients; hence, in a stress event, these products face higher instances of non-performance. Similarly, in an operating *Ijārah*, the lessee leases the underlying asset without an intention to buy the asset. As such, the lessee is more likely to default on lease payments during stress events since it is not the owner and not at risk of losing the underlying asset.

122. From a sector-exposure perspective, **home financing appears to experience the highest rate of NPF** and exposes respective IIFS to higher proportionate amounts of provisioning. In contrast, **the infrastructure sector had the least comparative amount of NPF, mainly since the exposure is usually to the public sector/government** as the ultimate servicer of the financing facility.

123. In general, often single-risk factor sensitivity stress tests are criticised for not being “stringent enough” nor “sufficiently extreme” to predict financial-sector meltdown should macroeconomic turmoil events occur. It is argued that in the macroeconomic context, changes in several risk factors are typically interrelated. In this regard, **scenario analysis that combines**

various risk factors into a single scenario is utilised. The following section reviews stress test results from a simplistic scenario analysis that **proportionately consolidates impact on regulatory capital** from both credit risks and market risks simultaneously.

3.5.2. Scenario Analysis

124. The main reason for using scenarios rather than single-factor shocks is that in the macroeconomic context, changes in several risk factors are typically interrelated. The “**Scenario Analysis**” Excel sheet⁴⁴ attached provides a simplistic template of how a common macroeconomic shock impacts on both credit and market risks, and of the resulting impact on regulatory capital and capital adequacy of the institutions and the aggregate financial sector. The data and conditions in this analysis are the same as previously explored individually in the credit risk and market risk sections.

125. The scenario stress tests shown in Table 9 highlight some interesting results when compared to the results explored in the previous section.

Table 9: Summary of IIFS Capital Adequacy (%) Post Macroeconomic Shocks

Shocks	All IIFS (Industry-wide)	IIFS 1	IIFS 2	IIFS 3	IIFS 4	IIFS 5
Macroeconomic Shock 1	7.5	7.4	7.3	7.4	7.9	7.2
Credit Shocks 1 & 1A						
Market Shock 1						
Macroeconomic Shock 2	6.0	6.2	5.8	4.9	6.9	5.8
Credit Shock 2						
Market Shock 2						

Note: Hurdle rate = 8% total capital. Figures in red indicate CAR below the hurdle rate.

⁴⁴ For simplicity of presentation, the Excel sheet contains only formulas linked to the other sheets – namely, “Credit Risk” for credit risk and “Market Risk” for market risk. In addition, it is assumed that credit and market risks are proportionately having an impact on regulatory capital in the common shock scenario.

126. When the impact of each macroeconomic shock on credit and market risks is considered simultaneously, **there is a substantial capital reduction causing the aggregate Islamic financial sub-sector's capital adequacy to fall below the established hurdle rate.** Macroeconomic Shock 2, where a prominent ECAI has cut the country's sovereign rating by two notches (BBB to B), is the more severe shock for the country's Islamic banking sub-sector.

127. Among individual institutions, **all IIFS fail the stress tests.** IIFS 3 is severely affected by Macroeconomic Shock 2, as its capital adequacy falls below 5%, while IIFS 5 is the most impacted in Macroeconomic Shock 1.

128. The **impact from macroeconomic shocks varies from IIFS to IIFS**, which enables each IIFS (and RSA) to identify its specific vulnerabilities and where it needs to be aware and/or take remedial action.

129. Overall, the scenario analysis highlights that **common macroeconomic shocks have the propensity to impact multiple risk factors simultaneously**, which has critical implications for the capital adequacy of individual IIFS and the aggregate financial sector.

3.6. Role of RSAs and Critical Considerations

130. **Stress tests are complementary to other tools for financial stability analysis.** Results from stress tests do not automatically trigger any action. The process is intended to help IIFS in identifying key sources of vulnerabilities and taking corrective actions to enhance its resilience to shocks.

131. **Supervisory authorities need to undertake immediate remedial action to ensure that vulnerable IIFS are better capitalised in relation to their risk exposures.** This would also involve enhanced vigilance of flagged institutions along with necessary follow-up actions and reporting, as has been discussed in Section 2.

132. When considering system-wide stress tests (the entire financial system) in dual-banking jurisdictions, a question legitimately arising is whether RSAs need to stress test Islamic banks as an aggregate (*industry-wide and excluding conventional banks*) separately. In most countries, Islamic banks are only part of the overall banking system, which also consists of conventional counterparts. Often, the Islamic banking sector constitutes the smaller market share of the overall banking system. Under these conditions, **how should the RSA conduct a system-wide stress**

test: (1) separately for IIFS and conventional banks; or (2) as a combined exercise consisting of the top and major IIFS and conventional banks?

133. When considering a combined exercise, a problem arises in that the stress tests for IIFS differ in some technical respects from those used for conventional banks. As a result, would a conventional stress test on the entire banking sector (including IIFS) be appropriate and sufficient for RSAs to gauge the health of the financial system? Similarly, an RSA may not be able to stress test the entire banking sector (Islamic plus conventional banks) using the IIFS stress-testing templates, since these require specific IIFS data that are obviously not available for conventional banks. Even, for instance, if a jurisdiction comprises a 75% market share for Islamic banks and 25% for conventional ones, an RSA would not be able to accurately stress test conventional banks using IIFS templates as the cohort of conventional banks will not be able to meet the data requirements of the IIFS templates.

134. The question that begs deliberation, therefore, is whether RSAs need to combine or segregate these two financial systems when it comes to system-wide stress tests.⁴⁵ If a combined exercise is preferred, how would the methodology of stress tests be designed to cover effectively both types of banking institution? An important consideration is the respective proportions of the overall dual system represented by the two sub-systems – Islamic and conventional.

⁴⁵ A possible approach in this regard could be to conduct industry-wide stress tests of IIFS (excluding conventional banks) as a separate exercise, and to consider including only the industry-wide (all IIFS) stress test results as a single and aggregated Islamic banking component alongside conventional banks in the broader system-wide stress-testing framework. The advantages of such a method are three-pronged: (1) all IIFS are individually subjected to appropriate stress tests, enabling the RSAs to identify problem banks (if any); (2) it provides the RSAs with an outlook on the aggregated performance and resilience of the Islamic banking sector under stressed conditions; and (3) by inserting an aggregated Islamic banking component in the broader stress-testing framework alongside conventional banks, the RSA can gain an indication of joint (conventional and Islamic) system-wide banking sector vulnerabilities under stressed conditions (if any). By inserting only an aggregated component of IIFS, adjustments to numbers for the IIFS results to fit into the conventional system-wide framework only needs to be done once. This particularly rests well in dual-banking system jurisdictions where the Islamic banking sector is small. However, in the case where a jurisdiction has an IIFS that has achieved a sizeable and material market share of the domestic banking sector, this IIFS could be added as a separate component in the system-wide stress-testing framework, in addition to the other aggregated data on Islamic banks and conventional banks.

Section 4: Liquidity Stress Tests

4.1. Introduction

135. The liquidity risk demonstrated how important a role it plays for soundness and stability of the financial system in the global financial turmoil faced by financial sector during 2008-9. The financial crisis also highlighted a pre-crisis lack of sound liquidity risk management in financial institutions. An idiosyncratic liquidity risk in a bank became systemic through direct and/or indirect linkages within the financial system in a very short period of time and the whole global financial system was halted. An important prudential tool developed since the crisis to help in the effective management of liquidity risks and to protect the financial system against similar negative liquidity events is the liquidity stress test, which helps financial institutions and RSAs to identify liquidity risk with extreme, yet plausible, idiosyncratic and market-wide liquidity stress scenarios.

136. Relatively less attention was paid before the financial crisis by standard-setting bodies, RSAs and banks, including IIFS, to the analysis of liquidity and its components, cash flow and maturity mismatch, compared to analysis of banks' capital. When the banks were hit by severe idiosyncratic funding shocks, the banking sector was affected by a liquidity crisis, with some central banks having to take unconventional measures to provide funding to solvent but illiquid banks. The crisis soon illustrated the importance of liquidity risk within stress-testing frameworks.

137. As expected, liquidity stress tests are not currently as well developed as credit and market risk stress tests, although there is now increased interest in the threats posed by liquidity risks as a result of the financial crisis and it is now assumed to be one of the main risks for the banking sector, including IIFS. The IIFS and RSAs have realised the importance of liquidity risk management, and have incorporated the formal stress-testing programme into their liquidity risk management frameworks.

138. The main reasons for the comparatively low level of development in the area of liquidity stress testing are: (a) liquidity crises are very low-frequency/high-impact events; (b) liquidity risk management was underestimated before the 2008–9 crisis; and (c) all liquidity crises are somehow different, making it difficult to standardise stress assumptions.

139. The RSAs and IIFS are endeavouring to be more alert to the liquidity position of IIFS and to manage this risk. It is important for RSAs and IIFS to have information about the liquidity position of IIFS in order to understand the risks IIFS take and how best to mitigate those risks. Due to the profit-sharing nature of IIFS, they are likely to be more stable. However, liquidity risks

have played a role in bringing financial distress to IIFS as well, and some of them were forced to close.

4.2. Liquidity Risk of IIFS

140. Liquidity risk is the potential loss arising from the inability of an IIFS (or other financial institution) either to meet its obligations or to fund increases in assets as they fall due without incurring unacceptable costs or losses. It has two aspects: (a) funding liquidity risk, and (b) market liquidity risk. Funding liquidity risk arises from expected and unexpected current and future cash flow and collateral needs. Market liquidity risk arises when an IIFS cannot easily offset or eliminate a position at the market price because of inadequate market depth or market disruption.

141. It is important to have a good understanding of the key drivers of liquidity of IIFS in order to be able to identify issues affecting sound liquidity stress-testing design. IIFS have often found management of liquidity risk a very challenging part of their operations. These challenges can be observed at all tiers of the liquidity risk management framework of an IIFS, including the institutional, interbank and central bank levels.

142. Two main sources of fund generation for liquidity purposes used by conventional banks are not applicable to IIFS: (a) interest-based financing from the interbank market; and (b) in most jurisdictions, transfer of debt assets, other than at their face value or in exchange for a commodity. The shortage or unavailability of *Sharī'ah*-compliant securities/*Sukūk* in many jurisdictions adds to these problems. IIFS therefore tend to hold and maintain high levels of cash and non-earning liquid assets compared to the conventional banks.

143. From a market perspective, the unavailability of an active *Sharī'ah*-compliant trading or repurchase (repo) market remains an ongoing problem. In addition, most jurisdictions lack any form of a *Sharī'ah*-compliant lender-of-last-resort (SLOLR) scheme to protect the soundness and stability of IIFS in situations of serious liquidity stress.

144. From the perspective of liabilities, IIFS generally have two types of income-generating accounts: unrestricted and restricted PSIA, the latter being normally accounted for “off balance sheet” and so not actually appearing on the liabilities side. There is also an increasing use of commodity *Murābahah* transactions- (CMT-) based term deposits. In principle, the profit- and loss-sharing (PLS) nature of IIFS has reduced liquidity risk problems, since if the investment account holder does not have the right to make withdrawals at short notice, liquidity stress events affecting PSIA concern the IAHs and not the IIFS itself. However, because of the common practice

in the market, unrestricted IAH commonly have withdrawal rights at short notice before maturity, which leads to unexpected cash outflows in times of stress like in conventional banks. (See the treatment of “run-off” in the IFSB’s GN-6 on liquidity risk.) If liquidity risk problems emerge, Islamic banks have limited options to employ Islamic money market instruments or requests to the central bank for an emergency liquidity facility on a *Sharī‘ah*-compliant basis. Moreover, deposits and PSIA generated by the IIFS are not covered by a reliable *Sharī‘ah*-compliant deposit insurance scheme in most jurisdictions. In addition, CMT-based term deposits tend to have short tenors and run off on maturity; they require a specific decision from the depositor to be rolled over.

145. From the perspective of difficulties and restrictions faced by IIFS even in normal times, the liquidity stress test scenarios and assumptions for IIFS should be carefully analysed by both IIFS and RSAs. In particular, determining the liquidity characteristics of assets of IIFS, including *Sharī‘ah*-compliant securities/*Sukūk* for the purpose of a fire sale in the event of liquidity shocks, is one of the key aspects of these tests.

146. By taking into account the peculiarities and impediments of IIFS in terms of liquidity risk, this TN endeavours to provide IIFS and RSAs with an Excel template for conducting a liquidity stress test. The template for IIFS is derived from Martin Cihak's stress test template⁴⁶ and Schiemeder et al.'s next generation stress tester.⁴⁷ The parameters of the liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) (quantitative requirements under Basel III) in the template are based on GN-6, which built upon Basel III, with a number of additions and adjustments to meet the specificities of IIFS.

147. The template includes four different modules for analysing the liquidity position of IIFS and/or the Islamic banking sub-system under stress scenarios:

- a. Implied cash flows analysis (ICFA) (five days and 30 days), which is a tool to simulate IIFS-run type scenarios while accounting for fire sales of liquid assets and/or *Sharī‘ah*-compliant central bank liquidity provision subject to eligible collateral and haircuts under different stress assumptions.
- b. LCR is a stress test based on a scenario that entails a combination of idiosyncratic and market-wide shocks that includes anything from the run-off of a portion of

⁴⁶ M. Čihák, “Introduction to Applied Stress Testing”, IMF Working Paper No. 59 (2007).

⁴⁷ C. Schiemeder, H. Hesse, B. Neudorfer, C. Puhr and S.W. Schmitz, “Next Generation System-Wide Liquidity Stress Testing”, IMF Working Paper No. 12/3 (2012).

funding to a three-notches downgrade in its credit rating and unscheduled draws on committed but unused credit and liquidity facilities.

- c. Maturity mismatch analysis is a liquidity gap analysis assessing risks arising from *Shari'ah*-compliant maturity transformations of IIFS; it simulates liquidity shortfalls in IIFS for different maturity buckets under both normal and stressed conditions.
- d. The NSFR intends to promote more stable funding of the assets and activities of banks over a one-year period under market-wide stress conditions.

148. The Excel-based template is an easy-to-use balance sheet-type liquidity stress-testing tool for IIFS that allows bottom-up tests to be run for many IIFS. For illustration, only five IIFS are included in the template, and data from these five IIFS is hypothetical. An IIFS can run liquidity stress tests for risk management purposes on an individual basis, and RSAs can also run the system-wide or industry-wide test for both micro- and macroprudential purposes.

149. The template uses IIFS balance sheet data to perform the stress tests on an IIFS-by-IIFS level. The needed data for ICFA is mainly from the balance sheet of IIFS, with more granular data on both the asset and liability sides using haircuts on different kinds of assets and withdrawal rates of different categories of deposits/PSIA based on stress scenarios. It is also possible for IIFS and RSA to modify the template based on their more granular data (different categories of assets and liabilities of IIFS based on their liquidity characteristics).

150. The template calculates LCR and NSFR ratios based on GN-6: *Guidance Note on Quantitative Measures for Liquidity Risk Management in IIFS*.⁴⁸ The assumptions in this template incorporate the same parameters for LCR and NSFR as in GN-6, which calibrates the rates for IIFS (see GN-6 for details). The template also allows RSAs and IIFS to simulate different kinds of scenarios and regulatory liquidity requirements (LCR and NSFR) based on the different data availability. The template for LCR and NSFR follows the data-reporting requirement for IIFS based on GN-6.⁴⁹

151. Maturity mismatch analysis is used intensively in liquidity management to visualise cash flows. It shows the capacity of an IIFS bank to deal with maturity mismatches. It plots cash flows across time. The template for maturity mismatch analysis can be used for analysing actual maturity mismatch under normal roll-over conditions and under defined

⁴⁸ IFSB, GN-6: *Guidance Note on Quantitative Measures for Liquidity Risk Management in IIFS*, April 2015.

⁴⁹ See Appendix 1: "Illustrative Summary of the LCR for IIFS" and Appendix 2: "Illustrative Summary of the NSFR for IIFS" of the GN-6.

stress conditions in which different roll-over rates can be used based on the severity of the stress scenarios. The maturity structure under both normal and stress conditions reveals maturity and volume mismatches between financing and deposits/PSIA.

152. The template for liquidity risk provides run-off rates as examples for benchmark scenarios. These scenarios and behavioural assumptions used in the template of liquidity tests are based on Martin Cihak's stress test template⁵⁰ and Schmieder et al.'s next generation stress tester. RSAs and IIFS should use their own scenarios and behavioural assumptions based on historical or experimental studies of the behavioural characteristics of assets and liabilities of IIFS, or rely on expert judgment if there is no such study, to reflect the IIFS- and country-specific circumstances. For example, in Schmieder et al.'s next generation stress tester, assumptions or run-off factors were benchmarked to the Lehman Brothers case. Although the Lehman Brothers calibration may not be appropriate for small jurisdictions and Islamic banks, there is no study as yet to benchmark in the template for small jurisdictions or IIFS. It is a simple matter for the stress tester to modify the assumptions based on institution- or country-specific circumstances.

153. The template can also be used for monitoring purposes, along with an individual liquidity stress test for IIFS and an industry-wide liquidity stress test for RSAs, within a relatively short period of time.

4.3. Liquidity Stress Scenarios

154. It is valuable to gain a better understanding of the key drivers of liquidity risk in order to identify issues through sound liquidity stress-testing design. Past experiences faced by different jurisdictions have generated a number of insights that can be used to better evaluate the liquidity stress test, whether conducted by IIFS or by RSAs.

155. Designing a liquidity stress-testing framework appears to be crucial, for the following reasons:

- a. IIFS have limited access to *Shari'ah*-compliant funding in the current market (i.e. limited access to *Shari'ah*-compliant facilities from central banks, interbank facilities, cross-border liquidity facilities, etc.), and there is a lack of an organised money market infrastructure.

⁵⁰ M. Čihák, "Introduction to Applied Stress Testing", IMF Working Paper No. 59 (2007).

- b. Specific types of stress tests are needed in light of the typical IIFS's balance sheet structure.
- c. An IIFS has a dual role, with respect to liquidity, in meeting the withdrawal rights of its current account holders and the liquidity expectations of its unrestricted IAHs. (See Principle 4 of IFSB-12: *Guiding Principles on Liquidity Risk Management for IIFS* for further details.)

156. IIFS and RSAs should consider idiosyncratic and market-wide stress scenarios, including short- and long-term considerations in their liquidity stress testing. It is valuable to be more conservative while transforming the scenarios into assumptions. Based on the type and severity of the scenario, an IIFS and RSAs need to consider the appropriateness of a number of assumptions or factors, potentially including:

- a. predominant element in the IIFS's funding (e.g. PSIA, or CMT-based deposits⁵¹ or current accounts) and its volatility;
- b. the degree of symmetry between the assets and liabilities in terms of maturities, currencies and other relevant aspects;
- c. the correlation between assets while stressing multiple scenarios;
- d. interaction of liquidity risk, asset and liability management, and funding strategy;
- e. relationship between liquidity and credit and asset prices, taking account of amplification feedback loops;
- f. possible *Sharī'ah*-compliant funding arrangements with the central bank (i.e. assuming that central funding will be available in the event of a market crunch) and other *Sharī'ah*-compliant facilities available for meeting liquidity shortages;
- g. the run-off or withdrawal risk of IAHs and refinancing risk of CMT-based deposits;
- h. a simultaneous drying up of market liquidity in several markets, and linkages between reductions in market liquidity and constraints on funding liquidity;
- i. the impact of credit-rating triggers;

⁵¹ "Commodity *Murābahah* transactions" means a *Murābahah*-based purchase and sale transaction of *Sharī'ah*-compliant commodities, whether on cash or deferred payment terms. Some IIFS offer deposits based on CMT in which the IIFS purchases a commodity from a customer (depositor) through a reverse *Murābahah* transaction on a deferred payment basis and then sells it for cash. See IFSB, GN-2: *Guidance Note in Connection with the Risk Management and Capital Adequacy Standards: Commodity Murābahah Transactions*, December 2010.

- j. severe constraints in accessing secured and unsecured *Sharī'ah*-compliant funding;
- k. restrictions on currency convertibility;
- l. contingent claims and, more specifically, potential draws on committed lines extended to third parties or the bank's subsidiaries, branches or head office;
- m. the ability to transfer liquidity across entities, sectors and borders, taking into account legal, regulatory, operational, and time zone restrictions and constraints; and
- n. liquidity reserves, regulatory required ratios and specific liquidity ratios.

157. The liquidity stress scenario is merely a conjecture on the potential future developments of the economy. In designing a test, it is important to determine whether such conjectures should be based on historical events, assuming that past shocks may happen again, or on hypothetical shocks – that is, on extreme but plausible changes in the external environment regardless of the historical experience. While historical scenarios are easier to implement and somewhat more tangible, hypothetical scenarios may be the only available option because it is demonstrated that each liquidity shock has its own dynamics and makes the past history no longer informative.

158. The Excel template simulates both IIFS-run-type scenarios for five and 30 days with the benchmark rates given in Schmieder et al.'s next generation stress tester (2012) while accounting for fire sales of liquid assets, maturity mismatch analysis, and Basel III liquidity ratios (LCR and NSFR).

Type	Rationale	Liability side	Asset side
Implied cash flows analysis (ICFA) – for five and 30 days	Modification of liquidity test based on Cihak (2007) and Schmieder et al.'s (2012) next generation stress tester, taking into account the peculiarities of IIFS (higher granularity, particularly on the assets side, use of haircuts).	Substantial (sudden) outflow of funding, including RPSIA. ⁵²	Fire sale of unencumbered liquid assets.
Liquidity coverage ratio	The liquidity coverage test (LCR) is similar to ICFA. It was calibrated to IIFS through GN-6 by IFSB.	Calculation of net cash outflow.	Haircuts for different types of assets based on their characteristics (levels 1, 2A and 2B).

