AN ANALYSIS OF THE FINANCIAL CRISIS OF 2008:

Causes and Solutions

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The financial crisis in 2008 is of such epic proportions that even astronomical amounts spent to address the problem have so far been insufficient to resolve it. Besides the well-publicized $700 billion approved by Congress in the autumn of the year, the Federal Reserve had already attempted to bail out institutions and markets with about $1.3 trillion in investments in various risky assets, including loans to otherwise bankrupt institutions and collateralized debt obligations like those backed by subprime mortgages that are defaulting at rapid rates (Morris, 2008). A further $900 billion was already being proposed in lending to large corporations in the fall of 2008 (Aversa, 2008), making a total of about $3 trillion in bailout money by that time, without even counting the massive sum of corporate debts already guaranteed by the U.S. government by then. An analysis of the fundamental causes of this "colossal failure" that has put "the entire financial system . . . at risk" (Woellert and Kopecki, 2008) is warranted in order to both solve the problem and avoid such events in the future.

Root Cause of the Crisis: Mispricing in the Massive Market for Credit Default Swaps

Many blame defaulting mortgages for the current financial crisis, but this massive tragedy is only a component and symptom of the deeper problem. The pricing of credit default swaps (CDSs), whose principal amount has been estimated to be $55 trillion by the Securities and Exchange Commission (SEC) and may actually exceed $60 trillion (or over 4 times the publicly traded corporate and mortgage U.S. debt they are supposed to insure), are virtually unregulated, and have often been contracted over the phone without documentation (Simon, 2008), is the primary fundamental issue from which all the other problems of the crisis emanate.

CDSs are actually rather simple instruments in concept, merely mandating that one party paying a periodic fee to another to insure the debts of some entity (such as a specified corporation) against default for a particular amount of time like 5 years. They are effectively debt insurance policies that are labeled otherwise to avoid the regulation that normally is imposed on insurance contracts. This unregulated market grew astronomically from $900 billion at the turn of the millennium to over $50 trillion in 2008 after Congress enacted a law exempting them from state gaming laws in 2000 (*PIA Connection*, 2008).

Any investment in a debt requires compensation not only for the time value of money but also a premium for the credit risk of the debt. Compensation for the time value of money is usually provided by the debt promising, at a minimum, a yield equal to that of the rate available on default-free government securities like U.S. Treasury bonds. The credit risk premium above that rate must compensate investors for not only the expected value of default losses but also for the systematic risk[1] relating to the debt, as well as for any embedded options (Murphy, 1988).

In a CDS or bond insurance contract, there is no initial

investment in the debt by the insuring party, and so only a credit risk premium is required. This premium must, however, include both the default risk premium and the systematic risk[1] premium. Appropriate appraisal methods for estimating those premiums have long been known (Callaghan and Murphy, 1998).

However, many practitioners today apply pure mathematical theories to evaluate credit risk and estimate credit risk premiums to be required (Glantz and Mun, 2008). Rajan, Seru, and Vig (2008) have provided an analysis of the very large forecasting errors that result from the application of such models that fit "hard" historical data extremely well but ignore human judgment of "soft information." The models of such "'quants' who have wielded so much influence over modern banking" are, according to some analysts, "worse than useless" (*NewScientist*, 2008b), and the result has been catastrophic for many institutions religiously adhering to them. Just for instance, one major insurer of debts via CDSs (AIG) placed "blind faith in financial risk models" and their small elite staff of modelers who initially generated large income for the firm for a few years that later turned into decimating losses (Morgenson, 2008).

Regulators' forecasts of serious problems and "horror stories" years in advance of today's crisis were largely ignored because of successful lobbying by the very financial institutions that are today either bankrupt or in the process of being rescued with government funding (Associated Press, 2008). For instance, the failures of the two federal agencies (often labeled Fannie Mae and Freddie Mac) were preceded in 2005 by a successful $2 million campaign by Freddie Mac to lobby Congress from restricting their own investments in higher-risk mortgages (Yost, 2008). These same agencies, banks, and other institutions provided assurances their lending practices (including those enabling loans without adequate documentation) were "safe" based on evaluations of past data (Associated Press, 2008).

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[1] "Systematic risk" is risk associated with aggregate market returns.

