DERIVATIVES CLEARINGHOUSES IN THE ERA OF FINANCIAL REFORM
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Introduction

One of the three goals of the Dodd-Frank Wall Street Reform Act (the “Reform Act”) was to address the risks of derivatives trading. Derivatives are financial instruments valued with reference to the price of a commodity, stock, currency, interest rate or other similar item. Most often, they are structured as swap contracts: on a date certain, one party is required to pay a fixed sum and the other party is required to pay the then current referenced price. The fixed payer has sold the risk of price movement and the fixed receiver has bought that risk. Derivatives can be used to hedge existing price risks or to speculate.

A derivatives trade inherently generates credit risks between counterparties in the amount of the expected value of the instrument upon its maturity. If one party defaults, the other has lost the opportunity to realize that value.

The amount of the credit risk is a function of the current value of the derivative. This value changes constantly as the reference price of the derivative changes. Assume A and B enter into a swap at the current market price which is $10. This is the fixed payment and A will be the fixed payer. On a day when the current market price is $11, A is at risk for receiving a net $1 from B at maturity. (Actually the risk is even greater, as will be discussed later). This is the “mark to market” risk – credit risk measured by market price.

The principle provision of the Reform Act relating to derivatives was a requirement that they be cleared by a clearinghouse (a “Derivatives Clearing Organization” or “DCO” under regulations). (Although the language is obscure, the regulatory agencies have asserted that they are empowered to direct applicability of the mandate to classes of swaps. There are no standards in the Reform Act relating to exercise of this authority.) This mandate will affect an enormous number of transactions. In 2008, the over-the-counter (i.e., traded off-exchange) interest rate swap market alone was $350 trillion in notional value and $8 trillion in mark-to-market value. The CFTC has estimated that the current cleared derivatives market is one tenth of the uncleared market.

The only exceptions are: “end user” transactions, in which non-financial businesses use derivatives to hedge or mitigate exposure to an asset value or commercial risk inherent in their businesses; and derivatives for which clearing is not offered by a clearinghouse. The Department of the Treasury is also authorized to exempt foreign exchange swaps from the clearing mandate. The end user exemption must be clarified early on and will revolve around the definition of “hedge or mitigate.” There are strong arguments that the exception should be narrowly interpreted and the Chairman of the CFC appears sympathetic. The foreign exchange authorization requires a finding that the exception would not affect systemic risk and that the mandate of cleared foreign exchange swaps will not impair market liquidity. Discussion will resolve around the proposed exclusion, if it comes. The most significant current discussion relates to the breadth of the types of swaps which will be cleared by clearinghouses.

A great deal rides on the clearing solution to derivatives risk. The Securities and Exchange Commission and the Commodities Futures Trading Commission are jointly charged with implementing the Reform Act, a task which will require months of investigation and drafting of regulations. The world of derivatives is tremendously complex. Clearing, on the other hand, is an arcane business, undefined by law and regulation. It must be understood and subjected to rigorous analysis. Innovative approaches will be required to balance the benefits of broad availability of clearing to the derivatives markets with the need to operate the clearing system prudently. If this effort falls short, a major element of financial reform will fail to reach its potential.

Several questions are suggested by the Reform Act and the current effort of regulators to implement it.

- What are clearinghouses and what do they do?
- What are the systemic risk implications of the requirements of the Reform Act?
- How will the list of derivatives offered for clearing be determined?
- What is the optimal clearing environment to address both derivative risk and systemic risk of clearinghouse failure?

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The Business of Clearing

The first thing to know about clearing is that it does not eliminate any risk. In fact, it concentrates the credit risk inherent in derivatives transactions. Why would the marketplace do such a thing? There are several important advantages of clearing:

- Clearinghouses manage credit risk using proven methods and systems which are uniform and virtually always superior to that which can be achieved by individual trading firms.
- Since the clearinghouse is the counterparty in all transactions, counterparty credit is always the same for a trader. Therefore, the price of individual transactions is not influenced by difference in counterparty credit risk. (Note that this is not true for customer transactions, as described below.)
- Operations, records and funds transfers are all centralized and efficient.
- There are certain netting benefits that require less cash margin than bi-lateral transactions that are subject to full collateralization of credit risks. However, as a practical matter, most bi-lateral transactions are not fully collateralized.

Basic Structure

In conventional structures, only clearing members transact directly with clearinghouses. Parties which are not clearing members must access clearing through a clearing member which is also a “Futures Commission Merchant,” meeting the qualifications of relevant law.

An FCM will execute back-to-back transactions with the customer and the clearinghouse so that it retains no market price risk. The risk of the customer’s credit resides with the FCM and the clearinghouse bears the credit risk of the FCM. Going the opposite direction, the customer is at risk for the FCM’s credit and the FCM bears the risk of clearinghouse default.

The list of clearing members varies from one clearinghouse to another, but major banks are all clearing members. Large trading firms, such as Shell and BP are also clearing members. Some financial institutions clear transactions for customers as FCM’s and for their own account. Some financial institutions are only in the customer-based FCM business.

Figure 1 illustrates the clearinghouse/clearing member/FCM/customer structure.

Products

Clearinghouses manage the risk that the price of specified products changes over specified time periods. “Product” is used here to denote the underlying subject of a derivative. Traditionally, clearinghouses focused on agricultural products, such as wheat, corn soybeans and pork. They moved on to precious and non-precious metals. Energy products came next: oil and products derived from oil, natural gas and electricity. Currencies of various countries were added. Finally, conceptual price points, such as interest rates, stock market indices and credit (defined as the interest rate spread over the

Figure 1 - Basic Clearinghouse Structure
rate paid by banks for funds used to lend) were added to the mix.

The scope of appropriate products for clearing has traditionally been defined by two characteristics: fungibility and liquidity. Products with these qualities could be fit into the risk management system that constitutes clearing, and products without these qualities could not.

Fungibility defines the product, in the clearing world. The price of a fungible product at any given point of time is the same, regardless of the geographical delivery point. Prices must be uniform in order for the derivative to make sense. More importantly, uniform prices are required to manage risks properly. Fungibility is closely related to storability. If a product is difficult to store, price will be more strongly influenced by delivery location. Storage may be physical, such as a grain silo, or conceptual, such as the ability of a national reserve bank or treasury to increase supplies of a currency.

