



## Role played by Risk Management and Clearing systems in the economy of Future exchanges and ECNs

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The main purpose of this document is to comment on the impact of Risk Management and Clearing Systems towards the creation a more risk-free environment for trading operations.

Nowadays Trading is becoming a real important part of Management.

Looking back over this past century, we can observe a lot of significant changes in the Futures industry. From an economic point of view, Futures markets, which were initially used to hedge producers and consumers from commodity price risks, have exploded during the 80's following their introduction on financial markets. During this period, the major players consisted of banks, financial institutions and obviously hedge funds. Viewed on an industry perspective, we have recently experienced a very severe contraction in the number of exchange markets resulting from the closing and merger of many stock exchanges with probably more to come. The way of conducting business has changed as well. The Internet has introduced a new trading dimension with the emergence of e-brokers and new trading markets ECNs (Electronic Commerce Network) which provide easier access for small orders coming from retail participants but within different regulatory environments for identical economic function following ECNs filed for exchanges status or not.

Why so much change? Profit creation, Shareholders values and Risk Management are not of recent creation, especially in the United States. However, in the rest of the world, the mutualization of risks, the welfare society and even the centrally-planned economies played a major role during the XX<sup>th</sup> century. With the fall of the Berlin Wall and the decreasing importance of the centrally-planned economies worldwide, the market-based model received predominance not only for the Economy but also for the behavior of economic agents in their daily life as never experienced before. Consequently, short term profits and new accounting regulations permitting the recognition of all components of value creation on a fair market value basis have brought the overall economy to a phase of rapid commoditization. Fair market value has to be defined relative to a benchmark and the transparency brought by this reference to the benchmark drove to an increased perception of volatility, and more volatility to hedging tools to reduce risks perceptions. The ultimate stage of this process was the securitization with full transfer of risks to investors, thus reducing the producers role to creation, marketing and processing. Trading is now becoming a real important part of management

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Technology makes trading easier and cheaper.

All this has been made possible by the huge technology improvements which have created an environment enabling a dramatic reduction in costs relative to the acquisition of information, as well as for the gathering and transportation of orders. Additionally, it is now possible to create an electronic exchange from scratch at a relatively low cost.

Futures markets and now ECNs offer a traded benchmark and normally provide volume and liquidity. They equally offer the possibility to trade the future without having to forecast the future price at the future expiry date, knowing that the market forecast is already expressed by the quotations given by the Futures market itself. Contrary to OTC market rules, the futures market provides transparency and normalized commodities with identical price for all parties. The counterparty risk is managed by a clearinghouse using a relatively complex system of margins to adjust the value of the collateral given, in guaranty, to play.

To be a neutral reference you need to provide totally independent information. Exchanges offer this through unique places where multiple orders from anonymous buyers and sellers are matched on agreed terms of a trade using established, non-discretionary methods.

Considering all the advantage offered by Exchanges, one can ask why we have experienced such a large expansion in the interbank market, and more generally in the OTC market.

- Firstly, not all institutions are authorized to work with exchanges,
- Secondly, normalized commodities are difficult to use as a perfect hedging tool by non professionals,
- Thirdly, regulated exchanges are heavily supervised and require margin accounts with the clearinghouse, limits in position sizes...
- Fourthly, large interbank volume for hedging purpose.

Banks offer customized products easy applied by non financial professionals, without any margin constraints or size limits providing the institutions bank credit is sufficient. This implies no impact on treasury lines, and counterparty risk is carried by the bank with or without collateral. To manage the customized OTC products sold to their customers banks constantly hedge their positions. This produces a huge flow of interbanks operations and an accumulation of off balance sheet figures.

Banks were so flexible and OTC volume has increased so much that counterparty risks made regulators nervous

This practice exposes banks and financial institutions to serious counterparty risks, although, collateralization and netting have become widespread practices to enable weaker credit to enter the market.

Nevertheless, over the past five years, the financial markets have experienced several crisis, the latest of which resulting in the near-collapse of LTCM emphasising the magnitude and the complexity of the interaction between Highly Leveraged Institutions (HLIs) and mainstream financial institutions. Banks and securities firms need more than ever to fully understand and manage the risks generated from these activities for their direct creditors and, under certain market conditions, to the financial market as a whole. A recent report issued by the Basle Committee on Banking Supervision highlighted banking institution's risk management deficiencies with respect to HLIs and recommended that "supervisors consider these issues carefully. Furthermore, given the potential systemic disruptions, the Committee has also considered the desirability and feasibility of direct regulation of HLIs". The report considers that the capital treatment of the credit exposure arising out of derivatives and repurchase transactions with HLIs, as well as the treatment of unsecured lending, lending with inadequate financial covenants and equity participation need to be evaluated in the context of the Basle Committee overall review of Capital Accord.

