FSB FINANCIAL STABILITY BOARD

Framework for Post-Implementation Evaluation of the Effects of the G20 Financial Regulatory Reforms

Technical Appendix

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Technical Appendix

Framework for Post-Implementation Evaluation of the Effects of the G20 Financial Regulatory Reforms

1.   Introduction to Technical Appendix

This technical appendix complements the Framework for Post-Implementation Evaluation of the Effects of the G20 Financial Regulatory Reforms ("the framework"). It is not meant to be prescriptive, but to provide more detailed information on technical aspects related to policy evaluations to aid experts involved in conducting the analysis. It has three main sections:

1. Models and methods
2. Scoring of tools
3. Literature review of methods and tools on the effects of reforms

The first section provides a more technical description of the tools reviewed in section 5 of the framework. The second section builds on the previous section to provide some guidance as to what tools could be useful under what circumstances for a given policy evaluation. Finally, the third section reviews recent studies on the effects of reforms to identify frequently employed analytical methods, including the limitations of the existing literature on evaluations, and specific challenges that pertain to certain types of analyses.

2.   Models and methods

This section describes in detail the tools reviewed in section 5 of the framework. This section is intended to accompany Table 1 and the Appendix Table 1 (page 12 of this document). It is not intended to provide an exhaustive characterisation of possible methods but rather an overview of typical approaches.

2.1   Qualitative analyses

Qualitative analyses are of three types: *peer reviews*; *assessments of compliance* of international standards; and *surveys* of financial institutions and market participants as well as of financial and other authorities involved in or affected by the reform(s) in question.

2.1.1   Peer reviews

Peer reviews are undertaken by the FSB and standard-setting bodies (SSBs) to evaluate the implementation of international financial standards and policies. These reviews do not aim to comprehensively analyse a jurisdiction's financial system structure or policies; do not assign grades, but rather qualitatively report on the progress made and recommend improvements and follow-up actions (where appropriate) in the areas of focus; and are mostly a desktop exercise. The basic input for most peer reviews is a questionnaire, completed by the reviewed jurisdiction(s), and in some cases, by financial institutions and other market participants, and then examined by the peer review team, followed by dialogue between the team and the relevant authorities from the jurisdiction(s).

Taking the case of the FSB as an example, there are two types of peer reviews: thematic reviews and country reviews.[1] *Thematic* reviews focus on the implementation and effectiveness across the FSB membership of international financial standards developed by SSBs and policies agreed within the FSB in a particular area deemed important for global financial stability. These reviews may also analyse other areas important for global financial stability where international standards or policies do not yet exist. The objectives of the reviews are to encourage full, timely and consistent cross-country and cross-sector implementation; to evaluate (where possible) the extent to which standards and policies have had their intended results; and to identify gaps and weaknesses in reviewed areas and to make recommendations for potential follow-up (including via the development of new standards) by FSB members.

Country reviews focus on the implementation and effectiveness of regulatory, supervisory or other financial sector policies in a specific FSB member jurisdiction. They examine the steps taken or planned by national/regional authorities to address the International Monetary Fund (IMF) Financial Sector Assessment Program (FSAP) and Reports on the Observance of Standards and Codes (ROSCs) recommendations on financial regulation and supervision as well as on institutional and market infrastructure that are deemed most important and relevant to the FSB's core mandate of promoting financial stability. Country reviews can also focus on regulatory, supervisory or other financial sector policy issues not covered in the FSAP that are timely and topical for the jurisdiction itself and for the broader FSB membership. Unlike the FSAP, a country review does not comprehensively analyse a jurisdiction's financial system structure or policies, nor does it provide an assessment of its conjunctural vulnerabilities or its compliance with international financial standards.

2.1.2   *Assessments of compliance*

The IMF and the World Bank established the Standards & Codes Initiative in 1999 to strengthen the international financial architecture through the development, dissemination, adoption and implementation of international standards and codes.[2] The IMF and World Bank have recognised international standards in 12 policy areas related to their work, and for which Reports on the Observance of Standards and Codes (ROSCs) are prepared. Those standards are assessed on a voluntary basis as part of FSAP assessments or as stand-alone Reports on the Observance of Standards and Codes (ROSCs). The assessments are based on an approved assessment methodology issued by the relevant SSB and include compliance grades.

In addition, some SSBs undertake their own compliance assessments to evaluate the timeliness, consistency and completeness of implementation of their standards. They include jurisdictional and thematic assessments of Basel III by the Basel Committee on Banking Supervision under the Regulatory Consistency Assessment Programme;[3] Level 1/2/3 assessments of the

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[1]   See the *Handbook for FSB Peer Reviews* (http://www.fsb.org/2017/04/handbook-for-fsb-peer-reviews-2/). For IOSCO peer reviews, see https://www.iosco.org/about/?subsection=display_committee&cmtid=19.

[2]   See http://www.imf.org/external/standards/index.htm and http://www.worldbank.org/en/programs/rosc.

[3]   See http://www.bis.org/bcbs/implementation.htm.

implementation of the Principles for Financial Market Infrastructures by CPMI-IOSCO;[4] and self-assessment and peer reviews of the Insurance Core Principles by the IAIS.[5]

2.1.3 Surveys

Surveys, generally sent to financial services and market participants (in contrast to the peer reviews that are conducted among FSB members), seek the views of a range of stakeholders in a number of areas. Given their bottom-up nature, survey-based qualitative analyses can complement methods that use macro- and sectoral level aggregates, and can identify specific areas of benefits and/or costs that require further evaluation. Qualitative analyses, including surveys, can provide input to quantitative methods, especially when data quality and availability are poor, and can incorporate insightful, forward-looking views of market participants as well as enabling anecdotal evidence, including on potential interactions and intended/unintended effects. Given their qualitative nature, however, information obtained through surveys typically cannot directly be used to measure the attainment (or not) of the specific and broad objectives, or the benefits and costs of reforms. Some qualitative inputs, especially those from structured surveys that restrict responses to a limited number of pre-identified options, however, can be transformed to numerical data. They may (supplemented by quantitative approaches and when conducted on a regular, ongoing basis) facilitate assessments pertaining to the achievement of specific and/or broad objectives, and sometimes for more comprehensive benefits-costs assessment. Some findings may need to be treated with caution, particularly if there are potential biases or low responses rates. The value of surveys could be enhanced if they were conducted on an ongoing basis.

2.2   Indicators and descriptive statistics

Indicators and descriptive statistics are often used in monitoring exercises such as financial stability reports and other internal and external exercises to monitor the soundness and potential build-up of idiosyncratic, sector-specific and systemic risk. Balance sheet-based metrics and market-based indicators measures[6] can point to impaired market functioning and imperfect risk transfers. Qualitative information may also be collected, e.g. on financial innovations and instances of market fragmentation or regulatory arbitrage that may be an unintended consequence of the reforms.