The best example for understanding fungibility is the derivative for wholesale electricity. Electricity is energy in the form of excited electrons and has no physical form. Potential for electricity can be stored in batteries, pump storage or, indeed, in generating plant capacity, but these have no material effect on fungibility of price. It is very expensive to build a power plant as a storage device; and other storage methods are not very effective. As a result, wholesale electricity prices are established continuously at each point of delivery; and there are thousands of these points in the United States. In the clearing sense, there are thousands of wholesale electricity products, not one. (Because of these extreme characteristics, electricity is the best example for illustrating the limitations of clearing, and will be used several times below).

Having defined a product, the liquidity of the market determines whether clearinghouse risk management techniques can prudently be used for the related price derivatives. Risks cannot be managed unless they can be measured reliably. The consequences of the realization of credit risks occur in the real world. Risk measurement is only useful if it accurately anticipates those consequences. Clearinghouse losses from defaults are caused by price moves. To estimate the size of a credit risk, the potential range of price moves must be measured. (The methodologies are described in detail below.) This measurement is meaningless if the clearinghouse cannot transact for a replacement contract within the predicted range of prices. If the specific market is not sufficiently liquid, meaning there are few buyers and sellers who are continuously accessible to the clearinghouse, the ability to transact is doubtful. Statistical measurements of price moves would not be useful tools for managing risk in such a case.

Liquidity of cleared contracts defines the prudence of clearinghouse management of risks. The Chicago Mercantile Exchange offers clearing for over 1300 contracts. The simple truth is that there are not 1300 contracts which trade in liquid markets. The Reform Act envisions an increase in products which will be cleared. This is a concern. It calls for a close examination of clearinghouse practices and procedures and an imaginative analysis of what clearing really means and how the credit risks in derivatives markets can be managed prudently and efficiently to minimize systemic risks.

This is a concern even beyond the health of the clearinghouses. Transacting risky derivatives through a clearinghouse pools risks and re-distributes them broadly among all of the clearing members (and potentially to the public if government support is ever required). This can be a dangerous incentive to enter into risky transactions. As will be discussed, this does not mean that the clearinghouses should avoid clearing as many derivatives as possible. It suggests that new and creative methodologies may be needed to navigate between the benefits of universal clearing and its inherent risks.

Influences on Clearinghouses

Clearinghouses are subject to two, sometimes conflicting, external influences. These must be understood as we embark on a path which entrusts clearinghouses with management of a significant portion of systemic risks.

Clearinghouses originally were owned by their members and operated to serve their needs. They are now often publicly traded and are no longer operated like utilities. They compete fiercely to increase the volume of contracts cleared and the fee revenues generated by volume. Ironically, there are very good arguments that competition does not make sense. There is a great benefit to transacting with a single clearinghouse. Netting of margin on individual transactions, some owed to the clearinghouse and some owed by the clearinghouse, is valuable. Operational convenience of using a single clearinghouse is also important. The fees and other costs, driven down by competition, are far less important than the credit risk transferred to the clearinghouse and the efficiencies of consolidated clearing.

Competition dates from the creation of ICE by the banks and major oil companies which sought to capture the value of the fee income for themselves. Having
cashed out their shares, trading firm interest in capturing the value of the fees they pay for clearing no longer drives competition; but competition persists nonetheless.

The primary way for clearinghouses to compete is by offering new contracts for clearing. The concern is that they are incented to compromise prudent management of risk to do so. The Reform Act mandates clearing of all contracts (except for end user and potentially foreign exchange contracts) for which clearing is offered. The temptation to push the boundaries of prudence will be great.

Dealer banks have enormous influence over clearinghouses because they can control volume. Of the two major US clearinghouses, the ICE is more susceptible. After all, the banks created ICE, largely to compete with the CME. But CME is under bank influence as well.

Bank influence is illustrated by the credit default swap market. ICE and CME raced to clear credit default swaps after the market collapse in September 2008. The ICE effort was successful, in part because the special purpose clearinghouse it set up agreed to give the banks a 49.9% share of revenues. CME naively attached a trade-matching feature to its structure, assuming that real-time CDS price transparency would be attractive add-on. The transparency feature angered the dealer banks who preferred opaque pricing. They were already inclined to prefer the ICE structure for obvious reasons. The dealers have largely declined to support CME’s massively expensive effort. Privately, CME has vowed never again to take on a project that the dealer banks don’t support.

Clearinghouses may take on derivatives imprudently, but the banks may use their influence to limit clearing. Banks like broad availability of clearing. If they are unable to transact bi-laterally with a counterparty because additional credit exposure to that counterparty is not internally available, it is useful to transfer credit risk to a clearinghouse. But, for some derivative classes, the profitability of bi-lateral transactions is so great that mandated clearing is unwelcomed. For these derivatives classes, it would be better for the banks if clearing were not offered.

These influences do not balance one another. The banks might well support clearing of some risky derivatives and, at the same time, use their influence to resist clearing of other derivatives which should be cleared.

History of Clearinghouses

In the fourth century BC, Aristotle wrote of a man named Thales. He had stumbled upon an opportunity in the olive market. Thales created a business in which he agreed to buy olives on a date certain in the future from a farmer. He then found a merchant who agreed to take the olives off of his hands on the same date. Each agreed upfront to a price. The farmer and the merchant each happily agreed to a price which favored Thales because each perceived a benefit from the certainty which dealing with Thales provided. Aristotle presciently described this business as a “financial device which involves a principle of universal application.”

Thales appears to have been the first derivatives clearinghouse. He did not really care about olives. He was in the business of facilitating a price hedge. Thales had one thorny problem: what if either the farmer or the merchant were no longer available at the delivery date which had been agreed. Perhaps the merchant went broke; or perhaps the farmer was banished by the Athenian government for backing the wrong political faction. Thales would have to find replacement olives or a replacement merchant, as the case may be, to fulfill the remaining half of the transaction. He faced one of two outcomes:

If prices had moved in his favor between the time the original contract was made and the replacement of the original contract, he made money from the default. If prices had moved in the other direction, he would lose money. If he had to replace the merchant side, he could lose as much as the full price he had to pay the farmer. Olive prices would never fall below zero. But, if he had to replace might go?

Very little changed for the subsequent 2400 years.

