Establishing a Market for Toxic Assets

in a Bear-Market Economy

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Table of Contents

Executive Summary

This white paper suggests a solution to one particularly difficult problem: how to buy and sell toxic assets whose true value cannot be established in an open market. At the root of the problem is a conflict between the transparency required in an open market and the need to keep financial information private. Resolving this conflict is essential to the resolution of the toxic asset problem. Furthermore, financial asset evaluation is complex; therefore, a workable solution incorporates complex, but fortunately feasible, system components.

The open market can match buyers with sellers when a seller can advertise items together with descriptions that are sufficiently detailed to permit buyers to reach a rational purchase decision. In the current financial markets, investments have become a "pig-in-a-poke" – a commodity with hidden attributes. The open market forces a tremendous discount on the price of such a commodity thus inhibiting trades.

New computer-assisted negotiation methods permit the trading of items with private, concealed attributes. The methods employ a "blind broker" who mediates a negotiation on the basis of encrypted terms provided by the buyer and seller. The broker is "blind" because the broker cannot break the encryption and expose the negotiation positions of the buyer and seller. The deals suggested by the blind broker are in an encrypted form that only the buyer and seller can decrypt. When the buyer or seller views a suggested deal, that party learns a little bit about the opposite party from the information included with the suggestion. However, each party remains secure in the knowledge that the opposite party cannot browse freely through their encrypted negotiating position. Thus, the parties are encouraged to trade even in a highly suspicious situation.

A drawback of the new negotiation method is that is conducted between two parties or a small group of parties. It does not scale in the same way as the catalog-based marketing represented in E-Bay or Amazon, for example. A second drawback is that the blind broker is limited to dealing with concealed attributes and concealed numbers or numerical ranges. A blind broker can compare concealed attributes and numbers for equality and compare concealed numerical ranges for overlap. The latter property enables a blind broker to find the suggested deal price given a concealed asking price-range and a concealed offer price-range. That is sufficient for many financial transactions, perhaps even for the toxic asset problem.

When the buyers and sellers require a sophisticated evaluation of the asset, the mediator can deploy "captive software agents". Agents are software downloaded from the Internet and allowed to run locally. They are intrinsically insecure. A captive agent, however, is suspected from the outset and it is admitted on a one way basis to a secure compartment. It cannot contact or return to the Internet. A captive agent can conduct a previously agreed audit procedure. The agent's findings can be incorporated in the concealed negotiation position to enrich the attributes used for the encrypted negotiation. This overcomes the limitations of the basic encrypted negotiation.

The Issue Seen as Comedy

Business is based on trust. Scott Adams deftly points out our trust deficit in his cartoon from May 14, 2009 (www.dilbert.com). Scott's punch line "And thus ended capitalism" could prove prophetic unless we adopt new means, at least during a transitional period, that compensate for the loss of trust. To "save capitalism" this paper proposes a novel, blind encrypted data matching technology to support mediation through a third party who is blind to the data.

Leading up to this crisis, no company developed software for a blind, third party because nobody predicted the breakdown of networks of trust on the scale seen today. Now we need a heroic effort to reverse the trends. Naturally, we need a symbolic hero.

Reviving trust in the system means that software for any proposed solution must submit itself to open inspection, test, and criticism. Thus, the answer suggested in this paper is backed by an open-core software project that is named after "Pygar", the blind angel that appears in the cartoon novel, "Barbarella" (Jean-Claude Forest, V-Magazine, 1962). Whether Pygar is a match for the Four Horsemen of the Financial Apocalypse remains to be seen. The battle may involve all our resources including humor!

The Issue: Toxic Assets Held by Banks

This white paper suggests a solution to one particularly difficult problem: how to buy and sell toxic assets whose true value cannot be easily established in an open market. In the words of the editors of The Economist: "many of the country's biggest banks may be insolvent. Their balance-sheets are clogged by hundreds of billions of dollars of 'toxic' assets – the illiquid, complex and hard-to-price detritus of the mortgage bust, as well as growing numbers of non-housing loans that are souring thanks to the failing economy". (See reference 1 at end.)

