



# Systemic risk information study

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# Foreword

## Introduction from Tim Ryan

Understanding and managing systemic risk will be a key challenge for both regulators and financial firms. Systemic risks – those risks which are not just a danger to single firms but which threaten the integrity of the broader market – require special attention. Monitoring and managing these risks is critically important in ensuring that our capital markets are a safe and reliable vehicle to drive growth in the broader economy. Regulators and legislators have recognized the importance of this issue, and we at SIFMA support the development of an effective systemic risk regulatory regime. To support this process, we are proud to introduce our *Systemic Risk Information Study*, produced together with Deloitte & Touche.

We hope this study will provide useful guidance on how new policies on monitoring systemic risk can be effectively implemented. There have been extensive debate in the academic, policy, and legislative communities on advantages of a range of regulatory structures. Regardless of the structure of new regulation, its effectiveness will be driven in no small part by the specific ways that information is tracked, shared, analyzed, and reported.

Monitoring systemic risk is not just an extension of reporting for compliance or enforcement purposes - looking beyond the actions of individual firms to the stability of the broader market will require asking different questions and looking at information in new ways. I believe this study provides valuable insights on how regulators can develop an accurate and insightful understanding of systemic risk issues in financial markets and market participants.

The financial services industry is also thinking about systemic risk in new ways, and this study incorporates the insights and experiences of risk managers, operations leaders, and treasurers from among our member firms. It draws on their experiences as they have managed through a range of systemic events. It incorporates their front-line perspective on what types of information were most effective in a range of situations, how they currently manage systemic risk information, and their perspectives on what regulators should focus on.

SIFMA's members – broker-dealers and asset managers nation-wide – want to be an effective partner to the regulatory community as it works to expand its understanding and monitoring of systemic risk. Both regulators and financial services firms need to have the information and tools to understand risks developing within the system and use those insights to manage, control, and mitigate risk. This report brings together the perspectives of these parties on how this can be done in hopes it will be both a useful resource and the start of a more in-depth conversation on this critical topic.

We thank you for your interest in this report and hope you find it to be a thought-provoking and valuable tool for future discussions.

T. Timothy Ryan Jr.

President and CEO

Securities Industry and Financial Markets Association

# Executive summary

## Background<sup>1</sup>

The enormous financial and economic costs associated with financial crises have been underscored by the events of the last several years, as has the critical importance of effective supervision in addressing systemic risks and promoting financial stability both in the United States and globally. Policymakers, regulators, and legislators here and abroad have taken, or are considering, a wide range of actions and legislative steps to improve financial regulation and supervisory oversight, particularly with respect to firms whose size, complexity, or interconnectedness could have a significant impact on the financial system as a whole. It is clear that better qualitative and quantitative information regarding the identification and mitigation of systemic risk will be critical components of any comprehensive financial regulatory reform.

As highlighted by the Financial Stability Board (FSB), critical global interconnectedness exists and yet is not captured in currently available sources: “The integration of economies and markets, as evidenced by the financial crisis spreading worldwide, highlights the critical importance of relevant statistics that are timely and internally consistent as well as comparable across countries.”<sup>2</sup> Global collaboration and cooperation is essential for effective monitoring of systemic risk; however, individual countries are taking different approaches to systemic risk regulation and financial reform.

In the United States, there have been calls for structural changes within the regulatory system resulting in a number of proposals, including the U.S. Treasury’s *Blueprint for a Modernized Financial Regulatory Structure (2008)*, and *Financial Regulatory Reform: A New Foundation (2009)*, plus financial reform bills in the U.S. Senate and the U.S. House of Representatives. Although these proposals differ in a number of aspects, one common element is the creation of a systemic risk regulator. These proposals have generated much discussion amongst U.S. regulators and government officials.

European developments relating to systemic risk regulation have run somewhat ahead of U.S. legislation. European regulatory agencies have begun to address the issue of systemic risk with initiatives, such as the establishment of the European Systemic Risk Board, which is responsible for macroprudential oversight of the European Union’s (EU) financial system and for issuing risk warnings and recommendations to its members. Macroprudential regulation focuses on preventing or

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<sup>1</sup> A series of interview questions (Appendix A) were asked of regulators, financial institutions and utility participants. The statements in this report reflect Deloitte & Touche’s analysis of the interview participant’s responses to these interview questions. All data referenced and presented, as well as the representations made and opinions expressed, are those of the participating organizations and their responses to the interview questions. As part of this study, Deloitte & Touche did not validate or verify the responses of the interview participants. This study should not be relied upon as a substitute for professional advice or services.

<sup>2</sup> Financial Stability Board and International Monetary Fund, *The Financial Crisis and Information Gaps*. Washington, D.C., October 2009.

safeguarding systemic risks, whereas microprudential regulation focuses on identifying risks to an individual firm and requiring firms to protect against those risks.<sup>3</sup>

In anticipation of legislation establishing a systemic risk regulatory regime for large, interconnected financial institutions, the Securities Industry and Financial Markets Association<sup>4</sup> (SIFMA) undertook a study to identify the potential types of industry risk information and capabilities a systemic risk regulator would likely require from industry participants. SIFMA engaged Deloitte & Touche LLP<sup>5</sup> to assist with the information gathering and analysis.

## Objective and approach

This study seeks to promote greater awareness and understanding of potential systemic risk information requirements. It focuses on the types of information a systemic risk regulator, irrespective of its structure, may require to monitor systemic risk, and how financial institutions and regulators currently capture, report, and analyze the information.

The study is based on interviews of regulators, securities broker-dealers and banks, insurance companies, hedge funds, exchanges, and industry utilities. The intent of these discussions was first, to understand how the interviewees, within their varied organizational perspectives, defined and/or viewed systemic risk and second, given this understanding, identify what types of information each thought would be appropriate to identify, measure, and monitor systemic risk. The insights gained from these meetings became the basis for the findings presented in this study and are aimed at supporting the financial industry's efforts to foster financial stability and accommodate the information needs of a systemic risk regulator. Furthermore, this study is intended to assist regulators, policymakers, the financial services industry, and others in preparing for systemic risk oversight and enhance their ability to respond to potential future systemic risk events.

Initial study activities consisted of: 1) identifying relevant participants to be interviewed; 2) developing appropriate interview questions for each group; and 3) performing a broad review of systemic risk-related literature and testimonies.

Following the initial activities, a four-step approach for identifying the potential key information requirements for a systemic risk regulator was developed:

- 1) Determine the potential key systemic risk themes and categorize the interview output
- 2) Identify and document the potential key data requirements
- 3) Determine potential systemic risk information approaches for monitoring systemic risk

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<sup>3</sup> Labonte, Marc. *Systemic Risk and the Federal Reserve*. Congressional Research Service, October 2009.

<sup>4</sup> SIFMA brings together the shared interests of securities firms, banks, and asset managers. SIFMA's mission is to promote policies and practices that work to expand and perfect markets, foster the development of new products and services, and create efficiencies for member firms, while preserving and enhancing the public's trust and confidence in the markets and the industry. SIFMA works to represent its members' interests locally and globally. It has offices in New York, Washington D.C., and London and its associated firm, the Asia Securities Industry and Financial Markets Association, is based in Hong Kong.

<sup>5</sup> As referred to in this document, "Deloitte & Touche" means Deloitte & Touche LLP, a subsidiary of Deloitte LLP. Please see [www.deloitte.com/US/about](http://www.deloitte.com/US/about) for a detailed description of the legal structure of Deloitte LLP and its subsidiaries. "Deloitte" is the brand under which tens of thousands of dedicated professionals in independent firms throughout the world collaborate to provide audit, consulting, financial advisory, risk management, and tax services to selected clients. These firms are members of Deloitte Touche Tohmatsu ("DTT"), a Swiss Verein.

#### 4) Assess information gaps within the systemic risk information approaches

In summary, the study objectives included performing an analysis to identify the implications for the following three elements across each of the potential systemic risk information approaches:

- What information may be needed — the potential financial and risk data requirements a systemic risk regulator may require to effectively oversee systemic risk
- What information is currently provided — the information currently provided to regulatory bodies from financial institutions and utilities
- Potential information gaps — the potential key gaps between the information a systemic risk regulator may require and the information currently available

Further information was captured through additional SIFMA member firm discussions. Specific discussions were held to look subjectively at the systemic risk modeling capability for each of the approaches had they been in place during prior market dislocations (e.g., recent financial crisis).

### Scope

Twenty-two organizations, including SIFMA member firms, regulators, CCPs, and exchanges, were interviewed (the interview questions may be found in appendix A). Attribution of any particular comments or views has not been made to specific organizations, or individuals.

### Key findings

Both financial institutions and regulators have a stake in what information will be required by a systemic risk regulator to effectively capture and monitor these indicators. As noted by the FSB, the crisis highlighted both the “difficulty of capturing, and the importance of, sound indicators of the degree and location of leverage or excessive risk-taking within the system.”<sup>6</sup> This is especially true in regard to the less regulated institutions and instruments as well as liquidity, credit, and tails risks within the more regulated sectors. It was essential, therefore, through the interview process, to identify key themes inherent to regulators, financial institutions, exchanges and industry utilities.

### Summary insights

The following concepts emerged from discussions with regulators, financial institutions, and industry utilities alike. While the list is not exhaustive, it highlights potential key insights which a systemic risk regulator may need to be aware of in order to efficiently identify and monitor the buildup of systemic risk in the financial system:

- All participants interviewed (and SIFMA) support the concept of a systemic risk regulator although there was some variance in views on structure and other matters
- Regardless of the structure of the systemic risk regulator, its roles and responsibilities for the overall markets may be analogous to that of a firm’s chief risk officer (CRO), but covering systemically important financial institutions (SIFIs), markets, and underlying systemic risks
- Systemic risk may develop in a short period of time or may build up over time. In normal market periods, daily and weekly reporting may be perceived to have limited benefit compared to the costs involved, however, in times of market stress more frequent reporting would be of greater value

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<sup>6</sup> Financial Stability Board. (October 2009).

- Across each of the eight potential systemic risk information approaches that were developed, there are gaps in:
  - The infrastructure necessary for financial institutions and regulators
  - The potential information needed by the systemic risk regulator
- All eight potential systemic risk information approaches are considered costly
- Emphasis on processing too much information at too granular of a level may ultimately hinder the ability of a systemic risk regulator to focus on the relevant build-up of systemic risks (“hot spots”); and result in missing the forest for the trees
- More transparency is needed for over-the-counter (OTC) transactions and counterparty information
- Data standards, consistency, and accuracy need to be enhanced in order to support aggregation on a firm-wide and industry-wide level
- Maturity transformation mismatches, defined as long-term assets funded by short-term liabilities, are a key systemic risk issue
- The industry as a whole needs to improve its monitoring of leverage and concentrations

### Key observations

Outlined below are the key observations in response to the interview questions:

- **Role and function of systemic risk regulator** — Since pending legislation from Congress includes the establishment of a systemic risk regulator, it appears likely that a systemic risk regulatory function, in either a single entity and/or a council, will be created. The systemic risk regulator is expected to have multiple roles, including overall financial market macroprudential regulation, regulation of systemically important firms, and facilitation of information sharing and coordination amongst individual regulators relating to issues of systemic importance.
- **European approach versus U.S. approach to systemic risk regulation** — Certain UK and EU regulatory authorities are viewed by some in the financial services industry, as being more advanced than their U.S. peers in their development of, and approach to, systemic risk information requirements. An example given in interviews was the UK tripartite regulatory structure (Financial Services Authority (FSA), Her Majesty’s Treasury, and the Bank of England) having clearly defined roles and responsibilities.
- **Focus on infrastructure** — Many organizations interviewed believe that the industry and regulatory efforts would be well served improving the market infrastructure’s “pipes” and “plumbing.” Some industry participants went so far as to suggest that enhancements to the “pipes” and “plumbing” are more important than identifying systemic risk data requirements.
- **Data and reporting** — The quality and timeliness of data emerged as the primary components of reporting requirements, with a view that information requirements will necessarily vary from ad hoc (during times of crisis) to more standardized reporting in less stress-filled times. A critical area of concern centered on data confidentiality and the need for assurance that robust information security measures would be in place to ensure privacy of data received.



- **Systemic risk identification and measurement** — The use of stress tests to identify and measure systemic risk were identified as a key approach. Furthermore, more specific guidelines are needed for future stress tests, along with the development, by the systemic risk regulator, of more stringent, market-focused stress tests to enable greater macroprudential oversight. A potential key issue in this regard, as noted by the Institute of International Finance (IIF), is how to prevent the emergence of marketplace bubbles in the future. “The idea would be to put into place monitoring of credit conditions in different parts of the market—for example, secured and unsecured exposures to households, commercial property lending, other corporate lending, and lending to other financial institutions (with further levels of granularity available). The need for action would be based on the constrained technical judgment of the authority charged with macroprudential oversight.”<sup>7</sup>
- **Systemic risk information approaches** — Eight potential systemic risk information approaches emerged which we describe as: stress tests, reverse stress tests, aggregated risk reporting templates, risk sensitivities, trade repositories, repositories and key industry utilities, concentration reporting analysis, and a regulator data warehouse. There are different benefits and costs associated with each approach, as well as varying complexities related to their information requirements. Depending on the type of approach, distinctive transmission and storage mechanisms would be needed and/or required by financial institutions, regulators, and utilities. It should be noted, however, that the eight approaches are not mutually exclusive, nor are they necessarily exhaustive, and a solution may draw on multiple approaches.
- **Role of CCPs and repositories** — CCPs and repositories are viewed as valuable sources for granular information. At the same time, however, industry participants expressed concerns regarding CCPs’ potential risk concentrations, including risk of the CCP itself, and whether systemic risks would ultimately be reduced through the use of CCPs.

### Systemic risk information needs

A systemic risk regulator will require a broad array of domestic and global data, including information covering: financial markets, products, market practices, and individual financial institutions.

An illustrative sample of the information needs concerning markets include:

- Credit expansions and contractions
- Asset and other price inflation and bubbles
- Flow of funds (between markets)
- Concentrations
- Interconnectedness of markets for potential contagion

In addition, there will be information required from individual financial institutions, including:

- Concentrations
- Counterparty and reverse counterparty exposures
- Leverage indicators
- Liquidity/solvency information
- Interconnectedness of firms

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<sup>7</sup> Institute of International Finance, Systemic Risk and Systemically Important Firms, An Integrated Approach, May 2010

The gaps in systemic risk information needs will be determined by the potential systemic risk regulator's adopted information approaches. This study identifies eight potential, non-mutually exclusive, systemic risk information approaches highlighted herein.

## Potential systemic risk information approaches

This study's initial goal was to identify the potential systemic risk information requirements that would be required by a future systemic risk regulator. In order to determine the systemic risk requirements, a significant aspect of the study was identifying which overall systemic risk information approach may support the potential needs and requirements of the systemic risk regulator and the financial institutions. As the interviews progressed, however, it became clear that no single information approach would serve all of the needs enumerated. Following an assessment of interview responses, a set of eight key systemic risk information approaches were identified and developed to illustrate possible approaches, taking into consideration some of the key benefits, implications, resource requirements and alternatives along with the complexity of each potential approach. Each systemic risk information approach impacts the data requirements of a systemic risk regulator, and as they are not mutually exclusive they may best be used in some type of combination. The eight systemic risk information approaches are:

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1. **Enterprise-wide stress test-based approach, (e.g., Supervisory Capital Assessment Program (SCAP))** — Relies on firms' internal models to produce a consistent set of stress tests in order to develop a more complete view of the soundness of SIFIs and the financial system. The regulator(s) will develop specific macroeconomic stress tests and communicate these to financial institutions who will be responsible for performing the analytics and reporting the results.
    - Key regulator(s) responsibilities
      - Developing and communicating specific macroeconomic stress test scenarios.
      - Reviewing and challenging the results.
      - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Key financial institution/financial industry utility responsibilities
      - Performing the analytics, based on the scenarios communicated by the regulators, and reporting the results.
  2. **Reverse stress test-based approach** — Requires firms to identify scenarios that may have a significant impact on their operations and to describe the precautions they would take to help mitigate the risks. Reverse stress tests require financial institutions to 'think backwards' to determine the risks and vulnerabilities which may lead to a weakening of their financial condition.
    - Key regulator(s) responsibilities
      - Developing and communicating high-level questions (e.g., what potential events could lead to losses of more than \$10 billion?)
      - Reviewing and challenging the results.
      - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Key financial institution/financial industry utility responsibilities
      - Developing stress scenarios focused on key exposures and concentrations of the financial institution in response to high-level regulatory questions, performing the analytics based on the scenarios identified and reporting the results.
  3. **Aggregated risk reporting template-based approach** — A summarized risk reporting template-based approach would enable the regulator(s) to obtain summarized risk data similar to the reports that a financial institution's CRO receives, allowing it to act in a role similar to that of a global CRO (all markets and all firms) with the ability to look across the risk information of financial institutions. This approach requires regulator(s) to identify and develop an appropriate and consistent standard for risk reporting across the market, which would feed into an aggregated risk template which is "owned" and maintained by the regulator(s).
    - Key regulator(s) responsibilities
      - Developing appropriate reporting templates to measure and report individual firm risk information.
      - Reviewing and challenging the results.
      - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Key financial institution/financial industry utility responsibilities
      - Generating the required information based on the requirements as established by the regulator template and reporting the results.
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4. **Risk sensitivity-based approach** — Financial institutions calculate and provide to regulator(s), relevant risk sensitivity information to represent the key risk exposures of their business. This will enable the regulator(s) to have access to summarized risk sensitivity data which they could analyze, as needed, to help identify, measure, and monitor systemic risk.

- Key regulator(s) responsibilities
    - Accessing, reviewing, and challenging the summarized risk sensitivity data received.
    - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Developing appropriate risk analytics and aggregations to assess areas of systemic risk concern.
  - Key financial institution/financial industry utility responsibilities
    - Generating the required risk sensitivity information and reporting it to the regulator(s).
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5. **Trade repositories-based approach** — Trade repositories act as hubs for the exchange of trade information and other relevant position level data as they connect relevant financial institutions, market participants, service providers, and regulator(s). Regulator(s) would have access to granular data which they then could analyze, as needed, in order to identify, measure, and monitor systemic risk.

- Key regulator(s) responsibilities
    - Developing a governance structure around trade repositories that outlines ownership, responsibilities, information sharing, and regulation.
    - Accessing, reviewing, and challenging the position and market-level data received (from financial institutions and utilities).
    - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Developing appropriate risk analytics and aggregations to assess areas of systemic risk concern.
  - Key financial institution/financial industry utility responsibilities
    - Financial institutions and utilities will be responsible for generating and reporting position-level data to the regulator(s).
    - Third-party repository organizations will be responsible for capturing and maintaining the transaction data and input received by firms.
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6. **Repositories and key industry utility firms-based approach** — Some financial institutions operate, in effect, in a utility role that often involves dealing with many financial institution participants accessing a market.<sup>8</sup> Because of their utility position, these firms are well placed to serve as an additional information source. Using the repositories and key industry utility firms-based approach, regulator(s) would potentially have access to position-level data, which they could analyze as required to help identify and monitor systemic risk.

- Key regulator(s) responsibilities
    - Developing a governance structure around trade repositories that outlines ownership, responsibilities, information sharing, and regulation.
    - Determining appropriate levels of counterparty information from clearing organizations.
    - Accessing, reviewing, and challenging the position and market-level data received (from financial institutions and utilities).
    - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Developing appropriate risk analytics and aggregations to assess areas of systemic risk concern.
  - Key financial institution/financial industry utility responsibilities
    - Financial institutions and utilities will be responsible for generating and reporting position-level data to the regulator(s).
    - Third-party repository organizations and industry utility firms will be responsible for capturing and maintaining the transaction data and input received by firms.
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<sup>8</sup> For example, firms which provide clearing services for other financial institutions, and firms which act as interdealer brokers.

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7. **Concentration exposure reporting-based approach** — Requires the regulator(s) to develop thresholds for key financial institutions across products, counterparties, and markets. Financial institutions will then generate reports on name-specific risks, including individual positions and exposures that they have to obligors and issuers that are above the defined threshold. Regulator(s) will perform the necessary analytics and aggregate the information to obtain an industry-wide perspective on concentration exposures.

- Key regulator(s) responsibilities
  - Determining appropriate exposure reporting thresholds for positions and counterparties.
  - Developing appropriate exposure reporting templates to measure and report individual firm risk information.
  - Performing the necessary analytics and aggregating the information to obtain an industry-wide perspective on concentration exposures.
  - Performing macroeconomic and other analytics to identify potential market bubbles.
  - Developing appropriate risk analytics and aggregations to assess areas of systemic risk concern.
- Key financial institution/financial industry utility responsibilities
  - Generating and reporting name-specific concentration information to the regulator(s).

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8. **Data warehouse-based approach** — Requires the regulator(s) to have a central data warehouse capable of receiving and storing transaction- and position-level data from all relevant financial institutions. Regulator(s) would have access to granular data which they could then analyze, as needed, in order to identify, measure, and monitor systemic risk.

- Key regulator(s) responsibilities
    - Developing and maintaining a data warehouse which receives position and market-level data.
    - Accessing, reviewing, and challenging the position and market-level data received (from financial institutions and utilities).
    - Performing macroeconomic and other analytics to identify potential market bubbles.
    - Developing appropriate risk analytics and aggregations to assess areas of systemic risk concern.
  - Key financial institution/financial industry utility responsibilities
    - Generating and reporting name-specific concentration information to the regulator(s).
    - Utilities will be responsible for generating and reporting position level data to the regulator(s).
    - Responsibility of third-party repository organizations and industry utility firms to capture and maintain the transaction data and input received by firms.
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## Assessment of gaps

In an October 2009 report, the FSB stated: “While the financial crisis was not the result of a lack of proper economic and financial statistics, it exposed a significant lack of information, as well as data gaps on key financial sector vulnerabilities relevant for financial stability analysis.”<sup>9</sup> Based on the identified potential systemic risk information approaches, it was possible to make an assessment of the gaps between the information required for each data approach and the information currently available. Key questions a systemic risk regulator might ask in order to identify and monitor systemic risk were developed as a means of articulating the effectiveness of each of the approaches. Specific emphasis was placed on infrastructure gaps and data gaps which might occur. The following chart highlights a sample of the key gaps identified for each of the eight approaches. A more detailed list of gaps for each approach is provided in the “Potential systemic risk information approaches section” found within this study.

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<sup>9</sup> Financial Stability Board. (October 2009).

Approach	Key gaps
<b>Enterprise-wide stress test-based approach</b>	<ul style="list-style-type: none"> <li>• Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data</li> <li>• Core dependency on financial institutions to have appropriate internal models to produce necessary information</li> <li>• Limited information from non-regulated financial institutions</li> </ul>
<b>Reverse stress test-based approach</b>	<ul style="list-style-type: none"> <li>• Reliance on firms to develop appropriate stress scenarios in response to high-level questions</li> <li>• Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data</li> <li>• Limited information from non-regulated financial institutions</li> </ul>
<b>Aggregated risk reporting template-based approach</b>	<ul style="list-style-type: none"> <li>• Increased regulator resource requirements to identify market 'hot-spots' based on information received</li> <li>• If results are based on sensitivities rather than a defined scenario, it may not capture nonlinear or contingent risks</li> </ul>
<b>Risk sensitivity-based approach</b>	<ul style="list-style-type: none"> <li>• Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data</li> <li>• Limited information from non-regulated financial institutions</li> <li>• Sensitivities may not capture nonlinear or contingent risks</li> </ul>
<b>Trade repositories-based approach</b>	<ul style="list-style-type: none"> <li>• Financial industry utility firms currently able to produce information of sufficient granularity; no key information gaps identified, however, technological- and infrastructure-related challenges exist, including: <ul style="list-style-type: none"> <li>– Significant infrastructure development for financial utilities</li> <li>– Significant costs and resource requirements for connections to the trade repositories</li> </ul> </li> <li>• Data privacy concerns exist for sharing detailed customer specific information internationally</li> </ul>
<b>Repositories and key industry utility firms-based approach</b>	<ul style="list-style-type: none"> <li>• Financial institutions and financial industry utility firms are currently able to produce information of sufficient granularity; no key information gaps identified, however, technological- and infrastructure-related challenges exist, including: <ul style="list-style-type: none"> <li>– Significant infrastructure development for financial institutions and utilities</li> <li>– Significant costs and resource requirements for connections to the trade repositories</li> </ul> </li> <li>• Data privacy concerns exist for sharing detailed customer specific information internationally</li> </ul>
<b>Concentration exposure reporting-based approach</b>	<ul style="list-style-type: none"> <li>• Challenges resulting from requests based on specific thresholds such as: <ul style="list-style-type: none"> <li>– Product</li> <li>– Asset</li> <li>– Counterparty</li> <li>– Regulatory defined calculations</li> </ul> </li> <li>• All information delivered in a summarized fashion, therefore there are potential gaps if any of the thresholds are incorrectly met</li> <li>• Limited information from non-regulated financial institutions</li> <li>• Data privacy concerns exist for sharing detailed customer specific information internationally</li> </ul>
<b>Data warehouse-based approach</b>	<ul style="list-style-type: none"> <li>• Financial institutions and financial industry utility firms are anticipated to generally be able to produce information of sufficient granularity; no key information gaps identified, however, technological and infrastructure-related challenges exist, including: <ul style="list-style-type: none"> <li>– Significant infrastructure development for financial institutions, utilities, and regulators</li> <li>– Significant costs and resource requirements for regulator(s) to maintain data warehouse</li> <li>– License costs to access market vendor data</li> </ul> </li> <li>• Data privacy concerns exist for sharing detailed customer specific information internationally</li> </ul>

## SIFMA member firm roundtable discussion summary

The eight systemic risk information approaches were discussed by a group of SIFMA's financial industry member firms' executives at a roundtable session held in March 2010. The enterprise-wide stress test-based approach received the most favorable comments from the roundtable participants as providing a more comprehensive view of the health of SIFIs. However, it was agreed that more robust, "tougher," and more detailed stress testing scenarios need to be developed to measure the impact of key systemic risk concerns on the financial institutions and the overall market.

