

# COMPUTER INFORMATION SYSTEMS AS A CATALYST FOR FRAUD, EXPLOITATION AND ECONOMIC UPHEAVAL IN WORLD FINANCIAL MARKETS

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## ABSTRACT

*The financial crisis of 2008 has its roots in banks and brokers making risky mortgage loans used to support risky mortgage collateralized securities. Computer Information Systems were an unintended catalyst, nexus and an enabler of the misdeeds and poor decisions made by financial managers at many levels. A study conducted in the northeast United States shows that managers include greed, mismanagement, and government policy as contributors, and IT as a nexus and enabler of the financial crisis.*

**Keywords:** IT and Financial Fraud, IT and Economic Upheaval

## INTRODUCTION

Banking failures and financial crises are not new to America. They have occurred from time to time since we first became a democratic nation. Government programs have been enacted to add stability to the financial systems, including the formation of the Federal Reserve Bank (Fed) in the early twentieth century. The primary mission of the Fed is to manage the country's monetary policy by controlling the money supply and interest rates through setting reserve requirements, establishing discount rates, and buying and selling government securities. The Fed also acts as the "lender of last resort" to commercial banks in times of financial crises. To protect depositors, the Federal Deposit Insurance Corporation came into being shortly after the Fed. For the most part, the Fed has added a stabilizing influence to the banking system, and we have seen a less volatile economy during the past 90 years.

What, then, has changed in 2008 that has put the financial markets in such a severe decline, what has caused the country's largest investment banking and brokerage firms to implode, and what put the money center commercial banks into a tailspin? Should we blame our decline on

inaction from the Fed, on world conditions, on economic decisions of the President? Or, if we look carefully, is there a hint that perhaps underlying all of our financial troubles is a layer of technology that has been quietly permeating the financial world? This technology has been creating opportunities for excessive risk taking, as well as creating the means for a few strategically placed individuals to make monumental investment errors, cause their company to lose enormous sums of money and even fail, and all but destroy our financial system. The problem is that unknowing, misguided, or even mal-intentioned people used sophisticated IT to advance their purposes, many times at the expense of others.

The financial world is increasingly connected through knowledge, capital and information, creating a global village where citizens and government have become interdependent. No country, no matter how small or how remote, can operate in isolation: the price of gold in New York is instantaneously transmitted to the gold market in Bangkok, where a local goldsmith must pay "market" price for his raw materials. While there are very short delays in circulating important market information, these delays are measured in seconds or at the most minutes, not the hours or days of delays seen in the era of teletypes and written communications. While individuals and firms have made profits in arbitrage transactions that take advantage of small price differences in competing markets, profitable arbitrage trades are becoming much more difficult with modern technology and telecommunications. Even more important in the crisis of our financial system is the deployment of technology to perform internal operations. In financial institutions, one of the most critical activities is the assessment of risk with the various securities that are being developed, then bought and sold. Risk management and analytics systems have replaced humans in this critical function, and have failed miserably. Problems with data set selection,

time lines utilized and basic risk assumptions employed have all contributed to misleading or even disastrous risk assessment outcomes from these systems. Add to this deposit insurance that guaranteed depositor funds would be safe even if banks failed encouraged bankers to take extraordinary risks in pursuit of profits (Wikipedia, 2008). One could argue that it is not the technology that has failed, but rather the absence of judgment on the part of risk managers who have utilized and relied on the technology (Sraeel, 2008; Hansell, 2008).

### **THE FINANCIAL CRISIS OF 2007-2008**

There is strong evidence that the current crisis has its roots in banks and mortgage brokers making risky mortgage loans (Fest, 2008; Steveman et al, 2008; Andrews et al, 2008). These mortgages were sold by the originators to third parties, where they were pooled together as collateral for various investment products (derivatives, collateralized debt obligations, credit swaps, and others). The rights to the mortgage payments were sold to investors and financial institutions as mortgage-backed securities. This distributed the credit risk of the mortgages from the originating bank to the investment firms that purchased and pooled the mortgages, then ultimately to the purchasers who became the securities owners. Real estate speculation, overbuilding, and poor underwriting judgment impacted the origination and granting of mortgages that formed the basis for these new securities, leading to very risky collateral. Added to this serious underlying mortgage risk was the use of complex computer software that produced securities with financial innovations that were attractive to both brokers and buyers, but concealed the true risk of these securities.