A solution to the toxic asset problem would enable banks regain the confidence of investors and resume their role fueling the wheels of commerce with short-term loans. Our proposal enlists software technology to solve the problem. We present our idea as a necessary part of the solution. The final section of this paper discusses whether it is also a sufficient answer.

A Few Simplistic Definitions

Investors hold financial instruments that serve as assets. Many of these assets pay a steady income to the owner. All the instruments should repay their principal by the end of a specified time. We call an asset "toxic" when the contractually obligated income is not received or when there is doubt whether the principal invested in the asset can be recovered as expected. Such assets are a problem for any investor, particularly for banks.

A bank is seen as solid and reliable when its value is based on solid assets. If a bank holds toxic assets, it is impossible to accurately determine the value of the bank's holdings and whether the bank is on a firm financial footing. Such a bank will loose the reputation it needs to conduct future business. In its weakened state, the bank may be vulnerable to acquisition at an unreasonably low price – the outcome of the bear-market psychology that drives down values in a self-fulfilling cycle. The bank may even engage in self-destructive short-term tactics such as recalling loans and foreclosing mortgages that would very likely be paid back in the long run but look bad on the books in the short run.

The difficulty behind the pricing problem for troubled or toxic assets is that the price is really the price of a "future"; that is the price of today's asset is governed by the expected value of the asset in the future. For example, the future value of a troubled mortgage is less than the outstanding principal because there is a probability that the principal will not be repaid. To sell an asset like this, one needs to be clear and honest about the possibility of default.

Why the Marketplace Can't Help the Banks Now

The management of a bank in today's bear market is caught in a cash crisis. A bank's assets can probably sustain the bank in the long run but the presence of toxic assets on the bank's books make it impossible to lend or borrow in the short run. A rational solution would be to sell the toxic assets. A toxic asset, like any distressed item, will sell at some price below its face value. Buyers who can afford to wait can buy low now with the expectation of a profit later when they sell. However, the definition of a toxic asset is that it cannot be priced reliably. The uncertainty forces the buyer to insist on an unfairly low price. Faced with huge losses on such a sale, a bank may resort to alternatives such as foreclosing a mortgage or recalling a loan just to get the loan off the books. These tactics can be self-defeating, however. A bank that forecloses ends up owning real estate in a falling market and a debtor may default rather than pay a recalled loan. Obviously the banks are in trouble today. What the banks need is a market where even toxic assets can be traded at a fair price.

A market for toxic assets could work if it provides full transparency. The future value of an asset is based on probabilities, which are conditional on measurable factors such as a mortgage holder's income and payment history, a business's profit margins, etc. A buyer has to see and believe all these measurable factors before it is reasonable to extrapolate the probabilities and the future value. A transparent market where all the factors are visible to the buyer could work for the buyers.

A fully transparent market for toxic assets is just a dream; in fact, it is a bank's worst nightmare. The banks are stalked by bears looking for weakness. If a bank makes an honest, transparent disclosure of the full circumstances of all loans and mortgages, the information can be exploited in hostile negotiations. Transparency about asset values would make a bank more vulnerable in a bear market. Moreover, a buyer sacrifices some reputation for financial soundness by acquiring distressed assets. Thus, both buyers and sellers want to keep the information under cover. An open transparent market is impossible. Consequently, the open market can't help the banks today.

How to Establish a Fair Market for Toxic Assets

Few people in the financial industry realize that the technical advances in computers and networks over the last twenty years now allow the creation of a market operating through blind agents. In a blind agent market, the buyers and sellers conceal the terms of the offerings and bids. There are no public displays of inventory, prices or bids. The blind agent can find deals where a buyer's bid matches a seller's offer even though all the terms are encrypted and it is impossible for the blind agent to read them. If the blind agent finds a deal that works, the agent sends it to the buyer and seller. The buyer and seller can decrypt the proposed deal and read it, but the blind agent or any eavesdropping party cannot. From that point, the buyer and seller can go ahead privately with the transaction revealing as little or as much as they want to the public.