A second approach which received favorable comments was the reverse stress test-based approach in which financial institutions develop their own scenarios which may have a significant impact on their operations and describe the precautions they would take to help mitigate the risks. It was noted that the use of reverse stress tests in conjunction with enterprise-wide stress tests would be effective since the scenarios identified from the various financial institutions' reverse stress tests would inform the regulators' scenarios and vice versa. Additionally, it was discussed that an aggregated risk reporting template-based approach could be an effective complement to the stress testing approaches to provide the systemic risk regulator with a view of the health of SIFIs.

The regulator data warehouse-based approach received the most negative feedback as member firms believe that the approach is impractical for a systemic risk regulator to use once implemented. Member firms also cautioned that relying on an approach focused on massive quantities of granular information may provide a false comfort to a systemic risk regulator, who should consider a more holistic view, such as of overall trends, major concentrations and imbalances, and significant interconnections between firms. A data-centric approach poses the risk that the systemic risk regulator could "miss the forest for the trees."

## Subjective "backtesting" assessment

To provide insights into the likely utility of these approaches in understanding potential future systemic events, a subjective backtesting exercise was performed to assess their strengths and weakness. The backtesting was set up as a simplified table top exercise, in which participants were asked to assess the utility of each of the data approaches against seven recent (i.e., post 1980) market dislocations and a hypothetical event; a clearing house failure. The market dislocations included a range of different types of systemic shocks, such as the 1987 stock market crisis, the Mexican peso crisis, and the recent global credit crisis.

The exercise participants were senior risk management professionals at a subset of the financial institutions which participated in the systemic risk information study. In the exercise, the participants rated the perceived utility of the information approaches in each of the identified market dislocations, and assessed the approaches usefulness in anticipating and understanding a market dislocation to help develop a perspective on their likely efficacy. They also assessed the approaches in terms of the quality of information captured and whether it was at a useful level of granularity (i.e., detailed enough to allow for meaningful analysis but structured and summarized enough to facilitate the identification of systemic issues). The likely comparability of information across firms and products, and how easily they lend themselves to aggregation to understand broader market problems was also a consideration in the exercise.

The exercise also highlighted the assumptions necessary for each model to be successful. The majority of participants were in favor of approaches which were less dependent on assumptions, and which had less complex assumptions around data reporting and analytics.

Exercise participants had the strongest confidence in stress testing-based approaches and risk template-based models, with additional interest in concentration exposure reporting. There was

general skepticism among the participants about the practicality and usefulness of the more granular data driven approaches, especially the regulator data warehouse.

Exercise participants were generally confident about the utility of the enterprise-wide stress test-based approach, which they believed reflected their experiences in performing the SCAP stress testing process (SCAP is described further in the “Systemic risk information initiatives” section) in 2009. Several said the relatively straightforward procedure for stress testing was seen as a practical advantage, noting it was “expedient to implement” and “focused on a known problem,” and was “reasonably easy to aggregate responses and it would be useful without delay.” However, a key assumption was stated that “regulators must have sufficient insight to spot an impending problem, define the metrics, and collect and analyze the data prior to the onset of a crisis.”

The reverse stress test-based approach was also seen as effective, with participants noting it offered similar advantages in efficacy and manageable scope. It was suggested that it might be “potentially more useful for identifying idiosyncratic scenarios which may not have occurred to all firms.” The results of reverse stress testing could be used as the input for regulator designed stress tests, so “new, interesting or material scenarios suggested by one firm could be made mandatory for other firms to calculate.”

Respondents also thought stress testing inherently had an effective division of labor between firms and regulators. “They force much of the basic work to be done by the banks, which collect information and can run it through their stress systems. This allows the regulator to focus on the types of stress events and potential correlations to understand their broader implications.”

Both the aggregated risk reporting template-based approach and the risk sensitivity-based approach also received strong scores, although responses were more mixed than on stress tests. They offered the advantages of “manageable implementation” and “consistent definitions for ‘apples to apples’ aggregation and comparison across firms.” Respondents noted that a specified data template format would make it much easier to aggregate information across firms, and create a picture of broader market trends. These approaches could also be useful once a crisis has developed, since they “provide info on what you need to dig into in a crisis because they have been previously sorted.” Regulators could also make the process more effective and suited to potentially emerging issues by conducting “periodic reviews of templates,” and evolving the template to take advantage of their “flexibility of design to adapt as the market changes.”

However, there were also “potential concerns over effectiveness if results are based on sensitivities rather than a defined scenario, as this may not capture non-linear or contingent risks,” although this would not be a problem for “crises which were simple cases of too much directional exposure.” Another participant cautioned that robust risk sensitivity analysis is less common outside the investment banking world.

Both the trade repositories-based approach and the repositories and key industry utility firms-based approach generally scored much lower than either the stress tests or the risk template based approaches. Participants were split in their scoring, with some seeing the approaches as having some utility, while others were quite skeptical they would be effective. Participants raised concerns about the volume of data regulators would need to work with, and the difficulty of creating an appropriate infrastructure. Many likened their concerns about these models to their concerns about the data warehouse-based approach discussed below. Several participants also noted that the repository driven approaches would be more useful in understanding certain types of crises, particularly those with a strong market risk component, such as the bond market crisis, and less effective for an event like the savings & loan crisis, which had a much smaller trading component.

The concentration exposure reporting-based approach received generally strong marks, with participants stating that it could be useful across the crises examined. Participants noted that it would

be “especially useful for spotting counterparty concentrations, during the 2008 crisis.” Another participant observed that “once the crisis has already broken it would also provide valuable information on interactions and exposures.” Some respondents suggested it would be most useful in certain types of crises, pointing to the Russian financial crisis / failure of Long Term Capital Management and the recent global credit crisis as situations where concentration reporting could have been most effective. However, one participant suggested “its effectiveness depends on measurement standards,” noting that “spotting credit default swap concentrations would have required reporting scenario credit exposure with stressed valuations of the underlying swaps, not just current unsecured exposure, which would have been small due to margining.”

The data warehouse-based approach was generally recognized as offering the most granular data but many participants raised concerns around its feasibility and its ability to model the systemic risks associated with the crises tested. One participant stated that “it has the potential to be the most powerful, but might end up being the least useful if the infrastructure is not good enough or if insufficient time and expertise is used to analyze the results.” While it was recognized that the quality of the infrastructure would be a critical factor in the success of any of the information approaches, participants believed that due to the size and complexity of developing a data warehouse-based approach, it would negatively impact this approach more extensively than any of the other approaches.

Respondents consistently pointed out concerns about the burden for market experience and knowledgeable data analysis this approach would place on the regulator. One participant stated that “you can ask for any data you want, but you will need to get an opinion about it and figure out what is really going on.” Although a data warehouse would provide regulators with “consistent, detailed definitions at the lowest possible level to accurately aggregate data,” this would only be possible with a large enough staff of “analysts with deep understanding of markets, products, etc. to find meaningful trends.”

Exercise participants also warned of the significant cost and complexity of this approach. One respondent believed that “a regulator would become the risk manager for the entire industry and that is a challenging exercise. The amount of work needed to build a risk management group for the entire financial system is huge.”

## Conclusion

There is much work to be done, both domestically and globally, in order to address the issue of systemic risks in the financial system. Although some initiatives are already in place and legislation is pending, new regulations must align with financial institutions’ ability to provide relevant information to regulators. It is hoped that the systemic risk information approaches described in this study will provide a systemic risk regulator with useful information to help determine potential information requirements and address potential gaps. Information gaps are inevitable, however, as noted by the FSB, “These gaps are highlighted, and significant costs incurred, when a lack of timely, accurate information hinders the ability of policy makers and market participants to develop effective policy responses.”<sup>10</sup>

The information requirements and gaps associated with the potential systemic risk information approaches described in this study may be beneficial for financial services industry firms, regulators and policymakers preparing for ongoing regulatory reform. The study should provide a starting point for understanding what potential information needs a systemic risk regulator may require from industry firms in order to successfully identify, monitor, and measure systemic risk in the financial system on an ongoing basis.

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<sup>10</sup> Financial Stability Board. (October 2009).



The eight systemic risk information approaches discussed herein have significantly different potential benefits and utility to a systemic risk regulator as well as different gaps in coverage, possible shortcomings, and potential costs to the industry and markets. In addition, they possess widely varying infrastructure requirements with accordingly different time and resources needed to implement and maintain. Thus, a systemic risk regulator may choose to use multiple systemic risk information approaches and also may consider a phased approach implementing different alternatives over time.

# Background

## What is systemic risk?

It is widely accepted that there is no single agreed-upon definition for systemic risk. As the systemic risk regulator role is developed and implemented, it is essential that industry and regulators have a common understanding as to what “systemic risk” means.

The definition below identifies interconnectedness as a key of systemically important firms:

- Systemic risks are developments that threaten the stability of the financial system as a whole and consequently the broader economy, not just that of one or two institutions. (Ben S. Bernanke, Chairman, Board of Governors of the Federal Reserve System (“Federal Reserve”))<sup>11</sup>

The European Central Bank’s definition offers another perspective, one which focuses on trigger events which may impact the overall economy:

- In the context of our economic environment, systemic risk is the threat that developments in the financial system can cause a seizing up or breakdown of this system and trigger massive damages to the real economy. Such developments can stem from the failure of large and interconnected institutions, from endogenous imbalances that add up over time, or from a sizable unexpected event. (Jean-Claude Trichet, President, European Central Bank)<sup>12</sup>

For purposes of this study, the factors to be included in a definition of systemic risk include: size (of an individual financial institution or a combination of smaller firms), interconnectedness, and the potential for underlying issues, such as complexity and leverage, exposure concentrations, erosion of market practices, marketplace bubbles, and the potential of a failure (of a systemically important firm or group of firms) to serve as a trigger event which may impact the broader real economy.

## Key drivers of systemic risk

When considering the complexity of the global financial system, it is essential that key drivers of systemic risk are identified. Knowing these drivers will enable a systemic risk regulator, to identify, measure, and monitor systemic risk events across the entire financial services system.

Throughout the interviews, participants stressed that in order for a systemic risk regulator to effectively identify and act upon the buildup of systemic risk they must be able to identify and measure each of the key drivers outlined below. Furthermore, participants highlighted that systemic risk generally does not build up overnight, rather it typically develops over a sustained period of time; therefore, it is important that a macroprudential regulatory body develop appropriate measures and/or metrics. In terms of systemic risk drivers and information requirements, Andrew Lo of the Massachusetts Institute of Technology identified the “four L’s of leverage, linkages, liquidity, and losses across the financial

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<sup>11</sup> Bernanke, Ben S. in an October 30, 2009, letter to Senator Bob Corker. Quoted in “Bernanke Offers Broad Definition of Systemic Risk.” *WSJ Blogs*, posted November 18, 2009. <http://blogs.wsj.com/economics/2009/11/18/bernanke-offers-broad-definition-of-systemic-risk/tab/article/>.

<sup>12</sup> Trichet, Jean-Claude. “Systemic Risk.” Paper presented at the Clare Distinguished Lecture in Economics and Public Policy, University of Cambridge, Cambridge, December 10, 2009.

system.”<sup>13</sup> Nine drivers of systemic risk were identified by our interview participants: size, interconnectedness, liquidity, concentration, correlation, tight coupling, herding behavior, crowded trades, and leverage.

## Size

Size is widely regarded as a key determinant of the systemic importance of individual financial institutions as well as a major driver of systemic risk. As stated by Federal Reserve Chairman, Ben S. Bernanke:

“In a crisis, the authorities have strong incentives to prevent the failure of a large, highly interconnected financial firm because of the risks such a failure would pose to the financial system and the broader economy. However, the belief of market participants that a particular firm is considered too big to fail has many undesirable effects. For instance, it reduces market discipline and encourages excessive risk taking by the firm. It also provides an artificial incentive for firms to grow in order to be perceived as too big to fail. And it creates an unlevel playing field with smaller firms, which may not be regarded as having implicit government support. ... Indeed, in the present crisis, the too-big-to-fail issue has emerged as an enormous problem.”<sup>14</sup>

Generally, size is regarded as relatively easy to measure because it can be based on the balance sheet data disclosed by regulated entities. There may, however, be complications around embedded leverage and interconnectedness, which could impact the calculation of size when determining the too-big-to-fail institutions. The significance of size for systemic risk depends on the composition of an institution’s activities, its respective size, and its interplay with other systemic risk factors, such as interconnectedness.

Although considered a key driver of systemic risk, according to a report published by NERA Economic Consulting (January 2010), using absolute size as a proxy for systemic importance may fail to identify the real sources of systemic risk. “Legislative proposals that rely on a size-based identification process would erroneously identify a number of financial firms as systemically risky, when in fact they are not. Other firms that do in fact pose significant systemic risk would fail to be identified.”<sup>15</sup> Therefore, it is important to monitor other drivers of systemic risk in addition to size.

## Interconnectedness

A key lesson of the recent financial crisis has been that the interconnectedness of SIFIs has significant implications for global and domestic financial stability. More needs to be done to monitor these interconnections and to assess their implications in order to improve the understanding and enable a closer monitoring of the allocation of risks internationally. (Financial Stability Board)<sup>16</sup>

The impact of systemic risk depends very much on the collective behavior of financial institutions and their interconnectedness as well as on the interaction between financial markets and the

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<sup>13</sup> Engle, Robert F. and Weidman, Scott T. *Technical Capabilities Necessary for Regulation of Systemic Financial Risk: Summary of a Workshop*. Washington, D.C: The National Academies Press. 2010.

<sup>14</sup> Bernanke, Ben S. “Financial Reform to Address Systemic Risk.” Speech to the Council on Foreign Relations, Washington, D.C., March 10, 2009.

<sup>15</sup> Laursen, Christopher; Sharon, Brown-Hruska; Mackay, Robert, Bovenzi, John. Why ‘Too Big to Fail’ is Too Short-Sighted to Succeed: Problems with Reliance on Firm Size for Systemic Risk Determination.” New York: NERA Economic Consulting, 2010.

<sup>16</sup> Financial Stability Board. (October 2009).

macroeconomy. (Gertrude Tumpel-Gugerell, Member, Executive Board of the European Central Bank)<sup>17</sup>

Elements of interconnectedness can generally be measured by consideration of counterparty risks related to a financial institution's activities. Knowing the interconnectedness of a financial institution could enable a systemic risk regulator to determine how many additional failures could be caused by the failure of an individual firm. Therefore, the interlinkage of financial institutions is critical in monitoring systemic risk as a whole.

Similar to the theory of too-big-to-fail is the systemic risk concept known as too-interconnected-to-fail. Too-interconnected-to-fail involves the potential failure of an institution and also the systemic effect of all other commercial activities dependent on that institution.<sup>18</sup> The challenges inherent in assessing interconnectedness have limited the ability of regulators to sufficiently determine the linkages and interconnectedness of firms operating within the financial system.

Derivative trading between financial institutions is an example of such interconnectedness. The systemic risk regulator would require greater awareness of the interconnectedness of activities between firms so that questions, such as the following, might be addressed.

- Who is trading with a given counterparty?
- Who and how many firms are exposed to a potential default of the counterparty?
- Who is 'betting against the firm' through use of credit default swaps (CDS) or other contracts?

Identifying and overseeing the build-up of potential systemic risk "hot-spots" within a market will require, on a relative basis, the development of appropriate metrics to measure the different levels of interconnectedness. This will be a complex challenge, but one that will need to be addressed by the systemic risk regulator.

Monitoring linkages that could lead to the too-interconnected-to-fail issue presents a significant challenge to a potential systemic risk regulator. In order to support the identification and monitoring of linkages, methodologies that enable policymakers to review data on potential systemic linkages must be developed.

In the *Global Financial Stability Report*,<sup>19</sup> International Monetary Fund (IMF) economists have developed three approaches for identifying potential systemic financial linkages, including:

- **The network approach** — Tracks the reverberation of a credit event and a liquidity squeeze throughout the system.
- **The co-risk model** — Exploits market data to assess systemic linkages at an institutional level and is an important method of assessing the markets' perception of how much more tightly the fortunes of financial institutions are linked together during stress times.
- **The default intensity model** — Measures the probability of failures of a large fraction of financial institutions (default clustering) as a result of both direct and indirect systemic linkages.

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<sup>17</sup> Tumpel-Gugerell, Gertrude. "Recent advances in modeling systemic risk using network analysis." Introductory remarks at the European Central Bank Workshop, Frankfurt, October 5, 2009.

<sup>18</sup> Property Casualty Insurers Association of America. *Systemic Risk*. [http://www.pciaa.net/web/sitehome.nsf/lcpublic/392/\\$file/Systemic\\_Risk\\_Definition.pdf](http://www.pciaa.net/web/sitehome.nsf/lcpublic/392/$file/Systemic_Risk_Definition.pdf).

<sup>19</sup> Espinosa-Vega, Marco. "IMF: Prevent Institutions Becoming Too Connected to Fail." *IMF Survey Magazine*, April 21, 2009. <http://www.imf.org/external/pubs/ft/survey/so/2009/RES042109B.htm>.

Each approach has its benefits to risk management, although they are limited in monitoring systemic risks if implemented in isolation. Implementing a combination of the three approaches can help to provide monitoring tools and help mitigate the too-interconnected-to-fail problem. These approaches can also help assess the wider impact of extreme events, identify information gaps, and provide surveillance metrics.

## Liquidity

Liquidity may be referred to as the ‘lifeblood’ of the financial system. Emerging from the recent financial crisis, financial institutions argue that the impact on liquidity is the most salient systemic risk driver. Liquidity risk has the potential to impact firms’ ability to meet their financial obligations. If the overall supply of liquidity dries up, a threat is posed to the financial system as financial institutions may be unable to sufficiently fund their operations. It is essential that financial institutions have sufficient funds available, at a reasonable cost, to meet potential demands from both funds providers and borrowers.

The dynamics of liquidity risk vary according to the balance sheets and corporate structures of financial institutions. Common signs of potential liquidity problems include increased funding costs, rating downgrades, decreases in credit lines, and requests for additional collateral. A trigger of the recent financial crisis, the bursting of the housing bubble in conjunction with large exposures of levered financial institutions, led to significant losses and funding liquidity issues which caused systemic liquidity spirals. Generating more data on trading volume trends, liquidity status, and trading volume declines could assist in identifying systemic risks.

It is widely accepted that increased regulation of CCPs will be required to help manage the buildup of systemic risks. However, regulators must avoid adopting approaches to influence central clearing parties, which may have unintended consequences, through increasing their collateral requirements during a crisis. These actions may exacerbate systemic risk problems by further restricting available liquidity. Therefore, it is critical that a systemic risk regulator maintains appropriate oversight of CCPs in a manner which will not have wider liquidity implications on the financial system.

In the period leading up to the recent financial crisis, liquidity was a known issue and regulators were receiving liquidity information on a firm-by-firm basis. However, regulators did not foresee the impact of systemic liquidity issues caused by structured investment vehicles and other non-regulated entities. This exemplifies the need for the availability of complete data across the financial system to support oversight of liquidity risk on a macroprudential basis, data which is currently lacking.

## Concentration

From a microprudential perspective, concentration risk refers to exposures with the potential to produce extreme losses that threaten the overall health of a financial institution. From a macroprudential perspective, concentration risk may occur when numerous financial institutions have exposures to a single counterparty, industry, or product. In concentrated positions/holdings, an oversupply of specific positions/holdings causes the inability to liquidate or transfer risk at a rational price. In a down-trending market, valuations may require additional collateral which continues the downward spiral.

Risk concentrations can arise in financial institutions’ assets, liabilities, and off-balance sheet items or through a combination of exposures across these categories. Risk concentrations can take multiple forms, including exposures to individual counterparties, groups of individual counterparties, and specific products or sectors. Prior to the recent financial crisis, there appeared to be insufficient regulatory oversight of the buildup of concentrations in certain market sectors, such as the real estate market. The SCAP addressed the question of what potential losses could occur in major banks given large concentrations in real estate. Unfortunately, the large and concentrated buildup in real estate-related exposures across the industry was missed by many.

Monoline insurers represent a good example of how concentrations present a significant source of systemic risk as they participate solely in financial guaranty insurance and guarantee the timely repayment of bond principal and interest if an issuer defaults. Due to the nature of their business, monoline insurers inherently have heavily concentrated risk exposures as they are not able to diversify risk over multiple product lines.

Initiatives, such as the SCAP, should help a systemic risk regulator identify and oversee the macroprudential buildup of concentration risk across the market. However, further enhancement of regulatory oversight initiatives is required as SCAP had its limitations (see the “Systemic risk information initiatives” section). Understanding market share and concentrations of an individual firm relative to the market and to its peers is needed in order for regulators to analyze trends and identify potential systemic risks. It is difficult, however, to effectively identify concentrations as there may not be a sufficient amount of available financial market / product transactional data and thus calculating concentrations on a macroprudential basis could prove to be a highly complex task for the systemic risk regulator.

### Correlation

The significance of correlation (also known as “too-many-to-fail”) as a driver of systemic risk was highlighted in a recent paper by John C. Hull, Professor of Derivatives and Risk Management at the University of Toronto’s Rotman School of Management,<sup>20</sup> where he stated “the underlying cause of the credit crunch was the high level of correlation between the default rates in different parts of the U.S.” In times of crisis, a group of financial institutions which would not typically pose a systemic threat might become systemically important due to heavily correlated risk exposures. It would be important for the systemic risk regulator to define the group of institutions classified as ‘jointly systemic’ and implement parameters for monitoring correlation risk across the market, using risk models, stress tests, and scenario analysis on a macroprudential basis.

Before the credit crisis, diversification of risk was considered a safe and risk-reducing practice, but with the benefit of hindsight it was noted that regulators and firms collectively did not have sufficient understanding of the types of risk and their correlations and concentrations to understand the implications of this practice and the remaining risks. Thus, it is important that a systemic risk regulator proactively monitor correlations and concentrations in order to identify the buildup of systemic risk in the financial system.

### Tight coupling

According to Richard Bookstaber, “A tightly coupled process progresses from one stage to the next with no opportunity to intervene. If things are moving out of control, you can’t pull an emergency lever and stop the process while a committee convenes to analyze the situation.”<sup>21</sup> As an example, tight coupling in financial markets comes from the feedback between mechanistic trading, price changes and subsequent trading based on the price changes. The mechanistic trading can result from a computer-based program or contractual requirements to reduce leverage when things turn bad.

When highly leveraged positions experience downturns in collateral value such that they are unable to meet their margin calls, the financial institution may be forced to sell additional assets. However, this may lead to falling asset prices which could cause a further decrease in collateral and may force further sales to increase the financial institution’s capital buffer. This downward spiral can lead to the

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<sup>20</sup> Hull, John C. “The Credit Crunch of 2007: What Went Wrong? Why? What Lessons Can Be Learned?” *Journal of Credit Risk*, 5, 2 (2009).

