Stock Market Crash

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MAT1475H: Calculus I Honors, Mathematics Department of New York City College of Technology, CUNY – Spring 2014

Introduction

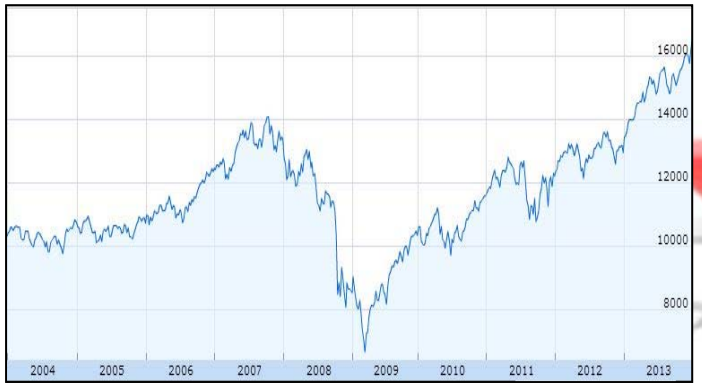
When people mention stock market they usually incorporate it with earning money. With the positive momentum of the stock these past couple years, people neglect the possibility of a stock market crash. If the market goes up it could also go down. But how fast could it drop? Imagine investing with your life saving in the stock market before the crash, how fast and how much momey could you lose? In this project, we are going to use calculus to answer these question and project a function of the graph for the future.

Background Information

Dow Jones Industrial Average (DJIA) is one of the most watched stock indexes in the world, which consist of 30 major companies. This major stock index was created by Wall Street Journal editor and Dow Jones & Company co-founder Charles Dow and calculated in May 26, 1896.One of the biggest Drops in this index was the stock market crash in 2008.On October 9, 2007, the Dow closed at its pre-recession all-time high of 14,164.43. In response, the Dow plummeted 13% in October. By November 20, 2008, it fell to 7,552.29, a new low.

Year	Stock Price (USD)
2004	$12836
2005	$12844
2006	$12419
2007	$14134
2008	$13134
2009	$8589
2010	$10531
2011	$12522
2012	$12633
2013	$13643
2014	$16123

However currently the market have been building up with a lot of positive momentum. Currently to the closing price of 16,604.15 on April 3 which move up approximately 119% from the 2008 drop. The Index is measured in United State Dollars (USD).



Research Question

How can we use calculus to predict the future position of your investments?

Methodology

The research uses the tools from the Calculus I Honors (MAT 1475H) exams in spring 2014. A total of 3 students participated in the data collection. The data are collected in the following way:

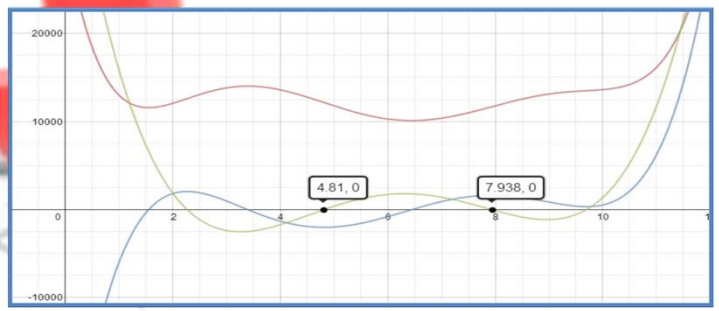
- Yahoo Finance: Research the closing price of the stock market in year intervals. We chose to look at the closing price at the end of each year because monthly is too small of an interval to determine the behavior of the stock market over time.
- Excel: Using the information from yahoo finance we plugged in our coordinates that we got from our data on excel to find the function of the graph. Then we used the scatter plot program in excel and graphed it. After that we added a trend curve and got the equation of the trend line from excel.

$$f(x) = 1.8104x^6 - 67.099x^5 + 962.4x^4 - 6670.4x^3 + 22792x^2 - 35072x + 31040$$

$$f'(x) = 10.8624x^5 - 335.495x^4 + 3849.6x^3 - 20011.2x^2 + 45584x - 35072$$

$$f''(x) = 54.312x^4 - 133.98x^3 + 11536.8x^2 - 40022.4x + 45584$$

Results



Roots of *f''(x) @ x = 4.81, 7.938*

- By exploring the graph, we can predict that the biggest drop was from year 2008 to 2009 and the biggest increase was from year 2013 to 2014. However, through 2009 through right now there is a positive response from the market.
- In 2008 to 2009 there is a negative slope of -4545
- In 2013 to 2014 there is a positive slope of 2480.
- The roots of the second derivative of the function display the most negative and positive slopes of the Dow Jones Index at x = 4.81 and 7.938.
- With the knowledge of the roots of the second derivative, average rate of change, as well as, the general shape of the two graphs, we can estimate that our graphs are shifted along the x axis 3 to 4 spaces to the left because our initial (x) started from the year 2004.
- By analyzing the data and the graphs, we know the average rate of change and instantaneous rate of change proves that the biggest decrease in the market was from year 2008-2009 and the biggest increase of the market was nearby 2014.

Conclusion

Based on our understanding of the stock market, the market is too volatile to predict due to many of issues regarding economic issues. We found that for the past 5 years, this index has only been increasing substantially. This may seem like a positive snapshot of what the economy is doing, since it's the biggest index in the market, but you cannot naively judge the market with the positivity of the recent years.

You have to also take into consideration that the same situation of the 2008 crash can occur unexpectedly. where there is ups there are always downs in life, so the next time you choose to invest in a stock, acknowledge the possibility that the market can respond negatively.

Acknowledgments

We would like to thank Professor Kate Poirier for supervising this research and for giving us the opportunity to work on this project. We would also like to thank Mathematics Department for offering Calculus I Honors course. This project gave us a great generalization of the market. This was a lot of fun which helped us learn the value of team work.

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