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Data Access Technologies and the ‘New Governance’ Techniques of Financial Regulation

David McNulty* , Andrea Miglionico**  and Alistair Milne*** 

ABSTRACT

Modern data and information technologies are having a profound impact on financial services and opening new frontiers in regulation. This article explores the opportunities for using modern tools of data access and sharing to embed regulatory objectives within the management and decision-making processes of financial firms. This can enhance oversight of prudential and conduct risks as well as substantially lowering compliance costs. It can also help address the information imbalances that limit the effectiveness of older approaches in which the firm is a ‘black box’ that can only be externally supervised. The central challenge is establishing an appropriate governance of data in regulated firms to ensure the achievement of both regulatory and business objectives. Such an approach can be viewed as a further and more radical development of established ‘new governance’ techniques of financial regulation.

KEYWORDS: regtech, meta-regulation, rule-based regulation, principles-based regulation, regulatory outcomes

I. INTRODUCTION

The global financial crisis of 2008 marked a significant turning point in the regulation of financial services.¹ The existing framework of prudential regulation failed to safeguard against

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¹ For an overview see John Armour and others, *Principles of Financial Regulation* (Oxford University Press, Oxford 2016) 8–10.

the systemic risk created by off balance sheet exposures, and the contagious effects of failures.² At the same time, a series of prominent conduct scandals has led to an increased concern with customer protection, alongside growing attention to international criminal and state terrorist activities and increased focus on reducing financial crime.³

Now, more than a decade on, finance is being transformed by a new generation of data and information technologies, including cryptographically secured collaborative software such as distributed ledger technologies, machine learning, application programming interfaces, and cloud computing.⁴ This wave of innovation is also taking advantage of the dramatic increase in available 'big' data, characterized by the three 'Vs' of volume, velocity, and variety.⁵

This article is motivated by recent developments in the application of technologies for enhancing access to, and sharing of, data. We argue that these data access technologies are an opportunity for a technology-driven development of the 'new governance' techniques of financial regulation, which embeds regulatory objectives within the management information and decision-making processes of regulated firms. This is potentially transformative, supporting much improved prudential and conduct outcomes. It is however much more than a technological challenge. It requires a detailed engagement and dialogue between regulators and regulated firms on the design and technologically enabled regulatory oversight of their data systems and processes.

The article is organized as follows. Section II reviews the established literature on regulatory strategies, highlighting meta-regulation as a central 'new governance' technique. As defined here, meta-regulation means that firms are responsible for establishing their own operational processes while regulators supervise their systems of internal control and their effectiveness in achieving desired outcomes. Section III then discusses the opportunity for employing data access and data sharing technologies to better align the commercial interests of firms with the objectives of regulators. Specifically, these technologies can be used as a tool of meta-regulation supporting detailed oversight and where necessary, intervention in firms' systems and processes.

Section IV illustrates these arguments with specific applications of data access technologies to four current regulatory challenges: reporting requirements; treating customers fairly; prudential oversight; and the UK senior managers certification regime. Taken together, these illustrations provide a practical guide for applying data access technologies to enhance meta-regulation and, potentially over time, to bring about a transformative change in the governance of financial firms to better achieve desired regulatory outcomes. The concluding section V summarizes our thoughts on unlocking the full potential of using data access and sharing technologies.

² Amongst many analyses, see for example Mark J Roe, 'The Derivatives Market's Payment Priorities as Financial Crisis Accelerator' (2011) 63 *Stanford Law Review* 539, 576–77; Erik F Gerding, 'Credit Derivatives, Leverage, and Financial Regulation's Missing Macroeconomic Dimension' (2011) 8 *Berkeley Business Law Journal* 29, 41–42; Adrian Blundell-Wignall and Paul Atkinson, 'Global SIFIs, Derivatives and Financial Stability' (2011) *OECD Journal: Financial Market Trends* 167, 186–88.

³ Stijn Claessens and Laura E Kodres, 'The Regulatory Responses to the Global Financial Crisis: Some Uncomfortable Questions' in Edward J Balleisen and others (eds), *Policy Shock. Recalibrating Risk and Regulation after Oil Spills, Nuclear Accidents and Financial Crises* (Cambridge University Press, Cambridge 2017) 436–37.

⁴ An exploding volume of practitioner literature discusses the major strategic and operational issues now arising across financial services from the application of these new technologies; see for example Brett King, *Bank 4.0: Banking Everywhere, Never at a Bank* (John Wiley & Sons, Chichester 2018) ch 7.

⁵ Borko Furht and Flavio Villanustre, 'Introduction to Big Data' in Borko Furht and Flavio Villanustre (eds), *Big Data Technologies and Applications* (Springer, London 2016) 3.

II. THE EVOLUTION OF FINANCIAL REGULATION

The deregulation of financial markets and services in the 1970s required the development of new regulatory strategies that were appropriate to a changing landscape.⁶ This involved a shift from rule- to principle-based regulation, with a focus on broad standards rather than prescriptive rules and on outcomes rather than process; however, this shift posed several challenges for the conduct of regulation.⁷ This section outlines this evolution, and the resulting emergence of various 'new governance' techniques of regulation, including meta-regulation of firms' internal systems and processes.

Rule-based regulation defines what does or does not constitute acceptable conduct on the part of the regulated entity. It achieves this by imposing clear, defined 'rules' (for example, the defined minimum capital levels imposed upon regulated banks), with the intention being that observance of the 'rule' should act as a primary guard against adverse consequences.

Principles, by their nature, are less prescriptive than rules. They might illustrate a relatively broad set of behavioural standards, but with less specification governing the precise means of achievement.⁸ Thus, while a principle can be viewed as a *general* rule, or a second level of statutory norm, principles take many different forms depending on who they are applied to and how they are applied.⁹ Similarly, an outcomes-based regulatory strategy also seeks to remove the prescription of strictly defined rules, replacing them with overarching objectives—or 'outcomes'—that it seeks to be achieved.¹⁰ However, such strategies involve the regulated entity in an enhanced degree of self-enforcement of regulatory principles.¹¹ The approach is characterized by emphasis on internal controls, best practice in compliance, and broad thematic regulatory engagement such as the 'treating customers fairly' approach of the UK Financial Services Authority (FSA).¹² One way of viewing the distinction between rules and principles is that rule-based regulation takes a prescriptive view of the manner in which outcomes are achieved, with a focus on the *process* rather than the end goal, whereas principles or outcomes-based regulation employs the reverse approach.¹³

Rulemaking is not an alternative to principles, being too inflexible and unable to adapt to the rapid innovation in modern financial instruments (for example, derivative instruments).¹⁴ At the same time, the mere statement of principles is insufficient to ensure effective application.¹⁵

⁶ Sue Konzelmann and Marc Fovargue-Davies, 'Anglo-Saxon Capitalism in Crisis? Models of Liberal Capitalism and the Preconditions for Financial Stability' in Geoffrey Wood and Mehmet Demirbag (eds), *Handbook of Institutional Approaches to International Business* (Edward Elgar, Cheltenham 2012). See also Gerald A Epstein (ed), *Financialization and the World Economy* (Edward Elgar, Cheltenham 2005) 3.

⁷ Julia Black, Martin Hopper and Christa Band, 'Making a Success of Principles-Based Regulation' (2007) 1 *Law and Financial Markets Review* 191, 192–93.

⁸ Anita Anand, 'Rules v. Principles as Approaches to Financial Market Regulation' (2009) 49 *Harvard International Law Journal Online* 111.

⁹ Julia Black, 'The Rise, Fall and Fate of Principles Based Regulation' in Kern Alexander and Niamh Moloney (eds), *Law Reform and Financial Markets* (Edward Elgar, Cheltenham 2011) 6–7. An example is the FCA's conduct of business framework that aims to ensure investor protection in the retail financial sector by providing a set of principles that represent the main obligations of firms: the Principles for Business (PRIN 2.1.1—'The Principles') enumerate relevant statements that are embodied in the UK prudential sourcebook. See the FCA's website at <<https://www.handbook.fca.org.uk/handbook/PRIN/2/1.html>>.

¹⁰ The concept of outcomes-based regulation is also interpreted as 'performance-based' regulation to indicate the attainment of outcome objectives and the flexibility to achieve them. On this point see Cary Coglianese, 'The Limits of Performance-Based Regulation' (2017) 50 *University of Michigan Journal of Law Reform* 525, 531–32.

¹¹ Julia Black, 'Decentering Regulation: Understanding the Role of Regulation and Self-Regulation in a 'Post-Regulatory' World' (2001) 54 *Current Legal Problems* 103, 112–13.

¹² FSA, 'Treating Customers Fairly: Towards Fair Outcomes for Consumers' (July 2006) <<https://www.fca.org.uk/publication/archive/fsa-tcf-towards.pdf>>.

¹³ Armour and others (n 1) ch 3.

¹⁴ Dan Awrey, 'Split Derivatives: Inside the World's Most Misunderstood Contract' (2019) 36 *Yale Journal on Regulation* 495, 554–55.

¹⁵ Julia Black, 'Using Rules Effectively' in Christopher McCrudden (ed), *Regulation and Deregulation* (Oxford University Press, Oxford 1998) 101.

The key issue is now understood to be how statements of principles are linked to the decision making of firms, and the achievement of desired regulatory outcomes.

Arguably, precise rules provide more effective control than principles in relatively simple situations, but that ordering reverses as the regulated activity grows more complex.¹⁶ Such thinking has influenced a shift in the UK and other jurisdictions towards principles-based regulation and the espousal of a ‘principles-based regulatory regime’ as financial systems have grown larger and more sophisticated.¹⁷

There are inherent tensions in the implementation of principles-based regulation.¹⁸ While regulated firms often express a preference for principles over rules in order to avoid unnecessary costs of compliance with regulatory rules, in practice they demand certainty in the interpretation, communication, and application of regulations, which in turn can lead to inflexible, conservative, and costly implementation. Firms also struggle with internal implementation of principles, and the resulting demands placed on their management systems to ensure that organizational outcomes conform to principles.

High level principles can moreover conflict—for example, risk control priorities might conflict with the principle of fair treatment of clients. The case of ‘hidden swaps’ in the UK provides an example: banks effectively passing on the responsibility of risk management of certain derivative instruments (in this case, interest rate hedging products) to customers, who were largely unaware that these products exposed them to substantial early loan repayment risk following a major fall in interest rates.¹⁹

Such challenges to principle-based regulation explain the emergence and application of a range of ‘new governance’ techniques in financial regulation. There is a large literature on ‘new governance’ in both financial and non-financial regulation, discussing many alternatives to top-down ‘command and control’.²⁰ These techniques include: a variety of different implementations of principle-based regulation; meta-regulation of regulated firm’s own processes and systems for regulatory compliance; enrolment of third parties such as credit-referencing agencies and standards bodies in regulatory processes and oversight; and risk-based allocation of regulatory resources for supervision and oversight.²¹

A prominent application of ‘new governance’ in financial regulation is the ‘internal models’ approach to capital adequacy regulation, delegating the assessment of market and credit risks to regulated banks.²² The experience of the crisis, however, revealed many shortcomings in these more flexible approaches to financial regulation.²³ Yet, post-crisis, there has been a renewed emphasis on many new governance techniques, especially in the work of the Financial Stability Board (FSB) promoting global regulatory standards in financial regulation, to address the particular problem of the ‘interdependence of regulatory regimes in a global system that is

¹⁶ John Braithwaite, ‘Rules and Principles: A Theory of Legal Certainty’ (2002) 27 *Australian Journal of Legal Philosophy* 47, 51–52.

¹⁷ In practice this has never been a binary ‘either/or’ choice—regulation has always been a mixture of rules and principles, with the challenge of regulatory design being determining the appropriate balance between the two. For discussion in the context of the regulatory strategy of the US Commodity Futures Trading Commission see Heath P Tarbert, ‘Rules for Principles and Principles for Rules: Tools for Crafting Sound Financial Regulation’ (2020) 10 *Harvard Business Law Review Online* 1.

