Master's Thesis in Finance

The Interactions among the U.S. Stock Market, Political Prediction Market, and the 2016 Presidential Election[1]

Abstract

The purpose of this study is to examine the influence of the 2016 general election on performance of the U.S. stock market. The thesis looks at the presidential election from two aspects: first, whether the wisdom of the crowds illustrated in prediction market can be taken as a reliable tool to predict the stock market performance. Records from Iowa Electronic Market was applied together with stock market data; second, compare and contrast the predicted results with the actual behavior of the stock market from an industrial perspective: how the stock market reacts under the expectation of future policies and whether such reactions go in line with Trump's campaign policies before, etc.

Key Words: 2016 U.S. Presidential Election, Prediction Market, Stock Market, Sector

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I Introduction

Political events, by and large, have always been under careful attention of stock market participants. For example, an amendment of regulations on tax deduction may induce butterfly effect on a firm's accounting treatment; the health condition of a nation's dictator can create huge fluctuation of different firms' performances, as how close the relationship between the firm and the dictator decided what businesses they can do and how many favorable policies they enjoy; rumors around the town about the possible political instability increase the stock market volatility almost for certain, while, strangely, no opposite reactions are found when politically-related positive news are broadcasted…things like these exist in all forms and with different degree of influences.

Being the most powerful nation in the world, each and every movement in U.S. politics garners investors' attention worldwide. Among all the possible political events, the once-in-four-year U.S. presidential election may be the thing that catches the most attention and has the most profound influence on U.S. economy. Besides, U.S. is a modern federal republic. The separation of executive, legislative, and judicial powers means that the president, federal courts and the Congress share rights. This fact means the U.S. president holds more power than many of his counterparts under different political systems, say the prime minister in a constitutional monarchy Britain or Sweden. Sounds like a careful study on the influence of U.S. presidential election almost a must. Before that, casting a look at the main steps of U.S. presidential election is necessary.

A U.S. Presidential Election

The U.S. election process goes as the following: An indirect election, presidential candidates must announce they are in the game almost two years before the Inauguration as fulfilling all the duties that Federal campaign laws require of can be

extremely time-consuming. After that, how to choose electors is determined by individual state independently, and registered eligible voters cast votes for electors, whom would make up the U.S. Electoral College. Once chosen, electors would cast electoral votes for the President on behalf of the people. For a candidate to be elected, he or she must receive an absolute majority of the votes, or chosen by the House of Representatives, in case that no one reaches the absolute majority.

B U.S. General Election 2016

Having the concept of basic process of U.S. presidential election in mind, since the thesis deals with the influences surrounding the 2016 U.S. presidential election, its special features are worth mentioning. The two main candidates in the 58th presidential election in the U.S. are Donald Trump of the Republicans and Hillary Clinton of the Democratic. While the mere last name of Hillary Clinton demonstrates her rich background in political affairs, Donald Trump serves as almost a figure to contrast -- the only presidential candidate who hadn't any experience in either public sectors or military of all people who have served the position, Trump has nothing to do with the most popular job experience –lawyer -- before presidency, too.

There exists another extremely interesting fact about Trump: as it's almost become a custom that presidential candidates disclose his financial information, Donald Trump becomes the only major-party candidate since 1976 to not disclose his full taxable income to the public with the reason that he was being audited. Besides, being the third generation of real estate conglomerate, the name of Trump is enough to catch attention. The 14-season TV show The Apprentice which he himself produced and hosted provided President Trump with colossal advantage in popularity and recognition among voters once he declared he would be running for presidency. All of these made Donald Trump the most extraordinary figure in the U.S. presidential election history. This

controversial figure won the majority in the voting on November 8th, 2016, became the 45th President of the U.S.

C Promises: Trump vs. Hillary

The election result is crystal-clear now with Trump's surprising winning – anyone who paid a bit of attention on popular media sources during the campaign would no wonder deem it to be a great surprise. Still, in hindsight, it is worthwhile to compare and contrast the promises two candidates made when they were running for presidency, as what Hillary and Trump promised would induce different expectations for different industries, while in turn, voting preferences and how firms behave on stock market.

The two candidates have both pictured their own outlook for the U.S. economy. Basically, Trump focuses more on cutting taxes, eliminating regulation and discouraging international trade cooperation, while Hillary wants to raise taxes on rich people, increase job training spending, attach importance on environmental protection and follow Obama's open international attitudes. A good starting point for us to understand how stock market actively interact through the campaign period, I chose several promises which Trump and Hillary made before the election day so as to compare and contrast.

C.1 Trade

The discontent around trade deals had always been a heated topic among U.S. citizens, and Trump took the chance to capitalize on such emotion. Way before the final election Trump began to refer to Northern American Free Trade Agreement (NAFTA) a "disaster" repeatedly, referring to it as "the worst trade deal that the U.S. ever signed"

as early as in the first presidential debate, which took place in September 26, 2016. What's more, not only did he tweeted for many times, expressing his dissatisfactory attitude towards TPP during 2015, in a speech on October 22, 2016, in Gettysburg, Pennsylvania, Trump made it very clear that the U.S. would withdraw from Trans-Pacific Partnership, the so-called TPP, "on my first day in office". When it comes to tariff, with the aim of bringing manufacturing jobs back, in an interview with New York Times Trump called for a 35% and 45% tariff on Mexican and Chinese goods respectively. From his viewpoint, this is "great thing for the American worker". This is a clear signal to the world that trade protectionism has gained upper hand in the U.S. While "made in U.S." firms benefit, those who rely on foreign trade would suffer.

For Hillary, her attitude was a bit blur. Previously a supporter of TPP – one of the drafters since 2010, such trade partnership used to be one of her four pillars[2] when she declared her candidacy. As time goes by, she turned to admit it's not the best deal for America[3]. She worried that higher tariffs would lead to a trade war, making it harder for the U.S. to keep the leading position on global stage. Her less dramatical plan was to focus on domestic production by bringing in tax incentives rather than just punishing imports.

C.2 Labor

As the U.S. unemployment rate has been through a steady downward trend, both candidates have promised to keep this trend going on, endeavor in putting Americans back to work. Trump's employment plan focuses on encouraging the new-establishment

[2] Hillary identifies four pillars of her campaign: "Building the economy of tomorrow, strengthening families and communities, fixing our dysfunctional political system, and protecting America from threats" for the first time in her Iowa Trip, Apr. 14th, 2015.

[3] "Hillary Clinton flip-flops on Trans-Pacific Partnership". Politifact, Oct. 8th, 2015.

of businesses and removing related regulations so as to make hiring easier. He promised to create 25 million jobs over 10 years[4]. In a word, he tends to turn away from the current globalization trend and hopes to increase domestic jobs.

Hillary's policy for jobs growth was more specific. She has called for increasing job training[5] - partially paid for by additional tax money from the wealthy people. Sha also called for a raise of the U.S. minimum wage, which gained the unions' support and in turn, supported by the unions and collective bargaining. Being a woman, she socially encouraged women to work by asking companies to provide for longer and paid family leave.

C.3 Financial

It is hard to say whether Trump is a friend or foe of financial sector. The most important thing may be that he repeatedly made it very clear that he would rip up the 2010 Dodd-Frank Act, dismantling this act ensures the "clever bankers" to function more at their free will. Seemingly beneficial, such radical reform may make the market worry about its long-term effect. Besides, in his forty years' way towards becoming a real-estate tycoon, no wonder he dealt extensively with Wall Street through his way up to success. "I know the people on Wall Street.... I'm not going to let Wall Street get away with murder", he said at Iowa campaign rally. It is not a secret that fund managers' incomes are taxed as capital gains, and Trump promised to get rid of such taxation loopholes.

Hillary decided to strengthen the Dodd-Frank Wall Street Reform Act in order to get away from the shadow of too-big-to-fail financial institutions. Besides the

[4] "Donald Trump Vows to Create 25 Million Jobs Over Next Decade". New York Times, Sept. 15th, 2016.

[5] "Workforce Skills and Job Training". The Office of Hillary Rodham Clinton

determination to tax bankers with high income honestly, which is the same as Trump's attitude, she would also like to tax high-frequency traders[6]. If this can be implemented, tax increase which merely comes from Wall Street would reach to $80 billion a year. The policies seem like a rein around the neck of Wall Street.

C.4 Extras

Trump thinks that the majority should enjoy the benefit of tax cut. He also want to reduce the number of tax brackets that wage-earners fall into, from seven to three. Besides personal income tax, he also like to reduce the U.S. corporate tax rate to 15% from the current 35%, one of the highest in developed world[7] and to allow people subtracting some of the income originally taxed on. This would lower the bracket people fall into by one step further.

Hillary, at the same time, would keep tax system almost the same, only add an additional bracket on the very top[8]. The additional income would be used to pay for university education for the poor and job training programs, which explains her popularity among workers' unions. In order to reach the goal of long-term growth, Hillary also proposed to raise short-term capital gains taxes while keeping the current rate only for assets occupied for longer than six years (inclusive). In the end, she would like to cut taxes for middle class and small businesses.

