# Enhancing an LEI/CICI Dataset with Additional Data to Monitor (Hidden) Network Risk Propagation

# Introduction and Objectives

The United States financial market and economy has time and again revealed itself to be robust. The markets and economy quickly recovered from the collapse of Long Term Capital Management in 1998 and the dot com crash of 2000. The market barely responded to the loss of Drexel Burnham Lambert in 1990 and the losses that resulted in Kidder Peabody being sold in 1994. While this is reassuring, it must be noted that U.S. and international regulators have focused on assessing the stability and integrity of each individual investment and commercial bank under the implicit assumption that the integrity of the system is maintained by regulating each bank *as an independent entity*. The Great Recession of 2008 and the ongoing global/EU recession has revealed that the stability of financial markets and the health of the national and global economy requires a more thorough understanding of *relationships among and between financial firms*. There is a consensus that protecting the integrity of the financial markets requires a more thorough understanding of the complex and interrelated financial and economic eco-system(s). Protecting these eco-systems requires an understanding of the common risks to which multiple banks are exposed, the channels through which risk is transmitted, and the dynamics of contagion whereby by a failing institution threatens the stability of other firms[[1]](#footnote-1).

While there is considerable activity today in developing more sophisticated models of risk and in developing more advanced regulatory tools, *all such work must be driven and informed by data[[2]](#footnote-2)*. Unfortunately, the limitations of current financial cyberinfrastructure severely restrict the availability of data, to market participants, regulators and researchers. These limitations commence with constraints on the data collection authority of regulators. They are exacerbated by the lack (or low acceptance) of ontologies and standards and protocols. Beyond these limitations is the inherent challenge of dealing with the complexity of financial information and the sophisticated analytical needs of regulators and researchers.

A first step for developing an understanding of systemic risk is to be able to label and identify all of the component financial contracts, exposures and relationships of each major financial participant. The Legal Entity (LEI) Identifier, and its precursor the CFTC Interim Compliant Identifier (CICI), provides a mechanism to label participants. Under the assumption of a successful rollout and adoption of the CICI and the LEI, our research has two distinct, yet interrelated objectives. Our first objective is to formalize the workflow around the reporting of trades and additional regulatory reporting, with respect to a class of financial contracts and/or market(s). We will identify any data/information gaps and assess the quality of the information. Our second objective is to enhance a seed dataset of contracts, LEIs and CICIs, with additional information that is scraped/extracted from available public utilities and portals. We will develop the appropriate mechanisms for dataset enhancement and network and visual analytics for identifying and investigating hidden networks that have the potential for flow of risks in a systemic crisis.

# Background on CICI and LEI

The proposed Legal Entity (LEI) Identifier and its precursor, the CFTC Interim Compliant Identifier (CICI), comprise an important first step in providing a standard to uniquely identify each participant and to (partially) capture relationships among participants. The CICI has been structured to satisfy ISO 17442[[3]](#footnote-3). The 20 digit LEI code is expected to be identical to that of the CICI for those firms, which received a CICI identifier.

ISO 17442 specifies that the identifier code contains no embedded intelligence. The ISO standard requires the applicant for the LEI to provide the following data attributes:

* The official name of the legal entity as recorded in the business registry, or with the fund manager for collective investment vehicles, or otherwise in the entity’s constituting documents. Where applicable, the name of the business registry in which the entity was formed and the identifier of the entity in the business registry should be recorded.
* The address of the headquarters of the legal entity or the address of the fund manager.
* The address and the country of legal formation as represented in ISO 3166*.*
* The date of the first LEI assignment.
* The date of last update of the LEI set of information.
* The date of expiry and reason for expiry, if applicable. For entities with a date of expiry, reason for the expiry should be recorded and, if applicable, the LEI of the entity or entities that acquired the expired entity.