Until relatively recently, clearinghouses dealt in agricultural products and metals. They were attached to exchanges in which financial institutions and major market participants continuously established prices for delivery on future dates by way of chaotic auctions. These auctions took place in the familiar pits, often populated by individuals with distinctive clothing such as bright colored jackets to indicate the identity of their employers. Each firm represented in the pits was a clearing member. When two clearing members agreed on a price, the contractual counterparty of each was the clearinghouse. So the clearinghouse, like Thales, constantly maintained a buy side/sell side balance. The contracts were called “futures,” and future delivery of the physical product was required. But soon, clearing members figured out how to close out offsetting positions before the delivery date, so futures practically related only to changing prices for notional physical products at a set delivery date. They were
indistinguishable from the swaps contracts described above. They became derivatives.

The clearing members owned the clearinghouses and established rules by which the clearinghouse managed the inherent credit risks. The primary rules related to cash deposits to be maintained by clearing members. These deposits were to mitigate any losses suffered by the clearinghouse if a clearing member defaulted and all of its contracts had to be replaced to re-balance the positions administered by the clearinghouse. Funds deposited were called “margin.”

The pits were notorious for opportunities to behave badly. A clearing member might be seeking a deal on behalf of a customer, entering into back-to-back transactions with the clearinghouse and the customer and extracting a fee for the service. Some customers were more important than others, and the clearing member might actually be transacting for its own account. Futures execution for less favored customers could intentionally be used to influence prices in favor of more favored customers or the clearing member, itself. Federal regulation of the futures exchanges dates from the 1920’s, culminating in the creation of the Commodities Futures Trading Commission in 1974, in part to bring order to the pits.

Over the last three decades, the clearinghouse business changed dramatically. Futures had become derivatives in every practical sense. They were instruments which tracked price, and physical delivery did not matter any more. So, why should futures be limited to tangible, physical products? Conceptual products could be cleared as long as prices could be derived continuously. Financial futures on the S&P 500 and other stock market indices, foreign exchange, interest rates, credit spreads and even the weather (valued in relation to energy prices) were introduced for exchange trading and clearing. Product lines were further expanded by different contract types: options on futures (which behave like a swap with a floored or capped price) and spreads (price differences between two futures) were added to the mix, multiplying the types of contracts and risks managed. CME currently offers more than 1300 categories of contracts for clearing, derivatives on everything from bushels of corn in Iowa to Turkish Lira to the weather in Hiroshima.

The expansion of product lines was integrally related to changes in the business of clearing. Clearinghouses had traditionally been adjuncts to exchanges, and exchanges were the places where buyers and sellers could reliably find prices in reasonably anonymous and transparent markets controlled by the members. At the turn of the millennium, this was all about to change.

Of course, not all derivatives were transacted on exchanges. Brokers dominated certain off-exchange (“over-the-counter”) markets such as the more arcane energy products. Brokers charged fees and sometimes acted against the interests of clients to curry favor with other, more profitable clients, rules to the contrary notwithstanding.

Information technology provided an alternative for the over-the-counter market. The first successful innovator was Enron. EnronOnline allowed traders of various products to transmit offers to Enron which could transact as a market maker (that is, it would enter into the deal planning to do the offsetting transaction in due course). It was a very popular source of reliable transactions until Enron went bankrupt. But, before the wheels fell off, Enron got very favorable treatment for “Swap Execution Facilities” (i.e., electronic over-the-counter trading platforms) in the Commodities Modernization Act of 2000. This was Enron’s most enduring contribution to the business of derivatives trading.

The Intercontinental Exchange (“ICE”) and some other electronic platforms piggybacked on Enron’s political influence. ICE was established by seven major banks and oil companies to facilitate over-the-counter energy trades without brokers – a sort of eBay for energy derivatives. The transactions were bi-lateral and not cleared. Soon, ICE created the ability for traders to elect to clear trades. By choosing this option, the two counterparts could have the trade data sent to their respective FCM’s. The London Clearing House agreed to accept ICE trades from the FCM’s for clearing. Later, ICE created its own clearinghouse to replace LCH, in order to capture the lucrative clearing fee business. ICE now transacts in all energy markets and in many financial markets as well.

But, perhaps the most important implication of ICE’s development was that the matching of buyers and sellers was no longer a business transacted in a pit or over a telephone. Soon, the pits and, in many respects, the brokers were replaced by electronic systems. And, importantly, clearing became a business separate from exchanges, swap execution facilities and brokers. Credit risk intermediation and matching of buyers and sellers could be mixed and matched.

The New York Mercantile Exchange (“NYMEX,” later to become a part of the Chicago Mercantile Exchange) responded by developing ClearPort, a system through which brokers and principals could submit transactions to clearing members for clearing at CME’s clearinghouse. In order to compete with ICE (which had captured much of the over-the-counter energy business largely by displacing voice brokers with their electronic
trade matching engine), CME began sharing clearing fees with the broker on each transaction submitted for clearing through ClearPort. This was an incentive to the broker to influence the principals to the trade to use CME clearing. ClearPort became one of CME’s most profitable businesses.

As trading exploded, the value of the exchanges, SEF’s and clearinghouses became apparent. ICE went public and so did CME. CME acquired NYMEX, COMEX and the Chicago Board of Trade. ICE also acquired many competitors. Clearinghouses, which had for more than a century been sleepy enterprises, run like utilities for the benefit of their members, were now intensely competitive businesses. Clearinghouses curried the favor of the dealer banks, who controlled volume on which revenues depended. They pushed to broaden product lines and lower transaction costs in the form of fees and margin intended to protect them from risks. The clearing business became highly concentrated as the acquisitions piled up.

The clearinghouses raced to clear more types of products, even those which did not fit the risk management models. They also became more accommodative in the rules for calculating margin. More products expanded the revenue base and less margin was a competitive advantage.

Then, after the greatest financial disaster in eight decades, Congress passed the Reform Act and clearinghouses became the principle solution to the derivatives market disaster.

The Decision to Mandate Clearing

The decision to feature clearing as a remedy for the systemic risk posed by derivatives market practices was not unopposed. Of course, the financial institutions which had profited from bi-lateral derivatives transactions at levels which defy belief resisted. So did “end users,” companies which used derivatives to hedge against price risks embedded in their businesses. End users relied on the practical argument that they did not cause the financial meltdown and did not deserve to be saddled with additional costs of mandated clearing. They were granted an exception, in large part because Democrats did not want to incur end user opposition.

Aside from political muscle, opponents of the clearing laid out reasoned arguments. By far the most complete representation of these arguments can be found in an article written just before passage of the Reform Act by Craig Pirrong. This analysis is useful to anticipate the political and policy discussion during implementation and may be a source for insights into the clearing and clearinghouses.