¹⁸ Julia Black, ‘Forms and paradoxes of principles-based regulation’ (2008) 3 *Capital Markets Law Journal* 425–26.

¹⁹ Jonathan Kirk, Thomas Samuels and Lee Finch, *Mis-Selling Financial Services* (Edward Elgar, Cheltenham 2019) ch 6.

²⁰ Orly Lobel, ‘The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought’ (2004) 89 *Minnesota Law Review* 342, 348 identifies eight clusters of approaches under the general umbrella of ‘new governance’ including: participation of non-state actors; public-private collaboration; decentralization; non-coerciveness (‘soft law’); and adaptability and constant learning. See also Orly Lobel, ‘New Governance As Regulatory Governance’ in David Levi-Faur (ed), *Oxford Handbook of Governance* (Oxford University Press, Oxford 2012) 66–68 reviews the difficulties involved in engaging private regulated parties in effective regulation without following a program of deregulation.

²¹ Black (n 18).

²² Robert F Weber, ‘New Governance, Financial Regulation, and Challenges to Legitimacy: The Example of the Internal Models Approach to Capital Adequacy Regulation’ (2010) 62 *Administrative Law Review* 783, 786.

²³ Black (n 18); Weber (n 22).

inherently pluralistic'.²⁴ Riles presents many criticisms of the effectiveness of the FSB's adoption of 'new governance' techniques, especially in relation to the inconsistent implementation of broad standards in different jurisdictions, and a resulting tendency for broad standards to be reinterpreted as mechanical rules.

The argument developed here is that data access technologies offer the opportunity for improving on this disappointing record of 'new governance' techniques in financial regulation, by embedding regulatory objectives within the management and decision-making processes of financial firms. The potential is to use technology in 'collaborative governance . . . to integrate the goals and interests of multiple stakeholders'.²⁵

Such an embedding of regulatory objectives is an example of 'meta-regulation': an approach to regulation in which firms are responsible for their own operational processes while regulators supervise their systems of internal control, and their effectiveness in achieving desired regulatory outcomes.²⁶ Meta-regulation has emerged as one of the most prominent of the new governance techniques of regulation. It seeks to address the fundamental challenge of linking regulatory principles to desired outcomes—the ultimate result which principles-based regulation seeks to achieve.²⁷ Such meta-regulation of systems and processes is also referred to as 'management-based' regulation, 'enforced self-regulation', or the regulation of firms' own self-regulation.²⁸

There is a substantial scholarly literature on meta-regulation. The remainder of this section locates the contribution of the present article in this broader literature. First, it should be noted that the term meta-regulation has been employed in several different senses, other than that used here.²⁹ It is sometimes used to refer to the review or cost-benefit analysis of existing regulation,³⁰ and has also been extended to embrace the increasing regulatory roles of a wide variety of state and non-state institutions.³¹ Some scholars reserve the term meta-regulation for a dynamic process in which regulators continuously recalibrate their regulation of systems and processes in the light of experience.³² Meta-regulation also varies in its execution—sometimes applied to firms and sometimes to self-regulatory organizations such as industry bodies, and operating either through narrow specific rules or more general principles.³³

²⁴ Annelise Riles, 'Is New Governance the Ideal Architecture for Global Financial Regulation?' in Charles Goodhart and others (eds), *Central Banking at a Crossroads. Europe and Beyond* (Anthem Press, London 2014) 245.

²⁵ Chris Ansell, 'Collaborative Governance' in David Levi-Faur (ed), *Oxford Handbook of Governance* (Oxford University Press, Oxford 2012) 498.

²⁶ Or as expressed by Cary Coglianese and Evan Mendelson, 'Meta-Regulation and Self-Regulation' in Robert Baldwin, Martin Cave and Martin Lodge (eds), *The Oxford Handbook of Regulation* (Oxford University Press, Oxford 2010) 151: 'Meta-regulation refers to ways that outside regulators deliberately—rather than unintentionally—seek to induce targets to develop their own internal, self-regulatory responses to public problems.'

²⁷ Julia Black, 'The emergence of risk-based regulation and the new public management in the United Kingdom' (2005) Public Law 510, who argues that 'even if an outcome is easily observable and measurable, which it is not, proving the causal connection between the outcome and the regulator's actions can be difficult' (at 535).

²⁸ Julia Black, 'Paradoxes and failures: "new governance" techniques and the financial crisis' (2012) 75 *Modern Law Review* 1045, notes these synonyms of meta-regulation and offers a definition close to that of this article: 'Under this strategy, regulators do not prescribe how regulatees should comply, but require them to develop their own systems for compliance and to demonstrate that compliance to the regulator.'

²⁹ Peter Grabosky, 'Meta-regulation' in Peter Drahos (ed), *Regulatory Theory: Foundations and Applications* (Australian National University Press, Canberra 2017) 155–56, notes that 'the term "meta-regulation" has meant different things to different people' and documents several different uses of the term going back to 1983.

³⁰ Michael D Reagan, 'The politics of regulatory reform' (1983) 36 *Western Political Quarterly* 149; Bronwen Morgan, 'Regulating the regulators: Meta-regulation as a strategy for reinventing government in Australia' (1999) 1 *Public Management: An International Journal of Research and Theory* 49.

³¹ Ian Ayres and John Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate* (Oxford University Press, New York–Oxford 1992) ch 4.

³² For example Cristie Ford, 'Macro- and Micro-Level Effects on Responsive Financial Regulation' (2011) 44 *UBC Law Review* 589.

³³ Coglianese and Mendelson (n 26) 148–50.

The literature also offers extensive discussion of the strengths and weaknesses of meta-regulation, in the specific sense of meta-regulation of systems and processes used in this article. Efforts at meta-regulation have not always been successful in changing outcomes, for example in environmental protection.³⁴ As reviewed by Gilad, its track record is also mixed in occupational and food projects health and safety regulation.³⁵ Similar concerns emerge in the context of corporate social responsibility.³⁶ The requirements for success in steering firm's own systems of internal control to achieve desired regulatory outcomes are demanding, and rely on high levels of knowledge and commitment on behalf of regulators, and also of motivation and capacity amongst firms.³⁷

There is a similarly mixed track record for meta-regulation in financial services. A considerable burden of responsibility remains with supervisors for understanding and interpreting outcomes, as illustrated by the evolution of the UK FSA rulemaking.³⁸ Delegating responsibility to firms for ensuring that their own risk management systems delivered effective regulatory compliance left room for wide interpretation among competing interests, leaving gaps in a context which should require continual and critical review by both regulators and industry—weaknesses that were exposed by the financial crisis.³⁹ A further example illustrating how meta-regulation has not worked as well as may be desired is the Basel Committee's principles for effective risk data aggregation and risk reporting (BCBS 239).⁴⁰ Banking institutions have struggled to comply with BCBS 239 given the great disparity in their systems for recording and analysing risk data.⁴¹ A further problem is presented by a reliance on legacy operating systems that do not easily interoperate in terms of reporting capabilities, and so can require manual workarounds.⁴²

Overall, meta-regulation to date appears to have been too reliant on broad statement of goals, not dialogue, and has failed to pay sufficient attention to the design, operation, and governance

³⁴ Coglianesi and Mendelson (n 26) 153–60 document the uneven track record of meta-regulation, specifically the limited achievements of US Responsible Care obligations on chemical companies following the 1984 Bhopal disaster and the Massachusetts Toxic Use Reduction Act (TURA) to promote environmental protection; and the more successful meta-regulation of the Institute of Nuclear Power Operations following the 1979 Three Mile Island accident.

³⁵ Sharon Gilad, 'It runs in the family: Meta-regulation and its siblings' (2010) 4 *Regulation & Governance* 491–92.

³⁶ Christine Parker, 'Meta-Regulation: Legal Accountability for Corporate Social Responsibility' in Doreen McBarnet, Aurora Voiculescu and Tom Campbell (eds), *The New Corporate Accountability: Corporate Social Responsibility and the Law* (Cambridge University Press, Cambridge 2007) 210. See also Gilad (n 35) 502–03.

³⁷ Gilad (n 35) 492–501; Christine Parker, 'Meta-regulation: The regulation of self-regulation' in Christine Parker, *The Open Corporation Effective Self-regulation and Democracy* (Cambridge University Press, Cambridge 2002) 245–46. Parker argues that effective meta-regulation requires a dynamic 'triple loop', illustrated by her figure 9.2: one in which firms continuously evaluate and improve both their mechanisms for monitoring and achieving compliance (self-regulation) and their systems, culture and practices which oversee and report on these mechanisms (self-evaluation) and regulators in turn pursue legal and regulatory strategies that 'add the "triple loop" that forces companies to evaluate and report on their own self-regulation strategies so that regulatory agencies can determine whether the ultimate substantive objectives of regulation are being met' (at 245).

³⁸ Andromachi Georgosouli, 'The FSA's Treating Customers Fairly (TCF) Initiative: What is So Good about It and Why It May Not Work' (2011) 38 *Journal of Law and Society* 405, 418–19.

³⁹ Ford (n 32) 623–62 argues that the micro-level implementation of meta-regulatory approach requires conversations with industry because 'dialogue, with an active, well-informed, critically thinking, and public minded regulatory presence, has the affirmative power to change perspectives and even the rules of the game . . . The response to the frailties of flexible, dialogue based systems to power, then, is not to terminate dialogue but rather to engage more strongly and insistently with it'.

⁴⁰ Basel Committee on Banking Supervision, 'Progress in adopting the Principles for effective risk data aggregation and risk reporting' (April 2020) <<https://www.bis.org/bcbs/publ/d501.pdf>>. The report stated that the global systemically important banks have not achieved full compliance with the Principles, as attaining the necessary data architecture and information technology infrastructure results the main challenge for those institutions.

⁴¹ Allan D Grody and Peter J Hughes, 'Risk Accounting—Part 1: The risk data aggregation and risk reporting (BCBS 239) foundation of enterprise risk management (ERM) and risk governance' (2016) 9 *Journal of Risk Management in Financial Institutions* 130, 139.

⁴² Automated processes will strengthen credit institutions' ability to produce aggregated data on an ad hoc basis for internal risk management purposes. See European Central Bank, 'Report on the Thematic Review on effective risk data aggregation and risk reporting' (May 2018) 18 <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.BCBS_239_repo_rt_201805.pdf>.

of the technological systems used in business processes. The contribution of this article, pursued in the following sections, is to explore how data access and sharing technologies can be used to strengthen meta-regulation and make it a more effective new governance technique.

III. DATA ACCESS AND DATA SHARING IN FINANCIAL REGULATION

The previous subsection reviewed the evolution of financial regulation and noted its continuing shortcomings in relation to achieving desired regulatory outcomes. Firms have an opportunity to depart from regulatory principles if regulators do not closely oversee their actions.⁴³ Even if there is oversight through meta-regulation, the breadth of discretion in implementation can result in 'cosmetic' compliance, with little real commitment to the underlying policy.⁴⁴

This section explores the opportunity for employing data access and data sharing technologies in financial regulation to more effectively align the objectives of regulators with the commercial interests of firms. This is, in effect, a further development of meta-regulation, using data technologies to support much greater transparency of internal systems and processes for senior management, investors, and regulators.

There is a substantial prior literature on the relationship between technology and regulation. From one perspective, closely related to that of this article, 'regulation is the technology of governance' and hence central to innovation in financial services and other industries.⁴⁵ The application of technology in regulation ('regtech') can reduce costs of compliance, but raises concerns that this may undermine rather than strengthen financial regulation and supervision.⁴⁶ The central challenge is therefore not automation of regulatory process, but rather how to use technology to improve the effectiveness of legal and regulatory frameworks.⁴⁷

Using technology to support greater transparency of internal systems can allow agreement between the regulator and regulated entities about metrics, observable by management and verifiable by regulators, that indicate compliance with regulatory principles, in turn supporting more effective ex-ante intervention. Doing this, however, requires an unprecedented level of dialogue with regulators, and joint assessment of firms' operational systems ensuring that these serve societal as well as private interests.

