

REGULATORY REVOLUTION: The Great Data Challenge

The recently created Office of Financial Research is expected to standardize data collection in the financial services industry, ushering in a new era that should give regulators and policymakers the power to better assess banks' risks and capital adequacy, preventing — or at least minimizing — future crises.

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The United States stands on the threshold of a transformation of financial market regulation. It is not an exaggeration to call it a revolution. In the wake of the near collapse of the U.S. financial market in 2008, the Congress began a legislative effort to reform the regulation of financial institutions and markets.

A few dozen pages dedicated to the creation of the Office of Financial Research (OFR) were kind of lost among the roughly 2,000 pages of Congressional legislation. However, the creation of this office is much more than just a minor footnote — it is a direct response to the data and analytical capacity deficiencies illuminated by the crisis.

The OFR will collect granular transaction and position data and build a large-scale, multidisciplinary research and analytical capability. The data it collects will enable a level of analysis not previously possible, and the required standardization of that data will transform the management of U.S. financial institutions.

Bear Stearns, Lehman and AIG: Lessons Learned

The financial crisis of 2008 showed how

painfully inadequate government data and analysis are when it comes to financial markets and institutions. In March of that year, the Bush administration made the decision to save Bear Stearns with a transaction that left the taxpayers with almost \$30 billion in contingent liability. This decision was made without good data on the implications of the alternative — i.e., letting Bear Stearns slip into bankruptcy.

Less than six months later, when faced with the impending collapse of a second investment bank, Lehman Brothers, Secretary of the Treasury Hank Paulson made the opposite decision and let Lehman slide into bankruptcy. Paulson made that decision, in part, because he believed that the problems at Lehman had been known for many months, and that its counterparties had been given ample opportunities to adjust their exposures. He concluded, therefore, that it would be safe to let Lehman go into bankruptcy. Unfortunately, that decision was made without access to data that would have revealed how interconnected Lehman continued to be with other financial entities. Simply put, Secretary Paulson was flying blind with regard to the consequences of his decisions.

The failure of Lehman triggered a cascade of events that quickly led to the freezing up of financial markets. The crisis was further compounded by the lack of information about the large, unhedged credit default swap (CDS) book on the balance sheet of AIG's Financial Products company. In fact, Secretary Paulson did not even learn about the problems at AIG until the very weekend that the decision was made to let Lehman slip into bankruptcy. The catastrophic market response to the Lehman failure forced the decision to commit almost \$200 billion of taxpayer money to save AIG and to make the counterparties to the company's derivatives contracts whole.

In early 2009, with the capital markets frozen and the major surviving financial firms teetering on the brink, the Obama administration had to determine if these firms were adequately capitalized. Such an assessment was critical to restoring confidence in the financial system.

However, neither the regulatory agencies nor the Treasury Department had the data and analytical capability to make the necessary determinations. The administration subsequently developed economic indicators for different stress scenarios, and then had the banks crunch their models and report back to the government regarding whether they were adequately capitalized under the different stress scenarios.

The irony of this exercise is that the banks used the same models to run the stress tests that they used to manage their risk during the run up to the crises, even though these models were not designed to anticipate the consequences of a cascading of failures across the market or of the drying up of liquidity. Simply put, they were the only models available.

The Data Challenge

The lack of necessary data has impeded broad based long-term research into financial markets that is equivalent to the research efforts applied to other important challenges, such as threats from nature (hurricanes, for example). However, the collection of market-wide granular data by the OFR will correct this deficiency and make such broad-based multidisciplinary research possible.

The fruits of this data and the associated research effort will equip policymakers with the ability to respond to future threats more effectively. No longer will policymakers be blind to the buildup of risk in financial markets. What's more, the data they possess will make clear the interconnectedness between important financial market entities that can spread

financial instability, and financial policymakers will no longer run the risk of making a crisis significantly worse because they do not have the information with which to see what is happening in the markets.