<sup>21</sup> Bookstaber, Richard. “The Myth of Non-Correlation” *Institutional Investor*, September 2007

failure of major organizations, thus impacting other connected organizations and triggering a potential systemic event.

Tight coupling caused by leverage can also lead to linkages between financial markets. According to testimony of Richard Bookstaber submitted to the U.S. House Financial Services Committee,<sup>22</sup> a highly leveraged market can have a significant negative impact on another unrelated market which is in a sound condition. This could be caused by fund managers being forced to sell the assets they are able to sell as opposed to those they would like to sell due to illiquid market conditions. This increases pressure on the financially stable markets which happen to house the securities held by the highly leveraged fund. If other highly leveraged funds have similar exposures, it can cause a ripple effect throughout the markets causing financial distress.

### Herding behavior

Herding behavior is a phenomenon in which individuals within a group perform common activities without consideration of the longer term consequences. An example would be financial institutions and investors following trends set by other organizations until contrary evidence cannot be ignored any longer. The recent financial crisis highlighted the dangers of following trends, such as chasing margins/returns while not performing individual credit analysis. Herding behavior can lead to sharp increases in asset values, overborrowing, and excessive risk taking. This may subsequently lead to falling asset values, rapid deleveraging, risk aversion, and significant losses.

Herding behavior can trigger a systemic event capable of drying up credit flows, impacting liquidity resulting in lower investor confidence. Herding behavior was evident during the previous financial crisis, where many investors were investing significant funds in securities backed by subprime mortgages. In order to potentially lessen the likelihood of future extreme events from developing, herding behavior should be a key focus area for the systemic risk regulator.

### Crowded trades

Individual positions are unlikely to pose a systemic risk, however, a large number of small failures, caused by 'crowded trades' can lead to significant risks developing within the overall financial markets. Similar to the concept of herding behavior, crowded trades occur when a large number of financial institutions follow similar trading strategies, and execute comparable trades. If a number of financial institutions adopt like investment strategies the level of risk is increased as additional assets may be invested in the same underlying risk. Thus, crowded trades could potentially create concentration risk. This behavior may lead to several financial institutions deleveraging at the same time which could create a vicious cycle effect of selling assets quickly, thus lowering prices, leading to more funds having to sell additional assets and so on. This heightens the need for the systemic risk regulator to be able to develop indicators which quantify the extent of crowdedness to help identify such concentrations.

### Leverage

U.S. House of Representatives Financial Services Committee Chairman, Barney Frank (D-MA), has expressed concerns regarding the vulnerability of highly leveraged, lightly regulated firms within the financial system, stating that there is a need for "some entity in the federal government that has got to be able to tell these unregulated entities that you are getting in over your head, you are too highly

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<sup>22</sup> Bookstaber, Richard. "Systemic Risk: Examining Regulators Ability to Respond to Threats to the Financial System." Testimony given before the U.S. House of Representatives' Financial Services Committee, Washington, D.C., October 2, 2007.

leveraged, you need to cut back on lending, you need to improve your capital. We have ways of doing that for banks, but not for nonbanks.”<sup>23</sup>

The term leverage refers to the use of borrowed funds. Excessive debt may cause financial distress as the organization may be forced to cut investment and renegotiate with creditors. During times of crisis concerns about excess debt, renegotiations with creditors, and the transfer of risk may become more severe. Frequently, this will be accompanied by an increase in the probability of credit default. A financially distressed firm’s default can lead to the distress of its lenders, and subsequently impact other firms, thus potentially increasing the buildup of systemic risk across the financial system.

Additionally, excessive risk taking caused by highly leveraged positions with maturity mismatches can lead to a fire-sale externality, which is described as “a situation in which the [financial] institution does not bear the full cost of its own actions.”<sup>24</sup> Fire-sale externalities occur due to the fact that individual financial institutions do not have incentives to account for the price impact that its own fire sale will have on asset prices. “Hence, fire sales by some institution spill over, and adversely affect the balance sheets of others, which constitute a negative externality.”<sup>25</sup> It is critical to monitor the negative externalities that a financial institution creates, or is correlated with, in order to identify a buildup of systemic risk.

In summary there are several main points with regards to leverage: deleveraging reduces risk, regulators and others should watch for increased pockets of leverage as a leading indicator for potential systemic risk, and finally, measures and drivers of leverage should be clarified and agreed upon to establish meaningful metrics and comparisons.

It is recognized that leverage based on new processes or a “new way of doing things” may also create a potential for systemic risk as previous safeguards are considered obsolete, therefore, new processes should be closely monitored and scrutinized. Developing measures for the above drivers may not be effective if introduced in isolation. In order to appropriately oversee the buildup of systemic risk, measures for a number of these drivers should be used in conjunction with each other to gain a more complete view. Financial institutions are in broad agreement that deleveraging has significantly reduced risks in the industry.

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<sup>23</sup> Sanati, Cyrus. “From Rep. Frank, a To-Do List for Changing Wall Street.” *The New York Times*, March 25, 2009.

<sup>24</sup> Brunneimeier, Markus K. *Financial Crises: Mechanisms, Prevention, and Management*. Princeton University, 2009.

<sup>25</sup> Ibid.



## Potential roles of a systemic risk regulator

Although the focus of this study is on systemic risk information requirements, it is essential to outline the potential role and responsibilities of a systemic risk regulator. These considerations will have an impact on the choice(s) of systemic risk information approaches and the associated information requirements.

### Macroprudential regulatory oversight

An anticipated key responsibility of a systemic risk regulator would be to provide macroprudential regulatory oversight by:

- Identifying SIFIs and key financial system infrastructure providers, vendors, and CCP entities
- Identifying regulatory gaps and emerging risks (e.g., “early-warning indicators” or “hot spots”)
- Monitoring system-wide risks
- Providing guidance to financial services regulators (e.g., Federal Reserve, Securities and Exchange Commission (SEC)) using a macroprudential approach
- Coordinating regulatory agency activities
- Establishing policies that affect the stability of the entire financial system

### Oversight of SIFIs

It has been proposed that there be a separate, independent regulatory body tasked with the oversight of SIFIs. Primary responsibilities of this body, on an ongoing basis, would include supervising, monitoring, and examining SIFIs, as identified by the macroprudential regulatory body.

## Potential structure of a systemic risk regulator

Although not a focal point of this study, but a potential driver of information requirements is the structure of the systemic risk regulator. Proposed structures have included establishing a systemic risk oversight council composed of key regulatory agencies or assigning the responsibility to an individual regulatory agency (either a newly created agency or an existing one, such as the Federal Reserve). Another consideration is possibly the creation of a ‘think tank’ composed of members of regulatory agencies, academics, and industry practitioners.

A critical component, regardless of the structure determined, as mentioned in the FSB and International Monetary Fund report, *The Financial Crisis and Information Gaps*,<sup>26</sup> will be an effective communication channel enabling ongoing dialogue amongst international systemic risk oversight bodies and analytical groups, domestic and international financial authorities, and the various regulatory and industry groups. Coordination among international regulators is essential to help avoid the duplication of work and to develop consistency of approaches to systemic risk issues.

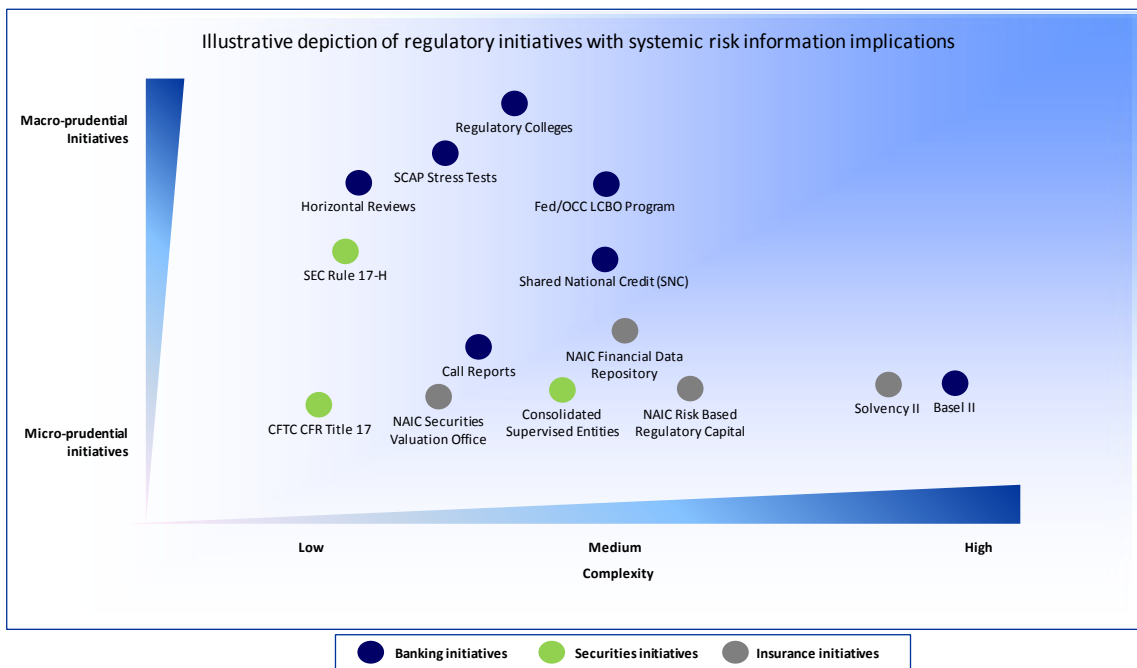
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<sup>26</sup> Financial Stability Board. (October 2009).

# Systemic risk information initiatives

## Illustrative systemic risk information initiatives

An important aspect of the data study was the identification of future data requirements, plus the designation of areas where existing practices could be leveraged. To accomplish this, an analysis of regulatory reporting initiatives and programs was undertaken, including assessing a sample of microprudential and macroprudential initiatives used by regulators of the banking, securities, and insurance industries. Key data requirements were identified and the chart below depicts microprudential and macroprudential initiatives at various stages of complexity of the implementation and ongoing maintenance of the initiatives. The range of these programs illustrates the varying degrees of macroprudential versus microprudential utility and the complexity of the implementation and maintenance of the initiatives. The illustration below contains a sample of regulatory initiatives placed subjectively on a low, medium, or high continuum of complexity. It is intended to show that the distinction between macroprudential and microprudential considerations is not binary; rather there is a range of relative prudential considerations.



Each of the initiatives identified in the chart are discussed in greater detail in the following sections to provide additional background on the information currently available in the market. Each initiative has been described at a high level to outline the process flow, benefits, implications, and resource requirements.

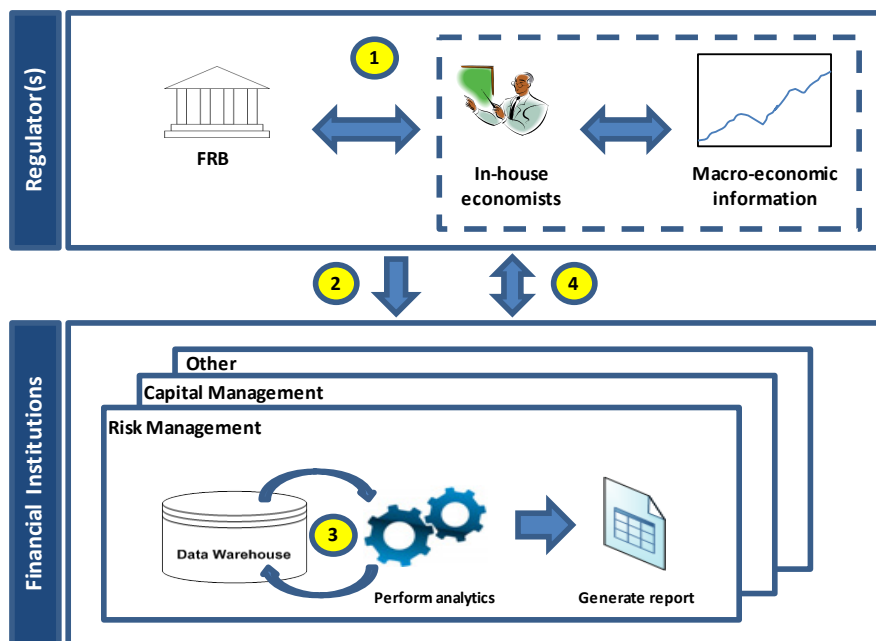
## Systemic risk initiatives

### Banking initiatives

#### **SCAP (Supervisory Capital Assessment Program)**

SCAP was a forward-looking exercise designed to estimate losses, revenues, and capital needs in 2009 and 2010 for 19 U.S. bank holding companies with assets exceeding \$100 billion dollars. Two macroeconomic scenarios were used. The process involved the projection of losses on loans, assets held in investment portfolios, and trading-related exposures, as well as a firm's capacity to absorb losses in order to maintain a sufficient capital level under a worse-than-expected macroeconomic scenario. The assessment was conducted by the Federal Reserve, in conjunction with the Federal Deposit Insurance Corporation (FDIC), and the Office of the Comptroller of the Currency (OCC).

Illustrative process flow of SCAP:<sup>27</sup>



#### **Some key benefits of the SCAP approach**

The SCAP process was an unprecedented initiative that covered the 19 largest financial services firms and was considered an overall successful exercise by regulators. The SCAP's design and process embodied two perspectives, i.e., combining top-down industry-wide estimates and projections with bottom-up, firm-specific data and analysis. The SCAP provided an example of how macroprudential and microprudential approaches to regulation can be combined to create a stronger supervisory framework, one that addresses a wide range of supervisory objectives. The process also demonstrated the benefits of applying a consistent set of scenarios, in this case ones which focused on credit risk and capital buffers resulting in different outcomes, to systemically important firms.

The ability to review capital positions across the industry allows supervisory authorities to identify industry trends. The publicized results gave confidence to the public and financial community that

<sup>27</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

banks had sufficient capital or were taking steps to increase capital, if necessary. Bank holding companies participating in the SCAP took substantial actions to improve their capital, including an increase of more than \$77 billion in Tier 1 common equity for those companies that needed an extra capital buffer.

The SCAP placed clear ownership and accountability for measuring and monitoring systemic risk with financial institutions. Mastery of conducting stress tests in response to potential regulatory requirements will enable banks to improve their scenario analyses and manage their economic capital more effectively.

### ***Implications of the SCAP approach***

Although the SCAP process was largely viewed as a successful exercise, there were some areas which require further enhancement. The SCAP exercise has an inability to assess vulnerabilities arising from interconnected events across risk and asset types. ‘Siloed’ traditional risk management models in various asset classes lacked the cohesiveness to properly forecast the overall firm impact of abnormal conditions and events.

Another implication of the SCAP was that it had a restricted scope, i.e., 19 large bank holding companies analyzing two basic scenarios — a continuing downturn in the overall economy and a slightly more adverse condition. Critics would argue that banks need a framework that allows managers and analysts to easily run different scenarios across a variety of risk factors and portfolios. Longer horizon and more detailed stress scenarios are needed to assess the risks of all asset classes and their impact on the overall market.

An area of concern with the SCAP was the macroeconomic assumptions that lay behind the loss estimates. The adverse scenario on which losses were based was very close to mainstream projections for key variables. The mainstream projections were in fact exceeded, illustrating that the scenarios were not sufficiently severe. Tier 1 common capital was used to assess capital levels but, according to the *Wall Street Journal*,<sup>28</sup> many experts believed that tangible common equity would have been a more accurate measure in assessing capital buffers.

In summary, SCAP was a complex exercise which required significant consultation between regulators and financial institutions to complete. There was heavy reliance on financial institutions to perform the analytics using internal models and provide results on a timely basis with potential varying quality of results.

### ***Some key resource requirements***

If SCAP were to be required on a regular basis, it would require, from an industry perspective, a relatively significant increase in financial institutions’ risk and analytics resources to compile and report the required information. From a regulatory perspective, regular SCAPs would require an increase in regulator(s)’ resources to recruit dedicated economists to develop the stress test scenarios, plus additional resources to review and challenge stress test results provided by financial institutions and validate the internal models used.

### ***Shared National Credit***

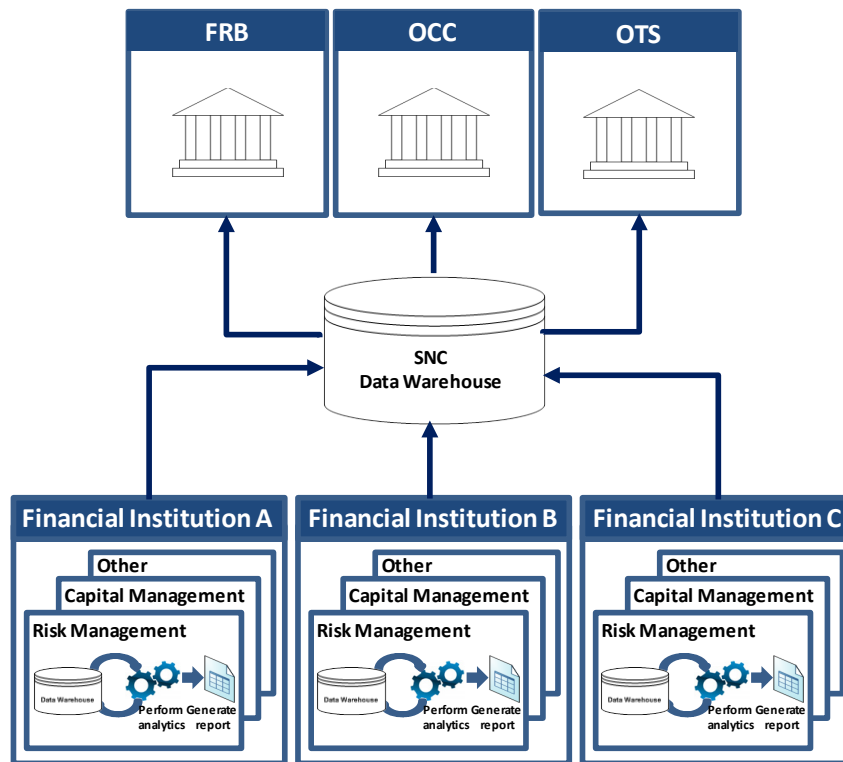
The Shared National Credit Program (SNC) was established in 1977 by the Federal Reserve, the FDIC, and the OCC, and provides a consistent review and classification of any loan and/or loan

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<sup>28</sup> Enrich, David; Fitzpatrick, Dan; and Eckblad, Marshall. “Banks Won Concessions on Tests, Fed Cut Billions Off Some Initial Capital-Shortfall Estimates; Tempers Flare at Wells.” *The Wall Street Journal Online*, May 9, 2009. <http://online.wsj.com/article/SB124182311010302297.html>

commitment of at least \$20 million that is shared by three or more unaffiliated federally supervised institutions.

Illustrative process flow of SNC:<sup>29</sup>



#### ***Some key benefits of the SNC approach***

- Provides consistent credit risk rating for shared credits
- Allows for evaluating underwriting and scoring process
- Allows for assessing credit quality migration

#### ***Some key implications of the SNC approach***

- Data management requirements for universe of shared national credits
- Limited coverage of overall loan market
- Private data (only to be used by regulators)
- Performed annually which may lead to timeliness issues

#### ***Some key resource requirements***

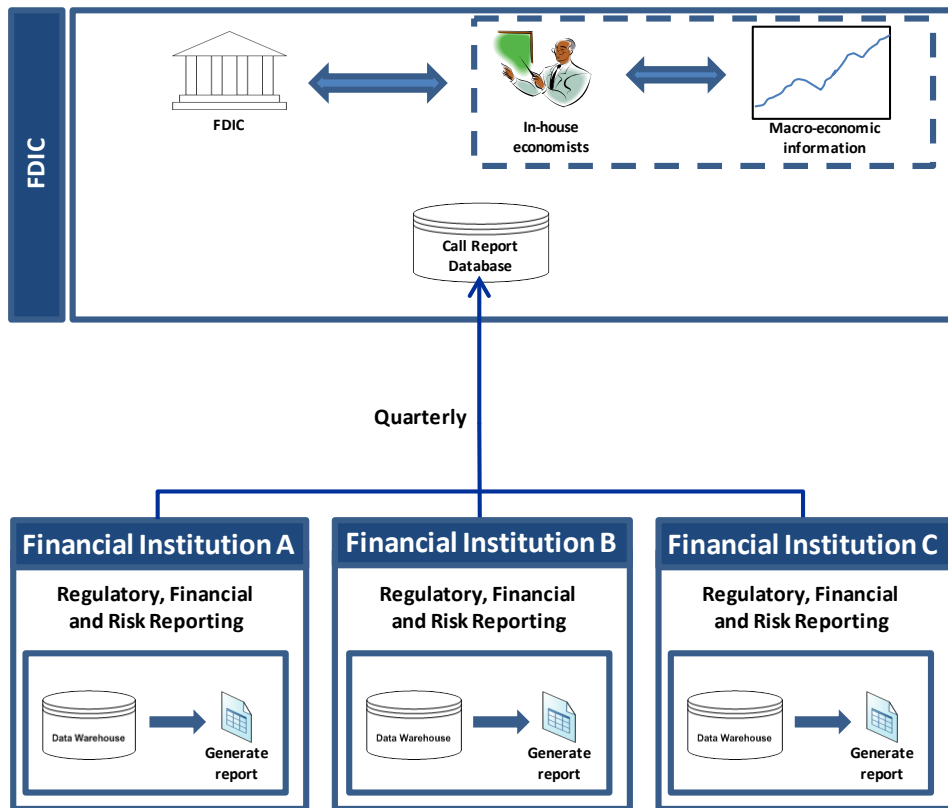
- Credit risk-trained examiners (regulators)
- Technology support for data capture (industry)
- Resources to populate templates (industry)

<sup>29</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

## Call reports

Call reports are quarterly reports of income and condition required by a financial institution's primary supervisory agency, i.e., Federal Reserve, OCC, and FDIC. The FDIC collects, updates, and stores the call reports data submitted by insured national and state non-member commercial banks and state-chartered savings banks.

Illustrative process flow of call reports:<sup>30</sup>



### Some key benefits of call reports

- Timely and accurate financial data regarding a bank's condition and the results of its operations
- Capability to perform enhanced peer group financial analyses
- Publicly available source of information regarding the status of the U.S. banking system

### Some key implications of call reports

- Places emphasis on FDIC to maintain an accurate and up-to-date call report database readily available to regulators, banks, and the general public
- Restricted to national and state nonmember commercial banks and state-chartered savings banks
- The information collected is high level in nature, may be insufficient to support bottom-up aggregation for systemic risk purposes

<sup>30</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

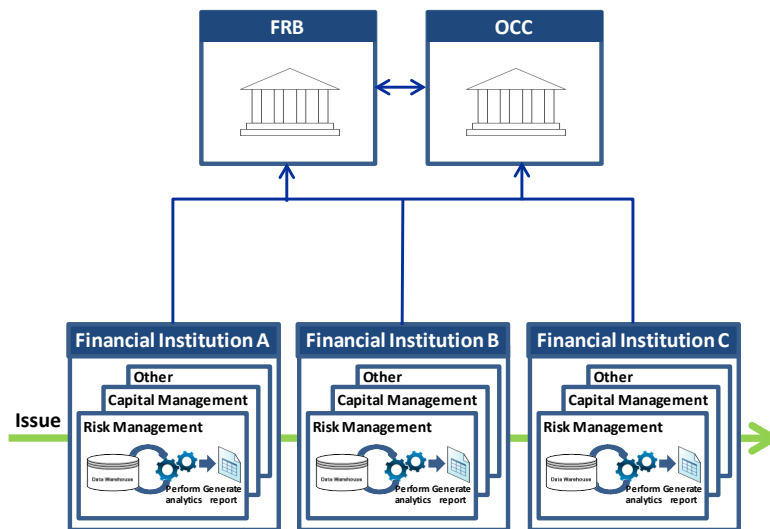
### **Some key resource requirements**

- Specialized FDIC resources who have the ability to interpret, challenge, manipulate, and propose corrections based on the information in the call reports
- Specialized analytical resources and technological systems to prepare and submit the call reports (industry)

### **Horizontal reviews**

Horizontal reviews examine issues in a specific area of several financial institutions. As an example, the Federal Reserve conducted a horizontal review of incentive compensation arrangements at large financial institutions under their supervision, which describes their plans, including relevant timetables, for improving the risk sensitivity of incentive compensation arrangements and related risk management, controls, and corporate governance practices.