This discussion of the application of data access and data sharing technologies in financial regulation is set out in three subsections. The first subsection outlines the new technologies that are available to support data sharing and data access. The following subsection examines how

⁴³ Cristie Ford, 'New Governance, Compliance, and Principles-Based Securities Regulation' (2008) 45 *American Business Law Journal* 1.

⁴⁴ Kimberly Krawiec, 'Cosmetic Compliance and the Failure of Negotiated Governance' (2003) 81 *Washington University Law Quarterly* 487.

⁴⁵ Jonathan B Wiener, 'The regulation of technology, and the technology of regulation' (2004) 26 *Technology in Society* 483, 489.

⁴⁶ Saule T Omarova, 'Dealing with Disruption: Emerging Approaches to Fintech Regulation' (2020) 61 *Washington University Journal of Law & Policy* 25, 48–49: 'RegTech . . . potentially enables financial regulators to synchronize their data collection and supervisory monitoring with individual firms' internal data management . . . On the one hand, digitizing and automating a critical mass of regulatory and supervisory functions can make them much faster and cheaper to perform. On the other hand, these same choices may irreversibly undermine regulators' overall ability to exercise meaningful oversight of the financial system.' See also Saule T Omarova, 'Technology v Technocracy: Fintech as a Regulatory Challenge' (2020) 6 *Journal of Financial Regulation* 75, 114–15: 'RegTech appears not simply as an efficiency-enhancing tool but as a paradigmatic shift toward a new regime of "real-time and proportionate" financial regulation and supervision . . . Digitizing and automating a critical mass of regulatory and supervisory functions can make them much faster and cheaper to perform—while, at the same time, irreversibly undermining regulators' overall ability to exercise meaningful oversight of the financial system.'

⁴⁷ Lyria Bennett Moses, 'Regulating in the Face of Sociotechnical Change' in Roger Brownsword, Eloise Scotford and Karen Yeung (eds), *The Oxford Handbook of Law, Regulation and Technology* (Oxford University Press, Oxford 2017) 574: 'At a broader level, we need to ask not how to "regulate technology" . . . but rather how existing legal and regulatory frameworks ought to change as a result of rapid changes in the things being created, the activities that are possible and performed, and the sociotechnical networks that are assembled.'

recent developments in data technologies can support transparency of processes and systems in financial firms to better achieve the objectives of regulators. The final subsection compares this opportunity with other developments in financial and regulatory technologies.

1. The new data access technologies

A range of new cryptographic based technologies now support automated, secure access to and sharing of data across public and private organizations. These technologies include: privacy enhancing technologies, for protection of personal data;⁴⁸ blockchain, and other solutions for sharing databases amongst multiple operators and users;⁴⁹ federated learning, which supports statistical modelling by bringing estimating algorithms to the data;⁵⁰ APIs (Application Programming Interfaces), for automated exchange of data between software;⁵¹ the semantic web, for structuring information on the internet;⁵² and knowledge graphs, for capturing information in a form suitable for computer processing.⁵³

Applications of these arise in diverse areas, including: the internet of things;⁵⁴ autonomous vehicles and traffic management;⁵⁵ public health and medicine;⁵⁶ open government;⁵⁷ industrial policy;⁵⁸ disaster risk management;⁵⁹ and city management.⁶⁰ Successful application of these tools for data access and data sharing, however, requires more than just the software technologies. Appropriate institutional arrangements for data governance are essential in order to avoid breaches of personal privacy and commercial confidentiality, to ensure compliance with data regulations such as General Data Protection Regulation, and to promote the trustworthiness and credibility of automated data technologies.⁶¹

A central challenge is agreement on, and adoption of common data standards across organizations. Several examples can be provided. One—where data sharing is fundamental, and therefore standards are well developed—is in payments, with the ISO standard 20022 now

- ⁴⁸ Nesrine Kaaniche, Maryline Laurent and Sana Belguith, 'Privacy enhancing technologies for solving the privacy-personalization paradox: Taxonomy and survey' (2020) 171 *Journal of Network and Computer Applications* 102807.
- ⁴⁹ Marianna Belotti and others, 'A Vademecum on Blockchain Technologies: When, Which, and How' (2019) 21 *IEEE Communications Surveys and Tutorials* 3796.
- ⁵⁰ Tian Li and others, 'Federated learning: Challenges, methods, and future directions' (2020) 37 *IEEE Signal Processing Magazine* 50.
- ⁵¹ Joshua Ofoeda, Richard Boateng and John Effah, 'Application programming interface (API) research: A review of the past to inform the future' (2019) 15 *International Journal of Enterprise Information Systems (IJEIS)* 76.
- ⁵² Pascal Hitzler, 'A Review of the Semantic Web Field' (2021) 64 *Communications of the ACM* 76.
- ⁵³ Shaoxiong Ji and others, 'A Survey on Knowledge Graphs: Representation, Acquisition and Applications' (2021) 33 *IEEE Transactions on Neural Networks and Learning Systems* 494; Aidan Hogan and others, 'Knowledge graphs' (2021) 12 *Synthesis Lectures on Data, Semantics, and Knowledge* 1.
- ⁵⁴ Shi-Cho Cha and others, 'Privacy enhancing technologies in the Internet of Things: Perspectives and challenges' (2018) 6 *IEEE Internet of Things Journal* 2159.
- ⁵⁵ Elnaz Namazi, Jingyue Li and Chaoru Lu, 'Intelligent intersection management systems considering autonomous vehicles: A systematic literature review' (2019) 7 *IEEE Access* 91946.
- ⁵⁶ Monica M Bertagnolli and others, 'Advantages of a Truly Open-Access Data-Sharing Model' (2017) 376 *New England Journal of Medicine* 1178; Nicola Rieke and others, 'The future of digital health with federated learning' (2020) 3 *NPJ Digital Medicine* 1.
- ⁵⁷ Marijn Janssen, Yannis Charalabidis and Anneke Zuiderwijk, 'Benefits, adoption barriers and myths of open data and open government' (2012) 29 *Information Systems Management* 258.
- ⁵⁸ Oscar Borgogno and Giuseppe Colangelo, 'Data sharing and interoperability: Fostering innovation and competition through APIs' (2019) 35 *Computer Law & Security Review* 105314.
- ⁵⁹ Massimo Migliorini and others, 'Data interoperability for disaster risk reduction in Europe' (2019) 28 *Disaster Prevention and Management* 804.
- ⁶⁰ Göran Smith and Johan Sandberg, 'Barriers to innovating with open government data: Exploring experiences across service phases and user types' (2018) 23 *Information Polity* 249.
- ⁶¹ Marijn Janssen and others, 'Data governance: Organizing data for trustworthy Artificial Intelligence' (2020) 37 *Government Information Quarterly* 101493; Ibrahim Alhassan, David Sammon and Mary Daly, 'Data governance activities: an analysis of the literature' (2016) 25(sup1) *Journal of Decision Systems* 64; Vijay Khatri and Carol V Brown, 'Designing data governance' (2010) 53 *Communications of the ACM* 148; Rene Abraham, Johannes Schneider and Jan vom Brocke, 'Data governance: A conceptual framework, structured review, and research agenda' (2019) 49 *International Journal of Information Management* 424.

adopted in all new industry payments initiatives.⁶² Another example is the global legal entity identifier (GLEI), originally developed to support post-crisis derivative reporting requirements (as set out in the 2009 Pittsburgh agreement of the G20, and legislated in the US Dodd-Frank Act and EU European Markets Infrastructure Regulation), subsequently developed through the GLEI foundation, and now a decade later finding wider application.⁶³ This point, the central role of agreed data standards, is developed further below in the context of automated regulatory reporting.

The potential of these automated data access and sharing technologies, both in public services and private business, has been addressed in a succession of Organisation for Economic Co-operation and Development (OECD) reports on data governance.⁶⁴ As the OECD notes, 'current developments related to data-driven innovation, including in the context of the Internet of Things and artificial intelligence, have made data access and sharing more crucial than ever'.⁶⁵ Reviewing available research, the OECD finds that access to and sharing of public and private data could yield economic value of between 1 per cent and 2.5 per cent of GDP, when also including private-sector data.⁶⁶

As highlighted by French and others, the financial services industry is increasingly recognizing the importance of these data technologies: '[N]ot only are our lives becoming more digital, but money and the way we transact are also evolving. Data flows play an ever-increasing role in this environment, making cooperation on digital policy and digital trade important priorities across society.'⁶⁷

As these authors emphasize, achieving the full economic potential of digital services—including financial services—requires co-operation across industry and government, especially in establishing 'interoperable protocols and standards for information sharing, data flow, safety and privacy', an appropriate 'regulatory architecture', and governance mechanisms to provide '[l]eadership . . . co-ordination, collaboration and conflict resolution'.⁶⁸

An example illustrating the challenges is: 'open banking'. Open banking has been pioneered in the UK and Australia as a tool of competition policy in retail banking. In 2016, the UK Competition and Markets Authority imposed, in an attempt to promote more effective competition in retail banking, a mandated industry collaboration on developing standard open banking APIs.⁶⁹ These APIs allow bank customers to authorize the sharing of their data with third party providers. Developing these APIs so that they adequately respect data security, customer privacy, and ensure proper use of shared data has been a substantial collaborative technology project, involving thousands of information technology professionals.

The development of open banking, or more generally of open finance, with sharing of customer data in the full range of retail financial services including investment management

⁶² Carter Klein and Robert J Denicola, 'Payments' (2018) 74 *Business Law* 1243.

⁶³ Ka Kei Chan and Alistair Milne, 'The global legal entity identifier system: How can it deliver?' (2019) 12 *Journal of Risk and Financial Management* 39; Victoria Cleland and Gerard Hartsink, 'The value of the Legal Entity Identifier for the payments industry' (2020) 13 *Journal of Payments Strategy & Systems* 322.

⁶⁴ OECD, 'Enhancing Access to and Sharing of Data' (2019); Elettra Ronchi and Christian Reimsback Kounatze, 'A decade and a half of OECD action on data governance policy-making' (Aout 2022) *Réalités industrielles* 71–72 <<https://www.nnales.org/ri/2022/ri-aout-2022/2022-02-16.pdf>>.

⁶⁵ OECD (n 64) 4.

⁶⁶ OECD (n 64) 6.

⁶⁷ Conan French, Jaco Grobler and Jessica Renier, 'Strategic Framework for Digital Economic Cooperation—A Path for Progress' (2022) 1 <<https://www.iif.com/Publications/ID/4879/Strategic-Framework-for-Digital-Economic-Cooperation--A-Path-for-Progress>>. Their analysis focuses on international digital transactions, but most of their framework is also applicable in a domestic context.

⁶⁸ French, Grobler and Renier (n 67).

⁶⁹ Markos Zachariadis and Pinar Ozcan, 'The API Economy and Digital Transformation in Financial Services: The Case of Open Banking' SWIFT Institute Working Paper No 2016-001 (2017) <<https://ssrn.com/abstract=2975199>>.

and insurance is being pursued in very different ways in different jurisdictions.⁷⁰ In the US, the development of open finance has been left to private-sector initiative. This has raised concerns about significant barriers to entry, with the possibility of a small number of ‘data aggregation’ platforms dominating the market, and a consequent restriction (rather than enhancement) of competition.⁷¹ In the EU, the 2015 Second Payments Services Directive mandated data sharing by banks, but the further step of mandating collaboration amongst banks to develop a standard API was pursued only in the UK.⁷² The EU has prioritized the development of a broad ‘data finance strategy’ which will support the digital transformation of finance, itself a part of a broader vision that ‘aims at creating a single EU market for data that will ensure Europe’s global competitiveness and data sovereignty’.⁷³

2. Using data technologies to advance meta-regulation

This subsection discusses how these tools of data access and data sharing could be used to develop meta-regulation as a more effective technique of regulatory oversight. A central point is that these tools can at the same time both (i) strengthen management information (making it more available, understandable, and actionable), hence allowing firms to better achieve their business objectives; and (ii) more effectively embed regulatory outcomes within firms’ business processes and decision making.