Professor Pirrong opposes the clearing mandate and expresses a preference for a system of default resolution procedures for bi-lateral derivatives positions. These are not mutually exclusive concepts. Innovative ideas for default resolution procedures can be helpful and could be applied even within the cleared market. The important issue is his opposition to the mandate.

Professor Pirrong concedes the efficiency of clearing (and presumably the wisdom of a mandate) if two conditions are met:

1. Default risk is shared efficiently; and
2. Clearing creates no perverse incentives.

In addition, Professor Pirrong suggests that the additional costs involved in clearing are a concern.

Default Risk Efficiency. In the analysis, the opposite of efficient sharing of default risk is “adverse selection.” Professor Pirrong identifies the fundamental issue as asymmetrical information and mispricing of credit risk by clearing systems lead to adverse selection which is inappropriately favorable to weaker credits. It is obvious that clearing members have unique credit profiles and that the credit risk of each should be priced differently. The assertion is that clearing systems have inferior access to information on individual balance sheets than bi-lateral counterparties have; and that clearing systems price credit risk uniformly anyway.

Professor Pirrong repeatedly states that clearinghouses price credit risk by setting margin levels. This statement is deeply flawed. Clearinghouses are fundamentally not in the business of pricing credit risk (although they obviously pay attention to creditworthiness of members). Setting margin measures the amount of credit risk, not its price. Clearing requires that this amount be fully collateralized so that the risk is fully mitigated. Of course, clearing members pay for this risk, but they pay their lenders who provide the funds for use as margin. A clearing member’s general source of liquid funding must be the most informed entity of all, assuming that it is minimally prudent in its lending business.

The analysis is correct in identifying asymmetrical information as a problem; its conclusions are, however, backwards. In the bi-lateral world, multiple counterparties must evaluate the creditworthiness of a derivatives trading firm. In practice, credit managers have much less knowledge of the balance sheets and liquidity of their counterparts than line short term lenders to those counterparts.
Professor Pirrong correctly observes that a derivatives position involves risk that the measurement is inadequate. In a clearinghouse, this risk is indeed allocated among the clearing members and is not priced specifically to the clearing member holding the contract. But that does not mean that bi-lateral transactions price this risk more efficiently. In fact, if a bi-lateral derivative were collateralized to a level equivalent to margining, credit managers would uniformly consider there to be no risk exposure at all. In fact, their risk measurement standards are usually lower than clearinghouses. As a result, this risk is not priced by counterparties at all in the bi-lateral world if it is collateralized. As in clearing, it is priced by lenders.

The whole discussion misses a subtle, but critically important, point. The risk of loss in excess of margin is viewed as predominantly the risk of inadequate measurement by the clearinghouse. The goal of the clearinghouse is to cover all credit risk. Of course, the proximate cause of a loss would be a credit default; but the more significant cause would be the failure of the clearinghouse to measure the risk. That is why allocation of the risk among clearing members is rational.

Professor Pirrong sees the multiple ways financial institutions charge for credit exposures in bi-lateral trades as providing flexibility and therefore efficiency. He accurately describes how the price can be straightforwardly charged or baked into the pricing of the swap. In a footnote (number 54) he describes the “bundling” of credit and derivatives exposures and states: “Many market participants evidently have a strong preference for the bundled service.” The obvious question is why they have the preference. The use of swap prices can be a convenient way to obscure both the cost of credit and the market price of the swap. In practice, these are the reasons most often motivating the practice.

Perverse Incentives. Professor Pirrong asserts that clearing involves a “moral hazard” which is a reason not to mandate it as a solution to derivatives risk. The moral hazard he identifies is partially correct; his conclusion that it disqualifies mandated clearing as a remedy is completely wrong.

His analytical problems are based on a fundamental misperception of the business of clearing. He repeatedly refers to clearing as primarily a means to socialize credit risk among the clearing members. He concludes that “[i]n a cleared market, absent restrictions, no dealer internalizes the cost of its default. This default cost is absorbed by the other members of the clearinghouse.”

As pointed out above, the goal of a clearinghouse is to measure the risk of loss on a default and require the clearing member to pre-fund it through margin. The clearing member pays the cost of the risk to its lending banks. The risk of mis-measurement is considered to be a clearinghouse failure, which is indeed absorbed by the clearing members to the extent that the estate of the defaulting clearing member does not make good.

Professor Pirrong concludes that the socialization of credit risk induces companies which hedge there business risks and clearing members to trade more than they otherwise would. The idea is that the counterparty credit risk which would have been experienced in a bi-lateral trade can be off-loaded on to the clearing members.

This is an illogical analysis, assuming that contract is one for which the risk of loss on default can be adequately measured. A loss which is fully collateralized and pre-funded has no consequence. A bi-lateral contract can be collateralized at the same level as a cleared contract. Comparing a fully cleared trade and an equally collateralized bi-lateral trade there is no material advantage since measured risk is fully covered. Clearing of these contracts does not incent additional trading activity.

The issue is a concern for contracts in which the default risk is difficult or impossible to measure by methods used by clearinghouses. In such a case, the trading firm cannot be certain of the amount of collateral needed to off-set the consequences of a default. Clearing the transaction would indeed transfer the risk of counterparty default in excess of margin to the clearing members. This does not lead to the conclusion that mandated clearing is inappropriate. The reasonable response is to consider alternatives to current practices which could mitigate or eliminate the undesirable incentives. Several of these are discussed below under “Ways to Move Forward.”

Cost of Margining

Professor Pirrong acknowledges that multi-lateral netting of collateral in the form of margin which is available in a clearing environment is an advantage. But he also cites the cost of daily cash transfers to meet margin requirements. He views this as a great burden, the cost of which overwhelms the other advantages of clearing.

Why else, he reasons, are all over-the-counter derivatives not cleared? That is an interesting question, especially after a closer look at the burden of margining.
For customers (not clearing members), access to clearing is through an FCM. Typically, FCM’s establish lines of credit so that customers do not have to continuously fund margin. There is a cost, but it is the cost of short term borrowing from the FCM to cover a credit exposure. This is very efficient and fair.

Clearing members must fund margin to the clearinghouse. For customer positions, they use the customer’s margin posted to them. For principal positions, they must fund the margin directly. Liquidity is required. But the clearing members are in the business of trading, not just at clearinghouses but in global markets. They must manage liquidity issues in multiple contexts. To be concerned over incremental liquidity demands resulting from mandated clearing is not credible.