The vision is clear. The challenge is also clear. The standardization and collection of data on a scale envisioned for the OFR has never been attempted for financial markets and institutions. How is it possible, you may ask, to carry out such a Herculean effort?

While the scale of the effort is unique for financial mar-

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kets, it represents a challenge faced and successfully met in other fields. For example, a sustained research effort to better predict the weather was carried out over a period of decades, amassing large amounts of data and accessing the capabilities of high-performance computing. The measure of its success is the ability to better predict threats to human well-being posed by natural disasters. Similarly, the maintenance of large networks, like national communications and power grids, is a testament to the ability to collect the data and do the analytics necessary to maintain high levels of reliability for large, complex systems. So there are successful precedents.

In this article, we discuss a framework for how to organize the data that needs to be collected in this new effort, and explain how financial regulation will be transformed in the process.

The Importance of Contracts

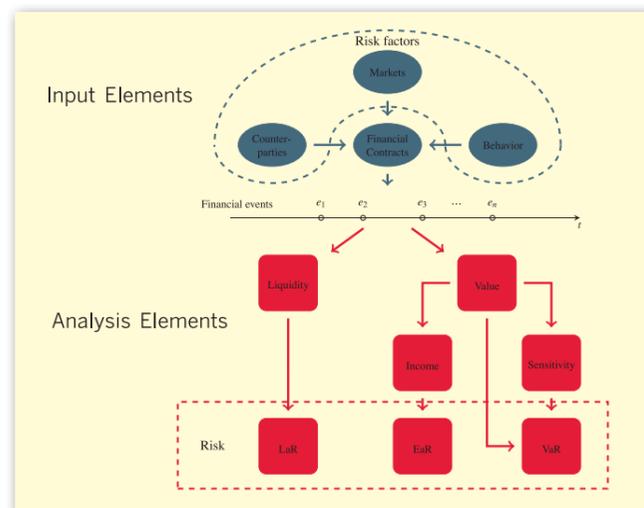
The data that is key to the new financial regulation can be found in the financial contracts that lay out the rights and obligations of the various counterparties. These contracts represent different types of cash flows that depend on defined events. While the number of contracts is voluminous, almost all contracts fall into a relatively small number of patterns that can be readily categorized.

Since the OFR will be collecting the contractual data from which cash flows can be derived, it will have the ability (along with other regulators) to assess risk and analyze the threats to

financial stability in a way that was never before possible.

Figure 1¹ (below) represents the architecture needed to support the aims of the OFR: namely, to “provide the data and the analytic tools to safeguard the U.S. financial system.” (In the words of Senator Christopher Dodd, the objective is “to look through the windshield” and not “through the rear-view mirror.”²)

FIGURE 1: THE BASE ARCHITECTURE



The core of the above model is the financial contract, a mutual promise of two or more counterparties to exchange cash flows according to a set of rules. The rules can be described by algorithms that determine their exact occurrence.³ These promises form the only hard facts of finance.

Risk Factors

Contracts are surrounded by, and relate to, the risk factors — e.g., markets, counterparties and behavior:

- **Markets.** Many contracts (e.g., floating rate bonds and options) include rules that refer to market conditions, such as interest rates, foreign exchange rates or stock indices. Market conditions are also used for discounting and valuation.

- **Counterparties.** Although financial contracts represent hard facts, the keeping of them is conditional. Counterparty data encompasses the conditions that determine the ability to meet the obligation.

- **Behavior.** Some rules governing the exchange of cash flows are not deterministic in the mechanical sense. The best

known examples are savings accounts, from which funds may be withdrawn at short notice, or mortgages, which in some countries can be prepaid without a fair-value penalty. Since such rules can only be formulated statistically, they are part of the risk factors.

Market conditions, counterparty and behavioral data are called *risk factors* because only their current conditions are known, and they can change unexpectedly. Contracts and the risk factors are called *input factors* because they constitute the facts.