The last step in a transaction that is mediated by a blind agent will look like a private sale; but the deal is determined in a competitive marketplace. The market, mediated by the blind agent, determines the price level for successful transactions. At the same time, the encryption of terms conceals the entire inventory as well as the bids. Mediated deals go forward, but the market's participants are protected from any party who wants to see and abuse information about a participant's market position.

encrypted bid   Broker   encrypted offer

encrypted deal
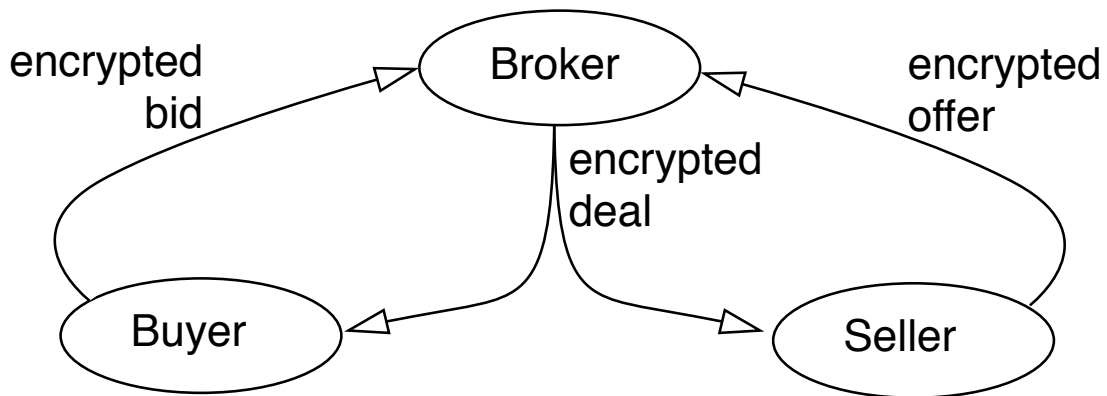
Buyer   Seller

The little figure above illustrates the basic flow of information in the market. The blind agent acts as a broker between a buyer and a seller. The buyer and seller encrypt their terms for transactions and the broker tries to find matching encrypted terms that will describe a deal that is acceptable to both sides. If the broker finds a deal, the deal is still encrypted until the broker sends it to the buyer and seller. They decrypt it and go forward. The method can be extended to more players in the market but we illustrate only the basic mechanism here.

The broker plays an important role in establishing a market for composite instruments such as packaged loans or derivatives. The broker must develop an acceptable template that can be used to describe the asset. The template should include fields for all available information that may effect asset value. Thus, a successful broker must be very knowledgeable and widely accepted arbiter of the evaluation formulae. Without an acceptable model, the mediated market won't work.

Captive Agents Handle Financial Complexities

An acceptable model of the potential value of an asset is likely to include calculations on the raw data that are not possible with the encrypted data. Indeed, a blind broker can compare concealed attributes and numbers for equality and compare concealed numerical ranges for overlap. The latter property enables a blind broker to find the suggested deal price given a concealed asking price-range and a concealed offer price-range. However, a complex financial model might require computing a function from a set of financial parameters. If the system does a good job concealing the true value of each parameter, then a function computed over the concealed parameters is useless for decision-making. The blind broker cannot perform a complex evaluation on encrypted data.

The financial evaluation formulae demand their own discussion, which we provide in the last section. For the moment, the issue is that a blind-agent broker cannot evaluate the formulae. Another component must be included in our proposed solution.