Some investors in debt securities look only at the credit ratings provided by a few rating agencies such as Moody's and Standard & Poors (S&P), which themselves evaluate credit largely using only mathematical models. Those models, which employ statistics to uncover past relationships between debt defaults and a few variables, as in the seminal Altman (1968) study, can ignore very important factors and possibilities (Woellert and Kopecki, 2008). While some have suggested that the models only need to be improved (*NewScientist*, 2008b), purely statistical models can't incorporate all possible factors that are relevant to a decision. In addition, statistical models are subject to the problems of spurious correlations between variables that are magnified as the number of variables is increased, so that attempts to incorporate more relevant variables may only increase other modeling errors.

Perhaps as a result, existing mathematical credit risk models have "a tendency to underestimate the likelihood of sudden large events" (Buchanan, 2008) that are especially important in the credit markets where the tail of a distribution is key in predicting the defaults that typically have a low probability of occurrence (Murphy, 2000). Most mathematical models fail to consider inter-related systematic risks (Jameson, 2008), and they tend to make unrealistic assumptions such as markets always being in equilibrium (*NewScientist,* 2008a). Despite their "poor risk modeling" in actuality (Jameson, 2008), the statistical accuracy of the models in predicting backward into the past (using historic data) resulted in the mathematical modelers developing such a "faith in their models" in forecasting the future that they began to "to ignore what was happening in the real world" (*NewScientist,* 2008b).

Even after the failure of the purely mathematical models existing in finance and economics, many today feel that mathematical models of markets must merely be refined, such as with gauge theory, the mathematical underpinning of the quantum field theories of the standard model of physics (Buchanan, 2009). It is questionable, however, whether credit analysis can ever be conducted without some human judg-

ment. Human judgment can incorporate a vast number of variables that are rapidly processed using simple but effective algorithms that are subconsciously developed (Gigenrenzer, 2007). It can therefore help avoid the errors of purely mathematical models that are based on unrealistic assumptions, that take into consideration only a subset of all the relevant variables, and that may be affected by past spurious relationships which may not hold in future environments.

Some have suggested that subjective human judgment opens up for the possibility of undesirable human biases and manipulation. However, with or without human judgment, financial models of credit risk are subject to manipulation, both legally and fraudulently. Just for instance, "soft information" about borrowers' capacity to repay that is difficult to communicate in mathematical models to the final investors of securitized loans is subject to manipulation by lenders seeking origination income (Rajan, Seru, and Zig, 2008). The modeling predictions at the credit rating agencies themselves (such as Moody's and S&P) have, at least recently, been biased toward granting higher ratings than merited in order to compete for revenues from the debtors who pay to be rated, and the result has been a "colossal failure" (Burns, 2008). Based on the recent record of the relative rates of defaults on loans made using strictly "hard information" (Rajan, Seru, and Zig, 2008), it may be concluded that human judgment may, at least within the framework of normal organizational controls, have greater capacity to detect and avoid biases than mathematical models that can be more easily manipulated than thinking human beings.

Modeling Away Systematic Risk and Systematic Risk Premiums

The more sophisticated mathematical models of debt instruments were based on theories that implied the systematic risks of debts could be hedged or diversified away (Duffee, 1999).

This modeling framework may have been the most catastrophic error of all. In particular, many modelers questioned the need to require any yield compensation for systematic risks (Elton, Gruber, Agrawal, and Mann, 2001).

Debt investors normally receive extra yield for the systematic or beta risk of debts because those risks of systematic losses during periods of market declines or recessions can't be fully diversified away (Murphy, 2000). Without systematic risk premiums on debts subject to default risk, risk-averse investors should optimally invest into default-free U.S. Treasury securities. However, theories have been developed that indicate investors may only need to charge sufficient interest to cover expected default losses (Duffee, 1999). These theories are based on unrealistic assumptions, such as no transaction costs and a continuous distribution of returns (Merton, 1974). As a result, the conclusions of the theories are invalid despite the impeccable accuracy of their mathematics.

While most of the failure in requiring sufficient compensation on loans to cover expected default losses in moderate economic scenarios may have been concentrated in the mortgage market, the inadequate yield premiums required for systematic risk became prevalent in most debt markets by 2007. A major contributing factor was the use of copula functions to measure systematic risk based on the correlation of current market prices of debts and related CDS insurance as well as past histories of the correlation of defaults (Salmon, 2009). Such misestimated functions resulted in an underestimation of the systematic risk of defaults across debts in distressed times and undercompensation for the systematic risk of debt investments.