Two candidates' positions on environmental related issues differ much, too. Hillary is a big fan of renewable energy and energy saving, while Trump thinks that global

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[6] "Hillary Clinton to Propose High-Frequency Trading Tax, Volcker Rule Changes". Bloomberg, Oct. 8th, 2015.

[7] "Trump plan cuts corporate taxes, promises sweeping reform". Reuters, Sept. 28th, 2015.

[8] "Here's how much Hillary Clinton's tax plan would hit the rich". CNN, Aug, 11th, 2016.

warming issue is just a lie and threatened to dismantle Paris Agreement if he took office[9]. Trump also advocates for an increase in defense budget[10], which would lead to the triumph of military-related heavy industries.

Obviously, Trump and Hillary are loved by distinct groups of voters with their sharp contrast of preferences, and it is intuitive that whoever win the race in the end, the "beneficial" sector would prosper with expectations that campaign promises turn to formal regulations even laws. Having this fact in mind and putting it aside for a little while, next I would introduce prediction market – in this special setting of U.S. presidential election, Iowa Electronic Market. Only through the statistical results coming from prediction market can we realize what market participants' actual attitudes towards campaign promises for different industries.

D On Prediction Market

A long-held tradition for almost all countries with modern electoral system, before the final outcome is announced, tons of opinion polls are conducted and the results of these opinion polls become the basis to make predictions and serve as guidance to study the stock market behavior. I chose to use the data from Iowa Electronic Market (IEM thereinafter) to study whether the investor psychology holds a certain degree of predictive power on the stock market.

A "winner-takes-all" form of market in predicting the result of 2016 U.S. presidential election, IEM was operated by the University of Iowa Tippie College of Business. It often acts like an indicator to election results. The actions participants take go as the following: participants act as "traders" whom would buy or sell "candidate shares".

[9] "Donald Trump would 'cancel' Paris climate deal". BBC News, May 27th, 2016.

[10] "Trump on the Issues -- Defense". Council on Foreign Relations

After the election outcome is determined, one dollar is received if the candidate that the "trader" bought his share won and 0 otherwise. The market participants' belief in two candidates' winning possibilities are expressed in the price of "candidate shares". For example, if a Trump share worth 0.6 dollar, then IEM "traders" as a whole think Trump's possibility of winning is 60%. Naturally, any risk-neutral rational trader would maximum the return by purchasing "candidate shares" which he thinks were priced lower – the collective attitude towards his winning chance -- than his expected probability of that candidate's chance of winning. Consequently, the price of a "candidate's share" by the end of the day would reflect what the market think of the candidate's chance of final winning.

Some may doubt that there are a great many websites collect opinion poll data, and these seem to be more readily accessible to the public, so why take the effort using IEM? Besides all the merits of prediction market which I would mention in the literature review part, one thing particular for the 2016 presidential election: Trump was portrayed as a controversial image most of the time, which means in situations such as public opinion poll or live interview, it is possible that people would tell "white lies" to make themselves "look good", especially when it comes to environmental and international trade issues – a real voter for Trump may fake his support for Hillary so as to be "politically correct" among friends and colleagues. An "inside tool" for scholars with anonymous nature together with monetary incentive, IEM minimizes the above-mentioned possibility. Except for the high chance of receiving dishonest result for this election, weaknesses of political polls are obvious, too. For instance, they often run for many days, and we often get only final not daily, continuous results, which means by nature it would be impossible for the results to be timely. Linking the daily IEM data with the daily market data provides us with a brand-new start of understanding the influence of presidential election even before the result is known.

E The Scope of Research

This paper is divided into six chapters, including an introduction and a literature review to briefly examine the resources available and related to the topic. After that, I would try to assess how stock market's reaction to 2016 Election by relating the prediction market data and stock market behavior from market perspective and industrial perspective respectively. Comparing the expected sector performance with their actual abnormal return not only helped us to see how and by what speed different industries react to Trump's winning, but also whether prediction market data can be applied as a useful tool to guide the investment behavior. Two huge financial institutions – Bank of America and Goldman Sachs – are studied separately, considering their sheer size and sudden change of attitude before election day; shortly after the election day; and till the 2016 year-end. In discussion part I put forward some interesting facts about financial sector and my opinions on the performance of prediction market during this election. In conclusion part, except for briefly summarizing the thesis I also brought up places that can be improved and room for future research.

II Literature Review

The literature review part is divided into four parts accordingly. The first part on the basics of stock market behaviors and how it can be influenced, working as the foundation on which either the effect of campaign promise or the election result can be studied. The second part reviewed prediction market. A relatively new and niche field of scholars' interest, it is also based on semi-strong form of EMH and serves as a good supplement to event study. Special merits of prediction markets are listed when compared with more popular political polling websites and IEM was proved to outperform historically. The next part briefly explained event study method, it's theoretical basis such as how it is linked to EMH, and the last part centered on former studies about political event related influence on stocks' performance.

A How Stock Market can be influenced

With the advent of finance globalization and the complexity of stock market as a whole, more and more factors are taken into consideration when we want to study how the stock market goes up and down, say, investor psychology, speculation, etc. The so-called "influences" on stock market are actually pieces of information which are incorporated into the stock price. As market is always supposed to be rational, Efficient Market Hypothesis is a theory just for this. Though the 1900 PhD thesis *The Theory of Speculation* by Louis Bachelier is said to be the first that proposed EMH, this theory only caught some attention till 1945 when Hayek argued again in his *The use of Knowledge in Society* that market is the most effective way of processing individual pieces of information within the borders of a society. Hayek's work laid the foundation for the 1965 *The Behavior of Stock Market Prices* by Eugene Fama on the random walk hypothesis. In the same year, Samuelson (1965) demonstrated that if the market is efficient, prices would show random-walk behavior, which supports the efficient-

market theory. This hypothesis was famously discussed by Malkiel (1973) who argued that investors cannot consistently outperform the market portfolio through individual stock picking, *Efficient Capital Markets: A Review of Theory and Empirical Work* by Fama in 1970 elaborated on the theory and the evidence from the former paper, while at the same time he defined three forms of financial market efficiency: weak, semi-strong and strong. These three papers laid the foundation for EMH, which illustrates that stock market always quickly digests all new public information about firms and stock prices would react accordingly in no time.

If the stock prices reflect the announcement of public information instantaneously and without bias, the market should be classified as semi-strong form of efficiency (Fama, 1970). Semi-strong form, just as its name suggests, holds when all publicly available information is reflected in stock price without bias, so that any changes in the content of information would be reflected without any lag, too. Obviously, it would be logical for scholars to measure the importance and study influence of a certain event by studying the stock price changes before, during, and after the event. This is also the basis on which prediction market data can be linked to actual stock market performances.

B Prediction markets

Just as what the old saying always goes: the sum of parts is always greater than the individuals involved. So are people's ideas when it comes to the power of collective wisdom -- the main idea of prediction market is that collective judgment is usually wiser than the conclusion of individual. Prediction market, also known as information market, just as the name suggests, is a form of market whose pay-off is dependent upon the result of some future event. Defined for the first time by Berg and Rietz (2003), prediction market was referred to as "market designed and run for aggregating

information scattered among traders and, subsequently, using the information in the form of market values in order to make predictions about specific future events".

Cherry and Rogers (2006) linked the idea of information market to the semi-strong version of EMH. According to them, the prices of securities in actual stock market will reflect all relevant public information. Traders in market aim at maximizing the reward, while the market organizers put the participants' performances together and harvest information generated from collective behaviors. In traditional stock market, such "price discovery function" is just by-products of trading. In contrast, information market was established for this.

Why prediction market is chosen, not the polling results at, say, Gallup, which are easier to get and understand? Kou and Sobel (2004) compared the predictive power of traditional polls and prediction market. They found even the best of traditional poll results failed. According to them, more plausible ways for using traditional polls in politics are more or less qualitative. When accessing the precision of prediction markets among events other than political issues, Wolfer and Zitzewitz (2004) reached similar conclusion that prediction markets always outperform. Other advantages are found by Hahn and Tetlock (2005), whom dug deeper into the usage of prediction market for the sake of public sector. They say that such markets (1) provide real-time information on the collective idea. (2) real money is involved, pay-for-performance contracts reveal authentic wish of participants.

Used to be called IPSM (Iowa Presidential Stock Market), initiated in 1988, IEM is the earliest practical political prediction market established. With the 1988 U.S. presidential election as their subject of study, Forsythe et al. (1992) found that, even though the so-called "judgement bias" exists among traders, say they would respond more often and positively if their favored candidate is on the way of winning, IEM overperformed ordinary opinion polls which were habitually used in these kinds of

studies. This is believed to be caused by the fact that such judgmental bias honestly reflects what the average people do.