Consistent with the experience of applying data technologies in other sectors, this is above all a challenge of governance—for individual firms, for the financial services industry, and for the regulatory authorities. Data and supporting data technologies are increasingly central to financial firms, so it is a board responsibility to oversee and ensure their effective application in operational and business processes. One challenge is overcoming the divides within firms—between specialists such as those in information technology and data science, and other staff with client facing and operational roles—and ‘orchestrating’ the adoption of data technologies so that they support business oversight and control. Another challenge is ensuring that senior management and board members have an adequate understanding of both data technologies and the associated security and privacy risks.

Achieving the full potential of these new data technologies will also require an unfamiliar degree of co-operation between financial firms. They will need to establish agreement around several issues: on data and technology standards; on the sharing of data; and on exploring opportunities for shared processing. They will also need to agree to sacrifice short-term opportunities in order to achieve improved long-term outcomes for clients and other stakeholders; however, this may meet with resistance from management focused on short-term profit performance. Here, regulators have a central role, going beyond their traditional mandates of oversight from a distance and intervening only when there is an imminent prudential or conduct threat. They have an opportunity to take responsibility for co-ordinating developments in data technologies, and engaging in ongoing dialogue with regulated firms about the most effective means of employing these to achieve both business and regulatory objectives. In short, data access technologies offer an opportunity for the further development of ‘meta-regulation’ in financial

⁷⁰ Han-Wei Liu, ‘Two decades of laws and practice around screen scraping in the common law world and its open banking watershed moment’ (2020) 30 *Washington International Law Journal* 28.

⁷¹ Dan Awrey and Joshua Macey, ‘The Promise and Perils of Open Finance’ (2023) 40 *Yale Journal on Regulation* 1, 5–7.

⁷² Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC.

⁷³ See <https://ec.europa.eu/info/consultations/finance-2022-open-finance_en> and <<https://digital-strategy.ec.europa.eu/en/policies/strategy-data>>. In 2022 the European Commission engaged in a consultation on the effectiveness of PSD2 in promoting open finance <https://finance.ec.europa.eu/system/files/2022-05/2022-open-finance-consultation-document_en.pdf>.

services, and embracing oversight and intervention in the technology and operational systems of regulated firms.⁷⁴

3. Related developments in financial and regulatory technologies

Such a 'new governance' application of data technologies in financial regulation is different from the recent substantial investment in regtech, which offers technology-based solutions to the vastly increased burden of compliance on financial firms since the global financial crisis.⁷⁵ There are inherent limitations to this compliance focus of regtech. The use of automated technology to reduce compliance costs and strengthen supervision can conflict with the exercise of manual or judgemental intervention of regulators, for example in authorization processes, detection of financial crime, or the identification of mis-selling practices.⁷⁶

More broadly, the automation of regulatory compliance is one aspect of a shift to 'code as law', raising far reaching questions about the extent to which contracts can and should be written as computer code and executed automatically, and whether this can ever go as far as envisaged by some digital utopians, with computer code entirely replacing institutional arrangements such as financial intermediaries and financial regulation.⁷⁷ Regulatory and management processes need to retain human and organizational elements even when they are technologically enabled, so the adoption of technology in regulation is not just about automation; it raises fundamental issues about regulatory design and the role of human agency.⁷⁸

The opportunity explored in this article for new governance-based implementation of data access technologies in financial regulation fits more closely with the views of some other commentators, who argue that modern data technologies have the potential to provide regulatory authorities with near-complete oversight of prudential and conduct risks, both for individual institutions and at the systemic level. The global financial crisis made clear the need for system-level oversight, in addition to the 'microprudential' supervision carried out at the individual firm-level.⁷⁹

One particularly vivid expression of this point of view envisages using technology for the real-time tracking of the global flow of funds.⁸⁰ Moving closer to such a full, real-time oversight

⁷⁴ On a similar point see Carolyn Abbot, 'Bridging the Gap—Non-state Actors and the Challenges of Regulating New Technology' (2012) 39 *Journal of Law and Society* 329, 338.

⁷⁵ Veerle Colaert, 'Regtech as a Response to Regulatory Expansion in the Financial Sector' (2018) 3 *Revue internationale des services financiers/International Journal for Financial Services (RISF)* 56; Ben Charoenwong, Zachary T. Kowaleski, Alan Kwan and Andrew Sutherland, 'RegTech' MTI Sloan Research Paper 6563-22 (2022) <<https://ssrn.com/abstract=4000016>>. See also Emmanuel Schizas and others, 'The global regtech industry benchmark report' (2019) <<https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2019-12-ccaf-global-regtech-benchmarking-report.pdf>>, which estimates that by early 2019 regtech start-ups worldwide had raised a cumulative \$9.7bn of venture capital investment, earned total 2018 revenues of \$4.9bn and had 44,000 employees. Kari Larsen and Shariq Gilani, 'RegTech is the New Black—The Growth of RegTech Demand and Investment' (2017) *Journal of Financial Transformation* Capco Institute 22.

⁷⁶ Omarova, 'Dealing with Disruption' (n 46). See also Mark Carney, 'New Economy, New Finance, New Bank' (speech given at The Mansion House, London, 21 June 2018) <<https://www.bankofengland.co.uk/speech/2018/mark-carney-speech-at-the-lord-mayors-bankers-and-merchants-dinner-mansion-house>>.

⁷⁷ On this point see Katharina Pistor, *The Code of Capital. How the Law Creates Wealth and Inequality* (Princeton University Press, Princeton 2019) ch 8.

⁷⁸ Karen Yeung, 'Towards an Understanding of Regulation by Design' in Roger Brownsword and Karen Yeung (eds), *Regulating Technologies: Legal Futures, Regulatory Frames and Technological Fixes* (Hart Publishing, Oxford—Portland 2008) 107. Yueh-Ping Yang and Cheng-Yun Tsang, 'RegTech and the New Era of Financial Regulators: Envisaging More Public-Private-Partnership Models of Financial Regulators' (2018) 21 *University of Pennsylvania Journal of Business Law* 354, 373–74.

⁷⁹ Claudio Borio, 'Implementing the Macroprudential Approach to Financial Regulation and Supervision' (2011) in Christopher J Green, Eric J Pentecost and Tom Weyman-Jones (eds), *The Financial Crisis and the Regulation of Finance* (Edward Elgar, Cheltenham 2011).

⁸⁰ Andrew Haldane, 'Managing global finance as a system' (Maxwell Fry Annual Global Finance Lecture at Birmingham University, Bank of England, 2014) 9 <<https://www.bankofengland.co.uk/-/media/boe/files/speech/2014/managing-global-finance-as-a-system.pdf>>, arguing that 'I have a dream. It is futuristic, but realistic. . . It would involve tracking the global flow of funds in close to real time (from a Star Trek chair using a bank of monitors), in much the same way as happens with global weather systems and global internet traffic'.

could indeed help achieve a safer post-crisis financial system.⁸¹ There are also other advocates of the transformative potential of technology in regulation.⁸² Kavassallis and others evidence the potential improvements of risk monitoring where digital standardized documents are made available to all relevant parties, including supervisory and regulatory authorities.⁸³ Butler and O'Brien also note the transformative potential of such practices for the supervision of the financial system, though greater international harmonization of regulatory regimes is likely to be required in order to fully capture these wider gains.⁸⁴

A comprehensive market-wide information system in which the regulator sees and responds to every undesired development is not however something that is imminently achievable. As the work of the OECD has emphasized, the development of data access and data sharing is not a one-time reform; rather, it is an ongoing and challenging programme of work which will have to be pursued over a period of years to fully realize its benefits.⁸⁵ The integration of data access technologies as a central new governance technique of financial regulation can however help facilitate an *evolution* towards better oversight of prudential and conduct risks.

The adoption of data access technologies in meta-regulation is also consistent with other current discussion of technology in regulation, both in compliance (regtech) and in supervision and oversight (suptech). These technologies have been viewed as helping support a forward-looking approach to the oversight and assessment of risk management.⁸⁶ The emergence of new fintech-based products and services, and new technology-based financial business models, poses a range of regulatory challenges.⁸⁷ Data access and sharing can help address some of these challenges, for example through enhancing standardized regulatory reporting.⁸⁸

IV. APPLYING DATA ACCESS TECHNOLOGIES IN FINANCIAL REGULATION

In this section we examine some specific applications of data access and data sharing technologies to achieve better regulatory outcomes—in regulatory reporting, treating customers fairly, prudential oversight, and the obligations of senior management. These applications illustrate a common theme: employing technology to ensure that internal systems, and the information they provide to business units, senior management, supervisors, and investors, are aligned with desired regulatory outcomes. Data access technologies help increase transparency, and thus can help address problems of information asymmetry and incentives which impede the achievement of regulatory objectives.

These applications, though varied, still fit within the theoretical framework of 'new governance', in particular meta-regulation, ie regulation of systems and processes, illustrating

⁸¹ Douglas W Arner and others, 'The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II' (2020) 25 *Stanford Journal of Law, Business & Finance* 245, 252.

⁸² Douglas W Arner, Janos Barberis and Ross P Buckley, 'Fintech and Regtech in a Nutshell, and the Future in a Sandbox' CFA Institute Research Foundation Briefs (2017) 13–14 <<https://ssrn.com/abstract=3088303>>.

⁸³ Petros Kavassalis and others, 'An innovative RegTech approach to financial risk monitoring and supervisory reporting' (2018) 19 *Journal of Risk Finance* 39.

⁸⁴ Tom Butler and Leona O'Brien, 'Understanding regtech for Digital Regulatory Compliance' in Theo Lynn, John G. Mooney, Pierangelo Rosati and Mark Cummins (eds), *Disrupting Finance. FinTech and Strategy in the 21st Century* (Palgrave Macmillan, London 2019) 85.

⁸⁵ OECD (n 64).

⁸⁶ Financial Stability Board, 'The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions' (9 October 2020) 35–36 <<https://www.fsb.org/wp-content/uploads/P091020.pdf>>.

⁸⁷ Cheng-Yun Tsang, 'From Industry Sandbox to Supervisory Control Box: Rethinking the Role of Regulators in the Era of FinTech' (2019) 2019(2) *University of Illinois Journal of Law, Technology & Policy* 355, 364–65. Omarova, 'Dealing with Disruption' (n 46) 48–49. Johannes Ehrentraud and others, 'Big tech regulation: in search of a new framework' *Financial Stability Institute Occasional Paper No 20* (October 2022) 11 <<https://www.bis.org/fsi/fsipapers20.pdf>>.

⁸⁸ Juan Carlos Crisanto and others, 'From data reporting to data-sharing: how far can suptech and other innovations challenge the status quo of regulatory reporting?' *FSI Insights No 29* (December 2020) 20–21 <<https://www.bis.org/fsi/publ/insights29.pdf>>.

how data access technologies may achieve better regulatory outcomes. This requires ongoing supervisory and regulatory dialogue, both with individual firms and across the wider industry, about the design of their internal data, operational, and management information systems, and the alignment of these systems with the objectives of regulation and supervision.⁸⁹

1. Regulatory reporting in the UK

A first example of employing technology to improve regulatory outcomes is drawn from the work of the UK financial authorities, both the Bank of England (BoE) and the Financial Conduct Authority (FCA), on transforming regulatory reporting. Initially viewed as a matter of 'converting regulation into code', it is now clear that it is a much broader challenge, requiring an alignment of reporting data and operational processes across the industry.