In particular, modeling procedures based on unrealistic assumptions resulted in many CDSs being priced to have the periodic payment compensate the insuring party for average default losses without adequate premium yields being required for systematic risk. Little or no extra yield cushion was required to cover the systematically above-average default losses that inevitably occur in some years. As a result, debt investors had set

themselves up for large losses at some point. With many of the insuring parties of CDSs being banks and other financial institutions that were highly leveraged with large current obligations, suffering losses created the risk of these insurers defaulting on their own obligations under the CDSs, leading to a potential domino effect for their swap counterparties and a possible systematic cascade of defaults.

Failing to charge a systematic risk premium on the CDSs compounded the problem of underestimating average default losses that, as previously mentioned, also emanated from the reliance on statistical models and that were applied without human judgment or business common sense. The result has been that debt insurance in the CDS market was very underpriced, and the payments on CDSs didn't even cover expected future default losses in average years.

Such underpricing of CDSs resulted in a credit bubble, as investors were able to hedge their investments in bonds and loans with the insurance of the CDSs to reduce their risk at abnormally low costs. In particular, the hedged positions of debt combined with CDS insurance were perceived to be virtually risk-free because the insuring parties on the CDSs (such as banks, the federal mortgage-insuring agencies FNMA and FHLMC, and insurance companies such as AMBAC, MBIA, and AIG) were typically granted the same credit rating by Moody's and S&P as the U.S. Treasury at Aaa. Because of the unregulated nature of the market for CDSs, it was difficult for investors to analyze or question whether the Aaa ratings of the insurers were justified, since lack of regulation resulted in inadequate disclosure. Investors (and the credit rating agencies themselves) may have also perceived (perhaps with some justification) that some of these insurers had implied U.S. government backing either because they were federal agencies (like FNMA and FHLMC) or were too large to fail (like many commercial and investment banks).

Yield spreads above the interest rates on default-free U.S. Treasury bonds therefore plummeted to the level of the cost of the CDSs as insured bonds and loans were perceived to be al-

most as risk-free as Treasury debt. The result was very low spreads between Treasury yields and corporate and other debt yields, especially junk yields.

The decline in the spreads between risky and risk-free debt yields to unprecedented levels was precipitated by investors seeking to arbitrage any bonds or loans that were priced to yield higher spreads. Those arbitragers would purchase higher yielding debts, buy cheap CDS insurance on them, and then earn the difference between the higher spread and the insurance premium as an excess return for little perceived risk. Such activities eventually drove the yield premiums on all bonds and loans down to the cost of the CDSs as competition with lenders engaged in forming such hedged positions forced down borrowing rates.

With market prices of publicly traded debts not incorporating adequate premiums for credit risk, new loans had to be similarly priced to compete with the public markets. Thus, lenders and debt investors in general locked themselves into returns that could be expected to average scarcely above those on default-free Treasury securities and were often less due to inadequate credit analysis (which, due to overemphasis on mathematical modeling without human judgment, resulted in much larger misestimates of the probability of default than otherwise).

However, for a while, lenders were able to generate profits because initial default rates on new issues of debt tend to be lower in the early years after origination, and because loan originations generate significant fee income to the lenders. Since the economy was still expanding at a healthy pace a few years ago, and since the artificially lower rates resulted in rising lending volume due to increased demand by borrowers (especially the less credit worthy who could manipulate the mathematical models), the short-term profitability was enhanced even more for lending institutions.

Nonetheless, given that no systematic risk premium was being charged, and given that the default risk premium was less than the average default losses over the life of the debt that

would be estimated by expert human credit analysts, the profits were almost certain to turn into losses as soon as defaults rose to a normal level. In particular, charging inadequate credit risk premiums results in negative income even with funding costs at Treasury rates. As a result, without the cushion of a systematic risk premium to cover higher than average default losses that systematically occur in some years, highly leveraged firms like banks could systematically experience negative income in those years, leading to liquidity problems related to bank runs and failure. Until then, however, it was possible for individuals and companies to borrow at extremely low premiums to Treasury rates for several years, as the low cost of debt insurance lowered the cost of borrowing.