Collateralization and netting work well in the interbank market, where trading books are marked to market and the bank's capital requirements for counterparty risk are limited by the CAD at 20%. However, it is less efficient for transactions related to non bank counterparties which are still generally weighted at 100%. To resolve this issue, initiatives have emerged to bring the clearing process for swaps and repo operations into the clearing facilities offered by clearing houses such as LCH or Clearnet.

Playing the role of a central counterparty, clearinghouses facilitate risk reduction and balance sheet netting.

To be able to understand the key position played by the clearinghouse we have to first explain how a clearinghouse facilitates risk reduction and balance sheet netting relative to the bilateral market practices, and secondly what is Clearing Risk and how clearinghouses measure it?

Clearinghouses facilitate balance sheet netting using a novation process in which the clearinghouse plays the role of a central counterparty. Innovation netting with a clearinghouse all transactions between the counterparties are assigned to a central clearing counterparty which permits multilateral netting of all transactions, thus reducing credit exposure (the net market value of the transaction at the time of default) and the probability of counterparty default.



Multilateral transaction netting reduces credit exposures that typically exist in the absence of clearing. In effect, multilateral netting allows clearing members to offset their net liabilities with some members against their net claims to other members. Thus, the benefits of multilateral netting tend to increase the clearing house's participation. Furthermore, the margining procedures typically used by clearinghouses have the effect of eliminating current exposures (or collateralising them) on a daily basis and reducing potential future exposition.

As the central clearing counterparty, clearinghouses guarantee the proper settlement of transactions effected by their members and, sometimes, by a member's clients. By assuming this role, they expose themselves to the clearing risk representing the potential replacement cost that clearinghouse would have to bear if one of the counterparties of a trade is unable to fulfil its liabilities in excess of its margin deposits.

The clearing risk is a specific risk, which combines *credit risk*, in the sense that it results from a counterparty's inability to meet its liabilities, *market risk* in the sense that it is caused by market shifts (general and specific *market risk*) between the time a transaction is executed and the time it is cleared, as well as *liquidity* and *systemic risk*. The latter is due to the critical position of major clearinghouses in the market place.

Clearing risk covers credit risk but as well market risk, liquidity and systemic risk

This Clearing risk could be measured using a Clearing Value at Risk which is an estimate of the upper bound on aggregated replacement costs that the clearinghouse would expect to incur during a given period (e.g. one day) within a given confidence level (e.g. 95%). In case of liquidity holes, replacement may take several days and prices may change by substantial and unpredictable amounts, far beyond several standard deviations. A correct estimate of the Clearing VaR must take into account such events.

Clearing risk could be measure using a Clearing Value at Risk which defines the level of Capital needed by the clearinghouse to face potential losses.

Clearinghouses that guarantee full completion of transactions must have sufficient capital to face potential losses up to the Clearing VaR (with a confidence level determined by regulation authorities). Other clearinghouses, that do not guarantee complete transaction execution, often organise clearing guaranty funds in order to share losses in the case of a member's default. The size of these funds is in direct relation with the Clearing VaR.

The calculation of Clearing VaR presents some idiosyncrasies which must be considered and include Default Probability and Cascade of Defaults.

Within the clearing framework, and because margin calls generally occur on a daily, and sometimes intraday basis, multi-period default simulation is meaningless. Similarly, rating transition probabilities, as used by most risk management systems and displayed by rating agencies, are insufficient for understanding a clearing default event. However, for most market operators, default probability is highly dependant on the loss amount, especially if the latter exceeds the firm assets. Such situations have occurred in the past (e.g. Barings 1994) and this feature strongly increases for all types of VaR — market, credit, clearing — as soon as portfolios contain derivative assets.

As already expressed, the near-collapse of LTCM has emphasized the magnitude and complexity of the interaction between Highly Leveraged Institutions and mainstream financial institutions. Often, members trade for their own account, as well as executing customer orders on separate accounts. However, in the event of a defaulting customer, they may have to use their own resources to achieve settlement for the customer's trades, resulting in a potential cascade of defaults.

Vis a vis their customers Clearing Members and Prime Brokers are exposed to Clearing risk

An apparently healthy member, such as a Prime broker who enables active traders to centralise their clearing and record-keeping at one broker, while executing trades through several, can be severely weakened by an over-exposed customer. Such customers may considerably affect the Clearing VaR.