The high costs of regulatory reporting are well known. A policy report commissioned by the BoE and FCA has estimated reporting costs for UK banks to be around £4.5bn a year.⁹⁰ The burden of regulatory reporting includes not just the routine costs of submitting reports, estimated at around 1 per cent of total operating costs,⁹¹ but also the additional costs of monitoring, interpreting, and adjusting to new reporting requirements, which often requires legal and compliance expertise that leads many smaller firms to rely on professional assistance to conduct their regulatory reporting.⁹² While manageable for larger firms, aggregate costs for the industry are substantial, and a particular burden on smaller competitors.⁹³

The work of the UK authorities began with a 2015 'call for input' by the FCA, which sought to explore how they might support the adoption and development of regtech.⁹⁴ These were part of the FCA and BoE's policy of wider support to the development of fintech and regtech in the UK.⁹⁵ The digital regulatory reporting initiative was then launched in 2017.⁹⁶ This originated from a number of 'tech sprints' organized by the FCA, examining the opportunity for using technology to lower the burden of regulatory compliance.⁹⁷

⁸⁹ For an insightful review of these processes and how they are changed by technology see Lyndon Nelson, 'Technological change: Is it different this time?' in Bill Coen and DR Maurice (eds), *Regtech, Suptech and Beyond: Innovation in Financial Services* (Risk Books, London 2021).

⁹⁰ PA, 'PA Consulting Digital Regulatory Reporting: A review of phases 1 and 2 of the digital regulatory reporting initiative' (September 2020) 6 <<https://www.paconsulting.com/newsroom/releases/pa-consulting-supports-fca-and-bank-of-england-to-revolutionise-regulatory-reporting>>. These high costs of regulatory compliance are highlighted in several other consultancy reports, for example KPMG, 'There's a revolution coming: Embracing the challenge of RegTech 3.0' (2018) <<https://assets.kpmg/content/dam/kpmg/uk/pdf/2018/09/regtech-revolution-coming.pdf>>, reporting global annual costs of regulatory compliance of \$270bn with average number of compliance staff in global banks of 7,000, four times that before the crisis.

⁸⁵ OECD (n 64).

⁹² FCA and BoE, 'Digital Regulatory Reporting Phase 2 Viability Assessment' (2020) <<https://www.fca.org.uk/publication/discussion/digital-regulatory-reporting-pilot-phase-2-viability-assessment.pdf>>.

⁹³ FCA and BoE (n 92). This report estimated ongoing annual costs of mortgage reporting amongst the large banks on their DRR project at £450,000 per year, with the costs of implementing new requirements in their systems an additional £700,000; reporting costs for derivatives were around six times as high, reflecting in part the need of international banks to report to multiple regulators. There some 60,000 reporting firms in the UK alone, suggesting costs across all regulatory reporting domains are large.

⁹⁴ On this and later FCA regtech initiatives <<https://www.fca.org.uk/firms/innovation/regtech>>.

⁹⁵ The FCA launched its programme 'Project Innovate' for supporting financial innovation through sandboxes and regulatory support in 2014. For review see FCA, 'The Impact and Effectiveness of Innovate' (2019) <<https://www.fca.org.uk/publication/research/the-impact-and-effectiveness-of-innovate.pdf>> the Bank of England FinTech hub <<https://www.bankofengland.co.uk/research/fintech>> explores opportunities for using technology to support the Bank's monetary and financial stability objectives. The Government Office for Science report by Mark Walport, 'FinTech futures: The UK as a world leader in financial technologies' (2015), provides a broader discussion and recommendations for UK policy on fintech including recommendations on RegTech.

⁹⁶ More detail is on the FCA webpage 'Digital Regulatory Reporting' <<https://www.fca.org.uk/innovation/regtech/digital-regulatory-reporting>>.

⁹⁷ Seven FCA Tech Sprints were run from April 2016 to August 2019, including 'unlocking regulatory reporting' and 'Model driven machine executable regulatory reporting' <<https://www.fca.org.uk/firms/innovation/regtech/techsprints>>. These were accompanied by the 'Digital Reporting Initiative' <<https://www.fca.org.uk/innovation/regtech/digital-regulatory-reporting>>, a joint BoE-FCA project in collaboration with seven major banks (Barclays, Credit Suisse, Lloyds Bank, HSBC UK, Nationwide, Natwest and Santander) in two phases from 2018 to 2020. The first phase focused on the

The viability assessment, following subsequent engagement on this initiative with several leading banks, concluded that a piecemeal approach limiting automated reporting to a single domain is unlikely to yield a favourable balance of benefits over costs.⁹⁸ A 'viable' transition to digital regulatory reporting (DRR) requires its introduction in multiple business areas, with alignment with ongoing change initiatives in regulated firms. As pointed out by Butler and O'Brien, achieving maximal benefit requires all firms to adhere to common approaches in operations and regulatory reporting: 'the full benefits of regtech will only materialise if the pitfalls of a fragmented Tower of Babel approach are avoided'.⁹⁹

A January 2020 consultation paper from the BoE then fulfilled a Bank commitment, resulting from its commissioned Future of Finance Report, to 'launch a review in consultation with banks, insurers and financial market infrastructures to explore a transformation of the hosting and use of regulatory data over the next decade'.¹⁰⁰

It has been presented as the start of a 'dialogue with regulated firms and solution vendors to shape the evolution of reporting over a 5–10-year horizon'. The aim is to both 'decrease the burden on industry and to increase the timeliness and effectiveness of data in supporting supervisory judgements'. A key point is a focus on developing common data standards as a public good, with 'wider benefits than just reporting efficiency'.

This was followed by the announcement by the BoE and the FCA of a more detailed plan for transforming data collection from the UK financial sector.¹⁰¹ This plan reinforces the point that the automation of regulatory reporting requires a 'buy-in' from the industry, with a commitment to addressing barriers in legacy data and technology silos in order to automate reporting processes. This programme for transformation of data collection moved into its second phase in September 2022, exploring four use cases: the reporting of operational failures; commercial real estate data; prudential data collection, and collection of data on retail banking products and services.

These developments reflect a recognition that automated regulatory reporting is not something that can be prescribed by the regulator, even in the simplest situations. Rather, the only viable approach is engaging in a wide-ranging dialogue with the industry, seeking to establish a road map that will support the adoption of digital regulatory reporting with the ongoing programmes of technology change in regulated firms.

Automated regulatory reporting is not without cost. It requires reporting requirements to be stated with greater precision, removing ambiguity, but at the expense of narrowing its scope.¹⁰² A related challenge for the reporting entity is adapting their internal systems. This in turn creates tensions: what is the business case for each firm to invest in changing its own systems, and can this rest purely on cost savings or does it require regulatory mandate? Should the agreed reporting solution favour some institutions or some particular proprietary solutions? If not, how

automation of regulatory reporting for UK domestic mortgages and Common Equity Tier 1 (CET ratio); the second phase focused on implementation with particular attention to mortgage and derivative reporting.

⁹⁸ FCA and BoE (n 92).

⁹⁹ Butler and O'Brien (n 84) 85. They argue for adoption of 'semantic standards' to support automated exchange of information between different computer systems, but the point is a more general one applying to all forms of data standardization.

¹⁰⁰ Bank of England, 'Transforming data collection from the UK financial sector' (2020) <<https://www.bankofengland.co.uk/paper/2020/transforming-data-collection-from-the-UK-financial-sector>>. This builds on the joint BoE and FCA work on digital reporting and the findings of Huw van Steenis, 'The Future of Finance Report' (2019) <<https://www.bankofengland.co.uk/report/2019/future-of-finance>>, which recommended amongst other wider objectives that the Bank both 'Support the data economy through standards and protocols' (Recommendation 3) and 'Embrace digital regulation' (Recommendation 9).

¹⁰¹ Bank of England, 'Transforming data collection from the UK financial sector: a plan for 2021 and beyond' (2021) <<https://www.bankofengland.co.uk/paper/2021/transforming-data-collection-from-the-uk-financial-sector-a-plan-for-2021-and-beyond>>.

¹⁰² Eva Micheler and Anna Whaley, 'Regulatory Technology: Replacing Law with Computer Code' (2019) 21 *European Business Organization Law Review* 349, 374.

is a coordinated, standard approach at industry level to be agreed?¹⁰³ On the positive side, the benefits are clearly not limited to regulatory reporting. The lack of standardization in definitions and descriptions of data used by regulated firms is also a significant barrier to efficiency gains in both firm operations and the use of new analytical techniques.¹⁰⁴

A separate BoE analysis of the regulatory challenges from emerging financial industry applications of artificial intelligence (AI) and machine learning highlights the importance of data, data governance, and data standardization to supervision and regulation of emerging technologies.¹⁰⁵ Broadly speaking, these new technologies can be accommodated within existing regulatory frameworks, but the practical challenges of doing this are substantial.¹⁰⁶

All this aligns with the discussion of automated regulation by Micheler and Whaley: 'it does not deliver a silver bullet that will make it easier for regulated entities to align their business interests with the public interest'.¹⁰⁷ Effective implementation requires a meta-regulatory strategy that engages with and influences firms' decisions on their own processes and systems.¹⁰⁸ Data access technologies can allow the possibility of a common agreed approach in the use of data which supports more effective compliance, supervision, and enforcement of regulation. This however requires a much greater degree of collaboration and dialogue than has hitherto been used in formulating reporting requirements, and it will not be a short-term fix.

2. Treating customers fairly

Customer protection offers a further example of where greater transparency of processes and systems could achieve better regulatory outcomes. This example highlights the corresponding need for a regulator-industry dialogue on the adoption and deployment of data technologies.

Fair treatment of customers is a prominent concern in the adoption of new technology. Financial services firms are increasingly automating credit and insurance risk assessment, fraud detection, and other financial services processes. There is a shift from more mechanical rules, to algorithms that utilize a wide range of data sources ('big data') and software that can update itself and learn from its own performance; this is one definition of artificial intelligence, ie software that learns from data, rather than having all rules pre-programmed.¹⁰⁹ Automated tools are increasingly used in credit scoring and in loan and insurance origination, substantially lowering costs and offering potential improvements in risk measurement and management.¹¹⁰

These technological innovations prompt questions about oversight and transparency.¹¹¹ Does automated decision making result in hidden bias, for example by making decisions using variables that are correlated with other variables (age, ethnicity, or other protected characteristics) which are prohibited as a basis for decision making, thereby allowing bias and

¹⁰³ Kevin Houston, Alistair Milne and Paul Parboteeah, 'Preliminary Report on Standards in Global Financial Markets' (2015) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2531210>.

¹⁰⁴ FCA and BoE (n 92).

¹⁰⁵ Bank of England, 'Artificial Intelligence and Machine Learning' Discussion Paper 5/22 (11 October 2022) <<https://www.bankofengland.co.uk/prudential-regulation/publication/2022/october/artificial-intelligence>>.

¹⁰⁶ Bank of England (n 105) para 4.36: 'Organisational and legacy issues make total data integration a significant challenge.'

¹⁰⁷ Micheler and Whaley (n 102) 351.

¹⁰⁸ Some of the challenges this involves are documented in Daniel Gozman, Jonathan Liebenau and Tomaso Aste, 'A Case Study of Using Blockchain Technology in Regulatory Technology' (2020) 19 MIS Quarterly Executive 19, reporting on stakeholder views on 'Project Maison', which was a 2017 proof of concept exploring the application of blockchain to UK mortgage loan regulatory reporting requirements.

¹⁰⁹ Yavar Bathaee, 'The Artificial Intelligence Black Box and the Failure of Intent and Causation' (2018) 31 Harvard Journal of Law & Technology 890, 898–99.

¹¹⁰ W Scott Frame, Larry Wall and Lawrence J White, 'Technological Change and Financial Innovation in Banking: Some Implications for fintech' Federal Reserve Bank of Atlanta Working Paper 2018-11 (October 2018) 2.