Given any financial contract and their surrounding risk factors, *financial events* can be calculated. In other words, the financial events on the time line correspond to reading the financial contract under certain risk factor conditions from which cash flows can be derived.

If we look at the lower half of Figure 1, we see that it is possible to derive the analysis elements: *liquidity, value, income, sensitivity* and *risk*. Note that in such a system, *value* is not an input but an output. Value, in this system, can be calculated not only under current risk factor conditions but also under shocked or stressed conditions. Value can also be calculated according to any valuation principle (nominal, fair, amortized cost, etc.) — or, in the case of options, by using different pricing models.

The distinction between *input* and *analysis* elements is very important. The traditional financial manager is concerned with what we refer to as analysis elements. Liquidity, value and income constitute the three focal points of any financial manager. In modern times, *sensitivity* — which indicates the change in value that flows from any change in the risk factors — and *risk* — which shows the distribution or shocked conditions of value, income and liquidity — have been added to the list.

Analysis elements (a handy way of expressing the state of financial contracts) depend fully on the input elements. However, once a value — be it book- or fair-value — has been calculated, the link to the causal factors is severed. Therefore, input elements are important from an analytical perspective, while analysis elements are important from a managerial perspective, and the link between them has to be maintained.

What's New?

Figure 1 also effectively explains the difference between old and new regulation, and lends credence to the term “revolution.”

Like the traditional financial manager, old regulation

focused on the analysis elements. Regulatory information, with few exceptions, was (and is) based on the analysis element value — mostly book value and, in some cases, fair or market value.⁴

Through their focus on value, regulators (1) rely on the calculations of the regulated entities and lose the critical relationship between value and the underlying contractual determinants, which is particularly troubling in times when risk matters; (2) have no knowledge about the relationship between value and the risk factors; (3) cannot “play” with the results, since the link to the causal risk factors has been severed; and (4) cannot aggregate the results due to the hidden nature of the assumptions (the input elements) and, consequently, do not have the ability to harmonize them

However, the new OFR-driven regulation will shift the focus from the analysis to the input elements. The OFR will standardize and collect data, from each financial intermediary, for two of the input classes: financial contracts and counterparties. Market data will be obtained directly from the providers and behavioral assumptions will (due to their statistical nature) be transparently defined in the proposed system.

The key focus will be placed on the financial contracts. The central position of the contract as the hub and spoke of the system has already been noted. It is the only constant — albeit highly complex — part of the system. It is complex because it must be possible to generate the financial events or the cash flows for every existing contract, under any risk factor condition. An optimal organization of financial contract data is therefore crucial.

Banks to date have not done a good job organizing this data. Financial contracts are more or less treated as a loose heap of attributes, upon which any algorithm can be unleashed to calculate value (usually) and its associated risks. This is inefficient, because it amounts to an endless recoding of the same cash flow generators. It is also the root cause of the “deadly silo structures.”^{5,6}

Banks that actually categorize financial contracts do so generally according to legal categories, such as loans, mortgages, deposits, etc. Such a categorization is of little help in understanding cash flow generation, which should be a major objective of any firm.

From an analytical perspective, the greatest interest is a categorization consistent with the patterns of cash flow generation. It is interesting to note that at least 98 percent of all real-life contracts follow a mere two- and-a-half dozen differ-

ent patterns or contract types. Defining and publishing these patterns, with their accompanying attributes, will be an important contribution of the OFR.

The OFR will not only define the data reporting standards, but focus attention on the terms of financial contracts; this will reduce costs and improve operational efficiency within financial institutions.

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Under the new regulatory regime, the analysis elements will still be of great interest. Value, liquidity, income and sensitivity remain the focus of analysis. However, rather than have only the regulated entities do the analysis, the regulators themselves will now be in a position to perform the analysis, and in a way that will make transparent the sensitivity of the outcomes to key assumptions.