The failure of firms such as Moody's and Standard and Poor's to accurately assess risk created a flood of securities onto the market that were given investment grade ratings that were not warranted. A Moody's employee is quoted in 2007 as saying "It seems we have blinders on and never question the information we are given. Combined, these errors make us look either incompetent at credit analysis, or likely we sold our soul to the devil for revenue, or a little bit of both." (Perry, 2008) There were warning signals as early as 1995, when *60 Minutes* aired a segment with Steve Croft (1995) that warned these new investments (especially derivatives) were not well understood and presented much

hidden risk for the investor. However, high yield investments with AAA investment grade ratings, low interest rates that encouraged investor leveraging, and massive inflows of foreign capital (often the results of balance of payments surpluses) created an atmosphere of unending investment prosperity. There was a feeding frenzy for investment grade high yield securities, and brokers and investment banks did all they could to keep the mortgage backed securities coming into the pipeline to fill these needs.

The housing boom was not sustainable, and once the real estate bubble burst, mortgage defaults increased as property valuations and equity went into a downward spiral, especially in speculative boom areas of Nevada, California and Florida. Adding to consumer distress was the resetting of adjustable rate mortgages, leading to significantly increased and often unmanageable mortgage payments. Subprime mortgages were the first to start to self destruct; however it was not long before all classes of borrowers were contributing to the mortgage delinquency and ultimately the foreclosure statistics. This caused cash flows for mortgages to dry up, which in turn caused payouts on the mortgage backed securities to dry up as well. It soon became apparent to investors that bad debts permeated throughout the mortgage backed securities industry, and no investment was safe (MoneyWeek, 2008, Tremblay, 2007).

### **COMPUTER SYSTEMS AS A CATALYST FOR FRAUD, EXPLOITATION AND ECONOMIC UPHEAVAL: CREATING THE GLOBAL ECONOMIC TSUNAMI**

Computers and telecommunications technologies are the driving forces of change in the operations of global markets, enabling banks and investment institutions to add complexity to their financial instruments, and to communicate instantly with investors and markets throughout the world. It is these very attributes that enabled people to reach far and wide with risky endeavors and financial instruments. The following are examples where technology played a direct role in the financial crisis.

#### **Information Mismanagement**

Lehman Bros. is being investigated to try and determine if they misled investors, creditors and others about their financial health. Lehman executives kept insisting that their company was

solid until just before the collapse, yet internal documents show they were aware the firm was overleveraged as much as three months before their collapse (MSN Money, 2008). It would appear this is a case of senior management not understanding or perhaps not properly evaluating the IT modeled risk assessment of their investments, not recognizing the bubble had burst, and taking extraordinary short term risks to increase their personal compensation and bonuses at the expense of the long term health of the firm.

### **Creation of Risky Securities**

Much of the hue and cry is focused on the investment risks with derivatives, and the complexity and underlying risks that are difficult if not impossible to understand and manage. Derivatives are financial securities whose value is derived from another underlying financial security. They are highly leveraged, and essentially constitute rights to something in the future rather than actually owning the underlying security or commodity. Options, swaps, and structured notes are all examples of derivatives, and can be used to speculate on the movement of commodity or security prices. Combining derivative products has been referred to as financial engineering, and mixing products from different asset classes has added immense complexity to the markets (Sooran, 2008; Pipeline, 2008). Generous credit ratings gave investors confidence to purchase securities they may not have understood, and securities and derivatives generated by Fannie Mae and Freddie Mac carried the implication of government guarantees made them very attractive to investors. IT made this type of financial engineering possible.

### **Ineffective Investment Risk Management**

Investment and brokerage firms had always relied on financial expertise and sound judgment to properly assess and manage risk. In the early 1990's, as financial derivatives began their explosive growth, however, a trend developed to use highly complex mathematical and statistical models to measure and manage risk. The risk managers were often "quants", with academic backgrounds in mathematics, statistics, or even physics who used IT to play an important role.