Illustrative process flow of horizontal reviews:<sup>31</sup>



### **Some key benefits of the horizontal reviews approach**

- Provides consistent view of key issues across SIFIs
- Allows focus on particular issues (“hot-spots”) as they arise
- Allows for institutional benchmarking

### **Some key implications of the horizontal review approach**

- Applies to banks, not to unregulated financial institutions
- Horizontal reviews gather data from multiple sources with inconsistent data formats as there is no central database for aggregation of historical and current information

### **Some key resource requirements**

- Specialized resources required for horizontal review subject (regulator)

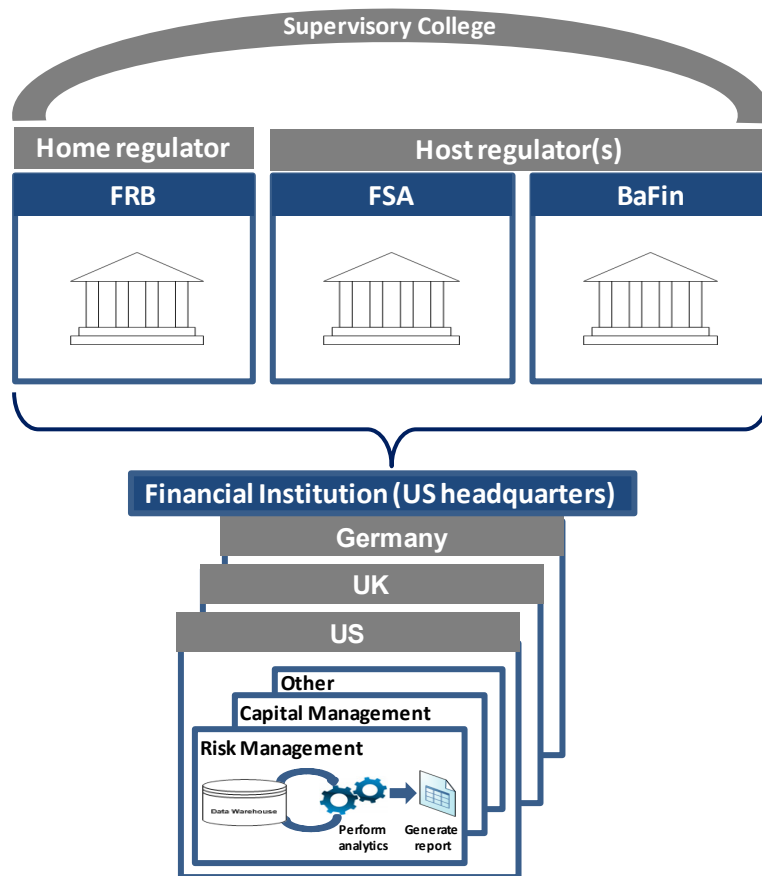
<sup>31</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche’s analysis. It does not represent the actual detailed process flow of any single institution or regulator.

- Increased information delivery pressure (industry)

### **Supervisory colleges**

Supervisory colleges can be related to both insurance and banking sectors and, therefore, cover a broad spectrum of financial services. An example of a banking supervisory college is a group of regulators who have a shared regulatory interest for a specific SIFI. The members of the regulatory college typically represent the regulators of material businesses of the SIFI. The members will have different roles depending if they are the home supervisor versus a host supervisor that may oversee non-headquarter location activities. A regulatory college may also cover a group of smaller institutions based on the size, product makeup of their assets and relevant locations.

Illustrative process flow of Supervisory College (example):<sup>32</sup>



#### **Some key benefits of the supervisory colleges approach**

- Coordination amongst regulators for systemically important firms
- Consistent approaches across regulatory bodies

#### **Some key implications of the supervisory colleges approach**

- Requires significant coordination efforts internationally across regulatory bodies

<sup>32</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.



- Output not publicly available

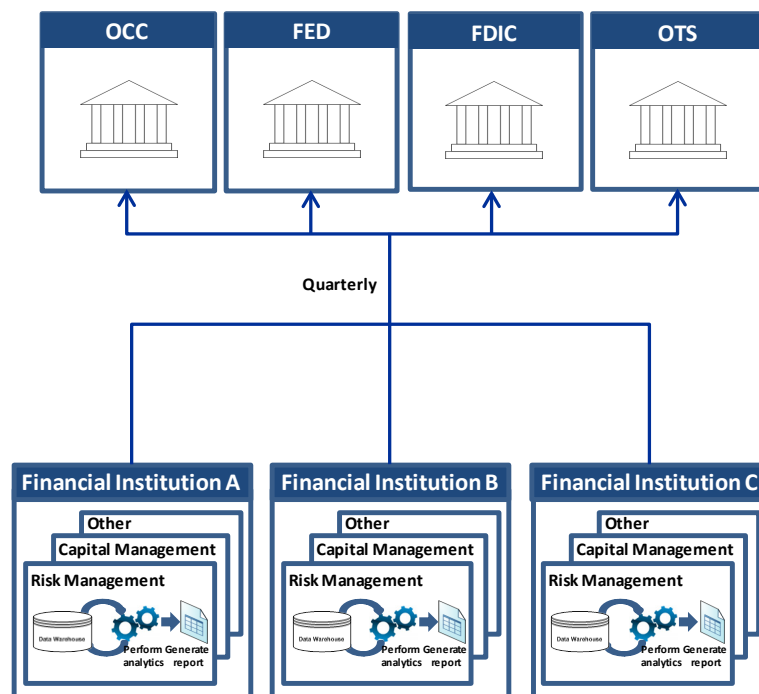
### **Some key resource requirements**

- Increased coordination required among regulators

### **Basel II**

Basel II provides a framework of banking regulatory guidance issued by the Basel Committee on Banking Supervision. The purpose of Basel II, which was initially proposed in 2004,<sup>33</sup> was to create an international standard that banking regulators can follow when developing regulations regarding the amount of capital that banks need to guard against financial and operational risks. Post the current financial crisis, there has been increased review and potential upcoming changes to the Basel II requirements, in the form of the proposals, which are currently referred to as 'Basel III'.

Illustrative process flow of Basel II:<sup>34</sup>



### **Some key benefits of the Basel II approach**

- Promotes enhanced risk-management processes, models, abilities, and linkages among large, internationally active banking organizations
- Improves consistency of capital regulations internationally

<sup>33</sup> Basel Committee on Banking Supervision. International Convergence of Capital Measurement and Capital Standards: A Revised Framework. Basel, Switzerland, June 2004.

<sup>34</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

### **Some key implications of the Basel II approach**

- Requires financial institutions to determine internal capital adequacy as part of Pillar II/internal capital adequacy assessment process requirements
- Requires, at a minimum, banks to subject their credit portfolios in the banking book to stress tests
- Time and costs associated with building the risk management infrastructure to comply

### **Some key resource requirements**

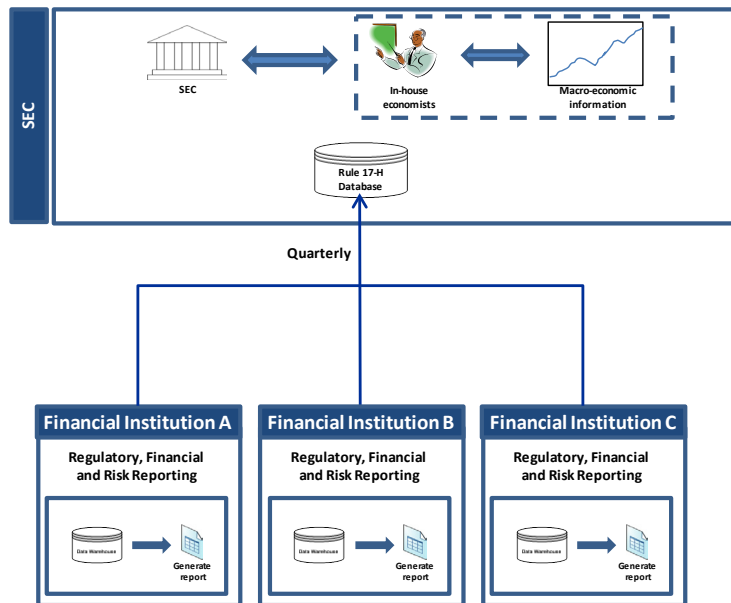
- Risk management and technological resources to develop infrastructure and data formats to comply with requirements (industry)
- Specialized resources to understand, review, and challenge the capital requirements (regulators)

## **Securities initiatives**

### **SEC Rule 17-H**

Rule 17-H refers to the risk assessment recordkeeping requirements for broker-dealers that are registered with the SEC and are part of a holding company structure with at least \$20 million in capital. The purpose of Rule 17-H is to assess risks that may stem from affiliated entities, including holding companies and keep apprised of significant events that could adversely affect broker-dealers, customers, and the financial markets.

Illustrative view of the process flow of SEC Rule 17-H:<sup>35</sup>



### **Some key benefits of the SEC Rule 17-H approach**

- Standardized template (Form 17) for financial institutions to populate, issued by SEC; flexibility because financial institutions can submit information in another format as long as all required data is included

<sup>35</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

- Requires financial institutions to maintain and preserve records and other granular information concerning entities related to the broker-dealer and file such information on a quarterly basis

### **Some key implications of the SEC Rule 17-H approach**

- Limited scope in reporting as only broker-dealers with over \$20 million in capital have to file
- Financial institutions required to generate accurate information in a timely manner

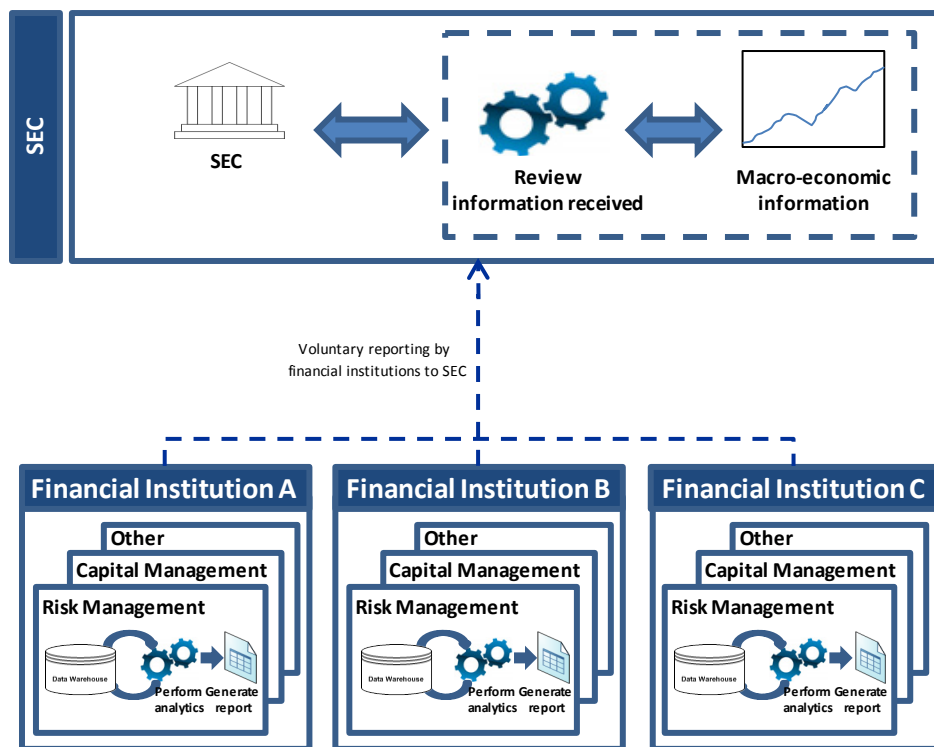
### **Some key resource requirements**

- Specialized resources to populate required forms and submit (industry)
- Specialized resources to review and challenge forms submitted (regulator)

### **Consolidated supervised entities**

The consolidated supervised entities (CSE) program was created in 2004<sup>36</sup> for global investment bank conglomerates that lack a consolidated prudential supervisor to voluntarily submit to regulation, designed to mirror Basel II/Pillar I Capital Requirements. The SEC did not have the authority to require these investment banks to report their capital, maintain liquidity, or submit to leverage requirements on a consolidated basis, therefore, the SEC created the voluntary CSE program to fill this regulatory gap.

Illustrative process flow of CSE:<sup>37</sup>



<sup>36</sup> U.S. Securities and Exchange Commission. "Alternative Net Capital Requirements for Broker-Dealers That Are Part of Consolidated Supervised Entities; Supervised Investment Bank Holding Companies; Final Rule." *Federal Register* 69, no. 118 (June 2004).

<sup>37</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

### Some key benefits of the CSE approach

- The CSE requires financial institutions to improve risk management standards through:
  - Establishing, documenting, and maintaining a system of internal risk management controls
  - Developing a risk control unit reporting directly to senior management, independent from trading units
  - Generating and retaining records related to its system of internal risk management controls

### Some key implications of the CSE approach

- Initiative was purely voluntary; broker-dealers need to agree to SEC supervision of their holding companies in exchange for alternative capital requirement
- Relies on broker-dealer internal models to calculate its market risk charges and derivatives-related credit risk charges

### Some key resource requirements

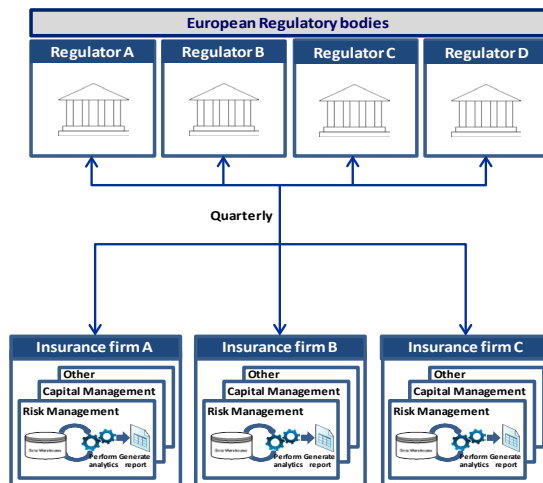
- Specialized resources needed to develop internal models in order to compute net capital figures (industry)
- Specialized resources to understand and assess and challenge the financial institutions' net capital calculations (regulator)

## Insurance initiatives

### Solvency II

Solvency II is a substantial enhancement and revision of the capital adequacy regime for the European insurance industry. It aims to establish a more risk-based set of EU-wide capital requirements and risk management standards that will replace the current Solvency I requirements. Solvency II applies to all insurance and reinsurance firms with gross premium income exceeding €5 million or gross technical provisions in excess of €25 million.

Illustrative process flow of Solvency II:<sup>38</sup>



<sup>38</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

### **Some key benefits of the Solvency II approach**

- Establishes new, strengthened EU-wide requirements on capital adequacy and risk management for insurers with a view to reducing the likelihood of an insurer failing
- May provide insurance supervisors early warning indicators so they can intervene promptly if capital falls below required level
- Reduces possibility of consumer loss or market disruption in insurance
- Requires EU insurance companies to undertake an “own risk and solvency assessment” (ORSA) to demonstrate prudent business management practices and assess overall solvency needs

### **Some key implications of the Solvency II approach**

- Limited scope focuses only on insurance companies in EU
- Requires significant risk management infrastructure development to comply with Solvency II regulations

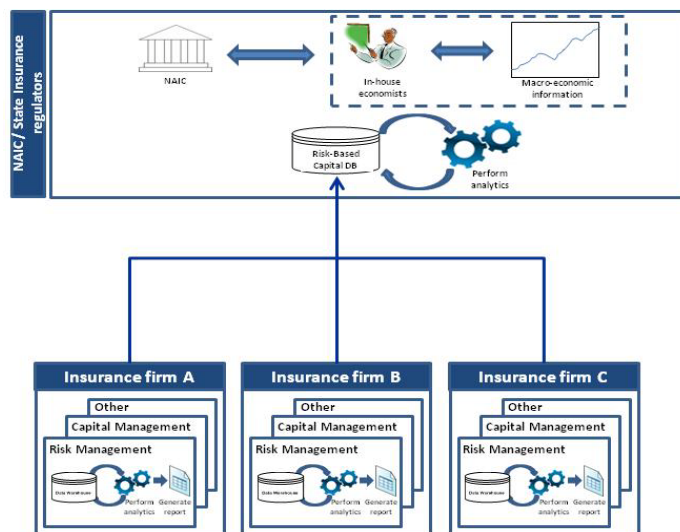
### **Some key resource requirements**

- Risk management and technological resources to develop infrastructure to comply with Solvency II requirements (industry)
- Specialized resources to review, challenge, and take action on insurance companies whose capital falls below required level (regulator)

### **NAIC Risk-Based Capital**

In the United States, the amount of capital required by state regulators for insurance companies is based on risk-based capital (RBC) formulas established by the National Association of Insurance Commissioners (NAIC) and adopted by state insurance regulators. The NAIC has separate formulas for life insurers, property and casualty (P&C) insurers, and health insurers and is typically calculated by applying factors to accounting aggregates that represent various risks to which a company is exposed.

Illustrative process flow of NAIC RBC:<sup>39</sup>



<sup>39</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche’s analysis. It does not represent the actual detailed process flow of any single institution or regulator.

***Some key benefits of the NAIC RBC***

- Provides uniform risk based capital adequacy standards that insurance companies should hold to protect customers against adverse developments
- Grants authority to state insurance regulator to take specific actions based on level of impairment
- Enables identification and monitoring of emerging and existing risks relative to their consistent or divergent impact on three RBC formulas (life, P&C, and health)

***Some key implications of the NAIC RBC***

- Places ownership on NAIC to develop formulas consistent across all U.S. insurance companies
- Certain risks and risk-mitigation factors (liquidity risk, operational risk, and risk of fraud)<sup>40</sup> are difficult to incorporate in a RBC formula and may not be accounted for
- Adequate capital alone cannot guarantee customer protection from adverse developments

***Some key resource requirements***

- Specialized resources to develop formulas and challenge results (regulator)
- Specialized resources to perform risk-based calculations to submit to NAIC (industry)

***NAIC Securities Valuation Office***

The NAIC Securities Valuation Office (SVO) is responsible for the ongoing credit quality assessment and valuation of securities owned by state-regulated insurance companies. The SVO conducts credit analysis on these securities for the purpose of assigning an NAIC designation and/or unit price. The SVO may be considered comparable in some aspects to a nationally recognized statistical rating organization.

***Some key benefits of the NAIC SVO***

- Credit analysis produced solely for the benefit of NAIC members who may utilize it for monitoring financial condition of its domestic insurers
- Provides analytical tools and products to ensure state insurance regulators have access to unbiased information about investment risks and potential impact on insurers
- Monitors economic developments, performance of specific securities or asset classes and innovations in financial markets, and alerts regulators of potential implications for insurance companies
- Assesses credit risk associated with unrated securities which serves as basis for calculation of regulatory capital needed to support those investments
- Analyzes content of an insurer's investment portfolio, providing regulators with a valuable examination planning tool, which aims to help regulators understand the investment marketplace and impacts on insurers

***Some key implications of the NAIC SVO***

- Unlike credit ratings of nationally recognized statistical rating organizations, NAIC designations are not produced to aid the investment decision-making process

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<sup>40</sup> Society of Actuaries. *Risk-based Capital*. Des Plaines, IL. 2002. [http://rmtf.Soa.Org/riskbased\\_capital.pdf](http://rmtf.Soa.Org/riskbased_capital.pdf)

**Some key resource requirements**

- Specialized analytical resources and technological systems to assess the credit quality of the securities
- Dedicated resources and systems to maintain and communicate the SVO ratings information

**NAIC Financial Data Repository**

The NAIC Financial Database Repository (FDR) stores more than 5,000 U.S. domiciled insurance companies' annual and quarterly financial statements. This financial database provides the nucleus for the NAIC's financial solvency surveillance function that insurance regulators can access through an online, Web-based system. The NAIC updates the FDR annually on behalf of, and at the direction of, the state insurance commissioners.

**Some key benefits of the NAIC FDR**

- Provides essential data for the Insurance Regulatory Information System (IRIS) financial ratio reports, RBC analysis, and other solvency-related reviews of individual companies, including reporting compliance and financial analysis
- Assists in preventing insolvencies for which liability is imposed on insurers under state guaranty fund laws
- Supports regulatory information needs, such as:
  - Mandated experience analysis for particular lines or sublines for individual companies and groups
  - General market structure and performance analysis
  - Statistics by company, groups, or the industry as a whole

**Some key implications of the NAIC FDR**

- Heavy reliance on insurance companies and state insurance regulators to provide accurate and complete filings in a timely manner.

**Some key resource requirements**

- Specialized NAIC resources who have the ability to interpret, challenge, manipulate, and propose corrections based on the information in the IRIS system
- Specialized analytical resources and technological systems to prepare and submit the IRIS information (industry)

**Illustrative financial information captured by regulators and repositories**

To illustrate the significant challenges associated with the breadth of information a consolidated systemic risk regulator would require access to, a combined balance sheet was developed that incorporates major sectors of financial institutions. With the intent of covering a large number of key product categories, this exercise was conducted for assets on the balance sheet and for OTC derivatives and listed derivatives.

Outlined below is a list of consolidated balance sheet asset data for U.S. banks, thrifts, broker-dealers, and insurance companies. Note that for simplicity purposes, U.S. financial institution assets only were included.

Based on this analysis, at a financial statement line item level, 100% of the balance sheet information is reported amongst call reports, FOCUS, thrift reports, and annual statutory financial statements. At

a more granular level, a complete and disclosed coverage of the details underlying the balance sheet information is not available.

Several regulatory information request programs where granular data was stored were identified, which includes regulatory information from the SNC and the NAIC. Per the table below, 12% of \$22.5 trillion total assets detailed transaction information is captured by regulators; most of that 12% is captured by the SNC as part of their program review of large syndicated loans and the remaining is captured by the NAIC securities valuation office. The detailed transaction information represents 34% of total loans, securities, and trading assets in this combined balance sheet.

Regulators, in their prudential oversight roles, commonly request and receive granular pieces of information from financial institutions. However, these data requests are not standardized, whether amongst regulators or across institutions types. Specific templates are issued and completed by the various organizations and subsequently stored in various manners, which are not consistently shared between regulators. The lack of data standardization and sharing of information causes significant complexity for a consolidated systemic regulator to monitor data across financial institutions.

Overall, these regulatory information request programs capture only a portion of the data which would be necessary to the systemic risk regulator. Although some believe that most or all granular information is already provided to regulators, it is not considered readily accessible or easily aggregated for systemic risk purposes.

### Assets (United States only)

Aggregate balances 12/31/2007 Data (\$ billions)	FDIC - Insured Commercial Banks <sup>1,2</sup>	Thrift Institutions <sup>1</sup>	Broker- Dealer <sup>1</sup>	P & C / Life/Health Insurance <sup>1</sup>	Total	Data Sources	\$ Amount covered
Cash and funds due from depository Securities / Credit Market Instruments	482	186 <sup>3</sup>	105	101	688		
US Government securities	1,591	265	1,354	5,402	8,611	NAIC Securities Valuation Office <sup>4</sup>	480
US Treasury Securities	950		230	649	1,829		
US Government obligations	30		-50	135	115		
Securities issued by states and political	919		280	514	1,713		
Asset-backed securities	141		50	404	595		
Other debt securities (incl. foreign)	84		-	-	84		
Equity securities	395	265	849	2,622	4,130		
Assets held in trading accounts	21		225	1,727	1,973		
Federal funds sold and re-repos	868	-	-	-	868		
Loans and leases, net	646	-	-	54	700	SNC - Shared National Credit <sup>5</sup>	2,300
Bank premises and fixed assets	6,538	1,276	-	445	8,259		
Other real estate owned	105	-	-	-	105		
Intangible assets	10	3	-	-	13		
All other assets	423	-	-	-	423		
<b>Total Assets</b>	<b>11,176</b>	<b>1,858</b>	<b>3,093</b>	<b>6,318</b>	<b>22,445</b>		<b>2,780</b>
						% of Total Assets ->	12%
						% of Total Loans, Securities and Trading Assets ->	34%

<sup>1</sup> "The Financial Services Fact Book 2009" *The Financial Services Roundtable & The Insurance Information Institute*, 2009 Edition  
<sup>2</sup> Includes U.S.-chartered commercial banks, foreign banking offices in the U.S., bank holding companies and banks in U.S.-affiliated areas.  
<sup>3</sup> Includes Invested Securities  
<sup>4</sup> "The Role of Ratings in Insurance Regulation, Rating Agency (E) Working Group of the Financial Conditions (E) Committee", A Public Hearing, September 24 2009 □  
<sup>5</sup> "Shared National Credit Results Reflect Large Increase in Credit Commitment Volume, and Satisfactory Credit Quality", Board of Governors of the Federal Reserve System Federal Deposit Insurance Corporation Office of the Comptroller of the Currency Office of Thrift Supervision, September 25 2007

### OTC Derivatives (Global)

Global OTC derivatives trade repositories are currently being developed. In 2009, the Bank of International Settlements' (BIS) *Quarterly Review* reported aggregate global derivatives outstanding as \$605 trillion. The Deposit Trust Clearing Corporation's (DTCC) DerivServ captured 90% of total global CDS outstanding. Additionally, there are other vendors, such as TriOptima and Intercontinental Exchange which are developing trade repositories. These repositories account for approximately 5% of the total \$605 trillion OTC derivatives outstanding.