Indicators are useful for evaluation purposes, given their ease of use compared to other methods. They can be used to assess implementation progress against narrow reform objectives (e.g., changes in bank leverage or liquidity monitoring as done for instance in Basel III monitoring reports) and thus serve as intermediate indicators of impacts, especially if sufficient time series or cross-section data are available. Asset prices or other asset market measures can, besides being used as intermediate indicators, also be vulnerability indicators, including by being combined into composite indicators. With sufficient cross-section or time series data, such indicators can inform on broader or ultimate objectives of reforms, such as financial resilience

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[4]   See http://www.bis.org/cpmi/info_mios.htm.

[5]   See https://www.iaisweb.org/page/supervisory-material/implementation-and-capacity-building/assessments.

[6]   Such measures include leverage; maturity, liquidity and currency mismatches; concentration, common and opaque exposures; and asset prices and other market measures (such as price-to-book ratios, loan-to-value measures, and CDS spreads)

or reduced systemic risk. Related, much work is underway to model risk scenarios and stress tests of individual or groups of financial institutions. This work seeks to identify and assess the effects of trigger events, vulnerabilities, and transmission channels (including financial-real linkages and other feedback effects) on broader financial stability. While these models do not directly estimate the impact of reforms (on resilience or other measures of financial stability) and also generally lack sufficiently long time-series data, they can provide inputs to simulate impacts of reforms.

2.3 Partial equilibrium type analyses

Partial equilibrium analyses are of two types, *theoretical* or *empirical*.

2.3.1 Theoretical

Theoretical models can help to identify and evaluate the effects of financial reforms. For one, modelling can help to identify the channels and potential impacts of regulation on financial intermediation, taking into account the roles of financial intermediation and the associated benefits, as well as the possible costs and vulnerabilities that can arise in the intermediation process.[7] Second, modelling can clarify which types of outcomes or transmission channels empirical analyses might want to focus on. They may, for example, provide hypotheses as to how a reform might affect what type of specific behaviour of financial institutions or agents.

Many different modelling frameworks exist that try to address specific question or focus on specific market failures. While models are a simplification of the real world and can thus at best provide partial answers, they can provide a tractable way for examining the effects of heterogeneity of agents.

Even though models have typically focused on individual financial institutions and agents, recent macroeconomic models have aimed at capturing the general equilibrium quantitative effects of financial intermediation by modelling the interactions among financial institutions and agents as well as relevant prices. This class of models (outlined below) is trying to proxy the full economy, instead of modelling a certain financial institution or agent – but are more complex than the latter approach.

2.3.2 Empirical

There are multiple research designs and econometric approaches that can be used to address multiple empirical challenges. Choices are often dictated by the reform being analysed and its setting—including the ability to conduct randomised trials, the presence of quasi- or natural experiments, or the need to rely on observational studies—and the availability of data and resources.

As such, when choosing a specific empirical strategy, a number of situations exist:

- Cases where *market asset prices* data are available and where the setting allows for the use of changes in asset prices to *proxy* the (perceived) impact of the reform.

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[7] Financial intermediation arises because of various financial frictions, including missing markets, information asymmetries, enforcement difficulties, and principal agency issues (such as moral hazard and adverse selection) as well as externalities related to market failures.

- Cases where *micro-data* are available and can be used (e.g. on banks, or corporations) vs. those where *no micro-data* are available and the reform must be evaluated at an aggregate (e.g. jurisdiction) level.

- Cases where *micro-data* are available and where either a *control group* is available vs. where *no control group* is available (e.g. when all agents in a market are subject to the reform and no similar non-affected group of agents exists that could serve as control group). The specific methods that are useful for the estimation of treatment effects differ between these two groups.

This distinction is by no means exclusive and multiple methods can and often should be used to obtain robust inference regarding the impact of a financial reform.

Event studies (market reactions)

Event studies measure the short-term impact of an event as perceived by financial markets on the value of the securities of a firm, industry, or sovereign, or on other asset prices. Event studies can be used to study the effects of regulatory reforms upon adoption or announcement. Under some conditions, they provide a fairly robust way of obtaining metrics for the specific benefits and impacts of reforms (e.g., their impact on the perceived risk of insolvency via changes in CDS value or on the cost of financing via bonds' spreads). The assumption is that around a (sufficiently short) event window, there are no other elements apart from the reform to affect the value of the variable of interest, allowing for a causal relationship between the reform event and the change in the valuation of the variable of interest. The effect measured is, of course, that perceived by financial markets. To interpret the effect as an efficient and unbiased estimate of the true impact of the regulation on the present value of assets requires the method to assume that financial markets incorporate correctly the expected future effects into the current asset prices analysed, and that financial markets price all securities correctly all the time, neither of which are assured. Also, like other studies, event studies have the limitation that it may take a considerable amount of time for the effect of the reforms to be realised. Event studies, due to their measurement of market reactions, are not as useful to study longer-term impacts of a particular regulation.

Quasi-experimental designs

Difference-in-difference tests

A true randomized trial experiment, often used in clinical trials of medicine (and sometimes in development economics), where the treatment is applied in a random fashion to otherwise identical units, is often seen as the "gold standard" of causal inference. Randomisation of treatment allows one to make credible inference of its effects on the basis of simple sample statistics for the treated and the non-treated units as it assures that there are no systematic other factors driving the difference in the outcome between treated units and not-treated units. Randomized trials are typically difficult and costly to conduct, however, even more so if one wants to allow for heterogeneous effects of the treatment (which requires larger samples). The more important constraint in economics is that many policies, such as most types of financial regulatory reforms, do not lend themselves to randomisation.

In the most likely event that a randomized trial is not available, some research strategies using real-world datasets with limited observation sizes can come close to replicating a true randomized experiment in terms of evaluating a regulatory reform. In such a quasi- or natural

experiment, agents that are treated due to a shock or change in policy are not randomly assigned but can sometimes be plausibly seen as-if randomly assigned. The key to those experiments is that the shock is exogenous to the agents and variables of interest and that differences can be expected between how various groups of agents are affected by the shock or policy change. Quasi- or natural experiments are hard to come by, also as there are often concurrent developments that confound inferences, but have been used to evaluate the impact of certain policy reforms, in what has become known as difference-in-difference (DiD) tests.

DiD can be used to estimate the effect of a reform by comparing two groups for two time periods. One of the groups—the treated—is exposed to the reform in the second period but not in the first period. The second group—the control— is not exposed (or less exposed) to the reform during either period. To calculate the effect of the reform, the average change in the control group is subtracted from the average change in the treatment group. This removes biases in second period comparisons between the treatment and control group that could be the result from permanent (time-invariant) differences between those groups, as well as biases from comparisons over time in the treatment group that could be the result of trends.