The recipients of the periodic insurance payment on the CDSs themselves were also able to initially report large profits from the contracts, despite the underpricing of the insurance, as the early defaults on new debt issues were lower than the insurance payments (Morgenson, 2008). That situation was especially prevalent in the residential mortgage market because newly issued mortgages tend to be characterized by especially low default rates compared to more seasoned ones. In addition, many of the newly originated mortgages had adjustable rates that offered a low teaser payment for the first 1–5 years of the loan before they were contracted to rise according to a formula based on market rates of interest, and default rates naturally rise significantly with such adjustable-rate mortgages (ARMs) when those artificially low rates expire.

The Foreclosure Catalyst

The current mortgage crisis itself seems to have been largely caused by the mispricing of CDSs. A major contributor to the lack of subjective judgment and verification of the model inputs was the fact that mortgage brokers were motivated by loan origination commissions to just maximize the volume of issued mortgages because they were to be owned by other investors

who took positions in them through collateralized debt obligations or CDOs (Buchanan, 2008). One factor causing CDO investors to accept such uncertainties may very well have been that such mortgage-backed securities were widely insured against losses from default by insurers like AIG via CDSs (Morgenson, 2008). As a result of such blurring of risks to final investors, many mortgages were made with no money down and no proof of income (Buchanan, 2008).

Insurers of mortgage-backed securities likely justified their pricing by applying purely statistical credit scoring procedures using a limited number of factors that didn't incorporate the effects of requiring no documentation for the inputs to the models and having no human credit analyst to provide a subjective judgment. In many cases, the unverified inputs to the models were even widely recognized to be false or misleading. For instance, Alternative-A mortgages, which required no documentation of income or assets, were widely referred to as "liar loans" but developed into a very large market because they generated large fees for mortgage bankers, who sold them to other investors (Zibel, 2008). The process was self-reinforcing initially since it generated very low costs for borrowers and large profits to lenders and insurers in the early years before default losses rose above credit premiums charged.

The problem of underpricing the insurance payments on CDSs on mortgage paper may have been at least partially exacerbated by the mathematical models of the insurers not fully allowing for the rising defaults that normally occur on adjustable rate mortgages as the interest rate invariably rises following initially low teaser rates. Unrealistic expectations of ever-rising home prices that would enable refinancing mortgages when the introductory teaser rates rose after a few years may have also contributed. Given the sensitivity of mortgage defaults to home price declines (Rajan, Seru and Vig, 2008), the existence of evidence of a possible bubble top in real estate prices at that time (Shiller, 2005) would make the latter expectations appear to be especially implausible.

However, Rajan, Seru and Vig (2008) have documented

the fact that mortgages originated for sale in securitized packages ignored such deficiencies in credit analysis because of inadequate incentives for the originating lenders to do more than consider data inputs into models that were based on imperfect evaluation of the past history of default rates on loans with a limited set of specified criteria. Those criteria ignored the very lack of motivation lenders had to conduct independent credit evaluation with "soft information", which includes "information about a borrower's income or assets that is costly for investors to process".

In the meantime, insurers of mortgage paper like AIG were able to record large profits from its insurance scheme until those higher default rates on the securitized mortgages materialized (Morgenson, 2008). However, default losses on subprime mortgages in 2007 began to exceed the credit premiums that had been charged on them. Subprime mortgages are loans to borrowers with high credit risk that were issued in unprecedented amounts beginning a few years ago and that effectively require rising home prices to prevent defaults (Bhardwaj and Sengupta, 2009). Most of the subprime mortgages, many of which were even guaranteed by FHLMC and FNMA (Frame, 2008), had introductory "teaser" rates, which, although already incorporating a large credit risk premium, were contracted to be raised to even higher levels after the expiration of the introductory teaser period of typically 2–5 years, and which effectively depended on rising real estate prices to enable refinancing to avoid defaults because of the borrowers inability to afford the payments at the end of that period (Bhardwaj and Sengupta, 2009). When residential real estate prices stopped advancing in 2007–2008 (Frame, 2008), the subprime mortgages couldn't be refinanced, and massive defaults began as the payment increases couldn't be made after the date of the interest rate reset.