The CICI program has an identifier, while structured to be identical to the future LEI identifier, is not identical to that proposed in the LEI program. The primary differences are expected to be in the scope of coverage and the required utilization of the Identifier in contracts and reports. The CICI only will be required for all counterparties engaged in a transaction under the auspices of the CFTC. According to the ISO document the LEI will be available for:

* all financial intermediaries;
* banks and finance companies;
* all entities that issue equity, debt or other securities for other capital structures;
* all entities listed on an exchange;
* all entities that trade stock or debt, investment vehicles, including mutual funds, pension funds and alternative
* investment vehicles constituted as corporate entities or collective investment agreements (including umbrella funds
* as well as funds under an umbrella structure, hedge funds, private equity funds, etc.);
* all entities under the purview of a financial regulator and their affiliates, subsidiaries and holding companies; counterparties to financial transactions

The CICI coverage is expected to be a large but not complete subset of the LEI coverage. A borrower in a corporate loan contract that does not engage in swap transactions may not be required to obtain a CICI but would be required to obtain the LEI. According to CFTC, the CICI will be used to identify counterparties in transactions under the auspice of the CFTC. Details regarding the utilization of the CICI identifier other than for identifying counterparties in contracts identified in CFTC regulations are not clear. It is not clear if the CICI will be used to identify entities referred to such transactions, but not parties to the transaction (reference entity in a credit default swap).

# Research Proposal

Our first objective is to formalize the workflow around the reporting of trades and additional regulatory reporting, with respect to a class of financial contracts and/or market(s). We will identify any data/information gaps and assess the quality of the information. Our second objective is to enhance a seed dataset of contracts, LEIs and CICIs, with additional information that is scraped/extracted from available public utilities and portals. We will develop the appropriate mechanisms for dataset enhancement and network and visual analytics for identifying and investigating hidden networks that have the potential for flow of risks in a systemic crisis.

# Task: Workflow and Quality Assessment of Trade Processing and Regulatory Reporting Using CICIs and LEIs

New regulations emanating from Dodd-Frank legislation will require the reporting of swaps and other contracts under the supervision of the CFTC to be reported utilizing the CICI to identify the counterparties. A close examination of the CFTC proposed rules[[4]](#footnote-4) suggests that there is a requirement for only one participant of the trade to report the trade (one-sided reporting). It is also our understanding that the rules do not specify a format for the reports but require the reports to be in a format acceptable to the (relevant) Swap Data Repository (SDR) to which the report is sent. Legal entities entering into the trades are required to maintain records of the trade for a specified period of time. Transaction data are reported to the SDR and made available, on demand, to the CFTC. The regulations are quiet with respect to where in the trade process the CICI is attached to the trade. It is unlikely that the CICI for every trade would be attached at the time the trade was done. The allocation of trades to an account by an investment advisory often is done subsequent to the actual time of the trade. Firms will need to develop software to accommodate the CICI reporting requirements. Ultimately, additional reporting requirements will be made including utilizing potential identifiers to classify trade types.

The team has identified a SIFI (systemically important financial institution) that is an industry leader with respect to best practices for financial data management. We cannot reveal the identity of the SIFI at present as we are negotiating the terms of engagement. The SIFI will be used to document and formalize a workflow behind the use of CICs and LEIs and one-sided reporting.

The following research tasks have been identified; we note that we may not be able to complete all tasks within the “seed first year” requested from the Sloan Foundation:

* The cost and benefits associated with one-sided and two-sided reporting.
	+ The pros and cons of both will be studied with respect to information quality and data gaps. It is also possible to convert from one to the other, but with some (negative) impact on quality.
* Standardization of reporting formats by the SIFIs.
	+ Downstream analysis and aggregation of reports requires the standardization of report elements. We will identify the elements of greatest value and suggest paths to standardization.
* Desirability of reporting to a single regulatory agency.
	+ We recognize that fragmented and distributed reporting is likely to continue for a long time. Thus we will examine the process for an agency such as the OFR to create a comprehensive picture with respect to some regulatory goals.
* Reduction in trade processing errors.
	+ While the identifier may be introduced due to regulatory pressures, we believe that its use can benefit market participants, for example through reducing errors in trade processing. We will characterize the types of errors that can be eliminated or reduced.

# Task: Hidden Networks and Systemic Risk

A primary purpose for the counterparty reporting is to identify risk exposures that could threaten the stability of the financial system. At first glance, it might appear that knowing the various exposures each firm holds might be sufficient for understanding the risks facing the system. What is extremely important, and not fully realized, is that one must understand the dynamics through which exposures can suddenly grow and threaten a firm in the event of a severe shock. Several research studies have shown that it is possible to have a systemic crisis even when each individual firm is adequately capitalized[[5]](#footnote-5). Multiple firms could offset similar exposures through buying protection from a smaller number of other firms. A shock that threatens several of the firms that provided protection can result in major risks cascading through the system. The leverage within the financial system together with the counterparty network through which exposures are offset is not immediately observable.