⁵² Refer to paragraph 53 of GN-6 for the treatment of RPSIA for liquidity purposes.

Maturity mismatch analysis	Comparison of the maturity structure of assets and liabilities of IIFS to identify liquidity gaps under different scenarios.	Simulation of funding subject to rollover. For example, 20% of funding maturing during the next 12 months cannot be rolled over.	Simulation of compensation of loss of funding by liquid assets under specific assumptions.
Net stable funding ratio	The net stable funding ratio is part of the liquidity test to be introduced as part of Basel III and assesses the stability of an IIFS's funding sources in more structural terms. The test was adopted according to the GN-6.	Calculation of stable funding.	Calculation of required stable funding resulting from business activities.

159. The objective of the LCR is to promote the short-term resilience of the liquidity risk profile of banks, including IIFS. It does this by ensuring that banks have an adequate stock of unencumbered high-quality liquid assets (HQLA) to meet their liquidity needs for a 30-calendar day liquidity stress scenario. The LCR is calibrated for IIFS in GN-6: *Guidance Note on Quantitative Measures for Liquidity Risk Management in IIFS* (April 2015). (For details of stress scenarios of LCR for IIFS, see paragraph 23 of GN-6.) The LCR helps to absorb the shocks arising from financial and economic stress, thus reducing the risk of spillover from the financial sector to the real economy.

160. Maturity mismatch analysis indicates the gaps between the contractual liquidity inflows and outflows for selected time bands. These gaps signify potential liquidity needs of an IIFS that need to be raised in respective time bands if all outflows occurred at the earliest possible date.

161. NSFR is seen as a complement to the LCR and is designed to provide incentives for banks and IIFS to seek more stable forms of funding. Again, it is based on a stress scenario that covers an extended firm-specific stress scenario. (For details of stress scenarios for IIFS, see paragraph 90 of GN-6.)

162. The scenarios may involve adverse conditions in line with historical maximum funding withdrawal rates. The stress scenarios should be designed based on the jurisdiction's special characteristics and some cases in the international area. For example, if a jurisdiction's IIFS liability structure is characterised by a comparably high share of wholesale funding, which makes

the IIFS vulnerable to a sudden and substantial funding withdrawal, the stress scenarios could be amplified further in the structural shortage of wholesale funding.

Box 1: Treatment of PSIA under GN-6

PSIA, commonly referred to as “investment accounts”, are offered by IIFS for raising funds. PSIA, whether retail or wholesale, are categorised under either unrestricted PSIA (UPSIA) or restricted PSIA (RPSIA), as in most cases their underlying contract is either the *Mudārabah* or *Wakālah*⁵³ principle or CMT-based deposit accounts with various maturities. The applicable run-off factor for PSIA depends on the withdrawal rights of the IAH and whether they are retail or wholesale accounts under GN-6. The reporting of PSIA, whether on- or off-balance sheet, is not relevant.

For RPSIA, IAH may have no withdrawal rights prior to maturity, or IAH may have withdrawal rights subject to giving at least 30 days’ notice. The IIFS managing the RPSIA is not exposed to run-off for LCR purposes, unless the contract maturity date falls within the next 30 days. Only in the case of RPSIA from which the IAH may withdraw funds at less than 30 days’ notice without any “significant reduction of profit” is the IIFS exposed to run-off for LCR purposes. Where an IIFS offers such RPSIA, it would be expected to retain a proportion of HQLA in the relevant RPSIA fund in order to meet withdrawals, in which case the HQLA would be netted off the amount of the run-off in calculating the total net cash outflows. The run-off factor applied to the RPSIA is based on the minimum ratios in GN-6, or on historical or experimental studies of the behavioural characteristics of RPSIA. Where the funds of RPSIA are invested in assets with a liquid secondary market, such that under normal conditions the assets may be monetised rapidly in time to meet a demand for withdrawal, there is a risk that under stressed conditions it may not be possible to monetise the assets so readily. Hence, there is a potential exposure to a (net) run-off for LCR purposes. The amount of the run-off for LCR purposes should therefore be reduced only in respect of cash and HQLA held in the RPSIA fund.

For UPSIA, in some cases withdrawals will be permitted either on demand or at less than 30 days’ notice, and the supervisory authority will need to apply the appropriate run-off factor as mentioned in the GN-6 or based on historical or experimental studies of the behavioural

⁵³ In fact, the *Wakālah* model, strictly speaking, is not a true PSIA since it is built on the earning of specific fees by the *Wakil* (agent) regardless of profit or loss from the underlying activity, and the entire profit will be attributed to the *Mwakil* (capital provider). However, some jurisdictions consider it as PSIA due to the fact that the *Wakil* might receive part of the profit as a performance-related incentive if the realised profit exceeds a certain level. In such cases, the *Wakil* will take part of the profit with the investors in general terms, but not in essence from a *Shari’ah* view.

characteristics of UPSIA. (Run-off factors for different categories of PSIA are shown in the “Liquidity Stress Test” Excel template.)

In some jurisdictions, PSIA may be offered on a *Wakālah* basis. Run-off rates for *Wakālah*-based PSIA are again based on the contractual withdrawal rights of the IAH, as indicated above.

163. When designing a scenario for IIFS, the following dimensions should be taken into account: (a) on the asset side, the availability of liquid assets (i.e. market liquidity), taking into account an adverse market risk scenario (i.e. changes in interest rates and foreign exchange rates); and (b) on the liability side, (i) the run-off rates of different types of funding, including PSIA (i.e. wholesale funding is assumed to be more volatile than retail funding); (ii) concentration of funding, which is simulated to have a negative impact on run-off rates; and (iii) the historical volatility or behaviour profile of deposits/PSIA at each IIFS.

164. There are some sources of stress that are common in most scenarios:

- a. reduction in asset prices;
- b. increased collateral and margin calls;
- c. reduced access to funding markets;
- d. increased deposits/PSIA withdrawals;
- e. non-rollover of term deposits/PSIA; and
- f. utilisation of credit lines previously approved.

165. Generally, there is a lack of assumptions based on models because of the fact that modelling liquidity risks is more complex. Liquidity stress tests therefore mainly use the assumptions on the current Basel III or GN-6 liquidity regulatory requirements (LCR and NSFR). New liquidity stress tests by some jurisdictions, however, rely on other economic measures in setting hurdle rates.

166. RSAs have a critical role to play in conducting system-wide liquidity stress tests, as banks generally lack the data needed to calibrate a liquidity stress test and often employ diverse assumptions and scenarios that can make it difficult for supervisors to assess the relative liquidity risk of different institutions.

167. Special attention should be given by RSAs and IIFS to the connection between liquidity risk and reputational risk. The IIFS's reputation is important, especially in times of financial stress. Any event that undermines confidence in an IIFS can easily generate liquidity and intraday risk. An IIFS's reputation for operating in a safe and sound manner is essential in attracting funds at a reasonable cost, as well as for retaining funds during a crisis. Liquidity stress tests should take into account the reputation risk potentially associated with the possibility of extraordinary withdrawals from IIFS.

168. Reputational considerations, which featured prominently in the crisis, need to be built into the scenario assumptions. In particular, stress testers need to take into account contingent liabilities such as committed credit/liquidity lines to customers. This risk is particularly high under market-wide funding dislocations.

4.4. Liquidity Stress Test Models

169. Testing for liquidity risks is less common than testing for risks to solvency because of the fact that modelling liquidity risks is more complex. First, to properly model liquidity fluctuations in IIFS, one needs to have very detailed, high-frequency data that are typically used by IIFS themselves in their liquidity management models. Second, to model the impact of large liquidity shocks, one needs to consider the broader liquidity management framework.

170. Given the lack of empirical evidence, as noted previously, the calculation of satellite models (i.e. econometric models) that link the outflow of deposits/PSIA to macroeconomic conditions is not yet feasible. Such models can be used to determine the haircuts for assets under stress (i.e. market liquidity risk). In addition, satellite models can be used to link banks' solvency under stress (e.g. capital ratios or banks' default probabilities) to funding costs.

171. Most IIFS forecast their cash flows by means of assumptions about the impact on inflows and outflows. These assumptions are mostly based on historical evidence and expert judgments. With the new Basel III liquidity requirement that was calibrated by GN-6 for IIFS, the IIFS and RSAs may start to set assumptions based on the run-off factors and haircuts as stipulated in GN-6. While the majority of the RSAs judge the liquidity conditions of an IIFS based on current or prospective (Basel III) regulatory requirements, some also rely on other economic measures.

172. The calibration of liquidity stress tests is an important issue for IIFS and RSAs. The country's own experience is the most frequently used source in establishing liquidity stress parameters. In establishing liability run-off rate assumptions, alternative approaches include using

IIFS' own estimates, reviews by supervisors, expert judgment or regulatory guidance. The liquidity stress scenarios also include haircuts on liquid assets. To establish the extent of the assumed haircuts, in addition to the country's own history, stress-testing teams rely on international experience, expert judgment, IIFS' own estimate, arbitrary shocks, or the haircuts applied by the central bank for its refinancing operations.

173. In the liquidity stress test, a model should consider: (a) the situation where there are different withdrawal rates for different types of deposits/PSIAs; (b) what variables can be used to approximate depositors'/IAHs' perceptions of an IIFS's safety; (c) the situation where an increase in market volatilities impacts the quality of collateral; and (d) what other liquidity outflows may affect the liquidity position of IIFS, including unscheduled draws on committed but unused credit and liquidity facilities that the IIFS has provided to its clients.

174. The liquidity stress test template contains basic examples of liquidity tests based on implied cash flow, maturity mismatch and regulatory liquidity requirements (LCR and NSFR). After inputting the basic data and assumptions based on the stress scenarios of IIFS or RSAs, the results of the tests for the default values can be followed in the spreadsheet. The template models a liquidity drain that affects all IIFS in the system, depending on the different run-off factors of different types of deposits/PSIAs. The template allows the IIFS and RSAs to change assumptions about the percentage of different kinds of deposits/PSIAs that get withdrawn each day, and about the percentage of liquid and other assets that IIFS can convert to cash each day.

175. The resulting spreadsheet summarises the ICFA, showing for each bank the number of days it would be able to survive a liquidity drain without resorting to liquidity from outside (i.e from other IIFS or the central bank). It may also be possible to add to the template a feature for central bank funding and contingent liabilities.

176. The key variables that a liquidity model has to incorporate are:

- a. cash flows;
- b. funding capacity;
- c. funding spread (distribution of profit between IIFS and IAH); and
- d. haircut.

177. RSAs and IIFS can model the cash flow, including behavioural components of the counterparties. They can also distinguish among deposits/PSIAs based on their behavioural characteristics. With respect to contingent cash flows, the IIFS should analyse their triggers.

Common triggers entail changes in economic variables, credit rating downgrades, country risk and specific market disruptions.

178. In short, a cash flow model should:

- a. model cash flows from all products;
- b. incorporate future business;
- c. distinguish sub-products within a product category; and
- d. incorporate a behavioural element.

179. There is no publicly available model of liquidity risk that has been commonly agreed between RSAs and banks, including IIFS. Therefore, it seems viable to estimate and forecast the liquidity risk drivers. However, data on liquidity crises are scarce, and in stress situations correlations may differ from past experience. Data gaps in general are an issue for liquidity stress testing.

180. RSAs and IIFS should calibrate models provided for liquidity stress testing based on the country-specific and/or institution-specific circumstances, taking account of the funding structure, level of competition, development of the market and any other relevant factors.

4.5. Review and Analysis of the Results

181. Adequately designed and properly implemented liquidity stress tests can generate valuable information on an IIFS's liquidity profile that cannot be generated from a limited set of standardised liquidity metrics. Liquidity stress tests should help inform IIFS' tolerance towards liquidity risk. The implementation of risk tolerance in liquidity risk management differs among IIFS, however, and RSAs still observe shortcomings with the integration of liquidity risk stress tests into IIFS' total risk management.

182. An example of the added value of stress testing beyond reliance on a single metric can be found in the LCR's 30-day horizon, which does not preclude intra-30-day timing mismatches. In a stress test, shorter and longer horizons can be explored to assess to what extent an IIFS's outcomes are sensitive. In addition to the results, in their evaluations IIFS and RSAs should look at the other aspects relevant to an IIFS's liquidity that can have a material impact, including the level of consolidation, the currency composition of exposures, and the composition of the liquidity buffer.

183. Liquidity stress testing results should be evaluated in line with an IIFS's overall strategy and annual planning cycles; results should be refreshed in the event of major strategic decisions, or other decisions that can materially impact capital or liquidity.

184. The results should be used as an input for adjusting and improving liquidity risk management. IIFS and/or RSAs should consider using the results of stress testing in the following areas:

- a. to identify and quantify sources of potential liquidity strain;
- b. to analyse possible impacts on the IIFS's cash flow position, profitability and solvency;
- c. to ensure that current exposures are consistent with the IIFS's established liquidity risk tolerance;
- d. to take remedial or mitigating actions, and to set various types of internal limits, including concentration limits on the IIFS's liquidity exposures;
- e. to decide the level of liquidity cushion/buffer needed;
- f. to ensure that intraday secured and unsecured *Sharī'ah*-compliant funding will be available in order to make payment and settlement system requirements;
- g. to find the level of unencumbered, high-quality liquid assets that can be sold or pledged to obtain *Sharī'ah*-compliant funds in a range of stress scenarios; and
- h. to shape the IIFS's contingency planning and help in determining the strategy and tactics to deal with events of liquidity stress.

185. The results of liquidity tests based on the top-down approach provide information for RSAs in these areas:

- a. They show the counterbalancing ability of IIFS (and their specific limits in case of reverse stress tests) to remain liquid.
- b. They allow a peer comparison – that is, the relative performance of banks under liquidity stress.
- c. They can provide a link between the joint resistance to liquidity and solvency risks if the feedback between solvency and liquidity risks is modelled.

186. From a system-wide perspective, considering the present market conditions and the liquidity infrastructure, results of stress tests may not give the actual conditions. RSAs have an

important role in solving the infrastructural problems of the Islamic financial services industry, which will require improvements in the provision of *Sharī'ah*-compliant deposit insurance and *Sharī'ah*-compliant lender-of-last-resort schemes, as well as a sufficient and regular supply of high-quality liquid assets.

187. An example of the results of the liquidity stress test template is given in Figure 1. RSAs and IIFS should review and analyse the results based on the aforementioned points. The summary of the results gives a concrete picture of the liquidity position of IIFS and/or a system based on the defined scenarios and assumptions. The output of the liquidity tests in the Excel template provides failure and pass rates (in terms of the number of IIFS and total assets, respectively), and the estimated funding shortfalls for each IIFS as well as at the system level (or group of IIFS tested). For the LCR and the NSFR, the tests show those banks that are likely to be below the regulatory threshold.

Figure 1: Summary of Liquidity Analysis

System-level Result							
Total Number of Banks tested	5						
Test 1-a Implied Cash Flow Test (5 Days)							
	Cumulative Withdrawal of Deposits/PSIA (Percent of Total, Assumptions for test)	Cumulative Loss of Short Term Funding (Percent of Total, Assumption for test)	Cumulative Total Loss of RPSIA (Percent of Total, Assumption for test)	Cumulative Total Loss of Funding (Percent of Total, Assumption for test)	Minimum number of periods of survival	Number of Banks illiquid	Survival - Percent of IIFS
Day 1	0.0%	0.0%	0.0%	0.0%	0	0	100.0%
Day 2	5.3%	0.0%	0.0%	3.4%	1	0	100.0%
Day 3	10.2%	0.0%	0.0%	5.1%	2	0	100.0%
Day 4	14.8%	0.0%	0.0%	8.0%	3	0	100.0%
Day 5	19.2%	0.0%	0.0%	10.7%	4	0	100.0%
	23.2%	0.0%	0.0%	12.1%	5	0	100.0%
Number of IIFS passing test through period 5	5						
Liquidity Shortfall	0						
Liquidity Shortfall as percent of total assets	0.0%						
Test 1-b: Implied Cash Flow Test (30 Days)							
Cumulative Withdrawal of Deposits (Percent of Total)	Cumulative Loss of Short Term Funding (Percent of Total)	Cumulative Total Loss of Funding (Percent of Total)	Survival	Number of Banks	Percent of Banks	Percent of Assets	
7.8%	0.0%	4.9%	No	0	0.0%		
			Yes	5	100.0%		
Number of IIFS failing the test	0						
Liquidity Shortfall	0						
Percent of total Assets	0.0%						

Test 2: Liquidity Coverage Ratio

Total High Quality Assets (% of Assets)	43.0%		Liquidity Coverage Ratio	Number of Banks	Percent of Banks	Percent of Assets
Other Cash Inflow (% of Assets)	1.2%	"Not Passed"	<0.25	0	0.0%	0.0%
Total Cash Inflow (% of Assets)	44.2%	"Not Passed"	0.25-0.5	0	0.0%	0.0%
Total Cash Outflow (% of Assets)	7.5%	"Not Passed"	0.5-0.75	0	0.0%	0.0%
		"Not Passed"	0.75-1	0	0.0%	0.0%
Average LCR (weighted-average)	6.90	"Passed"	>1	5	100.0%	100.0%
Median LCR	7.64					
Number of Banks failing the test	0					
Liquidity Shortfall	0					
Percent of total Assets	0.0%					

Test 3: Maturity mismatch analysis

Bucket	Cumulative no. of IIFS with shortfall	Shortfall (Percent of total Assets)
0	0	0.0%
Less than 3 months	4	16.4%
3 to 12 months	12	50.2%
1 to 5 years	24	100.0%
More than 5 years	24	100.0%
Not assigned	24	100.0%

Test 4: Net Stable Funding Ratio (NSFR)

Available Stable Funding (% of Assets)	18.2%		Net Stable Funding Ratio	Number of Banks	Percent of Banks	Percent of Assets
Required Stable Funding (% of Assets)	4.4%	"Not Passed"	<0.25	0	0.0%	0.0%
		"Not Passed"	0.25-0.5	0	0.0%	0.0%
Average NSFR	4.09	"Not Passed"	0.5-0.75	0.00	0.0%	0.0%
Median NSFR	3.87	"Not Passed"	0.75-1	0.00	0.0%	0.0%
Number of Banks failing the test	0	"Passed"	>1	5.00	100.0%	100.0%
Liquidity Shortfall	0					
Percent of total Funding Liabilities	0.0%					

Section 5: Recent Developments in Stress Tests

5.1. Integrated Liquidity and Solvency Tests

188. Liquidity risks typically cannot be isolated from other risks, such as solvency and contagion risks. Solvency issues are relevant for liquidity stress testing because quickly liquidating assets will come at a cost, which can hurt solvency buffers. Especially during stress periods, market participants with sound solvency profiles can experience liquidity strains. Recent experience has also shown that reputational contagion in particular can spread quickly. Integrated analysis should take into account the interconnectedness of liquidity, solvency and contagion risks.

189. The Global Financial Crisis also clearly showed the need to assess risks from a systemic perspective, taking into account the possible interlinkages between different risk factors and contagion risks within the financial system, as well as risk transmission between conventional banks and IIFS.

190. Solvency stress tests generally do not include those risk transmissions and systemic effects, such as the collapse of the interbank money market and other wholesale markets and the importance of feedback effects between market liquidity and funding liquidity risks of IIFS. General application is to conduct solvency and liquidity stress tests independently. As the 2008–9 global market turmoil highlighted the crucial importance of the linkages between different kinds of risks, especially credit, market and funding liquidity risk, the stress tests framework that integrates solvency and liquidity stress tests through different satellite models provides a more structural approach to simulate feedback effects within the financial system.

191. As integrated models for solvency and liquidity stress tests are complex and need deep expertise to implement, these models potentially provide a more complete picture of the possible impacts of tail events. These models should take into account multiple transmission channels (risk transmission between conventional banks and IIFS) and feedback effects.

192. The current models that attempt to simulate how a macrofinancial shock reinforced by idiosyncratic liquidity stress at the institutional level affects solvency are very limited. Some examples of the models also used by RSAs are:

- a. Aikman et al. (2009)⁵⁴ can be regarded as the most comprehensive approach to endogenising liquidity risk stress tests in a modelling framework.
- b. Barnhill and Schumacher (2011)⁵⁵ developed an empirical model linking solvency and liquidity risks, similar to work done by van den End (2010)⁵⁶ and Wong and Hui (2009)⁵⁷.
- c. Chan-Lau (2010)⁵⁸ and Barnhill and Schumacher (2011), used network models to capture the link between solvency and liquidity.

193. Liquidity and solvency risks are sometimes interlinked but frequently are treated separately, especially in supervisory stress tests. A more integrated exercise might recognise that IIFS could also incur capital losses from the liquidation of assets necessitated by funding run-off in times of stress. Integrated liquidity and solvency tests help to simulate the impact of changes in solvency, rating downgrades and concentration risk on funding costs.

194. RSAs and IIFS should be able to integrate, effectively and meaningfully, all the risks and business areas in the stress-testing programme to deliver a complete picture of industry-wide and IIFS-wide risks. This development currently is a work in progress.

5.2. Network Contagion and Second-Round Effect Analysis

195. While most stress-testing models focus on solvency risk, the 2008–9 financial crisis demonstrated that, in times of stress, liquidity risk and network spillover effects associated with interconnections among banks (both conventional and IIFS) can also be significant. The recent crisis also clearly showed the need to assess risks from a systemic perspective, taking into account the possible interlinkages between different risk factors and contagion risks within the financial system as well as risk transmission between the conventional financial system and the Islamic financial system.