More and more scholars interested in this field began to use data from IEM from then on. Among them, Hahn and Tetlock (2006) did a much more detailed and concentrated study on IEM. What's especially worth mentioning is that they brought up possible shortcomings of this seemingly perfect market. For example, the nature of IEM is being small and scholarly, and traders are not representative of U.S. population – richer and received more education. Besides, they exhibited bias in self-assessment as they think themselves to be more informed in campaign related knowledge than their peers. Still, IEM is thought as responsive and accurate both in absolute and relative terms considering its past performances in predicting final outcome. In the final part of the paper, the theoretical ground of IEM was explained, too.

Similar forms of political prediction markets also exist outside of U.S. border. Forsythe et al. (1995) studied a Canadian-style IEM (UBC Election Stock Market) equivalent and was successful in predicting the popular vote share. Leigh and Wolfers (2006) found out that in 2004 Australian election, performances of polls were quite uneven and almost useless (could because of in this certain election, a less favored party achieved the majority). However, both the quantity and quality of data of predicting markets outperformed "normal" sources and was proved to be useful in forecasting. After studying the predictive ability as well as possible usages of some existing prediction markets, Boyle and Videbeck (2005) advocated for setting up of an information market in New Zealand, too.

C Brief on Event Study

Study on prediction market are bought in to complement for and compare with the result of event study – how and to what degree that different sectors' performances change after the election day. The development and foundation of event study is shortly explained here.

The aim of event studies is to analyze law of stock price movements when a certain event happens. Usually conducted by financial economists, the aim of event study is to provide some insights into how market digest and reflect on new information. The event study method appeared for the first time in 1933, as James Dolley used 95 stock splits which took place from 1921 to 1931 to study the effect it has on stock price. The 1960s witnessed the significant achievement -- removing the effect of other contemporaneous perplexing events. Studies of John H. Myers and Archie Bakay (1948), C. Austin Baker (1956, 1957 and 1958) and John Ashley in 1962 marked this period. The development of event study into a form of modern science should pay tribute to Ray Ball and Philip Brown (1968) and Eugene Fama et. al.,1969. 1980s papers said goodbye to inappropriate hypotheses frequented in pervious works. Besides, papers such as Stephen Brown (1980) and Jerold Warner (1985) had more data at their disposal, monthly and daily respectively.

One of the fundamentals of modern finance, the method of event study is based on EMH. If a certain event induces sudden change in the price of stocks, it means the new information involved in the event was not reflected in the former information set "digested" by the stock market, which in turn shows that the market is efficient. In another word, if EMH doesn't hold, the methodology of event study no longer holds its ground, too.

Putting prediction market and event study together, Snowberg, Wolfers, et. al. (2011) elaborates their relationship. This paper argued that the results of event studies tend to be extremely sensitive to either subjective choices or external happenings. Specially,

three choices are important to the final outcome: start point and length of event window; prior probability at the beginning, and happenings elsewhere in the world when the event took place. On the basis of such bias, their paper argues that the prediction markets can be a useful tool in making up for the possible weaknesses of traditional event study.

D How have Political Events affected Financial Market

Both the former researches on political prediction market and event study method as a whole have been discussed before, some insights concentrating upon political events are discussed in the last part of literature review. A forerunner in this field, Brown et al (1988) investigated more than 9,000 events of different scope and came to the conclusion that, under the EMH hypothesis and with the help of probability distribution of stock returns, investors would form rational expectations before an exogenous event. As the event unfolded, investor beliefs are adjusted and risk and expected return would rise accordingly. Surprisingly, such change of price is not equal when the reactions to good and bad news are compared: unfavorable news usually induce stronger reaction than good news.

Among various events that could affect asset prices, in the modern times, political events have become one of the most important factors that influence either regional stock market or global finance as it tends to be unexpected and influential. Though I would write solely on the impact of U.S. presidential election, casting our eyesight beyond the border of the U.S. can be both interesting and rewarding. Be it solely U.S. or internationally; federal or constitutional monarchy; a huge presidential election or merely the change of health condition of a dictator, many previous literatures have already documented how these can influence the market.

For example, tax related laws may be the most crucial to the performance of companies. Culter (1988) thinks that the traditional "cash flow" method only pays attention to the changes in future tax payment while equilibrium importance is attached to analyzing the price change of existing capital. Using the event study method, the paper examined how U.S. stock market react to (1) vote by House of Representatives for the Tax Reform Act of 1986; (2) vote by Senate Finance Committee of a similar bill. The conclusion is that first, the differential taxation of old and new capital has substantial different influences on companies, and second, which I think worth noting: it seems that market didn't respond much to merely news about tax reform, and this is also a question remain unanswered till now. Though the influence of law's modification is by no means as profound as a general election, this early paper still serves as precious guideline on how to assess the influence of political affair on stock market. After almost two decades and by the same token, Sinai and Gyourko (2003) studied the influence of Taxpayer Relief Act, with the results being similar that change of tax policies is honestly reflected in the market values of firms. When it comes to the possible effects from news pieces rather than changes of regulations, Beaulieu et al (2006) dealt with the political risk news (possible separation of Quebec) and its impact on volatility of stock returns in Canada. Though such news plays an important role, it seems that investors think that such risk is diversifiable as no risk premium is required. Different firms expose to such risk with different degree, especially considering how much they involved in foreign investment.

In Southeast Asia where the corruption index is always high and the relicts of belief in the power of monarchy and powerful individual always exist, political connectedness can be the deciding factor in a firm's or a sector's productivity. Fisman (2001) noticed the huge downturn of the economy in Indonesia in the second half of 1997 coincided with the time when the health of second president and dictator of Indonesia, Hajji Suharto, declined. In this "event study" (whenever there are rumors about Suharto's health), the author made an index measuring political connectedness and how much firms rely on this, and the result was just as the hypothesis. A bit similar to the health

issue above, Liu et al (2016) found that the Bo Xilai political scandal is directly linked to decrease in “sensitive” stock prices in China. In order to measure how sensitive politically these stocks are, they used proxies such as company headquarter location, political connection (whether one or more persons served in the broad of directors are senior executive in the government, etc.). They also made further analysis, finding that after Bo’s scandal, the return volatility for those “sensitive” firms are significantly higher than ordinary firms.

Being the most powerful country of all in the world, U.S. presidential election is often seen as a good example of political events for many reasons, and much research has been done in this field. To the best of our knowledge, Niederhoffer et al (1970) is the first to find out with an “unanecdotal” method the relationship between U.S. presidential elections and stock market. At that time, data set was small, thus may hinder the accuracy of conclusion. The authors want to find out whether data testified the common idea that market prefers Republicans, and seems it was only testified by the stock movement one day after the election. For the longer term, no significant differences are sensed. The mindset of Santa-Clara and Valkanov (2003) is similar to that of Niederhoffer et al (1970), however the result is different. In this later paper, they researched 18 elections (10 Democratic and 8 Republican) and found out that market tends to be significantly higher when a Democrat becomes president when volatility is somewhat higher during Republican times, which remains a puzzle. Besides, they find that the market reacts very little to election news, immediately before and after the election, which is similar to Culter (1988) study on Tax Reform Act of 1986.

Roberts (1990) recorded that during the 1980 general election, as the international atmosphere then was tense and was at curial point of Cold War when the former Soviet Union was at its prime. Ronald Reagan’s “Make America Great Again” theme attached major importance to national defense, while his rival Jimmy Carter seems less

interested. With such candidate promises, defense related stock returns are positively related with Reagan victory.

Putting aside the Democratic/Republican differences and talking about policies alone, how and to what extent policies can be incorporated into equity prices remains an interest. Using returns of representative firms which favored under different party's promises together with Bush's winning probability, Brian Knight (2006) studied 2000 U.S. presidential election. He found that for politically sensitive firms, when the expected policies are (not) beneficial to their business, future performance can differ from 9% to astonishing 16%.

There are two papers serves as guidance for 2016 presidential election. Wagner et al. (2016) found that companies that have higher tax burden, or large proportion of domestic revenues have outperformed the rest. Wolfers and Zitzewitz (2017) chose presidential debate as the event to study and recorded some meaningful interaction between this political event and the market. With the odds of Hillary's winning increase during and after the debate, S&P 500 increased; FTSE 100 rose; KOSPI rose twice as much; currencies of nations which have free trade agreements with the U.S. rose…the magnitude is huge and it seems the prospect of Hillary's winning is bright.

III Before the Election: Does IEM work?

As part of my thesis would establish upon the event study method, and the standard procedure of event study is always to decide on the event window, estimation period, post event window, etc., and look at how the event would influence the market after it happened. What's in my mind is that, when the "event" is something as certain as an election, with definite date, diverse policy emphasis, and only one winner in the end, investors would try with all their might to put all the available information beforehand

so as to make their own judgement on who would win and what are the subsequent future policies going to be, etc., so as to maximum the profit. In this case, the market is influenced by their collective prediction of the election even before it starts. In general, prediction markets tend to be accurate and responsive of the market, which explained why I use IEM to study the 2016 presidential election further. On bringing IEM into the study, a more comprehensive understanding of the relationship between 2016 U.S. presidential election and the stock market is realized. More details and data applied for this election is explained in details in the next part.