The resulting foreclosures brought an excess supply of homes onto the market that caused residential real estate prices to fall, further inhibiting the refinancing of unaffordable mortgage payments and thereby contributing to further

mortgage defaults. Mortgage defaults tend to rise especially strongly when home equity (or the difference between the home value and the mortgage principal) turns negative, and the nationwide drop in real estate prices brought many mortgages into that risky position, causing severe declines in the market prices of those mortgages (especially the subprime ones that were often issued with very little homeowner's equity). As the market value of mortgages fell, the viability of many banks and other financial institutions was called into question, resulting in a wholesale bank run that required the Federal Reserve to bailout the system with several hundred billion dollars in liquidity in the summer of 2007.

As investors began to perceive that defaults could spread beyond mortgages, the systematic risk premiums began to rise across all debt instruments, resulting in a fall in debt prices across the board. Systematically falling debt prices led to further increases in perceived systematic risk and further rises in systematic risk premiums in a cycle that brought us to the 2008 financial crisis.

The Liquidity Crisis

Exacerbating the cycle along the way were the failures of several large financial institutions such as Bear Stearns, FNMA, FHLMC, Lehman Brothers, and AIG. These failures were related to the investments of those institutions into debt contracts of various types that had fallen in value to the point where their liabilities exceeded the market value of their assets. The risk of default resulting from that situation of financial insolvency of FNMA and FHLMC in the second half of 2008 that the U.S. government felt it judicious to provide those federal agencies with a massive bailout in order to lower the credit risk premiums on (and stabilize the prices of) the trillions of dollars in residential mortgages that they had guaranteed (Frame, 2008). In cases of non-governmental institutions without an implicit federal guarantee, there was a also liquid-

ity crisis that catalyzed the firm's failure, insofar as the market value of the liabilities of that investment bank on its massive portfolio of CDSs began to rise so much that the counterparty was able to demand additional collateral be put up as security against payment on the CDSs (as occurred first with Bear Stearns).

A similar liquidity crisis later ensued at AIG, with that insurance company having insured a massive amount of collateralized mortgage obligations. As previously explained, much of the mortgage crisis may be attributed to AIG and other insurers of mortgage paper like AMBAC and MBIA. In particular, many of the subprime mortgages may never have been originated and packaged into pools if there hadn't been an agreement by the insurance companies to guarantee the mortgage-backed securities with specified mathematical characteristics against default. The premiums charged on the CDSs do not appear to have provided sufficient compensation for the higher default rates on mortgages with lower (or no) down-payments, especially when no documentation was required and no human credit analysis was undertaken.

As more institutions failed, market credit risk premiums rose ever further, leading to further calls for collateral on firms that were receiving the periodic payments on CDSs. The resulting liquidity squeeze caused more defaults and further rises in market credit risk premiums in a vicious cycle. Despite the Federal Reserve's massive efforts to intervene with needed cash, credit risk premiums rose to over 8% on a leading index of CDSs (Moses and Harrington, 2008).

With the credit crisis leading to a severe stock market decline and panicked public requests by government leaders for taxpayers to bail out the troubled financial institutions in the fall of 2008, consumer confidence fell precipitously. That factor along with the contraction of credit from the earlier loose standards as mortgage defaults rose caused a serious decline in consumer spending that has resulted in a recession. With default rates rising in an economic contraction, the problem of having mispriced credit premiums on past debt contracts will

likely be magnified further, especially given another year of large amounts of ARMs scheduled for rising payments in 2009 that will further negatively impact consumer spending capacity. The result can lead to further declines in consumer confidence and spending that magnifies and lengthens the recession, which in turn exacerbates the credit crisis in a vicious cycle that may lead to a depression. In a depression, default rates and losses are much higher, and so a larger portion of rising credit risk premiums in existence today seems to represent rising default risk premiums (as opposed to just rising systematic risk premiums) as investors begin to forecast a larger chance of a depression scenario (and extremely large default rates) unfolding.

Possible Solutions to the Crisis

The current government policies of bailing out insolvent financial institutions and providing large monetary and fiscal stimuli to the economy are likely to both be ineffective and result in enormous costs long-term. These programs are very similar to Japan's failed "experiments" with a financial crisis in the 1990s that was also related to the popping of a real estate bubble and that has led to decades of economic stagnation there which continues today. The resulting huge government budget deficit in Japan (that is far higher than for any other developed country as a percentage of GDP) may also soon be replicated in the USA.