⁵⁴ Aikman, D., Alessandri, P., Eklund, B., Gai, P., Kapadia, S., Martin, E., Mora, N., Sterne, G. and Willison, M. (2009), "Funding liquidity risk in a quantitative model of systemic stability", *Working Paper No. 372, Bank of England*

⁵⁵ Barnhill, T. and Schumacher, L. (2011), "Modeling Correlated Systemic Liquidity and Solvency Risks in a Financial Environment with Incomplete Information", *WP/11/263, IMF Working Paper Series*.

⁵⁶ Van den End, J. (2010), "Liquidity Stress-Tester: Do Basel III and Unconventional Monetary Policy Work?", *DNB Working Paper No. 269*

⁵⁷ Wong, E., and Hui, C. (2009), "A Liquidity Risk Stress-testing Framework with Interaction between Market and Credit Risks", *HKMA Working Paper No. 06/2009*.

⁵⁸ Chan-Lau, J. (2010), "Balance Sheet Network Analysis of Too-Connected-to-Fail Risk in Global and Domestic Banking Systems", *WP/10/107, IMF Working Paper Series*.

196. Liquidity stress tests can be a more useful macroprudential instrument when they include network and feedback effects in the scenarios across institutions and system-wide. Network and feedback effects are rarely modelled in liquidity stress tests. Although liquidity stress tests that include network contagion and feedback effects are not early warning devices, they can unveil sources of systemic risk and vulnerability through regular system-wide monitoring. These tests can complement other tools and processes and foster communication about financial stability risks.

197. RSAs and IIFS tend to develop stress tests that do not account for second-round or contagion effects; that is, such tests assume that the IIFS's actions have no impact on the market and that there are no other IIFS seeking to undertake similar actions.

198. One of the challenges of financial stability analysis and stress testing is establishing scenarios with meaningful macrofinancial linkages – that is, taking into account network contagion and account spillover effects.

199. The impact of both idiosyncratic and market-wide scenarios takes place in three logically interlinked phases:

- a. the formation of a balance-sheet liquidity shortfall as the first-round effect of shocks;
- b. the reaction by IIFS and/or banks; and
- c. the feedback effects of shocks, including reputational and systemic risks.

With each step, re-counting the liquidity buffer is needed and the buffer should be examined to test that IIFS hold a sufficiently large amount of liquid assets to be able to survive the liquidity tension in their balance sheets.

200. Modelling contagion effects and their impact typically constitutes a challenge. By definition, spillover effects and dynamic contagion effects are implicitly captured in past data, but not necessarily if one uses structural econometric models – usually perceived as being “best practice”. Even if potential spillover events are captured in past data, such data might not be representative for a future scenario if, for example, linkages between economies and IIFS have become gradually more intense over time.

201. There are two main steps that need to be carried out when analysing contagion. The first step is to determine the bilateral exposures between involved IIFS. The second step is to develop

a simulation of how a stress event at one IIFS is propagated through the system along the paths of bilateral exposures.

202. RSAs and IIFS should apply both bottom-up and top-down approaches in conducting stress tests to capture second-round and systemic effects. Furthermore, if applicable, RSAs and IIFS could consider evaluating:

- a. an IIFS's liquidity position on a currency-by-currency basis for those currencies in which it is most active; and
- b. IIFS' group structure (i.e. legal entities subject to different regulatory regimes vs. consolidated).

203. The use of network analysis to perform stress tests is rare, although work is under way at several institutions. Some recent examples are provided in Box 2. These approaches endeavour to integrate balance sheet-based models of liquidity stress tests with a network model in a way that allows for the feedback effect of asset sales. The main scenario for network models is that contagion can occur after bank/IIFS failure due to confidence contagion, default in the network of interbank exposures (counterparty risk), or fire sales that are assumed to depress asset prices at the point of default. The scenarios can also include behavioural reactions, such as liquidity hoarding or pre-default fire sales.

204. While preparing methodologies and models for jointly modelling liquidity and credit stress, including second-round or “feedback” effects, RSAs and IIFS need to be more cautious in assessing the interactions between major risk factors (especially the interaction between credit risk and liquidity risk) and allowing for an assessment of profit-and-loss effects and second-round effects of specific stress events.

Box 2: Some Examples for Modelling Network Contagion Risk in a Stress-Testing Framework

One of the earliest integrated stress-testing models is the Systemic Risk Monitor of the Central Bank of Austria, which integrates satellite models of credit and market risk with a network model to evaluate the probability of bank default. In the model, shocks to credit and market risk exposures may trigger bank defaults, leading to interbank contagion effects in a network model that is built on a matrix of bilateral interbank exposures.

The Bank of England's RAMSI stress-testing framework uses models to estimate resilience in a stress scenario. The models simulate macroeconomic scenarios through satellite models for credit and market risk and net interest income, an interbank network model and an asset price function to simulate fire sales of assets (market liquidity risk). RAMSI has been extended to include feedback effects resulting from liquidity risks. This is the interaction mechanism between market liquidity shock and funding liquidity shock within RAMSI.

The Bank of Canada's Macro-Financial Risk Assessment Framework (MFRAF) identifies systemic risks by estimating interbank spillover effects at major Canadian banks under a stress scenario. The framework links solvency, market and funding liquidity risks. Funding liquidity risk is generated by banks' solvency risk and the potential for asset fire sales. Uncertainty about a bank's asset quality gives rise to solvency risk concerns, and lenders may stop rolling over their short-term deposits.

The difference between the results obtained in the bottom-up stress test and those obtained with a model-based stress-testing framework that integrates solvency risk, funding liquidity risk and market risk stems from the marginal impact of liquidity risk and network spillover effects. A striking finding of this model is that when liquidity and network spillover effects are considered together with credit losses for a given shock, the aggregate capital position of banks declines by an additional 20%. Liquidity risk and network effects lead to an additional 40-basis-point decline in the aggregate CET1 ratio beyond the effect of solvency risk. Liquidity risk explains 65% of this additional decline, and network effects account for the remaining 35%. The above findings underscore the importance of considering these risks jointly. These results illustrate the importance of liquidity risk and network spillover effects in times of stress: they add almost 20% to the estimated impact of this stress scenario on banks. It is therefore important for authorities to account for these effects when assessing the potential impact of stress scenarios on the banking system.⁵⁹

⁵⁹ K. Anand, C. Gauthier and M. Souissi, "Quantifying Contagion Risk in Funding Markets: A Model-Based Stress-Testing Approach", Bank of Canada Working Paper 2015-32 (August 2015).

5.3. Cross-Border Macro Stress Testing

205. Most banking systems include some foreign-owned IIFS, so it is valuable for IIFS and RSAs to analyse the cross-border exposure and cross-border contagion because of the various barriers to the cross-border flows of liquidity that impede IIFS' liquidity management.

206. The IIFS should perform liquidity stress tests both at the group and entity level. However, IIFS do not always include potential barriers to the cross-border flow of liquidity in their stress tests, even though these can be particularly prevalent in crisis situations. In the face of potential barriers to the cross-border flow of liquidity and collateral, it is important for IIFS and RSAs to conduct stress tests at both the group and entity level, and to account for these potential cross-border barriers in liquidity stress tests.

207. In terms of cross-border linkages across banking sectors, two main channels for credit risk can be distinguished:

- a. common exposures to the same (or systemic) sources of risk; and
- b. balance sheet linkages between institutions.

208. Common credit risk exposures can be a source of contagion across national banking sectors if widespread or systemic shocks affect IIFS in a number of different countries simultaneously, or if individual IIFS have exposures in multiple countries. Balance sheet linkages can be a source of contagion across national banking sectors, both for systemic and idiosyncratic shocks. With such linkages, shocks can be, and often are, propagated between financial institutions located in different countries through the *Shari'ah*-compliant interbank money and repo markets (where these exist).

209. Modelling the cross-border issues in stress testing faces impediments for RSAs and IIFS because of the lack of data on cross-border transactions or intragroup exposures, which makes it impossible to quantify the impact of cross-border contagion. A common way of modelling cross-border stress is to use some relatively homogenous variable that characterises the evolution of the credit quality of the financing either at a single bank or single country level. The cyclical dynamics of these variables can then be explained using a set of macrofinancial risk factors, which can also be subjected to various stress scenarios.

210. Although interconnectedness creates a strong case for conducting macro stress tests that take account of cross-border dimensions, cross-border exposures and cross-border contagion, different restrictions exist on intragroup cross-border transfers imposed by the host or home-country regulators (henceforth referred to as "ring-fencing").

211. Although this interconnectedness creates a strong case for conducting macro stress tests which take account of cross-border dimensions, progress in this area has been relatively slow for at least two main reasons:

- a. *Practical*: there is a lack of harmonised data across countries with sufficient time spans to allow for quantitative assessment of the relevant sources of risk and exposures.
- b. *Institutional*: the national RSAs are not keen to share information across institutions and on a cross-border basis, and this may also be limited by national practices and legal restrictions.

5.4. Summary

212. Stress testing is an important supervisory tool available to authorities to assess risks to the financial system. However, it is important to highlight that, despite recent significant progress in the development of stress-testing models, stress testing remains challenging because it attempts to capture the effects of tail events.

213. In most stress tests, solvency risk explains a large share of the deterioration in the capital ratios of banks during periods of severe stress. As demonstrated by the recent financial crisis, however, liquidity risk and network spillover effects can generate substantial additional losses for banks. These are even further extended into a multi-jurisdictional and cross-border context. Hence, it is important to take them into account when assessing risks.

APPENDICES

A.1. Supervisory Data Collection Template

214. The proposed data collection template is a guiding example and can be modified as necessary to suit each RSA's specific data needs.

215. Stress designs include diverse macroeconomic variables that define economic developments within the RSA's jurisdiction, as well as external economic and financial factors that have potential to influence economic developments in the local jurisdiction.

216. The domestic macroeconomic variables that may be part of stress designs include:

- a. measures of economic activity and prices (e.g. changes in real/nominal GDP, unemployment rate, real/nominal disposable incomes, consumer price index, and so on);
- b. measures of asset prices or financial conditions (e.g. changes in house price index, equity prices, stock market volatility, and so on); and
- c. measures of cost of funds (e.g. changes in base financing rates, three-month Treasury *Sukūk* yields, five-year *Sukūk* instruments, rates of return on ten-year corporate *Sukūk* instruments of different ratings, and so on).

217. The relevant external economic and financial factors that have the potential to stress the financial sector may include measures of changes in macroeconomic factors (e.g. real GDP, unemployment, asset prices, cost of funds/interest rates) of a foreign country or regional bloc (e.g. EU, ASEAN, GCC, and so on) that exert significant influence on the domestic economy through economic and financial linkages. The foreign currency exchange rate is a particularly important risk transmission channel.

Proposed Data Requirements for Islamic Banking System's Stress Tests⁶⁰

Table 10: Macroeconomic Variables	
Measures of Economic Activity and Prices	<ul style="list-style-type: none"> • Real GDP • Nominal GDP • Unemployment rate • Real income • Disposable income • Consumer price index • Any other variables significant for Islamic banks
Measures of Asset Prices and Financial Conditions	<ul style="list-style-type: none"> • House price index • Benchmark equity indices • Stock market volatility • Indices of key industries with significant concentration in IIFS financings (e.g. real estate, oil sector, infrastructure, and so on)
Measures of Cost of Funds	<ul style="list-style-type: none"> • Base financing rates • Islamic Treasury yields • Islamic interbank benchmark rates • Sovereign <i>Sukūk</i> rates of return • Corporate <i>Sukūk</i> rates of return • Any other costs of funds significant for Islamic banks
External Economic and Financial Conditions*	<ul style="list-style-type: none"> • Changes in external region/bloc/country economic activity and prices • Changes in external region/bloc/country asset prices and financial conditions • Changes in external region/bloc/country cost of funds • Currency exchange rates • Any other variables significant for Islamic banks

***Note:** An external country or regional bloc (e.g. EU, ASEAN, GCC, and so on) that exerts significant influence in the local domestic economy through economic and financial linkages.

⁶⁰ This list is not exhaustive and can be modified as necessary to suit each RSA's specific data needs.

Table 11: Islamic Bank Specific Variables Related to Financings and Investments

Financings Portfolio	<ul style="list-style-type: none"> • <i>Murābahah</i> financing • <i>Salam</i> financing • <i>Istisna</i> financing • <i>Ijārah</i> financing • <i>Ijārah Muntahia Bittamleek</i> financing (IMB) • <i>Muḍārabah</i> financing • <i>Mushārah</i> financing • Diminishing <i>Mushārah</i> financing • Other Islamic modes (if any)
Investments Portfolio – Trading Book	<ul style="list-style-type: none"> • Equity securities • Islamic collective investment schemes • Investment properties • <i>Sukūk</i> • <i>Murābahah</i> inventory – available for sale • <i>Salam</i> commodities • <i>Ijārah</i> assets – available for lease • <i>Mushārah/Muḍārabah</i> investments at cost – for trading, shares and commodities • Net foreign exchange position

Table 12: Additional Information on Variables Related to Financings and Investments

Financings/Investments Portfolio	At Cost	Fair/Market Value	Profit/Losses	Provisions (if any)	Underlying Assets/Colonial Value

Table 13: Islamic Bank Specific Variables Related to Capital and Liabilities

Capital and Liabilities	<ul style="list-style-type: none"> • Profit equalisation reserve • Investment risk reserve • Parallel <i>Salam</i> • Parallel <i>Istisnā`</i> • Funding liabilities (e.g. commodity <i>Murābahah</i> transactions, etc.) • Unrestricted PSIA • Restricted PSIA
--------------------------------	---

A.2. Stress-Testing Shocks and Scenario Designs⁶¹

218. Designing an appropriate scenario is one of the prominent aspects of stress testing. **There are four approaches in scenario designing, namely: (i) historical scenario, (ii) probabilistic scenario, (iii) hypothetical scenario, and (iv) reverse engineering scenario.**

219. The main objective of supervisors and individual institutions is to select a scenario or scenarios that will reflect the vulnerability of a financial institution or system. Figure 2 illustrates the approach developed by the IMF to conduct a financial sector assessment program (FSAP) in the UK.

Figure 2: Scenarios Used by the IMF to Conduct FSAP in the UK

	Variable	Moderate	Severe
Core	US effective exchange rate	–20% in 2 quarters	–40% in 1 quarter
	US 10-year yields	+2.5 pp* in 4 quarters	+2.5pp in 4 quarters
Accompanying	Global 10-year yields ex-US	+2pp in 4 quarters	+2pp in 4 quarters
	US house prices	–10% in 8 quarters	–15% in 8 quarters
	UK and selected Euro house prices	–10% in 8 quarters	–15% in 8 quarters
	Global equity prices	Endogenous (–5%)	–20% in 1 quarter
	Global credit spreads	+85bp in 12 quarters	+225bp in 12 quarters

*Note: pp = percentage points.

220. Serving the same purpose, the approach in scenario design may vary from one jurisdiction to another. For example, the Bank of England adopts three baseline and five stress scenarios (Box I).

221. In the US Federal Reserve, scenarios are divided into baseline, adverse and severely adverse (Box II).

222. For macro stress testing, the Bank of Japan implements one baseline and two stress scenarios. Stress scenarios are divided into two categories (Box III). The first is known as the Economic Downturn Scenario, where the assumption is that a harsh shock equivalent to the Lehman shock in 2008 occurs in overseas economies and the main focus is the change in credit losses. The other stress scenario is an upward interest rate shift scenario, which focuses on the analysis of the impact on the financial system of various rises in interest rates.

⁶¹ All examples in this section are for knowledge-sharing purposes and are not necessarily *Shari'ah*-compliant.

223. The Central Bank of the UAE uses two extreme scenarios to measure the resilience of local banks (Box IV). The resilience of banks in the test is measured with reference to their ability to maintain a capital adequacy ratio above the minimum level prescribed by the Central Bank, currently 12% of their risk-weighted assets. (Note that stress tests in the UAE include local banks only.)

224. In the European Union, the European Banking Authority (EBA) is responsible for the orderly functioning and integrity of the financial markets and the stability of the financial system. The 2014 EU-wide stress test is coordinated by the EBA and is carried out in cooperation with the European Central Bank (ECB), the European Systemic Risk Board (ESRB), the European Commission, and the competent authorities from all relevant national jurisdictions. In this process, the EBA has developed a common methodology and plays an important role in ensuring a comprehensive, consistent and comparable disclosure of the results. The ESRB and the European Commission have developed, respectively, the adverse and baseline scenarios (Box V). Competent authorities, including the ECB for the euro area, are responsible for the quality assurance of banks' data as well as for supervisory actions banks will have to take in response to the outcome of the exercise.

225. Overall, even though the details of scenarios may be different, all jurisdictions implement scenarios that are categorised as baseline, adverse and severely adverse.

Box I

UK Stress Scenarios (2015–2019)

Global growth disappoints materially relative to expectations, and disinflationary pressures build up further. This triggers a rapid deterioration of market sentiment globally. Risk appetite abruptly diminishes and market participants attempt to de-risk their portfolios, generating safe-haven capital flows to high-quality US assets. The dollar appreciates against a wide range of currencies, especially those of emerging market economies. Liquidity in some markets becomes seriously impaired and credit risk premium rise sharply. Commodity prices fall further, putting additional downward pressure on global inflation.

1. In China, policy supports a rebalancing of the economy towards consumption, but that takes time to take effect. Property prices fall sharply and, in turn, investment in residential property and associated industries contracts. Growth slows materially and the Renminbi depreciates against the dollar.
2. In the euro area, weaker domestic demand, world trade and commodity prices lead to further disinflationary pressures and the rate of deflation increases. This amplifies the downturn in activity, as consumption and investment decisions are delayed. In combination with weak demand and business confidence, unemployment increases materially throughout the euro area. Deflation also increases the real burden of debt and increases market concerns. Although the recession is widespread through the euro area, the increases in credit risk premium are largest for the most highly indebted sovereigns, households and firms.
3. These global shocks have adverse implications for activity in a number of emerging market economies, especially China's major trading partners, commodity exporters and economies with large external financing needs. These countries also experience a higher risk premium on foreign borrowing, which triggers a sudden stop to capital inflows and a sharp contraction of domestic credit and demand. Businesses that have issued dollar-denominated debt are particularly affected, given the appreciation of the dollar.
4. The global downturn impacts the United Kingdom. Output growth turns negative as export demand falls sharply. There are additional spillovers, through financial linkages and confidence effects. The household and corporate saving rates increase due to precautionary behaviour and the higher cost of credit as banks face higher funding costs. These mechanisms lead to falls in consumption, investment and property prices. The deterioration of global financial market sentiment is also evident in the United Kingdom — for example, through a sharp rise in risk premia on private-sector borrowers. In this scenario, it is assumed that policymakers observe these developments as a series of unexpected shocks. Additional monetary policy stimulus is pursued, which has the effect of lowering the yield curve over the course of the stress scenario.

UK Baseline Scenario (2015–2019)

1. World PPP-weighted GDP has grown at an average rate of about 3½% since its 2009 trough. In the baseline projection, world GDP growth is projected to rise somewhat from 2015, averaging 4% through the five-year horizon. Advanced economies continue to recover, albeit at different rates. The United States is projected to grow strongly, with growth peaking at 3.9% in 2015. Growth in the euro area is weaker, peaking at 1.8% in 2016. In the near term, recent declines in oil prices push down on inflation globally. Euro-area inflation remains low through the horizon, reaching 1.5% by the end of 2019.

2. Chinese growth slows through the projection, declining to around 6.2% by the end of 2019. But recovery in advanced economies supports a broader pickup in growth for other emerging markets through the five-year horizon. For example, growth in Brazil and South Africa reaches 3% and 2.6%, respectively, by end-2019, compared to outturns of –0.2% and 1.3%, respectively, in the latest data.
3. In the United Kingdom, growth remains robust in the near term, averaging 2.9% over 2015 and 2016, before moderating to an average of 2.6% thereafter. Unemployment continues to fall but at a reduced pace compared to recent outturns, reaching close to 5% by end-2017. Inflation falls further in the near term, as recent declines in energy prices continue to be passed through to petrol prices and utility bills. But in the second half of 2015, those and other temporary effects drop out, and inflation begins to increase. These projections are consistent with those presented in the Bank's February 2015 Inflation Report. Consistent with robust growth, asset prices continue to rise through the baseline scenario.

Source: Bank of England, www.bankofengland.co.uk/

Box II

US Baseline Scenario (2014 4Q – 2017 4Q)

The baseline scenario for the United States is for a sustained, moderate expansion in economic activity. Real GDP grows at an average rate of just under 3% per year over the scenario; the unemployment rate declines modestly, reaching 5.25% by the end of the scenario in the fourth quarter of 2017; and CPI inflation averages just over 2% per year.

Accompanying this moderate economic expansion is a gradual normalisation in Treasury yields across the maturity spectrum. Short-term Treasury rates begin to increase in the second quarter of 2015 and rise steadily thereafter, reaching just over 3% by the end of 2017. Five- and 10-year yields increase from the start of the scenario period and reach 4% and 4.25%, respectively, by the fourth quarter of 2017. Spreads on investment-grade corporate bonds change little over the scenario period, as do spreads on residential mortgages and other consumer loans. As a result, yields on BBB-rated corporate bonds and mortgage rates both increase roughly in line with long-term Treasury yields and the prime rate increases roughly in line with short-term Treasury rates.

Consistent with these developments, asset prices are assumed to increase modestly in the baseline scenario. Equity prices, nominal house prices, and commercial property prices all rise steadily throughout the scenario; in addition, equity market volatility is assumed to remain at low levels.

