

# Financial Ethics: A Review of 2010 Flash Crash

Omer Farooq, Salman Ahmed Khan, Sadaf Khalid

**Abstract**—Modern day stock markets have almost entirely become automated. Even though it means increased profits for the investors by algorithms acting upon the slightest price change in order of microseconds, it also has given birth to many ethical dilemmas in the sense that slightest mistake can cause people to lose all of their livelihoods. This paper reviews one such event that happened on May 06, 2010 in which \$1 trillion dollars disappeared from the Dow Jones Industrial Average. We are going to discuss its various aspects and the ethical dilemmas that have arisen due to it.

**Keywords**—Flash Crash, Market Crash, Stock Market, Stock Market Crash.

## I. INTRODUCTION

THE Stock markets have long been a source of financial bloodline for the economy. One can speculate that modern economy in fact arose with the rise of first stock markets. It provided the opportunity for anyone to give money to some entity that they believed would profit in the future thus providing returns for themselves and providing the money new companies needed to innovate, invent and produce new products. This would in turn result in increase the quality of life for everyone and would propel the country hosting the stock markets to a new age of prosperity and well-being of its people.

To trade in stock market there are a few things that were deemed necessary from the beginning of the stock market industry. The early investors recognised that stock listed in stock markets would be numerous and in turn would be purchased by the whole population. Although initially intended to be a sort of market place, there was a need for someone to buy and sell shares on behalf of their clients professionally. Enter the brokers.

### A. Stock Brokers

Stock brokers are the professionals hired by the population for trading the stocks of different companies on their behalf [1]. A client would tell the stock brokers which company's shares to buy and which to sell and then stock brokers would move on to the floor shouting at the top of their voices until they found a buyer for the stock they were looking to sell. Overtime these stock brokers accumulate market experience and gives rise to a new type of company.

### B. Mutual Funds

Mutual funds are for the people who want to invest and maximize their profits but are either lacking in skills or unwilling to spend the time needed for trading on stock exchange. Mutual funds are headed by an expert typically an ex-broker with lots of experience [1]. Stock brokers would pick the mutual funds of their clients and invest into those companies, which according to their experience and knowledge they thought can give maximum returns. This case study discusses how these mutual or institutional funds had been responsible for the crash.

### C. High Frequency Traders (HFTs)

Computers started to proliferate in the stock market in 1950s. Their proliferation increased in 1960s and 1970s and they finally went main stream in 1980s with the personal computer revolution. Finally an average Joe could make computations that would provide them with an opportunity to maximize their profits [1]. In the 1990s the use of computers went a further and now instead of just analysing strategies to maximize profits the computers instead started replacing humans in trading. Thus High Frequency Trading was born and specialised investing houses were set up. High frequency traders exclusively rely on computers to do the trading. The algorithms are designed to exploit even the minuscule difference in price of stocks and immediately buy or sell them. Hence they almost never hold on to the stock for more than a few hours. This unique characteristic allows them to take advantage of market noise and make quick money. Big Trading Firms J.P Morgan now has more software specialists on their floors than traders, thanks to these computers. These computers continuously monitor the stock market for fluctuations. In recent times the competition for speed has become so high that most firms these days have servers co-located on the stock exchange. So the speeds with which these computers execute trades are in the order of microseconds. Now because of the fact that there are no humans involved in the process and computers by definition are dumb and do not have context serves as an invitation to disaster as was learned on the afternoon of May 06, 2010.

Rest of the paper is organized as follows. Section II presents a brief history of stock market crash. The main ethical dilemmas are highlighted in Section III. We conclude in Section IV by suggesting some future improvements to prevent such disasters

## II. STOCK MARKET CRASH

On May 06, 2010 stock markets opened with a negative trend. The investors were worried about the European debt crisis that had especially hit Greece hard. The market trend

Omer Farooq and Salman Ahmed Khan are students at Dept. of Computer & Software Engineering, Bahria University, Islamabad, Pakistan (e-mail: omer.fq99@yahoo.com, salmanahmedkhan@hotmail.com).

Sadaf Khalid is lecturer at Dept. of Computer & Software Engineering, Bahria University, Islamabad, Pakistan (e-mail: authors\_us@hotmail.com).

was negative and the Dow Jones Industrial Average had already lost more than 300 points. However the worst was yet to come. Starting at approximately 14:42 hours the Dow Jones started to fall rapidly and suddenly within 5 minutes it had lost 600 points. However, just 20 minutes later it had regained almost all of the lost points which left observers reeling of what really happened. As a result Securities and Exchange Commission (SEC) was tasked with carrying out an investigation [2].