¹¹¹ On this discussion see Tal Zarsky, 'The Trouble with Algorithmic Decisions: An Analytic Road Map to Examine Efficiency and Fairness in Automated and Opaque Decision Making' (2016) 41 Science, Technology, & Human Values 118, 122–23.

discrimination to occur undetected by standard compliance processes?¹¹² Could technology-based lenders, claiming to overcome barriers to financial inclusion, actually recreate high-interest predatory lending that exploits less credit-worthy borrowers?¹¹³ Is the support for financial innovation by regulators in many jurisdictions leading to a danger of relaxation of enforcement that could itself result in undesirable treatment of customers?¹¹⁴

Consider the potential for biased pricing of credit or insurance products based not on actual risk of loss, but other customer characteristics such as age, religion, or ethnicity.¹¹⁵ Older, more established approaches are far from bias-free: for example, the evident bias against ‘people of color’ in the widely used FICO credit scoring in the US, perpetuating a dual credit system.¹¹⁶ The key question is therefore not whether or not a new technology is biased (all processes are likely to contain some bias), but does the technology reduce (or at least, not increase) bias, alongside improvements in process efficiency?¹¹⁷ This could not only be articulated as a regulatory principle, but also be underpinned by dialogue between regulators and industry; for example, in the case of the FICO score, by exploring the development of a sophisticated credit scoring assessment more accurately reflecting default risk, with less bias.¹¹⁸ Here data access and sharing is critical, because it is only through data access that regulators or outside consumer advisory firms can investigate the extent to which new data-based processes are reducing or increasing bias.

As a further example, consider the mis-selling of UK payment protection insurance (PPI).¹¹⁹ PPI was insurance protection against loss of income that would prevent repayment, sold alongside mortgage and consumer credit products.¹²⁰ Lack of transparency was at the heart of the PPI scandal—it was only after the passage of some years that regulators appreciated the scale of mis-selling, how customers were being misled, and the extent to which regulatory principles were breached.

¹¹² Kevin Petrasic, Benjamin Saul and James Grelg, ‘Algorithms and bias: What lenders need to know’ *White & Case* (2017) <<https://www.whitecase.com/sites/whitecase/files/files/download/publications/algorithm-risk-thought-leadership.pdf>>.

¹¹³ Kristin Johnson, Frank Pasquale and Jennifer Chapman, ‘Artificial intelligence, machine learning, and bias in finance: toward responsible innovation’ (2019) 88 *Fordham Law Review* 499, 502.

¹¹⁴ Jon Truby, Rafael Brown and Andrew Dahdal, ‘Banking on AI: mandating a proactive approach to AI regulation in the financial sector’ (2020) 14 *Law and Financial Markets Review* 110, 115.

¹¹⁵ Tal Z Zarsky, ‘Transparent Predictions’ (2013) 2013 *University of Illinois Law Review* 1503, 1549.

¹¹⁶ Lisa Rice and Deidre Swensnik, ‘Discriminatory effects of credit scoring on communities of color’ (2013) 46 *Suffolk University Law Review* 935, 966.

¹¹⁷ Aaron Klein, ‘Reducing bias in AI-based financial services’ *AI Governance Series*, Brookings Institute (2020) <<https://www.brookings.edu/research/reducing-bias-in-ai-based-financial-services>>.

¹¹⁸ Alex Gano, ‘Disparate Impact and Mortgage Lending: A Beginner’s Guide’ (2017) 88 *University of Colorado Law Review* 1109, 1167. For example, one source of racial bias in FICO is its 30 per cent weight on mortgage and other credit repayment history; with no weight on rent repayment history, biasing against renters including many people of colour. An amendment of FICO with a supporting record of rental repayment data, while clearly challenging, would reduce bias.

¹¹⁹ The problems of PPI and the response to the consumer complaints about PPI are described in FSA, ‘The assessment and redress of Payment Protection Insurance complaints, Feedback on CP/09 and further consultation’ (March 2010) <https://www.fca.org.uk/publication/consultation/cp10_06.pdf>. The Appendix 3 ‘Open letter’ lists 15 common failings in sale of PPI, including pressurized selling; failure to notify about cooling off period; not adequately describing the product; not clarifying if it was offering financial advice; where offering financial advice, not taking reasonable care to establish the suitability of the product; inadequate price disclosure; selling policies where the total costs exceeded the benefits of the policy; and hiding costs within the original loan. The FSA’s successor, the FCA, in ‘Payment protection insurance explained’ (22 August 2020) <<https://www.fca.org.uk/ppi/ppi-explained>>, summarized the outcome, after the passing of the 2019 final deadline for customer compensation claims: ‘As many as 64 million PPI policies have been sold in the UK, mostly between 1990 and 2010, some as far back as the 1970s. But we found that PPI was often mis-sold. More than £33bn has already been paid back to people who complained about the sale of PPI.’

¹²⁰ The PPI mis-selling scandal showed the failure of firms to comply with the prudential sourcebook and regulatory rules such as suitability, know your customer, and best advice. See Julia Black and Richard Nobles, ‘Personal Pensions Misselling: The Causes and Lessons of Regulatory Failure’ (1998) 61 *Modern Law Review* 789, 792. It is argued that ‘the pensions episode indicates that general rules are subject to limits inherent in the interpretive context in which they operate’ (at 819).

PPI mis-selling was addressed after the event through enforcement of consumer rights of redress, including overcoming in judicial review objections from the industry that the enforcement of consumer rights based on contravention of FSA principles was invalid.¹²¹ Partly as a consequence of the scandal, and also because of resource constraints, the FSA's successor the FCA was launched with a regulatory strategy that places less emphasis than did the FSA on seeking assurances on compliance with regulatory principles on a 'relationship managed basis', ie engagement with senior management in individual firms, and more emphasis on early intervention.¹²²

The lesson we draw from the PPI mis-selling scandal is that data access and sharing offer the opportunity to control such conduct problems through supporting such a shift from ex-post to ex-ante regulation. Customers, consumer groups, managers, and regulators should all have access to data that allows them to be well informed about the suitability of products. Operational systems should therefore be designed to give managers, investors, and other stakeholders (such as consumer organizations or financial journalists) the information needed to assess whether financial products and services appropriately meet consumers' needs. Crucially, meaningful dialogue between regulators and industry is then required to establish exactly how this is to be done.

A comparison can be made with the pricing of foreign exchange transactions by banks for their retail customers. It is normal for banks to offer low fee, or even fee-free retail foreign exchange, but at rates which depart substantially from mid-market levels—typically by 3 per cent or more.¹²³ Caveat emptor is a more plausible defence for banks in this case, because the pricing is transparent and there are alternative retail foreign exchange services that exchange at mid-market rates, charging only a fixed fee.¹²⁴ PPI was more egregious because customers were often sold a service that they not only did not need, but for which there was little transparency on costs and no alternative providers with whom they could compare costs or quality.

A further example is the evolution of investor protection as the industry makes increasing use of data technologies, often with data accessed through open banking. Regulation of these new automated investment solutions poses challenges both old and new.

Investor protection has been supported by regulatory intervention of several kinds, including:¹²⁵ (i) limiting distribution, for example preventing risky or complex products such as hedge funds being open to retail investors; (ii) requirements on disclosure, for example the 'key investor information documents' (KIIDs) summarizing information on investment objectives, risks, costs, and historical performance that must be provided for all retail investment products in the EU, both Undertakings for the Collective Investment in Transferable Securities (UCITS) and other structured investment products; (iii) product intervention with specific rules and regulations on particular retail investment products, especially those with favourable tax treatment; and, (iv) further rules on the provision of investment advice.

¹²¹ Black and Nobles (n 120).

¹²² FCA, 'The Journey to the FCA' (October 2012) 13 <<https://www.fca.org.uk/publication/corporate/fsa-journey-to-the-fca.pdf>>.

¹²³ This 3 per cent figure is from <<https://moneytransfercomparison.com/faq>>, a useful and regularly updated review of retail foreign exchange services.

¹²⁴ For example Transferwise. Their website (visited in July 2023) indicates that their fees at just under £5 for the exchange of £1,000 into Euros, are very similar to equivalent fee charged by leading commercial banks, but at a mid-market exchange rate. Conducting this exchange with a typical commercial bank exchange rate of 4 per cent above the mid-market rate would impose an additional cost of around £40, an overall charge nearly nine times the cost of the exchange with Transferwise.

¹²⁵ Niamh Moloney, 'Regulating the retail markets' in Niamh Moloney, Eilis Ferran and Jennifer Payne (eds), *The Oxford Handbook of Financial Regulation* (Oxford University Press, Oxford 2015) 756–757.

A range of new challenges arise from the adoption of new technologies. These include in the use of comparison sites and potentially adverse consumer impact, for example behavioural pricing, based on how people search online, and a drive to pure price rather than price and quality-based decision making.¹²⁶ Further examples include the appropriateness of recommendations emerging from ‘robo-advisers’, which offer relatively low cost personal investment advice,¹²⁷ and investor protection concerns arising from the expansion of peer-to-peer (P2P) lending markets and other new forms of platform-based investment, especially in the US, UK, and in China.¹²⁸ In P2P lending platforms, investors participate directly in lending by acquiring a participatory ownership share in loans made to a diversified range of typically more than two hundred individual borrowers without recourse to bank or other loan intermediaries, with returns depending directly on loan performance.¹²⁹ This raises questions around whether retail investors are adequately informed and protected.¹³⁰

While not a solution to all of these problems, it is clear that data access technologies can help to address such concerns. First, as discussed above in relation to regulatory reporting, standardization of data and operational systems can allow greater standardization of mandated investment disclosures. An ideal would be demonstrating that the disclosures of Firm A or of Firm B yield the same disclosure metrics when applied to the same investment product (this product could be provided by one of the firms, A or B, or even a third firm, C). Only then are the metrics of different firms fully comparable.

Second, in terms of product regulation, data access technologies can play a key role; for example, in ensuring accurate mark-to-market valuations and preventing investment in illiquid assets. Questionable investment in illiquid assets was for example a key factor in the suspension, and substantial investor losses, of the Woodford Equity Income Fund following a period of high redemptions in 2019.¹³¹ If a third party cannot obtain the same mark-to-market valuations as those reported by an investment fund from a statement of its investment portfolio, then it is not invested in liquid assets. Therefore, sharing of data to allow third party valuation should be a standard part of the supervisory toolkit, providing an objective assessment of whether regulations that prohibit investment in illiquid financial assets are being fully observed.

Data technologies are also central to addressing new challenges in investor protection. Looking specifically at automated advice and wealth management, robo-advisers can provide both speed and lower cost investment services, matching customer preferences and products assessment (for example, saving plans and pension management). They collect information supplied by the customer, and operate through algorithms.¹³² The service is fast, and less costly than, and

¹²⁶ Amit Datta, Michael Carl Tschantz and Anupam Datta, ‘Automated Experiments on Ad Privacy Settings: A Tale of Opacity, Choice, and Discrimination’ (2015) 1 *Proceedings on Privacy Enhancing Technologies* 92.

¹²⁷ An example is Nutmeg <<https://www.nutmeg.com>>. For a commentary see Dan Tammas-Hastings, ‘WealthTech: The challenges facing the wealth management industry’ LSE Business Review (2017) <<https://blogs.lse.ac.uk/businessreview/2017/06/16/wealthtech-the-challenges-facing-the-wealth-management-industry/>>.

¹²⁸ Ding Chen, Anil Kavuri and Alistair Milne, ‘Growing Pains: The Changing Regulation of Alternative Lending Platforms’ in Raghu Rau, Robert Wardrop and Luigi Zingales (eds), *Handbook of Technological Finance* (Palgrave Macmillan, London 2021) 441–42. P2P, marketplace or loan-based crowdfunding is one of the many new technology-based types of investment platform. Others include donation-based, reward-based, and equity-based crowdfunding. For an overview see Ivo Jenik, Timothy Lyman and Alessandro Nava, ‘Crowdfunding and Financial Inclusion’ World Bank CGAP Working Paper (March 2017) 5 <<https://www.cgap.org/research/publication/crowdfunding-and-financial-inclusion>>.