The baseline scenario for economic activity and inflation outside the United States features an expansion in activity, albeit one that proceeds at different rates across four countries. The outlook for real GDP growth in developing Asia is 6.25% per year; the expansion in real output in the United Kingdom proceeds at 2.5% per year; and real GDP growth in the euro area and Japan is assumed to average 1.5% per year and 1.25% per year, respectively.

US Adverse Scenario (2014 4Q – 2017 4Q)

The United States experiences a mild recession that begins in the fourth quarter of 2014 and lasts through the second quarter of 2015. During this period, the level of real GDP falls approximately 0.5% relative to its level in the third quarter of 2014, and the unemployment rate increases to just over 7%. At the same time, the US economy experiences a considerable rise in core inflation that results in a headline CPI inflation rate of 4% by the third quarter of 2015; headline inflation remains elevated thereafter. Short-term interest rates rise quickly as a result, reaching a little over 2.5% by the end of 2015 and 5.3% by the end of 2017. Longer-term Treasury yields increase by less. The recovery that begins in the second half of 2015 is quite sluggish, and the unemployment rate continues to increase, reaching 8% in the fourth quarter of 2016, and flattens thereafter. Equity prices fall both during and after the recession and by the end of the scenario are about 25% lower than in the third quarter of 2014. House prices and commercial real estate prices decline by approximately 13% and 16%, respectively, relative to their level in the third quarter of 2014.

Outside the United States, the adverse scenario features recessions in the euro area, the United Kingdom, and Japan and below-trend growth in developing Asia. This weakness in economic activity results in a period of deflation for some countries or country blocs. The exchange value of the dollar is little changed vis-à-vis the euro, the pound sterling, and the currencies of developing Asia. The dollar is assumed to depreciate against the yen, reflecting flight-to-safety capital flows.

This year's adverse scenario is qualitatively different from the 2014 adverse scenario. The main difference lies in the evolution of Treasury yields. The 2014 adverse scenario featured a sharp rise in long-term interest rates not accompanied by an increase in short-term interest rates and hence a steeper yield curves than in the baseline. In this year's scenario the hypothetical pick-up in US inflation results in a yield curve that is higher and flatter than in the baseline.

US Severely Adverse Scenario (2014 4Q – 2017 4Q)

The severely adverse scenario for the United States is characterised by a deep and prolonged recession in which the unemployment rate increases by 4 percentage points from its level in the third quarter of 2014, peaking at 10% in the middle of 2016. By the end of 2015, the level of real GDP is approximately 4.5% lower than its level in the third quarter of 2014; it begins to recover thereafter. Despite this decline in real activity, higher oil prices cause the annualised rate of change in the Consumer Price Index (CPI) to reach 4.3% in the near term, before subsequently falling back.

In response to this economic contraction – and despite the higher near-term path of CPI inflation – short-term interest rates remain near zero through 2017; long-term Treasury yields drop to 1% in the fourth quarter of 2014 and then edge up slowly over the remainder of the scenario period. Consistent with these developments, asset prices contract sharply in the scenario. Driven by an assumed decline in US corporate credit quality, spreads on investment grade corporate bonds jump from about 170 basis points to 500 basis points at their peak. Equity prices fall approximately 60% from the third quarter of 2014 through the fourth quarter of 2015, and equity market volatility increases sharply. House prices decline approximately 25% during the scenario period relative to their level in the third quarter of 2014.

The international component of the severely adverse scenario features severe recessions in the euro area, the United Kingdom, and Japan, and below-trend growth in developing Asia. For economies that are heavily dependent on imported oil – including developing Asia, Japan, and the euro area – this economic weakness is exacerbated by the rise in oil prices (to approximately \$110 per barrel) featured in this scenario. Reflecting flight-to-safety capital flows associated with the scenario's global recession, the US dollar is assumed to appreciate strongly against the euro and the currencies of developing Asia and to appreciate more modestly against the pound sterling. The dollar is assumed to depreciate modestly against the yen, also reflecting flight-to-safety capital flows.

This year's severely adverse scenario is similar to the 2014 severely adverse scenario. However, corporate credit quality is assumed to worsen even more than would be expected in a severe recession, resulting in a greater widening in corporate bond spreads, decline in equity prices, and increase in equity market volatility than in the 2014 severely adverse scenario.

Source: US Federal Reserve, www.federalreserve.gov/

Box III

Japan Baseline Scenario

Assumptions made for the baseline scenario assume that the overseas real GDP growth rate rises moderately from 2.5–3.0% in 2013 to about 4.0% through 2016. We use annual forecast data from the International Monetary Fund (IMF) to create quarterly series with the spline function. The nominal GDP growth rate rises from minus 0.2% in fiscal 2012 to 2.3% in fiscal 2013 and hovers at 2.0–2.5% through fiscal 2016. This assumption is based on the ESP forecasts provided by the Japan Center for Economic Research (JCER) from fiscal 2014 to fiscal 2015. We assume the same growth rate for fiscal 2016 as that for fiscal 2015. Stock prices (TOPIX) and 10-year JGB yields remain unchanged from the levels observed at the end of September 2013.

Economic Downturn Scenario

Assumptions made for the economic downturn scenario are as follows. Stresses equivalent to the Lehman shock in 2008 arise in overseas economies and global financial markets in the first half of fiscal 2014. Specifically, we assume that a large exogenous negative shock causes large downward revisions of real GDP growth rates in overseas economies, a situation comparable with the downward revision of actual GDP growth rates for 2008–2010 from the forecasts made in April 2008 and published in *IMF World Economic Outlook*. We also assume that the declines in the US and European stock market prices are equivalent to those seen from the pre-Lehman shock peak to the subsequent trough. Based on the above-mentioned assumptions, the overseas economic growth rate plunges to 0.5% in 2014 from 2.5–3.0% in 2013 and returns to around the baseline scenario level in 2016. Stock prices (TOPIX) fall by 55% between the end of March 2014 and the end of March 2015, and 10-year JGB yields decline by about 0.3 percentage points during the same period. Thereafter, stock prices and 10-year JGB yields remain more or less unchanged.

Upward Interest Rate Shift Scenario

Macro stress testing assumes the following two rising interest rate cases: a case in which interest rates rise in line with economic improvement; and a case in which interest rates rise with an economic downturn. Both cases assume a steepening scenario under which market interest rates for instruments with longer maturities rise by two percentage points, while those for instruments with shorter maturities do not rise significantly. We set the same assumptions for overseas economies as those employed in the baseline scenario.

A rise in interest rates in line with economic improvement

The first case assumes that the yield curve steepens gradually as demand for funds increases in line with the economic improvement and a rise in stock prices. The assumptions are explained in more detail as follows: Market interest rates for instruments with a 10-year maturity rise from the baseline scenario level by two percentage points for one year from the end of March 2014 and remain unchanged through the end of fiscal 2016. Interest rates for instruments with shorter maturities remain more or less unchanged. The nominal GDP growth rate increases from the baseline scenario level by about two percentage points in fiscal 2014. The upward shift of the nominal GDP growth rate is calculated based on the correlation between changes in long-term interest rates and the nominal GDP growth rate, and the maximum elasticity of their positive correlation since early 1990 when the Heisei bubble collapsed. Stock prices are endogenous variables in this simulation and rise gradually in line with the economic improvement, rising from the baseline scenario level by about 25% in fiscal 2016.

A rise in interest rates with an economic downturn

The second case assumes that a decline in stock prices and an economic downturn in tandem with a sharp rise in interest rates hinder an improvement in financial institutions' interest rate spreads on loans. The interest rate yield curve steepens immediately after the start of the estimation period. Specifically, 10-year rates rise by two percentage points from the baseline scenario level at the beginning of the April–June quarter of 2014 and remain at the same level through the end of fiscal 2016. Stock prices fall by 34% during the quarter, with a simultaneous rise in interest rates. Changes in stock prices are calculated based on the correlation between stock prices and long-term interest rates, and we use the maximum negative elasticity of the correlation since 1990 recorded in the April–October period of 1991. After declining for one year along with the economic downturn, stock prices are endogenously determined and drop 45% below the baseline scenario level. Stock prices stay at the same level after fiscal 2015. With respect to the economy, the nominal GDP growth rate deviates from the baseline scenario level immediately after the start of the estimation period, sitting at around minus 1.5% in fiscal 2014.

Source: Bank of Japan, www.boj.or.jp

Box IV

UAE

Central Bank of UAE uses two extreme scenarios to measure the resilience of local banks. (Note that ST in UAE includes the local banks only.) The resilience of banks in the test is measured with reference to their ability to maintain a capital adequacy ratio above the minimum level prescribed by the Central Bank, currently 12% of their risk-weighted assets.

The stress tests were based upon the two following scenarios:

Scenario 1:

Economic conditions deteriorate and NPL for each bank is assumed to rise from its current level to 15% of the total loan book. As an example, a bank with an 8% NPL ratio is now saddled with a 15% ratio; this 7% increase must be 75% provisioned and this provision is deducted from the bank's capital.

Scenario 2:

It recognises that the assets quality can differ from one bank to another. Accordingly, the NPL ratio is recalculated taking into account an increase of 50%, 75% and 100% from the level reported by each bank at the end of 2011. Again using the example of the same bank with an 8% NPL ratio, this bank is now tested with the NPL rising to 12%, 14% and 16% of its risk-weighted assets. Similar to the first scenario, 75% of the increase on NPL for each bank will be provisioned and deducted from the bank's capital.

Source: Central Bank of the Arab Emirates, *Financial Stability Review September 2012*,

www.centralbank.ae/pdf/reports/FinancialStabilityReportSept2012.pdf

Box V

EU Baseline Scenario (EC)

The winter 2014 forecast foresees a continuation of the economic recovery in most Member States and in the EU as a whole. After exiting recession in spring 2013 and three consecutive quarters of subdued recovery, the outlook is a moderate step-up in economic growth. Following real GDP growth of 1.5% in the EU and 1.2% in the euro area in 2014, activity is expected to accelerate in 2015 to 2.0% in the EU and 1.8% in the euro area. These figures each represent an upward revision of 0.1 percentage points compared with the autumn 2013 forecast. The forecast remains based on the assumption that the implementation of agreed policy measures at EU and Member State level sustains improvements in confidence as well as financial conditions and advances the necessary economic adjustment in Member States, by increasing their growth potential. The labour market is characterised by slowly stabilising employment, with unemployment remaining high, as labour market developments typically lag those in GDP by half a year or more. In keeping with this pattern, the outlook is for a modest rise in employment from this year onwards and a decline in the unemployment rate towards 10.4% in the EU and 11.7% in the euro area by 2015, with cross-country differences remaining very large. Subdued consumer-price inflation is expected to prevail in the EU and the euro area in 2014 at rates of 1.2% and 1.0%, respectively, before rising slightly by about one-quarter of a percentage point in 2015 when economic growth gains momentum.

EU Adverse Scenario (ESRB)

The adverse scenario, designed by the ESRB, reflects the systemic risks that are currently assessed as representing the most pertinent threats to the stability of the EU banking sector: (i) an increase in global bond yields amplified by an abrupt reversal in risk assessment, especially towards emerging market economies; (ii) a further deterioration of credit quality in countries with feeble demand; (iii) stalling policy reforms jeopardising confidence in the sustainability of public finances; and (iv) the lack of necessary bank balance sheet repair to maintain affordable market funding. The negative impact of the shocks, which include also stress in the commercial real estate sector, as well as a foreign exchange shock in Central and Eastern Europe, is substantially global. In the EU, the scenario leads overall to a cumulative deviation of EU GDP from its baseline level by –2.2% in 2014, –5.6% in 2015, and –7.0% in 2016. The EU unemployment is higher than its baseline level, by 0.6 percentage points in 2014, by 1.9 percentage points in 2015 and by 2.9 percentage points in 2016. For most advanced economies, including Japan and the US, the scenario results in a negative response of GDP ranging between 5–6% in cumulative terms compared to the baseline.

Source: European Banking Authority, www.eba.europa.eu

A.3. Stress Testing Definitions

226. Stress testing is defined as a “what if” exercise which measures the sensitivity of a portfolio, an institution, or a financial system to major changes in the macroeconomic environment or to exceptional but plausible shocks. A stress test can be conducted either at the portfolio level or the aggregate level. While portfolio-level stress testing measures the portfolio-level exposure to certain risks, an aggregate stress test is defined as a measure of the vulnerability of a group of reporting firms to specific stress scenarios.

227. The difference between an aggregate stress test and a portfolio stress test is that the objective of an aggregate stress test is to help regulators to identify structural vulnerabilities and overall risk exposures in a financial system that could lead to the disruption of financial markets. In contrast, the objective of a portfolio-level stress test is to assess and manage risks within the institution.

228. Two other widely used terms in stress testing are top-down (TD) and bottom-up (BU) approaches. In 2011, the IMF conducted an online survey among 23 jurisdictions, including G-20 countries. Of the 23 jurisdictions, seven were emerging markets and 16 were advanced economies. All responders shared a broadly similar working definition, where a BU was defined as an exercise implemented by individual institutions using their internal data and models, but based on common assumptions provided by a central authority. In contrast, the TD test is implemented solely by the central authority. The data used for TD tests is either confidential supervisory data or publicly available institution-by-institution data, or both.⁶²

229. Stress tests are also classified as macroprudential and microprudential stress tests, or “macro” and “micro” stress tests. Macroprudential stress testing is supervisory-level stress testing.

230. Today, in practice, most of the authorities conduct macroprudential stress tests by using both the TD and BU approaches, thus utilising the complementary strengths of each approach. The strength of TD testing lies in the fact that it can impose a more uniform methodology, whereas the strength of the BU testing is that it reflects each bank’s own risk profile more accurately.

231. However, elsewhere there are some similarities and differences in terminology interpretation. The following section gives a broader overview of the stress-testing practice in selected jurisdictions.

⁶² IMF, *Macrofinancial Stress Testing: Principles and Practices – Background Material*, <https://www.imf.org/external/np/pp/eng/2012/082912a.pdf>.

Stress Testing Terminology in Different Jurisdictions

Pakistan⁶³

232. The mandatory tests cover credit, market and liquidity risk, and contain three levels of shocks under each scenario. The three levels of shocks are defined as: (i) minor, (ii) moderate, and (iii) major shocks. This classification reflects the intensity of the shocks and magnitude of their impact. In total, 16 stress scenarios/shocks are defined.

233. Mandatory stress tests are minimum requirements to promote a culture of stress testing in banks/development financial institutions (DFIs). However, the State Bank of Pakistan encourages banks/DFIs to conduct additional stress tests, for their in-house consumption, that are commensurate with the size and complexity of their operations.

Malaysia⁶⁴

234. Given the margin for error in modelling techniques and key assumptions used in the conduct of stress tests, and the inherent limitations of both the TD and BU approaches, the combination of multiple stress-testing approaches in Malaysia serves to support a more robust assessment of systemic stability and institutional soundness. These approaches are further explained below.

Macro Stress Test

235. The macro stress test represents a TD approach that is used to:

- assess system-wide resilience and behaviour under exceptional but plausible risk events;
- identify systemic risks and vulnerabilities, including cross-sector or cross-institution contagion, and the potential spillovers to the broader economy; and
- determine potential system-wide capital and liquidity needs under stress conditions.

⁶³ *Guidelines on Stress Testing*. www.sbp.org.pk/bsrvd/2012/c-01-annex.pdf.

⁶⁴ Bank Negara Malaysia, *Guidelines on Stress Testing*, www.bnm.gov.my/guidelines/01_banking/04_prudential_stds/22_stress_test.pdf.

236. Macro stress tests were first used during the Asian Financial Crisis in 1997–8 to form the basis for decisions on the formulation of a holistic resolution strategy to address the crisis. By projecting the potential deterioration in asset quality and impairment in the revenue-generating capacity of banks across the financial system, the stress tests facilitated the assessment of the potential scale, scope and financial resources required of the institutional arrangements that were put in place at that time. Information obtained through the stress tests on the potential losses and capital shortfalls was critical in shaping the recapitalisation and asset carve-out strategies that followed. Since then, macro stress tests have become a regular feature of Bank Negara's (Central Bank of Malaysia) financial stability assessments and are used to evaluate pre-emptive actions by Bank Negara to address emerging risks well before conditions deteriorate to the point of an imminent system-wide crisis. When used in conjunction with sensitivity analyses and other early warning indicators, the macro stress tests provide valuable information for deciding on the nature, timing and calibration of macroprudential policy responses. The results of macro stress tests are deliberated at the Financial Stability Committee of Bank Negara.

Micro Stress Test by Supervisors

237. Micro stress testing by supervisors is a BU approach and is conducted primarily to assess the vulnerabilities and risk-bearing capacity of individual financial institutions. Forward-looking information derived from these tests has become increasingly important to better inform Bank Negara's supervisory assessments and interventions, which aim to identify and address risks in a timely manner. Results of the tests are deliberated on during regular engagements between supervisors and financial institutions to obtain a view on the adequacy of an institution's contingency plans, risk mitigation strategies and financial buffers. Where relevant, the Bank may, based on these engagements, require institutions to increase capital and liquidity buffers, including through adjustments to dividend payments or by reining in expansion plans. In addition, micro stress tests serve to cross-check the results of macro stress tests and stress tests by financial institutions. Supervisory micro stress testing serves a particularly important role in reducing the risk of overdependence on complex and computationally intensive models; identifying institution-specific vulnerabilities and cross-institutional interlinkages that might be obscured in aggregated data and system-wide estimations; and encouraging financial institutions to observe an appropriate degree of prudence in conducting internal stress tests and to maintain an adequate focus on tail risks.

Stress Tests by Financial Institutions

238. Stress testing by financial institutions has been a prudential requirement since 1998, a BU approach to complement the macro stress testing. When first introduced, these stress tests were conducted by financial institutions using a set of scenarios and shock parameters prescribed by Bank Negara. This practice offered an opportunity for financial institutions to build internal stress-testing capabilities while providing useful, if relatively generic, insights into the potential vulnerabilities of individual institutions to risks.

239. The three stress-testing approaches are closely coordinated and integrated within the Bank. The macro stress test provides an important robustness check to bottom-up tests, while achieving consistent applications of stress factors across all institutions to support the identification of system-wide vulnerabilities. It can also promptly surface weaknesses in the data quality and risk management models and practices of individual financial institutions. It also fosters a deeper understanding of the impact of collective behavioural responses to stress and the potential for second-order effects arising from systemic linkages between the financial system and the macroeconomy, thus contributing to more comprehensive risk assessments by supervisors and financial institutions.

Japan⁶⁵

Macro Stress Test

240. The Bank of Japan conducts macro stress testing with various scenarios reflecting financial and economic conditions at each point in time and publishes the results in its semi-annual *Financial System Report*. The framework has been improved over time to ensure it appropriately analyses risk factors in Japan's financial system. Current notable features of the Bank's macro stress testing are as follows. First, it includes a mechanism reflecting the feedback loop between the financial and economic sectors by using the Financial Macro-econometric Model, a medium-sized structural macro model comprising two sectors: financial and macroeconomic. Second, it can analyse not only aggregate figures such as capital adequacy ratios and net interest income, but also those for individual financial institutions.

⁶⁵ *Macro Stress Testing at the Bank of Japan*, https://www.boj.or.jp/en/research/brp/ron_2014/data/ron141008a.pdf.

Micro Stress Testing

241. Financial institutions started to use stress testing (micro stress testing) in the 1990s as an analytical tool to measure the potential vulnerability of financial institutions. National authorities and international organisations started to use stress testing as an evaluation tool to assess the vulnerability of a country's financial system based on the experience of international financial crises such as the Asian crisis. This is the beginning of macro stress testing.

242. According to the above-mentioned definition, the term “micro stress testing” refers to the BU stress test conducted by financial institutions on a bank-by-bank basis.

United Kingdom⁶⁶

Macroprudential Stress Test

243. Macroprudential stress testing is a TD approach that focuses on whether the banking system as a whole has the balance sheet capacity to support the economy. A central goal of the approach is to avert runs on systemically important banks by wholesale creditors that lead to a contraction of credit and damage to the broader economy. To avoid aggregate deleveraging in periods of distress, remedies focus on raising new capital measured in total dollars (or euros), rather than on merely satisfying capital ratios.

Microprudential Stress Test

244. Microprudential stress testing is a BU approach conducted by the regulatory authority to emphasise the traditional role of bank capital as a buffer against loss, shielding the deposit insurance agency. The focus is on resolving insolvent banks and on “prompt corrective action” to protect taxpayers. The motivating event to conduct microprudential stress test was the S&L (Savings and Loan) crisis and the benchmark is the Basel capital ratio.

⁶⁶ Bank of England, *Stress Testing*, www.bankofengland.co.uk/financialstability/Pages/fpc/stresstest.aspx.

European Union⁶⁷

Macro Stress Test

245. The ECB developed a TD stress-testing framework that currently covers the largest 80–90 banking groups in the European Union. The analysis is of relevance to the ECB from a broad financial stability perspective, but it can also provide important insights that are useful for monetary policy analysis, crisis-related activities and potentially also for macroprudential policy purposes.

Micro Stress Test

246. Micro stress testing is known as EU-wide stress-testing exercises coordinated by the European Banking Authority (EBA). The aim of such tests is to assess the resilience of financial institutions to adverse market developments, as well as to contribute to the overall assessment of systemic risk in the EU financial system. The EBA's EU-wide stress tests are conducted in a bottom-up fashion, using consistent methodologies, scenarios and key assumptions developed in cooperation with the ESRB, the European Central Bank (ECB) and the European Commission (EC).