However, the huge trade deficit of the USA necessitates foreign financing of the already large budget deficit there that may eventually collapse the dollar (along with U.S. economy through a resulting massive depression and/or inflation) when foreign investors (such as the Chinese government) begin to recognize the very poor long-term investment prospects for investing in U.S. government debt (that the Chinese government continues in order to inhibit a reduction in the benefits China derives from its massive trade surplus which

a large depreciation of the dollar against the Chinese yuan would cause). Despite this additional risk, a period of world-wide economic stagnation to be followed by massive inflation and/or depression in the U.S. could possibly still be avoided by applying other solutions to the crisis instead of a massive bailout of the financial markets.

One simple effective government policy would be to nationalize the depository institutions of the failed corporate holding companies, and simply let the holding companies and all other failed institutions go bankrupt and default on their CDSs. The nationalized banks could then go back to making loans as they did in the old days, having real human beings make credit-granting decisions. In addition, nationalized banks could choose to take controlling equity positions in borrowing companies in default on their loans and effectively nationalize them in order to enable them to continue to operate (and maintain some production and employment) if they have some chance of recovery. The cost of this policy to taxpayers might be rather small, especially since most of the losses on the defaulting CDSs would then either be offsetting or be incurred by investors like hedge funds. In addition, given that the current massive rescue operations don't seem to be successful in averting an economic downturn, it is unclear the need to rescue many of the failed financial institutions.

The real estate and mortgage crisis itself could possibly be resolved by allowing defaulting mortgagors to refinance with shared appreciation mortgages (SAMs) that would lower their payments in return for the lending institution receiving a share in the future appreciation on the home (Murphy, 2007). The SAMs could possibly be standardized to both reduce legal costs and also potentially create a secondary market for them in the form of SAM pools in which investors seeking diversification into residential real estate might be interested. By replacing foreclosure solutions with SAMs, less homes would be put on the market for sale, thereby reducing the downward pressure on real estate prices. The cycle of falling real estate prices leading to more mortgage defaults and foreclosures,

which cause further drops in real estate prices that prompt more foreclosures, might therefore not only be stopped but even reversed.

Any bailouts of industrial corporations like the U.S. automobile manufacturers would optimally be tied to the loosening of the credit standards of those companies for purposes of financing new purchases. With excess capacity and large gross profit margins in many industries (such as auto and home-building), credit would optimally be granted to any buyers whose expected value of default losses were only about 3% less than the gross profit margin (after all variable costs) earned from the sale. A mere 3% cushion represents the systematic risk premium required on the highest-risk debt (Murphy, 2000), and so employment of that credit granting criteria would not only increase effective demand and therefore production but also maximize profits (and should therefore be adopted even by companies not requiring a bailout).

This manufacturers' looser credit policy could be carried out by the existing financing affiliates of the manufacturers. Those affiliates could continue with their normal lending policies except that rejected credit applications would be considered in a joint venture with the manufacturer that would have those financing arms share in the profits and losses resulting from the extra manufacturing profits net of realized default losses at the extinguishment of the loans. Funding for the activities could be provided by packaging the loans in a pool that has both complete guarantees against default losses by and significant equity participation on the part of the manufacturer. In addition, a program enabling the purchase of federal guarantees, perhaps with the oversight and participation of nationalized banks, might be especially beneficial in reducing the financing cost of this program as long as credit remains tight.

Another policy that might enhance profitability and help reverse the ongoing economic decline would be to have cases of defaults on secured consumer loans (such as for autos or homes) result in possible renegotiation of both the loan terms and the collateral in a unique way. For instance, instead of re-

possessing cars of defaulting auto loan borrowers, a cheaper car (or even a clunker taken in by an auto dealer as a trade-in) could be offered in exchange for the existing, more valuable collateral. The borrower would have lower (and potentially more manageable) payments as a result, and independent vendors or dealers could participate in the program by assuming a share of the profits and losses from the new loans. The same could be done with respect to replacing foreclosures with trading defaulting mortgagors down to smaller houses with lower payments (and such programs could be combined with SAM participation by the lender to further lower periodic payments). Companies nationalized by nationalized banks could easily lead the way in developing such policies.