Aggregate notional outstanding 12/31/2009 Data (\$ billions)	Across all Institutions <sup>1</sup>	Data Sources	\$ Amount covered
Foreign exchange contracts	48,775		
Interest rate contracts	437,198		
Equity-linked contracts	6,619		
Commodity contracts	3,729		
Credit default swaps	36,046	DTCC DerivServ Trade Information Warehouse <sup>2</sup> ICE Trust CDS Clearing <sup>3</sup>	32,000 564
Unallocated	72,255		
<b>Total Derivatives</b>	<b>604,622</b>		<b>32,564</b>
		% of Total Derivatives ->	5%
		% of Total Credit Derivatives ->	90%

<sup>1</sup>BIS Quarterly Review (March 2010)  
<sup>2</sup>DTCC.com a/o 03.06.10  
<sup>3</sup>ICE Trust Credit Default Swap Clearing™ TheICE.com, Comprehensive data from launch through March 12, 2010

### Listed Derivatives (Global)

In 2009, \$73 trillion aggregate notional of listed derivatives were outstanding globally as per the BIS *Quarterly Review*. For these purposes, it has been assumed that all listed derivatives' position-level information is contained either in the relevant exchange or clearing house.

Aggregate notional outstanding 12/31/2009 Data (\$ billions)	Across all Institutions <sup>1</sup>	Data Sources	\$ Amount covered
<b>Futures</b>	<b>21,749</b>		<b>21,749</b>
Interest Rate	20,623		20,623
Currency	164		164
Equity Index	962		962
<b>Options</b>	<b>51,389</b>	Various Exchanges and Clearing Houses	<b>51,389</b>
Interest Rate	46,435		46,435
Currency	147		147
Equity Index	4,807		4,807
<b>Total Listed Derivatives</b>	<b>73,138</b>		<b>73,138</b>
		% of Total Listed Derivatives ->	100%

<sup>1</sup>BIS Quarterly Review (March 2010)

### Resource requirements of other major industry-wide regulatory initiatives

It is inherently very difficult to determine the resource requirements of a major initiative for systemic financial risk information, especially when the final legislation and regulation related to structures, and requirements is not yet in place. However, it is generally believed that any of the systemic risk information approaches would have significant resource requirements, both in terms of human capital cost and infrastructure/reporting capability development. There are resource requirement considerations from the initial development and implementation of necessary infrastructure, as well as the ongoing maintenance of the systemic risk information approach. More complex information approaches, such as the data warehouse-based approach, would likely have much greater time required to implement, as well as related resource requirements.

There are different resource requirements associated with each of the eight systemic risk information approaches which should be considered from both a regulatory and industry perspective. Outlined below are illustrative high-level examples:

#### Implementation of the systemic risk regulatory requirements

- Potentially significant resource requirements associated with implementing the systemic risk regulator infrastructure requirements, including:
  - In-house economists to develop scenarios and identify potential areas for concern
  - In-house analytical resources, infrastructure, and systems to collect, manipulate, analyze, and aggregate the financial institutions' information

#### Existing regulatory bodies

- Resource requirements may vary across existing regulatory bodies to support the systemic risk regulator based upon their existing infrastructure — potential increases in:

- In-house analytical resources and systems to collect, manipulate, analyze, and aggregate the financial institutions' information

### **Industry firms**

- Resource requirements may vary significantly within firms based upon their scale of operations, business mix, and also existing risk infrastructure capabilities

In order to develop some view of the order of magnitude of implementation and maintenance costs of a major initiative, such as systemic risk information, outlined below are indicative high-level cost estimates of complying with other large-scale multifunctional regulatory initiatives:

- **Basel II** — A study performed in 2003 estimated that the total global implementation cost for Basel II would exceed \$11 billion by end of 2005.<sup>41</sup> However, this estimate was likely far exceeded as several major firms have reported individual Basel II expenditures in the hundreds of millions U.S. dollars.
- **Solvency II** — A consulting firm estimated that the implementation of Solvency II entails three-year project costs of approximately 0.2% to 0.4% of annual premiums for individual firms. Therefore, an insurance company with €30 billion in total premiums would expect a project cost of between €60 million to €120 million.
- **Sarbanes-Oxley (SOX 404)** — Financial Executives International 2006 survey<sup>42</sup> estimated SOX compliance costs for 200 companies with average revenues of \$6.8 billion; the average compliance costs were \$2.9 million. The compliance cost for large global financial institutions is far higher and the total cost of compliance with SOX legislation has been seen by many as excessive.

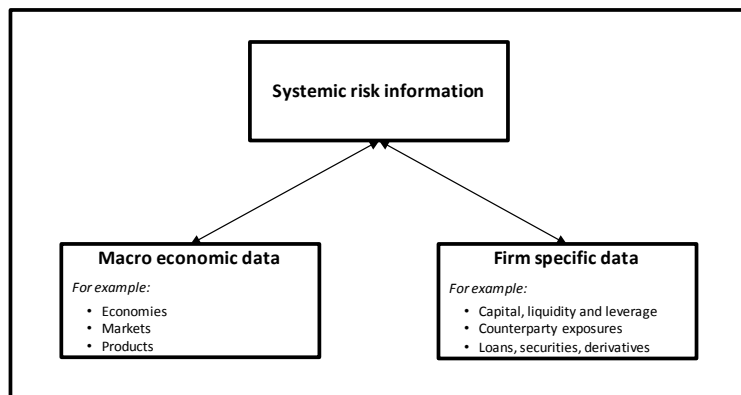
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<sup>41</sup> Karen Shaw Petrou. "Basel II Regulation: U.S. Market and Competitiveness Implications." Testimony before the Subcommittee on Financial Institutions and Consumer Credit and Subcommittee on Domestic and International Monetary Policy, Trade and Technology, U.S. House of Representatives, May 11, 2005.

<sup>42</sup> Financial Executives International. *Sarbanes-Oxley Section 404 Implementation Survey*. Florham Park, New Jersey, 2006.

# Systemic risk information requirements

A systemic risk regulator will have data requirements spanning international, economic, macroprudential, and microprudential arenas. The information will be needed for financial markets, countries, and individual financial institutions.



An illustrative sample of the information needs of the overall markets include:

- Overall markets data
  - Credit expansions and contractions
  - Asset price inflation and bubbles
  - Flow of funds (between markets)
  - Concentrations
  - Interconnectedness of markets for potential contagion

In addition, there will be information requirements from individual financial institutions, including:

- Firm-specific
  - Concentrations
  - Counterparty and reverse counterparty exposures
  - Leverage ratios
  - Liquidity/solvency information
  - Interconnectedness of firms

The systemic risk regulator should also seek to enhance existing monitoring systems and reporting requirements, especially for financial institutions deemed systemically important, including:

- Developing more robust cross-functional and cross-border information sharing and coordination mechanisms
- Expanding the perimeter of financial regulation, to heighten supervision and information requirements for lightly regulated institutions, such as hedge funds, and less transparent instruments, such as OTC derivatives.

The gaps for the systemic risk information needs will be driven by the future systemic risk regulator's adopted systemic risk information approach, as described in the next section.

# Potential systemic risk information approaches

## Overview of information approaches

Approach	Overview of information approach
<b>Enterprise-wide stress test-based approach</b>	A SCAP-type enterprise-wide stress test-based approach inherently relies on firms' internal models to produce a consistent set of stress tests in order to develop a more complete view of the overall health of the financial system. Industry regulator(s) will develop specific macroeconomic stress tests and communicate these to financial institutions who will be responsible for performing the analytics and reporting the results.
<b>Reverse stress test-based approach</b>	A reverse stress test-based approach requires firms to identify/envision scenarios that may have a significant impact on their operations and to describe the precautions they would take to help mitigate the risks. Reverse stress tests require financial institutions to 'think backwards' to determine the risks and vulnerabilities which hypothetically could lead to weakening their financial condition.
<b>Aggregated risk reporting template-based approach</b>	A summarized risk reporting template-based approach would enable the regulator(s) to obtain summarized risk information similar to the reports that a financial institution's CRO receives, allowing it to act in a role similar to that of a global CRO (all markets and all firms) with the ability to look across the risk information of financial institutions. This approach requires regulator(s) to identify and develop an appropriate and consistent standard for risk reporting across the market, which would feed into an aggregated risk template at the regulator(s).
<b>Risk sensitivity-based approach</b>	A risk sensitivity-based approach would require the regulator(s) to have a central repository capable of receiving and storing risk sensitivity information from all relevant financial institutions. Regulator(s) would have access to summarized risk sensitivity information which could be analyzed, as needed, to help identify, measure, and monitor systemic risk. This approach may be described as taking a market risk approach to analyzing shocks based upon a predetermined set of information that has been provided to the regulator.
<b>Trade repositories-based approach</b>	Central trade repositories connect relevant financial institutions, market participants, regulator(s), and service providers, and act as a hub for the exchange of trade information and other relevant position data. This would enable the regulator(s) to have access to granular information which they could analyze to help identify and monitor systemic risk.
<b>Repositories and key industry utility firms-based approach</b>	Some financial institutions operate in effect in an industry utility role, such as firms which provide clearing services for other financial institutions and firms which act as interdealer brokers. Due to their position dealing with many financial institutions accessing a market, these firms are well placed to serve as an additional information source. Using the repositories and key industry utility firms-based approach, regulator(s) would potentially have access to position-level data with which they could analyze as required to help identify and monitor systemic risk.
<b>Concentration exposure reporting-based approach</b>	A concentration exposure reporting-based approach would require the regulator(s) to develop thresholds for key products, counterparties, and markets. Financial institutions will then generate reports on name-specific risks, including individual positions and exposures that they have to obligors and issuers that are above the defined threshold. Regulator(s) will perform the necessary analytics and aggregate the information to obtain an industry-wide perspective on concentration exposures.
<b>Data warehouse-based approach</b>	A data warehouse-based approach would require the regulator(s) to have a central repository capable of receiving and storing position-level data from all relevant financial institutions. This would enable the regulator(s) to have access to granular information which they could analyze as needed to help identify, measure, and monitor systemic risk.

Eight systemic risk information approaches emerged during the systemic risk information study, including enterprise-wide stress tests, reverse stress tests, aggregated risk reporting templates, risk sensitivities, trade repositories, trade repositories and key industry utility firms, concentration exposure reporting, and a regulatory data warehouse. Each approach has different costs/benefits and underlying complexities related to information requirements, as well as transmission/storage mechanisms required by financial institutions, regulators, and utilities. These approaches are not mutually exclusive; therefore, the most optimal solution may be a combination of several approaches. A systemic risk workshop organized by the National Research Council of the National Academies noted, "Workshop participants noted that no one model will suffice for everything. Rather, there is a need for a suite of models, some coarse-grained, and some fine-grained, some at the macro level and some at the micro level."<sup>43</sup>

As a means of articulating the effectiveness of each of the approaches, potential key questions a systemic risk regulator might ask in order to identify and monitor systemic risk were developed. Specific emphasis was placed on infrastructure gaps and data gaps which might occur. These potential key gaps are identified for each of the following eight systemic risk information approaches along with some key benefits, implications, potential resource requirements, and potential alternatives of each.

It is important to take into consideration the information requirements of a systemic risk regulator, with respect to each systemic risk information approach.

The table below summarizes the key roles and responsibilities for the regulator(s) and financial institutions across the eight systemic risk information approaches.

Approach	Summary of roles and responsibilities	
	Key regulator(s) responsibilities	Key financial institution/utility responsibilities
<b>Enterprise-wide stress test-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing and communicating</b> specific macroeconomic stress test scenarios.</li> <li>• <b>Reviewing and challenging the results</b> in order to identify potential market bubbles.</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Performing the analytics</b>, based on the scenarios communicated by the regulators, and reporting the results.</li> </ul>
<b>Reverse stress test-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing and communicating high-level questions</b> (e.g., what potential events could lead to losses of more than \$10bn?).</li> <li>• <b>Reviewing and challenging the results.</b></li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Developing stress scenarios</b> focused on key exposures and concentrations of the financial institution in response to high-level regulatory questions, performing the analytics based on the scenarios identified and reporting the results.</li> </ul>

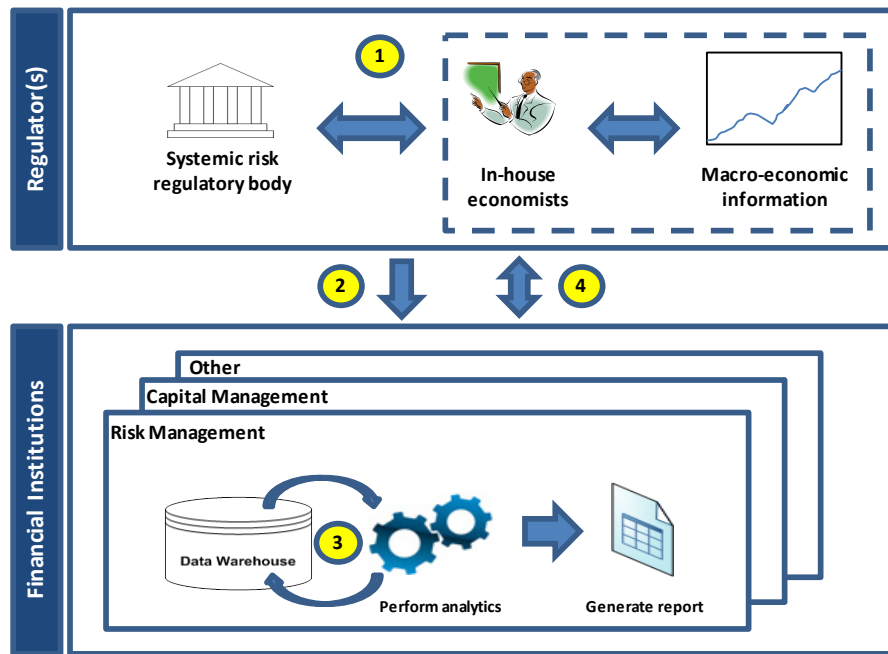
<sup>43</sup> Engle, Robert F. and Scott T. Weidman. The National Academies Press, 2010.

Approach	Summary of roles and responsibilities	
	Key regulator(s) responsibilities	Key financial institution/utility responsibilities
<b>Aggregated risk reporting template-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing appropriate reporting templates</b> to measure and report individual firm risk information.</li> <li>• <b>Reviewing and challenging the results.</b></li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Generating the required information</b> based on the requirements as established by the regulator template and reporting the results.</li> </ul>
<b>Risk sensitivity-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Assessing, reviewing, and challenging the summarized risk-sensitivity data</b> received.</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Generating the required risk-sensitivity information</b> and reporting it to the regulator(s).</li> </ul>
<b>Trade repositories-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing a governance structure</b> around trade repositories that outlines ownership, responsibilities, information sharing, and regulation.</li> <li>• <b>Assessing, reviewing, and challenging the position and market-level data</b> received (from financial institutions and industry utilities).</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• Industry utilities will be responsible for <b>generating and reporting position-level data</b> to the regulator(s).</li> <li>• Third-party repository organizations will be responsible for <b>capturing and maintaining the transaction data and input</b> received by firms.</li> </ul>
<b>Repositories and key industry utility firms-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing a governance structure</b> around trade repositories that outlines ownership, responsibilities, information sharing, and regulation.</li> <li>• <b>Determining appropriate levels of counterparty information</b> from clearing organizations.</li> <li>• <b>Assessing, reviewing, and challenging the position and market-level data received</b> (from financial institutions and industry utilities).</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• Selected financial institutions and industry utilities will be responsible for <b>generating and reporting position-level data</b> to the regulator(s).</li> <li>• Third-party repository organizations and industry utility firms (e.g., clearing banks) will be responsible for <b>capturing and maintaining the transaction data</b> and input received by firms.</li> </ul>
<b>Concentration exposure reporting-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Determining appropriate exposure-reporting thresholds for positions and counterparties.</b></li> <li>• <b>Developing appropriate exposure-reporting templates</b> to measure and report individual firm risk information.</li> <li>• <b>Performing the necessary analytics and aggregating the information</b> to obtain an industry-wide perspective on concentration exposures.</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Generating and reporting name specific concentration information</b> to the regulator(s).</li> </ul>
<b>Data warehouse-based approach</b>	<ul style="list-style-type: none"> <li>• <b>Developing and maintaining a data warehouse</b> which receives position and market-level data.</li> <li>• <b>Assessing, reviewing, and challenging the position and market-level data received</b> (from financial institutions and industry utilities).</li> <li>• <b>Performing macroeconomic and other analytics</b> to identify potential market bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Generating and reporting name specific position-level data</b> to the regulator(s).</li> <li>• Industry utilities will be responsible for <b>generating and reporting position level data</b> to the regulator(s).</li> <li>• Responsibility of third-party repository organizations and industry utility firms to <b>capture and maintain the transaction data and input</b> received by firms.</li> </ul>

## Enterprise-wide stress test-based approach

A SCAP-type enterprise-wide stress test-based approach inherently relies on firms' internal models to produce a consistent set of stress tests in order to develop a more complete view of the overall health of the financial system. Industry regulator(s) will develop specific macroeconomic stress tests and communicate these to financial institutions who will be responsible for performing the analytics and reporting the results.

A high level, illustrative process flow of an enterprise-wide stress test-based approach is outlined below:<sup>44</sup>



### Key steps of systemic risk information approach

- 1 Regulator(s) generates stress test approaches using its in-house economists
- 2 Regulator(s) communicates stress test approaches to financial institutions
- 3 Financial institutions perform analytics and develop stress test results report in requested format
- 4 Firms provide stress test results to regulator(s) who reviews, provides follow-up questions and aggregates responses to provide a broader portrait of risks in the financial sector

<sup>44</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.



***Some key benefits of systemic risk information approach***

- Ownership and accountability for measuring and monitoring systemic risk placed clearly with financial institutions
- More accurate results may occur with reduced inefficiencies as the stress tests will be performed in-house by analytics teams who understand their firm's risk tracking and measurement procedures
- Results are reported in a standardized format based on regulator requirements for easier aggregation and comparison
- Regulator(s) may not require significant investment in additional analytical resources

***Some key implications of systemic risk information approach***

- Core reliance on financial institutions to perform asset valuations and analytics using internal models and provide results on a timely basis
- Limited ability to analyze system-wide issues directly and to identify correlations to determine potential areas of concern
- Need for increased international coordination amongst regulators to better understand the interconnectedness of financial institutions and to develop common scenarios across markets and industries

***Potential resource requirements of systemic risk information approach***

- Increase in financial institutions' risk and analytics resources to perform regular and varied stress tests
- Increase in regulator(s) resources to:
  - Use dedicated economists to develop varied stress test scenarios
  - Appropriately review and challenge stress test results provided by financial institutions

***Potential alternatives to systemic risk information approach***

- Regulator(s) work with financial institutions to determine appropriate stress tests to reduce regulator "in-house" economist resource requirements
- Regulator(s) work with self-regulatory organizations (SROs) to develop appropriate stress test scenarios
- Regulator(s) adopt scenario-based approach and utilize their in-house economists to develop systemic risk-related scenarios which are communicated to financial institutions
- Reverse stress test-based approach

**Potential information requirements**

- Loans
  - First lien mortgages
  - Prime
  - Alt-A
  - Subprime
  - Second/junior lien mortgages
  - Closed-end junior liens
  - Home equity lines of credit
  - Commercial and industrial loans
  - Commercial real estate loans
- Securities
  - Available for sale
  - Held to maturity
- Key P&L statistics (e.g., pre-provision net revenue)
  - Net interest income
  - Non-interest income
  - Non-interest expense
- Allowance for loan and lease losses
  - Allowance for loan and lease losses at end of previous year
  - Allowance for loan and lease losses at end of year
- Post scenario Tier 1 capital
  - Tier 1 capital
  - Sum of Tier 1 elements
  - Common stockholders' equity
  - Risk-weighted assets

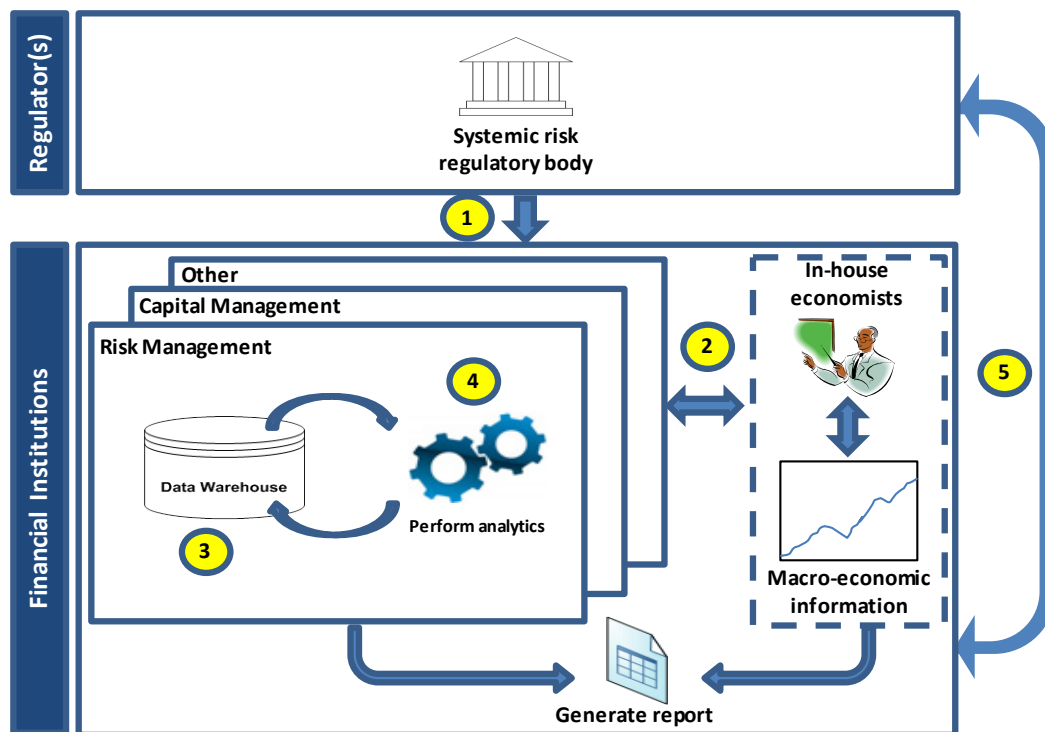
### Potential key gaps identified

- Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data
- Frequency of data request may limit the ability to capture and analyze information between formal requests (e.g., annual, semi-annual and quarterly)
- Lack of testing across portfolios
- Limited information from non-regulated financial institutions
- Core dependency on financial institutions to have appropriate internal models to produce necessary data

### Reverse stress test-based approach

A reverse stress test-based approach requires firms to identify/envision scenarios that may have a significant impact on their operations and to describe the precautions they would take to help mitigate the risks. Reverse stress tests require financial institutions to ‘think backwards’ to determine the risks and vulnerabilities which hypothetically could lead to weakening their financial condition.

A high-level, illustrative process flow of a reverse stress test-based approach is outlined below.<sup>45</sup>



<sup>45</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche’s analysis. It does not represent the actual detailed process flow of any single institution or regulator.