A IEM before the Election

There are two forms of data provided by IEM regarding the prediction results on the 2016 U.S. presidential election. One is based on vote shares won by two candidates, and the other holds the form of "winner-takes-all", whose mere name suggests that a correct prediction results in one-dollar payment and assu means nothing. As only one candidate would win the race finally and all the campaign promises turn into policies accordingly, which means a 60-40 win or an 80-20 win makes no difference to the subjects studied in this thesis, I chose to take data from the "winner-takes-all" market.

I use the prediction market data from the 4th of January, 2016 (first available piece of information in 2016) till one day before the election. In order to match the predictive market data with the actual S&P 500 market, first of all I deleted all IEM trading data recorded in weekends and public holidays, etc., as during these times the real stock market is closed. There are also days when no trading activities were recorded in IEM. When this happens, the average price and last price for the day of the candidate with no trading data available was recorded as 0 in the original version on IEM website. When this happened, I chose to take the price of the last trading day available, as no new

trading behavior means the participants' belief about the "candidate share price" remains the same.

Figure I: IEM trading volumes, beginning of 2016 till 7th, Nov.

This figure and table together offer some descriptive features of the IEM participants' behavior over the period between the beginning of 2016 till one day before the election day. "Trading Units" refers to the number of candidate shares in active transaction; "Trading volume" equals number of trading units multiplies last price of candidate share, referring to the amount of real money involved.

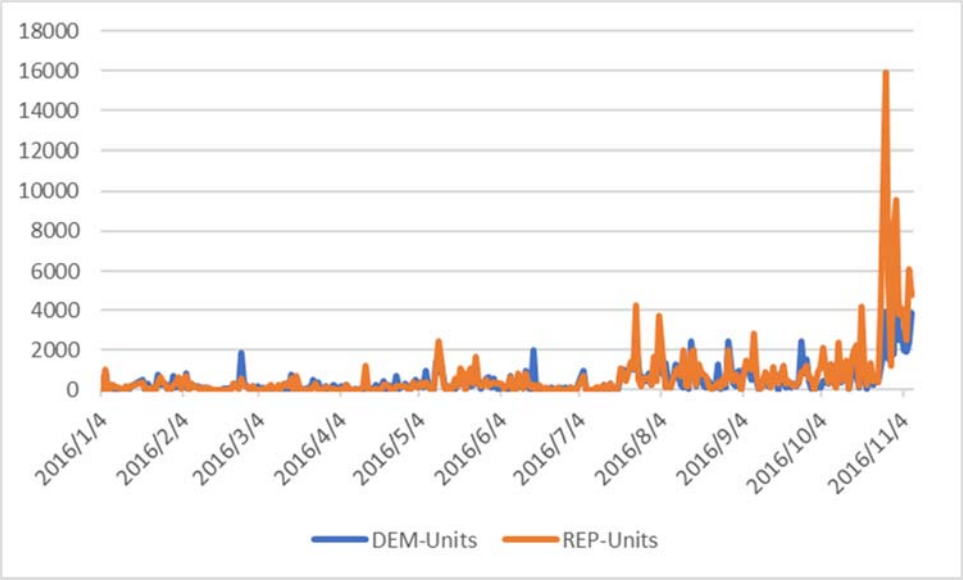


Table I: Descriptive statistics from IEM, beginning of 2016 till 7th, Nov.

Features	DEM	REP
Total Unites	140,916	207,272
Highest units recorded	5,619	15,929
Highest units, date	2016/11/1	2016/10/28
No-trading day count	14	10
Total Volume	99,913.35	63,312.87
Highest last price recorderd	0.95	0.45
Highest last price, date	2016/7/5	2016/5/22
Lowest last price recorderd	0.551	0.087
Lowest last price, date	2016/5/22	2016/10/20

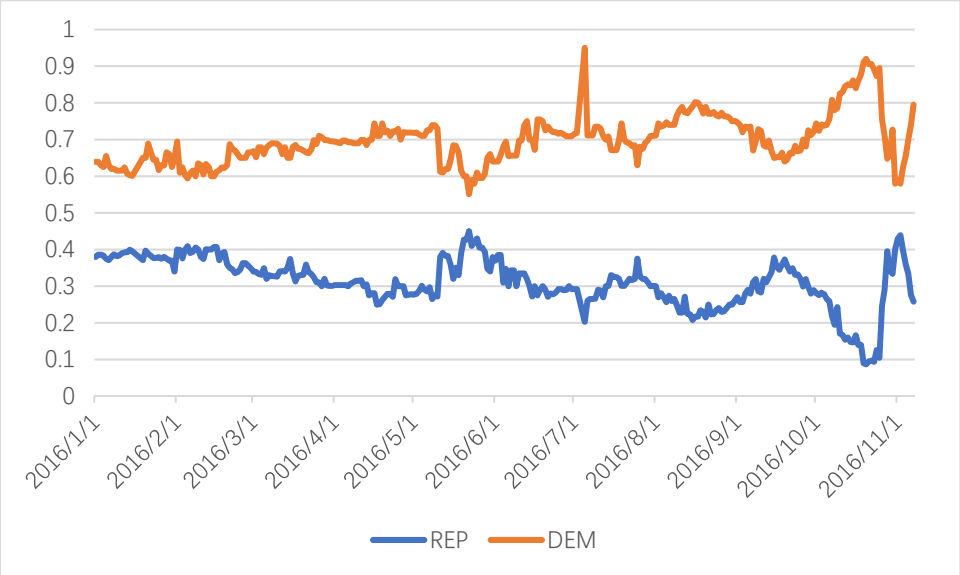
Table I illustrates some features of IEM data during the beginning of year 2016 till one day before the election day and Figure I recorded how actively participants were trading with IEM. Generally speaking, the number of people who took part in trading remain

small all the way till the beginning of August, after that some small sudden increases were recorded during presidential debates. The number of total participants skyrocketed suddenly after the middle of October, when the election day was just weeks away while tension and attention kept on rising. From a Democratic/Republican perspective, prediction market participants tend to be more interested in trading with Republican – Trump's share, as the trading units during this period of time totaled at 207,272, much more than Hillary's 140,916, and so is the total trading volume. Maybe this is due to the fact that popular opinion is that Hillary deserves an almost definite victory, so the space for speculation and gaining more-than-average profit is narrow if "betting on" Hillary. There are more days when no people trading Hillary share than the case with Trump share proved this fact as well.

Another astonishing record appears in the last price part: for Democratic Hillary, even the lowest record was above 0.5. As the last price of a certain day is just the market participants' belief of the candidate's chance of winning at the end of that day, this fact means not in one day that less than half of people think Hillary would be the final winner. While the situation for Trump is the complete opposite: even the highest record didn't surpass half, and, astonishingly, there exist days when less than 1% of people believe he would be the winner, and such extreme number was recorded only around two weeks before the election day! Figure II portrayed the winning probabilities of two candidates from IEM, which visually illustrates that not even once that people's belief in Trump was stronger than that of Hillary.

Figure II: Predictive Winning Probabilities of Two Candidates

This figure presents how the IEM traders' conception of each candidate's winning change evolve from the beginning of 2016 till one day before the election. The price of "candidate share" of each day recorded in IEM during this period was taken as their percentages of winning after normalization.



B Relating Prediction Market and Stock Market

The trends and evolvement of participants' attitudes in IEM were studied before, what's coming next is to link the prediction market and the actual stock market. The market price of a stock fully reflects its expected future profits as well as discount rate, so the change of price of the financial assets means first, how its expected future profits would change accordingly and second, changes in discount rate during this certain period.

It is intuitive that expected future profits of different sectors would be influenced by two candidates' campaign promise. And when it comes to discount rate, putting it simply, discount rate roughly equals to the sum of risk-free rate, risk premium, and inflation rate. As risk free rate and inflation rate during the campaign period are the same for all sectors, the major issue in determining the appropriate discount rate lies in deciding the risk premium of each sector, which requires more or less subjective

perception. A certain industry's risk premium basically depends on technical risks, economic risks, and political risks. While technical risks of different sectors can be treated as unchanged unless colossal development or much more efficient organization changes took place, which, obviously, neither happened during campaign period, both economic risks and political risks are influenced by campaign promises and expectations of future winner. For example, foreign exchange risk significantly influences the revenues and costs of firms relying more on international market; price risk, under the law of supply and demand, is partially determined by the international trade related regulations; when it comes to cost in relation to financing such as issuance cost or bond interest, (1) the percentage of such cost is determined directly by law, whose future remains to be seen during the term of new president; (2) the regulation for accounting treatment of such costs, say when and by how much they can be deducted or deferred can be different with distinct attitude of two candidates, which in turn influence how much tax a firm must pay. Political risk is the most straightforward influence caused by the election and is more or less entwined with the economic risk. Taking environment related regulations as an example, an enthusiastic in environmental protection, once elected, Hillary's attitude towards such issue would increase the costs of production of polluters such as mining. Even non-productive costs would rise because of that, as such firms have to organize studies on stricter environmental regulations which occupies time should be spent on production. On the contrary, Trump promised a much better life of such sectors. Investments in such sectors would be influenced because of uncertain expectations, too. Tax incentives for certain sectors such as special allowance or balance carried forward can be changed by government as well.