Consider the following example. Assume a new regulation was adopted that requires foreign banks to increase their capital but not domestic banks. If both foreign and domestic banks were providing credit to non-financial corporations in sufficiently similar ways before the regulation, it may be sufficient to compare the post-implementation lending of domestic banks and foreign banks to infer a usable estimate of the regulation's effect. If instead, the two groups already differed in their lending behaviour before the regulation then one has to adopt a different approach. One option is the DiD approach. Instead of comparing only the post-implementation lending, the DiD approach compares the change in lending between the two groups. As outlined in the previous paragraph, the use of the change in lending removes time-invariant determinants of lending behaviour between the two groups. For the approach to work, it must, however, hold that (1) the regulation, were it applied to the non-treated banks, would have the same effect than it has for the treated banks, and that (2) there are no unobserved and un-modelled time-varying differences in the two groups that drive their lending behaviour. Note that bias may be introduced if the regulation indirectly affects the non-treated group.

Regression discontinuity design

Regression discontinuity designs (RDD) exploit thresholds in laws and institutions (such as the asset size of a bank to which a particular regulation applies). In this example, the RDD would analyse banks that are just above or just below such a threshold. Banks above the threshold that need to comply with more extensive regulations are regarded as the treatment group whereas banks just below the threshold are regarded as the control group.

The design is based on the assumption that the banks above and below the threshold were very similar to begin-with and therefore the division into treatment and control group is as-if random, The analysis tests whether the banks behave significantly differently from one another after the introduction of the reform.

A different approach to measure changes over time is provided by methods for break-point testing. Break-point testing can be used to detect structural breaks in time series data which can then be related to regulatory reforms (e.g., changes in market liquidity). Various such econometric techniques exist. These methods can potentially be expanded by structural time

series analyses on split samples to study how the regulatory reform has effected the functioning of the system under consideration.

Regressions techniques

When suitable randomised trials and quasi- or natural experiments allowing for DiD are not available, one may still be able to test for the effect(s) of (regulatory) changes and provide for causal interpretations in some circumstances by using smart sample selection and choice of econometric methods. However, it will be more challenging to establish causality. Bias can stem from three sources:

1.   there can be omitted variables – factors other than the reform driving the outcomes which are not properly controlled for;

2.   there can be simultaneity – cause and effect being reversed, as when reforms respond to financial developments; and

3.   there can be endogeneity – behavioural responses that confound the true relationships between reforms and outcomes.

Econometric techniques, including regressions, can be used to address some of these issues, but often only partly.[8] These techniques include sophisticated approaches that allow for correction of the selection into treatment (e.g. regression discontinuity design). While these have their limitations (e.g. they can require that the treatment effects have no market-wide, equilibrium effects, which make it less well suited for analysing aggregate outcomes and better to evaluate the behaviour of individual agents). To address these issues, there is also a wide variety of econometric techniques, with considerable overlap among groups and classifications of econometric techniques. (Note that DiD tests and RDDs can be seen as a type of regressions, so some of the issues raised here also apply to DiD).

Important are cross-section and panel regressions, which can be used in many ways and for many purposes, including for cross-country tests, and these can also vary as to their use of instrumental variables and co-variates to try to control for endogeneity. In any case, there are many (statistical and other) assumptions that need to apply for a particular technique to be validly used. As such, one cannot easily generalise on the applicability and usefulness of a specific econometric techniques. Nevertheless, and especially with granular micro data, analyses are very doable in principle.

Given the wide availability of high-quality micro data in many countries, relying on established techniques in financial and economic research, and the practice of evaluation in other areas of policymaking, researchers have been able to evaluate financial regulation policy in many countries. Furthermore, a large experience with financial econometrics that takes into account the special characteristics of financial data and allows for specific tests, including for example of cointegration relationships among financial and economic variables, can be marshalled for analyses. While there are some incremental costs to the more intense use of micro-data (in terms of processing and training of staff for example), incremental costs for evaluation purposes are

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[8]   For a textbook treatment, see Woolridge, 2010, Econometric Analysis of Cross Section and Panel Data, 2nd Edition.

often small since much of the data collection has been going on for a longer time period in many countries.

Other techniques

Network analysis is a method used to shed light on interconnectedness and systemic interlinkages. A defining feature of network models is that they use *direct* (e.g. pairwise) relationships between institutions, sectors and jurisdictions as an input in computing measures of interconnectedness. Linkages within networks can lead to contagion, when shocks are not only spread through the financial system, but are amplified through these interlinkages rather than mitigated, especially in times of crisis. In the context of reform evaluation, network models may be used to study "systemic importance" (such as the contribution of specific institutions to systemic risk) and "shock propagation" (i.e. measuring the properties of financial networks with respect to sharing and propagation of risk). There are two distinct approaches to study interconnectedness. The "classical" (*direct)* approach is to simulate potential domino effects from the failure of one entity within a "physical network" based on direct financial linkages/exposures. More recent approaches using network-based econometric models or other non-network approaches take an *indirect approach*, looking at correlation networks.[9] The approaches and methods also differ in terms of their output, which characterise the state of networks in various ways, using network characterisation metrics (e.g. proximity metrics, centrality, etc.), as well as metrics on the fragility of the network, based on simulation results (number of failures etc.) or analytical approaches (shock absorption ratios, co-movement coefficients and distress probabilities).

Another technique, *break-point testing*, can be used to detect structural breaks in time series data which can then be related to regulatory reforms (e.g., changes in market liquidity). Various such econometric techniques exist. These methods can potentially be expanded by structural time series analyses on split samples to study how the regulatory reform has effected the functioning of the system under consideration.

2.4   General equilibrium type analyses

2.4.1   Theoretical, calibrated

General equilibrium models, such as *Dynamic Stochastic General Equilibrium (DSGE) models* are models of the overall economy that incorporate feedback effects between different markets, as prices and rates of return adjust. Frequently, they are derived from (intertemporal) optimising behaviour of agents whose own behaviour and interactions in markets are analysed. As such, they are, in principle well suited towards an overall assessment of the causal effects of a particular policy or a counterfactual set of conditions. Notably such models can provide quantitative aggregate analyses, often in a dynamic setup, and can be used to evaluate the possible (general equilibrium) effects of a specific financial reform, including the net overall social benefits. For example, they have been used to evaluate the overall effects and benefits of

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[9] For an overview of network models see ECB (2010), Summer (2013), Kara et al (2015) and Neveu (2016), for example.

regulatory changes (as in the earlier MAG reports[10] which evaluated how changes in capital and liquidity ratios transmit to economic activity through banks' adjustments to meet the higher target ratios, and how the responses from banks feed through into aggregate economic activity and the risk of financial crises).