Firms often measure their success relative to the success of their cohort group. This results in clusters of firms adopting similar trading strategies and accumulating similar risk profiles. This relativistic approach to self-measurement is an example of a hidden variable / hidden network.

The interconnected financial eco-system comprising the repo (repurchase) markets, prime brokerage funds, money funds, etc., is another example of a hidden network that was a large factor in the recent and ongoing systemic crisis. For example, hedge funds, sensing a weakness in the firm providing prime brokerage services, demand immediate return of their collateral. Much of this collateral has been re-hypothecated adding additional strain for the prime brokerage firm.

In order to protect the financial markets from a systemic crisis, it is desirable to understand the dynamics of risk transference in a crisis situation. First steps are to be able to measure each firms’ gross and net exposures, and to develop an understanding of the counterparty relationships and contracts that reduce the gross exposures to net exposures. The LEI (and CICI) that uniquely identifies each participant in the financial network is critical to this task. Large financial firms have extremely complex corporate structures with global branches, multiple wholly and partially owned subsidiaries, and joint ventures. The CICI, which contains no embedded intelligence, should be supplemented by data structures that relate ownership or control of one entity by another. Understanding how a financial shock impacts a SIFI requires understanding how the shock impacts each of the SIFI’s components, and how these components are interrelated.

Trade type identifiers have yet to be designed, much less adopted, that would facilitate standardized and functionally useful reporting of fairly standard securities contracts much less of more complex structured products and banking obligations. Even were corporate structure and position data available in a meaningful computer readable form, there do not exist adequate analytics for modeling the dynamics of risk transference in the presence of financial shocks.

This component of the project will begin a preliminary investigation of these issues and prepare recommendations for further research. The project will propose programs of study and further research that will lead to functionally useful data structure, will highlight the potential benefit for both individual firms and for market regulation for having these data structures, and will identify some of the potential theoretical roadblocks that need to be addressed.

# Conclusions

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# Research Team

Louiqa Raschid (PI) is a professor in the Smith School of Business and the Department of Computer Science and has experience in information integration and multi-disciplinary data management challenges. H. V. Jagadish is the Bernard A. Galler Professor of Computer Science and is an expert on BIGDATA, data on the Internet and biomedical informatics. Pete Kyle is the Charles E. Smith Chair of Finance and has deep expertise in market microstructure and contagion. Joe Langsam retired as a Managing Director of Analytical Research and brings decades of expertise in both information management and analytics of SIFIs.

# Methodology and Deliverables

Raschid and Jagadish have significant expertise in data management, information extraction, data mining and machine learning methods; appropriate solutions will be utilized in different phases of the research. Pete Kyle will lead on mathematical modeling. Joe Langsam will contribute domain specific models for analysis and will lead in quality assessment and evaluation. Expected deliverables include the following:

* Paper targeting the Harvard Business Review or similar outlet on monitoring systemic risk using LEIs and CICIs.
* Paper to a computer science archival journal on the information management challenges.
* Paper on the analytical and modeling challenges targeting a mathematics, economics or finance journal.

# Budget and Justification

The project will support 2 doctoral researchers or 1 post-doctoral researcher under the joint supervision of the 4 PIs and co-PIs. Funds will be used to provide travel to conferences and to the University of Maryland for quarterly meetings. Partial support is requested for Michelle Lui, Assistant Director of the Center for Financial Policy. The Lanka Software Foundation will provide software development services, in particular the development of Karsha Open Source Software.

The budget will be less than $125,000.

# References

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1. See references 6 and 11. [↑](#footnote-ref-1)
2. See reference 14. [↑](#footnote-ref-2)
3. International Standard IS) 17442, Financial Services – Legal Entity Identifier (LEI) First edition 2012-06-01 [↑](#footnote-ref-3)
4. See references 2, 3, 4 and 5. [↑](#footnote-ref-4)
5. See references 10, 11 and 12. [↑](#footnote-ref-5)