### ***Key steps of systemic risk information approach***

- 1 Regulator(s) develops and communicates high-level reverse stress testing instructions to financial institutions
- 2 Financial institution in-house economists and risk management teams work together to determine reverse stress testing events
- 3 Financial institutions perform analytics using scenario events and develop reports
- 4 Financial institutions repeat and refine reverse stress testing scenarios and perform analytics
- 5 Financial institutions provide data to regulator(s) who reviews and challenges results. Ongoing discussions driven by regulator(s) to help identify potential market hot spots and areas of focus

### ***Potential key benefits of systemic risk information approach***

- Responsibility for developing meaningful stress scenarios lies with financial institutions who have a clearer understanding of their business and may identify more idiosyncratic scenarios not familiar to regulators
- Regulator(s) may not require significant investment in analytical resources and/or in-house economists
- Financial institutions gain an increased understanding of the risks that could pose a systemic threat

### ***Potential key implications of systemic risk information approach***

- Limited ability to analyze system-wide issues directly and identify correlations to determine potential areas of concern
- Emphasis/reliance on firms to perform accurate asset valuations, generate meaningful stress scenarios, and understand impact of events leading to failure
- Need for increased international coordination amongst regulators to understand the interconnectedness of financial institutions and their ability to develop common scenarios

### ***Potential resource requirements of systemic risk information approach***

- Increased financial institution resource requirements to generate stress scenarios and perform required analytics
- Increased regulator(s) resources to review and challenge proposed scenarios and aggregate data across firms to identify trends and potential hot spots within market and assess the validity of internal models
- Increase of in-house industry economists to help develop specific scenarios for reverse stress tests

### ***Potential alternatives to systemic risk information approach***

- Combination of robust stress test approach (e.g., SCAP) with reverse stress test to improve stress scenario completeness using the results of reverse stress tests to inform scenarios developed by regulators
- Collaboration between regulator(s) and key systemic firms and/or SROs to develop either best practice reverse stress tests or expand processes to identify reverse stress test scenarios (“dire scenarios”) which would be communicated and applied at financial institutions

***Potential information requirements***

- Loans
  - First lien mortgages
  - Prime
  - Alt-A
  - Subprime
  - Second/junior lien mortgages
  - Closed-end junior liens
  - Home equity lines of credit
  - Commercial and industrial loans
  - Commercial real estate loans
- Securities
  - Available for sale
  - Held to maturity
- Key P&L statistics (e.g., pre-provision net revenue)
  - Net interest income
  - Non-interest income
  - Non-interest expense
- Allowance for loan and lease losses
  - Allowance for loan and lease losses at end of previous year
  - Allowance for loan and lease losses at end of year
- Post scenario Tier 1 capital
  - Tier 1 capital
  - Sum of Tier 1 elements
  - Common stockholders' equity
  - Risk-weighted assets

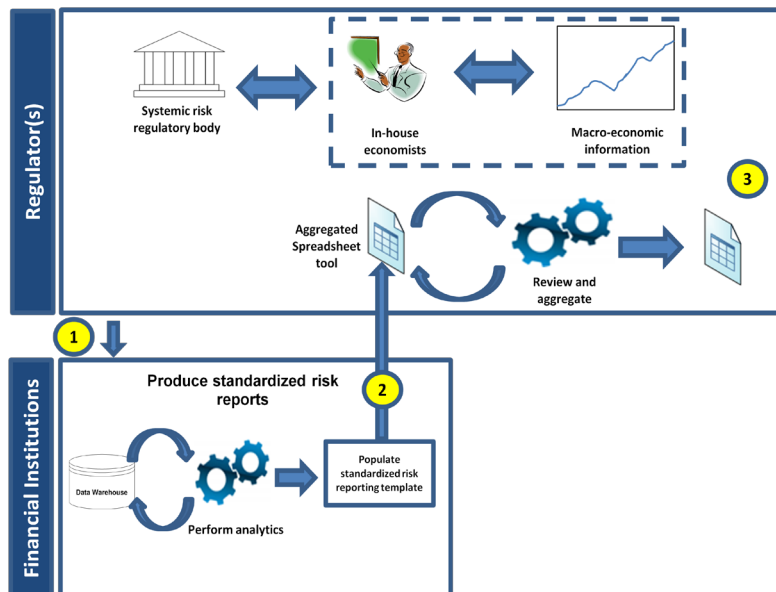
### Some key gaps identified

- Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data
- Frequency of data request may limit the ability to capture and analyze information between formal requests (e.g., annual, semi-annual and quarterly)
- As the financial institutions are determining the scenarios, there may be a lack of consistency. Therefore, the regulator(s) will be required to perform horizontal reviews to assess consistency in practices and also identify potential systemic risk events
- Core dependency on financial institutions to have appropriate internal models to produce necessary data
- Reliance on firms to develop appropriate stress scenarios in response to high-level questions
- Potential lack of standardized data from firms due to multiple sources/formats of data
- Increased regulator resource requirements to identify market hot spots based on information received

### Aggregated risk reporting template-based approach

A summarized risk reporting template-based approach would enable the regulator(s) to obtain summarized risk data similar to the reports that a financial institution's CRO receives, allowing it to act in a role similar to that of a global CRO (all markets and all firms) with the ability to look across the risk information of financial institutions. This approach requires regulator(s) to identify and develop an appropriate and consistent standard for risk reporting across the market, which would feed into an aggregated risk template which is "owned" and maintained by the regulator(s).

A high-level, illustrative process flow of a risk reporting template-based approach is outlined below:<sup>46</sup>



<sup>46</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

**Key steps of systemic risk information approach**

- 1 Regulator(s) develops and communicates standardized risk reporting template to financial institutions
- 2 Financial institutions populate the standardized template with required risk data and submit it to the regulator(s) on periodic basis (perhaps monthly)
- 3 The regulator(s) aggregates, reviews, and challenges results provided by financial institutions

**Potential key benefits of systemic risk information approach**

- Ability to monitor direct exposures by risk type at different levels, including business unit, trading desk, and geographical
- Enables identification of aggregated counterparty and reverse counterparty risks and performance of exposure analysis
- Facilitates the identification and monitoring of inter-firm linkages, which could potentially be aggregated by the regulator(s) across the financial system
- Provides clear guidance to firms on what is necessary for disclosure
- Enables regulators to receive standardized data, which can be aggregated across firms

**Potential key implications of systemic risk information approach**

- The data may not be of sufficient granularity; therefore, it may be a challenge to obtain a full view of risk across the market

**Potential resource requirements of systemic risk information approach**

- Regulator(s) would require risk analysts and economists to develop a standardized reporting template and to aggregate and assess information received from financial institutions to determine system-wide risk exposures
- Regulators would require development of additional risk infrastructure
- Financial institutions would require additional resources to populate and submit the standardized reporting template

**Potential alternatives to systemic risk information approach**

- Risk sensitivities based approach
- Concentration exposure reporting-based approach

**Potential information requirements**

- Top 10 revenue contributors
- Top 10 exposures by counterparty
- Top 10 exposures by asset type
- Counterparty (not complete list, but may capture top XX (e.g., 10, 25, 50, 100) counterparties
- Reverse counterparty (not complete list, but may capture top XX (e.g., 10, 25, 50, 100) reverse counterparties
- Securities
  - Available for sale

- Held to maturity
- Key P&L statistics (e.g., pre-provision net revenue)
  - Net interest income
  - Non-interest income
  - Non-interest expense
- Allowance for loan and lease losses
  - Allowance for loan and lease losses at end of previous year
  - Allowance for loan and lease losses at end of year
- Tier 1 capital
  - Sum of Tier 1 elements
  - Common stockholders' equity
  - Risk-weighted assets

***Some key gaps identified***

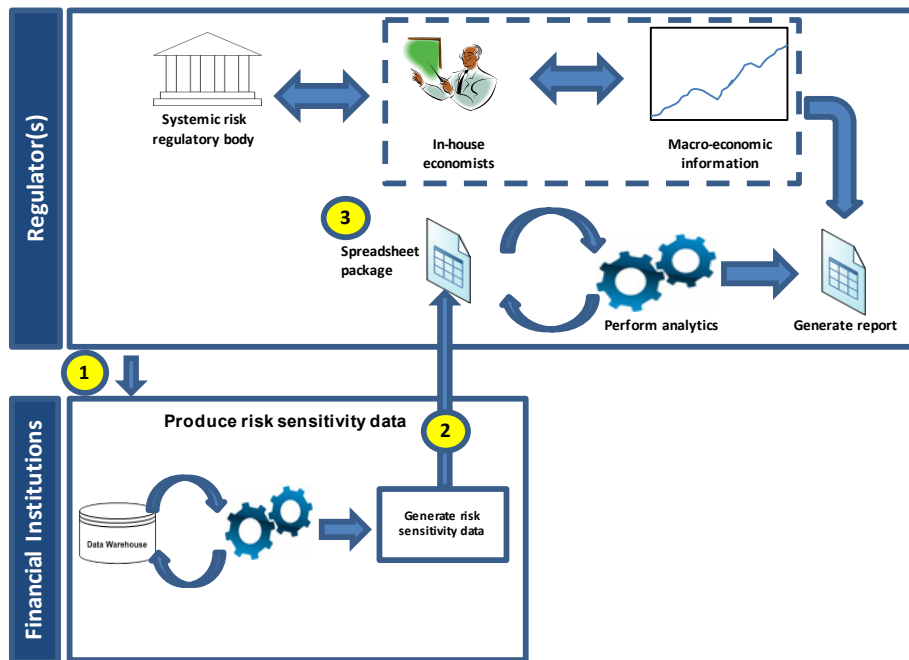
- Inability to completely assess vulnerabilities arising from interconnected events across risk and asset types due to lack of full detailed counterparty and reverse counterparty exposure data
- Inability to assess:
  - Leverage
  - Asset-price inflation
  - Liquidity/solvency
  - Flow of funds
- Horizontal reviews need to be conducted
- Lack of common referential data architecture
- Core dependency on financial institutions to have appropriate internal models to produce the necessary data
- Increased regulator resource requirements to identify market 'hot-spots' based on information received
- If results are based on sensitivities rather than a defined scenario, it may not capture non-linear or contingent risks



## Risk sensitivity-based approach

A risk sensitivity-based approach would require the regulator(s) to have a central repository capable of receiving and storing risk sensitivity data from all relevant financial institutions. Regulator(s) would have access to summarized risk sensitivity data which could be analyzed, as needed, to help identify, measure, and monitor systemic risk. This approach may be described as taking a market risk type of approach to analyzing shocks based upon a predetermined set of information that has been provided to the regulator.

A high-level, illustrative process flow of a risk sensitivity-based approach is outlined below:<sup>47</sup>



### Key steps of systemic risk information approach

- 1 Regulator(s) determines and communicates standardized and ad hoc as needed, risk sensitivity data requirements to financial institutions and financial industry utility firms
- 2 Financial institutions develop required data infrastructure, generate required data (standardized and ad hoc as needed), and provide it to regulator(s)
- 3 Regulator(s) stores received standardized and ad hoc data in an in-house data warehouse and performs data analytics through in-house modeling teams

### Potential key benefits of systemic risk information approach

- Summarized risk sensitivity-level data for all relevant financial institutions would provide regulator(s) ability to analyze the market to help determine potential areas of concern
- Summarized risk sensitivity data from financial institutions would be stored in-house by regulator(s) who could manipulate information as needed to perform necessary analytics

<sup>47</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

***Potential key implications of systemic risk information approach***

- Standardized risk sensitivity data policy would need to be developed and communicated to the market
- Data infrastructure, both at financial institutions and at regulator(s), would need to be developed and maintained
- Overall responsibility for identifying, measuring, and monitoring systemic risk would lie with regulator(s)
- Inability to identify counterparty- or name-specific risks, hence weak concentration analysis capabilities

***Potential resource requirements of systemic risk information approach***

- Increase in regulator(s) data warehouse management and monitoring technological team
- Increase in regulator(s) analytics teams to perform and interpret systemic risk-related stress tests and other calculations
- Increase in financial institutions' resources to generate required information and provide it to data warehouse on a regular basis

***Potential alternatives to systemic risk information approach***

- Data warehouse-based approach
- Trade repositories-based approach
- Concentration exposure reporting-based approach

***Potential information requirements***

- Financial institutions will need to utilize in-house reporting platforms and analytics to perform sensitivity-based approach and respond to specific-sensitivity requirements provided by the regulator
- Summarized risk-sensitivity information
- Potential data inputs
  - Position-level data
  - Transaction-level data
  - Margin and collateral
  - Liquidity and funding
  - Increased granular data on asset classes (e.g., CDS spreads and bond spreads)
  - Maturity transformation information
  - Leverage
- Loans
  - First lien mortgages
  - Prime
  - Alt-A
  - Subprime
  - Second/junior lien mortgages

- Closed-end junior liens
- Home equity lines of credit
- Commercial and industrial loans
- Commercial real estate loans
- Securities
  - Available for sale
  - Held to maturity
- Key P&L statistics (e.g., pre-provision net revenue)
  - Net interest income
  - Non-interest income
  - Non-interest expense
- Allowance for loan and lease losses
  - Allowance for loan and lease losses at end of previous year
  - Allowance for loan and lease losses at end of year
- Tier 1 capital
  - Sum of Tier 1 elements
  - Common stockholders' equity
  - Risk-weighted assets
- Potential data outputs
  - Aggregated sensitivity exposures
  - Risk profile and concentration data

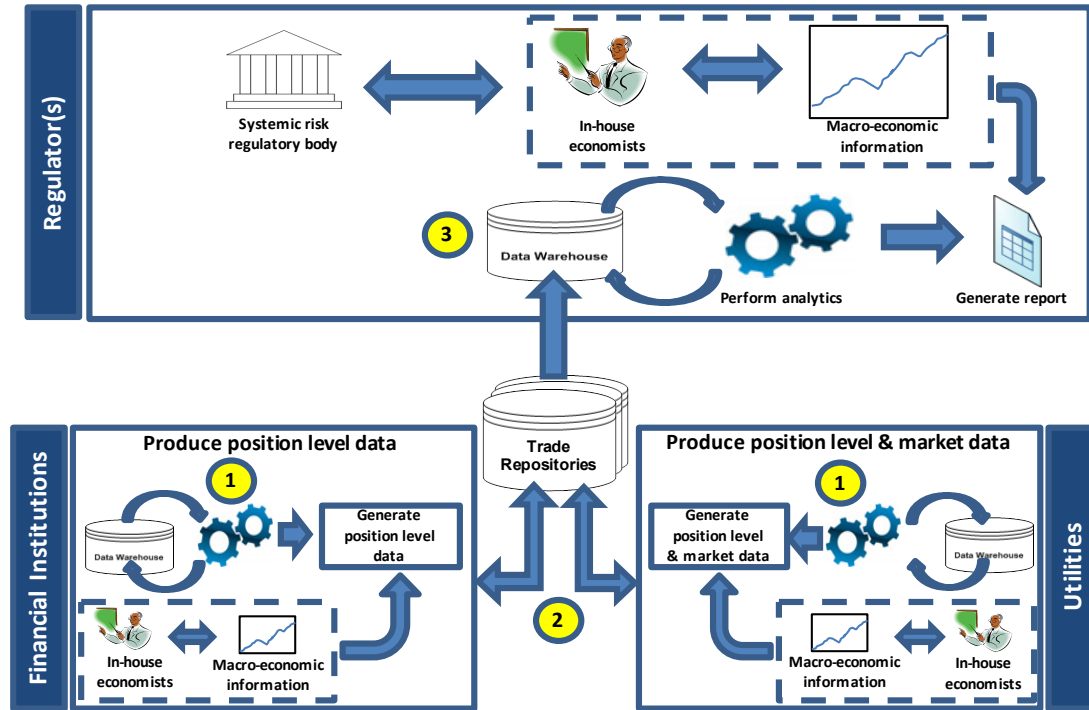
***Some key gaps identified***

- Inability to assess vulnerabilities arising from interconnected events across risk and asset types due to lack of counterparty exposure data
- Core dependency on financial institutions to have appropriate internal models to produce necessary data
- Inability to assess:
  - Leverage
  - Asset-price inflation
  - Liquidity/solvency
  - Flow of funds
- Horizontal reviews need to be conducted
- Increased regulator resource requirements to identify market 'hot-spots' based on information received
- Sensitivities may not capture non-linear or contingent risks

## Trade repositories-based approach

Central trade repositories connect relevant financial institutions, market participants, regulator(s), and service providers and act as a hub for the exchange of trade information and other relevant position data. This would enable the regulator(s) to have access to granular data which they could analyze to help identify and monitor systemic risk.

A high-level, illustrative process flow of a trade repositories-based approach is outlined below:<sup>48</sup>



### Key steps of systemic risk information approach

- 1 Financial institution and financial industry utilities determine the relevant position-level and market data that should be captured in the trade repository
- 2 Financial institution and financial industry utilities provide data to trade repositories, maintained by an independent third-party financial industry utility
- 3 Regulator(s) accesses required data from trade repositories to perform necessary macroeconomic and other analytics based upon scenarios and concerns identified

<sup>48</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

***Potential key benefits of systemic risk information approach***

- Regulator(s) would have access to granular, position-level, and market data to analyze overall market and identify correlations to determine potential areas of concern
- Regulator(s) would have ability to view firm's underlying position and exposure from central vantage point
- Builds on trade repositories, such as the DTCC trade information warehouse model for CDS data

***Potential key implications of systemic risk information approach***

- Potentially significant resource requirements for regulator(s), financial institutions, and utilities
- Organizations responsible for trade repositories must be responsive to needs of the regulator(s) and market participants
- Determination of responsibility for trade repositories, and their regulatory oversight
- Potential international privacy / confidentiality issues

***Potential resource requirements of systemic risk information approach***

- Significant resource requirements from third-party organizations (e.g., financial industry utility firms) to develop and maintain data repositories and input received from firms
- Dedicated resources from financial institutions to provide relevant data to repositories
- Dedicated resources from the regulator(s) to access, analyze, review, and challenge data as well as perform and interpret own macroeconomic and other analytics

***Potential alternatives to systemic risk information approach***

- Adopt multiple central trade repositories approach with a separate trade repository per asset class
- Each repository could be owned and maintained by the organization best placed to aggregate and provide required product/market information
- Firms to feed information directly to regulator(s) in addition to use of trade repositories

***Potential information requirements***

- Potential data inputs (requirements of utilities):
  - Position-level data
  - Information from market vendors
  - Transaction-level data
  - Margin and collateral
  - Liquidity and funding
  - Reference data for a common system of legal entity and counterparty identifiers
  - Increased granular data on asset classes (e.g., CDS spreads and bond spreads)
  - Security master information

- Potential data outputs (regulator calculations):
  - Counterparty exposures
  - Aggregated exposures
  - Potential future exposures
  - Risk profile and concentration data
  - Risk correlation data

### ***Some key gaps identified***

- Financial institutions and financial industry utility firms are currently able to produce data of sufficient granularity; no key data gaps identified, however, technological- and infrastructure-related challenges exist, including:
  - Significant infrastructure development for financial institutions and utilities
  - Significant costs and resource requirements for connections to the trade repositories
  - Significant costs for third-party vendor to maintain trade repository
  - Incomplete view of risk as positions not held in repository would not be aggregated and analyzed
  - Counterparty exposures currently not readily available in trade repositories
  - Core dependency on financial institutions to have the appropriate internal infrastructure to produce necessary data
- Inability to assess:
  - Leverage
  - Asset-price inflation
  - Liquidity/solvency
  - Flow of funds

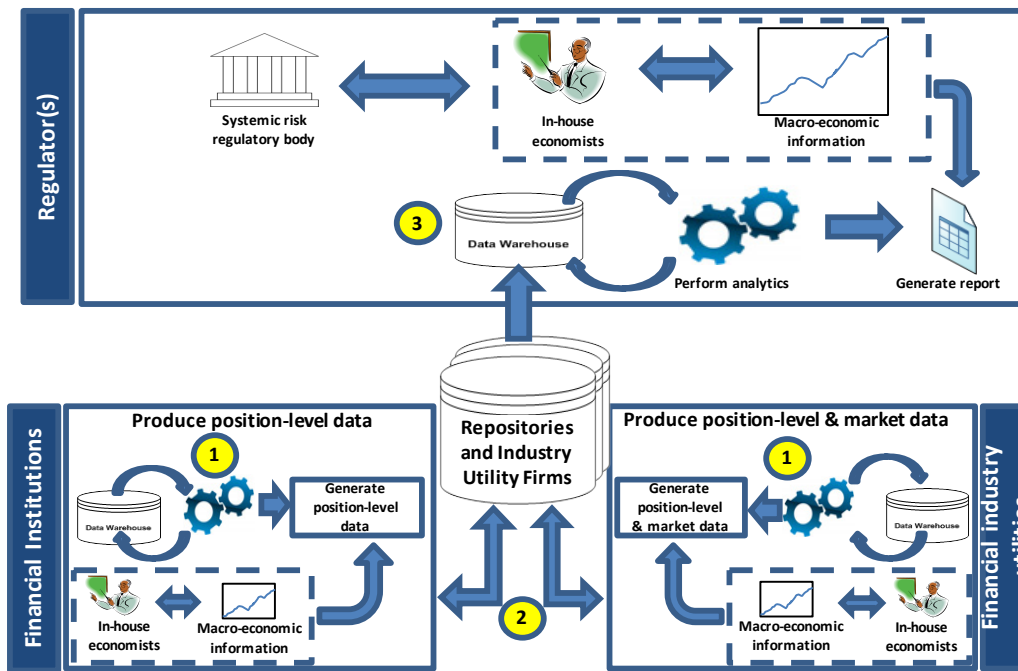
## **Repositories and key industry utility firms-based approach**

Some financial institutions operate in effect in an industry utility role, such as firms that provide clearing services for other financial institutions and firms which act as interdealer brokers. Due to their position dealing with many financial institutions accessing a market, these firms are well placed to serve as an additional information source. Using the repositories and key industry utility firms-based approach, regulator(s) would potentially have access to position-level data with which they could analyze as required to help identify and monitor systemic risk.

A high-level, illustrative process flow of a repositories and key industry utility firms-based approach is outlined below:<sup>49</sup>

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<sup>49</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.