Such models can, in principle, capture the effects of future reforms on agents' current and future actions, encompass the joint effects of various reforms on one or more financial sectors, aggregate effects within a sector or across sectors of a given or multiple reforms, and allow for the possibility that agents adapt, as incentives change and interactions occur. Moreover, they can and frequently do include financial and real feedback effects (e.g. through changes in interest rates, required rates of return, and macro-financial linkages to and from the real economy) and market failures or externalities.

That said, general equilibrium models that consider such feedback effects, have the correct initial conditions, feature the relevant trade-offs, and thus allow for proper counterfactuals and welfare analyses, can be difficult to design and build. The micro-foundation of financial intermediation in these models is often simplified and they provide fewer implications of policy transmissions through a specific channel. As such, many of these models may still fail to capture some of the many (general equilibrium) effects. With imperfect theories and limited knowledge on parameters for calibration, results of general equilibrium models can lack robustness, and possibly emphasise too much private costs. Nevertheless, and especially as research advances, general equilibrium analyses offer a more comprehensive way of answering questions about policy counterfactuals at an aggregate level.

2.4.2 *Empirical: Structural Time Series Models*

Empirical methods can be very useful at identifying a particular causal effect. However, the need for clean identification – overcoming problems of endogeneity, reverse causality – often means that the effect identified is partial or differential (say, between two groups of firms). An overall assessment of the total causal effects of a particular policy on the economy as a whole is usually much more difficult to achieve in a compelling way with empirical methods alone. That said, there is a set of models – *structural time series models* – that can be applied to assess the broader effects of reforms.

The most common ones are Vector Auto Regression models (VARs). A VAR is an econometric model used to capture the linear interdependencies among multiple time series. In its basic form, VARs allow for all the variables to enter the model in similar ways: each variable (e.g. GDP or credit) is explained with its own lags and the lags of the other model variables.

To study the effects of a (surprise) financial reform in a VAR requires so-called structural identification. This can involve using dummy indicators for the activation of policies, or directional indicators reflecting tightening and loosening of policies. These approaches are akin to structural time-series models often used to analyse the effects of monetary policy. Impulse

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[10] Macroeconomic Assessment Group (MAG) (2010), "Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements", Final Report; Macroeconomic Assessment Group (MAG) (2011), "Assessment of the macroeconomic impact of higher loss absorbency for global systemically important banks", FSB-BCBS.; Macroeconomic Assessment Group on Derivatives (MAGD) (2013), "Macroeconomic Assessment Group of OTC derivatives regulatory reforms".

response analysis can then be used to study how variables react to such shocks as the unanticipated adjustment of a policy instrument over time. Structural identification is critical yet demanding, however, and requires assumptions that allow a distinction between different shocks (e.g. unexpected supply or demand shocks) that are potentially relevant for the variables of interest. Assumptions may come from theory or from other empirical analyses, but are not directly amenable to statistical testing.

The VAR methodology also provides historical decompositions that can provide insights into the relative importance of different shocks (among which financial reforms) in shaping the behaviour of variables. In addition, counterfactual exercises on different paths of structural shocks and reforms can be performed. VARs can be used to assess reforms provided there is sufficient, quantifiable time-series variation. For example, to properly assess the impact of prudential policy instruments such as the countercyclical capital buffer could require some 20 years of quarterly data. The method is then better suited for short- and medium-term costs of financial reforms with more frequent data (e.g. daily or weekly data) but of less use for the estimation of long-term effects (e.g. in terms of probability and severity of financial crises).

The transmission of policies to disaggregate variables, e.g. individual banks or firms, can be studied in larger models based on the VAR methodology. These larger models, however, are typically over-parameterised so that some restrictions on the dynamic interdependency across units need to be placed. In Panel VARs (PVARs) the problem of proliferating parameters is typically solved by imposing some degree of shrinkage on the parameters or by assuming that the parameters have a factor structure. In Global VARs (GVARs) and in Factor Augmented VARs (FAVARs), on the other hand, it is assumed that the variables have a factor structure and that the variables within each unit are driven by lower dimensional unobserved factors that can be estimated through suitable linear combinations of the observed data.

3. Scoring of tools

This section provides additional detailed information on "choosing a set of tools" in the framework (section 5, page 11).

Depending on the type of policy evaluation and reform, one can look at the available models described in the previous section and then seek to be more precise as to what tools and methods could be more appropriate than others. The Appendix Table 1 (below), which builds on Table 1, outlines for each of the four categories of tools their general strengths in addressing the three questions/challenges (Box 1 of the framework):

1. Attribution: Did the reform "cause" an outcome?
2. Heterogeneity: Did the reform have similar effects across markets, states of the world, or jurisdictions and regions?
3. Aggregation/general equilibrium: Did the reform achieve its overall objective?

It thus provides a structure that will help guide under what circumstances specific tools are apt to be most useful for a given policy evaluation. This section offers guidance for each category of tools.

3.1　Qualitative analysis

As Appendix Table 1 shows, qualitative analysis may be useful to consider for implementation monitoring and in evaluating specific objectives, as it can to some degree address issues of attribution and heterogeneity. It can also be a complement in assessing unintended consequences and overall effects of reforms, but may then not address attribution, and in some cases, heterogeneity, well. Qualitative analyses can often also complement quantitative methods, especially when those are constrained by data availability, and because they can incorporate insightful, forward-looking views of market participants. Qualitative analyses such as surveys may help identify specific areas of benefits or costs that require further evaluation of post-crisis financial reforms, including because of interactions and intended/unintended side effects.

3.2　Indicators and descriptive statistics

These tools may be used to assess progress against specific reform objectives (e.g. changes in bank capital or liquidity) and thus serve as intermediate indicators of impacts, especially if sufficient time series or cross-sectional data are available. As Appendix Table 1 illustrates, indicators are more challenged in addressing issues of attribution and heterogeneity, and as such less useful for the second and third types (interaction and coherence, and overall effects of reforms) of policy evaluations. With a sufficient time-series or cross-section span, indicators could also help assess broader objectives, though more naturally, such statistics would be used in conjunction with other, such as partial and general equilibrium, methods since they typically cannot claim to have identified causal relationships and data series are too short (for example, increased financial resilience can best be assessed over a longer period of time that includes a full financial cycle and both stressed and normal market conditions). However, when using qualitative methods, the interests of respondents and objectiveness of the information source should be taken into consideration.

3.3　Partial equilibrium analyses

Theoretical partial equilibrium models can generally clarify the mechanisms and effects of financial intermediation and its associated benefits, as well as identify possible costs and vulnerabilities that can arise in the process. They can also identify possibly relevant outcomes and discover potential (unintended) consequences, thereby guiding empirical analyses. But, as is the case for theoretical concepts, they rely on assumptions and are thus unlikely to directly provide a sense of the magnitude of potential impacts of reforms.