A broker should work with the best minds in the market sector, consult with the major buyers and sellers, develop a consensus set of asset evaluation formulae. The broker's software team will then render the formulae as open-source software. The coded formulae must employ open-source policies to allow independent verification and review. The coded formulae become part of the template package that the broker sends to clients for the preparation of their negotiation positions. For each negotiation position, the formulae are evaluated and the results are included with the negotiation position before it is encrypted and sent to the broker for the encrypted negotiation. In this way, the software agents allow the best minds in the financial industry to recommend currently optimal evaluation procedures and these can then be coupled with the blind encrypted data matching procedure to protect each party from any attempt to obtain and exploit its proprietary financial data.

Lastly, we note that the negotiation position should contain more that the results of the complex formulae. Each parameter that enters a formula should be noted and included as a supplement to the negotiation position. Although the broker cannot evaluate these parameters, they are necessary to inhibit a natural ploy during negotiation – lying! There will always be a temptation to feed bad numbers into the financial formulae to gain an unfair advantage in a market transaction. It is important to discourage such behavior or the market will not be sustainable. We will take up the appropriate normative procedures next.

Enforcing the Fair Market

A fair market must be an honest market. The seller must accurately represent the asset that is up for sell and the buyer must make an offer that is within the buyer's ability to pay. If one party acts dishonestly, the encryption makes it impossible for the other party to prove what happened. For example, suppose the seller misrepresents the payment history on a loan. The buyer buys the loan and then discovers the deception. The seller's original representation was encrypted and only the buyer and seller saw the original description of the asset. There is no way a judge can evaluate a complaint made by the buyer. Unfortunately, the encryption of the terms in the blind-agent market mechanism is so good that it protects dishonest participants unless another mechanism is added. That mechanism is an outside authority. We will simply call the authority the "judge". The operation of the mechanism is illustrated in the next drawing:

request for
copy of deal

Broker

encrypted
deal

Buyer

complaint
+ encryption key

Judge

judgement
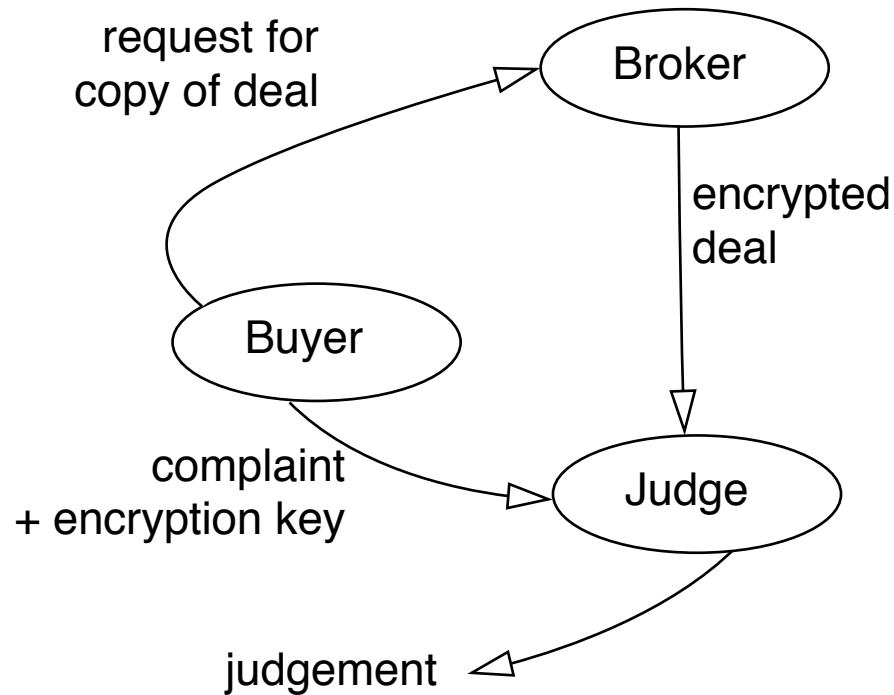
The mechanism is triggered by a complaint. In this case, the buyer asserts that a deal was concluded based on false encrypted statements made by seller. The broker has retained a record of the seller's statements. However, the broker's copies are all encrypted and useless as evidence unless they can be decrypted. However, the buyer can ask Broker to release the encrypted deal to the Judge. Then the buyer provides the judge with the encryption key. The Judge can then decrypt the statements in the deal and see how the seller represented the asset at the time the deal was negotiated. If the seller significantly misrepresented the asset, then the Judge should conclude the complaint in the favor of the plaintiff.