Comprehensive Clearing risk systems are complex and sophisticated

From a methodological point of view the Clearing VaR calculation requires sophisticated systems capabilities able to deal with the following issues :

- Monte-Carlo calculations based on historical covariance and simulation based on randomly generated movements of market variable;
- Combination of stress tests and standard moves, simulation that combines market variable shifts from a standard Gaussian/Log-normal distribution, with deterministic and probabilistic stress scenarios (non-standard shifted Gaussian/Log-normal distributions) to capture the fat tail effects;
- Joint default simulations (groups and sub-groups of portfolios), simulation of correlated default of accounts, groups of accounts or brokers, and then simulates the simultaneous default of group members;
- Event dependent default probabilities, assessment of a path dependent default probability for each client, broker or group;
- Chained default simulations, simulation of the actual default of a broker's customer according to its (path dependent) default probability and in a second step, simulation of the default of a broker or a group taking into account the default of customer's accounts.



As an illustration of above-mentioned mechanism, we can take the example of Paris Bourse SA which asked, as early as 1997, Strategic Risk Management to help put in place a Risk Management tool for its clearing activity currently handled by its subsidiary CLEARNET SA.

For this enterprise, Strategic Risk Management worked in close cooperation with Stochastic Risk Management in the design and the implementation of a Clearing VaR system able to deal with the issues listed previously. De facto, EXVaR®, the Clearing VaR solution customized for CLEARNET under the EXVaR® name, is specifically designed to provide a comprehensive Risk Management solution for Clearinghouses encompassing Credit risk, Market risk, Liquidity risk and their mutual interaction\*.

During our collaboration with CLEARNET SA for the design and the implementation of EXVaR®, it appeared that chained risks were the most delicate issue to be tackled.

During the development of our work, chained defaults surfaced as one of the most delicate issues to be tackle by the different members. The EXVaR® solution offers clearinghouse members the possibility to manage their counterparty risks arising from their own clients and provides a valuable solution for prime brokers who centralise the clearing and record-keeping for active traders at one broker, while executing trades through several.

Clearinghouses play a key role and are the strongest link in the chain for the creation of a secured trading environment but they are not alone. As mentioned briefly precedently, Clearing members and Prime Brokers face the same type of risks as the clearinghouse itself, so we think it is important to explain in more detail the specific situation of Prime brokers.

The role of Prime brokers, as well as third-party agent-lending specialists, is particularly important in the Repo market since most securities lenders have stringent eligibility qualifications for borrowers, and where many hedge funds and broker-dealers rely on their prime brokers for access to borrowed securities. To intermediate securities lending transactions on a principal basis, Prime brokers tend to be well-capitalised. Nevertheless, to avoid over-capitalization, they must manage closely their counterparty risks and protect themselves in the maintenance of collateral, margins and position limits in order to contain their risks in the event of default. Regarding the specific nature of the players and the type of operations involved, this task cannot be achieved by traditional credit analysis and requires the same level of sophistication that is provided by EXVaR® to Clearinghouse.

\* A pending patent protects the technology behind the tool, the idiosyncrasy of which being based on its unique capacity to apprehend the chained default risk of Clearinghouse members and catastrophic events.

Clearinghouses are central to the economy of Trading. The way they manage their risks and the tools they use to do it constitute an example for all the other economic agent involved in Trading operations.

We began this paper with a short review of the economy of Futures exchanges and ECNs. We then developed the clearinghouse's role in the process including the risks involved and the solutions used to monitor them and provide management support. We made a short comparison between Exchanges and OTC markets, pointing out their strengths and weaknesses, keeping risk at the heart of the discussion and clearinghouses, as the central counterparty, providing a solution to net part of the risks.

Regulators have brought some major support to the role of Clearinghouses, and their ability to adapt their offer to their users by reducing their capital needs through the reduction of their risk exposure. New Clearinghouse's functions, like ClearnetOTC or Swapclear, which open new possibilities for the clearing of repo operations and derivatives products like swaps, should encounter a frank success with professional searching for ways to reduce their risks and Capital base.

To conclude on the economy of Futures industry, exchange markets bring transparency in price formation and information. They offer all buyers and sellers an equal treatment and the opportunity to trade and hedge commodities and financial products within a set of rules enabling them to use a very substantial leverage with a counterparty risk limited to the clearinghouse. The security of this transactional environment provided by the clearinghouse is unique and constitutes a key strength. To be in a position to guaranty such a high level of security, clearing houses have put in place sophisticated risk management systems enabling them to monitor the position of their members and to adjust their margin to prevailing market conditions.