¹²⁹ Rainer Lenz, ‘Peer-to-Peer Lending: Opportunities and Risks’ (2016) 7 *European Journal of Risk Regulation* 688, 689–90.

¹³⁰ Alistair Milne and Paul Parboteeah, ‘The Business Models and Economics of Peer-to-Peer Lending’ CEPS, ECRI Research Report No 17 (2016) <<https://www.ceps.eu/ceps-publications/business-models-and-economics-peer-peer-lending>>. Olena Havrylychuk, ‘Regulatory framework for the loan-based crowdfunding platforms’ OECD Economics Department Working Papers No 1513 (2018) 13 <<https://www.oecd-ilibrary.org/content/paper/24ad924a-en>>.

¹³¹ FCA, ‘Update on the LF Woodford Equity Income Fund’ (2020) <<https://www.fca.org.uk/news/news-stories/update-lf-woodford-equity-income-fund>>.

¹³² Caelainn Carney, ‘Robo-Advisers and the Suitability Requirement: How They Fit in the Regulatory Framework’ (2018) 2018(2) *Columbia Business Law Review* 586, 614–15.

potentially superior to, advice from human advisers, although it does not automatically protect customers from inappropriate advice which may result in undesired outcomes.¹³³

The key issue is obtaining independent assessment of the quality of this automated advice. The opportunity is for checking robo-advisory outcomes through a regulatory requirement on sharing of underlying granular data (subject to anonymization to ensure customer privacy). The concern is whether a particular firm's robo-advice differs substantially from those of others.¹³⁴ By running their different advisory solutions on a shared database, outcomes can be compared. While there must be a distribution of outcomes since algorithms will be different, substantial departures from the norm may be an indication that something is not right, inviting further scrutiny. This is not something that can so easily be achieved in terms of human investment advice.

The conclusion from all these examples (bias in the pricing of credit and insurance products, PPI mis-selling, and investor protection) is that just as in regulatory reporting, what is required is a broader dialogue than has to this point been usual between regulators and individual firms—and also between regulators and the industry as a whole—on using data technologies to develop appropriate systems and processes to achieve desired regulatory outcomes. These should provide the necessary information for management, consumer bodies, regulators, and other stakeholders to demonstrate that customers are indeed being treated fairly.

3. Prudential oversight: the Basel Accords and Solvency II

Prudential oversight provides a further example of using data technologies to achieve better regulatory outcomes. This subsection illustrates how this can be done through standardizing the capture of data and sharing it appropriately on a granular basis for risk calculations.

Technology has for some time been central to the monitoring of bank capital adequacy (for example, 'Pillar 1' of Basel II, and the strengthened post-crisis Basel III),¹³⁵ and for the capital adequacy of insurance firms under the Solvency II regime.¹³⁶ Under these regulatory regimes, firms have an opportunity to use their own internal models, which are often highly sophisticated, for the calculation of risk exposures.

In theory, the use of internal models to assess capital requirements provides a more accurate calculation of prudential risk than the fixed risk weights of the original 1988 Basel I accord, or the alternative standard calculations in subsequent accords. In practice, however, allowing the use of internal models has at times facilitated *reduced* recognition of risk exposure;¹³⁷ for example, through transferring securitized assets from banking book to trading book, with the modelling assumption that exposures could be easily and quickly sold, therefore allowing them to be supported by much lower levels of capital.¹³⁸ Many of the banks most heavily exposed to the materialization of risk in the global financial crisis used risk models in a mechanical way

¹³³ This is the case of robo-debt which poses challenges of predictability and consistency with statutory or common law requirements. See Monika Zalnieriute, Lyria Bennett Moses and George Williams, 'The Rule of Law and Automation of Government Decision-Making' (2019) 82 *Modern Law Review* 425, 446.

¹³⁴ Michal S Gal, 'Algorithmic Challenges to Autonomous Choice' (2018) 25 *Michigan Technology Law Review* 59, 71–72.

¹³⁵ Douglas W Arner, Janos Barberis and Ross P Buckley, 'FinTech, RegTech, and the Reconceptualization of Financial Regulation' (2017) 37 *Northwestern Journal of International Law & Business* 371, 396.

¹³⁶ Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II). The PRA's focus is to ensure that, under the Solvency II regime, EU policyholders have an appropriate degree of continuity of cover for the risks they are insured against.

¹³⁷ Deirdre K Mulligan and Kenneth A Bamberger, 'Saving Governance-by-Design' (2018) 106 *California Law Review* 697, 715.

¹³⁸ See for example, Zoltan Pozsar and others, 'Shadow Banking' Federal Reserve Bank of New York, Staff Report No 458 (2010) 18 <https://www.newyorkfed.org/research/staff_reports/sr458.html>.

to persuade themselves that their risk exposures were manageable.¹³⁹ Even now, with tighter post-crisis rules on internal risk modelling, there is a tension between the desire of firms to use models to lower regulatory capital requirements, and the desire of regulators to impose capital requirements sufficiently high to ensure prudential safety and contain moral hazard.¹⁴⁰

Before the 2008 crisis, both the Basel accords and Solvency II already recognized these potential conflicts of interest, and developed additional mechanisms intended to ensure that firms held adequate prudential capital: for example, the ‘Pillar 2’ of supervisory review, and the ‘Pillar 3’ of disclosure and market discipline.¹⁴¹ But these additional mechanisms proved ineffective in 2008; weakened by a lack of transparency, risk exposures proved to be opaque even to firms’ own senior management,¹⁴² let alone to the supervisors and external investors who are expected to impose these additional disciplines.¹⁴³

The development of new data technologies offers the opportunity, again through dialogue between regulators and industry, to address this opacity and to strengthen the complementary pillars of financial regulation. A central issue, just as in the automation of regulatory reporting, is standardization of the way data on financial contracts is captured and recorded. In principle, data and risk calculation are separable: risk models apply assumptions about the distribution of underlying risk factors and their relationship to contractual cash flows and market prices, in order to calculate distributions of outcome. With standardization of data on financial contracts, incorporating identifiers for all market instruments and counterparties, then it is possible to compute automatically the response of cash flows and accounting valuations to any assumptions about the distribution and materialization of risk factors.¹⁴⁴

This can in turn support a strengthening of all three ‘Pillars’ of prudential supervision: bank risk management can use a suite, or panoply of risk models to validate their own internal capital calculations (Pillar 1)—a specific example would be allowing a range of analyses of non-performing loans to satisfy not just the requirements of accounting reporting standards, but also appropriately conservative regulatory capital requirements and the firm’s own preferred internal risk assessments.¹⁴⁵

Supervisors meanwhile can impose their own assumptions about the materialization of risk factors to ascertain the impact on cash flows and the value of assets and liabilities (ie stress

¹³⁹ Alistair Milne, *The Fall of the House of Credit: What Went Wrong in Banking and what Can be Done to Repair the Damage?* (Cambridge University Press, Cambridge 2009) ch 8, for comparison of the performance of different banks in the crisis, documenting the particularly high risks taken by UBS, Merrill Lynch, and Lehman Brothers and the failure of their own internal risk systems to alert senior management to these exposures.

¹⁴⁰ Kern Alexander, *Principles of Banking Regulation* (Cambridge University Press, Cambridge 2019) ch 4 for discussion of these challenges.

¹⁴¹ For critical review of the three-pillars approach see Jean-Charles Rochet, ‘Rebalancing the Three Pillars of Basel II’ (2004) *Federal Reserve Bank of New York Economic Policy Review* (Sept) 7, reprinted in Jean-Charles Rochet, *Why are there so many banking crises? The politics and policy of bank regulation* (Princeton University Press, Princeton 2009).

¹⁴² The lack of information on risk exposures available to senior management is evidenced by 2011 Bank of England testimony to parliament, see Mervyn King, Paul Tucker and Andrew Bailey, ‘Uncorrected Oral Evidence Taken before the Joint Committee on the Draft Financial Services Bill’ (2011) <<http://www.parliament.uk/documents/joint-committees/Draft-Financial-Services-Bill/Ucjcdfsb031111ev11.pdf>>.

¹⁴³ For further discussion on Pillars 2 and 3 during and since the global crisis see Marco Bevilacqua and others, ‘The evolution of the Pillar 2 framework for banks: some thoughts after the financial crisis’ Bank of Italy Occasional Paper No 494 (2019) (on supervisory review), and Mark Flannery and Rob Bliss, ‘Market discipline in regulation: Pre-and post-crisis’ in Allen N Berger, Philip Molyneux and John OS Wilson (eds), *Oxford Handbook of Banking* (3rd edn, Oxford University Press, Oxford 2019) on market discipline.

¹⁴⁴ One practical schema for computing cash flows is the ACTUS standard, see Petros Kavassalis and others, ‘An innovative RegTech approach to financial risk monitoring and supervisory reporting’ (2017) 19 *Journal of Risk Finance* 39; Willi Franz Brammert and Allan I Mendelowitz, ‘From digital currencies to digital finance: the case for a smart financial contract standard’ (2018) 19 *Journal of Risk Finance* 76; and Wolfgang Breyman and others, ‘Large-scale data-driven financial risk assessment’ (2019) in Martin Braschler, Thilo Stadelmann and Kurt Stockinger (eds), *Applied Data Science* (Springer, London 2019) 387.

¹⁴⁵ David Bholat and others, ‘Nonperforming loans at the dawn of IFRS 9: regulatory and accounting treatment of asset quality’ (2018) 19 *Journal of Banking Regulation* 35.

testing), and obtain near real-time information on bank exposures (Pillar 2). Access to granular level data has been central to the effective development of stress testing in both the US and in the EU.¹⁴⁶

Similarly, investors, credit rating agencies, and other external agencies have an opportunity to apply their own risk assumptions to internal bank data for valuation of both debt and equity holdings (Pillar 3). Another specific example is that the data on structured credit products should be granular enough for any outsider to calculate the 'waterfalls' of default from equity through junior to senior tranches, and not solely need to rely on the type of oversimplified aggregated models used for assessing structured credit risk before the financial crisis.¹⁴⁷

The potential benefits go beyond such modelling and quantification of risk and capital requirements. Two examples can be given. First, the standardization of contractual data can help support the resolution of distressed financial firms, allowing asset portfolios to be valued and transferred, while also minimizing the legal uncertainties associated with the commingling of assets and the rehypothecation of collateral. Second, data standardization and access to granular data is an essential precursor to making further progress on the modelling and quantification of systemic financial risk. There has been an explosion of work on systemic risk providing conceptual insight and new modelling frameworks for risks emergent at the level of the financial system as a whole,¹⁴⁸ but the absence of granular data limits the potential for using these new methods to quantify such risks.¹⁴⁹

As a further illustration, it is useful to consider the challenges of mutualizing risk exposure in derivative markets through a central counterparty (CCP) guarantee required by post-crisis regulation. While such guarantees can help contain systemic risk, they also raise the concern that they may aggravate financial instability in an extreme crisis, with financial stress on a central counterparty itself becoming a source of magnified systemic liquidity and credit risk. New financial technologies, facilitating sharing of data and automated execution of CCP contractual obligations, could again help address such concerns.¹⁵⁰

4. Senior managers regime

The UK Banking Reform Act 2013 introduced the Senior Managers and Certification Regime (SMCR), replacing the pre-existing Approved Persons Regime. This now provides our final example on how data access technologies can support better regulatory outcomes.¹⁵¹ The UK legislator adopted a 'meta-regulation' approach, making the regulated entity responsible for identifying the most senior individuals in the firm, and clarifying their responsibility and accountability for specified senior management functions.¹⁵² The new regime sits within a wider outcomes-based regime: the senior management is subject to sanctions as prescribed by the

¹⁴⁶ Pavel S Kapinos, Oscar A Mitnik and Christopher Martin, 'Stress testing banks: whence and whither?' (2018) 5 *Journal of Financial Perspectives* 3; Justus Inhoffen and Iman van Lelyveld, 'Financial stability: New, detailed datasets allow for innovation of stress tests' (2020) 10 *DIW Weekly Report* 17.