United States⁶⁸

Dodd-Frank Act

247. The *Dodd-Frank Wall Street Reform and Consumer Protection Act* (Dodd-Frank Act, or DFA) requires the US Federal Reserve to conduct an annual stress test of bank holding companies (BHC) with US\$50 billion or more in total consolidated assets and all non-bank financial companies designated by the Financial Stability Oversight Council (FSOC) for Federal Reserve supervision. DFA supervisory stress testing is a forward-looking quantitative evaluation of the impact of stressful economic and financial market conditions on BHC capital. This programme serves to inform these financial companies, as well as the general public, how the institutions' capital ratios might change during a hypothetical set of adverse economic conditions as designed by the Federal Reserve. In addition to the annual supervisory stress

⁶⁷ *EU-wide Stress Testing*, www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing.

⁶⁸ Dodd-Frank Act Stress Test, 2015: Supervisory Stress Test Methodology and Results, March 2015. www.federalreserve.gov/newsevents/press/bcreg/bcreg20150305a1.pdf.

test conducted by the Federal Reserve, each BHC is required to conduct annual company-run stress tests under the same supervisory scenarios and conduct a mid-cycle stress test under company-developed scenarios.

Comprehensive Capital Analysis and Review

248. The Comprehensive Capital Analysis and Review (CCAR) evaluates a BHC's capital adequacy, capital adequacy process, and planned capital distributions, such as dividend payments and common stock repurchases. As part of CCAR, the US Federal Reserve evaluates whether BHCs have sufficient capital to continue operations throughout times of economic and financial market stress, and whether they have robust, forward-looking capital-planning processes that account for their unique risks. If the Federal Reserve objects to a BHC's capital plan, the BHC may not make any capital distribution unless the Federal Reserve indicates in writing that it does not object to the distribution.

Hong Kong⁶⁹

Macro Stress Testing

249. "Macro stress testing" refers to a range of techniques used to assess the vulnerability of a financial system to "exceptional but plausible" macroeconomic shocks. Increasingly, macro stress testing plays an important role in the macroprudential analysis of public authorities. The main objective is to identify structural vulnerability and overall risk exposures in a financial system that could lead to systemic problems. In conjunction with stress testing to assess the vulnerability of the portfolios of individual institutions, macro stress testing forms the main part of system-wide analysis, which measures the risk exposure of a group of financial institutions to a specific stress scenario. It can also serve as a tool for cross-checking results obtained by financial institutions' internal models.

250. Macroeconomic stress tests involve two major elements. First, scenarios of extreme yet plausible adverse macroeconomic conditions need to be devised. Second, the impact of the

⁶⁹ *Supervisory Policy Manual*, "Stress-testing", www.hkma.gov.hk/eng/key-information/guidelines-and-circulars/circulars/2003/20030228-1.shtml.

adverse macroeconomic scenarios needs to be mapped on the banks' balance sheets. Through this, the robustness of banks can be evaluated.

Conclusion

251. Overall, in all the jurisdictions we have considered, the terminology used is almost identical. However, the interpretation may differ from one jurisdiction to another. For example, a top-down approach in all the above-mentioned jurisdictions refers to the stress-testing approach conducted by the supervisory authority to assess the vulnerability of the whole system against changes in economic and financial conditions.

252. Also, in all the above-mentioned jurisdictions, macro stress testing or macroprudential stress testing is conducted in a top-down fashion by supervisors. However, the divergence appears in interpretation of the bottom-up approach. In some jurisdictions – for example, in Japan – the bottom-up approach is used solely by individual banks to stress their portfolios.

253. Interestingly, the definition of macro stress test in Japan includes both approaches – top-down as well as bottom-up; in all the other jurisdictions under consideration, however, the macro stress test is conducted by utilising only a top-down approach.

254. In Malaysia, stress testing is divided into three groups: (a) macro stress tests, (b) stress tests by financial institutions, and (c) micro stress tests. Macro and micro stress tests are conducted by the supervisory authority using a top-down and bottom-up approach, respectively. In contrast, the stress test by financial institutions also utilises a bottom-up approach but conducted on the institutional level using the stress scenarios and shock parameters prescribed by the central bank.

255. In the US, two types of stress testing – namely, CCAR and DFA, respectively – correspond to macroprudential and microprudential stress tests. CCAR adopts a bottom-up approach at the supervisory level, while DFA adopts a top-down approach.

256. In conclusion, almost all the jurisdictions adopt the same approach of interpreting the terminology in a way that is compliant with the IMF's description. A top-down approach is described as an approach implemented solely by the supervisory authority, whereas a bottom-up approach could be utilised by supervisors as well as individual institutions.

CREDIT RISKS

Section 3.4.1 Credit Risks for IIFS

	IFSI (Islamic banking)	IIFS 1	IIFS 2	IIFS 3	IIFS 4	IIFS 5
Table 1. Asset Quality						
Total Financings (Net)	169,238	53,138	26,276	22,882	32,685	33,913
<i>Murābahah (collateralised)</i>	72,937	24,150	11,296	9,454	13,545	14,492
<i>Commodity Murābahah (unsecured)</i>	29,424	8,686	4,667	3,995	6,136	5,940
<i>Salam</i>	3,531	1,261	513	463	585	709
<i>Ijārah Muntahia Bittamleek</i>	44,161	13,339	6,763	6,142	9,064	8,853
<i>Operating Ijārah</i>	19,185	5,702	3,037	2,828	3,699	3,919
Performing Financing	162,484	50,995	25,170	22,023	31,455	32,497
<i>Murābahah (collateralised)</i>	70,525	23,459	10,875	9,102	12,984	14,105
<i>Commodity Murābahah (unsecured)</i>	28,539	8,430	4,537	3,852	6,012	5,708
<i>Salam</i>	3,456	1,232	498	454	581	691
<i>Ijārah Muntahia Bittamleek</i>	41,813	12,435	6,420	5,872	8,723	8,363
<i>Operating Ijārah</i>	18,151	5,439	2,840	2,743	3,499	3,630
Non performing financing (NPFs)	9,805	3,132	1,584	1,251	1,796	2,042
<i>Murābahah (collateralised)</i>	4,030	1,225	654	557	862	732
<i>Commodity Murābahah (unsecured)</i>	1,545	469	243	245	247	341
<i>Salam</i>	102	36	21	12	9	24
<i>Ijārah Muntahia Bittamleek</i>	2,851	1,057	435	324	433	602
<i>Operating Ijārah</i>	1,277	345	231	113	245	343
Reported data on collateral	81,319	26,022	13,011	10,843	15,180	16,264
<i>Murābahah (collateralised)</i>	54,822	17,543	8,772	7,310	10,233	10,964
<i>Ijārah Muntahia Bittamleek</i>	26,497	8,479	4,240	3,533	4,946	5,299
Provisions held	3,051	989	478	392	566	626
<i>Murābahah (collateralised)</i>	1,618	534	233	205	301	345
<i>Commodity Murābahah (unsecured)</i>	660	213	113	102	123	109
<i>Salam</i>	27	7	6	3	5	6
<i>Ijārah Muntahia Bittamleek</i>	503	153	92	54	92	112
<i>Operating Ijārah</i>	243	82	34	28	45	54
NPF / Total Financing	5.79%	5.89%	6.03%	5.47%	5.49%	6.02%
<i>Murābahah (collateralised)</i>	5.53%	5.07%	5.79%	5.89%	6.36%	5.05%
<i>Commodity Murābahah (unsecured)</i>	5.25%	5.40%	5.21%	6.13%	4.03%	5.74%
<i>Salam</i>	2.89%	2.85%	4.09%	2.59%	1.54%	3.38%
<i>Ijārah Muntahia Bittamleek</i>	6.46%	7.92%	6.43%	5.28%	4.78%	6.80%
<i>Operating Ijārah</i>	6.66%	6.05%	7.61%	4.00%	6.62%	8.75%

Equity Position in Banking Book						
<i>Muḍārabah / Mushārah Investments</i>	8,816	2,932	1,359	1,138	1,623	1,763
<i>Provisions held against operating losses</i>	856	255	142	101	182	176
Sukuk Held-to-Maturity in Banking Book						
<i>Fixed-Rate Ijarah Sukuk</i>	18,234	6,038	2,824	2,364	3,386	3,623
<i>Provisions held against non-payment of returns</i>	456	154	58	78	65	101
Regulatory capital	15,739	4,902	2,636	2,122	3,290	2,788
Risk-weighted assets (RWA)	186,360	57,905	31,693	25,368	37,421	33,974
Capital adequacy ratio (CAR) pre-shock	8.4	8.5	8.3	8.4	8.8	8.2

Credit Shock 1 - Recession has lead to an extremely weakened domestic economic activity and massive unemployment reaching 25% of working force. Local IIFS offer personal financing on CMT.

Financing Book

Modelled increase in NPFs (%)

<i>Murābahah (collateralised)</i>	25%
<i>Commodity Murābahah (unsecured)</i>	50%
<i>Salam</i>	10%
<i>Ijarah Muntahia Bittamleek</i>	20%
<i>Operating Ijarah</i>	30%

Additional NPFs following shock

	2744	859	443	362	500	579
<i>Murābahah (collateralised)</i>	1008	306	164	139	216	183
<i>Commodity Murābahah (unsecured)</i>	773	235	122	123	124	171
<i>Salam</i>	10	4	2	1	1	2
<i>Ijarah Muntahia Bittamleek</i>	570	211	87	65	87	120
<i>Operating Ijarah</i>	383	104	69	34	74	103

Provisioning of the additional NPF (%)

Additional provisions following shock

	823	258	133	108	150	174
<i>Murābahah (collateralised)</i>	302	92	49	42	65	55
<i>Commodity Murābahah (unsecured)</i>	232	70	36	37	37	51
<i>Salam</i>	3	1	1	0	0	1
<i>Ijarah Muntahia Bittamleek</i>	171	63	26	19	26	36
<i>Operating Ijarah</i>	115	31	21	10	22	31

Impact on RWA/impact on capital (%)

100%

Regulatory capital post-shock	14,916	4,645	2,503	2,014	3,140	2,614
RWA post-shock	185,537	57,647	31,559	25,259	37,271	33,800
Banking Book						
Modelled/Estimated Provisioning of Book Value (%)						
Equity Position in Banking Book	13%					
Sukūk Held-to-Maturity in Banking Book	5%					
Additional provisions following shock	746	274	118	87	133	133
Equity Position in Banking Book	290	126	35	47	29	53
Sukūk Held-to-Maturity in Banking Book	456	148	83	40	104	80
Impact on capital (%)	100%					
Impact on RWA (%) - Sukūk (unrated)	100%					
Impact on RWA (%) - Equity Position	135%					
Regulatory capital post-shock	14170	4,371	2,385	1,927	3,007	2,481
RWA post-shock	184,689	57,329	31,429	25,156	37,128	33,648
Capital adequacy post-shock	7.7	7.6	7.6	7.7	8.1	7.4
Memo items:						
Post-shock NPFs	12,549	3,991	2,027	1,613	2,296	2,621
Murābahah (collateralised)	5,038	1,531	818	696	1,078	915
Commodity Murābahah (unsecured)	2,318	704	365	368	371	512
Salam	112	40	23	13	10	26
Ijārah Muntahia Bittamleek	3,421	1,268	522	389	520	722
Operating Ijārah	1,660	449	300	147	319	446
NPF / Total Financing	7.41%	7.51%	7.72%	7.05%	7.02%	7.73%
Murābahah (collateralised)	6.91%	6.34%	7.24%	7.36%	7.95%	6.31%
Commodity Murābahah (unsecured)	7.88%	8.10%	7.81%	9.20%	6.04%	8.61%
Salam	3.18%	3.14%	4.50%	2.85%	1.69%	3.72%
Ijārah Muntahia Bittamleek	7.75%	9.51%	7.72%	6.33%	5.73%	8.16%
Operating Ijārah	8.65%	7.87%	9.89%	5.19%	8.61%	11.38%
Credit Shock 2 - Recession has lead to an extremely weakened domestic economic activity and has led to a massive sell-off in the domestic housing market as foreign investors initiate quick-fire house sales causing a 40% reduction in the local house price index						
Table 2. Asset Quality by Sector						
Total Financings (Gross)	169,238	53,138	26,276	22,882	33,029	33,913
Manufacturing	72,937	24,150	11,296	9,454	13,545	14,492

Home Financing	29,424	8,686	4,667	3,995	6,136	5,940
Infrastructure	3,531	1,261	513	463	585	709
Financial	44,161	13,339	6,763	6,142	9,064	8,853
Other	19,185	5,702	3,037	2,828	3,699	3,919
Non performing financing (NPFs)	9,805	3,132	1,584	1,251	1,796	2,042
Manufacturing	4,030	1,225	654	557	862	732
Home Financing	1,545	469	243	245	247	341
Infrastructure	102	36	21	12	9	24
Financial	2,851	1,057	435	324	433	602
Other	1,277	345	231	113	245	343
Modelled increase in NPFs by Sector(%)						
Manufacturing	20%					
Home Financing	70%					
Infrastructure	15%					
Financial	30%					
Other	25%					
Additional NPFs following shock	3,077	982	492	410	538	655
Manufacturing	806	245	131	111	172	146
Home Financing	1082	328	170	172	173	239
Infrastructure	15	5	3	2	1	4
Financial	855	317	131	97	130	181
Other	319	86	58	28	61	86
Provisioning of the additional NPF (%)	30%					
Additional provisions following shock	923	295	148	123	161	197
Manufacturing	242	74	39	33	52	44
Home Financing	324	98	51	51	52	72
Infrastructure	5	2	1	1	0	1
Financial	257	95	39	29	39	54
Other	96	26	17	8	18	26
Impact on capital (%)	100%					
Impact on RWA (%) - Home Financing	80%					
Impact on RWA (%) - All Others	100%					
Regulatory capital post-shock	14,816	4,608	2,488	1,999	3,129	2,592
RWA post-shock	185,501	57,630	31,555	25,255	37,270	33,791
Capital adequacy post-shock	8.0	8.0	7.9	7.9	8.4	7.7

Memo items:

Post-shock NPFs	12,882	4,114	2,076	1,661	2,334	2,697
Manufacturing	4,836	1,470	785	668	1,034	878
Home Financing	2,627	797	413	417	420	580
Infrastructure	117	41	24	14	10	28
Financial	3,706	1,374	566	421	563	783
Other	1,596	431	289	141	306	429
NPF / Total Financing	7.61%	7.74%	7.90%	7.26%	7.07%	7.95%
Manufacturing	6.63%	6.09%	6.95%	7.07%	7.64%	6.06%
Home Financing	8.93%	9.18%	8.85%	10.43%	6.84%	9.76%
Infrastructure	3.32%	3.28%	4.71%	2.98%	1.77%	3.89%
Financial	8.39%	10.30%	8.36%	6.86%	6.21%	8.84%
Other	8.32%	7.56%	9.51%	4.99%	8.28%	10.94%

Credit Shock 3 - IFSI assets are funded by both UPSIA and IIFS - Credit Shock 1 Scenario. The local RSA recognises an alpha factor of 0.5.

Assuming the total financings portfolio in Table 1 had been funded by UPSIA

Modelled increase in NPFs (%)

Murābahah (collateralised)	25%
Commodity Murābahah (unsecured)	50%
Salam	10%
Ijārah Muntahia Bittamleek	20%
Operating Ijārah	30%

Additional NPFs following shock

	2744	859	443	362	500	579
Murābahah (collateralised)	1008	306	164	139	216	183
Commodity Murābahah (unsecured)	773	235	122	123	124	171
Salam	10	4	2	1	1	2
Ijārah Muntahia Bittamleek	570	211	87	65	87	120
Operating Ijārah	383	104	69	34	74	103

Provisioning of the additional NPF (%)

	823	258	133	108	150	174
Murābahah (collateralised)	302	92	49	42	65	55
Commodity Murābahah (unsecured)	232	70	36	37	37	51
Salam	3	1	1	0	0	1
Ijārah Muntahia Bittamleek	171	63	26	19	26	36
Operating Ijārah	115	31	21	10	22	31

<i>Regulatory Alpha Factor</i>	0.5					
Impact on RWA/impact on capital (%)	100%					
Regulatory capital post-shock	15,327	4,773	2,569	2,068	3,215	2,701
RWA post-shock	185,948	57,776	31,626	25,313	37,346	33,887
Capital adequacy post-shock	8.2	8.3	8.1	8.2	8.6	8.0

MARKET RISKS

Section 3.4.2 Market Risks for IIFS

	IFSI (Islamic banking)	IIFS 1	IIFS 2	IIFS 3	IIFS 4	IIFS 5
Equity Position Risk in Trading Book						
<i>Equity Securities at Fair / Market Value</i>	2,922	732	576	448	781	386
<i>ICIS at Fair / Market Value</i>	1,419	375	295	213	343	193
<i>Investment Properties at Fair / Market Value</i>	6,139	2,013	1,478	896	1,037	716
Sukūk Risk in Trading Book						
<i>Sukūk at Fair / Market Value</i>	5,293	1,200	989	1,579	647	878
Commodities / Inventory Price Risk						
<i>Murābahah Inventory- AFS at Fair / Market Value</i>	1,694	496	397	256	299	247
<i>Salam Commodities at Fair / Market Value</i>	304	107	92	64	27	14
<i>Ijārah Assets - AFL at Fair / Market Value</i>	506	138	72	109	65	123
Mushārah / Muḍārah Investments in Trading Book						
<i>For Trading, Shares and Commodities - Fair / Market Value</i>	4,786	1,468	747	719	914	939
Foreign Exchange Risk in Trading Book	-726	-360	-174	-76	-109	-7
<i>Net Spot Position (long minus short) - USD</i>	-656	-290	-155	-75	-111	-25
<i>Net Spot Position (long minus short) - GBP</i>	-78	-58	-25	-4	-3	12

Net Spot Position (long minus short) - Euro	8	-12	6	3	5	6
Regulatory capital	15,739	4,902	2,636	2,122	3,290	2,788
Risk-weighted assets (RWA)	186,360	57,905	31,693	25,368	37,421	33,974
Capital adequacy ratio (CAR) pre-shock	8.4	8.5	8.3	8.4	8.8	8.2

Market Shock 1 - Recession has lead to an extremely weakened domestic economic activity and massive unemployment reaching 25% of the work force. There is deflation as prices of assets and locally produced commodities contracts

Modelled decrease in market prices (%)						
Murābahah Inventory	15%					
Salam Commodities	35%					
Ijārah Assets	20%					
Change in market values following shock	462	139	106	82	67	67
Murābahah Inventory	254	74	59	38	45	37
Salam Commodities	106	37	32	22	10	5
Ijārah Assets	101	28	14	22	13	25
Impact on capital (%)	100%					
Impact on RWA (%) - AFS and AFL	188%					
Impact on RWA (%) - Commodities	188%					
Regulatory capital post-shock	15,277	4,763	2530	2040	3223	2721
RWA post-shock	185,494	57,644	31,494	25,213	37,295	33,849
Capital adequacy post-shock	8.2	8.3	8.0	8.1	8.6	8.0

Market Shock 2 - A two-tier sovereign ratings cut has led to a sharp increase in required yields on fixed-income instruments. Benchmark rates on 5 year Ijārah Sukūk increases by 100bps

Modelled decrease in market values (%)

Sukūk

30%

ICIS

15%

Change in market values following shock

1801

416

341

506

246

292

Sukūk

1588

360

297

474

194

263

ICIS

213

56

44

32

52

29

Impact on capital (%)

100%

Impact on RWA (%) - Sukuk

50%

Impact on RWA (%) - ICIS

150%

Regulatory capital post-shock

13,938

4,486

2,295

1,617

3,045

2,496

RWA post-shock

185,246

57,641

31,478

25,083

37,247

33,798

Capital adequacy post-shock

7.5

7.8

7.3

6.4

8.2

7.4

Market Shock 3 - Expectations of US Federal Reserve rates increase combined with tapering in bond purchases has caused domestic currency exchange rate to depreciate by 40% to the USD

Depreciation to USD (%)

40%

Change in Net Spot Position (long minus short) - USD - post-shock

-262.4

-116.0

-62.0

-30.0

-44.4

-10.0

Impact on capital (%)

100%

Impact on RWA (%)

100%

Regulatory capital post-shock	15,476	4,786	2,574	2,092	3,246	2,778
RWA post-shock	186,097	57,789	31,631	25,338	37,377	33,964
Capital adequacy post-shock	8.3	8.3	8.1	8.3	8.7	8.2

Market Shock 4 - IFSI assets are funded by both UPSIA and IIFS - Market Shock 2 Scenario. The local RSA recognises an alpha factor of 0.5.