But Professor Pirrong raised an interesting question: Why the preference of bi-lateral transactions over clearing? Here are some possibilities:

- Financial institutions can offer credit to customers in the form of foregone collateral to cover risk. The credit is tied to an advantageously priced derivatives trade. The price of the credit, embedded in the derivatives price, is obscured. In practice, derivatives-embedded lending is considered by banks as much more lucrative than straightforward corporate lending.
- Customers may value the hedge and the embedded credit extension more than a derivatives price which is tight to the market. Often, their primary task is to hedge and the price is secondary. Think of a regulated utility whose fuel and purchased power costs are passed through to consumers, but who need to hedge to please the ratings agencies and equity analysts.
- The credit extension is not reported by the customer the same as direct lending, so their balance sheets appear healthier. These motivations are predominant among end users.

Professor Pirrong expresses concern about the liquidity funding risk imposed by the cash demands daily margining. The much greater liquidity risk in the derivatives markets arises from credit extension in the form of foregone collateral in the bi-lateral market. Virtually all of these transactions include a trigger requiring full and immediate funding of collateral if the counterparty is downgraded by the ratings agencies. Imagine the liquidity demand if numerous such arrangements were triggered simultaneously at a time of stress which caused the downgrade. There are several significant examples of these liquidity crises resulting in bankruptcies and forced sales of large industrial firms.

Clearinghouses are proud of the historic absence of loss from clearing member default beyond available margin. But a clearing member default in the new world of clearing could very easily be sizable. It could also be correlated with a large price movement that changes derivatives values radically. Worse still, it could be associated with a frozen marketplace, much like the market for residential mortgage securities in 2007/08. Arguably, the only risk management technique which is really important is the daily margining (i.e., collateralization) of credit risk. Other management techniques are relatively static or depend on comprehensive and accurate information. Margining is not static; it adjusts as the risk rises and falls. The question is whether the risk measurement methods are adequate and whether the clearinghouses can keep up with rapidly changing markets.

The issues reach beyond the health and welfare of clearinghouses. As observed above, risks are not eliminated by clearing. They are transferred by the traders to the clearinghouse for (hopefully) superior management. The technique used is to measure the potential consequences of default and collateralize the risk through margining. If the measurement accurately anticipates the consequences, there is no risk which is uncollateralized. The risk of faulty measurement is spread among the clearing members through the funding of the default fund, described below. As the scope of clearing increases to include price risks which are less reliably measurable, the related transactions actually become more attractive to traders. They can offload the risk to other clearing members. This incentive to engage in risky behavior is a real concern. It also may complicate the ability of a clearinghouse to resolve a major default. Clearing members who did not engage in risky behavior may be less willing to contribute funds to cover the losses of those clearing members who did.

Layers of Protection

Clearinghouses often stress their layered approach to management of credit risk. Figure 2 illustrates the layers of risk management by clearinghouses.

The first layer, the role of the FCM as a conduit for customers, is not particularly relevant to systemic risk analysis. Obviously, the concern is clearing member default. Clearinghouses track the credit of their members, but it is debatable whether they are as effective as the banks and credit rating agencies. In addition, even if new transactions by a clearing member are blocked, its existing portfolio is a problem. Early remedial action is useful, but especially for the large financial institution clearing members, it questionable whether it will work.
There is considerable pressure from certain customers which qualify under the criteria for membership at the large clearinghouses for expansion of membership. The hesitance of clearinghouses to expand membership is explained differently, depending on who is asked. Clearinghouses say they want to maximize the creditworthiness of members. Customers who seek membership say that the existing members want to keep the club restricted to protect fees. But there is one consideration that is not discussed. Narrow membership means that the probability of a default is lower. A customer default is not a clearinghouse issue unless the FCM also defaults. But narrow membership also means that an FCM default has potentially larger consequences. This is not the most critical of issues, but the response to customers seeking wider membership should take this into consideration.

Clearinghouses maintain default funds to cover losses from a clearing member default in excess of margin on hand. Clearing members contribute to the funds based on transaction volume. Outside capital is used as well. As an example, the Chicago Mercantile Exchange, the largest clearinghouse, maintains a default fund somewhat larger than $2 billion. There is little doubt that a default fund constitutes a prudent approach to systemic risks mitigation. However, the numbers involved in a default default are behemoth. CME measures the daily change in overall risk exposures so that it can collect additional margin to maintain coverage. The average daily change in risk is in excess of $3 billion. However, the aggregate daily change has exceeded $18.5 billion in volatile market conditions. Again, this is not the total risk exposure, but the daily change in risk in response to which margin must be adjusted. It would seem that the default fund is inadequate in relation to the kind of systemic risk that was experienced in 2008.

If the default fund is exhausted, the clearinghouse can make a capital call on clearing members. This has never happened. Clearing members have an obvious incentive to maintain a viable clearinghouse. But two factors suggest that this layer of protection will not be practically useful if it is ever needed.

- Clearinghouses are already clearing esoteric and highly specialized derivatives. They are about to add a good many more categories of derivatives to their risk pool. Diversity of the classes of risk is a real concern. If the crisis centers on a single category of derivatives, the clearing members who were not involved with that category could very well resist funding the loss.
- A capital call could become an accelerant for systemic collapse.

The Reform Act has added a new tool: systemically important clearinghouses, as yet unspecified by the Financial Stability Oversight Council, can borrow from the Federal Reserve Discount Window if necessary to maintain liquidity. While this clearly decreases the potential for clearinghouse failure, the implications relating to the “Too Big to Fail” issue are obvious. The credit management tools employed by clearinghouses are, perhaps, even more significant as a result. The basic management tool – constant measurement of risk and collateralization of that risk through margin – is the most important.

**Margining**

There are two types of margin which clearinghouses require: maintenance margin and initial margin. Notwithstanding their names, maintenance margin will be considered first.

**Maintenance Margin.** Maintenance margin covers the mark-to-market risk discussed above. As the price associated with a derivative moves so as to create clearing member credit risk to the clearinghouse, the amount of that risk has to be funded by the clearing member. If the price subsequently moves in the opposite direction, maintenance margin is reduced and the clearing member receives a credit. A clearing member is very likely to have some derivatives which move in its direction and some which move against during any calculation period. These movements are netted and the required maintenance margin payment (or credit) is the netted amount.