All in all, different campaign promises made investors' expectation on future profit and discount rate diverse. Principally, Trump's promises made it easier for quality firms to get the fund they need. However, such freedom may cause instability and in turn make investment riskier. Different expected future policies would obviously pose varied

effects on the market. I assume that the total value of market participates is influenced by such electoral probabilities, which laid the foundation for studying the effectiveness of predictive power of IEM.

Define the market return rate to be R_M, and the sum of value of all the participating firm in the market at time t to be $V_{M,t}$. The market return at time t can be expressed as:

$$R_{M,t} = \frac{V_{M,t} - V_{M,t-1}}{V_{M,t-1}} \tag{1}$$

The probability of Hillary's winning is P_H. By the same token, the winning probability of Trump is P_T. Following my line of reasoning mentioned above, the expected value of market under Hillary's or Trump's ruling is V_H or V_T, respectively. Putting the expected total market cap and the winning probabilities together, I write the market value at time t as:

$$V_{M,t} = P_{H,t}V_H + P_{T,t}V_T \tag{2}$$

As the total chance of winning is always 1 regardless of time,

$$P_H + P_T = 1 \tag{3}$$

Which is not influenced by time.

Express (1) in terms of (2) and (3), I get

$$R_{M,t} = \frac{(P_{H,t}V_H + P_{T,t}V_T) - (P_{H,t-1}V_H + P_{T,t-1}V_T)}{P_{H,t-1}V_H + P_{T,t-1}V_T,}$$

Doing calculation:

$$R_{M,t} = \frac{(V_H - V_T)\ (P_{H,t} - P_{H,t-1})}{V_T + (V_H - V_T)P_{H,t-1}}$$

Dividing V_T at numerator and denominator at the same time and assume the constant $\frac{V_H - V_T}{V_T} = \beta$

$$R_{M,t} = \frac{\beta \Delta P_{H,t}}{1 + \beta P_{H,t-1}} \tag{4}$$

The prediction results from IEM and the financial market data are linked in this way.

It is worth mentioning here that, as data from IEM is only used during campaign period, V_H or V_T are assumed to remain unchanged during the period which IEM is studied, ignoring time discount. Counter-intuitive at first sight, the assumption of unchanged total value justifies itself. First, V_H and V_T are defined merely for doing calculations and don't appear in the final form of model. Only the difference between V_H and V_T matters in the end. Second, when changes of value took place, the larger V_H becomes, the larger β is. V_T exists in both numerator (with a minus sign in front) and denominator, so the larger it becomes, the smaller β is (Both V_H and V_T are positive, obviously). In another word, the β in the final form of model is but a parameter determining the degree of pro-Hillary of a certain sector. The more pro-Hillary one sector is, the bigger β is. This fact means the final result wouldn't be influenced even V_H and V_T are assumed to be unchanged.

Market is also affected by other factors as well except for campaign related issues. In order not to perplex the expression and the coming estimation, such influences are assumed to be fixed, which are represented by the parameter α. ε is the residual with expect value 0. So (4) is expressed more precisely as:

$$R_{M,t} = \alpha + \frac{\beta \Delta P_{H,t}}{1+\beta P_{H,t-1}} + \varepsilon, E(\varepsilon) = 0 \quad (5)$$

Before using the IEM data to test the influence of campaign promises on the market as a whole, I noticed that the sum of the share prices of Trump and Hillary is usually slightly exceeded or lower than 1. I feel like to believe this is because the participate traders didn't discount as the influence is trivial. Though the difference is extremely small, I normalized the original data anyway to make the sum of prices on two parties at the end of each day equal to one.

C Influence on Market as a Whole

I chose the S&P 500 value weighted return excluding dividends as market return rate, as S&P 500 incorporated the biggest and most representative firms of the U.S., while at the same time easy to get access. Testing the overall influence of predictive power from investors on the market as a whole with equation (5) using least squares method, no significant effect is found as the estimation result of both $\hat{\alpha}$ and $\hat{\beta}$ are close to zero.

In another word, looking at the market as a whole and election prediction probabilities, no significant relationship is found.

D Influence on Individual Industries

Already tested the link between aggregate return of market and the prediction market, I took one step further to look at the possible influences on industrial level. "Translating" SIC code of S&P 500 firms, those firms were divided according to Fama-French 17 industry classifications[11]. The reason I chose FF-17 classification is that first, it is one of the benchmark classification system widely used in academic world and second, the industries are becoming more and more detailed and complex as time goes on, the primary 12-industry classification seems not enough. However, faced with this trend, colossal conglomerates no longer limit themselves in one or several main businesses as well. In this case, on the contrary, a rather detailed firm classification system makes it difficult to position such firms. So, I feel the 48-industry classification is too detailed

[11] Though it is called FF-17, this industry classification system is actually consisted of 18 industries. Considering the advent of technology and service industries, a brand-new type of industries named "nonclassifiable" was added into the group. The representative "nonclassifiable" firms are mainly new internet giants whom provide various kinds of recreational online services which are hard to define and classify, names of such firms are Tripadvisor inc., Facebook inc., Paypal holdings inc., etc. I would refer to this classification with its original name FF-17, only that the actual number of industry classification is 18.

to be realistic. A trade-off in between, I feel this FF-17 classification system strikes a good balance.

In order to test the predictive power on individual industries, I substitute the market return on the left of equation (5) with the industrial return rate. Consider the predictive power of IEM on the whole market is tested to be ignorable, I omitted the market influence and used the same model to do estimation. Different industries are denoted as i. i = 1~18.

$$R_{i,t} = \alpha_i + \frac{\Delta P_{H,t}}{1+\beta_i P_{H,t-1}} + \varepsilon, E(\varepsilon) = 0 \tag{6}$$

Running least square method, α and β of each sector are listed as following:

Table II: Parameters for different sectors

In this table the parameters of each sector are sorted with a descending order of β. The bigger β is, the more pro-Hillary this sector is during campaign period, so the sectors can also be seen as sorted with a descending order of how much they support Hillary. α denotes non-campaign related influences and was a constant in this case.

Sectors	α	β
Oil	0.001436	0.065248
Cars	-0.000318	0.063709
Rtail	-0.000284	0.031511
Trans	0.000096	0.028849
Other	0.000637	0.025555
Steel	0.000220	0.023011
Mines	0.004095	0.018560
FabPr	0.000777	0.017712
Clths	-0.000070	0.008909
Utils	0.000970	0.006884
Nonclassifiable	0.001066	0.006255
Cnsum	-0.001727	0.003527
Finan	-0.000115	0.002711
Cnstr	-0.000438	0.001567
Food	0.000612	-0.000761
Chems	0.001019	-0.007525
Durbl	0.001001	-0.012274
Machn	0.000990	-0.018484

While α records the influences other than campaign promises, parameter β depicts the predictive power of collective wisdom. The bigger the β is, the more "pro-Clinton" this industry is, and vice versa. At first glance, we noticed that for almost all sectors (14 out of 18), parameter β is positive. Even though there are still 4 industries which seem to be on the side of Trump, the effect is small. This is understandable considering how firmly people believe that Hillary could win and how positive market would become after Hillary takes office.

The advantages of Hillary include female voters, labors' unions and trade unions, even Republicans that change side to support Hillary[12]. Not only did the result from Wolfers and Zitzewitz (2016) proved that a Trump victory would reduce the value of S&P 500 and other important foreign markets by as much as 15%, Santa-Clara and Valkanov (2003) found out the "Democratic premium" exists all through the political cycle. It seems the winning of Hillary is considered more logical by the whole nation. A simple observation of market before the election illustrate how market fears Trump, too: as the "Email Gate"[13] on Hillary's side is resurfacing -- from hinder sight this is thought to be influential to the campaign result – Trump took this chance to gain more ground. With more winning possibility for Trump in the mind of investors, on November 4th, the S&P 500 got a ninth day down by 3.1%, the longest losing streak since 1980s as the index fell for the eighth straight day[14]. U.S. 10-year treasuries rose

[12] "The Republicans Defecting to Hillary Clinton". The Atlantic, Aug. 5th, 2016.

[13] The "Email Gate" of Hillary Clinton refers to the fact that Hillary used her family's unsecured private server for official communications when she served as Secretary of States instead of official email account. Of all the emails investigated, over 100 sent emails contained classified information without classification markings, 2,093 were classified "confidential" by the State Department. (July 2016 witnessed the conclusion that Clinton was "extremely careless" but no charges be filed. On October 28, 2016, FBI director James Comey notified Congress that the case was restarted. On November 6, decision was made that the conclusion was not changed. The re-opening of the investigation only days before the election day is believed by many to have changed the election result.