**Key steps of systemic risk information approach**

- 1 Financial institutions and utilities already provide position and market-level data to the repositories and key industry utility firms
- 2 Repositories and key industry utility firms store position and market-level data and provide regulator(s) access to this information
- 3 Regulator(s) perform necessary macroeconomic and other analytics based upon scenarios and concerns it identifies

**Potential key benefits of systemic risk information approach**

- Regulator(s) would have access to granular, position-level, and market data to analyze the overall market and identify correlations to determine potential areas of concern
- Regulator(s) could access a wider range of product information than from trade warehouses alone and potentially draw on the observations of utility firm staff who are already monitoring markets.
- Would help provide regulator(s) the ability to view a firm’s underlying position and exposure from a ‘central vantage point’

**Potential key implications of systemic risk information approach**

- Potentially significant resource requirements for the regulator(s), financial institutions, and utilities
- Dependency on clearing organizations for information
- Overall responsibility for identifying, measuring, and monitoring systemic risk would lie with regulators
- Emphasis/reliance on financial institutions to provide complete and accurate position-level data
- Potential international privacy/confidentiality issues

**Potential resource requirements of systemic risk information approach**

- Dedicated resources from regulator(s) to access, manipulate, review, and challenge data as well as perform and interpret their own macroeconomic and other analytics

- Dedicated resources from key industry utilities to maintain and provide information to regulator(s) as well as react to changing regulator(s) data requests
- Regulators would require development of significant additional risk infrastructure

### ***Potential alternatives to systemic risk information approach***

- Trade repository-based approach
- Data warehouse-based approach
- May also have firms feed information directly to regulator in addition to use of key industry utilities

### ***Potential information requirements***

- Potential data inputs (requirements of utilities):
  - Position-level data
  - Information from market vendors
  - Transaction-level data
  - Margin and collateral
  - Liquidity and funding
  - Reference data for a common system of legal entity and counterparty identifiers
  - Increased granular data on asset classes (e.g., CDS spreads and bond spreads)
  - Security master information
- Potential data outputs (regulator calculations):
  - Counterparty exposures
  - Aggregated exposures
  - Potential future exposures
  - Risk profile and concentration data
  - Risk-correlation data

### ***Some key gaps identified***

- Financial institutions and financial industry utility firms are currently able to produce data of sufficient granularity; no key data gaps identified, however, technological- and infrastructure-related challenges exist, including:
  - Significant infrastructure development for financial institutions and utilities
  - Significant costs and resource requirements for connections to the trade repositories
  - Significant costs for third-party vendor to maintain trade repository
  - Incomplete view of risk as positions not held in repository would not be aggregated and analyzed
  - Counterparty exposures currently not readily available in trade repositories
  - Core dependency on financial institutions to have the appropriate internal infrastructure to produce necessary data
- Inability to assess:
  - Leverage

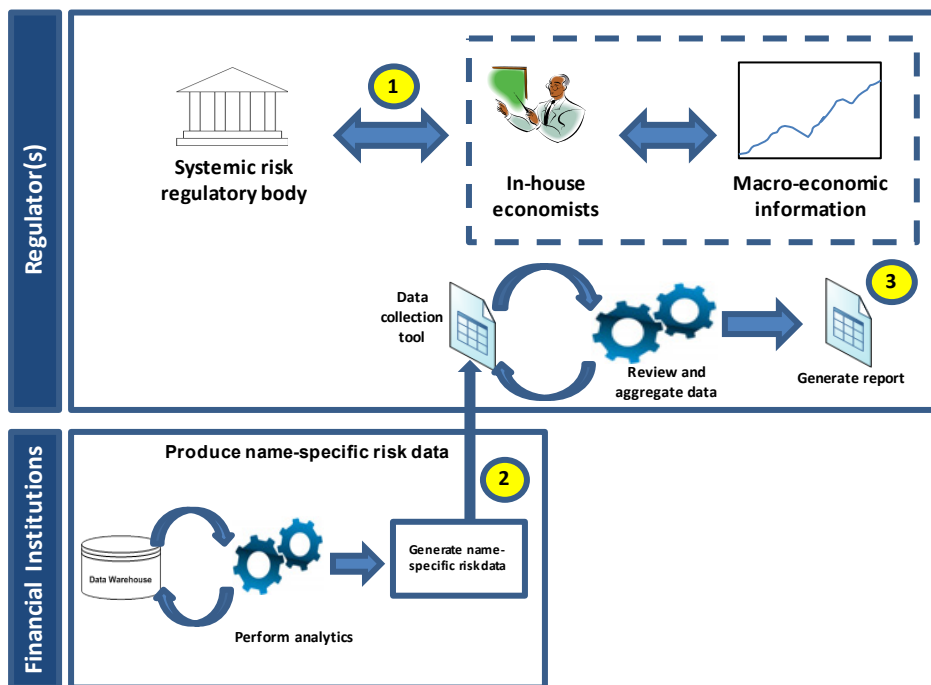


- Asset-price inflation
- Liquidity/solvency
- Flow of funds

### Concentration exposure reporting-based approach

A concentration exposure reporting-based approach would require the regulator(s) to develop thresholds for key products, counterparties, and markets. Financial institutions will then generate reports on name-specific risks, including individual positions and exposures that they have to obligors and issuers that are above the defined threshold. Regulator(s) will perform the necessary analytics and aggregate the information to obtain an industry-wide perspective on concentration exposures.

A high-level, illustrative process flow of a concentration exposure reporting-based approach is outlined below.<sup>50</sup>



#### Key steps of systemic risk information approach

- 1 Regulator(s) develop high-level thresholds for key products, counterparties, and markets and communicate to financial institutions
- 2 Financial institutions generate the required data in excess of the defined thresholds and report to the regulator(s)
- 3 Regulator(s) review and aggregate data reported; ongoing discussions driven by regulator(s) to help identify potential market 'hot-spots' and areas to focus attention

<sup>50</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.

***Potential key benefits of systemic risk information approach***

- Does not require significant infrastructure build as existing initiatives can be leveraged
- Ability to identify concentrations of counterparties and markets above set thresholds
- Ability to identify idiosyncratic exposures across the market
- Information will be in a format that enables regulator(s) to aggregate in order to identify potential areas of concern

***Potential key implications of systemic risk information approach***

- May require significant manual processes which may cause potential data accuracy and completeness issues
- Identification of appropriate thresholds by product, market, or name may be time consuming
- Materiality threshold might suit some firms better than others
- Heavy reliance on financial institutions to generate information using internal models

***Potential resource requirements of systemic risk information approach***

- Significant increase in financial institution analytics teams to generate name-specific data
- Increase in regulator(s) economists teams to develop appropriate thresholds
- Increase in regulator(s) data analytics teams to analyze and aggregate data to identify potential 'hot-spots'
- Regulators would require development of additional risk infrastructure

***Potential alternatives to systemic risk information approach***

- Data warehouse-based approach

***Potential information requirements***

- Information related to loans
  - First lien mortgages
  - Prime
  - Alt-A
  - Subprime
  - Second/junior lien mortgages
  - Closed-end junior liens
  - Home equity lines of credit
  - Commercial and industrial loans
  - Commercial real estate loans
- Counterparty and reverse counterparty
- Information related to securities and other financial instruments inventory
  - Available for sale
  - Held to maturity

- Key P&L statistics (e.g., pre-provision net revenue)
  - Net interest income
  - Non-interest income
  - Non-interest expense
- Allowance for loan and lease losses
  - Allowance for loan and lease losses at end of previous year
  - Allowance for loan and lease losses at end of year
- Tier 1 capital
  - Sum of Tier 1 elements
  - Common stockholders' equity
  - Risk-weighted assets

### ***Some key gaps identified***

- Challenges resulting from requests based on specific thresholds, such as:
  - Product
  - Asset
  - Counterparty
  - Regulatory defined calculations
- All data delivered in a summarized fashion, therefore, there are potential gaps if any of the thresholds are incorrectly defined
- Key challenge in capturing concentrations; for control purposes one may be required to produce the entire data set on a regular basis, in order to confirm that concentrations reported are accurate and complete

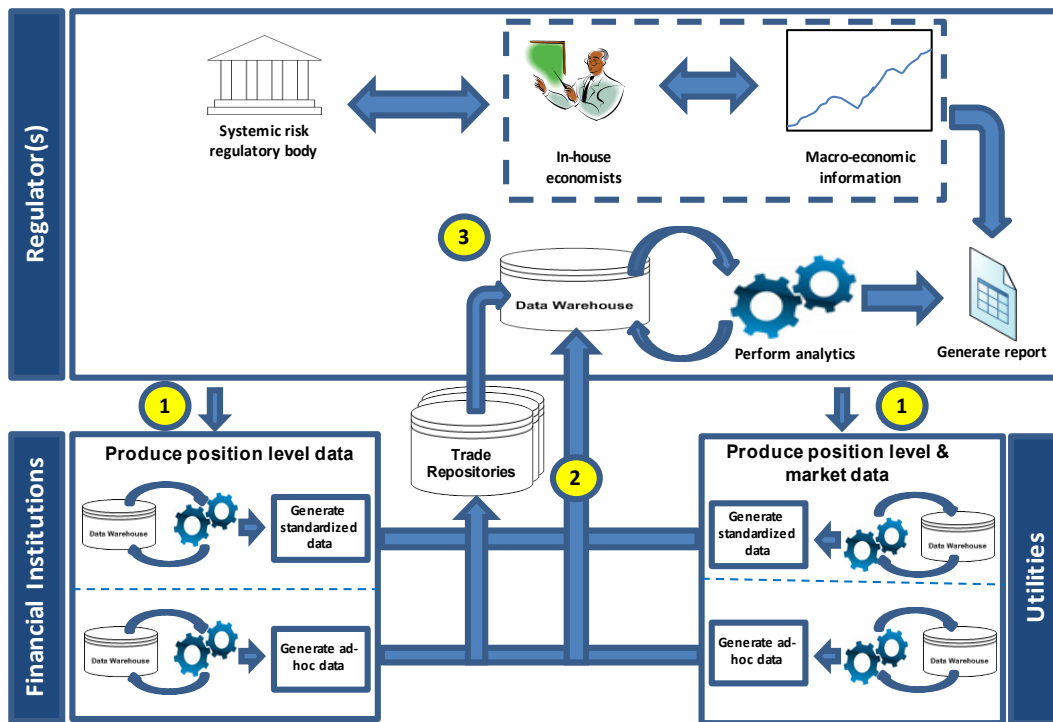
### **Data warehouse-based approach**

A data warehouse-based approach would require the regulator(s) to have a central repository capable of receiving and storing position level data from all relevant financial institutions. This would enable the regulator(s) to have access to granular data, which they could analyze as needed to help identify, measure, and monitor systemic risk.

A high-level, illustrative process flow of a data warehouse-based approach is outlined below:<sup>51</sup>

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<sup>51</sup> The illustrative process flow is a high-level, conceptual diagram based on the information gathered during this project and Deloitte & Touche's analysis. It does not represent the actual detailed process flow of any single institution or regulator.



**Key steps of systemic risk information approach**

- 1 Regulator(s) determines and communicates standardized and ad hoc as needed, data requirements to financial institutions and financial industry utility firms
- 2 Financial institutions and financial industry utility firms develop required data infrastructure, generate required data (standardized and ad hoc as needed), and provide it to regulator(s). Regulator(s) may also receive data from existing trade repositories
- 3 Regulator(s) stores received standardized and ad hoc data in in-house data warehouse and performs data analytics through in-house modeling teams

**Potential key benefits of systemic risk information approach**

- Detailed position-level data for all relevant financial institutions would provide regulator(s) ability to analyze overall market and correlations to help determine potential areas of concern
- Granular, position-level data from financial institutions would be centrally stored in-house by regulator(s) who can manipulate information to perform necessary analytics

**Potential key implications of systemic risk information approach**

- Standardized data policy would need to be developed and communicated to market
- Implementation timeframe and costs associated with developing and maintaining infrastructure, both for the regulator(s) and financial institutions; phased approach may alleviate some of the challenges
- Overall responsibility for identifying, measuring, and monitoring systemic risk would lie with regulator(s)
- Potential international privacy / confidentiality issues

**Potential resource requirements of systemic risk information approach**

- Significant increase in regulator(s) data warehouse management and monitoring technological team

- Significant increase in regulator(s) analytics teams to perform and interpret systemic risk-related stress tests and other calculations
- Increase in financial institutions' resources to generate required information and provide on regular basis to data warehouse

### ***Potential alternatives to systemic risk information approach***

- Data warehouse could be owned and/or maintained by third-party data or data and analytics vendor
- Third-party data vendor could normalize multiple data formats sent by financial institutions and pass along to regulator(s)
- Regulator(s) supplement data from trade repositories with additional information from financial institutions and utilities

### ***Potential information requirements***

- Potential data inputs (requirements of financial institutions and utilities):
  - Information from trade repositories
  - Information from market data vendors
  - Position-level data
  - Transaction-level data
  - Margin and collateral
  - Liquidity and funding
  - Reference data for common system of legal entity and counterparty identifiers
  - Increased granular data on asset classes (e.g., CDS spreads and bond spreads)
  - Security master information
  - Maturity transformation information
  - Leverage
- Potential data outputs (regulator calculations):
  - Counterparty exposures
  - Aggregated exposures
  - Potential future exposures
  - Risk profile and concentration data
  - Risk-correlation data

### ***Some key gaps identified***

- Financial institutions and financial industry utility firms are anticipated to generally be able to produce data of sufficient granularity; no key data gaps identified, however, there will be increased pressure on the systemic risk regulator to be able to use so much detailed data efficiently. Additional technological- and infrastructure-related challenges exist, including:
  - Significant infrastructure development for financial institutions, utilities, and regulators
  - Significant costs and resource requirements for regulator(s) to maintain data warehouse
  - License costs to access market vendor data

- Reliance on financial institutions to supply sufficient data for regulator to perform macroeconomic and other analytics
- Core dependency on financial institutions to have appropriate internal models to produce necessary data

## Other initiatives proposed by financial institutions, regulators, and academics

In addition to the systemic risk information approaches described in this study, there have been other initiatives proposed by financial institutions, regulators, and academics in order to help measure and monitor systemic risk. A sample of proposed initiatives is summarized below:

### CoVaR

CoVaR is a proposed measure for systemic risk described in a Federal Reserve Bank of New York Staff Report<sup>52</sup> that may help to shift the focus of supervision to overall financial sector risk, and to the potential externalities that actions of individual institutions may impose on the financial system as a whole.

One of the most common measure of risk used by financial institutions is Value at Risk (VaR). VaR focuses on the risks within an individual institution in isolation and does not, therefore, reflect systemic risk.

The prefix ‘Co’ which is added to the VaR measure stands for conditional, co-movement, contagion, or contributing. The difference between CoVaR and VaR is that CoVaR captures the marginal contribution of individual institutions to the overall systemic risk.

### Systemic risk and application of the Shapley<sup>53</sup> methodology

While the CoVaR model is focused on modeling an individual institution (or groups of institutions) and takes a bottom-up approach, an alternative approach identified in a BIS Working Paper<sup>53</sup> takes a top-down approach by identifying a methodology for attributing the systemic risk to institutions. Leveraging game theory constructs, the paper proposes an attribution method to distribute systemic risk to individual institutions and provides examples to show the interaction of the methodology across size, the institutions risk profile and strength of exposures to common risk factors and macroprudential capital rules.<sup>54</sup>

### Risk Assessment Model for Systemic Institutions (RAMSI)

The recent financial crisis has illustrated the importance of modeling the closure of funding markets to financial institutions and accounting for liquidity feedbacks within a model of systemic risk.

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<sup>52</sup> Adrian, Tobias and Brunnermeier, Markus K. “CoVaR.” *Staff Report*. Federal Reserve Bank of New York. August 2009 (revised).

<sup>53</sup> Tarashev, Nikola, et al. “Attributing systemic risk to individual institutions.” *BIS Working Paper No. 308*, Bank for International Settlements, Basel, Switzerland, May 2010

<sup>54</sup> Shapley, Lloyd (1953), Game theorist that developed a solution to cooperative games, developing a attribution methodology that carries his name: Shapely Value. The portion of the overall value (e.g., output) that this methodology attributes to each player in a game equals the average of this player’s marginal contributions to the value created by all possible subsets of players.

The RAMSI model, developed by the Bank of England,<sup>55</sup> provides a quantitative framework for assessing how the balance sheets of core banks in the United Kingdom's (UK) financial system dynamically adjust to macroeconomic and financial shocks. The framework incorporates macro- credit risk, interest and non-interest income risk, network interactions, and feedback effects arising on both the asset and liability side of the balance sheet.

RAMSI employs elements of traditional stress testing combined with theoretical work on modeling systemic events. Going forward, there are planned enhancements for the RAMSI model, in particular, the capability to analyze banks' cash flow constraints and determining how mitigating actions in light of funding stress may affect the wider macroeconomy. It is envisaged that RAMSI's analytical framework will become a key part of the analysis of systemic risk in the UK.

## Assessing financial linkages and systemic implications

A recent IMF report on global financial stability entitled *Responding to the Financial Crisis and Measuring Systemic Risk*<sup>56</sup>, highlighted that systemic linkages can arise from liquidity squeezes and other stress events, as well as from financial institutions' solvency concerns. The report illustrated the approaches and methodologies that could be adopted to provide metrics and tools to monitor systemic linkages, focusing on the 'too-connected-to-fail' issue.

To support the identification and assessment of these financial linkages and the potential systemic implications, four potential complementary approaches are proposed — the network approach, the co-risk model, the distress dependence matrix, and the default intensity model. The report highlights that each approach has limitations, but together they provide an important set of tools for assessing financial linkages and systemic implications.

### The network approach

The network approach is a methodology developed to help assess the systemic effects of financial institutions' direct linkages. It utilizes network analysis, which traces the reverberation of credit events or liquidity squeezes throughout the system. This provides useful measures of financial institutions' resilience to the potential systemic effects caused by financial distress.

The network approach requires a matrix of inter-institution exposures to be developed, which includes gross exposures across financial institutions. Once the matrix has been constructed, shocks are simulated to specific financial institutions in order to track the 'domino effect' on other organizations within the network.

Network analysis provides a measure of the degree to which a financial system may be impacted by the financial distress transmitted across the financial institutions. The analysis can also help identify 'vulnerable' spots where contagion is high. Network analysis can also be used to track the path of contagion such that it can be monitored and assessed on a regular basis.

### The co-risk model

The co-risk (or co-movement) model is capable of assessing both direct and indirect financial linkages at an institutional level. These linkages can arise from exposure to common risk factors (e.g., the adoption of similar portfolio holdings or risk management systems), common accounting practices

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<sup>55</sup> Aikman, David, et al. "Funding liquidity risk in a quantitative model of systemic ability." *Working Paper No. 372*, Bank of England, London, June 2009.

<sup>56</sup> IMF Washington DC, Global Financial Stability Report, *Responding to the Financial Crisis and Measuring Systemic Risks*, April 2009

across financial institutions, or other factors. By tracking the market's perception of how the credit risk of one institution affects other institutions' credit risk, linkages between financial institutions can be determined.

The co-risk model utilizes market data to assess the systemic linkages between financial institutions in times of crisis, focusing on bilateral relationships. The data at the core of the co-risk model includes Moody's KMV expected default frequencies, corporate bond spreads, the VaR of financial institutions' portfolios, and corporate bond spreads.

Under efficient markets, co-movement of these variables should provide information on both the direct and indirect linkages between financial institutions. This type of analysis provides a useful surveillance tool, as it highlights the institutions that are perceived to have greater connections with other financial institutions.

### **The distress dependence matrix**

The distress dependence matrix is a methodology that is capable of assessing the implications of direct and indirect financial linkages for the U.S. banking system. The distress dependence matrix is used to examine financial institutions in pairs. One financial institution's co-risk measure versus each of the others is averaged across the sample, to determine its connection to the overall system.

Having determined the joint probability distribution of distress across a group of financial institutions, it is then possible to 'slice' this multivariate distribution to estimate the probability of a financial institution experiencing distress conditional on another institution being in distress.

This analysis can provide useful insight into how potential distress in an individual financial institution can affect other institutions and, ultimately, the stability of the overall system. However, as the findings from the distress dependence matrix are focused on pairs of institutions, the information should be used in conjunction with other measures of systemic linkages when making decisions on individual institutions.

### **The default intensity model**

Whereas the co-risk model and the distress dependence matrix focus on the implication of direct and indirect financial linkages for the banking system, the default intensity model assesses indirect financial linkages, including those to the broader economy.

The collapse of Lehman Brothers Holdings Inc. highlights how the failure of an institution can cause distress in other financial entities through the complexity of contract relationships. It is important to not focus solely on the knock-on effects of individual institutions on the other entities within the financial system, but also on their interaction with the wider economy as a whole.

The default intensity model is used to measure the probability of failure of a large set of financial institutions due to systemic linkages. Based on historical default data, the default intensity methodology focuses on the time-series properties of banking default data to examine systemic linkages. The data includes the annual number of corporate and banking defaults, the actual and fitted economy default rates and the default rate probability and number of defaults.



# Key concepts and underlying issues

Specific areas highlighted by meeting participants were reviewed, e.g., improvement to the overall financial infrastructure, data granularity, reporting requirements (standardized reporting versus ad hoc requests), data infrastructure, stress test approaches, information confidentiality, top-down aggregation versus bottom-up aggregation (macroprudential versus microprudential), the role of CCPs, data quality versus data timeliness, and living wills. Issues raised and discussed surrounding each of these areas are summarized below.

## Improvements to the overall financial infrastructure

Increased complexity in both individual products and the overall market has exacerbated the financial system's robust-yet-fragile connected network characteristics (i.e. within a certain range the connections act as a shock absorber but beyond that range they may serve as a shock amplifier) and increased counterparty pricing uncertainty, according to Andrew Haldane (April 2009).<sup>57</sup> Therefore, it is clearly recognized that there is a need to improve the infrastructure of the financial system in order to better identify and manage the build-up of systemic risk.

A selection of regulators and industry participants alike, stated that the current financial infrastructure is fairly archaic, and that there needs to be more resiliency in the financial system, in particular the OTC derivatives market as it lacks transparency. In order to help address the transparency issue within the OTC market, CCPs have been identified as a potential source for increasing disclosure of data within financial institutions and reducing systemic risks in the marketplace. At the same time, it has been suggested by Darrell Duffie and Haoxiang Zhu<sup>58</sup> that CCPs may simply concentrate risk in the clearing party rather than reduce systemic risk in the financial system.

Another consideration to the required improvements to the overall financial infrastructure's transparency is broader systemic transparency. The IIF noted that "there needs to be sufficient transparency of the exposures created, risks undertaken, and interconnections among market participants to allow the authorities charged with systemic stability oversight to have a clear view of the overall level and distribution of risks. This holistic view is needed for authorities to make sound judgments on the need for intervention and, if needed, its form."<sup>59</sup>

Regulators and financial institutions agree that there should be an increased focus on the "pipes" and "plumbing" of the financial system, to help reduce systemic risks embedded in areas such as intraday credit risk of clearing banks and the tri-party repo process. Therefore, according to some, the efforts of a systemic risk regulator may be better served fixing the "plumbing", e.g., payment and settlement systems, rather than focusing on data and macroeconomic and other analytics. Addressing this issue may help to mitigate systemic risk.

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<sup>57</sup> Haldane, Andrew. "Re-thinking the Financial Network." Speech delivered at the Financial Student Association, Amsterdam, April 2009.

<sup>58</sup> Duffie, Darrell and Zhu, Haoxiang. "Does a Central Clearing Counterparty Reduce Counterparty Risk." Stanford University, July 2009.

<sup>59</sup> Institute of International Finance (May 2010)

One proposed method for improving the financial system infrastructure is to focus on the enhancement of risk management practices within organizations across the entire market. Another concept put forth is placing a greater emphasis on the more elementary aspects of sound risk management, thereby allowing financial institutions to gain a better understanding of their key risks and how to mitigate them effectively.

## Stress test approaches

Stress tests are widely recognized as an effective tool for identifying and managing risk vulnerabilities. Historically, stress tests have been conducted on a largely microprudential basis, for specific risk areas. Some have focused on adding additional elements to the stress testing approach to broaden their utility across risk areas, e.g., “stress-testing exercises involving tail risk scenarios can strengthen the analysis of financial soundness.”<sup>60</sup>

It is recognized that stress tests need to be performed on a more macroprudential basis; however, there inherently are challenges around the development of appropriate macroprudential stress test scenarios. A systemic risk regulator would need to develop more stringent, market-focused scenarios which enable greater macroprudential oversight. One example of a macroprudential stress test approach was the SCAP conducted by the Federal Reserve, a forward-looking activity, which facilitated the estimation of losses, revenues, and reserve needs for bank holding companies utilizing two macroeconomic scenarios.

Despite certain limitations, this exercise was broadly deemed a success by regulators and financial institutions as the information released from the SCAP was comparable across firms, a valuable benefit as it enabled other financial institutions and regulators to assess firms’ positions. Of equal importance, boards of directors of financial institutions were able to understand the SCAP results. The SCAP is considered an example of a regulatory program which helped contain a broad market panic, and built confidence in the market. Although the scenarios defined under the SCAP would need further refinement to be used again, stress tests provide a good basis going forward.

The use of reverse stress tests is viewed as another efficient tool for monitoring system-wide risks. This would help enable regulators to ask financial institutions questions, such as “what would it take for your firm to lose \$10 billion?” Reverse stress tests would place responsibility with the financial institutions for generating scenarios beyond the normal business setting, and assessing those results so as to uncover potentially hidden risks and risks with potential systemic implications.

A key benefit of stress testing and reverse stress testing is that regulators will not be required to develop detailed data warehouses and related infrastructure, as the stress tests place the analytical responsibilities with the financial institutions that are best positioned to understand their risks.

## Data granularity

There is no consensus on the level of data granularity that financial institutions should provide regulators during both normal market conditions and in times of crisis.

Some regulators agreed that potentially more granular data is necessary to identify and monitor systemic risks in the marketplace, including such data as:

- Position-level data
- Loan-level information

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<sup>60</sup> Ibid.

- Information on off-balance sheet risks
- Issues related to maturity transformations

Other regulators, meanwhile, do not support the concept of requesting more granular data, stating that capturing information, such as transaction level detail, would not be effective in monitoring systemic risks. They argue that those who support requests for more granular data must not understand the implications of working with such large volumes of data and the challenge of effectively analyzing it to capturing meaningful observations. Indeed, it is generally agreed that capturing firm-specific position-level data would be a key challenge for a regulatory IT function in terms of building out the infrastructure to support the capture of such data, maintaining a database to store the information, and performing the necessary analytics. It would also be a significant challenge for financial institutions to build out the technology architecture to support regulators' requests for data in a standardized format across the financial system.