Assuming the total Sukūk and ICIS portfolio had been funded by UPSIA

Modelled decrease in market values (%)

Sukūk

30%

ICIS

15%

Change in market values following shock

1801

416

341

506

246

292

Sukūk

1588

360

297

474

194

263

ICIS

213

56

44

32

52

29

Impact on capital (%)

100%

Impact on RWA (%) - Sukūk

50%

Impact on RWA (%) - ICIS

150%

Regulatory Alpha Factor

50%

Regulatory capital post-shock

14,838

4694

2,466

1,869

3,167

2,642

RWA post-shock

185,406

57683

31,511

25,107

37,286

33,820

Capital adequacy post-shock

8.0

8.1

7.8

7.4

8.5

7.8

SCENARIO ANALYSIS

Section 3.5.2 Scenario Analysis

	IFSI (Islamic banking)	IIFS 1	IIFS 2	IIFS 3	IIFS 4	IIFS 5
Regulatory capital	15,739	4,902	2,636	2,122	3,290	2,788
Risk-weighted assets (RWA)	186,360	57,905	31,693	25,368	37,421	33,974
Capital adequacy ratio (CAR) pre-shock	8.4	8.5	8.3	8.4	8.8	8.2
Macroeconomic Shock 1						
Credit Shock 1 and 1A						
Impact on Regulatory Capital	1,569	532	251	196	283	307
Impact on RWA	1,670	576	263	212	293	326
Market Shock 1						
Impact on Regulatory Capital	462	139	106	82	67	67
Impact on RWA	866	261	199	155	126	125
Regulatory capital post-shock	13,708	4,231	2,279	1,844	2,940	2,414
RWA post-shock	183,824	57,068	31,230	25,001	37,002	33,523
Capital adequacy ratio (CAR) post-shock	7.5	7.4	7.3	7.4	7.9	7.2
Macroeconomic Shock 2						
Credit Shock 2						
Impact on Regulatory Capital	923	295	148	123	161	197
Impact on RWA	858	275	137	113	151	182

Market Shock 2						
<i>Impact on Regulatory Capital</i>	1,801	416	341	506	246	292
<i>Impact on RWA</i>	1,113	264	215	285	174	175
Regulatory capital post-shock	10,984	3,520	1,790	1,216	2,533	1,925
RWA post-shock	181,852	56,528	30,878	24,604	36,676	33,165
Capital adequacy ratio (CAR) post-shock	6.0	6.2	5.8	4.9	6.9	5.8

1. Overview on Liquidity Stress Test Framework for IIFS

This version: 25 February, 2016

The liquidity stress test framework for IIFS is derived from the Martin Cihak's stress test template (2007) (higher granularity, particularly on the assets side, use of haircuts) and Schmieder and others (2012) (for liquidity coverage ratio and net stable funding ratio) next generation stress tester taking into account the peculiarities of IIFS. The framework consists of three modules Implied Cash Flows (5 days & 30 days), maturity mismatch analysis, LCR and NSFR, which also incorporates recent regulatory framework for liquidity risk (LCR and NSFR) for liquidity stress tests.

Methods					
Type	Rationale	Description		Shock	
		Liability side	Asset side	Liability side	Asset side
Implied Cash Flow Analysis (ICFA)	Modification of liquidity test based on Cihak 2007 and Schmieder and others (2012) next generation stress tester based on the peculiarities of IIFS (higher granularity, particularly on the assets side, use of haircuts) .	Substantial (sudden) outflow of funding	The ICFA is similar to Liquidity Coverage Test (LCR) under Basel III which was calibrated to IIFS through GN-6 by IFSB.	Outflow of 30 percent of funding within a month; 5 percent consecutive outflow during five days	10 percent of assets are liquid (cash, government securities, bank bonds); 90 percent of liquid assets are unencumbered; Haircuts of 0 percent (cash), 5 percent (sovereign Shari'ah compliant instruments/Sukuk), 10 percent (Other Sukuk)
Liquidity Coverage Ratio	The ICFA is similar to Liquidity Coverage Test (LCR) under Basel III which was calibrated to IIFS through GN-6 by IFSB.	Calculation of net cash outflow	Haircuts for different types of assets based on their characteristics (Level 1, level 2A and 2B)	Increase in outflows and decrease in inflows; parameters for roll over are set by stress tester	Application of haircuts for liquid assets used to counterbalance funding gaps
Maturity Mismatch Analysis	Comparison of the maturity structure of assets and liabilities to identify funding gaps under different scenarios. T	Simulation of funding subject to rollover.	Simulation of compensation of loss of funding by liquid assets under specific assumptions.	20 percent of funding maturing during the next 12 months cannot be rolled over.	How much deleveraging is necessary to stay liquid
Net stable Funding Ratio	The net stable funding ratio is part of the liquidity test to be introduced as part of Basel III and assesses the stability of a bank's funding sources in more structural terms. The currently foreseen framework is implemented. The test will be adopted according to the final decision by the Basel Committee.	Calculation of stable funding.	Calculation of required stable funding resulting from business activities.	Parameters in line with GN-6	Parameters in line with GN-6.

2- Inputs for the Tests

IIFS	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Year	2014	2014	2014	2014	2014	2014
Month	12	12	12	12	12	12
Type of bank		Fully fledged	Fully fledged	Fully fledged	Fully fledged	Fully fledged
Parent name						
Ownership by parent (Percent)						
Consolidated (= "Yes"), Standalone (= "No")						

Data from Financial Statements, P&L, Regulatory Data	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Assets	82,084,134	16,849,329	16,545,897	15,947,302	16,447,158	16,294,449
Market share in Islamic Banking (Assets)	100%	20.5%	20.2%	19.4%	20.0%	19.9%
Market share in Banking (Assets)	15%	3.1%	3.0%	2.9%	3.0%	3.0%
Liquid Assets (reported, e.g. according to bank's definition)	30,380,417	6,300,865	5,997,190	4,183,220	5,963,106	7,936,036
Total Credit Exposure (including counterparty credit risk)	56,072,164	11,418,599	10,439,524	12,992,519	12,126,392	9,095,130
Total Funding liabilities	74,112,949	14,552,627	15,267,373	14,958,984	14,617,758	14,716,207
Total regulatory capital	7,009,048	1,671,897	1,165,293	1,516,350	1,574,910	1,080,598
Tier 1 Capital	5,726,351	1,451,240	935,663	972,074	1,395,943	971,431
Net income (post-tax, previous year)	569,614	70,864	43,938	13,389	388,066	53,358
Capital Ratio (Before stress, reported)	12.2%	12.4%	10.5%	11.9%	13.2%	12.8%
Tier 1 ratio (Before Stress, Reported)	10.0%	10.8%	8.4%	7.6%	11.7%	11.5%

Input Parameters for Liquidity Risk Analysis - Core	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Liquid assets/total assets	37.0%	37.4%	36.2%	26.2%	36.3%	48.7%
Liquid assets/short-term liabilities	72.3%	73.3%	73.3%	30.6%	82.2%	101.1%
Customer Deposits and UPSIA/total assets	51.8%	17.5%	62.0%	79.6%	56.0%	45.2%
UPSIA/ Total Assets		26.6%	31.2%	32.7%	27.4%	28.6%
RPSIA/ Total Assets		3.1%	2.5%	0.8%	3.7%	2.8%
Total Financing/Total Deposits	122.8%	153.6%	101.8%	102.3%	131.7%	123.4%

Total Customer Deposits/UPSIA	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Demand Deposits (Current Accounts)	46,961,414	7,435,069	10,256,137	12,695,351	9,205,985	7,368,871
Retail	22,934,771	2,955,882	5,095,079	7,475,924	4,699,431	2,708,454
Stable	13,760,862	1,773,529	3,057,047	4,485,554	2,819,659	1,625,073
Less Stable	2,752,172	354,706	611,409	897,111	563,932	325,015
Wholesale	11,008,690	1,418,823	2,445,638	3,588,444	2,255,727	1,300,058
Stable	9,173,908	1,182,353	2,038,032	2,990,370	1,879,772	1,083,382
Less Stable	1,834,782	236,471	407,606	598,074	375,954	216,676
	7,339,127	945,882	1,630,425	2,392,296	1,503,818	866,705
	0					

Term Deposits/UPSIA	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Retail Deposits/UPSIA	24,026,643	4,479,187	5,161,058	5,219,427	4,506,554	4,660,417
Stable	9,592,602	2,199,419	2,686,470	1,442,448	2,221,110	1,043,155
Less Stable		659,826	805,941	432,734	666,333	312,947
Wholesale	14,434,041	1,539,593	1,880,529	1,009,714	1,554,777	730,209
Small business customers/SMEs		2,279,768	2,474,588	3,776,979	2,285,444	3,617,262
Operational Accounts		810,902	990,835	2,006,792	915,378	1,446,905
Institutional Network of cooperative IIFS		270,947	347,628	378,254	228,844	361,726
Non-financial corp., sovereigns, central banks, MDBs and PSEs		313,988	123,749	258,840	114,422	180,452
Other entities		883,930	1,012,376	1,133,094	1,026,800	1,628,179
		1,234,455	1,076,566	987,467	897,566	456,735

RPSIA	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
RPSIA maturity less than 5 days	2,119,041	529,600	413,215	125,452	600,524	450,250
RPSIA maturity less than 30 days	21,190	5,296	4,132	1,255	6,005	4,503
	211,904	52,960	41,322	12,545	60,052	45,025

Short-term Funding

Secured
<ul style="list-style-type: none"> Backed by Level 1 assets or with central banks Backed by Level 2A assets Secured funding transactions with domestic sovereign, PSEs or MDBs that are not backed by Level 1 or 2A assets. PSEs that receive this treatment are limited to those that have a risk weight of 20% or lower. Backed by Shari'ah-compliant residential mortgage-backed securities (RMBS)[1] eligible for inclusion in Level 2B Backed by other Level 2B assets
All others
Unsecured

22,613,419
568,019
22,045,400

5,644,580	3,083,727	6,184,798	2,556,521	5,143,792
14,568	94,935	107,912	21,594	329,010
8,976	75,765	100,765	15,667	127,885
5,592	19,170	7,147	5,927	201,125
5,630,012	2,988,792	6,076,886	2,534,927	4,814,782

Central Bank Funding

0

0	0	0	0	0
---	---	---	---	---

Intragroup funding & commitment

0

0	0	0	0	0
---	---	---	---	---

Long-term funding (Sukuk or other)

Domestic Currency
Foreign Currency
USD
EUR
YEN

5,481,171
3,766,698
1,714,473
0
0

619,801	944,451	1,298,261	1,993,290	625,368
415,000	850,244	750,545	1,300,234	450,675
204,801	94,207	547,716	693,056	174,693
204,801	94,207	547,716	693,056	174,693

Equity-type funding

7,438,114

2,168,248	1,125,821	1,340,076	1,683,934	1,120,035
-----------	-----------	-----------	-----------	-----------

Contingent liabilities

10,477,679

2,356,343	4,545,545	0	123,435	3,452,356
-----------	-----------	---	---------	-----------

		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Assets	82,084,134	16,849,329	16,545,897	15,947,302	16,447,158	16,294,449
Cash and cash equivalent	1,238,526	550,408	45,876	120,454	454,344	67,444
Central Bank Reserves	8,204,916	2,550,408	465,311	1,050,720	3,355,029	783,448
Government Bonds & Treasury Bills and other exposure with 0% risk-weighting	12,836,915	342,984	4,642,013	1,853,810	725,895	5,272,213
Financial assets held-to maturity	4,136,576	1,500,343	120,565	600,056	1,245,567	670,045
Financial assets available for sale (Investments)	2,771,957	1,175,559	559,035	170,212	65,315	801,836
Financial assets held-for-trading	359,081	130,618	71,799	32,361	10,671	113,632
Asset backed assets	0	0	0	0	0	0
Equities	372,675	50,545	5,435	234,567	75,564	6,564
Derivatives	459,771	0	87,156	121,040	30,721	220,854
Other assets	1,386,515	791,616	124,323	198,288	106,366	165,922
Intra group financing and commitments	0	0	0	0	0	0
Financing (customers /financial institutions financing)	56,072,164	11,418,599	10,439,524	12,992,519	12,126,392	9,095,130
Off-balance sheet financing	13,882,150	2,906,325	1,553,388	3,179,385	4,075,747	2,167,305

For Liquidity Coverage Ratio

Level 1 Assets
Level 2A Assets
Level 2B Assets
ALA treatment
Stable retail deposits/UPSIA by natural persons and small businesses
Less stable retail deposits/UPSIA by natural persons and small businesses
Operational Accounts
Operational Accounts (covered by deposit insurance scheme)
Cooperative IIFS in an institutional network
Non-financial corp, sovereigns, central banks, MDBs and PSEs
Non-financial corp, sovereigns, central banks, MDBs and PSEs (covered by deposit insurance scheme)
Secured funding backed by Level 1 assets
Secured funding backed by Level 2 assets

2,778,969
836,990
0
0
9,173,909
4,586,954
4,716,717
5,857,420
1,528,985
2,966,794
4,450,191
113,604
170,405

IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
881,670	419,277	627,659	248,986	601,377
293,890	139,759	42,553	160,329	200,459
45,875	0	0	0	0
0	0	0	0	0
1,182,353	2,038,032	2,990,370	1,879,772	1,083,382
591,176	1,019,016	1,495,185	939,886	541,691
1,066,473	1,228,823	0	1,073,703	1,347,718
1,030,060	1,409,844	986,822	1,264,547	1,166,147
197,059	339,672	498,395	313,295	180,564
492,424	702,524	598,074	633,643	540,129
738,636	1,053,786	897,111	950,465	810,193
2,914	18,987	21,582	4,319	65,802
4,370	28,480	32,374	6,478	98,703

Secured funding backed by other valuable assets (close to Level 2)	113,604	2,914	18,987	21,582	4,319	65,802
Collateral needed in case of downgrade by 3 notches	0					
Undrawn but committed credit facilities to corporate and retail customers	0	0	0	0	0	0
Undrawn but committed liability facilities	0					
Other contingent funding liabilities and Shariah compliant hedging (such as guarantees, letters of credit, revocable)	13,882,150	2,906,325	1,553,388	3,179,385	4,075,747	2,167,305
Scheduled outflows	0					
Planned outflows related to renewal or extension of new loans (retail or wholesale)	2,803,608	570,930	521,976	649,626	606,320	454,756
Schedule cash inflows during next 30 days	5,064,620	987,194	1,025,229	963,362	1,009,953	1,078,882
RPSIA with maturity less than 30 days	211,904	52,960	41,322	12,545	60,052	45,025
Investment to HQLA for RPSIA	42,381	10,592	8,264	2,509	12,010	9,005

For Liquidity Coverage Ratio (In Detail)

High quality Liquid Assets

A. Level 1 assets:	25,182,748	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Coins and banknotes	1,238,526	3,489,676	5,942,767	4,481,752	5,080,913	6,187,640
Qualifying central bank reserves (including required reserves).	8,204,916	550,408	45,876	120,454	454,344	67,444
Qualifying Sukūk and other Shari'ah-compliant marketable securities issued or guaranteed by sovereigns, ce	0	2,550,408	465,311	1,050,720	3,355,029	783,448
Qualifying domestic currency Sukūk and other Shari'ah-compliant marketable securities issued by sovereign	12,836,915	0	0	0	0	0
Qualifying foreign currencies' Sukūk and other Shari'ah-compliant marketable securities issued by sovereign	2,902,391	342,984	4,642,013	1,853,810	725,895	5,272,213
B. Level 2 assets (maximum of 40% of HQLA):	378,996	45,876	789,567	1,456,768	545,645	64,535
Level 2A assets	290,568	293,890	0	85,106	0	0
Shari'ah-compliant marketable securities issued or guaranteed by sovereigns, central banks, PSEs, multilate	224,594	248,015	0	42,553	0	0
Qualifying Shari'ah-compliant securities (including commercial paper) and Sukūk that satisfy all of the condi	65,974	182,041	0	42,553	0	0
Level 2B assets (maximum of 15% of HQLA)	45,875	65,974	0	0	0	0
Qualifying Sukūk and other Shari'ah-compliant securities	0	45,875	0	0	0	0
Qualifying Shari'ah-compliant equity shares	45,875	0	0	0	0	0
Qualifying other Shari'ah-compliant liquidity instruments that are widely recognised in the jurisdictions of th	0	0	0	0	0	0

Net Cash Outflow

A. Retail deposits and PSIA:	23,353,464	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Demand deposits and term deposits (less than 30 days' maturity)	23,353,464	3,972,948	5,743,517	5,928,002	5,040,769	2,668,228
• Stable deposits (Shari'ah-compliant deposit insurance scheme meets additional criteria)	0	3,972,948	5,743,517	5,928,002	5,040,769	2,668,228
• Stable deposits	5,629,953	1,014,532	1,417,350	1,329,845	1,230,265	637,961
• Less stable retail deposits	17,723,511	2,958,417	4,326,167	4,598,157	3,810,504	2,030,267
Term deposits and RPSIA with residual maturity greater than 30 days	0	0	0	0	0	0
B. Unsecured wholesale funding:	0					
Demand and term deposits (less than 30 days' maturity) provided by small business customers:	0					
• Stable deposits	6,164,994	920,401	1,149,983	1,731,168	1,061,588	1,301,855
• Less stable deposits	8,269,047	1,359,367	1,324,605	2,045,812	1,223,856	2,315,407
Operational accounts generated by clearing, custody and cash management activities	1,587,400	270,947	347,628	378,254	228,844	361,726
• Portion covered by deposit insurance	0	0	0	0	0	0
Cooperative IIFS in an institutional network (qualifying deposits with the centralised institution)	991,452	313,988	123,749	258,840	114,422	180,452
Non-financial corporates, sovereigns, central banks, multilateral development banks and PSEs	5,684,379	883,930	1,012,376	1,133,094	1,026,800	1,628,179
• If the entire amount fully covered by deposit insurance scheme	0	0	0	0	0	0
Other legal entity customers	0					
C. Secured funding:	0					
• Secured funding transactions with a central bank counterparty or backed by Level 1 assets with any counte	113,604	2,914	18,987	21,582	4,319	65,802
• Secured funding transactions backed by Level 2A assets, with any counterparty	170,405	4,370	28,480	32,374	6,478	98,703
• Secured funding transactions backed by non-Level 1 or non-Level 2A assets, with domestic sovereigns, mu	113,604	2,914	18,987	21,582	4,319	65,802
• Backed by residential mortgage-backed securities (RMBS) eligible for inclusion in Level 2B	0	0	0	0	0	0
• Backed by other Level 2B assets	0	0	0	0	0	0
• All other secured funding transactions	0	0	0	0	0	0
D. Additional requirements:	0					
Shari'ah-compliant hedging (Tahawwut)	0					
Undrawn credit and liquidity facilities to retail and small business customers	0					
Undrawn credit facilities to non-financial corporate, as well as sovereign, central banks, PSEs and multilatera	0					
Other contractual obligations extend to financial institution	0					
Trade finance	0					

619,801	745,938	1,298,261	2,433,228	125,361
0	0	0	0	0
137,555	316,642	288,128	437,349	27,821
482,246	429,296	1,010,133	1,995,879	97,540

More than 5 years	0	0	0	0	0
	0				
	0				
	0				
	0				
	0				
	0				

Other on-balance sheet funding liabilities (Roll-over risk)

Less than 3 months	0				
3 to 12 months	0				
1 to 5 years	0				
More than 5 years	0				
	0				
	0				
	0				
	0				
	0				
	0				

Off-balance sheet liabilities (Roll-over risk)

Less than 3 months	0				
3 to 12 months	0				
1 to 5 years	0				
More than 5 years	0				
	0				
	0				
	0				
	0				
	0				
	0				

Assets

Cash, Government Sukuk

Less than 3 months	4,458,183	1,306,177	717,990	323,613	974,081	1,136,322
3 to 12 months	1,736,869	576,297	316,783	142,781	199,653	501,355
1 to 5 years	756,041	108,840	59,828	26,966	465,720	94,687
More than 5 years	1,197,344	371,669	204,302	92,083	205,953	323,337
	767,929	249,371	137,077	61,783	102,755	216,943
	0					
	0					
	0					
	0					
	0					
	0					

Trading Assets

Less than 3 months	55,853,645	11,827,409	10,439,524	12,992,519	11,499,063	9,095,130
3 to 12 months	9,305,543	1,732,175	1,757,268	2,187,009	2,098,123	1,530,968
1 to 5 years	13,892,386	4,993,023	2,053,856	2,556,128	2,500,017	1,789,362
More than 5 years	15,943,663	2,941,451	2,985,685	3,715,837	3,699,499	2,601,191
	16,712,053	2,160,760	3,642,715	4,533,545	3,201,424	3,173,609
	0					
	0					
	0					
	0					
	0					
	0					

Financing

Less than 3 months	0					
3 to 12 months	0					
1 to 5 years	0					
More than 5 years	0					

0
0
0
0
0
0

0
0
0
0
0
0

Off-balance sheet assets

Less than 3 months
3 to 12 months
1 to 5 years
More than 5 years

0
0
0
0
0

3- Assumptions for the Tests

Implied Cash Flow Tests (ICFT)

Outflow of Funds for CFT (5 and 30 days)
--

	5 Day Test		30 Day Test
	Percent outflow per day		Cumulative outflow during 30 days (Percent)
Total deposits	3.0%		5.0%
Demand Deposits	3.0%		10.0%
Retail Deposit and Small Business Customer	3%		5%
Stable			
Less Stable			
Wholesale Customer	10%		10%
Term Deposits/UPSIA	3.0%		3.0%
Retail Deposits/UPSIA	3%		1.0%
Wholesale deposits/UPSIA	6%		2.0%
Small business customers/SMEs			
Operational Accounts			
Other entities			
RPSIA with maturity less than 5 days	20%		
RPSIA with maturity less than 30 days	3%		1%
Short-term Funding	0.0%		0.0%
Secured			
• Backed by Level 1 assets or with central banks			
• Backed by Level 2A assets			
• Secured funding transactions with domestic sovereign, PSEs or MDBs that are not backed by Level 1 or 2A assets.			
• Backed by Shari'ah-compliant residential mortgage-backed securities (RMBS)[1] eligible for inclusion in Level 2B			
• Backed by other Level 2B assets			
• All others			
Unsecured			
		could also be inflow	
Central Bank Funding	Please Enter		Please Enter
		could also be inflow	
Intragroup funding & commitment	Please Enter		Please Enter
Long-term funding/ RPSIA	0.0%	Note: Long-term funding unlikely to be withdrawn within a few days	0.0%
Domestic Currency	0%		0%
Foreign Currency	0%		0%
	0%		0%
	0%		0%