For institutions suffering strictly from a liquidity crisis but having a firm value in excess of their liabilities, simple enforcement of the regulations on short sales might be of great assistance without a government bailout or a change in operating policies. In particular, as shown theoretically and empirically by Murphy, Callaghan, and Parkash (2005), companies with inadequate internal liquidity can have their stock price shorted down to zero and then be totally unable to access the capital markets, thereby resulting in the failure of the firm. To inhibit such shorting down of value, the illegal "naked" shorting that is concentrated in foreign markets but also goes on in the U.S. because of inadequate enforcement by clearing agents (Boni, 2006) could be prevented by having the SEC start to enforce the laws requiring delivery of borrowed shares by short sellers. Since there is an estimated $1 trillion in illegal "naked" short sales (Financial Wire, 2004), which have been alleged to be related to the activities of organized crime (Weiss, 1997), enforcing the requirement that short sellers deliver the securities they sell like any other seller would result in a short squeeze that would send stock market prices soaring, as those short sellers had to buy back the securities they sold to deliver the shares they had never borrowed. Most importantly, however, such a policy would inhibit the bankruptcy of the thou-

sands of firms that have been shorted out of existence (Financial Wire, 2005) simply because of a short-term liquidity crisis.

With the current financial catastrophe having led to a significant economic decline already in late 2008 despite the government's enormous (and ineffective) monetary stimulus of $3 trillion, a significant amount of government spending would be required very soon to reverse the decline in consumer sentiment and spending that is threatening to increase in 2009. Because tax cuts would likely be heavily saved or used to pay down debt in this environment, direct large-scale government outlays (like for the environment, infrastructure, education, research, and subsidies or other incentives for consumer purchases of homes and other goods) are needed. Government spending could also be employed to offset any declining output and employment caused by the failure of financial institutions and other corporations.

To inhibit future financial catastrophes, CDSs would have to be put under regulatory oversight again (perhaps requiring all trading of such derivatives on futures exchanges that minimize counterparty risks). In addition, accounting firms could make changes to ensure allowing for more appropriate reserves for bad debt losses on newly issued loans that are more likely to default as they become more seasoned (to reduce the short-term cosmetic incentives for excessive risk taking). Finally, business schools and finance professors in particular could focus more on teaching how to exercise better human judgment and foresight (and possibly less on mechanical statistical and mathematical analysis).

Rizzi (2008) has provided some additional undocumented insights about the most recent financial crisis along with some changes in the organizational financial framework that may help avert another catastrophe of a similar nature. However, the specific characteristics of the credit bubble and crash (and methods for resolving and averting them) were not addressed in that excellent general analysis.

CONCLUSION

By analyzing the root causes of the financial crisis, it is possible to estimate the costs of resolving that crisis utilizing current policies of bailing out investors who made poor investment decisions. Although the cost of the bailout may be staggering, cheaper solutions appear to exist. In any event, it would seem imperative that the financial managers of the future be better educated in the art of credit analysis.

Much broader lessons could conceivably be drawn from the financial crisis of 2008–????. In particular, given that "comparisons between price and value is what much of finance is about", and given that human psychology and sentiment risk are important determinants of market prices (De Bondt, 2008), the enormous deviations between price and value that occurred in the most recent crisis hopefully will prompt financial experts to reconsider purely mathematical models of value that ignore subjective forecasts and the human element in general.

REFERENCES

E. Altman. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance* 23 (1968), 589–609.

Associated Press. "Bush Administration Ignored Clear Warnings." http://www.msnbc.msn.com/id/28001417#storyContinued

J. Aversa. "Fed Eyes Plan to Fund Short-Term Business Loans." Associated Press (October 7, 2008).

G. Bhardwag and R. Sengupta. "Did Prepayments Sustain the Subprime Market?" European Banking Center Discussion Paper Number 2009-09S.

Boni, L., 2006. Strategic Delivery Failures in U.S. Equity Markets. *Journal of Financial Markets* 9, 1–26.

M. Buchanan. "Crazy Money." *NewScientist* (July 19, 2008), 32–35.

M. Buchanan. "Can Science Fix Economics?" *NewScientist* (June 6, 2009), 35–42.

J. Burns. "Former Ratings-Firm Officials Blame Conflicts for Rosy Views." *Wall Street Journal* (October 23, 2008), A4.

J. Callaghan and A. Murphy. "An Empirical Test of a Stochastic Cash Flow Theory of Evaluating Credit." *Advances in Financial Planning and Forecasting* 8 (1998), 31–51.

D. Collins and C. McMahon. "Great Bailout of 2008: What's Next." *Futures* (November 2008), 28–36.

W. De Bondt, G. Muradoglu, H. Shefrin, and S. Staikouras. "Behavioral Finance: Quo Vadis?" *Journal of Applied Finance* 18 (2008), 7–17.