From an industry perspective, some financial institutions argue that such a detailed data-oriented approach would not be either effective or efficient for a systemic risk regulator. There is a concern about being potentially overwhelmed with granular data and “losing the forest for the trees.” Regulators should determine what risks they are trying to measure, agree on the appropriate information to be requested, all the while balancing the benefit of the information collected from financial institutions against the burden it takes to produce and the challenge of analyzing it efficiently.

Regardless of the challenges, it appears that some increased level of granular information would have been helpful during the recent financial crisis, in particular data such as volume trends, liquidity, flow of funds, concentrations, counterparty risk, and interconnectedness. Information on market size may have been useful for both financial institutions and regulators, as a way of identifying crowded trades, especially for more illiquid products. As an example, more data on size and concentrations within some CDS providers may have supplied regulators with information on the risk transfers between firms with CDS contracts and greater insights on such coverage. It was consistently noted by participants that more granular information would be requested and needed to manage systemic risk during a crisis and less granular data needed during normal times.

Data needs to be flexible, able to be aggregated, and produced in a timely manner in order to provide sufficient information for regulators to draw conclusions on risks in the financial system. There are, however, concerns surrounding information confidentiality and directionality of trading positions. It is acknowledged that providing more granular data on this type of information may negatively impact a financial institution's businesses. This topic is covered in more detail in the section below on information confidentiality.

### Reporting requirements (standardized reporting versus ad hoc requests)

There is currently a significant volume of information reported by financial institutions and industry utilities. This data, however, is not consistent across the market, highlighting the point that current reporting initiatives, both standardized and ad hoc require enhancement to support systemic risk management. In *The Financial Crisis and Information Gaps*, the FSB stated: “The development of common reporting templates for use across countries (and regions) would permit aggregation at the national level and cross-institutional and country comparison. If sufficiently granular, it would facilitate measurement of concentration, (including “crowded trades”) and identification of network links.”<sup>61</sup>

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<sup>61</sup> Financial Stability Board. (October 2009).

Regulators require financial institutions to provide information on their business activities through the use of standardized reports and/or ad hoc requests. Most financial institutions prefer standardized reports as the effort required to produce data in response to 'custom' requests often can be substantial. During times of crisis, financial institutions are heavily focused on performing normal business activities to maintain their operations. Added regulatory reporting requests at this critical time places the burden on financial institutions to dedicate extra resources in response.

This concept of normal periods versus crisis periods has become an important consideration in defining reporting requirements. Regulators were in broad agreement that in times of crisis, reporting requests would be more frequent and ad hoc in nature. During the recent credit crisis, financial institutions received extremely detailed reporting requests and were asked to provide their results to the regulators in an accelerated manner. Many institutions indicated that this "hurried" timeframe disrupted firms' operations (during a time of market stress) as they worked to provide the information to the requesting regulator.

Exposures which proved to be troublesome during the recent financial crisis were built up over long periods of time, not simply a few days. Industry respondents believe that had related, more granular information on these exposures been disclosed on financial institutions' periodic regulatory filings, it is possible that such standardized reporting would have sufficed for identifying and monitoring the market bubble and would not have required firms to complete numerous ad hoc reporting requests. Regulators agree with industry respondents that ad hoc requests are expensive to produce and analyze. A reaction to this by some regulators, however, is a view to increase the frequency and depth of standardized reporting, an option that financial institutions disagree with, citing that increasing the frequency of reporting may place an enormous burden on firms while providing limited benefits.

"An additional data challenge is presented by entities that fall outside the regulatory perimeter, and that may not disclose information on their exposures and operations in a sufficiently granular manner to allow assessments of their systemic relevance."<sup>62</sup> In order to obtain a holistic view of systemic risk across the financial system, regulators would need additional information from these entities that fall into the "shadow banking system."

Financial institutions agree that standardized reporting is the preferred approach, but at the same time, they should understand and accept that ad hoc requests will continue to be forthcoming. The challenge facing regulators is how to minimize the burden these requests may have on financial institutions and utilities, at the same time obtaining the data they need.

## Data infrastructure

In order to obtain a standard set of information requirements that financial institutions can provide to regulators, a robust data infrastructure is essential. This will help to identify the build-up of systemic risk as regulators will have comparable data from financial institutions across the financial system. There is general agreement that regulators should enhance their own data infrastructure in order to better manage information requests, including overall enhancements to management information systems and reporting capabilities.

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<sup>62</sup> Ibid.

As discussed, one potential solution, which would help enable the regulator to capture information and perform macroeconomic and other analytics, is a data warehouse. Using this model, a systemic risk regulator would have access to underlying data of financial institutions, and would have the ability to analyze information as required. This would facilitate improved identification and assessment of systemic risks. A proposed example of developing the infrastructure to support a data warehouse is the creation of a data 'landing zone' to collect information and a data mapping tool to normalize the information gathered. This option would require a systemic risk regulator to have the flexibility to manage non-standardized data formats, and the capability to understand and analyze risk information effectively.

Implementing and maintaining a regulatory data warehouse is an enormous challenge coupled with significant costs for regulators, financial institutions, and industry utilities. Additionally, if a large, fixed architecture, such as a regulatory data warehouse is built, areas that are not deemed as critical at the time of establishing the data standards may not be monitored very closely thereby leading regulators to overlook a potential build-up of systemic risk. An initiative of this significance would require coordination amongst regulators, financial institutions, and utilities in order to build, maintain, and connect to the data warehouse. Crucial to the successful use of a data warehouse is the ability of a systemic risk regulator to understand the data stored in it and the capability of using this data to perform risk analytics on a macroprudential level.

Another potential alternative is a trade repository, which acts like a data warehouse, albeit on a smaller scale, containing only certain products and asset classes, e.g., OTC derivatives. The repository could be operated by a third-party vendor, such as DTCC, who maintains the existing repository, i.e., Trade Information Warehouse, for CDS transactions. There has been support for expanding the DTCC's Trade Information Warehouse to a broader model covering more products in order to create a hub from which regulators could access information and better understand market risk.

There are two proposed approaches to help provide information to the regulator via a trade repository:

- Individual firms and the financial industry utility housing the trade repository would both provide information to the regulator, recognizing there will inherently be some redundancy to the information provided as transactions executed by the individual firms may be reported multiple times and would need to be properly accounted for.
- Alternatively, individual firms could report the information to the regulators, who would then use the data stored in a financial industry utility's repository as a cross-checking tool.

The use of trade repositories would enable increased transparency, even for some of the less transparent hedge funds as the dealer side of transactions would be reported.

Although there would be useful information stored in trade repositories, there would continue to be a need to obtain supplementary sources of data from both regulators and financial institutions to gain a holistic view of risk. In addition, there is a key concern about entering nonstandard trades into a data repository as these may include complex products which would have to be "forced in" to the repository, potentially causing problems such as increased risks to data integrity and reduced usefulness of information in the repository. Regardless of these issues, some financial institutions agreed that the introduction of trade repositories should be a "top of the list" priority to help monitor systemic risk.

Trade repositories could be an important systemic risk monitoring tool, as they provide a means for both regulators and financial institutions to access more granular information, including counterparty information, on a timelier basis. Trade repositories have the promise of improving a member firm's information disclosure and also serving as a useful tool for unwinding a financial institution, as they would contain detailed information about the organization's positions.

Similar to the data warehouse model, crucial to the successful use of a trade repository would be the ability of regulators to also utilize and bring into context key macroeconomic and market indicators in the analysis in order to identify risk concentrations. Ensuring that a systemic risk regulator is sufficiently capable of monitoring the correct risk measures and asking focused questions in order to understand complex risks would be another key challenge to using this model.

## Information confidentiality

Data confidentiality is a major area of concern for financial institutions, specifically around the disclosure of proprietary information, such as directional positions or trading strategies. Releasing this type of information could lead to a competitive disadvantage, if publicly known. There is very clear agreement that during the implementation of various regulatory reform and other changes, there is a critical need to respect and protect the confidentiality of information in the financial services industry. Some expressed concerns centered on the disclosure of real-time information, as this could potentially impact the financial markets. At its worst, in a time of market crisis, sharp movements in the market could potentially lead to a panic amongst traders and the investing public, thus increasing herd behavior and systemic risks. A proposed solution to protecting information confidentiality would be to disclose trading activity information on a lag basis of approximately 24–72 hours after the trade is made. Systemic risk issues often tend to occur when large concentrations build over time, not as a result of one day's trading activity. So, delayed trading activity reporting should not reduce the ability of a systemic risk regulator to oversee and identify potential concentrations through analysis of underlying data.

There are also concerns of data privacy issues related to the sharing of cross-border customer information, which could include counterparty information or other credit exposures. There was general agreement amongst financial institutions and regulators that jurisdictional issues would be a challenge to overcome in exchanging customer information with international regulators and organizations. Different countries have different laws governing the disclosure of private customer information, and it appears that new legislation would need to be implemented around the globe for sharing cross-border customer information.

The potential disclosure of amounts paid by parties for bankruptcy claims was another example given. According to *Reuters*, hedge funds expressed great concern regarding the reporting of their positions and prices paid for claims, as this increased disclosure was seen as potentially harming their competitive position by revealing their trading strategies.<sup>63</sup>

Requiring hedge funds to disclose all their position and trading information seems to be a political improbability. Large, more institutionalized hedge funds might voluntarily comply with regulatory reporting requirements; although, it appears unlikely that other hedge funds would follow suit. There was general agreement, therefore, that a systemic risk regulator would be required to implement robust information security measures to ensure data privacy across the financial system, thus potentially gaining buy-in from industry firms.

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<sup>63</sup> Hals, Tom. "Hedge funds, bankruptcy judges spar over disclosure." *Reuters*, February 4, 2010. <http://www.reuters.com/article/idUSN0414910020100204>

## Top-down aggregation versus bottom-up aggregation (macroprudential versus microprudential)

“Microprudential regulation focuses on identifying risks to an individual firm and requiring firms to protect against those risks, whereas macroprudential regulation focuses on preventing or safeguarding systemic risks.”<sup>64</sup> “Macroprudential analysis needs to identify the trends in the economy and in the financial system which have implications for financial stability and, as a result, for macroeconomic stability, and to identify the measures which could be taken to address the resulting risks.”<sup>65</sup>

Did financial institutions have sufficient capabilities to aggregate data at different levels across the firm during the recent financial crisis, including the ability to aggregate counterparty risk information? Some contend they did not. In particular, participants were in broad agreement that regulators had challenges aggregating the information they were collecting across the financial system because, at present, regulators request information in several different formats. The lack of comparable data to support microprudential and macroprudential aggregation was seen by some as a hindrance in the regulators’ ability to identify potential extreme events or ‘bubbles’ within markets.

Therefore, there was general agreement that a systemic risk regulator should look to develop common industry-wide data standards and clear reporting guidelines to increase the comparability of data reported by financial institutions. Participants believed that these may better support the aggregation of data across financial institutions, and enable a systemic risk regulator to identify potential concentrations and the build-up of systemic risk within markets.

To monitor systemic risk effectively across the financial system regulators must capture aggregated data from financial institutions either by a ‘top-down’ (i.e., the data required from the markets) or bottom-up approach (i.e., the underlying data from financial institutions). Some believe that a combined approach of top-down/bottom-up aggregation would be most helpful in identifying and monitoring systemic risk.

Producing and disseminating aggregate data are valuable approaches to assessing the soundness of the financial system. It must also be “recognized that tail risks, variations in the distributions within aggregates, and the volatility of indicators over time may contain important signs of emerging vulnerabilities”<sup>66</sup> and potential market bubbles. These should be key focus areas for a systemic risk regulator.

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<sup>64</sup> Labonte, Marc. *Systemic Risk and the Federal Reserve*. Congressional Research Service, October 2009.

<sup>65</sup> Financial Services Authority. *The Turner Review: A regulatory response to the global banking crisis*. London, March 2009.

<sup>66</sup> Financial Stability Board. (October 2009).

## The role of central clearing counterparties (CCPs)

CCPs and data repositories have been proposed as sources for providing valuable information, on a granular position-level data (including trading and volume data), for a systemic risk regulator. CCPs are viewed as an effective way to obtain counterparty exposure information, a key facet of monitoring systemic risk. Opinions differ on the increased use of CCPs. Financial institutions and utilities believe that increased centralized clearing would help to reduce systemic risks in the financial system. The Financial Services Authority stated in the *Turner Review*, that it “strongly supports the objective of achieving robust and resilient central clearing house arrangements for CDS clearing,”<sup>67</sup> and has been working with U.S. and European regulatory authorities and potential market infrastructure providers to expedite this.

Regulators agree that counterparty exposure information would have been useful from a systemic risk perspective during the recent financial crisis. As an example, after a financial services firm failed, regulators realized that the information they had been receiving on counterparty exposures was inaccurate and/or incomplete. They had not been given required information on specific units/customers (e.g., legal entities), which had counterparty risk exposure, but instead were being sent ‘street names’<sup>68</sup>, which did not support the analysis of risk exposures across financial institutions.

Financial industry utility firms concur that if CCPs are not used, the market would be subject to greater risk. The CCPs argue that by increasing the flow of trades through a central clearing organization, there is more transparency, positions are marked-to-market continuously, and exposure is calculated and margined appropriately.

There has been debate around the use of CCPs for OTC products. Limited coverage of information regarding the OTC derivatives markets, particularly CDS, plus a lack of transparency, helped to conceal key elements of an important risk transfer channel within the financial system.<sup>69</sup> A balance is needed between transactions that are centrally cleared and those that should remain OTC. Relatively standard, ‘vanilla’ (i.e., simple) products should be centrally cleared, which will account for the majority of OTC transactions. However, some utilities have stated that the more complex, non-standardized products (e.g., structured, exotic products) should stay OTC and not be centrally cleared. Non-standardized, exotic products could take longer to relocate and put the CCP itself at much greater risk. These non-standardized products should continue to be cleared over the counter bi-laterally; however to improve monitoring, there should be regular, standardized reporting for them.

Numerous questions and concerns have been raised around risk concentrations and the risk of the CCP itself, with both regulators and financial institutions questioning whether systemic risks have in fact been reduced through the use of CCPs. Would the increased use of CCPs result in too much concentration, i.e., ‘too many eggs in one basket’? Would the CCP mitigate risk or transfer it? While CCPs may reduce the probability of default, loss-given defaults may increase since the use of CCPs inherently concentrates exposures. If simple transactions are centrally cleared, would market participants have less overall counterparty risk due to the risk-reducing actions of a CCP or would they end up with more concentrated risks from the remaining higher risk transactions because the positions are less diversified and may have more concentrated risk profiles?

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<sup>67</sup> Ibid.

<sup>68</sup> The term ‘street names’ refers to the clearing broker name reported, rather than the underlying holder of the risk (i.e. the customer) name.

<sup>69</sup> Financial Stability Board. (October 2009).



Competition exists amongst CCPs. If multiple CCPs have the ability to clear the same products, margins may decrease for cleared products in order to incentivize membership which could increase credit risk and contribute to the build-up of systemic risk. CCPs may also expose the system to greater risk as they clear products which are too complex for them. Clearing corporations' risk management and infrastructure capabilities vary considerably. The regulation of CCPs differs, with some having less regulatory oversight. Such a wide range of differences among CCPs could create substantial systemic risks. One view, therefore, is that CCPs should be subjected to central bank oversight through stress tests and scenario analysis.

Capitalization requirements for exchanges and CCPs present another potential issue as exchanges tend to have lower capital requirements than financial institutions. Moving trades from OTC transactions between dealers to an exchange may not necessarily make the financial system safer, because the risk is likely being transferred to organizations which are subjected to less regulation and lower regulatory capital requirements.

Finally, questions have been raised regarding the approaches adopted by regulators when overseeing CCPs. The specific concern expressed was that regulators may raise CCP collateral requirements during a crisis which could exacerbate systemic risk problems during times of crisis by restricting available liquidity.

More robust CCPs are needed. CCPs will need highly skilled resources with robust systems and capabilities in order to appropriately manage the increased responsibility.

Clearly there is much to think about when considering an increased role for CCPs. As one regulator stated, "we would pity the regulator of the clearing house that fails." Another comment offered was that "there is no single entity whose failure could cause a bigger problem to the market than a CCP."

It was noted by the IIF that "in addition to the significant progress that has been made in extending the use of central counterparty arrangements in circumstances in which it is appropriate to do so, the industry has also committed to, and continues to make significant progress toward, the recording of interest rate and equity derivatives not cleared through a central counterparty."<sup>70</sup>

## Data quality versus data timeliness

A key challenge for regulators in today's economy is obtaining pertinent data that is timely, accurate and comparable to support the measurement and identification of systemic risk. There are, however, differing opinions as to whether the focus of a systemic risk regulator, from a data perspective, should be on quality or on timeliness. There are concerns around the quality of data received from financial institutions. Traditionally, the information populated on the standardized reporting templates has been heavily balance sheet focused with limited reporting of the quality of assets. Although the reports contain information on performing versus nonperforming assets (i.e., when an asset ceases to generate income for a financial institution on an actual realization basis), there is a need for more gradation and granularity.

The focus on 'timely' versus 'accurate' data varies depending on when and for what purpose the information is used for. In times of crisis, regulators would require information on a timelier basis; however this also necessitates their understanding of the relative accuracy of the information received. Such comprehension would enable regulators to apply appropriate assumptions to their assessment of the financial institutions supplying the data plus the reliability of the information.

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<sup>70</sup> Institute of International Finance, May 2010

Information used for policy purposes is expected to be accurate. It is generally acknowledged that the task of obtaining more accurate, firm-specific data is inherently easier in normal times. Decision-making in a crisis will always inherently have some level of incomplete data. In conjunction with this, the 80/20 rule applies to the data timeliness versus accuracy question. Regulators may not need all information verified, but will need information in a timely manner, especially during a crisis.

In normal periods, systemic risk is commonly considered to gradually build up over a period of time. In these periods, the focus should be on the importance of receiving accurate data, even if it is not received in the timeliest manner. However, there is a widely held point of view, which believes that receiving near-accurate information on a timely basis, as opposed to accurate data that is not provided in a timely manner, is preferable, especially during times of crisis. Implementing measures to enable financial institutions to respond to requests on a regular, timely basis with “somewhat accurate data,” thus becomes the priority during periods of crisis.

A minority opposing view observed is that the data timeliness versus accuracy question relies on a false premise, i.e., firms can only be accurate or timely. The view believes that if necessary firms could increase their infrastructure capabilities in order to provide both enhanced data timeliness and accuracy. Likewise, standards should not be established for infrastructure and quality of data as a separate matter, rather they should be combined in order to increase the efficiency associated with a possible change. Financial institutions should be required to enhance their capabilities that allow for the timely production of high-quality information, rather than focusing purely on timeliness or quality improvements.

## Living wills

The recent financial crisis has highlighted the need for more robust recovery and resolution plans to help prevent systemically important firms from failing. Adair Turner, chairman of the financial services authority in the UK, has outlined a proposal<sup>71</sup> for SIFIs to develop recovery and resolution plans known as ‘living wills.’ Prior to the financial crisis, regulators were performing wind-down simulations, however, in hindsight, the wind-downs were not robust enough to foresee the events that occurred, plus all the activities needed to prevent a crisis. A structured resolution plan, aka living will, would be of great benefit to a systemic risk regulator.

For regulators, an important consideration when discussing the concept of living wills, is to be able to identify where the sources of information will be coming from, how quickly a regulator can access that information and how useful the information would be if a firm had to perform a “quick sell-off” for increased liquidity. SIFIs need further clarification and more formal guidance to better articulate the concept and the requirements for their organizations.

While it is widely accepted that the concept of a living will is still in its infancy and needs further clarification, there is broad agreement that the advance development of these recovery and resolution plans will help to simplify the winding down process in the event of financial institution failure, potentially reducing the pressure on government authorities. In essence, living wills have caught attention due to the challenges of resolution of SIFIs.

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<sup>71</sup> Turner, Adair. “Large systemically important banks: addressing the too-big-to-fail problem.” Speech given at the Turner Review Conference: progress towards global regulatory reform, London, November 2, 2009.

# Appendix A — Interview questions

## Regulator interview questions

- How would you envision the role of a systemic risk regulator?
- What information might a systemic risk regulator need that you didn't have, and why?
- Of the information you collected, how might a system risk regulator look at that differently?
- What would your expectations be on receiving information?
  - Frequency
  - Robustness
  - Consistency
  - Granularity
  - Latency (timeliness)
- What additional information do you plan to collect?
- What firm and macroeconomic information/metrics would you suggest to develop in order to identify emerging systemic risks?
- How would you identify and measure the systemic risks with regard to:
  - Risk types
  - Products and markets (e.g., is a firm overexposed to a specific product/market?)
  - Firms
  - Practices
  - Gaps/insufficiently monitored segments
  - Infrastructure (e.g., clearance, settlement, and payment systems)
  - Interconnectedness
- How would you suggest this information be used as a systemic risk regulator?

## Industry interview questions

- How do you envision the role of a systemic risk regulator?
- What information or capabilities should a systemic risk regulator have had to oversee systemic risk?
- How would you describe your organization's capabilities to meet the systemic risk information requests?
- What information were you asked to produce for regulators that was difficult or you were unable to produce, with respect to:
  - Timeliness
  - Accuracy

- Robustness
- Granularity
- What would you want to know about the risks in other firms, utilities (and be willing to disclose to others)?
- What should a systemic risk regulator be focusing on within your firm and like firms in order to monitor systemic risk?
- How would you identify and measure the systemic risks with regard to:
  - Risk types
  - Products and markets (e.g., is a firm overexposed to a specific product/market?)
  - Firms
  - Practices
  - Gaps/insufficiently monitored segments
  - Infrastructure (e.g., clearance, settlement, and payment systems)
  - Interconnectedness
- How could macroeconomic information be used in a systemic risk analysis?
- How do we align incentives to mitigate systemic risk exposure?

### **Financial industry utility interview questions**

- How do you envision the role of a systemic risk regulator? In particular, what should their main responsibilities be?
- As a financial markets utility:
  - What information do you currently collect from member firms, exchanges, or others which may support systemic risk analysis/monitoring?
  - What are some of the risks in your member firms and their counterparties that *could be* monitored to assess systemic risk levels?
  - Going forward, what additional information would you envisage having to collect to better support systemic risk measurement and management?
- In the past, what systemic risk information were you asked to produce, that was difficult or you were unable to produce, with regard to:
  - Timeliness
  - Accuracy
  - Robustness
  - Granularity
- How could macroeconomic information be used to support the identification, measurement and monitoring of systemic risk? What types of macroeconomic information would be of most use?
- What are some of the metrics you could adopt to help identify and measure systemic risk with regard to:
  - Risk types

- Products and markets (e.g., is a firm overexposed to a specific product/market?)
  - Firms
  - Practices
  - Gaps/insufficiently monitored segments
  - Infrastructure (e.g., clearance, settlement, and payment systems)
  - Interconnectedness, concentration, and leverage
- In your opinion, what areas could the systemic risk regulator focus on within your organization in order to better monitor systemic risk?
  - How would you assess your firm’s capabilities to meet systemic risk information requests from a future systemic risk regulator?
  - What information or capabilities could you have had to better manage your own risk?

# Appendix B — Public policy considerations

The focus of this study is on the information requirements of a potential systemic risk regulator, but there are important public policy issues to be determined by policymakers, regulators, and others based on the broad nature of systemic risk and systemic risk regulation.

However, while not the focus of the study, and not intended to be a complete list, the following public policy issues were identified for consideration:

- Structure of systemic risk regulator(s), e.g., what are roles of key organizations such as FRB, Treasury, etc.
  - How do regulators coordinate domestically?
  - How do regulators coordinate globally?
- Definition of roles and potential actions of various parties, e.g., does it follow a clearly articulated structure such as the UK's tripartite regulatory structure of the FSA, HM Treasury, BoE
  - When is action taken?
  - Who has the authority to take action?
- Who is systemically important?
  - Is it a public list?
  - Is it a list or a ranking of each firm's relative systemic risk importance?
  - How are systemically important firms with a foreign headquarters addressed?
- Scope of the systemic risk regulator
  - Does it include systemic risk oversight of unregulated or lightly regulated entities?
- What is the level of confidentiality that will be maintained by the systemic risk regulator for confidential information, such as:
  - Direction of trades/portfolios held by firms
  - Trading strategies of firms
  - Customer transaction information, especially cross-border customer information
  - Overall firm systemic risk information

It should be noted that the structure of a systemic risk regulator has not yet been defined. Therefore, when a systemic risk regulator is referred to in this study, it could be either a single agency or a council consisting of multiple regulatory bodies