The OFR regulation will offer a number of potential benefits, including:

- All of the inputs will be used to generate the cash flows and the analysis elements.
- Assumptions will be transparent: under old regulation, the risk-factor assumptions were buried within a single number, such as market value. But in the future, the risk factors (assumptions) will be explicit and open.
- Regulators can “play” with the results, and will no longer have to rely on the regulated entities for analysis. Regulated entities will provide the correct input data, and regulators will do stress testing and capital adequacy assessments directly.
- Data will be aggregated at a market or system level, and, since assumptions will be transparent and controllable, it will be possible for the first time to do risk management on a systemic level.

Under the new regulation, regulators will care about data and analysis. The new approach will define contracts along contract types. For any given contract type, the basic pattern of cash flow generation will be clear. It will be possible to define unique algorithms that turn data into intelligible analysis information, such as value⁷ and income.

By turning the regulatory focus to collecting input elements

(from which analysis elements can be calculated in a fully consistent and more flexible way), a revolution of Copernican dimensions has been unleashed.

Data Issues, Cost and Benefit

To be effective, data must be collected at the single-contract level.⁸ Every reporting entity must supply data organized according to set standards. Much of the regulatory effort in future will go to the correct mapping of the financial contracts and the counterparties.

Data processing and central storage will also be a significant undertaking, likely on a scale similar to those used in large

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physics experiments. Nevertheless, it is doable. The data must be protected at the highest level, to ensure that no proprietary information is compromised. The U.S. government has a very good track record when it comes to protecting highly sensitive data (such as the IRS and Census data), and there is already legislation in place that should secure the OFR’s data.

Regulators and the government — as the owner of last resort — will benefit by gaining clear insight into the financial sector, with system-wide stress tests becoming a standard exercise. New insight into the universe of the financial contracts and their linkage to the counterparties will help re-establish the much needed confidence in the financial system and increase its stability. Key decisions made in ignorance, such as those Secretary Paulson found himself making, should become a thing of the past.

The financial industry stands to benefit as well. The standardization of contract types could shatter silos and increase the quality of analysis and internal communications. The standard line of defense given by CEOs’ in the hearings in the aftermath of the crisis — “we didn’t know” — will become less acceptable.

Financial investors will benefit, too, since standardized descriptions of financial contracts will make them much easier to understand — possibly to the chagrin of some issuers. In fact, the standardization of data should lead to much more

meaningful transparency when it comes to investment alternatives, and we believe that even the retail investor could become much better informed.

In the end, the new regulation will be one of those rare “positive sum games.” While the new regulation will impose costs on industry, the financial benefits that will flow to financial firms — in the form of lower operating costs, better management of risk and a healthier, more competitive financial market — will be many times greater than the costs associated with the OFR.

FOOTNOTES

1. See figures 2 and 3 in *Unified Financial Analysis – The Missing Links of Finance* (Wiley 2009), Brammertz et. al, for a more detailed explanation.
2. GARP news, 4/25/10.
3. It is common to think in legal terms in relationship to contracts, which of course is also correct. For analytical purposes, it is, however, more expedient to think in a set of logical algorithms.
4. The main exception to the rule is the market risk report under Basel I (now incorporated in Basel II).
5. See “Silos but Deadly,” *The Economist*, December 5, 2009.
6. The very same data structures have also attributed much to the regulators’ woe. Recently, two Swiss bankers with first-hand experience relayed the same story when discussing the relationship between them and the regulators. As one said: “How are regulators stopped most easily? If they ask for data, send them a lot of data. If they ask again, send them even more. At the second attempt, they calm down. They have no chance to make any sense out of it. Why should they?”
7. Since value has different expressions, such as nominal, fair or amortized cost value, all the algorithms will be made public. While value derivation for option-related products is often a question of taste, several versions must be offered and the system must be kept open to allow for additional versions.
8. For practical reasons, aggregated data might be used in a first period, until a single contract is available. Here we present only the ideal target system.

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