Empirical models may be used to tackle, to various degrees, problems of attribution and heterogeneity. Appendix Table 1 lists three particular types of empirical analyses: event studies, quasi-experimental, regression techniques and, other techniques. Model choices are often dictated by research designs—including the ability to conduct randomised trials, the presence of quasi- or natural experiments, or the need to rely on observational studies—and the availability of resources and data. While one cannot easily generalise on the applicability and usefulness of a specific technique, all three types can be useful in assessing specific objectives, to shed light on attribution and heterogeneity, and, to varying degrees, address the interactions among reforms. But all are less helpful, at least from a conceptual perspective (to allow for endogenous settings), in evaluating the broader objectives and the overall effects of reforms.

3.4   General equilibrium type analysis

General equilibrium models are needed in many circumstances to assess broad objectives and the overall impact of reforms, to study the transmission and relative importance of different financial reforms on broad objectives, and to assess sensitivities and counterfactuals. One class of empirical models can be purposefully applied to study the transmission and relative importance of different shocks, among which financial reforms, in shaping the behaviour of variables, typically at the aggregate level, and to assess counterfactuals along different paths of structural shocks and reforms. The usefulness of this approach is determined by its ability to implicitly capture endogeneity, i.e. non-linear indirect effects (such as second-round effects). For such models to be useful to assess reforms, however, sufficient, quantifiable time-series data are often required (e.g. 20 years of quarterly data), making them better suited for evaluations of the short- and medium-term costs of reforms, than for long-term effects (e.g. in terms of probability and severity of financial crises). Other, structural general equilibrium models can be fruitfully applied to examine the overall macroeconomic impact of reforms as they incorporate various feedback effects, and allow for an examination of welfare effects – the theoretically most satisfactory way for evaluating whether the reform is ultimately a net benefit or net cost to society. However, such models require a number of assumptions, which may come from theory or other empirical analyses, but are not always amenable to statistical testing.

3.5   Choice of tools

From this discussion follows criteria as to which tool is preferable to use for what specific reform analysis. As regards to attribution, it suggests the need to use more partial equilibrium tools if the state of world varies much or if there are other congruent reforms or shocks. Also when there is much concern of agents adapting, e.g. when reforms are announced far in advance, or when agents have many alternatives, it may be more necessary to use tools that can properly account for attribution. In terms of heterogeneity, questions that can help dictate the tool choice include whether reforms are similar (-ly phased in) everywhere, and whether there are large differences among affected agents. Whether the data available provide (nearly) complete or only very partial coverage is an important consideration as well. In terms of the need for general equilibrium analyses, this will in part depend on whether reforms were aimed at many agents or largely at narrow sets of actors. Also when there are many concerns of unintended consequences and side effects, and when the implications for the real economy can be expected to be large, general equilibrium analyses are more likely needed.

This set of criteria can provide some guidance on what methods to use for which type of reform so as to obtain results as robust as possible. For example, when attribution, heterogeneity and general equilibrium concerns are limited, methods 1 and 2 may suffice. When general equilibrium concerns are limited, methods 1, 2, and 3 may suffice. When attribution, heterogeneity and general equilibrium concerns are large, but reforms are targeted, methods 2, 3, and 4 may suffice. But when attribution, heterogeneity and general equilibrium concerns are large, and multiple reforms occur at the same time, a combination of all four methods may be most useful.

Appendix Table 1: Properties of tools

	Type of evaluation	Implementation monitoring (pre-evaluation analysis)	Evaluation of individual reforms	Evaluation of interactions and coherence of reforms	Evaluation of overall effects
Category of tools	1. Qualitative analysis	A, H	A, H	H	H
	2. Indicators and descriptive statistics	A, H	A, H	H	H
	3. Partial equilibrium type analysis				
	a. Theoretical		A, H	A, H	
	b. Empirical				
	i. Event studies		A*, H*	A, H	
	ii. Quasi-experimental		A*, H*	A*, H*	
	iii. Regression techniques		A*, H*	A, H	
	iv. Other techniques		A*, H*	A, H	
	4. General equilibrium type analysis				
	a. Theoretical, calibrated			A, H, G	A, H, G*
	b. Empirical			A, H, G	A, H, G*

Notes: Attribution = A, Heterogeneity = H, General Equilibrium = G; a * after one of the alphabetic codes signifies that the tool is particularly useful. Grey shading signifies that the tool is not particularly useful for this type of evaluation.

4. Literature review of methods and tools on the effects of reforms

4.1 Introduction

What follows is a literature review of official sector studies as well as academic research on the effects of reforms based on a selected list of studies. *This overview does not seek to give a detailed account of the findings of the literature, but rather a selective review of examples of evaluation studies focused primarily on the G20 priority reform areas*. Its aim is to identify frequently employed analytical methods, limitations of the existing literature on evaluation, and specific challenges that pertain to certain types of analyses and go beyond the generic issues identified in Box 1 of the evaluation framework. This review has informed the development of evaluation approaches within the framework, in particular with regard to the categorisation and usefulness of the tools for policy evaluation.

The review suggests that the literature is uneven in terms of coverage and depth across the core reform areas: many studies cover the impact of Basel III, and less focus has been placed on "too-big-to-fail" (TBTF) and over-the-counter (OTC) derivatives, while only very few studies consider other reform areas. This uneven coverage stems from differences in the reforms' implementation progress, as well as in the availability of data and underlying theoretical work. Several studies have also looked at domestic reform initiatives (such as structural reforms) and measures that go beyond international standards (e.g. higher leverage ratios). Additionally, a number of studies consider cross-cutting issues such as the combined effect of reforms on market liquidity.

Descriptive statistics and qualitative analyses have been most commonly used to study reform effects so far, along with regression analyses (and other types of partial equilibrium studies) in many areas. General equilibrium type studies have been limited to ex-ante analysis of major reform elements (mainly for Basel III) and theoretical contributions.

Generally, the costs of reforms are more widely studied than their benefits. Strict benefit-cost studies are rare. In many cases, research connects regulatory changes (e.g. higher capital ratios) to relevant indicators capturing resilience and terms of financing (e.g. changes in risk indicators, spreads, or cost of lending) rather than broader G20 objectives as such (e.g. increased financial stability and sustainable economic growth).

4.2 Basel III (higher capital and liquidity requirements)

The higher capital and liquidity requirements under Basel III intend to "improve the banking sector's ability to absorb shocks arising from financial and economic stress, whatever the source".[11] Evaluations in this reform area have focused mainly on the effects of changes in capital requirements, and lesser on liquidity regulation as well as on analysis of combined effects of reforms (see BCBS 2016 and Thakor 2014 for reviews of the literature).

