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"Feeling Stressed?" A Critical Analysis of the Regulatory Prescribed Stress Tests for Financial Services in the UK

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Abstract: This paper captures a qualitative review of the regulatory prescribed stress tests for UK financial services designed by the Bank of England and the Prudential Regulation Authority (PRA)/Financial Conduct Authority (FCA) after the Global Financial Crisis. It presents a critical analysis of the use of stress testing as part of supervisory practices for UK banking institutions and insurance undertakings, commenting on their qualitative characteristics, after looking at the regulatory prescribed stress tests from three key categories: the macroeconomic scenarios for banks, denoted as the bank stress tests (BST), the insurance stress tests (IST), and the biennial exploratory scenarios (BES). In this study, five trends describing regulatory prescribed stress are identified: (1) the regulatory collaboration, (2) cross-industry stress tests, (3) exploratory scenarios, (4) reporting and disclosure requirements, and (5) the underlying modelling capabilities and tools. The associated challenges of (A) governance, (B) frequency, (C) individual disclosures, (D) data and modelling, and (E) capabilities and skillset from participating institutions underpinning these stresses are highlighted, shaping the policy recommendations for future exercises. These address the gaps identified from existing stress tests towards the effective prudential supervision of UK financial services, based on each scenario category, for improvements and advances to practices.

Keywords: stress testing; scenario analysis; prudential supervision; risk management; financial regulation

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1. Introduction

Scenario analysis is a tool for strategic planning, as highlighted in the seminal work of Schoemaker (1993, 1995). It is a process used for identifying and assessing the potential implications of a range of future states under conditions of uncertainty (Bishop et al., 2007). In this sense, scenarios are hypothetical constructs, not representing forecasts or accurate predictions, but instead consisting of plausible pathways of future developments (Postma & Liebl, 2005; Georgiou & Pantos, 2022, p. 76). Scenario analysis and planning is a process widely used in strategic management (van der Heijden, 2005) and, as an extension, in strategic risk management (Andersen & Schrøder, 2012). It is a qualitative analytical tool to support risk management, with this technique employed to understand uncertainty in an "unpredictable world" (Andersen & Schrøder, 2012, p. 159). It provides insights to the "what if?" questions (Chapman, 2011; Andersen & Schrøder, 2012) and thus often is also referred to as the "what if?" analysis. It is also used as a futures thinking tool within policymaking in the UK, applied in different contexts and setups, such as for the COVID-19

pandemic (Georgiou & Pantos, 2022). It is a core policy-making tool, part of the UK's futures thinking toolkit (SOIF, 2021; Government Office for Science, 2024). A special case of scenario analysis in UK policy-making is the stress testing for financial services (Georgiou & Pantos, 2022).

Stress testing is used as a tool of a quantitative nature within financial risk management (Hull, 2015; Hassani, 2016). Stress testing involves the use of severe but plausible scenarios (Hull, 2015, p. 463). It is a risk management tool to measure the resilience of financial institutions in relation to hypothetical adverse scenarios (e.g., severe recessions) (Dent et al., 2016). The results of stress and scenario testing are used by supervisors and regulators to measure risks and manage them through setting policy. Stress tests have different characteristics in terms of their background, assumptions, limitations, methodological approach, and modelling. They could be employed to evaluate financial stability (Marcelo et al., 2008) and could be considered in a bottom-up (Quagliariello, 2019) or top-down setup (Kapinos & Mitnik, 2016). Stress testing is primarily connected to the banking system and macroeconomic stresses (Quagliariello, 2009), with studies on the calibration and design of scenarios for banking institutions (Isogai, 2009). Stress testing is often linked to previous crises and systemic events, such as the Great Depression (Varotto, 2012), with the use of historical scenarios from prior crises shaping bank stress testing (Dent et al., 2016). There is a plethora of studies focusing on types and components of stress testing, covering certain risks and examples of exercises with novel modelling approaches linked to regulation. In particular about macroprudential stress testing and frameworks (Anderson et al., 2018; Aikman et al., 2023). Most papers focus on the quantitative angle, with particular emphasis on macroprudential stress testing and its principles (Greenlaw et al., 2012) and testing for system risks under different scenarios (Breuer & Summer, 2020; Vodenska et al., 2021). Quantitative studies on the macroprudential stress testing methodology have focused on modelling approaches (van den End et al., 2006; Buncic & Melecky, 2013) and the stress testing frameworks (Kwiatkowski & Rebonato, 2011; Varotto, 2012). Other studies have focused on the capital position of bank stress testing and the modelling on the bank balance sheet (Schuermann, 2014), with the capital adequacy implications (Kapinos et al., 2015) and the role of stress testing disclosures in affecting banks' risk profile (Goncharenko et al., 2018; Goldstein & Leitner, 2018). Linked to the type of scenarios is the macro-financial stress testing framework for credit risk (Maino & Tintchev, 2013), with frameworks and approaches to macro stress tests for banks discussed in the literature (Borio et al., 2012). Risk factors and scenario selection are elements of bank stress testing for credit risk modelling (Breuer & Summer, 2020), with certain macroprudential stress tests integrating liquidity and solvency risks beyond credit and macroeconomic implications, capturing financial distress and systemic risks (Bakoush et al., 2022).

Overall, bank stress testing has been developed significantly in the past three decades and has evolved to become a core part of the regulatory toolkit (Dent et al., 2016). It is considered a key innovation and reform introduced in the post-global financial crises (GFC) world (Kohn, 2020). Studies on UK regulatory prescribed stress tests have focused primarily on the bank stress tests. These have been covered extensively in Dowd's four "no stress" reports, commenting on flaws in the BoE's bank stress testing programme, based on previous exercises, such as the 2015 and 2018 iterations (Dowd, 2015a, 2015b, 2017, 2019), and more recently regarding stress testing during COVID-19 (Buckner & Dowd, 2022). Consequently, this paper seeks to add to the stress testing literature after presenting a critical analysis of a particular type of stress test: the ones prescribed by regulators in the UK for financial services, covering simultaneously the exercises for banks and for insurers, plus other financial institutions. This qualitative study looks at the regulatory prescribed stress test characteristics and components to provide insights in relation to their identified

trends and associated challenges for future exercises, offering policy recommendations for financial services preparedness.

The focus of this paper is placed on the regulatory prescribed scenarios, which are designed and developed by prudential supervisors/regulators and are imposed on certain financial institutions. These are usually the systemic financial services, meaning the largest banks[1], asset managers, and reinsurance undertakings. In this case, attention is placed on the regulatory prescribed stress tests for UK financial services, as developed by the UK prudential regulators, the Bank of England (BoE) and the Prudential Regulation Authority (PRA), often supported by the Financial Conduct Authority (FCA). Stress tests are widely discussed in the literature, as mentioned above, but mostly focusing on their quantitative components. Moreover, often emphasis is placed on stress testing approaches and models outside the exercise run by supervisory and regulatory bodies. Plus, it is common to focus on a specific type of stress testing in relation to a use, risk considered, and/or applicable sector (i.e., for credit risk, for banks only). Therefore, there is a gap in providing a combined critical analysis of stress testing practices for all financial services within a specific jurisdiction. This paper seeks to offer insights in that area, commenting on regulatory prescribed stress tests for UK financial services after conducting a qualitative analysis regarding their characteristics, key elements, and components.

Regulatory prescribed stress testing is a core element of prudential supervisory objectives. It is an example of rules-based supervision of a prudential nature, since its dimensions are pre-defined, with an expected approach for quantification, contrary to micro-prudential stress tests (principles-based regulation (Armour et al., 2016)) developed by the entities themselves. There are different regulatory requirements underpinning stress testing and scenarios, conditional on their use and purpose, for each type of financial services entity, such as under the Solvency II Directive for re-insurance undertakings. These are not described in this paper, since attention is placed on a special case of stress testing, the ones developed and designed by regulators, complementing scenarios examined at the entity level. Regulatory prescribed stress tests have specific objectives and aims, in line with the supervisory approach underpinning them. In the UK, this is in alignment with the Bank of England's approach to banking and insurance supervision (BoE, 2023f, 2023g). The exact objectives of each regulatory- prescribed stress test linked to its nature and the risks covered (i.e., cyber risks), are usually stated in the letter announcing the exercise. Different stress and scenario tests are considered in financial services for various uses and purposes, and are part of an overarching stress and scenario testing framework (SSTF). The regulatory prescribed stress tests led by the prudential supervisors are also part of the SSTF. The following figure (Figure 1) attempts to depict these types of stress and scenario tests, to support the development of the SSTF. The core supervisory objectives of regulatory prescribed stress tests created based on the PRA's and BoE's approach to supervision (BoE, 2023f, 2023g) also shape the SSTF. These are presented on the left-hand side (LHS) part of the figure, segmented into sectoral (i.e., for the entire financial sector) and entity-specific objectives. There is a direct link between those supervisory objectives and the different requirements for examining a range of stress and scenario tests. The purpose and underlying reason of for examining them is are presented on the right-hand side (RHS) part of the figure. Regulatory prescribed stress tests are the key linking the supervisory objectives of the LHS with the uses from the RHS, explaining their importance in creating the SSTF.

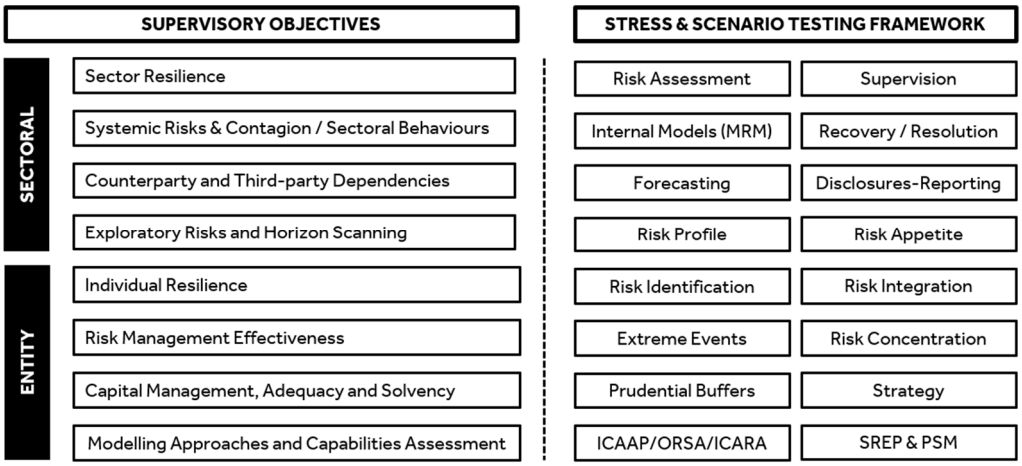

Figure 1. Regulatory Prescribed Stress Tests—Uses, Purpose, Framework.

In this paper the different regulatory prescribed stress tests for UK financial services are presented, split by sector, for banks initially and for insurers, and then by purpose and type, such as the exploratory scenarios. The (main) regulatory prescribed stress tests for UK financial services in the scope of this paper are presented in the figure (Figure 2) below. The three categories of regulatory prescribed stress tests graphically depicted in that figure are the bank stress tests (BST), the insurance stress tests (IST), and the (biennial) exploratory scenarios (BES). The timeline for the different types of regulatory prescribed stress tests is captured, with each scenario comprising the BST, IST, and BES[2] by the year of each corresponding exercise, discussed in the main part of this paper.

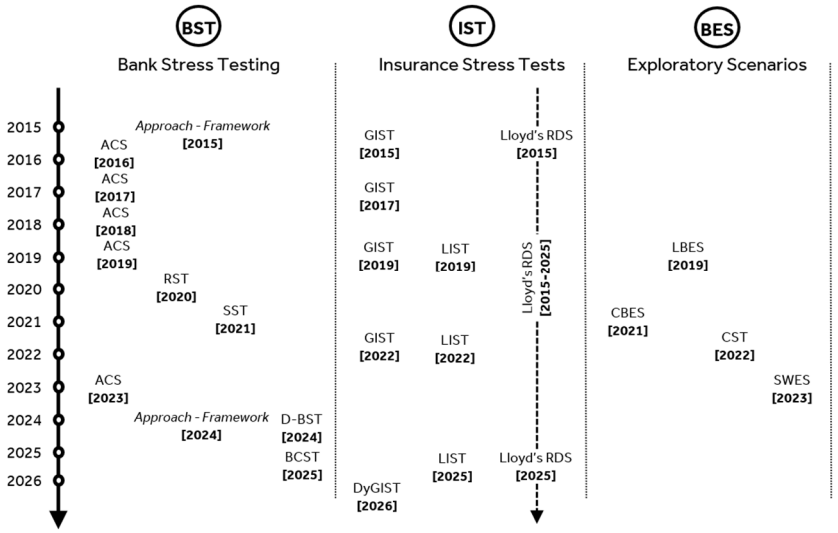

Figure 2. UK Financial Services Regulatory Prescribed Stress Tests.

The key elements of each regulatory prescribed scenario are briefly discussed, covering the main assumptions, data, timelines, participants with entities in scope, and the lessons learnt from the obtained results. This critical analysis supports the identification of trends and future challenges, discussing policy recommendations. The five trends describing regulatory prescribed stress tests based on the previous exercises, referring to the regulatory collaboration, cross-industry stresses, exploratory scenarios with their reporting/disclosures, and modelling and tools, are discussed and explained. Linked to the challenges underpinning future exercises, covering governance, frequency, individual disclosures, data/modelling, and capabilities/skillset, recommendations for regulators and

participating entities are noted. The proposals for policy developments aim to enhance the supervisory framework to account for those challenges while at the same time supporting financial institutions in improving their internal stress testing practices. Practical suggestions on stress testing advances are presented in the study originating from the critical review and qualitative analysis conducted.

The paper is structured as follows. After briefly covering the methodological approach followed, the main part of this paper is divided into four sections. The first part with Section 3 discusses the macroeconomic scenarios for banks dedicated to BST. The second part, with Section 4, presents insurance stress testing for the IST, covering the stresses for general insurers, life insurers, and the realistic disaster scenarios for Lloyd's of London. This is followed by the exploratory scenarios, the third part and Section 5 for the BES, with a sub-section dedicated to each scenario for financial services, presenting the climate, liquidity, cyber, and system-wide exercises. Stress testing developments with proposals and recommendations are discussed in the final Section 6 and fourth part. The conclusion, Section 7, summarises the key findings, highlighting directions for future research and further extensions.

2. Methods and Approach

This doctrinal legal research critically examines the risk management tool of stress testing in terms of its development, use, and application from a regulatory and supervisory perspective of prudential nature for UK financial services. A socio-legal approach is adopted (Halliday & Schmidt, 2010) to conduct this empirical legal research of financial regulation (Black, 2010). Attention is placed on the design and practice of financial regulation, capturing the UK financial services stress and scenario testing regime (Black, 2010). The underlying regulatory framework comprises both rules and principles underpinning supervision for financial system stability and individual institution safety, soundness, and overall solvency (Moosa, 2015; Kokkinis & Miglionico, 2021). This consists of the legislative, regulatory, and soft-law rules and principles applied to financial institutions (Kokkinis & Miglionico, 2021, p. 13) in relation to stress testing as a supervisory tool of solvency financial regulation and its use (van Greuning & Bratanovic, 2009; Moosa, 2015). Focuses on the prudential supervision of financial institutions and the prudential provisions (Armour et al., 2016) and the risk-related financial requirements (Kokkinis & Miglionico, 2021, p. 21), as triggered by crises (Cranston, 2002). Stress testing linked to capital adequacy requirements with 'buffers' for banks (Cranston, 2002; Armour et al., 2016) is instrumental within the context of (bank) supervision and analytical review, which is part of the supervisory process (van Greuning & Bratanovic, 2009). The objective is to comment on developments post the GFC 2008/09, strengthening the prudential regulation, with emphasis on stress testing that is considered a tool utilised in preparation for future major crises (Buckley et al., 2016; Benjamin, 2025). Stress testing as a measure of prudential regulation and supervision and how it supports their function and objectives for advances to financial regulation (towards optimality) (Herring & Santomero, 2000) are examined in this study.