While many models were developed, one model emerged to be almost universally utilized by

firms in the financial securities industry. Initially developed at JP Morgan, the model is called Value-at-Risk (VAR). While very complex and with numerous components, requiring an enormous investment in computer hardware and software for the typical Wall Street firm, the model was widely accepted by senior managers and board members because of its extremely intuitive and simple result. Utilizing the firm's computer software and systems that would comb through the firm's investment positions, the VAR would measure, with a specific probability, the maximum loss a firm could incur for a specific time-period, i.e., one day or one week. For example, a one-day VAR measure of \$100 million with a 99% probability would mean that the firm had a 99% probability of a maximum loss of \$100 million over the next twenty-four hours. If that risk was viewed as excessive, investment positions would be closed-out to lessen the risk to a level that management judged as appropriate (Duffy and Pan, 1997).

It is widely acknowledged that the VAR models used by Wall Street grossly underestimated the risks associated with the complex high yield mortgage backed securities and derivatives being created. (Nocera, 2009) This was not because of a fundamental flaw in the VAR model, but because of the failure of the risk managers, senior operating managers, and board members to realize the limitations of the model and the assumptions underpinning its use. For example, the VAR model uses the most recent historical data, which represented orderly financial markets during normal, or non-crisis periods. In essence, very few risk managers measured or evaluated the probability "tail" risk. In the example above, the maximum loss that isn't measured is the 1% tail risk -- the risk that occurs in a financial crisis. While it is clear that risk managers, senior management and board members can be criticized for exercising poor and lax judgment, it is also clear the technology was the enabler. It gave them a false sense of security with the false reassuring blanket of sophisticated analysis made possible by the latest technology.

### **Unsound Investment Credit Ratings**

Three credit rating agencies (Moody's, Standard & Poor's and Fitch) are authorized by federal regulators and the SEC to appraise creditworthiness of corporate and government securities. Many feel they have done a poor job, including Rep Henry Waxman, who stated

during recent Congressional hearings “The story of the credit rating agencies is a story of colossal failure. The result is that our entire financial system is now at risk.” (Perry, 2008) In this case rating agencies missed an opportunity to deploy technology to improve their performance, instead being satisfied with maintaining very high profits ( a 50% operating margin) from their securities rating activities (Kidwell et al (2), 2008).

### **Excessive Management Compensation and Greed**

Countrywide Financial is a case of executive bonuses being tied to short term earnings targets directly linked to loan production. They created as many mortgage loans as possible and stoked the sub-prime mortgage generating machine by lowering lending standards and utilizing automated underwriting systems that allowed borrowers to qualify for loans that they had no hope of ever being able to pay. Here again, IT was used specifically as a detriment to investors, and as an instrument of greed. Based on increasing business volume (even though much of the volume was very high risk subprime borrowers), CEO Angelo Mozillo was granted bonuses in excess of \$400 million between 2003 and 2007. The consequences of his quest for short term mortgage loan volume to enhance his compensation package have all but destroyed the company: Countrywide stock has lost about 90% of shareholder value since the start of 2007 (MSN Money, 2008).

### **Instantaneous Communication**

Wall Street is facing global competition and is losing its commanding grip on financial markets, in part because technologies have made information and capital more mobile. Hence a positive and powerful attribute of IT served as a driver along with modern telecommunications giving investors throughout the globe instant securities information, market prices, market volumes, market trends, and communications with brokers and securities dealers throughout the world. To overcome their lessening influence on world markets, Wall Street firms met the competition with a continuous flow of

innovative financial products and new applications of technology (Kidwell et al, 2008).

### **Rogue Traders**

During the past year traders and company executives made big bets on foreign-exchange gambles using currency derivatives. Technology rich trading desks made for easy entry into the markets, and lax internal controls gave traders opportunities to execute trades well above their authorized limits. Banks such as Citic Pacific, Hong Kong, and retail firms such as Commercial Mexicana are facing bankruptcy because of the currency bets made by one or a small number of employees. Firms burned in the currency trading market complain that brokers and banks have not adequately disclosed trading risks, and utilizing automated trading systems have kept the currency bets from the immediate attention of management (Regalado et al, 2008).