One strand of the literature analyses how banks adjusted their balance sheets in reaction to the new regulatory requirements – e.g. whether they issued equity, retained earnings or reduced (some types of) assets – often using *indicators* and *accounting approaches* (Cechetti 2014) but also based on *regression analysis* (Cohen and Scatigna 2014). Such analyses provide insights

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into the transmission channels and adjustments in behaviour of market participants which could be intended, but also point to unintended changes that were not anticipated at the design of the reform. These methods can be useful to identify trends – including differences across jurisdictions, market participants or sectors – and areas for further analysis. By definition, the descriptive approaches are not meant to identify behavioural changes or *general equilibrium* effects. Neither are they useful to establish *causality (attribution)*. Their strength lies in their simplicity, transparency, and flexibility when constructing counterfactuals but also in identifying issues and trends deserving more attention.

Other studies estimate the *post-implementation effect* of changes in capital requirements on volumes and lending prices at the bank level using *regressions* (Elliott, Salloy and Santos 2012, Dagher et al. 2016, Bridges et al. 2014). This type of analysis faces a number of challenges, most notably to understand how and to what extent results from analyses based on individual capital variations can be generalised.[12] In addition, it is empirically challenging to disentangle the different roles of capital identified by the theoretical literature, such as risk buffers, incentive mechanisms, or resolution triggers (Calomiris 2013, Claessens 2014). Several studies examine the impact of capital on the overall cost of financing (Miles at al., 2012; Gambacorta and Shin 2016). However, estimates on the precise scale of MM effect vary. While this approach allows identifying *causal effects* (*attribution*) of individual capital shortfalls and bank behaviour in a *partial equilibrium setting*, it is not clear whether the result also hold in a general equilibrium setting (e.g. across countries and if all banks raise capital at the same time, etc.).

In a nutshell, research so far has been able to identify *heterogeneous effects* on the bank level along several dimensions and, when using regression analyses, *attribute* changes in bank behaviour to regulation-induced changes in capital. However, less work has been undertaken on the post-implementation evidence for the overall effects of regulation under a general equilibrium setting. Further, the literature looks typically only at the cost-side of the reforms.

Studies taking an *ex-ante perspective* on the effect of reforms have been used for calibration purposes ("optimal capital") and can help in establishing counterfactuals. Frequently applied approaches include dynamic stochastic general equilibrium or macro-econometric models (MAG 2010, BCBS 2010, Begenau 2015, Clerc et al. 2015, Corbae and D'Erasmo 2017, Nguyen 2015). Such models are useful to estimate costs (reduced lending and lower GDP) and benefits[13] (lower probability of crises) at the *aggregate level* and some of these models also provide welfare analysis, i.e. compute both costs and benefits of regulations. Transitional costs are estimated to be higher compared to long-term costs (MAG 2010, BCBS 2010). The *combined effects* of largely implemented reforms (capital requirements, G-SIB surcharge, LR Surcharge) or agreed reforms (leverage ratio, total loss-absorbing capacity) *on* long-term macroeconomic *benefits and costs* in terms of GDP have been analysed by Fender and Lewrick (2016) for a large sample of international banks or by Brooke et al. (2015) for the UK.

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[12] This missing dimension, quantifying *aggregate effects,* can be partly supplemented by cross-country analyses (Vandenbussche et al. 2015, Lim et al. 2011), which often study the effects of (capital based) macroprudential policies on aggregate variables. Alternatively, using data linking information from financial institutions and the real economy, such as employment decisions of borrowing NFCs (Jiminéz et al. 2017) can deliver proxy results.

[13] Note that the Basel Committee on Banking Supervision (2010) relied on benefits based on partial equilibrium methods.

4.3 Too-big-to-fail (TBTF)

The objective of policy measures for Systemically Important Financial Institutions (SIFIs) is to address the "systemic and moral risks associated with large and complex financial institutions".[14] Post-crisis reforms aim to address TBTF risks through the establishment of effective resolution regimes (and by removing obstacles to resolvability), by requiring SIFIs to hold higher loss absorbing capacity, and by making them subject to more intensive supervision. Ultimately, these measures aim at having SIFIs internalise their systemic costs.

Post-implementation empirical evidence on the effects of TBTF reforms remains preliminary and is based on a range of methods. They include *qualitative studies*, e.g. drawing on interviews with affected financial institutions and regulators (GAO 2015), *indicator-based* and descriptive evidence on the evolution of SIFIs' funding costs, safety and soundness (FSB 2016 and GAO 2015), and studies using *regressions* to estimate the effects of the TBTF reforms. Evidence on the *overall* financial stability *effects* of TBTF reforms is scarce (e.g. in terms of crises avoided or tempered), although this aspect was covered by ex-ante impact assessments (BCBS/BIS/FSB 2015 and MAG 2011).

The literature can be divided into three main strands: (1) Empirical studies of funding advantages of SIFIs, based on market prices/spreads on bonds, deposits, credit default swaps, equity etc.; (2) Credit rating agency (CRA) expectations of government support, as reflected in ratings uplifts for SIFIs or other changes in rating methodologies; and (3) Evidence of improvements in areas targeted by reforms to resolution regimes, such as on the structure and resolvability of SIFIs.

The first strand of the literature examines the measurement of funding cost advantages for SIFIs (see Siegert and Willison 2015 and FDIC 2014 for reviews of this literature). This literature tends to capture the general impact of TBTF reforms on market prices, rather than the impact of specific resolution-related reforms. Much of the literature predates recent reforms to resolution regimes and is focused largely on European and US financial institutions. The fact that to date there have only been a small number of practical resolution cases testing the effectiveness of new regimes is an important limitation of the literature. *Attribution* of changes in estimated funding cost advantage to regulatory reforms is complicated by important factors, such as the cyclical variation in funding cost advantage because implicit guarantees are more valuable during periods of financial stress. Moreover, measures of funding cost advantages are inherently imprecise, not least because the TBTF status is not precisely observable. A number of analyses have been published by CRAs to explain the methodologies underpinning their ratings and the process used to arrive at them. The ratings-based approach exploits the fact that CRAs typically provide a breakdown of a bank's rating, showing the standalone rating and their expected likelihood of government support. The rating uplift associated with such support can then be translated into a funding cost spread based on the historical relationship between credit ratings and bond spreads. However, the expectations of support tend to vary across CRAs; their methodologies are subjective and have changed over time; and the extent to which they influence market behaviour is subject to debate, particularly since ratings have been slow in reflecting changes in the institution's creditworthiness.

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[14] See http://www.fsb.org/2010/11/r_101111a/.