Studies in law and financial regulation, as mentioned above, have focused on prudential regulation and supervision without looking in detail at the characteristics of regulatory prescribed stress tests, thus providing the theoretical background adopted in this case. Additionally, most financial economics studies have focused primarily on banks stress tests and often in a cross-comparison across different jurisdictions (Baudino et al., 2018). A comparative analysis of bank stress testing from Baudino et al. (2018) is of a qualitative nature, similar to this study, but captures different regulators, with the UK being one of the frameworks examined. Plus, the most recent stress testing developments at the UK level with the updated BoE's approach (BoE, 2024c) are not reflected. The propositions

of Borio et al. (2012) are for macro stress tests only, for the macroprudential framework considerations, and for banks at the global level. Similarly, for macroprudential stress testing for banks only (at the US level primarily), elements of macroprudential stress testing, covering the purposes, scope, and output, with asset and liability considerations, are discussed in Greenlaw et al. (2012). Schuermann (2014) has developed a framework for stress testing banks after reviewing other macroprudential stress tests from different jurisdictions, covering risks considered and the volume of participating banks. Vodenska et al. (2021) have modelled the European Banking Authority (EBA) stress test results for system risks where UK banks previously participated. Kolari et al. (2019) have used the bank risk dimension as a determinant of predicting pass or fail of bank stress tests for European Banks. Other studies on UK stress tests have focused only on banks and the bank macroeconomic stress test, such as Dowd's reports from the Adam Smith Institute (Dowd, 2015a, 2015b, 2017, 2019), and equally not commenting on the latest exercises. Consequently, there are no studies commenting on the entire stress testing framework across financial services, with this paper providing key insights from the critical review of the UK regulatory prescribed stress tests. On the basis that the focus of this study is the financial regulation and prudential angle of stress testing for financial services, a qualitative (document) analysis is conducted to understand their differences and provide insights for future developments. This methodological approach allows the comparison of the characteristics of the regulatory prescribed stress tests for UK financial institutions, looking at their core elements (i.e., how their results were published, how many entities were in scope, etc.) and how these have evolved in line with the approach to supervision from UK regulators.

The methodological approach adopted comprises conducting a critical analysis of the stress testing publications from the BoE, the PRA, and the FCA[3]. This refers to the prudential regulation and supervision regarding stress and scenario testing, with secondary data from the UK financial services regulators and supervisors. Specifically, the scenario guidelines and specifications, with the accompanying announcements and the published results, are reviewed and critically examined. The document analysis involves reviewing the BoE's approach to stress testing, based on its bank-specific publication (BoE, 2015, 2024c) and the overarching approach to banking and insurance supervision (BoE, 2023f, 2023g). The focus is placed on the qualitative characteristics of the regulatory prescribed stress tests. Commenting on their design and calibration (Isogai, 2009) and their definitions and main components, as anticipated in stress tests for the financial system (Quagliariello, 2009). This involves examining their scope, risks considered, timelines, and entities in scope (volume, type, list) with the published results and the format of their output. These dimensions for the key regulatory prescribed stress tests for financial services in the UK are described in the subsequent sections of this paper.

In relation to the research content and innovation, this is obtained from 'joining the dots' (Benjamin, 2025) between the different types of regulatory prescribed stress tests summarised. This is based on their critical examination, even if in a qualitative format, covering the exercises developed for different types of financial institutions (i.e., insurance stress tests), as well as combining the joint exercises (i.e., the exploratory scenarios). As there is a gap in the literature regarding those types of scenarios prescribed by the regulators for different purposes, characteristics, and entities in scope. Most stress testing studies are quantitative and focus on banks mainly, presenting the different modelling components of stress tests. Examples include studies performed at the global level and for macro stress tests and the macroprudential framework (Borio et al., 2012; Schuermann, 2014; Baudino et al., 2018). Therefore, this paper attempts to capture the qualitative characteristics of regulatory prescribed stress tests for all financial services, banks and insurers, asset managers and

funds, all from the same jurisdiction, the UK, simultaneously in the same study. This is an advance on previous studies that have focused on UK bank stress testing only (Dent et al., 2016; Dowd, 2015a, 2015b, 2017, 2019; Buckner & Dowd, 2022). In this paper, the key differences and similarities of those types of scenarios are discussed, providing valuable insights to (a) entities in scope, (b) entities not in scope so they could advance their own stress testing practices, and (c) other regulators to learn from the approach of the BoE/PRA/FCA in the UK. As a risk management tool, scenarios and stress are widely referenced in legal, regulatory, and policy requirements. Therefore, understanding their core elements and evolution is of high importance for both policy-makers and financial institutions. Especially from a qualitative perspective and the legal and regulatory angle, examining and commenting on their characteristics. Scenario analysis as a technique is also linked to the PESTEL analysis and framework[4] (Johnson et al., 2017). For this reason, a PESTEL[5] analysis based on Johnson et al. (2017, pp. 34–47) and Andersen and Schrøder (2012, pp. 149–150) should be conducted as part of the critical analysis of regulatory prescribed stress tests. This supports the review of their characteristics, as discussed in detail in the subsequent sections of this paper. The following table (Table 1) presents the PESTEL analysis for the regulatory prescribed stress tests for UK financial services, showing how these issues and associated risks are reflected at each type for the BST, IST, and BES, respectively.

Table 1. PESTEL Analysis of UK Financial Services Regulatory Prescribed Stress Tests.

PESTEL	BST	IST	BES
Political	• All are developed by policy makers, regulators, supervisors [BST-IST-BES] • The Lloyd's RDS linked to the IST capture political risks in the syndicate specific de minimis scenarios [IST] • Only the Climate Change (CBES) reflects policy intervention and direct policy impact, based on the NGFS scenarios and the three policy/pathways: EA, LA, NAA [BES]		
Economic	• Bank stress tests are the pure macro-economic scenarios, with detailed economic analysis and trends [BST] • All the scenarios for life insurers (LIST) include economic factors, but in the ones for general insurance (GIST) only the inflation component (when that scenario is included) is linked to economic conditions [IST] • The liquidity (LBES) and system-wide (SWES) scenarios capture economic conditions, from a liquidity shock, and a combination of liquidity and credit counterparty risks, respectively [BES]		
Social	• All scenarios focus on the UK, from a geography/location and implications to the UK society [BST-IST-BES] • The Lloyd's RDS reveal exposure to other geographies outside the UK, mainly in the US, Japan, and EU [IST] • In the Lloyd's RDS, there are scenarios covering social implications (i.e., terrorism, satellite risks etc.) [IST] • Life insurance scenarios capture risks (longevity, mortality) associated with demographics and societal implications [IST] • There are social considerations in the transition variables for climate change (CBES) [BES]		

Table 1. *Cont.*

PESTEL	BST	IST	BES
Technology	• All scenarios required advanced modelling capabilities and techniques, often with use of specific software and statistical packages, for their quantification [BST-IST-BES] • There are four cyber risk related scenarios in the RDS, with four satellite risks scenarios, capturing technology related risks [IST] • Cyber risks were captured in the 2019 GIST (as exploratory) and in the 2022 GIST (specifications linked to the Lloyd's RDS) [IST] • The cyber (CST) is the closely linked to technology, with the impact of a severe data integrity incident [BES]		
Ecological/ Environmental	• Scenarios for general insurance capture the impact from natural catastrophes (i.e., floods, windstorms); plus, in the GIST 2019 exercise climate change was also included as exploratory consideration [IST] • On the basis that Lloyd's RDS for exposure management, the main scenarios are linked to natural catastrophes, such as windstorms, typhoons, earthquakes and flood events [IST] • The climate scenario captures in detail climate change related risks and their implications to financial risks, with the CBES by design incorporate environmental implications [BES]		
Legal (& Regulatory)	• All scenarios are examined based on existing regulatory requirements (i.e., CRR, CRD, Solvency II) [BST-IST-BES] • Evolving regulation is captured in the climate and cyber scenarios [BES] • There are specific scenarios capturing liability risks in Lloyd's RDS [IST] • The Lloyd's RDS are compulsory for all syndicates every year [IST] • The cyber scenario (CST) had voluntary participation [BES] • Participation to rest stresses upon invitation is not optional [BST-IST-BES] • For all stress tests there are detailed requirements about regulatory submissions [BST-IST-BES] • Scenario approach is documented in separate guidance only for banks, but capturing exploratory scenarios too [BST-BES]		

3. Macroeconomic Scenarios for Banks

The approach to stress testing the UK banking system is documented in the BoE's guidance initially issued in 2015, followed by an update last year in 2024 (BoE, 2015, 2024c). This guide details the approach, supervisory objectives, and scenario characteristics of the regulatory prescribed stress tests for UK banks (BoE, 2024c). Until the recent update on the guidance, the macroeconomic[6] scenarios for banks were captured in the concurrent[7] stress test run annually, the ACS (BoE, 2015). In addition to the ACS, in 2021 a Solvency Stress Test (SST) was examined, followed by the 2024 desk-based stress test (D-BST). From 2025, the frequency of the ACS will be reduced, transitioning into an exercise run every other year, referred to as the Bank Capital Stress Test (BCST) (BoE, 2024c). In-between this cyclical scenario exercise, a macroeconomic stress differing in nature, scope, and granularity, more akin to the D-BST, is going to take place (BoE, 2024c). Bank stress testing focuses on the stability of the sector, assessing key financial risks[8]. These typically are credit, market, counterparty, and interest rate risks on the banking book (IRRBB), in line with the regulatory capital requirements and the Basel regime. Their evaluation under stressed conditions provides insights on the capital and liquidity adequacy of the banking

institution. The impact on banks is conditional on the type of shock under macroeconomic stress tests (Quagliariello, 2009, Fig. 2.1). Reporting of those assessments with further detail describing the banks' risk profile is provided under the Internal Capital and Liquidity Adequacy Assessment Processes (ICAAP/ILAAP). How these risks are considered and shape regulatory prescribed stress tests is explained in the Basel Committee of Banking Supervision (BCBS) principles for sound stress testing practices and supervision (BCBS, 2009, 2018).

On the basis that the ACS exercises are of a similar nature, only the latest stress is examined below. The results of the ACS provide insights on the appropriate balance between sector and individual bank resilience, used to inform the FPC and RPC on the resilience of the banking system to cyclical risks (BoE, 2015). The ACS of 2022/23 was the first exercise since 2019 and the start of COVID-19 for the UK banking sector (BoE, 2022c). The systemic banks are usually invited to participate, referring to the largest UK banks and building societies[9] accounting for ~75% of lending to the UK real economy (BoE, 2022c, Section 4). It consisted of a macroeconomic stress that is calibrated by design as more extreme than the GFC and is based on the current macroeconomic outlook (BoE, 2022c). The baseline scenario is broadly consistent with the central projections in the report of the (August 2022) Monetary Policy Committee (MPC) Report (BoE, 2022c). The ACS assesses the resilience of the UK banking system to deep simultaneous recessions in the UK and global economies, large falls in asset prices and higher global interest rates, and a separate stress of misconduct costs consisting of (a) a UK and global five-year macroeconomic stress (2022 Q3 to 2027 Q2), (b) traded risk stress, linked to a financial market scenario consistent with the content and calibration of the macroeconomic stress, and (c) misconduct costs stress (BoE, 2022c). Quantitative templates were available with the evolution of the macroeconomic environment and economic conditions underpinning the forecasts employed in the scenario about relevant parameters, such as spreads, interest rates, foreign exchange currency rates, etc. (BoE, 2022c). The assessment completion consists of quantitative templates submitted with the inclusion of a qualitative review of banks' stress-test capabilities, a new angle, and similar to the insurance requirements as discussed in Section 4 of this paper (BoE, 2022c). In terms of the results reporting, they were published in aggregate and individual format in July 2023 after the exercise was completed (BoE, 2023d). In the results, a comparison with the 2019 ACS and the GFC was presented to provide insights on the participating banks' performance (BoE, 2023d, Table A). The detailed results and post-stress financial position of each participating systemic bank are captured in an annexe with the granular disclosures (BoE, 2023d, 2023h). This level of detail is aligned with the prior ACS exercises. Considering the importance of the ACS and to support participating banks, the BoE has published different data templates, a manual, and a dictionary, detailed in the Stress Test Data Framework (STDF) (BoE, 2022b).

During the start of the coronavirus pandemic in 2022, the BoE cancelled the concurrent stress test in 2022 and instead launched the Solvency Stress Test (SST) in 2021, which was different than the ACS (BoE, 2021d). The objective of the SST was to test the resilience of the UK banking system against a much more severe evolution of the pandemic and consequent economic shock (BoE, 2021d). The aim of the SST was to move beyond the capital buffer adequacy assessment and rather refine the 'reverse stress test' (RST) exercise assessment the PRA conducted in August 2020 (BoE, 2021d). Note that the RST was discussed at the August 2020 FPC's Financial Stability Report but limited to aggregate results and themes, based on its nature (BoE, 2020, pp. 48–59). The participating banks of the SST were disclosed[10], with the results published in both aggregate and individual format (BoE, 2021d, Section 3, 7, 2021e). The SST results were published in Q4 of the same year the

exercise was launched, mirroring the format and granularity of the ACS, with the results and financial position detailed in a separate annexe (BoE, 2021e).

In 2024 the PRA prescribed the desk-based stress test (D-BST), including two hypothetical severe but plausible combinations of adverse shocks to the UK and global economies (BoE, 2024b). The two D-BST scenarios, referring to the supply shock and the demand shock, are countercyclical and originated from the vulnerability assessment of the Financial Policy Committee (FPC) (BoE, 2024b). According to the BoE's description of the D-BST scenarios, the supply shock assumed a severe negative global aggregate supply shock based on rising geopolitical tensions and commodity prices, with disrupted supply chains resulting in higher inflation, whereas the demand shock was based on a severe negative global aggregate demand shock with global recession and dropping inflation (BoE, 2024b). The pathway of macroeconomic variables was provided, in comparison to the previous ACS and the GFC, as a benchmark (BoE, 2024b, Table A). Contrary to the previous ACS and SST exercises, the list of participating banks was not disclosed. However, it was stated that the major banks and building societies, representing three-quarters of the lending activity in the UK, took part (BoE, 2024b). The results were published in the November 2024 Financial Stability Report (BoE, 2024a, Section 6, pp. 66–83). Again, comparing them against the ACS and SST results, it included slightly less detail and reported on an aggregate level, without individual disclosures from participating banks. The insights of the obtained results will be used to inform the 2025 exercise on the Bank Capital Stress Test (BoE, 2024a) in line with the new approach to bank stress testing (BoE, 2024c).

Finally, not ACS participating firms perform their own stress testing based on the PRA guidance, using a published scenario every six months to serve as a guide for banks and building societies designing their own scenarios. Beyond the ACS, SST, and D-BST, the PRA also publishes stress and scenario tests for smaller banks and building societies that do not participate in the concurrent stress testing. For these stresses, only the pathways of the relevant macroeconomic variables are provided and disclosed. These scenarios are usually utilised for the ICAAP purposes. More information is available directly from BoE's dedicated website on stress testing.

4. Insurance Stress Test

The Insurance Stress Test (IST) is (usually) a biennial exercise, asking the largest regulated life and general insurers to provide information about the impact of a range of stress scenarios on their business (PRA, 2023a). The IST is a key priority for the PRA and insurers, with the objective to (1) assess sector resilience to severe but plausible adverse scenarios, (2) guide supervisory activity, and (3) enhance PRA's and firms' ability to respond to future shocks (PRA, 2022b). The IST exercise is split into separate scenarios for life insurers and for general insurers, denoted as LIST and GIST, respectively. In terms of objectives and purpose, similar to bank stress tests, it is to evaluate the resilience of the sector and inform policy setting. Specifically, the PRA uses the GIST and LIST to (1) assess sector resilience, (2) guide supervisory activity, and (3) support capacity building in risk management (PRA, 2023a).

The IST exercise was initially launched back in 2015 for general insurers. The IST 2022 was the fourth PRA exercise for general insurers and the second for life insurers since the introduction of Solvency II. Therefore, there have been four GIST exercises, in 2015, 2017, 2019, and 2022, with the last two accompanied by a LIST exercise too. There have been three LIST exercises to date with the current 2025 scenarios since starting back in 2017, followed by the 2022 exercise, both run in parallel with the equivalent GIST. The IST is a core element of the insurance supervision, with its results published in aggregated format, usually a few months after the IST is completed. However, contrary to the bank stress test,

individual results are not disclosed. Indeed, in the initial GIST and LIST exercises, not even the participating entities in scope are listed. Only in the 2022 and 2025 exercises is the list of insurers invited to participate captured (PRA, 2022a, 2022d, 2025b).

Another unique feature of the IST is the qualitative return to accompany the spreadsheet template, which was first introduced in 2022, the "Results and Basis of Preparation" (RBP), capturing the internal approach in quantifying the IST (PRA, 2022c). The RBP report requires a firm to provide a narrative of its scenario results, including perspectives on the conclusions, limitations, data and modelling issues, and any management actions taken and assumptions made beyond those set out by the PRA (PRA, 2022c). It is used by the PRA to assess the comparability and robustness of the results and hence the plausibility of forming an assessment of sector resilience based on aggregating firm results (PRA, 2022c). The purpose of the RBP report is to provide information on the level of governance and quality assurance as well as additional information required to support the quantitative results (PRA, 2022c). The similarity with the bank stress testing is that the RBP reports are used to gather information about firms' risk management capabilities and thus inform the PRA's supervisory approach (PRA, 2022c, 2025b). The RBP was also included as a requirement in the most recent LIS 2025 (PRA, 2025a).

Finally, another interesting point in relation to the IST is the international supervisory collaboration, as it happened back in 2019 with the support of the Bermuda Monetary Authority (BMA) (PRA, 2019b, 2020). This was the first joint exercise with the BMA, after recognising the reliance on Bermuda-based reinsurers and the focus of the exercise on natural catastrophe scenarios (PRA, 2019b, 2020). This was conducted in accordance with the Insurance Core Principles (ICPs) of the International Association of Insurance Supervisors (IAIS) (PRA, 2020).