[14] "S&P 500 losing streak extends to ninth straight day". Reuters, Nov. 4th, 2016.

about 2 basis points to 1.77, and yield on 30-year U.S. treasuries rose four basis points to 2.56.

Anyway, I ranked the 18 industries with parameter β in a downward trend as above, we found that oil – oil and petroleum products -- topped the list, with automobiles second and retail third. Industries that don't like Hillary very much are chemicals, consumer durables, and machinery.

It is somewhat counter-intuitive to see oil and petroleum products sector topped the list as this industry is "renowned" for being a polluter. Hillary has always been holding up an environmentally friendly image – don't forget she wishes for cutting America oil consumption by one third[15]. Trump's attitude is the total opposite: coal workers love him and so is Trump to them, and he doesn't seem to have any hesitation in using energies such as oil and coal excessively[16]. However, during a later research I found out that oil and gas industry was pouring almost twice as much money to support Hillary – 6.9 million in total[17] -- than what they donated to Trump. Trump chose to use mostly his own fortune on campaigning can be one explanation to this, but not convincing at all: oil and petroleum industry has always been a backer of Republicans, so when Trump chose not to depend on their political donations, why don't they just spend usual "budget for donation" on operations and research, but on Hillary, the Republican candidate's rival? I can only attribute this fact to the market's disbelief of Trump on the whole. The situation for automobile industry is partially understandable. In general, automakers are multinational corporations, so a freer international trade relations and lower tariff that Hillary supports are more beneficial.

[15] "Climate Change". The Office of Hillary Rodham Clinton

[16] "Donald Trump's Energy Plan: More Fossil Fuels and Fewer Rules". New York Times, May 26th, 2016.

[17] This number includes all the donation received on her campaign and Super PAC that supported her. PAC (Political Action Committee) refers to group that can accept unlimited political donations as long as it is not a part of official campaign. This form of pooling political fund was legalized in 2010, via Citizens United v. FEC

Though car producers are faced with emission-related regulations, the trend towards more environmental-friendly even electric cars is irreversible. From a retailer's perspective, Hillary is more easily cooperated while Trump seems more unpredictable. Besides, retail industry relies heavily on economic and international trade policies. Hillary's promise of increasing minimal wage attracts retail industry employees as well.

It is natural that machinery sector is a supporter of Trump: traditionally a labor-intensive industry, it was Trump whom made great promises to American workers about bringing their jobs back; promised huge investments to infrastructure projects which turned into demand for machinery – though Hillary promised a 27.5 billion five-year plan on infrastructure, "Her number is a fraction of what we are talking about", according to Trump[18]; beneficial policies to new-established firms, etc. The consumer durables sector has a similar in hiring patterns as it is labor-intensive, too. Under great pressure from cheap and nice goods from abroad, this sector is wishing for more space to breathe with Trump's protectionist attitude even though this sector was never under spotlight through the campaign period. Chemical-related industries are extremely sensitive to environmental policies. As Trump made clear that humans are not responsible for climate change – at least he thinks so -- and would "cancel" Paris climate deal, no doubt chemical sector would embrace Trump. Still, chemical sector is pro-Trump when oil and petroleum products sector seems the most supportive of Hillary in prediction market marks a pair which is hard to understand as the environmental regulations they face are similar. This difference may be attributed to the sensitivity of oil prices to international trade relations.

Besides the top three sectors, finance – whose prediction market data illustrates that this sector hides among its industrial counterparts, only ranked the second to the last

[18] "Trump Promises to Double Clinton Infrastructure Spending Plan". Fox Business, Aug. 02nd, 2016.

among supporters – a pretty mediocre behavior. It was believed by the market that, if Hillary become the U.S. president in near future, she would take over the baton from Obama's hand and keep a stable attitude towards monetary policy. Even if changes should be taken, a step-by-step mode on fiscal policy is more possible as she tends to emphasize on long-term, steady growth. In such ideal prospect, though a firm stance on financial regulations such as to strengthen the Dodd-Frank Act, a complete opposite when compared with attitude of Trump[19], the U.S. stock market would take a certain supporting role. For Trump, memory is still vivid about his harsh accusation on Wall Street of "murdering", promises to break up huge banks and force finance guys with high income to pay more taxes, etc. All in all, a higher ranking for financial sector is expected.

IV The Election: Event Study

In previous part I linked the prediction market behavior and actual stock market performance from the beginning of 2016 and election day. Classifying the S&P 500 firms into 18 sectors, I got to know how investors think of the influence of campaign related news on different industries, i.e. a certain sector is supportive of Hillary or Trump; how sensitive the sectors can be to such news, etc. In order to test how well such prediction result work in forecasting market behavior after the election, next I would study the performance of real stock market from the election result is known till the end of 2016. By comparing and contrast, it would become clear whether the study in the relation between prediction market and stock market can be the guidance in investment behaviors.

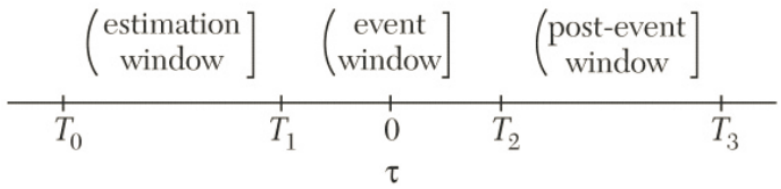
[19] "Clinton vs. Trump: Where They Stand on Wall Street". The Wall Street Journal, Oct. 25th.

Formerly, we used to think that as when compared with other global stock markets, U.S. market appears to have more obvious premium. So, if some black-swan happenings took place just like Trump's winning, this could serve as a trigger or an excuse for the market to increase in selling, causing fluctuations in the U.S. stock market. Putting aside this result from prediction market temporarily, I turn to traditional event study method, calculating the abnormal returns (AR), cumulative (average) abnormal returns (CAR or CAAR) etc., of different industry groups, compare and contrast the results with what I got from prediction market.

A Event study methodology

In order to analysis the influence of election result on stock market, first of all I introduce the standard market model event study methodology depicted by Dodd and Warner (1983) and Brown and Warner (1985).

Figure III: Event study as a line graph



Source: MacKinlay (1997)

Just as the above graph shows, 0 (or more commonly we call it Day 0) is the time that the event happens. The period between T0 and T1 constitutes estimation window, the period between T1 and T2 is event window. Usually a short term around Day 0, it is where our interest of research lays. Time between T2 and T3 is called post-event window, which only matters when longer-term impacts are studied.

It was during the above event window that the abnormal return (AR) is calculated. It is calculated as the actual return of a certain security during the event window minus the "normal" return, say market return, or expected return, $E(R_t)$, the ex-ante expected return conditional solely on information available before the event happens of that security at the same time. According to MacKinlay (1997), there are two kinds of models for calculating expected return: statistical and economical. The former assume asset return follows statistical distribution rather than driven by economic force, with constant mean return (CAR) model as the most commonly used one. What else are market model, factor model, etc. Economical models would simulate asset return behavior, for example Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), etc. In the case of this thesis, I applied the most straightforward method as to use industrial return minus the market return to do the calculations. The advantage of this way in the special setting of 2016 presidential election is that it doesn't require setting the estimation period as in other methods, as events such as Brexit took place in the middle of 2016. Such external factors influenced the U.S. stock market on the whole and was almost certain would have effect on estimation result. Anyway, the abnormal return is calculated the following way:

$$AR_{it} = R_{it} - R_{mt} \tag{6}$$

Accumulated abnormal return and cumulative average abnormal return are expressed as:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{7}$$

$$CAAR_t = \sum_{t=1}^{T} AAR_t \tag{8}$$

Before I conduct the study on different industrial groups, one thing should be mentioned: completely opposite of what people believed in before the election, for example the prediction result from IEM illustrates that two-thirds of the sectors are pro-Hillary; the obvious investors' beliefs during presidential debates that there exists an extremely positive relationship between stock market behavior and Hillary's winning, which was