¹⁴⁷ Ralph C Mayrell, 'Too Complex to Perceive? Drafting Cash Distribution Waterfalls Directly as Code to Reduce Complexity and Legal Risk in Structured Finance, Master Limited Partnership, and Private Equity Transactions' (2014) 34 *Pace Law Review* 349, who argues for the release of the underlying granular data and accompanying code used for computing waterfall payments as an alternative to prospectus requirements on structured credit products for professional investors.

¹⁴⁸ Walmir Silva, Herbert Kimura and Vinicius Amorim Sobreiro, 'An analysis of the literature on systemic financial risk: A survey' (2017) 28 *Journal of Financial Stability* 91, review the wide range of contributions.

¹⁴⁹ Robert M Heath and Evrim Bese Goksu, 'Financial Stability Analysis: What are the Data Needs?' IMF Working Paper No 17/153 (2017).

¹⁵⁰ Emiliios Avgouleas and Angelos Kiayias, 'The promise of blockchain technology for global securities and derivatives markets: the new financial ecosystem and the "holy grail" of systemic risk containment' (2019) 20 *European Business Organization Law Review* 81, 110.

¹⁵¹ FCA, 'Senior Managers and Certification Regime' <<https://www.fca.org.uk/firms/senior-managers-certification-regime>>.

¹⁵² Iain MacNeil, 'Regulating instead of punishing: the Senior Managers Regime in the UK' in Katalin Ligeti and Stanislaw Tosza (eds), *White Collar Crime. A Comparative Perspective* (Hart Publishing, Oxford–Portland 2019) 225.

Financial Services and Markets Act 2000 (FSMA), which empowers the Prudential Regulation Authority (PRA) and FCA to scrutinize and approve any person that performs a controlled function in an authorized firm, such as a bank.¹⁵³

The regime was intended to ‘encourage individuals to take greater responsibility for their actions, and . . . make it easier for both firms and regulators to hold individuals to account’.¹⁵⁴ The SMCR identifies fifteen ‘executive’ senior management functions, and a further six oversight functions.¹⁵⁵ Amongst these, the Chief Operations Function is responsible for the internal operations and technology of the firm, including data systems. Crucially, however, the regime does not clarify that those occupying senior management functions must have access to the data and information necessary for them to fulfil their roles.

Hickman is sceptical about the effectiveness of the SMCR in increasing individual responsibility, both because of inconsistent application and because there is no supporting regime of individual sanctions.¹⁵⁶ The regime can, however, be seen as helpful in ensuring that firms think through their systems of operational control in a consistent and comprehensive way.¹⁵⁷ It also provides an additional means through which supervisors can question and challenge individuals within firms, and investigate whether they are paying sufficient attention to regulatory objectives.¹⁵⁸

Making outcomes observable is an essential requirement for effective meta-regulation, both in terms of management implementation and imposing sanctions.¹⁵⁹ Data technologies can be used to support greater awareness of potential undesired outcomes, in turn strengthening the senior managers regime by removing the argument that failure to avert undesirable outcomes may be excused by a lack of knowledge of customer or market impacts, or of risk exposure that required management action.

A related issue, highlighted by the Basel Committee, is increasing concern over operational risks associated with new technologies.¹⁶⁰ There is a clear need to identify ‘the contributions and the limitations of technological solutions for senior management and for regulators, which would be important in ensuring that compliance achieves its public goals’.¹⁶¹ As Bamberger argues, institutionalization of technology in risk measurements can create a perception of

¹⁵³ FSMA 2000, s 59(1). The FSMA identifies two such groups of individuals: members of the governing bodies of financial firms (directors), and senior managers to whom significant functions have been delegated. The SMCR, which also applies to insurance firms, aims to hold senior managers accountable for their actions, although the individual responsibility requires observable outcomes to ensure compliance with principles. See Terry Allen, ‘Strengthening the link between seniority and accountability: the Senior Managers and Certification Regime’ Bank of England Quarterly Bulletin Q3 (2018) 5.

¹⁵⁴ PRA and FCA, ‘Strengthening accountability in banking: a new regulatory framework for individuals’ Consultation Paper (July 2014) 5 <<https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2014/cp1414.pdf>>.

¹⁵⁵ BoE and PRA, ‘Strengthening individual accountability in banking’ Supervisory Statement SS28/15 (December 2021) <<https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2021/ss2815-december-2021.pdf>>.

¹⁵⁶ Eleanore Hickman, ‘Is the Senior Managers and Certification Regime changing banking for good?’ (2022) 85 *Modern Law Review* 1440, 1458–60.

¹⁵⁷ Liezl de Villiers Getz, ‘Connecting Senior Managers and Certification Regime requirements with operational risk’ (2020) 12 *Journal of Securities Operations & Custody* 207.

¹⁵⁸ BoE and PRA, ‘Evaluation of the Senior Managers and Certification Regime’ Report (December 2020) 8 <<https://www.bankofengland.co.uk/prudential-regulation/publication/2020/evaluation-of-the-senior-managers-and-certification-regime>>.

¹⁵⁹ Julia Black, ‘The Development of Risk Based Regulation in Financial Services: Canada, the UK and Australia’ Research Report (2004) 30 <<https://www.lse.ac.uk/law/people/academic-staff/julia-black/Documents/black19.pdf>>.

¹⁶⁰ Basel Committee on Banking Supervision, ‘Revisions to the principles for the sound management of operational risk’ Consultative Document (August 2020) 16–17 <<https://www.bis.org/bcbs/publ/d508.pdf>>.

¹⁶¹ James A Fanto, ‘The Professionalization of Compliance: Its Progress, Impediments and Outcomes’ Brooklyn Law School, Legal Studies Paper, No 651 (2020) 59–60 <<https://ssrn.com/abstract=3678677>>.

accuracy and reliability, while at the same time masking uncertainties associated with employing sophisticated predictive methodologies.¹⁶²

Again, data access technologies can help to address such concerns. Board members, investors, and regulators alike should be able to ask any individual holding a senior management responsibility to respond quickly and easily to requests for detailed analysis of the risks and uncertainties resulting from portfolio and trading decisions.

V. CONCLUSIONS

The prudential and financial stability risks highlighted by the global financial crisis, together with many episodes of misconduct, have led to a dramatic expansion in the regulation of financial services in the post-crisis era. This at times piecemeal response has resulted in an extensive, but also often incoherent framework of rules and principles.¹⁵³ One consequence is high costs, including both accumulated fines on financial institutions and costs of ongoing compliance; costs that fall ultimately on customers and investors. Alongside this, there has been a continued failure to satisfactorily achieve regulatory objectives.

There is nowadays an expanding 'regtech' and 'suptech' industry that seeks to automate compliance and reduce its costs.¹⁶⁴ However this does not address a fundamental critique that a naïve reliance on technology, without proper acknowledgement and management of its shortcomings, is itself a source of regulatory risk.¹⁶⁵

This article has explored the opportunity for deploying data access technologies to embed regulatory objectives within the management information and decision-making processes of financial firms. This is presented as a development of the 'new governance' techniques of financial regulation, so as to improve the management of business and regulatory risks. The potential benefits are more than just automated compliance; they are an opportunity to bridge the myriad gaps in data and information (amongst firms, between firms and their clients, and between the industry and the regulatory authorities) that has limited the ability of regulation to achieve its desired outcomes.

These opportunities are illustrated in four specific applications of the use of these technologies: in regulatory reporting; treating the customer fairly; prudential oversight; and the UK senior managers regime. Across these illustrative application areas, the central challenge is establishing an appropriate governance of data, to increase transparency and ensure the achievement of *both* regulatory and business objectives. As is already happening in the case of regulatory reporting, this requires regulators and industry to engage in substantial ongoing dialogue about access to data held within firms by investors, customers, and supervisors.

While the potential gains are large, fully exploiting this opportunity requires substantial and coordinated cross-industry investment in agreed standards and supporting systems. This co-operative endeavour has to be aligned with the business objectives of firms and their strategic decisions on digital technology adoption. This is a particular challenge in financial services, where investments have conventionally been determined on the narrow criteria of investment return to the individual institution.

The discussion presented here is far from exhaustive. The four illustrative applications explored in section IV are preliminary examinations of particular areas of financial regulation.

¹⁶² Kenneth A Bamberger, 'Technologies of Compliance: Risk and Regulation in a Digital Age' (2010) 88 *Texas Law Review* 675.

¹⁶³ John Armour, 'Current state of the fintech industry and its challenges' (February 2017) <<https://oxfordfls.org>>.

¹⁶⁴ Arner and others (n 135). See also Financial Stability Board, 'The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions. Market developments and financial stability implications' (9 October 2020) 28–29 <<https://www.fsb.org/wp-content/uploads/P091020.pdf>>.

¹⁶⁵ Bamberger (n 162).

There is room for a great deal more analysis of the opportunities and practical challenges to improved meta-regulation using data access technologies. A central issue, that needs further investigation, is the incentive for regulated firms to co-operate on industry-wide change to support improved data access, which will include the cost of replacing or upgrading the myriad legacy systems that have been inherited from past mergers and acquisitions. The costs and benefits may not immediately stack up for firms, particularly over the relatively short-term horizon that often governs decision making in publicly listed firms.

There are other related issues that go beyond the remit of financial regulation and impact on many other business and public services. One is the interaction of data access technologies with the challenges of data security and privacy, and the need for effective digital identity solutions. Further analysis is also merited of the implications of data access technologies for the organization and structure of regulation. In particular, this includes the extent to which enhanced transparency based on data access can reduce the transaction costs that have shaped current approaches, and hence justify alternative approaches.¹⁶⁶ Here there is a parallel with the argument made by Grabosky about technology and pluralistic regulation. He points out how technological developments, specifically the emergence of the internet and widespread access to social media, have enhanced the potential for independent third party monitoring of regulatory outcomes, and for the voicing of the concerns of individual citizens and the engagement of social movements in the regulatory process.¹⁶⁷ Data access technologies are similarly a technological enhancement that could substantially improve the effectiveness of meta-regulation of systems and processes in achieving desired regulatory outcomes.

The following can be offered by way of a final conclusion. While data access technologies create substantial opportunities for achieving better outcomes for investors, customers, and regulators, this is no simple technological fix; it requires a fundamental shift in the relationship between regulators and firms. Regulators will need to move beyond their established mandates for establishing rules and principles, by setting expectations for firms' systems and processes. They will need to go further still, by becoming involved in co-ordinating cross-industry developments in data access technologies, and ensuring full discussion and exploration of their adoption into the systems and processes of firms.

The required dialogue goes well beyond existing meta-regulation. It therefore represents a substantial further development of the 'new governance' techniques: a partnership in which regulators and industry co-operate on data technology developments and adoption. There will undoubtedly be limits to such co-operation in circumstances where the interests of regulators and firms are too divergent for agreement on data access and sharing to be made on a voluntary basis alone. The substantial compliance costs of financial regulation, with limited impact on prudential risk and customer outcomes, do however suggest that new approaches based on the emerging technologies of data access can offer considerable benefits to both financial firms and their regulators.

¹⁶⁶ Yang and Tsang (n 78) section IV, discussing transactions costs and the organization of financial regulation and how these may be changed by fintech and regtech.

¹⁶⁷ Grabosky (n 29) 155: 'The third general trend may be seen in the growth and diffusion of technology that has significantly increased the regulatory capacity of non-state actors, no less than of governments.'