It should also be noted that the PRA usually shares the initial IST with scenario specifications, descriptions, and assumptions with participating entities in scope, inviting feedback before finalising the IST and officially launching the exercise. The key highlights from the seven GIST and LIST exercises are presented in the following two sub-sections as below. An overview of the insurers that participated in the recent GIST and LIST exercises is presented in Appendix A (Table A1).

4.1. General Insurance

The first GIST exercise was launched in 2015, where the largest general insurers of Category 1 and 2, 26 in total across 39 legal entities, inclusive of Lloyd's syndicates, were invited to participate; however, they were not specified publicly (PRA, 2016). The GIST 2015 consisted of three different scenario categories: (a) five market-wide stress tests, (b) four difficult-to-assess scenarios focusing on emerging risks, and (c) two-firm specific defined scenarios (PRA, 2016). In the first category, denoted as "Type A", eleven stress tests of severe but plausible events were included (PRA, 2016). These stresses consisted of natural catastrophes[11], three synchronised terrorism events, a motor lability stress, and an economic shock linked to the bank's stress test, as in the previous section (PRA, 2016). The emerging risk-related scenarios, denoted as "Type B", which include less detail in terms of their specification and flexibility in their application, consisted of a supply chain disturbance, a liability stress scenario, a solar flare, and a cyber loss (PRA, 2016). The final category of firm identified future stress tests as "Type C", including an idiosyncratic scenario considered to be a 1-in-200-year event and also one reverse stress test with an assumed return period beyond that (PRA, 2016). The results with the findings from each scenario of the GIST 2015 were detailed in the "Dear CEO" letter issued in April of 2016 (PRA, 2016). In the Annexe of that letter, the aggregate market-level impact was disclosed, along with insights from PRA's interpretation of the market results (PRA, 2016). Even for Type B and C scenarios,

which were defined flexibly, PRA's observations were noted to provide a market-wide view (i.e., return period of reverse stress tests in Table 11) (PRA, 2016).

The second exercise for general insurers was the GIST 2017, two years after the GIST 2015. As in the GIST 2015, the 26 largest GI firms, with the addition of the largest 16 Lloyd's syndicates, participated (PRA, 2017a). The GIST 2017 consisted of fewer scenarios, split into two sections: Section 1 with defined severe but plausible scenarios and Section 2 with an exposure-gathering exercise for UK risks by sector (PRA, 2017b). As explained earlier in the first section, the IST serves different supervisory objectives, with the GIST 2017 designed to support the PRA for both insurance sector (macro) and individual entity (micro) level supervision[12] (PRA, 2017c). Given the significant reduction in the volume of scenarios compared to the GIST 2015, the GIST 2017 was concluded within that year, publishing the feedback and results in December, after the April launch of the exercise (PRA, 2017b, 2017c, 2017a). Section 1 consisted of defined scenarios, comprising a set of four natural catastrophe scenarios as Part A, with Part B an economic downturn scenario, again linked to the BoE's ACS for 2017, similar to the approach of the GIST 2017 (PRA, 2017c). The four natural catastrophe scenarios include a European windstorm and flood set of events at the EU and UK level, a Pacific North-West earthquake and associated tsunami, a California earthquake, and a set of US hurricane events, all examined separately in isolation (PRA, 2017c). Section 2 captured the exposures of general insurers to different sectors of the UK economy in terms of number of policies, gross written premiums, and total limits, segmented by main lines of insurance business (PRA, 2017c). The results of the GIST 2017 were published in aggregate format, with more detail in the area of reinsurance interconnectedness and overall resilience of the sector as key findings of the exercise (PRA, 2017a). Areas for improvement were also highlighted in relation to exposure management, natural catastrophe modelling, post-loss planning, and accounting (PRA, 2017a). Finally, the output of Section 2 was noted under consideration to support the development of liability scenarios for future exercises (PRA, 2017a).

The third GIST was the 2019 exercise and the first to be jointly coordinated with the BMA (PRA, 2019b). The PRA clarified that entities were invited to participate on a voluntary basis (PRA, 2019b), with the GIST 2019 not being a pass vs. fail exercise and not designed to set capital buffers, but instead covering PRA's sectoral and firm supervisory objectives[13] (PRA, 2019a). As in the previous two GIST exercises, the entities invited to take part were not disclosed; however, the PRA again noted that the largest 20 general insurers and the 15 largest Lloyd's syndicates participated, representing 75% of the UK GI sector (PRA, 2020). As in the previous exercise, the GIST 2019 was split into separate parts: the core stress tests of Section A with a severe economic downturn scenario (insurance asset shock) and Section B with four natural catastrophe liability shock scenarios[14], superimposed onto the Section A scenario, plus a liability scenario with assumed deterioration in technical provisions because of claims inflation examined in isolation (PRA, 2019b, 2019a). The final part, Section C, is of an exploratory nature and not a stress test, with climate change scenarios (C1); the exposure-gathering information for liability exposure management (C2), similar to GIST 2017, and lastly, a cyber underwriting loss scenario (C3) (PRA, 2019a, 2019b). The GIST 2019 specifications were detailed, providing the scenario background with key assumptions and input for modelling (PRA, 2019a). The GIST 2019 was the first regulatory prescribed stress test at the UK level that included the initial exploratory climate change scenario (PRA, 2019a). The cyber risk scenario was also new for the GIST, but variations of it have been included in the Lloyd's RDS since the 2016 exercise (Lloyd's, 2016). The increased level of detail also characterises the results of the GIST 2019, published the year after, again in aggregated format, capturing the feedback and key findings (PRA, 2020). Coinciding with COVID-19, the PRA noted three areas for further work at the industry

level in relation to data quality, allowance for risks outside standard models, as well as allowance for secondary perils based on recent events (PRA, 2020). Postponing the next GIST to 2022 (instead of 2021) because of COVID-19 was a key supervisory development, with statements about follow-up work on cyber stress tests (as in GIST 2022) and the BoE's CBES discussed in Section 4.1 below (PRA, 2020).

The final and most recent set of scenarios was the GIST 2022, in line with earlier exercises, to assess sector resilience to severe but plausible adverse scenarios, guide supervisory activity, and enhance regulatory and entity ability to respond to future shocks, according to the PRA (PRA, 2022a, 2022b, 2023a). The GIST 2022 comprised two scenario categories: Section A with three natural catastrophe scenarios and Section B with three cyber underwriting scenarios (PRA, 2022a). The natural catastrophe scenarios included a set of US hurricane events, similar to GIST 2019; California Earthquakes, like the Lloyd's RDS; and windstorm plus flooding events happening in the UK, like GIST 2017 (PRA, 2022a). Note that the natural catastrophe scenarios with the CAT vendor model output (i.e., from RMS and Verisk-AIR) are closer to the Lloyd's RDS explained in Section 4.3 below. At that same GIST exercise, cyber risk scenario considerations were introduced, building from the GIST 2019 exercise on the cyber exploratory scenario, focusing on the underwriting of this risk (PRA, 2022a). Specifically, the three cyber scenarios prescribed were a cloud down, a data exfiltration, and a systemic ransomware (PRA, 2022a). In the scenario specification, guidelines, and instructions underpinning the GIST 2022, the PRA provided in detail the responses participating entities provided as part of their feedback for the first and second rounds of technical input requests (PRA, 2022a, Annex 1). This was the first time in the IST that the feedback from insurers invited to take part was publicly disclosed, improving the level of transparency (PRA, 2022a). Actually, it was reported that upon receiving feedback from the insurance industry, the cyber-attack on the shipping navigation system, which was the further scenario, was dropped eventually (PRA, 2022a, Annex 1, 13, p. 54). The full list of the entities invited to participate was also disclosed, listing the 17 large UK general insurers but without naming the 21 selected managing agents from the Society of Lloyd's (PRA, 2022a, Annex 2, p. 59). That was another positive development that further improved the level of transparency of the GIST exercise. The feedback from the GIST 2022 exercise was detailed in the "Dear CEO Letter" published by the PRA a few months post its completion in early 2023 (PRA, 2023a). Obtained results were disclosed in aggregate format again, with key findings, and overall followed the trend of increased level of detail (PRA, 2023a). The increased level of detail also characterises the results of the GIST 2019, published the year after, again in aggregated format, with movements in aggregate solvency coverage ratio post each scenario (PRA, 2023a). Key findings were also noted by scenario, highlighting modelling gaps (primarily about the natural catastrophe scenarios) and (inter)dependencies with reinsurers (PRA, 2023a).

Finally, following from the 2022 GIST, the PRA published their intention to run a dynamic general insurance stress test in 2025, denoted as the DyGIST (PRA, 2023b). Based on the PRA's initial statement, the objectives of the DyGIST are to assess the industry's solvency and liquidity resilience to a specific adverse scenario, involving a simulation of sequential adverse events over a short period of time, to evaluate the effectiveness of insurers' risk management and management actions following that, as well as to inform PRA's supervisory response post that scenario (PRA, 2023b). The DyGIST is the extension of the GIST, an evolution of exploratory nature, which has been eventually delayed with amended timelines and an anticipated start in May 2026 (PRA, 2024d).

4.2. Life Insurance

There have been three LIST exercises to date with the current 2025 scenarios since starting back in 2019, followed by the 2022 exercise, both run in parallel with the equivalent GIST. The first LIST was published in 2019, consisting of two parts with four scenarios: the economic and life-insurance-specific stress (Parts A and B) and the exploratory climate change scenario (Part C), as for the equivalent GIST (PRA, 2019c). The first core scenario included a downturn and deterioration in the economic environment (Part A), with three life insurance-specific scenarios imposed on the first core scenario (Part B) (PRA, 2019b, 2019c). The life insurance-specific stresses refer to a credit spread with a credit quality step rise as the insurance asset shock with spread increase, an increase in longevity with a fall in base mortality rates, and a more severe base mortality rate stress, resulting in a breach of the minimum SCR of 100%, all (separately) added to the first core scenario (PRA, 2019c). The LIST shares in common all the characteristics with the GIST exercise of the same year (PRA, 2019a, 2019b, 2019c). The entities invited to participate are not disclosed, the scenario specifications are provided in detail, and the key feedback points from the request for technical input that resulted in changes are noted in the "Dear CEO Letter" announcing the IST 2019 exercise (PRA, 2019a, 2019b, 2019c). The same applies to the reporting of the LIST results, captured in the same "Dear CEO letter" issued by the PRA the year after the IST 2019, presented in an aggregated format, with the key findings and learnings (PRA, 2020, Annex 3). From the published results, it is clarified that 17 large life entities across 12 groups were invited to complete the LIST 2019, but without naming them (PRA, 2020, Annex 3). Limitations around data and methods because of approximations and simplifications are noted, mirroring the modelling comments accompanying the GIST, revealing a common theme across the insurance industry on data and modelling (PRA, 2020).

The second LIST exercise was issued in 2022, the same year in which a GIST was also performed (PRA, 2022b, 2022d). The LIST 2022 scenario consisted of four stages: initial market shock (stage 1), developing market shock (stage 2), protracted market shock (stage 3), and protracted market and longevity shock (stage 4) (PRA, 2022d). At each stage, the different underlying economic conditions and market characteristics (i.e., interest rate drop by −50 bps) were provided to capture the impact from the stress, conditional on the insurers responses for the asset side (no trading vs. trading post stress) and the liabilities (Transitional Measures on Technical Provisions—TMTP) (PRA, 2022d). In terms of the scenario dimensions and parameters, the same approach was followed as for the GIST 2022, showing the feedback participating insurers provided to the PRA (PRA, 2022d, Annex 1). The entities invited to participate, referring to the 16 largest UK life insurers across 12 insurance groups, were listed and publicly disclosed in a similar manner as for the GIST 2022 (PRA, 2022d, Annex 2, p. 41). The reporting of the obtained findings with feedback was on an aggregate basis, mirroring the reporting for the GIST, presented in the same "Dear CEO letter" published, focusing on management actions (PRA, 2023a).

The current LIST 2025 is the latest life-specific exercise, prescribed without an equivalent GIST (PRA, 2025a, 2025b). It was announced in 2024 where the preparatory work took place, with entities invited to participate responding to the request for technical input (PRA, 2024c). Indeed, an initial publication from the PRA detailing the approach to the LIST was issued, providing additional insights and further detail for each scenario component (PRA, 2024a). This is a crucial development to note under the IST exercises, notifying earlier invited entities in scope while at the same time setting the tone and being prescriptive for all scenario dimensions. It was formally launched in early 2025, listing the firms in scope, the 11 largest life insurers, as detailed in Appendix A (Table A1) (PRA, 2024a; 2025b, Annex). The objectives of the LIST 2025 were sector and individual firm resilience to severe but plausible events, improved insight into risk management vulnerabilities, and

strengthened market understanding and discipline through individual publication (PRA, 2024a). The exercise consisted of three parts: a three-stage evolving financial market stress as the core scenario (Section A), an exploratory downgrade stress on the material matching adjustments considered on top of the core (Section B), and another exploratory scenario added to the core scenario on the material funded reinsurance arrangements (Section C) (PRA, 2024c). The anticipated results of LIST 2025, which is currently ongoing, will be published on an aggregate basis for all scenarios and on an individual entity for the core scenario, under Section A (PRA, 2024a, paras. 4.33–4.35). This is the first IST exercise where the publication of individual results is planned, in line with PRA's supervisory expectations, anticipated in Q4 2025 (PRA, 2024a, Figure 1). It would be interesting to critique this when it becomes available in 2025, evaluating the quality, completeness, and detail underpinning individual disclosures for the LIST 2025, along with the key findings and feedback from participating entities. Following from the IST 2022, the LIST 2025 includes the 'Results and Basis of Preparation' Report as a requirement, covering the governance, quality assurance, data, assumptions, and modelling in general and for each scenario with specific sub-sections (PRA, 2025a). Guidance on the regulatory submission is detailed for the first time in the scenario guidance and specification (PRA, 2025b, Section E, p. 29). The overall LIST requirements noted about data and the quantitative submission are also introduced in this exercise (PRA, 2025b, Section D, p. 24).

4.3. Lloyd's Realistic Disaster Scenarios

In addition to the PRA's GIST, where often certain syndicates participate, Lloyd's of London publishes a list of compulsory stress tests for all syndicates every year. This set of mandatory stress tests, focusing on catastrophic risks and defined as Realistic Disaster Scenarios (RDS), is designed to test both the London market and individual syndicates. Contrary to the more recent PRA IST exercises, the Lloyd's RDS have been around a lot longer, by around two decades, starting back in 1994, even if in a different format with fewer scenarios (Orr et al., 2003). Specifically, in a paper produced by the Institute and Faculty of Actuaries (IFoA) in the UK, the history of RDS is briefed, mentioning the bulletins back in 1994 and in 1995 where the disaster plan and respective disaster scenarios were first introduced (Orr et al., 2003). The RDS has evolved, with the last ten exercises from 2015 being available from Lloyd's of London[15]. To ease the comparison with the rest of the regulatory prescribed stress tests, the focus is placed on those last eleven RDS exercises, despite the fact that some of the pre-2015 RDS might also be publicly available.

According to Lloyd's of London, based on the most recent RDS, the exercise consists of three sets and categories: (a) Compulsory Event Scenarios, (b) Syndicate-defined scenarios, and (c) Syndicate specific scenarios (Lloyd's, 2025). The RDS are based on catastrophic risks at a global level, though mostly in the US, with the exact RDS list by year and category presented in detail in Appendix A (Table A2). The scenarios cover windstorms, a typhoon, a UK flood, earthquakes, terrorism events, and cyber incidents (Lloyd's, 2025). For the compulsory scenarios, the scenario description, assumed losses (at industry level) with implications, causes, and information required to produce the quantification are provided (Lloyd's, 2025). There are also alternative scenarios A & B[16], with managing agents required to report two from that list, on the basis of materiality, capturing the largest accumulation of risks not already covered in the compulsory or in the de minimis scenarios (Lloyd's, 2025). An overview with assumptions and background is provided for the alternative scenarios A & B (Lloyd's, 2025). Similarly, for the de minimis scenarios, the description and type of the event are provided, along with additional information and the underlying assumptions, if applicable (Lloyd's, 2025). The de minimis scenarios include a loss of major complex, aviation collision, satellite risks, liability risks, political risks, and marine

scenarios (Lloyd's, 2025). Specifically, there are two different marine scenarios (marine collision and cruise incident), two liability risks (professional vs. non-professional lines) scenarios, and four different satellite risk scenarios (Lloyd's, 2025). The different scenarios for political risks are the only ones not detailed in the generic RDS specification but instead are detailed in a separate publication[17] provided by Lloyd's directly to the syndicates in scope (Lloyd's, 2025). A scenario ID is provided for all scenarios under (a) and (c), referring to the Compulsory Event Scenarios and the (c) Syndicate-specific scenarios (Lloyd's, 2025). This allows the comparison of output from prior RDS exercises since almost all RDS scenarios and their respective IDs remain the same. Linked to exposure management, industry-simulated losses are provided, with the exposure at market level, usually based on simulated output from catastrophe models, allowing managing agents and syndicates to estimate their individual exposure and gross/net loss. Looking at the previous eleven RDS exercises, the key differences to note refer to cyber, political, and marine risk scenarios. The four cyber scenarios[18] became part of the Compulsory Event Scenarios from the 2022 RDS exercise (Lloyd's, 2022). Previously there was only one cyber-related risk scenario, the "Cyber Major Data Security Breach" (ID: 76), that was included in the RDS exercises for six years since 2016 under the Syndicate-specific Scenarios (Lloyd's, 2016, 2017, 2018, 2019, 2020, 2021). The political risk scenarios are not detailed, and only in the past two exercises are their IDs (29, 31, 49, 81) disclosed (Lloyd's, 2024, 2025). Finally, the two marine scenarios remain identical; however, in 2015-16 their ID was different[19], with slight variations in the exact scenario assumptions (Lloyd's, 2015, 2016).