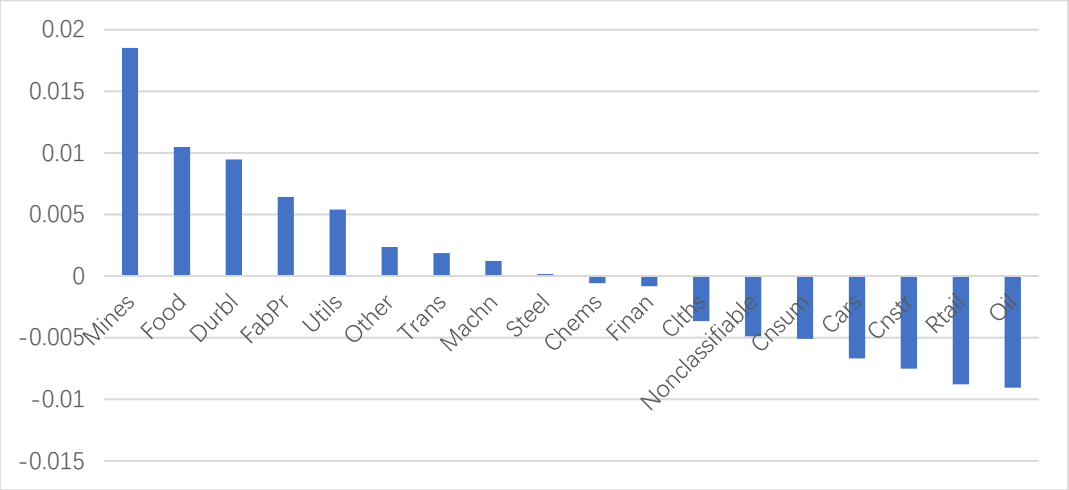
depicted by Wolfers and Zitzewitz (2016). However, the overall performance of S&P 500 almost skyrocketed after Trump won with a 4.64% increase by the end of 2016. Not only is this fact opposite to the long-held belief that market favors Democratic, it also turned back to the forecast by Bank of America, an often-trustworthy insights provider, whom thought the economy would slow-down its speed and financial market would be in chaos with Trump's presidency.

B Influence on Individual Industries

Cumulative average abnormal return is a straightforward way in testing and comparing the influence of election on stock prices. In order to calculate the CAAR of different time interval for 18 sectors, I used the return of each sector minus the market return of the same day. After that I plot the CAAR of 18 industries one day after the election; 10 days after; and the CAAR between the date which election finally took place till year end respectively. Besides, what's worth extra mentioning is that if we look at the t-test result for CAAR of each sector, each day, it seems that for some sectors such as Nonclassifiable and Other, the result was not significant enough. Still, basically sectors that both Trump and Hillary attached importance to during their campaign and sectors that illustrated huge changes which are worthy of discussion showed a significant result (Considering the amount of data it is not realistic to present in the content of thesis. It is provided together with the final version).

Figure III: CAAR, one day after election

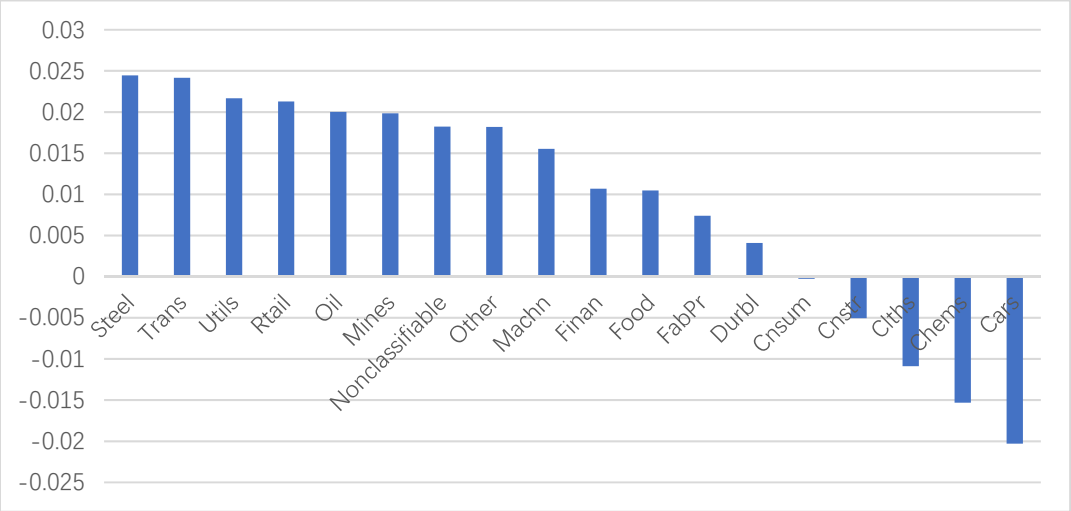
The CAAR of all 18 sectors one day after the election are demonstrated here in descending order. Roughly the number of sectors with positive or negative CAAR is the same, so are the magnitudes.



When I compare how different industries react one day after the election took place, I found that, used to be the no.1 in supporter of Hillary, on hearing news of Trump victory, oil sector responded swiftly by falling behind all the way to the very last of all. So are cars and retail sectors. Both of them showed a negative initial response on Trump's future administration. Mining industry was recorded with the highest CAAR merely one day after election, which is intuitive. Food and consumer durables ranked the second and third while chemicals and machinery basically followed the market. This fact mainly comes from the different time length required for absorbing the shock for different industries. At this time, financial sector stays with the market.

Figure IV: Average CAAR for Next 10 Days

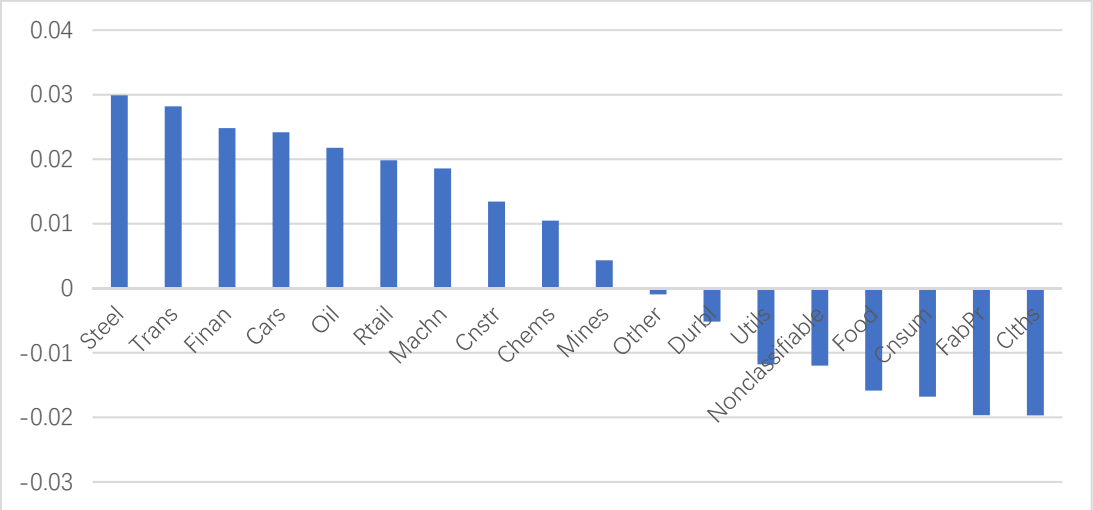
The average CAAR of all 18 sectors from two days after the election till eleven days after election are demonstrated here in descending order. At this time 13 out of 18 sectors have positive average CAAR while only 3 are negative, which testify that the market prospers on the whole after Trump's winning. Consumer Products sector mainly follows the market.



After another 10 days, industries that are prone to be traditional, labor intensive and receives campaign promises on Trump's side are gaining. At the same time, the whole market stood on a stable upward trend as more industries are gaining than losing. Car industry remains behind. However former Trump supporters such as food and consumer durables sectors showed up a seemingly unsatisfactory reaction now. Oil industry is catching up considering its natural intimacy towards Republicans and Trump campaign promises. At this time, retail sector illustrates a positive reaction, partially because Trump wants to keep the jobs in the U.S. What catches our special attention is financial sector again – showing a bit of ambiguity in prediction market, it is now stepping up steadily.

Figure V: Average CAAR from 11th Day After Election till Year-end

The average CAAR of all 18 sectors from eleven days after the election till 2016 year-end are illustrated in descending order. 10 out of 18 sectors have positive average CAAR while 7 are negative. "Other" sector mainly follows the market.



Paying attention to the average behavior of the industries all through the year end and comparing these results with their reactions on prediction market, one day after, and ten days after the election day. For one thing, their performances differ greatly not only from prediction market results, but also immediate and 10-day-old response. Not only the direction but also the magnitude. Examples are that among four sectors which used to be on Trump's side in prediction market, two have positive CAAR (chemicals and machinery) while the rest (food and consumer durables) are negative. The top three Hillary supporters (oil, cars and retail) are still doing well after Trump was elected. For another, the overall period industrial behaviors are more firmly in line with Trump's campaign statements. For example, Clothes sector (including Textiles, apparel and footwear) is the one that suffers the most with their traditional dependence on imports, which is against Trump's protectionism stance. In general, heavy industry is Trump's favorite.

By the 2016-year end, from a cautious beginning in prediction market, it is now very clear that financial sector is a winner under Trump's administration. Never innocent as it seems, if we take the donation point of view, financial sector is the largest single

source of campaign donations and the third largest lobby group, spending over 2 billion in total trying to influence the 2015-2016 U.S. presidential election cycle[20], and it also provides the largest part of campaign fund for Hillary (Appendix I) -- the share of saying from Wall Street may be much larger than it has been reported.