Maintenance margin is calculated and assessed daily. But, clearinghouses can call for additional amounts intraday, if circumstances compel it.
The only real question regarding maintenance margin is the reliability of the price. Ideally, the price is set based on legitimate market transactions. That is not the reality for a number of cleared derivatives. Many derivative categories (and within a category, many specific maturities) currently cleared are traded only sporadically. The clearinghouse may use models that infer prices from related derivatives or for the same derivative type with a different duration. These indices are imprecise and therefore impose risk on the clearinghouse. The clearinghouse may respond that the exposure is low because volume is low; but that is a trap. There could be many such categories which in aggregate are, or could become, a problem. And once concessions are made to market based pricing, it is hard to stuff the genie back in the bottle.

Initial Margin. Clearinghouses are highly structured entities. They are not trading houses with market views. They must be balanced, with mirror image derivative transactions (one long and one short), at all times. If a clearinghouse loses a transaction because of a credit default, it must be replaced as rapidly as possible to re-balance the portfolio. The lost transaction was paired with its mirror image. If prices move against the lost position, the clearinghouse is liable to the mirror image paired clearing member for the mark-to-market movement and it no longer has a source of funding.

Ideally, the covering transaction would be executed instantaneously. If this could be accomplished, maintenance margin would be more likely to be sufficient to cover any loss. But it is by no means a guarantee. At any point in time, maintenance margin is based on earlier market prices, probably from the close of trading the day before. It is unlikely that those prices would be available in the market.

Instantaneous covering transactions are practically impossible. A default would involve multiple positions. It is also likely that the markets would be stressed by the default. Especially in thinly traded markets, there may be few clearing members who are capable of executing the covering transactions. They have strong incentives to price covering transactions aggressively since the clearinghouse is compelled to act and act quickly.

The risk that a covering transaction will cost more than the maintenance margin is the risk of market illiquidity and volatility. For convenience, this will be referred to as the “cover risk.” To measure cover risk so that it can be collateralized, the clearinghouse must estimate potential price moves from the time of the last mark to market until the covering transaction can be put in place. The initial margin must be sufficient to cover the risk.

Complex algorithms have evolved to calculate estimated cover risk. The most commonly used algorithm is SPAN, a proprietary methodology developed by the CME and licensed to clearing members and customers for cash management and to other clearinghouses for initial margin calculations. It is similar to value at risk (“VaR”) algorithms and there is debate over which approach is better for less liquid markets. Both approaches are calculations of statistically probable results based on some fundamental assumptions:

1. **Holding Period** refers to the assumed number of days required to cover a lost trade. It represents the relative liquidity of the marketplace, as well as operational delay. Longer holding periods translate into higher initial margin since prices can move greater amounts over longer periods.

2. **Mean reversion** refers to the tendency of the price of a class of derivative to revert to a mean. A high tendency to revert to mean mitigates the effect of a longer holding period. This factor is based on fundamental characteristics of the underlying commodity or financial instrument. For instance, a large component of electricity prices is the capital cost of power generation which is fixed. However, the requirement to serve demand on daily bases, regardless of how great the demand is, can lead to high, but transitory, price spikes, particularly on days when temperatures are high. Therefore, power derivatives have relatively high mean reversion characteristics.

3. **Confidence Interval** is a percentage of the historically observed price points which is intended to be covered. It is generally high, 95% and above. Extremes of price, both high and low, are excluded. Often, the distribution of the price points is skewed in one direction. For instance there could be more extremely high prices than low prices in the data set. This is referred to as a “fat tail,” and must be taken into consideration in the algorithm. Figure 3 illustrates a data set and confidence interval.

4. **Duration of the remaining term of the derivative** significantly affects volatility, especially as the termination date of the derivative nears. Price can be affected more by factors which change near the notional date of delivery of the commodity or financial instrument. For example, a derivative on electricity prices can change a great deal because of near-in weather forecasts which define the actual supply and demand on the date of notional delivery. The algorithm reflects this volatility and the initial margin is higher for shorter remaining durations as a result.
- **Seasonality** can be significant, especially for derivatives based on commodities prices. For instance, energy prices for deliveries in the summer months and some winter months are higher and more volatile than in spring and fall months. An adjustment for this is required.

- **Absolute Price Level** is significant because prices tend to be more volatile at extremely high and low levels. The algorithm must account for this.

If the statistics yield an inadequate result, initial margin may be insufficient to cover the actual losses which are realized and the system is at risk.

Statistics are useful only if past performance validly predicts future events. The data set of historical price observations must be predictive of future prices. Much is known about agricultural products, metals and familiar energy products. Less is known about more recently created and thinly traded derivatives markets.

Some markets are particularly susceptible to non-market forces. Currency markets are influenced by political events, but so are many others. Physical events affecting geographical distribution of products to delivery points, particularly energy products, can affect predictive quality of historic price data. There is no doubt that there are many derivative contracts for which the measurement risk is substantial because price can change based on unmeasured factors.

The Armageddon scenario is a market collapse for a class of derivatives simultaneous with large scale defaults. Replacement of positions lost by the clearinghouse in the defaults may not be replaceable for an extended period of time. Remember the mortgage backed securities market. Banks could not liquidate positions and could not even estimate market prices to measure losses. Everyone knew that the losses were enormous; but more significantly, they were immeasurable.

**Components of Prices.** For some products, the trading markets are relatively active, with substantial and continuous volume. The transactable price for that product is reliably ascertainable at any given point in time. These are referred to as reference price products.

Often, there are sets of products which are priced based on a reference price. The pricing relationship is a function of real world conditions. An example is natural gas. A great deal of the natural gas consumed in the United States is sourced at the Henry Hub in Mississippi. Henry Hub gas is traded extensively and is a reference price for natural gas. Natural gas delivered elsewhere, say the Houston Ship Channel, is priced at a spread to Henry Hub. In the real world, the gas will be sourced at the Henry Hub and must be transported via pipeline to the Houston Ship Channel, so the price at that point will be greater to reflect the additional costs. The difference in prices is referred to as basis.

Basis differentials may be traded in liquid markets so that they are suitable for the management tools used by clearinghouses, but sometimes they are not. Basis is a function of real world conditions and these conditions and these conditions can change. For natural gas, pipeline capacity and availability are important. So is the demand at other destination points which can affect prices and priority of distribution. The adequacy of historic relationships to the reference price is directly related to the stability of the correlation of reference and delivery point price movements.

The reliability of these correlations depends on the risk of events which change underlying conditions. These risks are by their nature difficult to measure statistically. They require prudent business judgment. The correlation between Henry Hub prices and Houston Ship Channel will be far more stable than the correlation with a delivery point at a greater distance from the reference price point. There is a greater risk of intervening events.