Finally, Lloyd's also publishes certain systemic risk scenarios[20], beyond the RDS. By design these scenarios capture systemic risks, effectively the probability of the financial system failing (Selody, 2011; LaBrosse et al., 2011). With systemic risk defined as the risk of threats to financial stability triggered by sudden and unexpected events in any part of the financial system (Freixas et al., 2015). Interaction among financial firms, insurance companies in this case, and the London market specifically, leads to systemic risk under crisis conditions (Acharya, 2013; Fouque & Langsam, 2013). This explains the rationale of those stresses, capturing systemic shocks (Schwarcz, 2016). These are more akin to the exploratory scenarios described in the subsequent section, focusing on the risk drivers, narrative, and qualitative description of their systemic nature, based on hypothetical but plausible events. An assumed return period, in the form of the probability of a 1-in-X-years event, is noted, with a severity description and any historical reference, if applicable, plus a high-level view of scenario effects. Examples of these systemic risk scenarios include a volcanic eruption and a human pandemic. Note that the results of the Lloyd's RDS and exploratory systemic risk scenarios are not published.

5. Exploratory Scenarios

There are different types of exploratory scenarios prescribed for financial services in the UK. These are designed and developed to capture risks outside the financial and macroeconomic stresses. The key examples covered in the subsequent sub-sections are the scenarios for climate, liquidity, and cyber-related risks, ending with the most recent system-wide exploratory scenario. Note that the stress test on central counterparties (CCPs), of an exploratory nature but not focusing on banks or insurers, is not in the scope of this analysis and thus excluded from this paper.

5.1. Climate Change

The Climate Biennial Exploratory Scenario (CBES) of 2021 is the most comprehensive climate-specific scenario run for the UK financial system. As discussed above under the IST, the CBES is not the first climate scenario, considering that the initial exploratory

climate change scenario was launched under the PRA's IST in 2019. However, it is the most complete and detailed exercise, co-developed based on the work of the Network for Greening the Financial System (NGFS)[21], when the BoE holds its secretariat role. The purpose of the CBES was to evaluate the resilience of the largest financial services to the risks—both physical and transition and partially liability too—associated with climate change (BoE, 2021b). Considering its scope, the largest banks, building societies, and general and life insurers participated to ensure a majority coverage of each sector. The (28) entities invited to participate, segmented by category, are detailed in Appendix A (Table A3). The CBES was launched in June 2021, after an initial delay, and completed in 2022, when the aggregated results were published (BoE, 2021b, 2022a).

The CBES included a set of climate scenarios exploring the impacts on both firms' liabilities and investments stemming from physical and transition risks (BoE, 2021b). It was a bottom-up climate stress test based on the NGFS scenarios, notably the "NGFS Net Zero 2050", the "Delayed Transition" and the "Current Policies" as starting points (BoE, 2021b). It included a qualitative exercise with high-level modelling for three exploratory climate scenarios based on different pathways: Early Action (EA), Late Action (LA), and No Additional Action (NAA) (BoE, 2021b). The NAA scenario focuses on physical risks, both acute and chronic, whereas the EA and the LA focus on transition risks instead, based on two pathways of net zero greenhouse gas emissions, with a different policy intervention (BoE, 2021b). The EA assumed a long-term orderly transition in line with the Paris Agreement, whereas the LA assumes a sudden transition followed by a disorderly transition (BoE, 2021b). The change in global warming levels is the same under EA and LA, observing the same temperature in Year 10 (1.4 °C) and Year 30 (1.8 °C), lower than under the NAA during the same time frame for Year 10 (2.5 °C) and Year 30 (3.3 °C) (BoE, 2021b, Table 3.B). The NAA leads to an increase in global temperature beyond 4 °C because it assumes no policy action is taken, and a failure to improve climate policy is observed (BoE, 2021b). The climate scenarios underpin the detailed modelling assumptions and variables provided for the scenario quantification. Specifically, the BoE provided in the "spreadsheet" format (Microsoft Excel) four types of variables[22] for those three scenarios: (1) Macro, (2) Financial, (3) Transition, and (4) Physical (BoE, 2021b). The summary of impact by each of those three scenarios for transition and physical risks is detailed in Figure 3.A of the CBES (BoE, 2021b, Figure 3.A) before describing how these risks cascade into the economy and society, translated into impact. Key elements of the CBES to note are the (i) scope of the parameters, with the four categories of variables used; (ii) multiple scenarios; (iii) the longer-term horizon[23], with forecasts until 2050; (iv) overall novel modelling approaches; (v) the sectoral approach, including both banks and insurers; and (vi) stages of the exercise with a second round of financial services participating, in addition to the initial list (BoE, 2021b, Box A).

It is important to consider these (i)–(vi) innovative and unique characteristics of that exploratory scenario when analysing its derived results. On the basis that these elements supported the CBES participating entities preparing for the climate change risk management requirements as in PRA's Supervisory Statement SS3/19 (BoE, 2022a). Referring to the Governance, Risk Management, Disclosures, and most importantly, Scenarios Analysis, as per the Task Force on Climate Related Disclosures (TCFD) (BoE, 2022a; PRA, 2024b). Specifically, about governance arrangements, a framework for climate risk reporting, setting climate-related risk appetite, and overall capability to assess climate-related risks using the scenario analysis tool (BoE, 2022a). The key lessons from the CBES findings are used to inform setting PRA's supervisory policy and approach, shaping BoE's strategy and policy as next steps (BoE, 2022a; Woods, 2022).

In the published results, the aggregated view for banks and insurers is presented and discussed, commenting on certain examples of good practice to highlight the desired expectations from a regulatory perspective (BoE, 2022a). However, these are in less detail compared to the bank macroeconomic scenarios, such as the ACS. The results are also split between the transition and physical risks, with a separate sub-section on climate litigation (BoE, 2022a, Box C). The key highlights from the CBES exercises refer to the lack of data and key factors on managing climate risks, the quality of assessment and modelling of climate risks, and the improvements required on climate risk management capabilities (BoE, 2022a). With all those findings supporting supervisory updates, such as to SS3/19 and PRA's approach in supervising banks' and insurers' climate change risk management practices (BoE, 2022a). Moreover, further developments are needed in line with the Climate Change Adaptation Report 2021 (PRA, 2021) and the SS3/19 supervisory statement about enhancing banks' and insurers' approaches to managing the financial risks from climate change that provides guidance and requirements for the UK financial services to understand climate risk exposure and transmission channels (BoE, 2022a; PRA, 2024b).

From the CBES, there are gaps observed in relation to SS3/19 and PRA's expectations about climate scenario testing and risk management practices overall (BoE, 2022a). There are no firm-specific idiosyncratic climate change scenarios developed and reported, with the focus placed on the qualitative analysis, with no link to financial metrics, such as key performance/risk indicators (KPIs/KRIs) and the quantitative disclosures (BoE, 2022a). Plus, the impact modelled mostly focuses on the asset side and investments (BoE, 2022a). The link to financial metrics and quantitative disclosures needed is flagged, considering the lack of data and key factors on managing climate risks as part of the framework and standards for disclosures and sustainability reporting (BoE, 2022a). The quality of assessment and modelling of climate risks, with improvements needed on climate risk management capabilities, is another key finding (BoE, 2022a), linked to the stress testing developments and recommendations noted in Section 6 of this paper. For the overarching regulatory approach, finance stability policy issues and actions related to climate risks are stated, with developments in line with CCAR 2021 and SS3/19 to understand climate risk exposure and transmission channels (BoE, 2022a). The above learnings of the CBES with further insights are detailed and further explained in the guide published in 2023 by the Climate Financial Risk Forum (CFRF), the joint PRA and FCA initiative to support UK finance services, with support from academic institutions (from the UK Centre for Greening Finance and Investment) and commercial partners (CFRF, 2023).

Finally, another unique element of the CBES was that it had a second round (BoE, 2022a, Box E). In line with previous Biennial Exploratory Scenarios (BES), the second round of the CBES allowed the Bank of England to gather further insights, with detail on the participating entities' responses, such as management actions to the scenarios (BoE, 2022a, Box E). An interesting feature of that second-round approach was that additional financial institutions beyond the systemic ones were invited to participate and complete this exercise.

5.2. Liquidity

The second exploratory regulatory prescribed stress test is the 2019 Liquidity Biennial Exploratory Scenarios (LBES). The LBES was launched in 2019 but then paused in 2020 because of the coronavirus pandemic, with live liquidity risk management implications to consider (BoE, 2021a, para. 89). According to the Financial Policy Committee (FPC), the LBES focused on the implications of a severe and broad-based liquidity stress affecting major UK banks simultaneously, featuring a material liquidity run lasting 90 days, followed by a nine-month recovery period (BoE, 2021a, para. 90). In terms of its parameterisation, the magnitude of liquidity outflows was calibrated to be similar to the set of stresses that

determine the size of banks' regulatory liquidity buffers (equivalent to around 60% of the value of banks' high-quality liquid assets at the start of the stress) (BoE, 2021a, para. 91). The obtained results provided insight on banks' response, defensive strategies, and impact on the liquidity coverage ratio (LCR) and the liquidity buffers (BoE, 2021a, paras. 93–99). Overall, this exploratory scenario supported the evaluation of the prudential liquidity regime, feeding into liquidity policy discussions by the FPC (BoE, 2021a, paras. 97–99). The LBES was not released in a separate publication, neither when it was launched nor its results. There was no detailed publication with its assumptions, timelines, listing participating banks, and then presenting their results, either in aggregate format or on an individual basis. Instead, its key elements were reported in the minutes of the March 2021 FPC meeting, in two pages with ten paragraphs (BoE, 2021a, paras. 89–99). This approach differs significantly from the effort and volume of publications compared to the CBES introduced above. Perhaps the results disclosure is the biggest area of concern, where more detail should have been provided. Equally important, but similarly not published, is the scenario background, with the exact parameters and assumptions, considering that certain non-participating institutions could use this to either replicate or structure an idiosyncratic scenario.

5.3. Cyber

The third exploratory scenario is the cyber stress test launched in 2021, inviting entities to participate on a voluntary basis (BoE, 2021c). This was based on the initial analysis of cyber-related risks and attacks discussed at the 2017 and 2018 FPC meetings, detailed in the respective Financial Stability Reports[24] (BoE, 2021c). The cyber stress test focused on a severe data integrity incident as a separate exercise from the PRA's operational resilience policy but complementing it in terms of policy objectives (BoE, 2021c). The cyber stress test (CST) is detailed in the March 2021 FPC meeting (BoE, 2021a, paras. 67–82). It is based on the framework of regulation to strengthen the resilience of the UK financial system to cyber risk from the 2017 and 2018 FPC meetings (BoE, 2017, 2018). Its core elements are (i) to provide clear baseline expectations for firms' resilience, (ii) to regularly test the resilience in line with the evolving nature of those risks, (iii) to identify entities outside the financial regulatory perimeter, and (iv) to ultimately test arrangements for responding to cyber incidents (BoE, 2021a, para. 67). The CST scenario assumed data integrity was compromised, targeting most systemic contributors in the end-to-end payments chain under disruption and the ability to resume services in a timely manner (BoE, 2021a, para. 79). The objectives of the CST were to understand the ability to identify the nature of the disruption faced along with the financial stability impacts from being outside impact tolerance in the event of a data integrity compromise (BoE, 2021a, 2023i). Similar to the LBES described above, the cyber stress test of 2022 (CST) was presented actually in the same FPC summary report, under a page with five paragraphs (BoE, 2021a, paras. 78–82), without a separate publication noting its dimensions, timelines, and entities in scope. The participating entities were not disclosed, even if the exercise stated that the systemic institutions were invited to that exercise.

The key findings of the CST, also linked to operational resilience, were published in the March 2023 FPC (BoE, 2023b, paras. 94–100) and in a letter from the PRA addressed to "Dear SMF 24 or equivalent" (BoE, 2023i). In fact, the letter with the findings provided more information on the scenario narrative. (BoE, 2023i). The key findings were segmented into six broad categories: Industry coordination, (2) Communication, (3) Contingencies, (4) Mitigants, (5) Reconciliation and (6) Testing capabilities (BoE, 2021a). The latter is another example of the core stress testing developments noted in Section 6, about strengthening scenario analysis and stress testing capabilities internally, especially in that area about

cyber-related risks, inclusive of data integrity, availability, and confidentiality (BoE, 2023i). Regulatory collaboration between the BoE, the PRA, and the FCA is noted under next steps, linking this exercise to operational resilience and the overarching approach to banking supervision (BoE, 2023i). That is another area about cross-sectoral work on regulatory prescribed stress testing, explained in the stress testing developments. Finally, there are additional scenarios capturing cyber risks linked to operational resilience and information, communication, and technology (ICT) risks not captured in this paper. These are the Critical National Infrastructure Banking Supervision and Evaluation Testing (CBEST) and the Simulated Targeted Attack & Response assessments for Financial Services (STAR-FS), for instance.

5.4. System-Wide

The final and most recent in chronological order exploratory scenario is the system-wide exploratory scenario (SWES) of 2023. The SWES was run by the BoE, guided by the FPC and the Prudential Regulation Committee (PRC) in collaboration with the FCA, The Pensions Regulator (TPR), and other regulators (BoE, 2023e). The aim of the SWES was to improve the understanding of banks and non-bank financial institutions (NBFIs) behaviours during stressed conditions, along with their interaction in shock amplification for the UK financial market and overall financial stability (BoE, 2023e). In a similar manner to the CBES, the SWES comprises two rounds to allow for the system-wide interactions and amplification effects (BoE, 2023e). An extended list of fifty-four (54) banks, insurers, CCPs, and various funds[25] were invited to participate in the SWES (BoE, 2023e, Table A). The exact SWES participants by type of financial institution are included in Appendix A (Table A4). The banks and insurers include the systemic institutions that participated at the CBES. For the large banks of the SWES in particular, these are the systemic institutions that also participate in the macroeconomic scenarios, such as the ACS and the SST described above. The scope of the SWES consists of evaluating the impact of a severe but plausible stress on global financial markets, focusing on the individual financial firm interaction to exacerbate shocks (BoE, 2023e). In comparison to the systemic risk scenarios (which capture systemic risks), the SWES considers the entire financial system, explaining the system-wide nature of this exercise (BoE, 2023e, 2024d). It is deemed an effective tool from a financial stability perspective in understanding system-level vulnerabilities (BoE, 2023e, 2024d). This is because the SWES offers an analytical view to explore the associated risks and resilience of the financial system after examining the dynamics, behaviours, and interconnectedness of the financial institutions under stressed conditions (BoE, 2023e, 2024d). The system-wide nature of the SWES is reflected in the entities in scope, comprising all types of financial institutions (BoE, 2023e, 2024d), contrary to other regulatory prescribed stress tests, apart from the exploratory scenarios, where only one category is usually included.

A core angle of the SWES was the evaluation of the key transmission mechanisms and channels, looking at liquidity demand and supply, with actions to deleverage, reduce risk exposures, and/or rebalance portfolios (BoE, 2023e, Figure 1). Upon the launch of the scenario phase of the SWES, the variable pathways were provided in a spreadsheet format, along with the timelines and the dimensions of the first round with subsequent steps. (BoE, 2023c). The scenario narrative with the day-to-day detailed timeline[26] of that hypothetical market shock was also issued, complementing that guidance (BoE, 2023a). The SWES results were published in aggregate format a year later in Q4 2024 (BoE, 2024d). In the published results, more information on the methodology of the scenario was included, based on the narrative and guidance, providing also insights on the second round of this exercise (BoE, 2024d). The four components of the SWES assumed (1) the default of a mid-sized relative value hedge fund, with elevated concerns on counterparty credit risk (2) single

notch downgrades of several jurisdictions (the UK included too), plus a small number of financial institutions and corporates; (3) an unexpected announcement by sovereign wealth funds on intentions to reduce advanced-economy debt holdings; and lastly, (4) longer-term shocks to economic fundamentals beyond the 10-day horizon (BoE, 2024d).