Contingent Liabilities	0%	0%
RPSIA	0%	0%

Inflow of Funds for ICFT (gradual for 5 periods and cumulative one longer period)

	5 Period Test						
	Remains liquid?	Haircut (in case of fire sale)	Value after haircut	Percent Encumbered - PreTest	Additional encumbered (due to margin calls)	Percent Unencumbered - Post Test	Percent Unencumbered liquid Assets
Assets			27.1%			123.9%	27.1%
Cash and cash equivalent	Yes	0.0%	100.0%	0.0%		100.0%	100.0%
Central Bank Reserves	Yes	0.0%	100.0%	0.0%		100.0%	100.0%
Government Bonds & Treasury Bills and other exposure with 0% risk-weight	Yes	20.0%	80.0%	0.0%		100.0%	80.0%
Financial assets held-to maturity	No		0.0%	0.0%		100.0%	0.0%
Financial assets available for sale (Investments)	Yes	30.0%	70.0%	0.0%		100.0%	70.0%
Financial assets held-for-trading	Yes	40.0%	60.0%	0.0%		100.0%	60.0%
Asset backed assets	No	0.0%	0.0%	0.0%		100.0%	0.0%
Equities	Yes	50.0%	50.0%	0.0%		100.0%	50.0%
Derivatives	Yes	50.0%	50.0%	0.0%		100.0%	50.0%
Other assets	No		0.0%	0.0%		100.0%	0.0%
Intra group financing and commitments	No		0.0%	0.0%		100.0%	0.0%
Financing (customers /financial institutions financing)	No		0.0%	0.0%		100.0%	0.0%
Off-balance sheet financing	No		0.0%	0.0%		100.0%	0.0%

	One single period test						
	Remains liquid?	Haircut (in case of fire sale)	Value after haircut	Percent Encumbered - PreTest	Additional encumbered (due to margin calls)	Percent Unencumbered - Post Test	Percent Unencumbered liquid Assets
Assets			27.1%			123.9%	27.1%
Level 1 Assets	Yes	0.0%	100.0%	0.0%		100.0%	100.0%
Level 2A Assets	Yes	0.0%	100.0%	0.0%		100.0%	100.0%
Level 2B Assets	Yes	20.0%	80.0%	0.0%		100.0%	80.0%
ALA treatment	No		0.0%	0.0%		100.0%	0.0%
Stable retail deposits/UPSIA by natural persons and small businesses	yes	30.0%	70.0%	0.0%		100.0%	70.0%
Less stable retail deposits/UPSIA by natural persons and small businesses	yes	40.0%	60.0%	0.0%		100.0%	60.0%
Operational Accounts	yes	0.0%	100.0%	0.0%		100.0%	100.0%
Operational Accounts (covered by deposit insurance scheme)	yes	50.0%	50.0%	0.0%		100.0%	50.0%
Cooperative IIFS in an institutional network	yes	50.0%	50.0%	0.0%		100.0%	50.0%
Non-financial corp, sovereigns, central banks, MDBs and PSEs	No		0.0%	0.0%		100.0%	0.0%
Non-financial corp, sovereigns, central banks, MDBs and PSEs (covered by collateral)	No		0.0%	0.0%		100.0%	0.0%
Secured funding backed by Level 1 assets	No		0.0%	0.0%		100.0%	0.0%
Secured funding backed by Level 2 assets	No		0.0%	0.0%		100.0%	0.0%

Outflow of Funds - LCR Test	
Purpose of the test: Simulation of (i) Three notch downgrade in rating, (ii) Run-off of a proportion of retail deposits, (iii) Loss of unsecured wholesale funding, reduction of secured wholesale term funding; (iv) Loss of secured short-term financing for all but high quality liquid assets; (v) Requirement of higher collateral haircuts and/or more collateral to satisfy derivative positions; (vi) Draws of committed but unused credit and liquidity facilities; (vii) Need to fund balance sheet growth to mitigate reputational risk	

High quality Liquid Assets	
A. Level 1 assets:	
Coins and banknotes	100%
Qualifying central bank reserves (including required reserves).	100%
Qualifying <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued or guaranteed by sovereigns, central banks, PSEs, MDBs or relevant international organisations assigned a 0% risk weight for credit risk under IFSB-15	100%
Qualifying domestic currency <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued by sovereign or central banks that have a non-0% risk weight	100%
Qualifying foreign currencies' <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued by sovereign or central banks that have a non-0% risk weight	100%
B. Level 2 assets (maximum of 40% of HQLA):	
Level 2A assets	
<i>Shari'ah</i> -compliant marketable securities issued or guaranteed by sovereigns, central banks, PSEs, multilateral development banks or relevant international organisations, qualifying for a 20% risk weighting for credit risk under IFSB-15.	85%
Qualifying <i>Shari'ah</i> -compliant securities (including commercial paper) and <i>Sukūk</i> that satisfy all of the conditions	85%
Level 2B assets (maximum of 15% of HQLA)	
Qualifying <i>Sukūk</i> and other <i>Shari'ah</i> -compliant securities	75%
Qualifying <i>Shari'ah</i> -compliant equity shares	50%
Qualifying other <i>Shari'ah</i> -compliant liquidity instruments that are widely recognised in the jurisdictions of the home country	50%

Outflow of funds	
A. Retail deposits and PSIA:	
Demand deposits and term deposits (less than 30 days' maturity)	
• Stable deposits (Shari'ah-compliant deposit insurance scheme meets additional criteria)	3%
• Stable deposits	5%
• Less stable retail deposits	10%
Term deposits and RPSIA with residual maturity greater than 30 days	0%
B. Unsecured wholesale funding:	
Demand and term deposits (less than 30 days' maturity) provided by small business customers:	
• Stable deposits	5%
• Less stable deposits	10%
Operational accounts generated by clearing, custody and cash management activities	25%
• Portion covered by deposit insurance	5%
Cooperative IIFS in an institutional network (qualifying deposits with the centralised institution)	25%
Non-financial corporates, sovereigns, central banks, multilateral development banks and PSEs	40%
• If the entire amount fully covered by deposit insurance scheme	20%
Other legal entity customers	100%
C. Secured funding:	
• Secured funding transactions with a central bank counterparty or backed by Level 1 assets with any counterparty.	0%
• Secured funding transactions backed by Level 2A assets, with any counterparty	15%
• Secured funding transactions backed by non-Level 1 or non-Level 2A assets, with domestic sovereigns, multilateral development banks or domestic PSEs as a counterparty	25%
• Backed by residential mortgage-backed securities (RMBS) eligible for inclusion in Level 2B	25%
• Backed by other Level 2B assets	50%
• All other secured funding transactions	100%
D. Additional requirements:[1]	
Shari'ah-compliant hedging (Tahawwut)	100%
Undrawn credit and liquidity facilities to retail and small business customers	50%
Undrawn credit facilities to non-financial corporate, as well as sovereign, central banks, PSEs and multilateral development banks	10%
Other contractual obligations extend to financial institution	100%

Trade finance	0%
Any additional contractual outflows	100%
Any other contractual cash outflows	100%
Secured funding backed by Level 1 assets	0%
Secured funding backed by Level 2 assets	15%
Secured funding backed by other valuable assets (close to Level 2)	25%
Collateral needed in case of downgrade by 3 notches	
Undrawn but committed credit facilities to corporate and retail customers	
Undrawn but committed liability facilities	
Portion of assets reinvested	80%

NSFR

Available Stable Funding	
<ul style="list-style-type: none"> • Total regulatory capital (excluding Tier 2 instruments with residual maturity of less than one year); • Other capital instruments and liabilities with effective residual maturity of one year or more 	100%
<ul style="list-style-type: none"> • Stable deposits and/or unrestricted profit-sharing investment account (UPSIA) with residual maturity of less than one year provided by retail and small business customers 	95%
<ul style="list-style-type: none"> • Less stable deposits and/or UPSIA with residual maturity of less than one year provided by retail and small business customers 	90%
<ul style="list-style-type: none"> • Funding with residual maturity of less than one year provided by non-financial corporate customers; • Operational accounts; • Funding with residual maturity of less than one year from sovereigns, public-sector entities (PSEs), and multilateral and national development banks • Other funding with residual maturity between six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions 	50%
<ul style="list-style-type: none"> • All other liabilities and equity not included in the above categories, including liabilities without a stated maturity (with a specific treatment for deferred tax liabilities and minority interests); • Net NSFR Shari'ah-compliant hedging liabilities (if NSFR Shari'ah-compliant hedging liabilities are greater than NSFR Shari'ah-compliant hedging assets); • "Trade date" payables arising from purchases of financial instruments, foreign currencies and commodities 	0%

Required Stable Funding		
<ul style="list-style-type: none"> • Cash; All central bank reserves; all claims on central banks with residual maturities of less than six months; "Trade date" receivables arising from sales of financial instruments, foreign currencies and commodities 		0%
<ul style="list-style-type: none"> • Unencumbered Level 1 assets, excluding coins, banknotes and central bank reserves 		5%
<ul style="list-style-type: none"> • Unencumbered financings to financial institutions with residual maturities of less than six months, where the financing is secured against Level 1 assets 		10%
<ul style="list-style-type: none"> • All other unencumbered financing to financial institutions with residual maturities of less than six months not included in the above categories; Unencumbered Level 2A assets 		15%
<ul style="list-style-type: none"> • Unencumbered Level 2B assets; High-quality liquid assets (HQLA) encumbered for a period of six months or more and less than one year; Financing to financial institutions and central banks 		50%

<ul style="list-style-type: none"> • Unencumbered residential real estate financing with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach; Other unencumbered financing not included in the above categories, excluding financing to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach 		65%
<ul style="list-style-type: none"> • Cash, securities or other assets posted as initial margin for <i>Shari`ah</i> - compliant hedging contracts and cash or other assets provided to contribute to the default fund of a central counterparty; Other unencumbered performing financing with risk weights greater than 35% under the standardised approach and residual maturities of one year or more, excluding financing to financial institutions; Unencumbered securities that are not in default and do not qualify as HQLA with a remaining maturity of one year or more and exchange-traded equities; Physical traded commodities 		85%
<ul style="list-style-type: none"> • All assets that are encumbered for a period of one year or more; All other assets not included in the above categories, including non-performing financing, financing to financial institutions with a residual maturity of one year or more, non-exchange-traded equities, fixed assets, items deducted from regulatory capital, <i>Takāful</i> assets, and defaulted <i>Shari`ah</i> - compliant securities 		100%

Broad (Liabilities and Assets)

Liabilities	Portion of liabilities that can be/are rolled over	Haircut (resulting from margin calls, etc.)	Liabilities rolled over
Less than 3 months	100%	0%	100.0%
3 to 12 months	100%	0%	100.0%
1 to 5 years	100%	0%	100.0%
More than 5 years	100%	0%	100.0%
Not assigned	0%	0%	0.0%
Not assigned	0%	0%	0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%

Assets	Percent of assets that are renewed	Change in value	Assets carried forward
Less than 3 months	100%	0%	100.0%
3 to 12 months	100%	0%	100.0%
1 to 5 years	100%	0%	100.0%
More than 5 years	100%	0%	100.0%
Not assigned	100%	0%	100.0%
Not assigned	100%	0%	100.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%

Fine-granular buckets

Interbank liabilities (Roll-over risk)	Portion of liabilities that can be/are rolled over	Haircut (resulting from margin calls, etc.)	Liabilities rolled over
Less than 3 months	80%	0%	80.0%
3 to 12 months	80%	0%	80.0%
1 to 5 years	80%	0%	80.0%
More than 5 years	80%	0%	80.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%

Trading Assets, Derivatives & Securities	Percent of assets that are renewed	Change in value	Assets carried forward
Less than 3 months	100%	0%	100.0%
3 to 12 months	100%	0%	100.0%
1 to 5 years	100%	0%	100.0%
More than 5 years	100%	0%	100.0%
Not assigned	0%	0%	0.0%
Not assigned	0%	0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%

Long-term liabilities (Roll-over risk)	Portion of liabilities that can be/are rolled over	Haircut for liabilities that can be rolled over	Liabilities rolled over
Less than 3 months	80%	0%	80.0%
3 to 12 months	80%	0%	80.0%
1 to 5 years	80%	0%	80.0%
More than 5 years	80%	0%	80.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%

Loans	Percent of assets that are renewed	Change in value	Assets carried forward
Less than 3 months	100%	0%	100.0%
3 to 12 months	100%	0%	100.0%
1 to 5 years	100%	0%	100.0%
More than 5 years	100%	0%	100.0%
Not assigned	0%	0%	0.0%
Not assigned	0%	0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%

Other on-balance sheet funding liabilities (Roll-over risk)	Portion of liabilities that can be/are rolled over	Haircut for liabilities that can be rolled over	Liabilities rolled over
Less than 3 months	80%	0%	80.0%
3 to 12 months	80%	0%	80.0%
1 to 5 years	80%	0%	80.0%
More than 5 years	80%	0%	80.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%

Off-balance sheet assets	Percent of assets that are renewed	Change in value	Assets carried forward
Less than 3 months	100%	0%	100.0%
3 to 12 months	100%	0%	100.0%
1 to 5 years	100%	0%	100.0%
More than 5 years	100%	0%	100.0%
Not assigned	0%	0%	0.0%
Not assigned	0%	0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%

Not assigned			0.0%
--------------	--	--	------

Off-balance sheet liabilities (Roll-over risk)	Portion of liabilities that can be/are rolled over	Haircut for liabilities that can be rolled over	Liabilities rolled over
Less than 3 months	80%	0%	80.0%
3 to 12 months	80%	0%	80.0%
1 to 5 years	80%	0%	80.0%
More than 5 years	80%	0%	80.0%
Not assigned		0%	0.0%
Not assigned		0%	0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%
Not assigned			0.0%

Not assigned		0%	0.0%
--------------	--	----	------

4- Result of Stress Tests

Scenario Definition

Assumptions based on...

Market-
wide/Uniform

Test 1-a: Cash Flow Test: Simulation of a run on deposits - 5 day test

	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Situation before Test							
Total Deposits	46,961,413.7		7,435,069	10,256,137	12,695,351	9,205,985	7,368,871
Total Short Term Funding (Wholesale)	22,613,418.6		5,644,580	3,083,727	6,184,798	2,556,521	5,143,792
Total Assets	82,084,134.4		16,849,329	16,545,897	15,947,302	16,447,158	16,294,449
thereof: Liquid Assets (according to scenario)	22,285,015.5		4,301,738	4,705,497	2,970,591	4,495,355	5,811,836
thereof: Illiquid Assets (according to scenario)	59,799,118.9		12,547,591	11,840,400	12,976,712	11,951,803	10,482,613
Period 1	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding	2,484,037.2		393,280	542,501	671,524	486,953	389,779
Outflow of deposits	2,484,037.2		393,280	542,501	671,524	486,953	389,779
Short term Funding	0.0		n.a.	n.a.	n.a.	n.a.	n.a.
Change of other funding	0.0		n.a.	n.a.	n.a.	n.a.	n.a.
Outflow of RPSIA			15,888	12,396	3,764	18,016	13,508
Inflow of Assets (through Fire Sale)	22,285,015.5		4,301,738	4,705,497	2,970,591	4,495,355	5,811,836
Net Cash Inflow since beginning of test	0		n.a.	n.a.	n.a.	n.a.	n.a.
Illiquid? (0=no, 1=yes)	0		n.a.	n.a.	n.a.	n.a.	n.a.
Period 2	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding (Day 2)	2,380,981.6		382,613	518,552	630,645	472,138	377,034
Outflow of deposits (Day 2)	2,319,317.5		367,201	506,527	626,995	454,663	363,932
Loss of Wholesale Funding (Day 2)	0		0	0	0	0	0
Change of other funding (Day 2)	0		n.a.	n.a.	n.a.	n.a.	n.a.
Outflow of RPSIA	61,664		15,411	12,025	3,651	17,475	13,102
Cumulative Outflow of Funding (after Day 2)	4,928,590.0		791,781	1,073,450	1,305,933	977,107	780,320
Cumulative outflow of deposits	4,803,354.7		760,481	1,049,029	1,298,519	941,616	753,710
Cumulative loss of wholesale funding	0		0	0	0	0	0
Cumulative change of other funding	0		0	0	0	0	0
Cumulative change of RPSIA	125,235		31,299	24,421	7,414	35,491	26,610
Net Cash Inflow since beginning of test	17,356,425.5		3,509,957	3,632,047	1,664,658	3,518,248	5,031,516
Illiquid? (0=no, 1=yes)	0		0	0	0	0	0
Period 3	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding (Day 3)	2,227,334.1		358,117	485,039	589,499	441,856	352,822
Outflow of deposits (Day 3)	2,167,519.9		343,168	473,375	585,958	424,905	340,113

Loss of Wholesale Funding	0	0	0	0	0	0
Change of other funding (Day 3)	0	n.a	n.a	n.a	n.a	n.a
Outflow of RPSIA	59,814	14,949	11,664	3,541	16,951	12,709
Cumulative Outflow of Funding (after Day 3)	7,155,924.1	1,149,898	1,558,489	1,895,432	1,418,963	1,133,142
Cumulative outflow of deposits	6,970,874.6	1,103,649	1,522,404	1,884,477	1,366,521	1,093,823
Cumulative loss of wholesale funding	0	0	0	0	0	0
Cumulative change of other funding	0	0	0	0	0	0
Cumulative change of RPSIA	185,049	46,248	36,085	10,955	52,442	39,319
Net Cash Inflow since beginning of test	15,129,091.4	3,151,840	3,147,008	1,075,158	3,076,391	4,678,694
Illiquid? (0=no, 1=yes)	0	0	0	0	0	0
Period 4	System	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding (Day 4)	2,027,521.2	321,003	442,800	548,112	397,461	318,145
Outflow of deposits (Day 4)	2,027,521.2	321,003	442,800	548,112	397,461	318,145
Loss of Wholesale Funding (Day 4)	0	0	0	0	0	0
Change of other funding (Day 4)	0	n.a	n.a	n.a	n.a	n.a
Outflow of RPSIA	58,020	14,501	11,314	3,435	16,442	12,328
Cumulative Outflow of Funding (after Day 4)	8,998,395.8	1,424,652	1,965,204	2,432,589	1,763,982	1,411,968
Cumulative outflow of deposits	8,998,395.8	1,424,652	1,965,204	2,432,589	1,763,982	1,411,968
Cumulative loss of wholesale funding	0	0	0	0	0	0
Cumulative change of other funding	0	0	0	0	0	0
Cumulative change of RPSIA	243,069	60,749	47,399	14,390	68,884	51,647
Net Cash Inflow since beginning of test	13,043,550.4	2,816,336	2,692,894	523,612	2,662,488	4,348,221
Illiquid? (0=no, 1=yes)	0	0	0	0	0	0
Period 5	System	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding (Day 5)	1,954,580.7	314,610	425,554	516,511	388,079	309,827
Outflow of deposits (Day 5)	1,898,301.5	300,545	414,580	513,179	372,130	297,869
Loss of Wholesale Funding (Day 5)	0	0	0	0	0	0
Change of other funding (Day 5)	0	n.a	n.a	n.a	n.a	n.a
Outflow of RPSIA	56,279	14,066	10,974	3,332	15,949	11,958
Cumulative Outflow of Funding (after Day 5)	10,896,697.3	1,725,197	2,379,784	2,945,767	2,136,112	1,709,837
Cumulative outflow of deposits	10,896,697.3	1,725,197	2,379,784	2,945,767	2,136,112	1,709,837
Cumulative loss of wholesale funding	0	0	0	0	0	0
Cumulative change of other funding	0	0	0	0	0	0
Cumulative change of RPSIA	299,348	74,814	58,373	17,722	84,834	63,605
Net Cash Inflow since beginning of test	11,088,969.8	2,501,726	2,267,340	7,101	2,274,409	4,038,394
Illiquid? (0=no, 1=yes)	0	0	0	0	0	0
Total Liquidity Shortfall (0 if no shortfall)	0	0	0	0	0	0
Test 1-b: Implied Cash Flow Test: Simulation of a run on deposits - 30 day test						

Situation before Test	System	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
------------------------------	---------------	--------------	--------------	--------------	--------------	--------------

Total Deposits	46,961,414		7,435,069	10,256,137	12,695,351	9,205,985	7,368,871
Liquid Assets (according to scenario)	22,285,016		4,301,738	4,705,497	2,970,591	4,495,355	5,811,836
Illiquid Assets (according to scenario)	59,799,119		12,547,591	11,840,400	12,976,712	11,951,803	10,482,613
Day 30	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Outflow of Funding	3,679,223		597,699	800,547	988,518	715,078	577,381
Outflow of deposits	3,641,344.3		576,508	795,251	984,386	713,824	571,375
Outflow of Wholesale Funding	0		0	0	0	0	0
Change of other funding	0		n.a	n.a	n.a	n.a	n.a
Outflow of RPSIA			21,190	5,296	4,132	1,255	6,005
Inflow of Assets (through Fire Sale)	20,860,152		3,726,057	4,656,903	2,732,853	4,003,229	5,741,110
Net Cash Inflow since beginning of test	17,180,929		3,128,359	3,856,356	1,744,335	3,288,151	5,163,729
Illiquid? (0=no, 1=yes)	0		0	0	0	0	0
Total Liquidity Shortfall (0 if no shortfall)	0		0	0	0	0	0