Is the Blind Agent Market a Sufficient Answer?

We are proposing **a market mediated by a blind agent** for the sale of toxic assets and have outlined the proposal as it would be implemented by networked computers. A computer-based solution is one approach to the problem. This closing section will mention two other approaches: financial models and continuous improvement processes.

Evaluation of the toxic assets is a challenge even to the best financial minds. Deals signed in the previous bull market were badly executed and improperly documented (see reference 3 below). The current market value of many loans cannot be quantitatively evaluated because the documentation is missing. Consequently securitized assets based on those loans cannot be priced either. In the solution proposed above, the blind agent deals with numbers that are concealed to protect the market players from excessive scrutiny; but the blind agent still deals with numbers. Good numbers are hard to find for the toxic assets.

A complete solution of the toxic asset problem will require a new, **respectable model of asset value**. In fact, financial engineers are at work already on new models (see reference 2 at the end). In truth, similar models lay behind the packaged loans and derivatives that greased the economy's decline into the present mess! For that reason, it will be hard for the new models to gain any traction with investors. That may be unfair. In a nutshell, the old models relied on historical data without realizing that the glut of new derivatives and securitized assets would effectively rewrite history. Historical statistical patterns were never fixed and eternal; it was simply very profitable for everyone to claim that they were. Financial modeling must emerge from its own self-created ruins by coupling accurate measurements with exhaustive testing of the models to support a **continuous improvement process** (see reference 4). The same continuous quality improvement has revolutionized industrial production; the financial industry needs to catch up with Toyota! Given the gravity of our situation, independent validation for new financial models - perhaps through the National Academy of Sciences - might be appropriate.

For readers who have forgotten about the continuous improvement process, the keys to its success in manufacturing were (1) extensive measurement of results without insistence on extreme precision (20% measurement accuracy on each cycle is more than enough to ensure an improvement), (2) improvements driven from the bottom up by the people who execute the business of the company, (3) action with full support of management, (4) rapid iteration to achieve success by stepwise improvements. The process formalizes quality engineering in manufacturing and we believe it is adaptable to financial engineering.

The **new financial models of asset values could work well in combination with a blind agent market for toxic assets.** The models lend some credibility to the numbers that are negotiated in a sale while the concealment of the agent mechanism allows more flexibility to work in a risky area of business. If a market can be established, it will grow as the models are refined by the continuous process improvement and the trading partners gain experience and confidence dealing with each other. With luck, we can return to a fair and vibrant market.

References to More Information

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3. "Guess What Got Lost in the Loan Pool?", Gretchen Morgenson, The New York Times, March 1, 2009.

4. "Continuous Improvement Process", Wikipedia,
   http://en.wikipedia.org/wiki/Continuous_improvement ;
   by iterative refinement methods such as PCDA or Deming Cycle, Wikipedia,
   http://en.wikipedia.org/wiki/PDCA .

5. An example of blind-agent market software for a fictitious financial market similar to currency swaps:
   http://www.wwnsoftware.com/demo1/BEDM_Demo/Welcome.html .

6. Author's web site: http://www.wwnsoftware.com

7. The methods discussed in this article support the evolution of greater cooperation in society along the principles of social science developed in the last twenty years. The author has established a blog to discuss the application of blind agents to the evolution of cooperation:
   http://ectn.typepad.com

8. Related open source software project: http://ectn.typepad.com/pygar