The BoE caveated that the SWES results are influenced by both the design of the exercise and firms' starting position but nevertheless provide useful insights into the interrelationship of the financial system participants under stress (BoE, 2024d). The thirteen (13) detailed findings were presented in a summary form, grouped into three categories: Inconsistent expectation between participants (#3), System-wide interactions (#4), and Sectoral behaviour (#6) (BoE, 2024d, Annex 1). The detailed findings with the next steps were accompanied by deep dives on the outcomes and observations at the sectoral level for insurers, hedge funds, funds[27] (pensions vs. open-ended), and lastly banks (BoE, 2024d, Annex 4, Box C). The overarching outcomes are summarised in six (6) conclusions from the SWES towards the resilience of the financial system and UK core markets and, most importantly, on the role of the system-wide stress testing that is aligned to the focus of this paper (BoE, 2024d, Section 4). The first four conclusions are linked to the underlying components of the SWES, on the initial shock amplifications from firms' collection actions, resilience of the repo and gilt markets, illiquidity of the sterling corporate bond market under stress, and policy responses to vulnerabilities highlighted (BoE, 2024d). The final two conclusions refer to the importance of system-wide exercises from a regulator's perspective as an effective tool for the identification and understanding of system-level vulnerabilities from a financial stability lens, used to support prudent supervision with surveillance and risk assessments, as well as to inform designing future exercises (BoE, 2024d). All conclusions are explained and criticised, with the BoE listing next steps based on the findings and learnings of the SWES (BoE, 2024d). The volume and cross-sectoral approach of participants are unique features of the SWES, as well as the regulatory collaboration with the engagement of the TPR outside the BoE, the PRA, and the FCA.

6. Stress Testing Developments

The final section of this paper presents the proposed developments and recommendations around regulatory prescribed stress testing. These are based on the analysis and presentation of existing regulatory prescribed stress and scenario tests for financial services, as covered in the previous three sections. They are linked to existing regulatory requirements in relation to stress and scenario testing practices and advances. The first part covers the proposals and developments of a regulatory and supervisory nature, including proposals for future exercises. The second part documents the future challenges based on the trends around regulatory prescribed stress testing from the perspective of the entity participating in them. The third part discusses further the policy recommendations to consider in updating the regulatory prescribed stress testing framework.

6.1. Trends and Proposals

The stress testing developments discussed in this section are segmented into five themes, as graphically depicted in the figure (Figure 3) below. These trends comprise the regulatory collaboration (#1), cross-industry stress testing (#2), exploratory scenarios (#3) with their reporting and disclosure requirements (#4), and finally the underlying modelling capabilities and tools (#5).

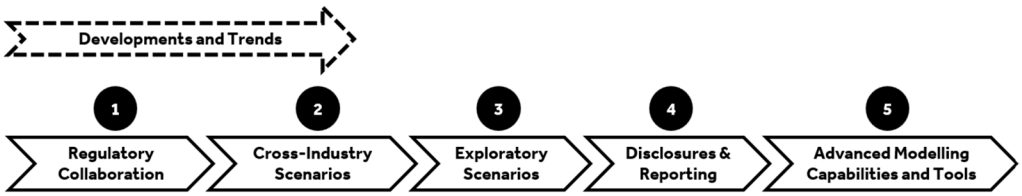

Figure 3. Regulatory Prescribed Stress Test—Developments and Trends.

Regulatory collaboration is the first theme observed. Examples include the jointly run exploratory scenarios co-developed between the FCA and the PRA and also the GIST 2019 jointly developed by the PRA and the BMA, showcasing the collaboration from different jurisdictions. Considering certain new and emerging risks, an intensified level of collaboration is anticipated, involving UK supervisors joining forces to design, develop, and perform regulatory prescribed stress testing exercises. Especially considering operational risks and the exploratory scenarios, where comprehensive joint assessments led by multiple regulators and supervisors could address the gaps in technical components. For instance, the ICO collaborated with the PRA and the FCA on scenarios for ICT risks, capturing the data loss, use, and information security compromise angle. The more complex scenarios become, for emerging risks and of an exploratory nature, the more regulatory collaboration and coordination are required to strengthen supervisor's approach in understanding and assessing adequately those risks. Beyond collaboration with other UK regulators for joint assessments, cross-border options should also be considered. Building on the relationship between regulators and supervisors from other jurisdictions, capitalising on joint memberships at global consortiums (i.e., members of the International Association of Insurance Supervisors-IAIS). Perhaps the starting point could be looking at EU-level regulatory prescribed stress tests, on the basis of the pre-Brexit involvement, to understand developments, deviations from the UK approach, and any findings that could be transposed for supervising UK-based financial services. Therefore, linking EU-wide and other global scenario exercises to analyse differences, incorporate lessons learnt, and target synergies to gain technical expertise in certain areas could transform regulatory prescribed stress testing. This regulatory collaboration could also be facilitated under a supervisory college in cases of global financial services with multiple supervisors. An extension to regulatory collaboration is the development of cross-industry scenarios. Again, certain exploratory scenarios are market- or industry-wide, such as the CBES and SWES, including different types of financial services as their participants. Building on those exercises, developing regulatory prescribed stress tests for multiple financial services should be considered to enhance cross-sectoral learnings and, most importantly, evaluate the linkage between sectors (i.e., how insurance losses could affect non-performing exposures of banks, etc.).

Increasing the understanding about certain risks is, by design, inherent in the nature of regulatory prescribed stress tests. Especially for the exploratory scenarios, where often the focus is placed on non-financial, new, and emerging risks. This objective about exploring and understanding those risks is a common characteristic shared between the themes of regulatory collaboration and cross-sectoral scenarios. Exploratory scenarios, as detailed in the previous section, examined under different objectives, are utilised by regulators and supervisors to inform setting their policy. These exercises have a lot of unknowns and are in ongoing development, though they reveal key areas of concern that could be addressed via policy implementation. The Bank of England is leading the development and application of exploratory scenarios, with these stresses becoming a core element of its bank stress testing approach (BoE, 2024c). In that direction, the design and development of additional scenarios for emerging risks is anticipated (i.e., what about pandemic-related stresses?). Building on the regulatory collaboration and cross-industry scenarios, exploratory scenarios

for operational risks could be prescribed, linking operational resilience with cyber, data, and ICT risks. In general, using the stress testing tool for emerging risks is an approach that has reached momentum and will be intensified further. However, these exploratory scenarios should be accompanied by further guidance. Special guides should be published on exploratory scenarios, with future developments for the methodological approaches and modelling of stress tests.

With more regulatory prescribed stress and scenario tests, the question of increased reporting and disclosures comes naturally. Currently, there is a dual approach to disclosing the stress testing results: on an aggregate basis for some scenarios or on an individual basis for other stresses. Often individual reporting is accompanied by the aggregate view as a benchmark. In the macroeconomic bank stress tests, the results are presented in aggregate format for the entire banking sector and on an individual basis for the systemic banks participating in them. For the IST, until the current LIST 2025 exercise, where for one component the individual results are anticipated (PRA, 2024d), only the aggregate view has been reported in the past. Similarly, for the exploratory scenarios, the aggregated view is disclosed. For the RDS, no reporting is available at all. Reporting requirements with increased levels of detail, plus publication of results in both aggregate and individual formats, should be considered as the norm to increase the level of transparency. Trialling individual disclosure of results, as in the existing scenarios and based on other regulatory prescribed stress tests outside the UK (e.g., such as the IST from EIOPA, where participating entities who gave consent published individual scores), is a parameter anticipated in future exercises. Beyond the individual vs. aggregate view of results, including more detail in the obtained results to provide further insights is expected. This will reinforce the findings and lessons learnt from each stress-testing exercise.

The final development, which correlates with the above four themes, captures the modelling, data, capabilities, and tools. Financial services face the "perfect storm" in terms of stress testing; additional scenarios to run, which are more complex, are requested more frequently and require more advanced modelling techniques. A core objective of stress testing beyond understanding policy developments and individual and sectoral resilience is the enhancement of risk management capabilities. Therefore, the evolution of stress testing requirements aims to support financial services in evaluating their own scenario modelling capacity and capability. However, without support and supervisory guidance, there is a danger of over-reliance on third-party providers, as highlighted in certain regulatory prescribed stress testing exercises and discussed in the next sub-section. Further guidance on regulatory prescribed stress testing exercises should be provided to support participating entities. This could take the form of detailed guides with specific examples, modelling approaches, and technical information, such as the publications from the Climate Financial Risk Forum (CFRF) with the scenario analysis tool for climate, linked to the CBES. Alternatively, providing insights on supervisory expectations and noting the gaps and the steps to achieve improvements is the other option. For instance, the RBP requirement from the recent IST exercises serves that purpose, with participating insurers strengthening their governance, modelling, and overall documentation accompanying the quantified results. Especially in the area of management actions, their applicability, usability, and effectiveness. Since gaps are often observed around management responses and remedial actions, consider that regulatory prescribed stress tests are hypothetical exercises and cannot be tested in practice (apart from exceptions, of course). The increased frequency of regulatory prescribed stress testing influences the deployment of stress testing capabilities. More regular stress tests, which are more severe (but plausible), with longer horizons and complex risk transmission channels, require advanced modelling capabilities and overall robust stress testing practices. The horizon-, short-, medium-, and long-term, if applicable- adds

to the complexity, with more assumptions and advanced considerations to be made in the modelling and the actual quantification of results. The same applies to the nature of risks captured for financial vs. non-financial risks of primary and secondary impact. Modelling systemic risks and contagion effects creates more challenges, especially under exploratory scenarios. The regulatory prescribed stress test setup introduces another layer of challenge, with amplified and cancelled risks based on the underlying drivers. These risks should be accounted for in the modelling approach and overall scenario quantification.

6.2. Future Challenges

The developments explained earlier in this section arise from the future challenges in relation to stress and scenario testing practices from regulatory exercises identified and noted. The future challenges and trends discovered are linked to the characteristics of the regulatory prescribed stress test exercises. Contrasting to the proposals and recommendations described earlier, these challenges are mostly aimed at the financial services participating in the regulatory prescribed stress tests. These future challenges and trends of stress and scenario testing practices and activities, which are all interconnected, are graphically depicted in the figure (Figure 4) below. These refer to the governance (A), frequency (B), individual disclosures (C), and data and modelling (D), with capabilities and skillset required from participating institutions (E), all underpinning regulatory prescribed stress tests.

Figure 4. Regulatory Prescribed Stress Tests—Future Challenges.

The first challenge is around the governance of regulatory prescribed stress testing. The governance is an angle captured by the PRA in the Insurance Stress Tests, with the introduction of the Results and Basis of Preparation Report, the qualitative return accompanying the quantitative stress testing submission. Governance refers to the oversight and documentation around stress and scenario testing practices. Firstly, about the documentation, with adherence to the internally developed process and procedure documents and ideally the Stress & Scenario Testing Framework. Secondly, about the different types of reviews, checks, and audits of the stress testing results and their underpinning modelling processes. Then, in terms of the formal governance process, with reviews and outcomes sign-off at the relevant Committee/Board level.

Following from the governance and oversight of stress testing and its different underlying steps and components, a core challenge influencing it, in effect, is how often the regulatory prescribed stress tests are run. Considering the effort, time, and resources required, their frequency is crucial in determining the appropriate governance approach, oversight, and overall stress testing practices. Note that beyond regulatory prescribed stress tests issued by the regulators inviting entities to participate, either on a voluntary or not basis, there are additional stresses, scenarios, sensitivities, etc., performed concurrently by each entity as part of business-as-usual activities. These tests are often linked to existing regulatory requirements and supervisory expectations (i.e., ICAAP, ORSA, etc.). At the same time, depending on the entity under supervision, specific scenarios—in isolation or as part of a risk assessment—might be requested by the regulators. Therefore, an increased frequency of regulatory-prescribed stress tests could potentially adversely impact the delivery of other tests and regulatory returns. It is anticipated to have a scenario to complete every year, and in certain cases there might be two scenarios happening simultaneously: one macroeconomic/financial risk stress plus an exploratory scenario based on the exploratory scenarios. Finding the right balance is key and already underlined in the latest Bank of England's approach to stress testing (BoE, 2024c). A pragmatic approach, decreasing the burden on financial services and primarily on banks, is noted by the Bank of England, recognising the strain these exercises create (BoE, 2024c). This should be considered in combination with external factors and risks. A good example in that area is COVID-19, with some regulatory prescribed stress tests being postponed eventually.

The third challenge, perhaps concerning some financial institutions only, is the reporting of the results. Individual disclosures and granular reporting requirements increase the level of governance and oversight. Currently, the results of the macroeconomic stress tests for the systemic banks show the results at the entity level. Therefore, for the top UK banks, individual results are already reported for some regulatory prescribed stress tests. For instance, this is not the case for the exploratory scenarios. For insurers, the LIST 2025 is the first exercise where the publication of entity-level results is anticipated in late 2025. This actually follows from the EU equivalent exercise, where, from the 2018 IST for EU-level insurers from the European Insurance and Occupational Pensions Authority (EIOPA) onwards, the individual entity results are published, on a voluntary basis, upon providing consent. The rise in regulatory-prescribed stress tests will ultimately result in more detailed results reported at both the aggregate and entity levels if the former remains on a voluntary basis. These requirements around reporting of the results challenge the governance around stress testing practices. Thus, robust processes and procedures around stress testing practices should be in place to ensure that these are fully met.

The fourth challenge, about data and third-party vendor policy, has already been flagged by the Bank of England and the PRA in previous exercises, for the exploratory scenarios, but also for the IST. This refers to the reliance on external parties to support with data, models, and modelling of financial and non-financial impact. Especially considering the exploratory scenarios with uncertainties and unknowns. Plus, commenting on the oversight and governance as part of the overall model risk management (MRM) approaches underpinning stress testing practices. Associated with the strain on resources are the monetary implications and costs attached to that external support. Interlinked to the increased frequency of regulatory-prescribed stress testing, the reliance on third-party providers for support should be considered as part of the long-term risk management strategy. In the short-term dependencies might exist as the initial phase, but in the long-term financial services should be looking to minimise this, bringing in-house components of the stress and scenario testing cycle. Arguably this might be neither cost-effective nor achievable. External support is probably needed in certain areas with advanced modelling,

which cannot be substituted by internal methodologies and data. As well as in auditing results and providing assurance, as this is often covered externally.

Nevertheless, in the long-term financial services should consider strategic developments around resourcing and capabilities as the final challenge, connected to the reliance on external support. Investments in skillset, modelling techniques, methodological approaches, and overall, in strengthening stress testing practices, are a challenge with the increasing number of regulatory prescribed stress tests with the additional reporting requirements. At the same time, this presents an opportunity and solution to external support since ultimately certain stress-testing activities should be developed internally and maintained for future exercises, transitioning into BAU. This long-term approach towards championing the SSTF will allow us to overcome these challenges arising from the regulatory prescribed stress testing developments. Targeted focus on human capital to empower technical capabilities with the use of technological advancements to support modelling and scenario quantification should be the ultimate goal to counter existing hurdles and prepare for future regulatory developments. This should be accompanied by novel approaches to testing, combining quantitative and qualitative techniques, to understand the associated risks and implications from regulatory prescribed stress tests. For instance, in addition to the financial modelling, conducting a PESTEL and a SWOT[28] analysis (Chapman, 2011; Andersen & Schrøder, 2012; Johnson et al., 2017), particularly for the exploratory scenarios, could strengthen their examination. These qualitative approaches could be utilised to understand the dynamics and characteristics of the different regulatory prescribed stress tests, with their output utilised to inform the modelling and the qualitative regulatory returns. This approach could also be adopted by non-participating financial institutions. A combined PESTEL and SWOT analysis could be deployed to support them in interpreting the regulatory prescribed stress tests and then replicating them in a pragmatic and proportionate way.

6.3. Policy Recommendations

After highlighting the trends and challenges associated with regulatory prescribed stress tests, to discuss the associated practical recommendation with the policy contribution of this paper. To present some overarching suggestions for both the supervisors and regulators, prescribing the stress tests and also for the financial services participating in those exercises. The increased frequency, complexity, and granularity of the regulatory prescribed stress testing exercises create challenges for the participating financial institutions. To address these while at the same time preparing for future scenarios, financial services should focus on strategic investments to improve their practices internally. They should target building capabilities and technical skills and allocating adequate resources as ultimate objectives. At the same time, regulators and supervisors should work closely with financial services to support them in completing the stress-testing exercises, given the challenges introduced. The continuation of support with dedicated guidance, workshops, and forums is recommended. Especially for non-banking institutions, publishing equivalent guides documenting the approach to stress testing. In relation to exploratory scenarios in particular, developing a 'stress testing sandbox' to provide assistance in a live environment could also be considered. The following figure (Figure 5) depicts the overarching recommendations in relation to regulatory prescribed stress testing for UK financial services. The three categories, BST and IST, with their overlapping BES, are driving the trends and challenges associated with regulatory prescribed stress tests, as shown in the upper part of the figure. To address these, supervisory and regulatory bodies could provide more support to participating entities from financial services and the improvements required at their entity level, as shown in the lower part of the figure.