Test 2: Liquidity Coverage Ratio (LCR) Stress Test

	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Apply cap on Level 2 liquid assets (to %40 of Level 1 liquid assets)?							
Assets (Total)	82,084,134		16,849,329	16,545,897	15,947,302	16,447,158	16,294,449
Stock of High Quality Liquid Assets							
Level 1	25,182,748		3,489,676	5,942,767	4,481,752	5,080,913	6,187,640
Level 2	269,920		233,750	0	36,170	0	0
ALA Treatment	0		0	0	0	0	0
Total High Quality Assets	25,452,668		3,723,426	5,942,767	4,517,922	5,080,913	6,187,640
Total High Quality Assets (percent of Assets)	31.0%		22.1%	35.9%	28.3%	30.9%	38.0%

Calculation of potential Cash Outflow	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Outflow of retail deposits	2,053,849		346,568	503,484	526,308	442,564	234,925
Outflow of unsecured wholesale funding	4,053,619		681,763	712,754	903,651	672,002	1,083,449
Outflow from secured funding	53,962		1,384	9,019	10,252	2,051	31,256
Other contractual outflows	0		0	0	0	0	0
Outflow from RPSIA	169,523		42,368	33,057	10,036	48,042	36,020
Total Cash Outflow	6,330,953		1,072,083	1,258,314	1,450,246	1,164,659	1,385,650

Calculation of Cash Inflow	System		IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total Cash Inflows (Amounts from retail and wholesale counterparts)	5,064,620		987,194	1,025,229	963,362	1,009,953	1,078,882
Minus: portion of amortizing assets re-invested	4,051,696		789,755	820,183	770,690	807,962	863,106
Cash Inflow	1,012,924		197,439	205,046	192,672	201,991	215,776

Liquidity Coverage Ratio	4.82		4.26	5.64	3.59	5.28	5.29
Surplus/Shortfall of Liquidity	0.0		0	0	0	0	0
Number of banks below 1 (i.e. failing the test)	0		0	0	0	0	0

Test 3: Net Stable Funding Ratio (NSFR)

	System
Total Assets	82,084,134
Total Available Stable Funding	14,935,680
Total Required Stable Funding	3,632,994
Available Funding/Required Funding	4.09
Surplus/Shortfall of Liquidity	0.0
Number of banks below 1 (i.e. failing the test)	0

IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
16,849,329	16,545,897	15,947,302	16,447,158	16,294,449
3,919,197	3,641,193	2,769,720	2,587,930	2,017,640
853,109	695,013	716,094	714,133	654,644
4.59	5.24	3.87	3.62	3.08
0	0	0	0	0
0	0	0	0	0

5- Calculation

1 Implied Cash Flow Tests

5 Period test

Period 1	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Outflow of Funding	2,547,608	409,168	554,898	675,288	504,969	403,286
Total Customer Deposits/UPSIA	2,484,037	393,280	542,501	671,524	486,953	389,779
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a.	n.a.	n.a.	n.a.	n.a.
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contingent liabilities	0	0	0	0	0	0
RPSIA	63,571	15,888	12,396	3,764	18,016	13,508
Inflow of funds from fire sales of unencumbered liquid assets (scenario)	22,285,016	4,301,738	4,705,497	2,970,591	4,495,355	5,811,836

Period 2	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Outflow of Funding	2,380,982	382,613	518,552	630,645	472,138	377,034
Total Customer Deposits/UPSIA	2,319,317	367,201	506,527	626,995	454,663	363,932
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a.	n.a.	n.a.	n.a.	n.a.
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contingent liabilities	0	0	0	0	0	0
RPSIA	61,664	15,411	12,025	3,651	17,475	13,102

Period 3	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Outflow of Funding	2,227,334	358,117	485,039	589,499	441,856	352,822
Total Customer Deposits/UPSIA	2,167,520	343,168	473,375	585,958	424,905	340,113
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a.	n.a.	n.a.	n.a.	n.a.
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contingent liabilities	0	0	0	0	0	0
RPSIA	59,814	14,949	11,664	3,541	16,951	12,709

Period 4	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Outflow of Funding	2,085,541	335,504	454,114	551,546	413,903	330,473
Total Customer Deposits/UPSIA	2,027,521	321,003	442,800	548,112	397,461	318,145
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a.	n.a.	n.a.	n.a.	n.a.
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contingent liabilities	0	0	0	0	0	0
RPSIA	58,020	14,501	11,314	3,435	16,442	12,328

Period 5	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Outflow of Funding	1,954,581	314,610	425,554	516,511	388,079	309,827
Total Customer Deposits/UPSIA	1,898,301	300,545	414,580	513,179	372,130	297,869
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a.	n.a.	n.a.	n.a.	n.a.
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contingent liabilities	0	0	0	0	0	0
RPSIA	56,279	14,066	10,974	3,332	15,949	11,958

Percentile	25%	50%	75%	100%
Total Assets (Threshold)	16,294,449	16,447,158	16,545,897	16,849,329

Total Assets (in Quartile)	15,947,302	32,241,751	48,688,909	65,234,806
-----------------------------------	------------	------------	------------	------------

30 Period Test	System	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Net outflow of Funding	3,662,535	581,804	799,383	985,640	719,829	575,878
Total Customer Deposits/UPSIA	3,641,344	576,508	795,251	984,386	713,824	571,375
Short-term Funding	0	0	0	0	0	0
Central Bank Funding	0	n.a	n.a	n.a	n.a	n.a
Intragroup funding & commitment	0	n.a.	n.a.	n.a.	n.a.	n.a.
Long-term funding (Sukuk or other)	0	0	0	0	0	0
Contigent liabilities	0	n.a.	n.a.	n.a.	n.a.	n.a.
RPSIA	21,190	5,296	4,132	1,255	6,005	4,503
Total inflow of Funds	22,285,016	4,301,738	4,705,497	2,970,591	4,495,355	5,811,836

	5 Period Test					
	<i>Percent outflow first period</i>	<i>Additional, Period 2</i>	<i>Additional, Period 3</i>	<i>Additional, Period 4</i>	<i>Additional, Period 5</i>	<i>Cumulative, 5 Periods</i>
Total deposits	5.29%	4.94%	4.62%	4.32%	4.04%	23.2%
Demand deposits	5.8%	5.3%	4.9%	4.6%	4.2%	24.9%
Retail Deposit and Small Business Customer	3.0%	2.9%	2.8%	2.7%	2.7%	14.1%
Wholesale Customer	10.0%	9.0%	8.1%	7.3%	6.6%	0.0%
						0.0%
						41.0%
						0.0%
						0.0%
						0.0%
						0.0%

Term Deposits/UPSIA	4.8%	4.6%	4.3%	4.1%	3.9%	21.6%
Retail Deposits/UPSIA	3.0%	2.9%	2.8%	2.7%	2.7%	14.1%
Wholesale deposits/UPSIA	6.0%	5.6%	5.3%	5.0%	4.7%	0.0%
						0.0%
						26.6%
						0.0%
						0.0%
						0.0%
						0.0%

RPSIA	3.0%	2.9%	2.8%	2.7%	2.7%	14.1%
--------------	------	------	------	------	------	-------

Short-term Funding	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Secured	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unsecured	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0.0%
						0.0%
						0.0%

Central Bank Funding	n.a.	n.a.	n.a.	n.a.	n.a.	0.0%
-----------------------------	------	------	------	------	------	------

Intragroup funding & commitment	n.a.	n.a.	n.a.	n.a.	n.a.	0.0%
--	------	------	------	------	------	------

Long-term funding	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
--------------------------	------	------	------	------	------	------

30 Period Test
<i>Cumulative outflow during 30 Periods (Percent)</i>

7.75%
14.2%
7.0%
25.0%

1.6%
1.0%
2.0%

1.0%

0.0%
0.0%
0.0%

n.a.

n.a.

0.0%

Domestic Currency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Foreign Currency	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
						0.0%
						0.0%

0.0%
0.0%
0.0%
0.0%

Contingent Liabilities	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
-------------------------------	------	------	------	------	------	------

n.a.

RPSIA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
--------------	------	------	------	------	------	------

n.a.

2- Liquidity Coverage Ratio

	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Total High Quality Liquid Asset		3,723,426	5,942,767	4,517,922	5,080,913	6,187,640
A. Level 1 assets:		3,489,676	5,942,767	4,481,752	5,080,913	6,187,640
Coins and banknotes	1,238,526	550,408	45,876	120,454	454,344	67,444
Qualifying central bank reserves (including required reserves).	8,204,916	2,550,408	465,311	1,050,720	3,355,029	783,448
Qualifying <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued or guaranteed by sovereigns, central banks, PSEs, MDBs or relevant international organisations assigned a 0% risk weight for credit risk under IFSB-15	0	0	0	0	0	0
Qualifying domestic currency <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued by sovereign or central banks that have a non-0% risk weight	12,836,915	342,984	4,642,013	1,853,810	725,895	5,272,213
Qualifying foreign currencies' <i>Sukūk</i> and other <i>Shari'ah</i> -compliant marketable securities issued by sovereign or central banks that have a non-0% risk weight	2,902,391	45,876	789,567	1,456,768	545,645	64,535
B. Level 2 assets (maximum of 40% of HQLA):		233,750	0	36,170	0	0
Level 2A assets		210,813	0	36,170	0	0
<i>Shari'ah</i> -compliant marketable securities issued or guaranteed by sovereigns, central banks, PSEs, multilateral development banks or relevant international organisations, qualifying for a 20% risk weighting for credit risk under IFSB-15.	190,905	154,735	0	36,170	0	0
Qualifying <i>Shari'ah</i> -compliant securities (including commercial paper) and <i>Sukūk</i> that satisfy all of the conditions	56,078	56,078	0	0	0	0
Level 2B assets (maximum of 15% of HQLA)		22,938	0	0	0	0
Qualifying <i>Sukūk</i> and other <i>Shari'ah</i> -compliant securities	0	0	0	0	0	0
Qualifying <i>Shari'ah</i> -compliant equity shares	22,938	22,938	0	0	0	0
Qualifying other <i>Shari'ah</i> -compliant liquidity instruments that are widely recognised in the jurisdictions of the home country	0	0	0	0	0	0

	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Net Cash Outflow		1,029,715	1,225,257	1,440,210	1,116,617	1,349,630
A. Retail deposits and PSIA:	2,053,849	346,568	503,484	526,308	442,564	234,925
Demand deposits and term deposits (less than 30 days' maturity)	2,053,849	346,568	503,484	526,308	442,564	234,925
• Stable deposits (Shari'ah-compliant deposit insurance scheme meets additional criteria)	0	0	0	0	0	0
• Stable deposits	281,498	50,727	70,868	66,492	61,513	31,898
• Less stable retail deposits	1,772,351	295,842	432,617	459,816	381,050	203,027
Term deposits and RPSIA with residual maturity greater than 30 days	0	0	0	0	0	0
B. Unsecured wholesale funding:		681,763	712,754	903,651	672,002	1,083,449
Demand and term deposits (less than 30 days' maturity) provided by small business customers:		181,957	189,960	291,140	175,465	296,633
• Stable deposits	308,250	46,020	57,499	86,558	53,079	65,093
• Less stable deposits	826,905	135,937	132,461	204,581	122,386	231,541

Operational accounts generated by clearing, custody and cash management activities	396,850	67,737	86,907	94,564	57,211	90,432
• Portion covered by deposit insurance	0	0	0	0	0	0
Cooperative IIFS in an institutional network (qualifying deposits with the centralised institution)	247,863	78,497	30,937	64,710	28,606	45,113
Non-financial corporates, sovereigns, central banks, multilateral development banks and PSEs	2,273,751	353,572	404,950	453,237	410,720	651,271
• If the entire amount fully covered by deposit insurance scheme	0	0	0	0	0	0
Other legal entity customers	0	0	0	0	0	0
C. Secured funding:		1,384	9,019	10,252	2,051	31,256
• Secured funding transactions with a central bank counterparty or backed by Level 1 assets with any counterparty.	0	0	0	0	0	0
• Secured funding transactions backed by Level 2A assets, with any counterparty	25,561	656	4,272	4,856	972	14,805
• Secured funding transactions backed by non-Level 1 or non-Level 2A assets, with domestic sovereigns, multilateral development banks or domestic PSEs as a counterparty	28,401	729	4,747	5,396	1,080	16,451
• Backed by residential mortgage-backed securities (RMBS) eligible for inclusion in Level 2B	0	0	0	0	0	0
• Backed by other Level 2B assets	0	0	0	0	0	0
• All other secured funding transactions	0	0	0	0	0	0
D. Additional requirements:[1]		0	0	0	0	0
Shari'ah-compliant hedging (Tahawwut)	0	0	0	0	0	0
Undrawn credit and liquidity facilities to retail and small business customers	0	0	0	0	0	0
Undrawn credit facilities to non-financial corporate, as well as sovereign, central banks, PSEs and multilateral development banks	0	0	0	0	0	0
Other contractual obligations extend to financial institution	0	0	0	0	0	0
Trade finance	0	0	0	0	0	0
Any additional contractual outflows	0	0	0	0	0	0
Any other contractual cash outflows	0	0	0	0	0	0
Secured funding backed by Level 1 assets	0	0	0	0	0	0
Secured funding backed by Level 2 assets	0	0	0	0	0	0
Secured funding backed by other valuable assets (close to Level 2)	0	0	0	0	0	0
Collateral needed in case of downgrade by 3 notches	0	0	0	0	0	0
Undrawn but committed credit facilities to corporate and retail customers	0	0	0	0	0	0
Undrawn but committed liability facilities	0	0	0	0	0	0
Other contingent funding liabilities and Shariah compliant hedging (such as guarantees, letters of credit, revocable credit and liquidity facilities etc)	0	0	0	0	0	0

2- Net Stable Funding Ratio						
	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Available Stable Funding	14,935,680	3,919,197	3,641,193	2,769,720	2,587,930	2,017,640
• Total regulatory capital (excluding Tier 2 instruments with residual maturity of less than one year); • Other capital instruments and liabilities with effective residual maturity of one year or more	114,942	0	21,789	30,260	7,680	55,213
• Stable deposits and/or unrestricted profit-sharing investment account (UPSIA) with residual maturity of less than one year provided by retail and small business customers	2,757,815	422,095	1,637,620	273,028	189,217	235,856
• Less stable deposits and/or UPSIA with residual maturity of less than one year provided by retail and small business customers	6,263,440	1,815,803	1,029,003	1,280,647	1,241,498	896,489

• Funding with residual maturity of less than one year provided by non-financial corporate customers; • Operational accounts; • Funding with residual maturity of less than one year from sovereigns, public-sector entities (PSEs), and multilateral and national development banks • Other funding with residual maturity between six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions	5,799,483	1,681,300	952,781	1,185,785	1,149,535	830,083
• All other liabilities and equity not included in the above categories, including liabilities without a stated maturity (with a specific treatment for deferred tax liabilities and minority interests); • Net NSFR Shari'ah-compliant hedging liabilities (if NSFR Shari'ah-compliant hedging liabilities are greater than NSFR Shari'ah-compliant hedging assets); • "Trade date" payables arising from purchases of financial instruments, foreign currencies and commodities	0	0	0	0	0	0

	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFS5
Required Stable Funding	3,632,994	853,109	695,013	716,094	714,133	654,644
• Cash; All central bank reserves; all claims on central banks with residual maturities of less than six months; "Trade date" receivables arising from sales of financial instruments, foreign currencies and commodities	0	0	0	0	0	0
• Unencumbered Level 1 assets, excluding coins, banknotes and central bank reserves	1,197,211	146,963	294,845	218,065	231,328	306,010
• Unencumbered financings to financial institutions with residual maturities of less than six months, where the financing is secured against Level 1 assets	695,938	201,756	114,334	142,294	137,944	99,610
• All other unencumbered financing to financial institutions with residual maturities of less than six months not included in the above categories; Unencumbered Level 2A assets	1,739,845	504,390	285,834	355,735	344,861	249,025
• Unencumbered Level 2B assets; High-quality liquid assets (HQLA) encumbered for a period of six months or more and less than one year; Financing to financial institutions and central banks with residual maturities between six months and less than one year; Deposits held at other financial institutions for operational purposes; All other assets not included in the above categories with residual maturity of less than one year, including financings to non-financial corporate clients, financing to retail and small business customers, and financing to sovereigns and PSEs	0	0	0	0	0	0
• Unencumbered residential real estate financing with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach; Other unencumbered financing not included in the above categories, excluding financing to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach	0	0	0	0	0	0
• Cash, securities or other assets posted as initial margin for <i>Shari'ah</i> - compliant hedging contracts and cash or other assets provided to contribute to the default fund of a central counterparty; Other unencumbered performing financing with risk weights greater than 35% under the standardised approach and residual maturities of one year or more, excluding financing to financial institutions; Unencumbered securities that are not in default and do not qualify as HQLA with a remaining maturity of one year or more and exchange-traded equities; Physical traded commodities	0	0	0	0	0	0

• All assets that are encumbered for a period of one year or more; All other assets not included in the above categories, including non-performing financing, financing to financial institutions with a residual maturity of one year or more, non-exchange-traded equities, fixed assets, items deducted from regulatory capital, Takāful assets, and defaulted Shari'ah-compliant securities	0	0	0	0	0	0
---	---	---	---	---	---	---

Test 2.2: Maturity Mismatch/Rollover Analysis
--

	Total	IIFS1	IIFS2	IIFS3	IIFS4	IIFSS
Test 2.2.A: "Descriptive maturity mismatch analysis" (no consideration of rollover)						
Less than 3 months	26,168,206	3,229,482	5,880,432	4,934,396	8,095,777	4,028,119
3 to 12 months	-1,218,822	-1,666,628	629,853	804,301	-1,103,983	117,635
1 to 5 years	-10,073,386	-3,020,006	-2,711,438	-1,883,889	541,169	-2,999,222
More than 5 years	-23,165,245	-2,746,087	-5,554,763	-5,457,491	-4,191,355	-5,215,549
Shortfall in first 1 maturity buckets? (0='No', 1='Yes')	0	0	0	0	0	0
Cumulative number of banks with Shortfall						
Less than 3 months	0	0	0	0	0	0
3 to 12 months	2	1	0	0	1	0
1 to 5 years	5	1	1	1	1	1
More than 5 years	5	1	1	1	1	1

6- Summary of the Aggregate Outcome of Liquidity Analysis

System-level Result

Total Number of Banks tested	5
------------------------------	---

Test 1-a Implied Cash Flow Test (5 Days)

	Cumulative Withdrawal of Deposits/PSIA (Percent of Total, Assumptions for test)	Cumulative Loss of Short Term Funding (Percent of Total, Assumption for test)	Cumulative Total Loss of RPSIA (Percent of Total, Assumption for test)	Cumulative Total Loss of Funding (Percent of Total, Assumption for test)	Minimum number of periods of survival	Number of Banks illiquid	Survival - Percent of IIFS
Day 1	0.0%	0.0%	0.0%	0.0%	0	0	100.0%
Day 2	5.3%	0.0%	0.0%	3.4%	1	0	100.0%
Day 3	10.2%	0.0%	0.0%	6.7%	2	0	100.0%
Day 4	14.8%	0.0%	0.0%	9.7%	3	0	100.0%
Day 5	19.2%	0.0%	0.0%	12.1%	4	0	100.0%
	23.2%	0.0%	0.0%	14.7%	5	0	100.0%

Number of IIFS passing test through period 5	5
Liquidity Shortfall	0
Liquidity Shortfall as percent of total assets	0.0%

Test 1-b: Implied Cash Flow Test (30 Days)

Cumulative Withdrawal of Deposits (Percent of Total)	Cumulative Loss of Short Term Funding (Percent of Total)	Cumulative Total Loss of Funding (Percent of Total)	Survival	Number of Banks	Percent of Banks	Percent of Assets
7.8%	0.0%	5.0%	No	0	0.0%	
			Yes	5	100.0%	

Number of IIFS failing the test	0
Liquidity Shortfall	0
Percent of total Assets	0.0%

Test 2: Liquidity Coverage Ratio (LCR)

Total High Quality Assets (% of Assets)	31.0%		Liquidity Coverage Ratio	Number of Banks	Percent of Banks	Percent of Assets
Other Cash Inflow (% of Assets)	1.2%	"Not Passed"	<0.25	0	0.0%	0.0%
Total Cash Inflow (% of Assets)	32.2%	"Not Passed"	0.25-0.5	0	0.0%	0.0%
Total Cash Outflow (% of Assets)	7.7%	"Not Passed"	0.5-0.75	0	0.0%	0.0%
		"Not Passed"	0.75-1	0	0.0%	0.0%
		"Passed"	>1	5	100.0%	100.0%
Average LCR (weighted-average)	4.82					
Median LCR	5.28					
Number of Banks failing the test	0					
Liquidity Shortfall	0					
Percent of total Assets	0.0%					

Test 3: Maturity mismatch analysis

Bucket	Cumulative no. of IIFS with shortfall	Shortfall (Percent of total Assets)
0	0	0.0%
Less than 3 months	0	0.0%
3 to 12 months	2	40.6%
1 to 5 years	5	100.0%
More than 5 years	5	100.0%
Not assigned		

Test 4: Net Stable Funding Ratio (NSFR)

Available Stable Funding (% of Assets)	18.2%
Required Stable Funding (% of Assets)	4.4%
Average NSFR	4.09
Median NSFR	3.87
Number of Banks failing the test	0
Liquidity Shortfall	0
Percent of total Funding Liabilities	0.0%

	Net Stable Funding Ratio	Number of Banks	Percent of Banks	Percent of Assets
"Not Passed"	<0.25	0	0.0%	0.0%
"Not Passed"	0.25-0.5	0.00	0.0%	0.0%
"Not Passed"	0.5-0.75	0.00	0.0%	0.0%
"Not Passed"	0.75-1	0.00	0.0%	0.0%
"Passed"	>1	5.00	100.0%	100.0%