This business judgment lies beyond the quantitative underpinnings of clearinghouses. It requires particular attention, especially in a competitive environment in which revenues are a function of volume.

**Netting of Initial Margin.** As described above, netting of maintenance margin is straightforward. A clearing member owes the clearinghouse $20 maintenance margin on a trade on the same day the clearinghouse owes the same member $15 as a refund of another trade’s initial margin. The clearing member pays $5.
Netting of initial margin is a horse of a different color. Initial margin is collateral for a market move that may happen, but has not happened yet. Netting is justified if some offset will (or is highly likely to) occur on default of the clearing member.

The easiest example is a clearing member that holds long and short contracts on exactly the same product with the same duration. If the clearing member defaults and prices move, there will be a loss on one of the contracts but an equivalent gain on the other. Another way to think of it is that the clearinghouse would not need to replace those two positions.

Now assume that the long and short contracts are not the same, but historically the two prices have moved in tandem. Further assume that the movements are highly correlated. (Henry Hub and Houston Ship Channel natural gas, described above, are good examples). If the price moves after a default are expected to follow this pattern, the initial margin can be reduced on both contracts to reflect this correlation. In theory, both initial margins should be reduced by the inverse of the correlation factor. At a 90% correlation level, the reduction is substantial.

Historic correlations are generally based on real world conditions which cause prices to move in tandem. These conditions can change abruptly and decisively, as when a government announces a new policy which alters exchange rate correlations. The probability of changed conditions may be difficult or impossible to anticipate. The example usually cited in the power market is a truck backing into a transformer which alters the path of power flowing on the grid. It has happened and will again, but knowing where and when is impossible. The concern is not negligent operation of vehicles, but larger scale physical events which change correlations.

A clearinghouse which decided to be more competitive by lowering margins would likely look first to price correlation assumptions. The reductions are often high and the change is obscure. Unfortunately, price correlation assumptions are most subject to event risks which cannot be measured easily. Correlations involve more judgment than other factors. As a result, they deserve more attention from regulators and analysts than they actually receive.

Conclusion

Competition among clearinghouses is intense. Their revenues are driven by volume of contracts cleared. There is a strong incentive to exceed the boundaries of prudent risk management in order to succeed against the competitors. The dilemma is that clearinghouses are the most effective environments for managing the credit risks generated by derivatives which threaten the viability of the financial system. This calls for careful analysis and creative problem solving to achieve the dual goals of effective management of risks to the financial system and prudent techniques for the entities tasked with this management.

Ways to Move Forward

The regulators have a difficult task ahead. It is obvious that careful scrutiny of clearinghouses will be important as they implement the Reform Act and in the post-implementation period. Prudency must be balanced with the mandate of the Reform Act that as many derivatives as possible should be cleared.

Proponents of the Reform Act are understandably concerned about the range of derivatives cleared. The regulators have no authority to order clearinghouses to clear a category of derivatives; they can only study the advisability of clearing, report to Congress and direct that bi-lateral trades be collateralized. The clearinghouses must initiate the process of clearing any category of swaps, and this concerns proponents. It is important that they confront the real limitations on clearing, however. Their goal must be to maximize clearing of derivatives, using creative solutions where appropriate, without creating an environment in which systemic risk to the financial sector is merely shuffled around or even made worse.

There are several factors which the regulators should consider in the months ahead. These are discussed below. Of particular note are the last three which constitute direct methodologies for expanding the scope of cleared contracts while minimizing systemic risk.

Regulatory Expertise. Clearinghouses currently have the ability to self certify new products and risk management procedures. In a competitive environment, in which clearinghouse judgment could be clouded by the need for ever-increasing revenues, this is problematic. The Reform Act increases the involvement of the regulatory agencies substantially, especially in establishment of newly cleared contracts proposed by clearinghouses. The regulators need to develop the expertise to understand the implications of each new category of derivatives. They must meaningfully analyze the prudency of new contracts, and the exclusion of other contracts, on a case-by-case basis.

Decision Making and Governance. In the Reform Act, the public has entrusted the clearinghouses with an enormously important role in the economy. Much has been written about potential influence of the clearing
members, in particular the banks, on clearinghouses. Our legal colleagues have been concerned with formal governance issues and ownership shares and the CFTC has promulgated proposed regulations limiting ownership by clearing members and requiring independent directors. These issues are important. But far more important is the influence of dealer banks as sources for clearinghouse volume and, as a consequence, revenues. Banks control and direct volume. The Reform Act even provides rules allowing a non-bank counterparty to choose the clearinghouse to be used for a trade. But if that counterparty depends on a bank to be available when it needs a price hedge or credit, it is naive to think it will resist the desires of that bank.

The real business of a clearinghouse is credit management. This is typically controlled by a tremendously powerful risk committee. Dealer bank involvement on risk committees is common and freely acknowledged. Clearinghouses assert that bank knowledge of risks is helpful; and that their influence is appropriate since the clearing members represented by the banks are at risk if something goes awry.

But 2008 tells us that the public is also at risk if the clearinghouse does not properly balance prudent risk management with the mandate of the Reform Act. At a minimum, the public’s interest should be represented by membership on the risk committees of major clearinghouses. Regulatory representation, or representation by other public interest organization, would legitimize the process as long as resources and expertise were provided to challenge decisions such as which derivatives are cleared and which are not.

At a recent roundtable held by the SEC and CFTC on clearing, a representative of JP Morgan said that the financial sector would support a governmentally owned clearinghouse that was guaranteed by the government. It is an intriguing idea, especially if the italicized language were dropped. A government guarantee might even make sense, so long as it kicked in after the clearing members bore all of the losses they could; after all, that is where we are anyway.

Quarantining Risk Pools. Clearinghouses, especially CME and ICE, have become much larger, with far more diverse product lines in recent years. Their corporate strategies have been to absorb smaller clearinghouses and similar operations in order to compete with each other. Size brings economies of scale. But the value from economies of scale is minimal compared with the need to manage derivatives risks prudently.

In a clearinghouse offering broad ranges of contracts, the diversity of pooled risks is problematic. A crisis in one market can spread to other markets through the risk pool. There are two approaches which might work. The most obvious is to dismantle the large, multi-product clearing houses. Multiple, more specialized clearinghouses can provide all of the benefits of clearing sought by the Reform Act. The risks which are pooled would be more understandable since they would be more uniform. And the failure of a clearinghouse would be contained to a category of products.