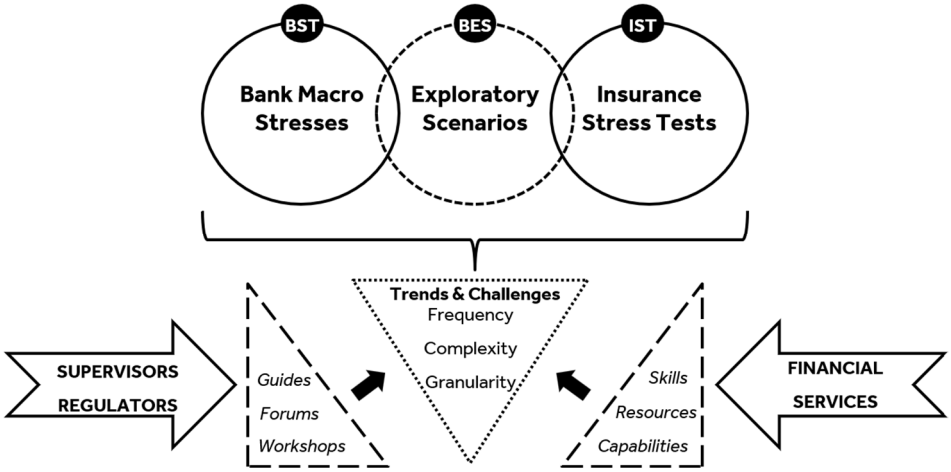

Figure 5. Regulatory Prescribed Stress Testing Framework Proposals.

Based on the above, amendments to the PRA Rulebook should be considered, introducing the regulatory prescribed stress tests and their requirements. Currently the approach to bank stress testing is documented in a separate publication from the Bank of England (BoE, 2024c). However, there is no equivalent documentation for the rest of the financial services, such as insurers and asset managers. Therefore, introducing sector-specific guidance should be considered, or alternatively, expanding the scope of the bank stress testing approach, since it partially covers the BES (BoE, 2024c). Then, reflecting on regulatory prescribed stress testing, developments in the underlying requirements about scenarios in general should be considered. Regulatory prescribed stress tests should be extended and integrated into existing risk assessments. This refers to the stress and scenario testing requirements under the ICAAP/ILAAP for banks, the Solvency II Own Risk and Solvency Assessment (ORSA) for insurers, and the Internal Capital Adequacy and Risk Assessment (ICARA) for asset managers, among other testing requirements (i.e., Operational Resilience). These should become part of the Supervisory Review and Evolution Process (SREP)[29] and the Periodic Summary Meeting (PSM), in line with the supervisory approach for each financial services entity. The development of one's own idiosyncratic scenarios to further enhance capabilities within financial services should complement this. Effectively designing them based on BCBS principles (Scenario Analysis Principle 12; BCP15, Stress Testing Principles). Combining top-down and bottom-up approaches towards stress and scenario testing based on regulatory prescribed stress tests and their own scenarios (as part of the ICAAP/ILAAP, ORSA, ICARA) is recommended with their evaluation under the supervisory review (SREP, PSM). These actions could be regarded as the ideal preparation for the challenges of the regulatory prescribed stress tests, based on the trends noted in Section 6.1 above.

Regulatory prescribed stress tests are considered an effective tool, based on their respective supervisory objectives. This is highlighted in the publication of results from the UK regulatory and supervisory bodies. Despite the gaps identified and areas for further development, these exercises are deemed of high importance to ensure the prudent supervision of financial institutions. This is validated by the fact that this supervisory tool continues to be employed, with the stress testing framework evolving further for improvements. The trends and challenges associated with regulatory prescribed stress tests should be considered in the development of policy recommendations. This approach allows them to remain an effective supervisory tool for the safety, soundness, and solvency of UK financial services. The summary of the proposals for policy developments in enhancing the UK supervisory framework to account for those challenges (the Figure 4A–E in Section 6.2 above) is presented in the table (Table 2) below. The policy recommendations are linked to

the type of regulatory prescribed stress test, building from the BST, IST, and BES distinctions. This supports commenting on the differences and similarities between those three types of regulatory prescribed stress tests, also factoring in the heterogeneity between the financial institution types (i.e., banks vs. insurers).

Table 2. UK Financial Services Regulatory Prescribed Stress Tests—Policy Recommendations.

Challenge	BST, IST and BES Policy Recommendation
(A) Governance	• Introduce requirements about the results and basis of preparation, replicating the IST format [BST-BES] • Clarify the requirement to expand in the stress testing framework requirements for banks and insurers, the consideration of "exploratory" approaches and emerging risks, based on PRA's approach to bank and insurance supervision [BST-IST] • Review the SSTF as part of the supervisory review and periodic summary meetings [BST-IST]
(B) Frequency	• Develop cross-industry scenarios for new and emerging risks [BES] • UK regulatory collaboration for stress tests capturing financial risks for insurers, inclusive of Lloyd's, and for non-financial risks under exploratory scenarios [IST-BES] • Collaboration with international regulators for joint exercises [BST-IST] • Avoid the overlap of two scenarios, happening simultaneously, not requiring an exploratory scenario during the same period with the BST and the IST [BES] • Scenarios for banks and insurers should be prescribed every other year at best, allowing entities improve practices and incorporate learnings before the next exercise [BST-IST] • Lloyd's RDS to remain annual, with the systemic risk scenarios from Lloyd's requested to be examined on ad-hoc basis, every other year at the earliest [IST] • Exploratory scenarios to be prescribed every other year in line with the BoE's updated approach to bank stress testing from 2024 [BES]
(C) Individual Disclosures	• Trial individual disclosure requirement (initially on voluntary basis) for insurers replicating bank stress tests and EIOPA's approach [IST] • Disclose results of the Lloyd's RDS exercise in aggregate format [IST] • Require updates to the SSTF for the oversight, review, validation of individual disclosures [IST-BES] • Extending the exploratory scenario results disclosure, presenting them on individual basis, after the IST trial replicating BST [BES]
(D) Data and Modelling	• Formalise requirement about internal frameworks and models [BST-IST] • Issue guidance on model risk management (MRM) for insurers, in a similar manner as for banks [IST] • Include in the principles for doing business at Lloyd's a separate provision on the RDS exercise, plus, the Lloyd's systemic risk scenarios [IST] • Publication of data sources and tools for scenario quantification [BES]

Table 2. *Cont.*

Challenge	BST, IST and BES Policy Recommendation
(E) Capabilities and Skillset	• Development of industry forums with tailored guidance (similar to the CFRF for CBES) for the exploratory scenarios [BES] • Require formal allocation of dedicated resources to support regulatory prescribed stress testing [BST-IST-BES] • Consider introducing Senior Management Function (SMF) allocation as part of the FCA's Senior Managers and Certification Regime (SMCR) for stress testing [BST-IST-BES]

7. Conclusions

The use of stress testing, especially for banks, is quite timely, considering that the Bank of England updated the approach to bank stress testing in late 2024 (BoE, 2024c), as covered in a recent policy-maker speech in early 2025 (Benjamin, 2025). Almost a decade after publishing the initial approach to bank stress testing post the GFC 2008/09 (BoE, 2015), the revised approach of 2024 with the exploratory scenarios captures the direction of travel about regulatory prescribed stress testing (BoE, 2024c; Benjamin, 2025), based on the trends and challenges highlighted in this paper. The objective of the paper is to present a critical analysis and discussion on the regulatory prescribed stress tests, based on the ones developed and designed by the BoE, the PRA, and the FCA in the UK for the past decade. Regulatory stress testing has evolved during that decade, with different types of stress for banks as well as other types of financial institutions, such as insurers and funds, with the Bank of England leading advances in that area (i.e., exploratory scenarios as explained earlier (BoE, 2024c; Benjamin, 2025). This justifies the use of the UK approach to regulatory stress testing, making it an interesting case for other regulators and different jurisdictions across the globe.

7.1. Summary of Findings

This qualitative study on regulatory prescribed stress tests for UK financial services aims to 'join the dots' between their different characteristics (Benjamin, 2025). This builds on the literature regarding those types of scenarios prescribed by the regulators for different purposes, characteristics, and participating institutions. In this paper, the key differences and similarities of those types of scenarios are discussed, providing valuable insights to (a) entities in scope, (b) entities not in scope so they could advance their own stress testing practices, and (c) other regulators to learn from the approach by the BoE, the PRA, and the FCA in the UK. As a risk management tool, scenarios and stress are widely referenced in legal, regulatory, and policy requirements. Therefore, understanding their core elements and evolution is of high importance for both policy-makers and financial institutions. The three categories of UK financial services regulatory prescribed stress tests, the BST, IST, and BES, are examined and discussed. From their review, five underlying trends are identified: (1) regulatory collaboration; (2) cross-industry scenarios; (3) exploratory scenarios, with both #2 and #3 linked to the BES; (4) disclosures and reporting requirements, applicable to all; and finally (5) advanced modelling capabilities and tools, as overarching developments highlighted for all regulatory prescribed stress tests. These formulate five associated challenges noted for future exercises: (A) governance, (B) frequency, (C) individual disclosures, (D) data and modelling, and (E) capabilities and skillset. Practical suggestions to address those challenges, supporting financial services to prepare for those exercises while at the same time improving their approaches, which are documented in the advances to the regulatory prescribed stress testing framework. Recommended policy developments to

accompany them are also noted above for consideration by the UK's prudential regulators and supervisors (BoE, PRA, FCA).

7.2. Further Extensions

Research on risk management and stress testing continues to evolve. This work on regulatory prescribed stress testing could be the starting point in looking at additional parameters and perspectives. The broad areas where further research could provide valuable insights are linked to (i) the regulators prescribing these exercises (the government body running the stress tests), (ii) the stress test itself from a quantitative perspective (the macroeconomic modelling under the bank stress tests), and (iii) finally, the supervisory approach with regulatory developments (i.e., RegTech with AI).

The paper could be further extended based on different angles and dimensions. Initially, in terms of the regulatory prescribed scenarios examined, consider additional scenarios prescribed by the Bank of England, such as the Central Counterparties Stress (CCPs), the CBEST, and the STAR-FS. Then, moving beyond the Bank of England and the PRA/FCA, look at scenarios developed, designed, and prescribed by other UK regulatory and supervisory bodies. In that direction, potentially examining any scenarios from The Pensions Regulator (TPR) and the Payment Systems Regulator (PSR). Outside financial services supervisors, any scenarios required by the Information Commissioner's Office (ICO) and the Competition and Markets Authority (CMA), if available and applicable to financial services.

Extending the scope and geographical location could be another dimension, examining the regulatory prescribed scenarios in different jurisdictions, such as in Europe, at the US level, etc. A cross-comparison between different jurisdictions to understand the differences between supervisory approaches in running regulatory prescribed stress testing is an area worth conducting further research in. Especially considering the developments in regulatory collaboration and cross-industry scenarios, there are lessons to be learnt based on regulatory prescribed stress test exercises led by financial services regulators and supervisors across the globe. A technical analysis of the regulatory prescribed stress tests, examining their calibration, modelling, and obtained results from a quantitative perspective, is the other main category of direction for further research. For instance, looking at the insurance stress tests, commenting on how these are designed, the assumptions on the forecasted losses, and how these are transposed to the Solvency Capital Requirement (SCR) movements.

This assessment of the regulatory prescribed stress tests could be enhanced after incorporating a quantitative analysis with the actual financial information of the entities in scope under stressed conditions. However, note that this is feasible only for the regulatory prescribed stress tests where the results are available, ideally disclosed on an individual basis. Moreover, this extension could only focus on either banks or reinsurance undertakings, since a cross-sectoral comparison is rather weak because of the different metrics captured between the banking and the insurance books. Considering the differences between financial institution types, based on the risk profile, types of shocks with assumptions in the stress tests, and most importantly, the regulatory regime and underpinning framework, a combined quantitative analysis would be challenging[30], explaining why this study has focused on the qualitative characteristics of the regulatory prescribed stress tests. Only under some exploratory scenarios might there be certain common indicators, but still detailed individually reported results should become available to be examined quantitatively. Furthermore, examining the supervisory approach and ultimate objectives noted for regulatory prescribed stress testing is the third area for additional research. Effectively commenting on the impact of the supervisory approach (e.g., rules-based vs. principles-based) on shaping regulatory prescribed stress testing. Linked to that, different technological developments,

such as the use of Artificial Intelligence and RegTech, could present a further interesting perspective to consider evaluating.

Finally, expanding this research from a methodological and data perspective beyond the quantitative analysis could also be achieved. Conducting interviews with regulators and supervisors, and also with experts from the entities participating in the regulatory prescribed stress test exercises, could enrich the findings discussed above. Alternatively, collect data from those individuals via surveys and questionnaires with the same aim regarding the proposals and recommendations covered in this previous section. This could allow us to validate, confirm, or contradict the trends and themes around regulatory prescribed stress testing discussed in this paper. For instance, revealing the actual process followed by regulators and supervisors in designing those stress test exercises (i.e., are they using a PESTEL analysis for the scenario development). Most importantly, this enhanced research could support the generation of solutions on how best to address the challenges noted. Both from a supervisory development perspective about stress and scenario testing and from entity internal practices towards stress testing advances.

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Abbreviations

The following abbreviations are used in this manuscript:

ACS	Annual Cyclical (Concurrent) Stress
AI	Artificial Intelligence
BAU	Business As Usual
BCST	Bank Capital Stress Test
BES	Biennial Exploratory Scenario
BMA	Bermuda Monetary Authority
BoE	Bank of England
BST	Bank Stress Test
CBES	Climate Biennial Exploratory Scenario
CBEST	Critical National Infrastructure Banking Supervision and Evaluation Testing
CCP	Central Counterparties (Stress)
CFRF	Climate Financial Risk Forum
CMA	Competition and Markets Authority
CST	Cyber Stress Test (of 2022)
D-BST	Desk-Based Stress Test (2024)
DyGIST	Dynamic General Insurance Stress Test (2025)
EBA	European Banking Authority
EIOPA	European Insurance and Occupational Pensions Authority
EU	European Union
FCA	Financial Conduct Authority
FPC	Financial Policy Committee
GFC	Global Financial Crisis (2008/09)
GIST	General Insurance Stress Test
IAIS	International Association of Insurance Supervisors
ICAAP	Internal Capital Adequacy Assessment Process
ICARA	Internal Capital Adequacy and Risk Assessment

ICO	Information Commissioner's Office
ICT	Information, Communication, and Technology (risks)
IFoA	Institute and Faculty of Actuaries (UK)
ILAAP	Internal Liquidity Adequacy Assessment Process
IRRBB	Interest Rate Risk on the Banking Book
IST	Insurance Stress Test
LBES	Liquidity Biennial Exploratory Scenarios
LCR	Liquidity Coverage Ratio
LHS	Left-hand side
LIST	Life Insurance Stress Test
MPC	Monetary Policy Committee
MRM	Model Risk Management
NBFIs	Non-Bank Financial Institutions
NGFS	Network for Greening the Financial System
ORSA	Own Risk and Solvency Assessment
PESTEL	Political, Economic, Social, Technological, Ecological/Environmental, Legal (and Regulatory)
PRA	Prudential Regulation Authority
PRC	Prudential Regulation Committee
PSM	Periodic Summary Meeting
PSR	Payment Systems Regulator
RDS	Realistic Disaster Scenario (for Lloyd's of London)
RHS	Right-hand side
RST	Reverse Stress Test
SCR	Solvency Capital Requirements
SREP	Supervisory Review and Evolution Process
SST	Solvency Stress Test
SSTF	Stress & Scenario Testing Framework
STAR-FS	Simulated Targeted Attack & Response assessments for Financial Services
STDF	Stress Test Data Framework
SWES	System-Wide Exploratory Scenario
SWOT	Strengths, Weaknesses, Opportunities, Threats
TPR	The Pensions Regulator
UK	United Kingdom

Appendix A

Additional detail regarding certain characteristics of the regulatory prescribed stress tests, such as the participating entities and types of scenarios are presented in this Appendix. The following table (Table A1) presents the insurance entities in scope of the PRA's IST. It includes the insurers which took part at the previous GIST and LIST exercises from 2022 and 2025 respectively, with "Yes" denoting participation. The corresponding category for each insurance company is also captured, with the general insurers (GI) that participated at the GIST 2022 and the life insurers (LI) from the LIST 2022 and 2025. For the LIST exercises. Note that the National Farmers Unition Mutual Insurance Society Limited is the only insurance company in scope of both the GIST and the LIST in 2022, having both a GI and LI book. In a comparison between the LIST 2022 and 2025 participants, a reduction in the volume of entities in scope is observed, with certain insurers dropped from the most recent exercise based on size.

Table A1. PRA IST list of entities in scope [GIST * & LIST 2022–2025].