Finally, the literature on SIFI structure and resolvability consists primarily of papers analysing the public information available on resolution planning of the largest US banks (e.g. summaries of progress, guidance from the authorities etc.), and studies on SIFI resolvability looking at loss absorbing capacity, group structures and complexity on the basis of publicly available information. Limitations to the analysis included the data gaps in information available on the complexity of G-SIBs, making comparisons across jurisdictions difficult because of differing definitions, reporting criteria and thresholds, e.g. of material entities (Carmassi et al, 2014).

4.4 OTC derivatives markets reforms

Post-crisis OTC derivatives markets reforms (central clearing and, where appropriate, platform trading of standardised derivatives and higher capital and margin requirements for non-centrally cleared derivatives, and trade reporting to trade repositories (TRs) of all OTC derivative transactions) aim at improving transparency in the derivatives markets, mitigating systemic and counterparty risk, and reducing the scope for market abuse.

The literature evaluating the effects of OTC derivatives reforms has taken a variety of approaches to analyse reform effects on markets and market structure.

Indicators and descriptive statistics have been a common means to *monitor* the *post-implementation* effects of reforms (FSB 2016, Duffie 2016, ISDA 2016). Such studies can monitor implementation progress, illustrate stylised facts, highlight key issues and point to further areas for research but are not designed to *attribute* reforms to outcomes.

Network analysis is frequently applied to gain insight into the effect of reforms on risk stemming from within networks of financial institutions. Some of these studies are staff working papers or research papers produced by employees of authorities that have access to trade reporting (TR) data. Examples include analysing reform impacts on netting sets and exposures across different assets, on risks of and from contagion, procyclicality of margin requirements and impact on collateral demand (Duffie and Zhu 2011, Garratt and Zimmerman 2015, Ali, Vause and Zikes 2016, Abad et al. 2016). These analyses typically study the effects of reforms on the financial sector only and are not designed to assess *overall* reform effects on the economy.

Regression analyses are also a popular method for a range of questions, such as the impact of central clearing on CDS pricing (Du et al. 2016, Loon and Zhong 2014), the effect of migration from bilateral to multilateral intermediation on executing costs (Collin-Dufresne et al. 2016, Benos et al. 2016) or the impact of reporting requirements on market liquidity (Loon and Zhang 2016). These studies often use transaction-level data and apply statistical techniques which rely on identifying differences between pre- and post-regulatory trends. While the focus is usually on explaining the dynamics of prices or volumes, research has also shed light on changes in market structures or choice of counterparties (Gündüz 2016, Du et al. 2016). By controlling for other covariates, these kinds of analyses can, if done appropriately, establish *causality*. The multi-faceted nature of the questions often demands the combination of methods such as *regressions, simulations and accounting based* approaches (Heller and Vause 2016) or the use of other techniques such as matched sample analysis (Loon and Zhong 2016).

Reporting requirements have provided large amounts of data from TRs. However *data-related problems* that limit the aggregation of granular data are likely to hinder analysis, even when authors have access to TR data (Osiewicz, Fache Rousova, and Kulmala 2015). Due to the

global nature of the market, a comprehensive analysis would benefit from consistent global data (Ali, Vause and Zikes 2016).

An example of analysing benefits and costs of the reforms from an *ex-ante perspective* is the MAGD (2013). Reform benefits were proxied by a reduction in counterparty risk in the OTC derivatives market through central clearing and collateral requirements and measured by GDP losses through financial crises avoided. The anticipated costs of reforms include holding more high-quality, low-yielding assets as collateral which reduce income. Generally, measuring impact on a global business with insufficient and inconsistent (global) data remains problematic.

4.5   Shadow banking[15]

Shadow banking is broadly defined as financial intermediation creating bank-like risks (liquidity/maturity transformation, leverage, incomplete credit risk transfer) outside the prudentially regulated banking sector.[16] The FSB and SSBs issued a range of standards and recommendations, e.g. on securitisation (IOSCO 2012a), money market funds (IOSCO 2012), or asset management (FSB 2017) to better regulate shadow-banking activities and thereby contain systemic risks. However, these standards and recommendations are generally not as prescriptive as, for example, bank regulation (Basel III), and therefore might lead to a more *heterogeneous* national implementation. Moreover, in many areas, reforms are recent and not yet fully implemented, so only limited data and experience are available for post-implementation evaluation.

Therefore, research on the effects of shadow banking reforms is scarce.[17] Malatesta et al. (2016), for example, focus on the development and the nature of shadow banking within the Euro Area and compare it to developments in the U.S. and to traditional banking. The study mostly uses *descriptive statistics*, while one *regression* tries to identify the factors driving the lending behaviour of banks and non-banks to non-financial companies.

4.6   Other reforms and issues

4.6.1   *Market liquidity*

A number of post-crisis reforms were, from a conceptual perspective, expected to have an impact on market liquidity. Enhanced capital and liquidity requirements (e.g. Basel III) and restrictions on certain investments by banks (e.g. Volker Rule) were anticipated to reduce liquidity. Regulations to increasing transparency were generally expected to benefit liquidity in

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[15] The FSB defines shadow banking as "credit intermediation involving entities and activities (fully or partially) outside the regular banking system". Some authorities and market participants prefer to use other terms such as "market-based finance" instead of "shadow banking". The use of the term "shadow banking" is not intended to cast a pejorative tone on this system of credit intermediation. The FSB is using the term "shadow banking" as it is the most commonly employed and, in particular, has been used in previous G20 communications.

[16] FSB Documents on Shadow Banking (FSB 2013, 2016).

[17] Some other studies evaluate reforms (proposals) on a conceptual level without any post-implementation data (Hanson et al. 2015, Greene et al. 2013).

some markets.[18] Technological innovations, the impact of the financial crisis, expansionary monetary policy, changing patterns in the liquidity demands of large asset managers and changes in expected returns are also among the factors mentioned as potentially influencing market liquidity.

One specific challenge is that market liquidity has not been a direct focus of regulation. As a consequence, research in this area falls into two categories. Some papers attempt to directly link changes in market liquidity to regulation on specific elements (market participants, business lines, products, etc.) likely affected (e.g. dealer inventories). Others take a more general approach and seek to explain changes in market liquidity indicators such as bid-ask spreads and the ease to execute larger trades or spreads. In the latter case, given multiple potential drivers (and transmission channels) the *attribution* of market outcomes to specific reforms is difficult.

A number of studies are based on time series of *descriptive statistics* and rely on *correlation* rather than causality. This approach is useful to identify relationships among variables, understand market characteristics such as breadth, immediacy, tightness, depth or resilience (PWC 2015) and motivate research meriting deeper analysis. *Case studies* of periods with strong market reactions (2014 Treasury bond flash, 2015 Bund tantrum in Europe, or the abandonment of the peg of the Swiss Franc to the Euro in 2015) provide evidence of the underlying forces affecting market liquidity and especially the resilience thereof (Anderson et. al 2015, BIS 2016, Adrian et al. 2017, Brandao-Marques et al. 2015, PWC 2015). However, this work relies typically on one-off events and findings cannot be easily generalised or *attributed* to reforms.