### **DAMAGE ASSESSMENT AND TAKING STOCK**

The financial losses involved in the current economic and banking crisis are truly staggering. There is plenty of blame to go around, and while it is easy to divert attention from individuals to issues of technology and unpredictable markets, in the end the primary cause of the economic meltdown is the action of a small group of people employed in the banking and brokerage business. Greed, fraud, and mismanagement are not new problems for our society; they have been with us for centuries. What is new in this financial and economic crisis was the enabling role of technology.

To test the reasonableness of technology as the enabler of the financial crisis of 2008-2009, a survey of 97 business professionals located in the northeast United States was conducted. Exhibits 1, 2, 3 and 4 respectively, show the demographics of respondents by major job responsibility, major business activity of their respective firms, number of employees in their firm, and whether the customer base is Regional, National, or Global.

### **Exhibit 1--Major Job Responsibility**

Management	22.7%	Operations	17.5%
Marketing	28.9%	Other	13.4%
Finance	17.5%		

**Exhibit 2--Business Activity**

Manufacturing	21.6%	Government/Military	1.0%
Bank/Finance	22.7%	Other Services	46.4%
Computer	9.3%		

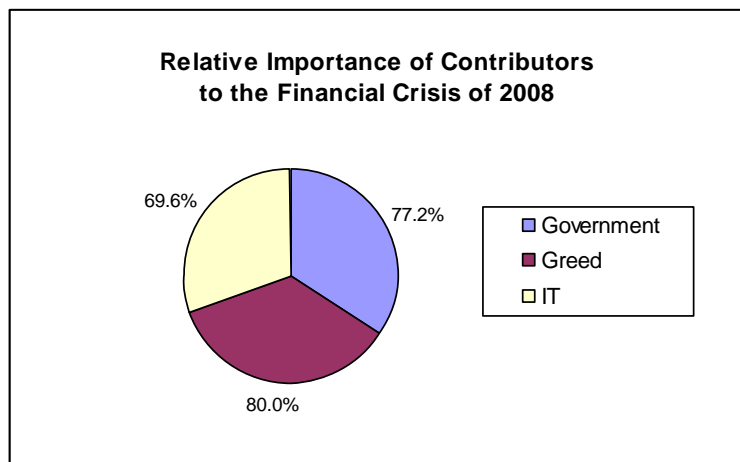
**Exhibit 3--Employees**

1-50	19.8%	2001-10000	12.5%
51-500	26.0%	over 10000	29.2%
501-2000	12.5%		

**Exhibit 4--Geographic Range**

Regional	37.3%
National	20.8
Global	40.9

**Exhibit 5--Relative Importance of Contributors to the Financial Crisis of 2008**



Respondents were asked questions about their view of the possible causes of the 2008 financial crisis. Responses to the 14 questions of the survey clustered around three perceived central causes. These are greed, government policy and information technology. Although not considered the primary culprit, IT was viewed as a significant contributor to the financial crisis by more than two thirds of the survey respondents.

Key players on Wall Street and elsewhere surely knew that they were taking enormous risks with the firm's and their client's funds. Brokers and fund managers continually offered upbeat appraisals of risky, complex and confusing investment products, and clients and investors purchased these investments for their high yield, with only casual concern for risk and safety.

Rating agencies such as Moody's either were unable to accurately assess the risk, or went along with the desires of the investment firms to produce marketable high yield securities, and didn't look too closely. Unfortunately for the investment community that relied on ratings, many of the imploding securities continued to be rated investment grade, even when the underlying mortgage delinquency rates were ballooning. During the first part of the decade an expanding economy encouraged everyone to believe that the real estate boom would continue forever, and securities backed by mortgages were good as gold. Investment managers did nothing to dissuade their clients from harboring this belief, and the commissions and bonuses kept rolling in.

## SUMMARY

Few people are immune from the consequences of this financial meltdown, and while technologies have been shown to be a catalyst for the economic upheaval, the ultimate responsibility must rest with the individual bankers, brokers and managers who made self-serving decisions, gained immense wealth during the run-up, and did not have the fortitude to put the brakes on. The profits were just too much to resist, and greed prevailed. In many cases the ready availability of very fast and highly sophisticated IT was a catalyst and enabler for fraud, exploitation and economic upheaval in world financial markets.

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