Insurance Company	Category	GIST 2022	LIST2022	LIST2025
Admiral (Group)	GI	Yes		
Ageas Insurance Limited	GI	Yes		
Allianz Insurance plc	GI	Yes		
American International Group UK Limited	GI	Yes		
Aspen Insurance UK Limited	GI	Yes		
Aviva Insurance Limited	GI	Yes		
Aviva International Insurance Limited	LI		Yes	Yes
Aviva Life & Pensions UK Limited	LI		Yes	Yes
AXA Insurance UK plc	GI	Yes		
Canada Life Limited	LI		Yes	Yes
Convex Insurance UK Limited	GI	Yes		
Flood Re Limited	GI	Yes		
Hiscox Insurance Company Limited	GI	Yes		
Just Retirement Limited	LI		Yes	Yes
Legal & General Assurance Society Limited	LI		Yes	Yes
Liverpool Victoria Financial Services Limited	LI		Yes	
Lloyds Bank General Insurance Limited	GI	Yes		
Partnership Life Assurance Company Limited	LI		Yes	Yes
Pension Insurance Corporate plc	LI		Yes	Yes
Phoenix Life Assurance Limited	LI		Yes	
Phoenix Life Limited	LI		Yes	Yes
QBE Limited	GI	Yes		
ReAssure Limited	LI		Yes	
Rothesay Life plc	LI		Yes	Yes
Royal & Sun Alliance Insurance Limited	GI	Yes		
Scottish Widows Limited	LI		Yes	Yes
Standard Life Assurance Limited	LI		Yes	
The National Farmers Union Mutual Insurance Society Limited	LI and GI	Yes	Yes	
The Prudential Assurance Company Limited	LI		Yes	Yes
TransRe London Limited	GI	Yes		
UK Insurance Limited	GI	Yes		
XL Catlin Insurance Company UK Limited	GI	Yes		

* Note that there are also 21 selected Managing Agents from the Society of Lloyd's part of GIST 2022 (PRA, 2022b, 2022a, 2023a).

The subsequent table (Table A2) presents the Lloyd's of London RDSs for the period from 2015 to 2025. The list of scenarios with corresponding ID comprising each annual RDS exercise for the last eleven years is captured in the following table, with "x" denoting the year each scenario was part of the RDS. As discussed earlier, the difference to note arises from the cyber related risk scenarios, which were included in 2022 in category (a), apart from the major data security breach which was initially under category (c) since 2016.

Table A2. Lloyd's of London RDS [2015–2025].

Scenario	ID	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Compulsory Event Scenarios (a)												
Two Windstorm Events (North-East)	41	X	X	X	X	X	X	X	X	X	X	X
Two Windstorm Events (South Carolina)	42	X	X	X	X	X	X	X	X	X	X	X
Florida Windstorm (Miami Dade)	2	X	X	X	X	X	X	X	X	X	X	X
Florida Windstorm (Pinellas)	3	X	X	X	X	X	X	X	X	X	X	X
Gulf of Mexico Windstorm (Onshore and Offshore)	12	X	X	X	X	X	X	X	X	X	X	X
European Windstorm	8	X	X	X	X	X	X	X	X	X	X	X
Japanese Typhoon	13	X	X	X	X	X	X	X	X	X	X	X
California Earthquake (Los Angeles)	4	X	X	X	X	X	X	X	X	X	X	X
California Earthquake (San Francisco)	5	X	X	X	X	X	X	X	X	X	X	X
New Madrid Earthquake	6	X	X	X	X	X	X	X	X	X	X	X
Japanese Earthquake	9	X	X	X	X	X	X	X	X	X	X	X
UK Flood	51	X	X	X	X	X	X	X	X	X	X	X
Terrorism (Rockefeller Center)	43	X	X	X	X	X	X	X	X	X	X	X
Terrorism (One World Trade Center)	78	X	X	X	X	X	X	X	X	X	X	X
Cyber—Business Blackout II	82								X	X	X	X
Cyber—Ransomware Contagion	83								X	X	X	X
Cyber—Cloud Cascade	84								X	X	X	X
Cyber—Major Data Security Breach	76			*Under (c) during 2016-2021*					X	X	X	X
Syndicate specific Scenarios—De Minimis Scenarios (c)												
Marine Scenarios (Marine Collision IN US waters, Major Cruise Vessel Incident)	79, 80	*15, 16*	*15, 16*	X	X	X	X	X	X	X	X	X
Loss of Major Complex	17	X	X	X	X	X	X	X	X	X	X	X
Aviation Collision	18	X	X	X	X	X	X	X	X	X	X	X
Satellite Risks (Solar energetic particle event, Design deficiency, Generic deficiency, Space debris)	70, 71, 72, 73	X	X	X	X	X	X	X	X	X	X	X
Liability Risks (Professional Lines, Non-Professional Lines)	53, 54	X	X	X	X	X	X	X	X	X	X	X
Political Risks (ID provided applicable for 2024 and 2025 only)	29, 31, 49, 81	X	X	X	X	X	X	X	X	X	X	X

Data Source: (Lloyd's, 2023).

The next table (Table A3) shows the participating entities of the CBES 2021 (BoE, 2021b, Table 3.A). There have been 28 different financial institutions that took part in the 2021 CBES exercise, split by category, into banks with building societies, life, and general insurers. Note that certain participating institutions refer to the UK-based entity only. In the GI category, the 10 largest syndicates from the Society of Lloyd's are included, but without being explicitly stated.

Table A3. CBES List of Participating Institutions.

Category	Number	Entities
Banks and Building Societies	7	Barclays, HSBC, Lloyds Banking Group, Nationwide Building Society, NatWest Group, Santander UK, Standard Chartered
Life Insurers	5	Aviva, Legal & General, M&G, Phoenix, Scottish Widows
General Insurers	16	AIG **, Allianz Holdings plc **, Aviva, AXA **, Direct Line, RSA **, Society of Lloyd's (10 syndicates only, but without being named)

** Denotes UK entity only.

The final table (Table A4) shows the participating entities of the SWES 2023 (BoE, 2023e, Table A). These 54 financial institutions are segmented into four categories, split by type into banks (14), insurers (6), central counterparties (2), and asset managers/funds (32), that is

the largest category between them. In a similar approach as for the CBES 2021 participating institutions, only the UK entity is considered for the multinational financial services.

Table A4. SWES List of Participating Institutions.

Category	Number	Entities
Banks	14	Banco Santander S.A. (London Branch), Barclays, BNP Paribas (London branch), Citibank N.A. (London branch), Deutsche Bank AG (London branch), Goldman Sachs International, HSBC, JPMorgan Chase Bank N.A. (London branch), Lloyds Banking Group, Merrill Lynch International, Morgan Stanley & Co. International plc, NatWest Group, Santander UK, Standard Chartered
Insurers	6	Aviva Life & Pensions UK Limited, Legal & General Assurance Society Limited, Pension Insurance Corporation plc, Rothesay Life plc, Scottish Widows Limited, The Prudential Assurance Company Limited
Asset Managers/ Funds	32	abrdn PLC, AHL Partners LLP, Aviva Investors, Blackrock Group Limited, Brevan Howard Asset Management LLP, BT Pension Scheme Trustees Limited, Capula Investment Management LLP, Citadel Advisors, Citigroup Global Markets Limited, Columbia Threadneedle Investments, Greater Manchester Pension Fund, HSBC Bank Pension Trust (UK) Limited, Insight Investment Management (Global) Limited, J.P. Morgan Securities plc, Legal & General Investment Management Limited, Lloyds Banking Group Pensions Trustees Limited, LMR Partners LLP, M&G Investment Management Limited, Man Group Investments Limited, Mariner Investment (Europe) LLP, Millennium Capital Partners LLP, PIMCO Europe Limited, Point72 Europe (London) LLP, Railways Pension Trustee Company Limited, RBC BlueBay Asset Management, Rokos Capital Management LLP, Royal London Asset Management Limited, Schroder Investment Management Limited, The Pension Protection Fund, The People's Pension Trustee Limited
CCP	2	ICE Clear Europe Limited, LCH Limited

Notes

1 Building on previous financial crises hitting the banking sector. Examples of UK banks from recent events, covering Northern Rock, Royal Bank of Scotland and the Lloyds Banking Group are discussed in Lybeck (2016).

2 BST comprisies of the Annual Cyclical Scenario (ACS), the Reverse Stress Test (RST), the Solvency Stress Test (SST), the Desk-Based Stress Test (D-BST) and the Bank Capital Stress Test (BCST). The IST is split iinto the General Insurance Stress Test (GIST) and the Life Insurance Stress Test (LIST). The Lloyd's Realistic Disaster Scenarios (RDS) are linked to the GIST, and thus considered within that category. Finally, the Climate Biennial Exploratory Scenario (CBES), the Liquidity Biennial Exploratory Scenario (LBES), the System-Wide Exploratory Scenarios (SWES), and the Cybest Stress Test (CST) are all part of the exploratory scenarios under the BES.

3 More information about the UK regulators and the tripartite system is explained by Alexander (2010), regarding the PRA's and the FCA's predecessor, the Financial Services Authority (FSA), the BoE and the HM Treasury. That previous unified UK system (FSA as single regulator) with the Financial Services and Markets Act is also explained in Armour et al. (2016, Chapter 27.2.3), commenting on the current regulatory responsibility in the UK (Armour et al., 2016, Chapter 24.3.2). Kokkinis and Miglionico (2021, Chapter 3) expanded on the regulatory architecture of the UK banking system.

[4] Referring to a Political, Economic, Social, Technological, Ecological/Environmental, Legal (and Regulatory) framework, as explained in Johnson et al. (2017, p. 34), denoted as PESTEL, allowing to understand how the regualtory prescribed stress test components are translated into impact for the entity in scope.

[5] For a general example of this analysis please see Appendix 8 in Chapman (2011). The relationship of the PESTEL and scenario analysis is explained in Andersen and Schrøder (2012, pp. 149, 175).

[6] Quagliariello (2009) divides macroeconomic stress tests into two types; the sensitivity analysis and the scenario analysis. Under each type there are two available approaches; the bottom-up and the top-down.

[7] Dent et al. (2016) describe the concurrent stress testing of banks, based on the BoE's approach. Please see Figure 2 for its graphical illustration (Dent et al., 2016, Fig. 2).

[8] Please see Chapter 2 of Bessis (2015) for the broad classes of financial risks for banks, refering to credit, market, liquidity, interest rate, and foreign exchange, with operational (as non-financial) risk too. The banking risk spectrum of van Greuning and Bratanovic (2009, Table 1.1) presenting the key banking risks by type (financial, operational, environmental is also a helpful reference to explain the risks considered under regulatory prescribed stress tests.

[9] Note that eight banking institutions participated to that ACS exercise, referring to Barclays, HCBS, Lloyds Banking Group, Nationwide, NatWest Group, Santander UK, Standard Chartered and Virgin Money UK (BoE, 2022c, Section 4, para. 4.1).

[10] The following banks participated in the 2021 SST: Barclays, HSBC Holdings, Lloyds Banking Group, Nationwide, NatWest Group, Santander UK Group Holdings, Standard Chartered and Virgin Money UK (BoE, 2021d, Section 3).

[11] Specifically, two windstorm events followed by a severe UK flood event, and three US hurricanes linked to the actual 2005 events but with different storm pathways, with all events quantified separately (PRA, 2016).

[12] The PRA's objectives underpinning the GIST 2017 were the following: (1) Assessment of market resilience, (2) Preparedness and prioritisation, (3) Dependencies on reinsurers and other jurisdictions, and (4) Supporting sector resilience in the United Kingdom, for Macro level, and (5) A consistent view of stress testing, (6) Internal model (IM) review, (7) Exposure management of risks, and (8) Influencing firms, for Micro level (PRA, 2017c).

[13] Referring to (1) System Resilience, (2) Systemic Risks/Sectoral Behaviours, (3) Counterparty Dependencies, (4) Exploratory Risks/Horizon Scanning as Sectoral and (5) Effectiveness of risk management, (6) View on capital and (7) Assessment of modelling approaches as Firm Supervisory (PRA, 2019a).

[14] A cluster of three US hurricane events, a severe earthquake in the US (California), an extremely severe earthquake in Japan, a large UK windstorm with large flood even (PRA, 2019a).

[15] Lloyd's of London maintains a dedicated page of their website on Realistic Disaster Scenarios (RDS) where all previous annual exercises from 2015 until now are made available. Please see the below for more information: https://www.lloyds.com/conducting-business/underwriting/realistic-disaster-scenarios (accessed on 1 March 2025).

[16] Based on Lloyd's's (2025) RDS examples include: (1) Earthquakes other than those occurring in the US and Japan, (2) a 'Shelby-type' liability loss, (3) a major flood incident outside the UK, (3) accumulation of casualties to members of sports team, (4) Caribbean/USA hurricane windstorm clash, (6) Pandemic risk, and (7) Terrorism accumulations other than Manhattan.

[17] This "RDS Political Risk Scenario Specification document" for each year, is not publicly available, provided upon request by Lloyd's Exposure Management Team.

[18] From Lloyd's's (2025) RDS referring to the following: Business blackout II (ID: 82), Ransomware Contagion (ID: 83), Cloud Cascade (ID: 84), Major Data Security Breach (ID: 76).

[19] Initially 15 and 16 for RDS 2015 and 2016, with ID 79 and 80 from RDS 2017 onwards (Lloyd's, 2015, 2016, 2017).

[20] Lloyd's of London has published six systemic risk scenarios up until January 2025. These are the following: (1) Extreme leading to food and water shock, (2) Illuminating cyber crime, (3) Deconstructing global economic stagnation, (4) Volcanic eruption, (5) Revealing the risks of geopolitical conflict, (6) Human pandemic. More information is available at Lloyd's dedicated page of their website on Systemic Risk Scenarios. Please see the below for more information: https://www.lloyds.com/news-and-insights/futureset/futureset-insights/systemic-risk-scenarios/ (accessed on 1 March 2025).

[21] The CBES scenarios are a subset of the NGFS (BoE, 2021b). More detail on the underpinning assumptions, forecasts and parameters of the CBES climate pathways, as well as additional scenarios, are available from the NGFS scenario portal, accessible at: https://www.ngfs.net/ngfs-scenarios-portal/ (accessed on 1 March 2025).

[22] Examples include inflation, unemployment etc. under macro variables, equity prices, government bond yields, swap rates etc. for financial variables, precipitation rate, wind speed, sea level etc. for physical variables and finally, carbon prices, vehicle registration by fuel type etc. for transition variables.

[23] Note that initially in earlier versions of the CBES the time-horizon was even longer, extended to 2080 and 2100.

[24] Initially at the June 2017 Report towards building cyber resilience in the UK financial system (BoE, 2017, Box 7) and then at the June 2018 Report for the disruption of financial services from cyber incidents (BoE, 2018, Box 1).

[25] Referring to pension funds, hedge funds and funds managed by asset managers (BoE, 2023e).

[26] The timeline of the key events captured the developments in Day 1, 2, 3, 4 and Days 5 to 10 onwards.

[27] Split into open-ended funds (including money market funds), and defined benefit pensions schemes with liability-driven investment strategies (BoE, 2024d, Annex 4).

[28] The Strengths, Weakness, Opportunities, and Threats (SWOT) analysis from Barney (1995), linked to the PESTEL analysis in "translating" the regulatory prescribed stress tests. For an example of a general SWOT analysis application please see Appendix 7 in Chapman (2011).

[29] The Pillar 2 components of the supervisory review for banks are explained in van Greuning and Bratanovic (2009), highlighting the use of risks assessments, such as stress and scenario tests in this case.

[30] A quantitative analysis is feasible for examining either a specific type of stress test (i.e., macroprudential stresses, climate change scenarios), or a specific type of entity, either for banks only or insurance companies only in this case, explaining the validity of the qualitative approach of this study.

References

Acharya, V. V. (2013). Measuring systemic risk. In J.-P. Fouque, & J. A. Langsam (Eds.), *Handbook of systemic risk*. Cambridge University Press.

Aikman, D., Beale, D., Brinley-Codd, A., Covi, G., Hüser, A.-C., & Lepore, C. (2023). *Macroprudential stress-test models: A survey* (IMF Working Paper WP/23/173). Monetary and Capital Markets Department, International Monetary Fund.

Alexander, K. (2010). Banking crisis: Regulation and supervision. In I. G. MacNeil, & J. O'Brien (Eds.), *The future of financial regulation*. Bloomsbury.

Andersen, T. J., & Schrøder, P. W. (2012). *Strategic risk management practice: How to deal effectively with major corporate exposures*. Cambridge University Press.

Anderson, R., Danielsson, J., Baba, C., Das, U. S., Kang, H., & Segoviano, M. (2018). *Macroprudential stress tests and policies: Searching for robust and implementable frameworks* (IMF Working Paper WP/18/197). Monetary and Capital Markets Department, International Monetary Fund.

Armour, J., Awrey, D., Davies, P., Enriques, L., Gordon, J. N., Mayer, C., & Payne, J. (2016). *Principles of financial regulation* (1st ed.). Oxford University Press.

Bakoush, M., Gerding, E., Mishra, T., & Wolfe, S. (2022). An integrated macroprudential stress test of bank liquidity and solvency. *Journal of Financial Stability*, *60*, 101012. [CrossRef]

Barney, J. B. (1995). Looking inside for competitive advantage. *The Academy of Management Executive*, *9*(4), 49–61. [CrossRef]

Baudino, P., Goetschmann, R., Henry, J., Taniguchi, K., & Zhu, W. (2018). *Stress-testing banks—A comparative analysis* (FSI Insights on Policy Implementation No. 12). Financial Stability Institute, Bank for International Settlements.