Only a minority of studies employs *regressions* to investigate a specific *causal* relationship. A number of papers estimate, for instance, the fraction of spreads that can be attributed to market illiquidity (Aquilina and Suntheim 2016, Dick-Nielsen et al. 2012). Another strand of research employs regressions to estimate the effect of monetary policy (IMF 2015) or of regulation (Trebbi and Xiao 2015) on market liquidity.

As data is scarce, researchers often conduct surveys to collect their own data (e.g. ESRB (2016) collected qualitative data from market makers).

Papers typically do not explicitly evaluate *benefits and costs* of regulatory reforms leading to changes in market liquidity.

Adrian et al. (2017) offer suggestions on how to improve the literature on market liquidity. For example, they discuss how to improve certain liquidity measures e.g. by considering joint, or co-liquidity of assets and their close substitutes (that can be generated by futures, options or swaps) or by calculating market liquidity conditional on certain characteristics of underlying assets. They also point out methodological pitfalls. For instance, when intermediation behaviour changes from market–making towards an agency model, liquidity measures cannot be interpreted the same way over time.

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[18]   However, it remains unclear what the optimal level of liquidity is. Shin (2016) argues that before the crisis there was too much liquidity.

4.6.2 Interconnectedness and systemic linkages

In the aftermath of the crisis, there has been an increased focus on examining interconnectedness and systemic linkages of financial institutions and markets using *network models/analysis.*

One approach to study interconnectedness is to look at direct exposures. Espinosa-Vega and Sole (2011), for example, document the use of a classical network approach at the example of cross-border bank credit exposures from the BIS. They illustrate the implications of credit and funding shocks hitting a number of financial entities in specific jurisdictions on financial stability elsewhere. The credit shocks simulate potential domino reactions due to the incurred credit losses of failures on other institutions, while for funding shocks the simulation assesses whether there are alternative sources of funding to make up for the loss of liquidity. Other studies have used CDS networks to study direct relationships, such as Markose et al. (2012).

A second approach is to use econometric techniques to estimate empirical relations using market price data (*indirect exposures*). This approach includes Granger Causality Tests, examination of common portfolio holdings and Variance Decomposition techniques. One example of the latter is Diebold and Yilmaz (2014), who use equity return volatility data to derive pair-wise directional connectedness measures between institutions based on the Generalised Variance Decompositions of the underlying Vector Autoregression (VAR) model. The model allows to quantify the systemic contribution of each institution to overall network connectedness and systemic risk. The Systemic Risk Monitor by Hamilton, Hughes and Malone (2015) combines techniques of network analysis with Moody's CreditEdge platform to estimate statistically significant Granger causal connections between pairs of entities using bivariate vector auto-regression models. Other indirect approaches do not explicitly take into account networks, and complement the output of network models. Models that fall into this category include Principal Component Analysis, Co-movement Factor Regressions and Credit Portfolio Models. Approaches that fall into the latter category are Segoviano and Goodhart (2009), Jobst and Gray (2013) and Adrian and Brunnermeier (2016). They use market price data (equity prices, credit default swaps (CDS), bond yields and option prices) and explicitly look at contributions of different entities to systemic risk (and tail events), while measuring overall systemic risk as a probability.

4.6.3 Global financial system openness and integration

Regulation can affect the global financial system openness and integration in several ways. The G20 reforms aimed at preserving an open and integrated financial system by: raising systemic resilience at the global level and improve confidence in financial institutions and the functioning of markets; increasing regulatory and supervisory co-operation and information sharing, including in managing crisis and addressing failing cross-border institutions; undertaking a robust approach to monitoring and reporting on national implementation of the agreed international reforms; and committing to identify and address implementation challenges and material unintended consequences of regulatory reforms.

Studies on the state and changing nature of global financial integration and its underlying causes are fairly rare. Claessens and van Horen (2014) study the impact of the financial crisis on global financial integration and economic conditions in home and host countries. The IMF (2015) disentangles the effects of regulations from the effects of the macroeconomic environment and

bank-specific attributes on financial integration. Forbes et al. (2017) examine the interaction of bank regulatory policies and unconventional monetary policies. These studies employ *regression* models. Including both regulatory changes and other factors in the analysis is essential to establish *causality (attribution)*.

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5. FSB informal working group on development of a Framework for Post-Implementation Evaluation of the Effects of the G20 Financial Regulatory Reforms

Australia	**David Orsmond** Deputy Head, Financial Stability Department Reserve Bank of Australia
Canada	**Larry Schembri** Deputy Governor Bank of Canada
France	**Laurent Clerc** Director Financial Stability Banque de France
Germany	**Claudia Buch** Vice President Deutsche Bundesbank
Hong Kong	**Cho-hoi Hui** Division Head, Market Research Hong Kong Monetary Authority
India	**PSS Vidyasagar** Director, G20 Division, International Department Reserve Bank of India
Italy	**Fabrizio Venditti** Directorate General for Economics, Statistics and Research Banca d'Italia
Japan	**Takuo Komori** Deputy Commissioner, International Affairs Financial Services Agency
Mexico	**Fabrizio Lopez-Gallo Dey** Director, Financial System Risk Analysis Banco de México
Singapore	**Lily Chan** Principal Economist/Specialist Leader, Macroprudential Surveillance Monetary Authority of Singapore
South Africa	**Nicola Brink** Head, Resolution Planning Division South African Reserve Bank

Switzerland	**Regula Hess** Economist Swiss Federal Department of Finance
UK	**Neeltje Van Horen** Research Advisor Bank of England
	Michael Straughan Manager, Economic Analysis Bank of England
US	**Joao Santos** Vice President Federal Reserve Bank of New York
	Michael Kiley Deputy Director, Financial Stability Board of Governors of the Federal Reserve System
	Stijn Claessens Senior Advisor Board of Governors of the Federal Reserve System
ECB	**Skander Van den Heuvel** Adviser
European Commission	**John Berrigan** Deputy Director General, DG FISMA
IMF	**Nigel Jenkinson** Assistant Director, Monetary and Capital Markets
BCBS	**Davy Reinard** Member of Secretariat
CPMI	**Morten Bech** Head of Secretariat
IAIS	**Conor Donaldson** Implementation and Assessment Manager
IOSCO	**Raluca Tircoci-Cracium** Head of Growth and Emerging Markets Implementation Monitoring and Technical Assistance
	Anna Zhang Implementation Monitoring Advisor

FSB Secretariat

Tara Rice
Member of Secretariat

Christian Schmieder
Member of Secretariat

Costas Stephanou
Member of Secretariat