#### A. Causes

It all started when a mutual fund named Waddell & Reed decided to sell a very large amount of a particular stock bundle called E-Mini. The sheer size of the stock was unprecedented and it was worth around \$4.1 billion dollars. Initially when all of the manual buyers were exhausted, the stock was pushed to HFTs algorithms [3]. These computers powered traders started to purchase huge amounts of stock. However when the resulting shortage of buyers of E-Mini caused a price deflation, the algorithms decided to stop buying and start selling which in turn were purchased by other HFT houses and so forth. This created an effect known as hot-potato where there is large amount of selling but little net overall movement. As these auto bots were selling the stock along with Waddell & Reed, this created a drop in the price of E-Mini of 3 percent within 4 minutes [4]. The traders who traded this particular stock in other markets also sold it in some other markets hence creating a domino effect that jumped hoops to transfer to S&P 500 index there also driving the price down 3 percent [2]. Fig. 1 shows the Dow Jones Index during crash [2].



Fig. 1 The Dow Jones Index during the Crash

As this effect was going on, computer systems from some HFTs started to withdraw from the stock market, because they had been designed to cease operation when sudden volatility in the market occurs. Also the investors had deemed that this might indicate some new phenomena for which their algorithms are not designed. This resulted in a crunch of cash as most of the amount of cash was locked up in trading houses that had ceased trading. This caused even more pressure on the index and it spiralled into further losses.

#### B. Stopping

All of this finally came to a halt when the built in mechanism of the stock exchange came into action and halted trading of the particular stock for just 5 seconds. However these 5 seconds were enough to bring normality back to the stock exchange [2], [3]. Automatic sell order subsided replaced by automatic buy order, and when finally the dust settled, stock exchange recouped most of its lost points. However same cannot be said about the investors who lost a lot of money.

#### C. Losses

The effects and losses of this crash were profound and widely felt. Capital of approximately a trillion dollars disappeared from the market for few minutes [2], [3]. Both individual investors and mutual funds lost millions when blue chip companies such as Procter & Gamble share price tumbled to pennies. Other companies whose price tumbled to a cent per share included Accenture, Exelon while other stocks such as apple and HP ballooned to an incredible \$100,000 dollars, thousands of times greater than normal price.

#### D. Future Prevention

Many things have been done to prevent future occurrence of such a disaster. The main stay of which has been the installation of circuit breakers in stock exchanges. Circuit breakers are special programs designed to stop trading of a particular stock when its price moves rapidly upside or downside within a very short interval of time. This will prevent the future occurrence of such an algorithmic driven anomaly

### III. ETHICAL DILEMMAS

The stock market crash renewed a long running debate on the ethics of using auto bots in place of humans for trading. The proponents of this idea state that computer bots increase the profits for institutional funds which in turn provide profit to their shareholders. Thus computers are helping people to make more money [5].

However, the opponents state the crash was caused fully by automatic trading systems and many people lost their livelihoods because of this crash. They deem that the safeguards that have been provided to prevent such an occurrence in the future are insufficient. They point out to the fact that automated bots sold and bought shares without giving any thought to the context, and if a human trader was in place he would have easily recognised the anomaly and corrected it, thus preventing it from becoming a huge mess.

Blue Chip Companies such as Procter & Gamble, normally regarded as very low risk stocks, suffered a price depression in the aftermath of this artificial crash [6], [7].

The critics point that many people lost huge amounts of cash when perfectly normal orders got executed in those few minutes. Dallas based mutual fund is one such example, whose order got executed at the same time the crash occurred hence causing them tremendous loss.

The ethical dilemma that in theory one investor could manipulate the market using large order and gaming the market through HFTs remains on back of the minds of many people which in turn reduces both their appetite and tolerance for risk which are in effect the engines of growth for the economy.

Automatic bots playing with each other and affecting the lives of real people is not sensible critic argue. However the ethical dilemma lies in the fact that many average people have also made money using these automated systems.

#### IV. CONCLUSION

It can be said that this stock market crash was a dark hour in the field of computational finance in general and automatic trading in particular. Many people lost their wealth, their investments and their capacity to invest. However instead of banishing the automatic trading system from the realm, it is the need of the hour that more stringent rules are adopted to regulate this industry so that advantages can be maximized with a minimum loss factor. Although computer ethics define different rules of ethics for preventing from such crimes, but a strict check and implementation of these rules for ordinary people has also become mandatory.

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