BCBS. (2009). *Principles for sound stress testing practices and supervision*. Basel Committee on Banking Supervision, Bank for International Settlements.

BCBS. (2018). *Stress testing principles*. Basel Committee on Banking Supervision, Bank for International Settlements.

Benjamin, N. (2025, January 15). *Joining the dots* [Speech]. Bank of England. Available online: https://www.bankofengland.co.uk/speech/2025/january/nathanael-benjamin-speech-at-the-city-uk-the-future-of-stress-testing (accessed on 1 March 2025).

Bessis, J. (2015). *Risk management in banking* (4th ed.). John Wiley & Sons.

Bishop, P., Hines, A., & Collins, T. (2007). The current state of scenario development: An overview of techniques. *Foresight*, *9*(1), 5–25. [CrossRef]

Black, J. (2010). Financial markets. In P. Cane, & H. M. Kritzer (Eds.), *The Oxford handbook of empirical legal research*. Oxford University Press.

BoE. (2015). *The Bank of England's approach to stress testing the UK banking system*. Bank of England.

BoE. (2017). *Financial stability report* (Issue No. 41). Bank of England.

BoE. (2018). *Financial stability report* (Issue No. 43). Bank of England.

BoE. (2020). *Financial stability report*. Financial Policy Committee, Bank of England.

BoE. (2021a). *Financial Policy Summary and Record of the Financial Policy Committee meeting on 11 March 2021*. FPC, Bank of England.

BoE. (2021b). *Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change*. Bank of England.

BoE. (2021c). *Prudential Regulation Authority statement on the 2022 cyber stress test: Retail payment system*. Prudential Regulation Authority, Bank of England.

BoE. (2021d). *Stress testing the UK banking system: Guidance on the 2021 stress test for participants*. Bank of England.

BoE. (2021e). *Stress testing the UK banking system: 2021 Solvency Stress Test results*. Bank of England.

BoE. (2022a). *Results of the 2021 Climate Biennial Exploratory Scenario (CBES)*. Bank of England.

BoE. (2022b). *Stress testing data framework manual* (Version 202203). Bank of England.

BoE. (2022c). *Stress testing the UK banking system: Key elements of the 2022/23 annual cyclical scenario*. Bank of England.

BoE. (2023a). *Detail on the system-wide exploratory scenario hypothetical scenario*. Bank of England.

BoE. (2023b). *Financial Policy Summary and Record of the Financial Policy Committee meeting on 23 March 2023*. FPC, Bank of England.

BoE. (2023c). *Launch of the scenario phase of the system-wide exploratory scenario*. Bank of England.
BoE. (2023d). *Stress testing the UK banking system: 2022/23 results*. Bank of England.
BoE. (2023e). *The Bank of England's system-wide exploratory scenario exercise*. Bank of England.
BoE. (2023f). *The Prudential Regulation Authority's approach to banking supervision*. Prudential Regulation Authority, Bank of England.
BoE. (2023g). *The Prudential Regulation Authority's approach to insurance supervision*. Prudential Regulation Authority, Bank of England.
BoE. (2023h). *The results of the 2022/23 ACS stress test of the UK banking system: Annex*. Bank of England.
BoE. (2023i). *Thematic findings from the 2022 cyber stress test* ["Dear SMF 24 or equivalent" letter]. Prudential Regulation Authority, Bank of England.
BoE. (2024a). *Financial stability report*. Financial Policy Committee, Bank of England.
BoE. (2024b). *Stress testing the UK banking system: Scenarios for the 2024 desk-based stress test*. Bank of England.
BoE. (2024c). *The Bank of England's approach to stress testing the UK banking system*. Bank of England.
BoE. (2024d). *The Bank of England's system-wide exploratory scenario exercise final report*. Bank of England.
Borio, C., Drehmann, M., & Tsatsaronis, K. (2012). *Stress-testing macro stress testing: Does it live up to expectations?* (BIS Working Papers No. 369). Monetary and Economic Department, Bank for International Settlements.
Breuer, T., & Summer, M. (2020). Systematic stress tests on public data. *Journal of Banking & Finance*, *118*, 105886. [CrossRef]
Buckley, R. P., Avgouleas, E., & Arner, D. W. (Eds.). (2016). *Reconceptualising global finance and its regulation*. Cambridge University Press.
Buckner, D., & Dowd, K. (2022). *Can UK banks pass the COVID-19 stress test?* KSP Books.
Buncic, D., & Melecky, M. (2013). Macroprudential stress testing of credit risk: A practical approach for policy makers. *Journal of Financial Stability*, *9*, 347–370. [CrossRef]
CFRF. (2023). *Learning from the 2021/22 Climate Biennial Exploratory Scenarios (CBES) exercise in the UK: Survey report*. Collaboration between the UK Centre for Greening Finance and Investment and the Climate Financial Risk Forum. Climate Financial Risk Forum and UK Centre for Greening Finance and Investment.
Chapman, R. J. (2011). *Simple tools and techniques for enterprise risk management*. John Wiley & Sons.
Cranston, R. (2002). *Principles of banking law* (2nd ed.). Oxford University Press.
Dent, K., Westwood, B., & Segoviano, M. (2016). Stress testing of banks: An introduction. *Bank of England Quarterly Bulletin*, *2016*(Q3), 130–143.
Dowd, K. (2015a). *No stress: The flaws in the Bank of England's stress testing programme*. Adam Smith Institute.
Dowd, K. (2015b). *No stress II: The flaws in the Bank of England's stress testing programme*. Adam Smith Institute.
Dowd, K. (2017). *No stress III: The flaws in the Bank of England's 2016 stress tests*. Adam Smith Institute.
Dowd, K. (2019). *No stress IV: The flaws in the Bank of England's 2018 stress tests*. Adam Smith Institute.
Fouque, J.-P., & Langsam, J. A. (Eds.). (2013). *Handbook of systemic risk*. Cambridge University Press.
Freixas, X., Laeven, L., & Peydro, J.-L. (2015). *Systemic risk, crises, and macroprudential regulation*. MIT Press.
Georgiou, P., & Pantos, S. (2022). A critical analysis on the use of scenario planning as a policy making tool for resilience. *Sentio*, *4*, 76–84.
Goldstein, I., & Leitner, Y. (2018). Stress tests and information disclosure. *Journal of Economic Theory*, *177*, 34–69. [CrossRef]
Goncharenko, R., Hledik, J., & Pinto, R. (2018). The dark side of stress tests: Negative effects of information disclosure. *Journal of Financial Stability*, *37*, 49–59. [CrossRef]
Government Office for Science. (2024). *The futures toolkit: A set of tools to help you develop policies and strategies that are robust in the face of an uncertain future*. Produced in collaboration with SAMI Consulting. UK Government.
Greenlaw, D., Kashyap, A. K., Schoenholtz, K., & Shin, H. S. (2012). *Stress out: Macroprudential principles for stress testing* (Working Paper No. 71, Initiative on Global Markets). University of Chicago, Booth School of Business.
Halliday, S., & Schmidt, P. (2010). *Conducting law and society research: Reflections on methods and practices*. Cambridge University Press.
Hassani, B. K. (2016). *Scenario analysis in risk management: Theory and practice in finance*. Springer.
Herring, R. J., & Santomero, A. M. (2000). What is optimal financial regulation? In B. E. Gup (Ed.), *The new financial architecture: Banking regulation in the 21st century*. Greenwood Publishing Group, Bloomsbury.
Hull, J. C. (2015). *Risk management and financial institutions* (4th ed.). John Wiley & Sons.
Isogai, T. (2009). Scenario design and calibration. In M. Quagliariello (Ed.), *Stress-testing the banking system*. Cambridge University Press.
Johnson, G., Angwin, D., Régner, P., Whittington, R., & Scholes, K. (2017). *Exploring strategy* (11th ed.). Pearson.
Kapinos, P., Mitnik, O., & Martin, C. (2015). *Stress testing banks: Whence and whither?* (Working Paper Series, FDIC CFRF WP2015-07). Federal Deposit Insurance Corporation, Center for Financial Research.
Kapinos, P., & Mitnik, O. A. (2016). A top-down approach to stress-testing banks. *Journal of Financial Services Research*, *49*, 229–264. [CrossRef]

Kohn, D. (2020, February 5). *Stress tests: A policymaker's perspective* [Conference presentation]. Macroprudential Stress Testing Conference, European Central Bank, Frankfurt, Germany. Available online: https://www.bankofengland.co.uk/-/media/boe/files/speech/2020/stress-tests-a-policymakers-perspective.pdf (accessed on 1 March 2025).

Kokkinis, A., & Miglionico, A. (2021). *Banking law: Private transactions and regulatory frameworks*. Routledge, Taylor & Francis Group.

Kolari, J. W., López-Iturriaga, F. J., & Sanz, I. P. (2019). Predicting European bank stress tests: Survival of the fittest. *Global Finance Journal*, *39*, 44–57. [CrossRef]

Kwiatkowski, J., & Rebonato, R. (2011). A coherent aggregation framework for stress testing and scenario analysis. *Applied Mathematical Finance*, *18*(2), 139–154. [CrossRef]

LaBrosse, J. R., Olivares-Caminal, R., & Singh, D. (Eds.). (2011). *Managing risk in the financial system*. Edward Elgar Publishing.

Lloyd's. (2015). *Realistic disaster scenarios* (Scenario Specification, EM 128 v1.0). Lloyd's of London.

Lloyd's. (2016). *Realistic disaster scenarios* (Scenario Specification, EM 155 v1.0). Lloyd's of London.

Lloyd's. (2017). *Realistic disaster scenarios* (Scenario Specification, EM 196 v1.0). Lloyd's of London.

Lloyd's. (2018). *Realistic disaster scenarios* (Scenario Specification, EM 218 v1.0). Lloyd's of London.

Lloyd's. (2019). *Realistic disaster scenarios* (Scenario Specification, EM 260 v1.0). Lloyd's of London.

Lloyd's. (2020). *Realistic disaster scenarios* (Scenario Specification, EM 292 v1.0). Lloyd's of London.

Lloyd's. (2021). *Realistic disaster scenarios* (Scenario Specification, EM 337 v1.0). Lloyd's of London.

Lloyd's. (2022). *Realistic disaster scenarios* (Scenario Specification, EM 386 v1.0). Lloyd's of London.

Lloyd's. (2023). *Realistic disaster scenarios* (Scenario Specification, EM 426 v1.0). Lloyd's of London.

Lloyd's. (2024). *Realistic disaster scenarios* (Scenario Specification, EM 496 v1.0). Lloyd's of London.

Lloyd's. (2025). *Realistic disaster scenarios* (Scenario Specification, EM 518 v1.0). Lloyd's of London.

Lybeck, J. A. (2016). *The future of financial regulation: Who should pay for the failure of American and European banks?* Cambridge University Press.

Maino, R., & Tintchev, K. (2013). Stress testing interconnected banking systems. In J. A. Batten, P. MacKay, & N. Wagner (Eds.), *Advances in financial risk management: Corporates, intermediaries and portfolios*. Palgrave Macmillan.

Marcelo, A., Rodriguez, A., & Trucharte, C. (2008). Stress tests and their contribution to financial stability. *Journal of Banking Regulation*, *9*(2), 65–81. [CrossRef]

Moosa, I. A. (2015). *Good regulation, bad regulation: The anatomy of financial regulation*. Palgrave Macmillan studies in Banking and Financial Institutions. Palgrave Macmillan.

Orr, J., Piniecka, B., & Choi, S. (2003). *The overhaul of Lloyd's Realistic Disaster Scenarios: 2003 update* [Working paper]. Institute and Faculty of Actuaries. Available online: https://www.actuaries.org.uk/system/files/documents/pdf/overhaul-realistic-disaster-scenarios.pdf (accessed on 1 February 2025).

Postma, T. J. B. M., & Liebl, F. (2005). How to improve scenario analysis as a strategic management tool? *Technological Forecasting & Social Change*, *72*, 161–173. [CrossRef]

PRA. (2016). *General Insurance Stress Test 2015 feedback* [Dear CEO letter]. Prudential Regulation Authority, Bank of England.

PRA. (2017a). *General Insurance Stress Test 2017 feedback* [Dear CEO letter]. Prudential Regulation Authority, Bank of England.

PRA. (2017b). *General Insurance Stress Test 2017* (GIST 2017) [Dear Firm Contact letter]. Prudential Regulation Authority, Bank of England.

PRA. (2017c). *General Insurance Stress Test 2017. Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.

PRA. (2019a). *General Insurance Stress Test 2019. Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.

PRA. (2019b). *Insurance Stress Test 2019* (IST 2019) [Dear CEO letter]. Prudential Regulation Authority, Bank of England.

PRA. (2019c). *Life Insurance Stress Test 2019: Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.

PRA. (2020). *Insurance Stress Test 2019 and COVID-19 stress testing: Feedback for general and life insurers* [Dear CEO letter]. Prudential Regulation Authority, Bank of England.

PRA. (2021). *Climate-related financial risk management and the role of capital requirements* (Climate Change Adaptation Report 2021). Prudential Regulation Authority, Bank of England.

PRA. (2022a). *General Insurance Stress Test 2022. Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.

PRA. (2022b). *Insurance Stress Test 2022* (IST 2022) [Dear CEO letter]. Prudential Regulation Authority, Bank of England.

PRA. (2022c). *Insurance Stress Test 2022. Requirements for the "Results and basis of preparation" report*. Prudential Regulation Authority, Bank of England.

PRA. (2022d). *Life Insurance Stress Test 2022. Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.

PRA. (2023a). *Insurance Stress Test 2022 feedback* [Dear Chief Executive Officer letter]. Prudential Regulation Authority, Bank of England.
PRA. (2023b). *PRA statement on the dynamic general insurance stress test in 2025*. Prudential Regulation Authority, Bank of England.
PRA. (2024a). *Approach to life insurance stress test 2025*. Prudential Regulation Authority, Bank of England.
PRA. (2024b). *Enhancing banks' and insurers' approaches to managing the financial risks from climate change* (Supervisory Statement, SS3/19). updating April 2019. Prudential Regulation Authority, Bank of England.
PRA. (2024c). *Life Insurance Stress Test (LIST) 2025: Request for technical input* [Dear firm contact letter]. Prudential Regulation Authority, Bank of England.
PRA. (2024d). *Update on the Dynamic General Insurance Stress Test*. Prudential Regulation Authority, Bank of England.
PRA. (2025a). *Life Insurance Stress Test 2025. Requirements for the 'Results and basis of preparation' report*. Prudential Regulation Authority, Bank of England.
PRA. (2025b). *Life Insurance Stress Test 2025. Scenario specification, guidelines and instructions*. Prudential Regulation Authority, Bank of England.
Quagliariello, M. (2009). Macroeconomic stress-testing: Definitions and main components. In M. Quagliariello (Ed.), *Stress-testing the banking system*. Cambridge University Press.
Quagliariello, M. (2019). *Are stress tests beauty contests? (and what we can do about it)* (EBA Staff Paper Series No. 4). European Banking Authority.
Schoemaker, P. J. H. (1993). Multiple scenario development: Its conceptual and behavioral foundation. *Strategic Management Journal*, *14*(3), 193–213. [CrossRef]
Schoemaker, P. J. H. (1995). Scenario planning: A tool for strategic thinking. *Sloan Management Review*, *36*(2), 25–40.
Schuermann, T. (2014). Stress testing banks. *International Journal of Forecasting*, *30*, 717–728. [CrossRef]
Schwarcz, S. L. (2016). *Perspectives on regulating systemic risk* (1st ed.). Oxford University Press.
Selody, J. (2011). The nature of systemic risk. In J. R. LaBrosse, R. Olivares-Caminal, & D. Singh (Eds.), *Managing risk in the financial system*. Edward Elgar Publishing.
SOIF. (2021). *Features of effective systemic foresight in governments around the world*. Report commissioned by the Government Office for Science of His Majesty's UK Government, School of International Futures. School of International Futures (SOIF Ltd).
van den End, J. W., Hoeberichts, M., & Tabbae, M. (2006). *Modelling scenario analysis and macro stress-testing* (DNB Working Paper No. 199). De Nederlandsche Bank.
van der Heijden, K. (2005). *Scenarios: The art of strategic conversation* (2nd ed.). John Wiley & Sons.
van Greuning, H., & Bratanovic, S. B. (2009). *Analyzing banking risk: A framework for assessing corporate governance and risk management* (3rd ed.). International Bank for Reconstruction and Development, World Bank.
Varotto, S. (2012). Stress testing credit risk: The Great Depression scenario. *Journal of Banking & Finance*, *36*, 3133–3149. [CrossRef]
Vodenska, I., Aoyama, H., Becker, A. P., Fujiwara, Y., Iyetomi, H., & Lungu, E. (2021). From stress testing to systemic stress testing: The importance of macroprudential regulation. *Journal of Financial Stability*, *52*, 100803. [CrossRef]
Woods, S. (2022, May 24). *Climate capital* [Speech]. Webcast hosted by the Global Association of Risk Professionals. Bank of England.