Alternatively, multi-product clearinghouses could create risk silos for related product groups. Operational efficiencies would be maintained, but risk events would be contained to specific products. This would be more expensive for the clearinghouse and the clearing members. But, having experienced the effects of “Too Big to Fail” institutions, the cost could be well worth it.

Limiting Discretion in Risk Management. Clearinghouses have traditionally cultivated a “black box” approach to risk management. Rules for establishing price in order to calculate maintenance margin are all subject to being overridden by daily committee meetings. This is appealing as a way to minimize risk, assuming that the committee always errs on the conservative side. But this is not always the case. For one thing, recall that clearinghouses are always balanced. Conservative in one direction may be risky in the other. And the advisability of clearing contracts for which price is difficult to determine is questionable. At a minimum, greater detail in price determination procedures is needed; and any departure from procedures should involve regulators for an outside view.

In practice, initial margin is changed infrequently and often abruptly. It is remarkable that clearinghouses tout the sophistication of SPAN, but do not continuously re-calculate initial margin. Continuous re-calculation may be an operational headache for the clearinghouse and the clearing members, but it is much better than re-calculation at intervals established at the discretion of clearinghouse management.

Higher Initial Margin. Additional collateral always mitigates credit risk. SPAN predicts price moves statistically. It is generally used to calculate margin sufficient to cover 99% of historic price observations assuming a 2-5 day holding period before a defaulted trade is replaced. The problem is predictability of real world outcomes for riskier contracts using statistics. The data set of historical price observations (volatility) and assumed transactability at the extreme data set prices within the holding period (liquidity) may not be valid predictors for a given contract. Clearinghouses could depart from traditional levels of risk coverage in order to increase their security for problem contracts. A rule which requires 100% of observations to be covered, or
even that price level times a factor like 1.5, would provide better coverage of default risk. While this approach does not directly address the issue of the quality of risk measurement, covering 150% of measured risk for difficult contracts indisputably improves risk coverage. This is a simple and direct way to increase the number of contracts cleared.

Disaggregation of Illiquid Contracts. Most contracts which are risky to clear using conventional techniques can be broken down into clearable and unclearable components. A simple example is power delivered at the Duquesne, Pennsylvania delivery point on the grid. In virtually every imaginable circumstance, power flows from the PJM West Hub to Duquesne. The PJM West Hub is the most liquid power delivery point in the United States. Power at Duquesne is very likely to be the PJM West Hub price plus a differential. A Duquesne swap can be disaggregated for clearing into a PJM West swap, which is cleared, and a swap on the difference in price between Duquesne and PJM West, which is not. This will achieve clearing of a significant portion of the credit risk.

This approach is applicable to a very high proportion of swaps on illiquid price points. It efficiently extracts the clearable risk from transactions and reduces the uncleared risk in the marketplace.

Intelligent Allocation of Risk. The Reform Act has created a tension between the congressional intent to clear more products and contracts and the continuing integrity of the clearinghouses as more difficult-to-measure risks are heaped on them. The fear is that we have not eliminated systemic risk, merely concentrated it. If management systems can be made to work, this will be a good thing; but if they cannot, the consequences could be even worse.

A more flexible approach to clearing as a concept is needed for products which do not fit prudent criteria for clearing. The concern is that the risk management tools will not be effective on a default by a clearing member. The market for the contract may not provide covering transactions at prices which maintain the integrity of the clearinghouse. It is a problem of risk to the clearinghouse as a result of unpredictable illiquidity and volatility.

For these problem products, the clearing members which deal in the relevant markets could be required to provide liquidity at prices which fit within the available margin of the defaulting clearing member (or, perhaps margin plus a fixed cap on clearinghouse loss from default). Losses above the available margin would be borne by those who choose to participate in the problematic market. This would protect the clearinghouse from loss, but it would also fairly and reliably allocate the loss among surviving clearing members.

It would also incent clearing members to manage their participation in these markets more carefully, rather than encouraging participation in risky markets as is the case under conventional clearing structures. Today, the risks of an illiquid or complex cleared market are shared by the clearinghouse and all clearing members via the default fund. Conventional clearing actually incentivizes the development of risky markets by socializing the risk. Intelligent allocation of risk would provide the opposite incentive.

Importantly, clearinghouses would have no basis for declining any derivatives contracts. This approach could lead to universal clearing of derivatives by slightly adjusting the conventional concept of clearing.

Importantly, clearinghouses would have no basis for declining any derivatives contracts. This approach could lead to universal clearing of derivatives by slightly adjusting the conventional concept of clearing. There is no doubt that this result is superior to leaving these contracts in the opaque, bilateral environment. That is the real alternative to intelligent allocation of risk.

The mechanics are simple. Defaults result in an unbalanced clearinghouse portfolio, a condition which cannot be tolerated. Instead of entering the market to replace contracts lost because of default, the clearinghouse would exercise a new right, built into the derivatives, to terminate positions of other clearing members in the problematic market. Margin held by the clearinghouse would be made available to non-defaulting clearing members to compensate them for losses on termination, if any. Positions with maintenance margin which has been netted for price correlations make things a bit more complicated, but the procedures to address them are fairly clear.

The principle is straightforward: if you deal in an illiquid and risky market sector, you and the others behaving the same will bear the risk of loss, not the entire system. The concept is not entirely novel: both ICE and CME used versions of it in their approach to credit default swaps.

Risk is not eliminated. Clearing never eliminates risk. It is reallocated to the clearing members dealing in the problem contracts. Clearing member risk associated with the problem can be managed using the “Higher Initial Margin” and “Disaggregation of Illiquid Contracts” techniques described above. Clearing member loss in an actual default would be less likely. Using the concepts in tandem, the advantages of clearing would be maximized with the least amount of systemic risk.
Adopting this innovative approach to clearing is by far the most effective way to manage through the issues of clearing in the context of the Reform Act. Clearinghouses will not do this spontaneously – in the competitive environment, a clearinghouse’s superior ability to take on risk is an advantage which an allocated risk system would undercut. It must be mandated. The regulatory agencies must push the clearinghouses to expand the concept of clearing in order to give maximum affect to the intent of Congress.

Endnotes

2. Reform Act, Section 723(a).
5. Reform Act, Section 723(a).
6. Reform Act, Section 721(a).
17. CMEgroup.com/clearing/files/financialsafeguardspdf.
18. Reform Act, Section 806.
23. Reform Act, Section 723.
24. Reform Act, Sections 723 and 763.