F. Duffee. "Estimating the Price of Default Risk." Review of Financial Studies 12 (1999), 197–226.

E. Elton, M. Gruber, D. Agrawal, and C. Mann. "Explaining the Rate Spread on Corporate Bonds." *Journal of Finance* 56 (2001), 247–277.

G. Favel. "Sold Short." *Futures* (November 2008), 32.

FinancialWire. "StockGate: The Tune May Have Changed, But the Song is the Same." *Investors Business Daily* (June 25, 2004).

FinancialWire, 2005. "Regulation SHO Gets Confuser and Confuser as Listing 'Disappear'." *Investors Business Daily* (January 28, 2005).

Frame, S. "The 2008 Federal Intervention to Stabilize Fannie Mae and Freddie Mac." *Journal of Applied Finance* (Fall/Winter 2008), 124–136.

G. Gigerenzer. *Gut Feelings: The Intelligence of the Unconscious.* Viking: New York (2007).

M. Glantz and J. Mun. *The Banker's Handbook on Credit Risk.* Elsevier: Burlington (2008).

B. Jameson. "The Blunders that Led to Catastrophe." *NewScientist* (September 27, 2008), 8–9.

C. Jones and O. Lamont. "Short-sales Constraints and Stock Returns." *Journal of Financial Economics* 66 (2002), 207–239.

P. Koh. "Stung by the German Connection.": *Euromoney* (April 1, 2005), 1.

R. Merton. "On the Pricing of Corporate Debt: A Further Note." *Journal of Finance* 29 (1974), 449–470.

G. Morgenson. "Behind Insurer's Crisis: Blind Eye to a Web of Risk." New York Times (September 28, 2008).

C. Morris. "Fed's $1.6 Trillon Bet: The $700-Billion Wall Street Bailout Was Only the Half of It." *Washington Independent* (October 14, 2008).

A. Moses and S. Harrington. "Company Bond Risk Surges on Argentina Default Concerns."Bloomberg (October 23, 2008).

A. Murphy. "A Discounted Cash-Flow Model of Fixed-Income Securities Subject to Multiple Calls." *Southern Economic Journal* 55 (1988), 21–36.

A. Murphy. *Scientific Investment Analysis.* Quorum Books: Westport (2000).

A. Murphy, J. Callaghan, and M. Parkash. "Shorting Down Value." *Review of Pacific Basin Markets and Policies* (2009).

A. Murphy. "An Analysis of SAM Pricing in the UK." Presented at the 2007 European Financial Management Association (EFMA) meeting.

NewScientist. "Crunchonomics." July 19 (2008a), 5.

NewScientist. "Blinded by Science." September 27 (2008b), 5.

PIA Connection. "Congress Exempted Credit Default Swaps from State Gaming Laws in 2000." October 15 (2008).

U. Rajan, A. Serun, and V. Vig. "The Failure of Models that Predict Default: Distance, Incentives, and Default." Chicago GSB Research Paper No. 08-19.

J. Rizzi. "Behavioral Basis of the Financial Crisis.*" Journal of Applied Finance* 18 (Fall/Winter 2008), 84–96.

Salmon, F. "Recipe for Disaster: the Formula that Killed Wall Street." *Wired Magazine* (March 17, 2009).

R. Shiller. "Homes are a Risky Long-Term Investment." *TIAA-CREF* (Summer 2005), 19–22.

E. Simon. "Meltdown 101: What are Credit Default Swaps?" *Kansas City Star* (October 26, 2008).

Weiss, G. "The Mob is Busier than the Feds Think.*" Business Week* (December 15, 1997), 130.

L. Woellert and D. Kopecki. "Moody's, S&P Employees Doubted Ratings, E-Mails Say." Bloomberg online (October 22, 2008), http://www.bloomberg.com /apps/news?pid=20601087&sid= a2EMlP5s7iM0&refer=home

Yost. "AP IMPACT: Mortgage Firm Arranged Stealth Impact." Associated Press (October 20, 2008).

A. Zibel. "Liar Loans Threaten to Prolong the Crisis." *Huffington Post* (August 18, 2008).

S. Zwick. "CDS: Still the Object of Desire." *Futures* (May 2009), 50–52.