Trump's attitude is completely new when compared with his predecessors. Already a successful businessman himself with much media coverage, Trump declared that he would sponsor campaign mostly from his own pocket. This fact is obvious when donations from top industries of each side are listed and total amount compared (Appendix II). In this case, the influence of financial sector on Trump was deemed to be limited. Though Trump's decisions such as to reform the financial supervision system with deregulation as well as blocking loopholes in some hedge fund managers who evade paying taxes promise an even freer environment do nothing bad, as both candidates hate the tax evasion behavior of ultra-rich managers, Wall Street still worried that Trump's economic and fiscal policy stance is not clear and the possibility of changing frequently is pretty high. In a word, Trump is believed to bring uncertainty and affect the stable operation of the financial industry, and maybe that's the reason why he got less support than a milder Hillary despite his seemingly beneficial promises in prediction market. Totally opposite attitude between perdition market behavior and actual market performance, that is what makes the financial sector's reaction is particularly interesting.

C Two Representative Finance Firms

Among all the firms which constitute the financial sector in S&P 500, two of them are especially worth mentioning. The first one is Bank of America Corp. After the Trump's winning became an unchangeable fact, the firm released a forecast on U.S.

[20] "Wall Street Spent $2 Billion Trying to Influence the 2016 Election". Fortune, Mar. 8th, 2017.

GDP growth in almost no time, predicting a 0.5% decline in the first half of 2017 because of "despair in the financial markets" that the election result may cause[21]. However, after around a week, the CEO of Bank of America stated in front of the public benefits the Trump administration can bring: "… (the election) then basically focused people on a few things. Faster growth, that's good for Bank of America. A higher interest rate structure, that's good for Bank of America."[22] It sounds almost absurd considering how short a period of time it took to embrace Trump.

Another is Goldman Sachs Group Inc. Former Goldman Sachs partner Steve Mnuchin was nominated by Trump as Secretary as the Treasury only three weeks after the election day[23], a fast decision for nomination of such important Cabinet position. Except for him, Steve Bannon is the chief executive officer for Trump and Gary Cohn became the Director of the National Economic Council, all three have had experiences in Goldman Sachs. It is not a rare choice for presidents-to-be to nominate cabinet with Wall Street veterans while Goldman Sachs is one of the most influential institutions. Things only became beyond understanding when I link Trump's former attitude towards Goldman Sachs. "(you guys at Goldman Sachs) have total, total control over Hillary"[24]; "Hillary is meeting in secret with international bank (Goldman Sachs) to plot the destruction of U.S. sovereignty"[25]. To make it short, he used to be absolutely no-fan of this Wall Street giant.

Comparing the price behavior of Bank of America Corp., Goldman Sachs, financial sector and the market as a whole after the election, it is clear that financial sector did

[21] "On Trump Election, BofA Merrill Lynch Shaves 0.5% From GDP Growth Forecast in 1H2017". NGI, Nov, 10th, 2016.

[22] "Bank of America CEO Brian Moynihan on the Trump rally, regulation and rising rates". CNBC, Dec. 6th, 2016.

[23] "Steven Mnuchin nominated for US treasury secretary". The Guardian, Nov. 30th, 2016.

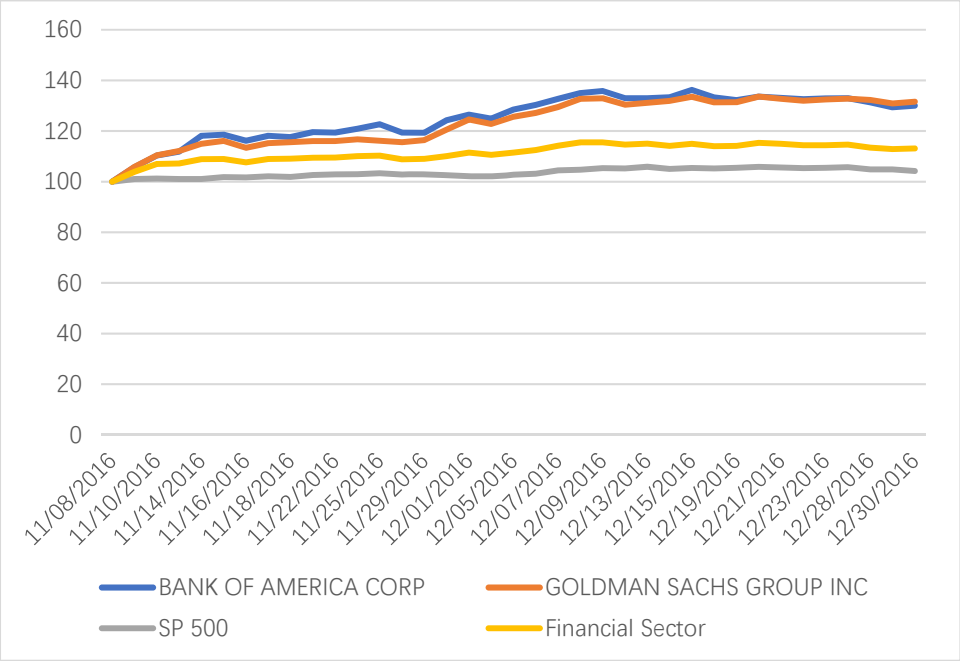
[24] "Donald Trump Said Goldman Sachs Had 'Total Control' Over Hillary Clinton — Then Stacked His Team With Goldman Insiders". International Business Times, Nov. 16th, 2016.

[25] "Donald Trump's 'international bankers' speech leaves some uneasy". JTA, Oct. 14th, 2016.

fairly well when compared with market. Among the financial service providers, BofA and GS performed even better.

Figure VI: Indexed Price of BofA, GS, S&P 500 and Financial Sector after Trump Victory

After the election result is known, the evolvement of BofA and GS stock price as well as S&P 500 index, Financial Sector index are compared visually after indexation. While all four illustrate an ascending pattern, financial sector outperformed S&P 500 index while the two banks showed even much better market data when compared with financial sector on the whole.



With their huge market cap, deeply-rooted influence on the political-financial climate of the U.S. and the sudden U-turn of relationship with Trump, I think they deserve a more careful study.

To conduct the individual study on the two banks, the first step is to turn back to prediction market. In the previous parts I constructed the model relating the prediction market probability to the market performance as well as the different sectors. Now, as the stock market behavior of the two banks cannot escape the influence from the sector they belong to, I also considered the industrial influence this time:

$$R_{bank,t} = \alpha_i + \gamma_{bank} R_{i,t} + \frac{\beta_{bank} \Delta P_{H,t}}{1+\beta_{bank} P_{H,t-1}} + \varepsilon_i,\ E(\varepsilon_i) = 0 \quad (10)$$

$R_{i,t}$ refers to the sector return rate (in this case, financial sector) and the $R_{bank,t}$ on the left refers to the return rate of banks, in this case only BofA and GS. The range of data used is the same as I conducted sectorial study on prediction market: from the beginning of year 2016 till one day before the election day.

Running the data and compare the results with the financial industry behavior, I found that in either case, the parameter β_{bank} is minimal while γ_{bank} is much larger, showing a heavy dependence of single bank behavior on the industrial trend. This fact proved that however special in terms of size or strategical position in terms of influences on policy making, performance of a certain financial institution's stock is always closely connected to the sector it belongs to.

V Discussions and Future Research

The former chapters have addressed the influence on stock markets from the election point of view, about the effectiveness of prediction market, which industries are more sensitive, etc., but financial sector's active interaction throughout the whole period of presidential election is worthy of a bit mentioning. A sector whose fundamental effect is to redistribute resources among industries, financial sector is a nice indicator with its own prediction and self-adjustment ability. There exist studies that claim the election news has no influence the stock market (Santa-Clara and Valkanov (2003) and Culter (1988)). John Higgins, chief market economist from the independent institute Capital Economics thought that if we learn from the last two presidential elections, the strong performance of the stock market a year later was not due to a shift in the balance of

political power but triggered by the economic rebound[26]. However, on the contrary, looking back at year 2009, three days before the stock market hit its intraday low of 666 in 2009 March, the then president-to-be Obama made a perfectly timed market call, suggesting that P/E ratios have begun to enter an excellent trading level. Since then, the stock market has risen by 225% when compared with his last day in office[27] -- a perfect example of how the charisma of a political image influences the Wall Street. In a word, the relation between political events and financial market is interactive, complex, and may depend on special settings.

A Financial Sector: More Interesting Facts

Naturally, politicians need votes to win. In order to get votes, they need to fund the campaign. It is also natural for campaign contributors to expect that their money would get repaid in the form of favorable legislation for the sectors their business belongs to, positions in places such as the Congress of acquaintances, friends, or even themselves, etc. The amount of donation from firms and corporations used to be limited by law before 2010. After the Citizens United v. FEC[28], which lifted the former upper limit restriction on independent political spending, the fund poured into political campaign increased dramatically.

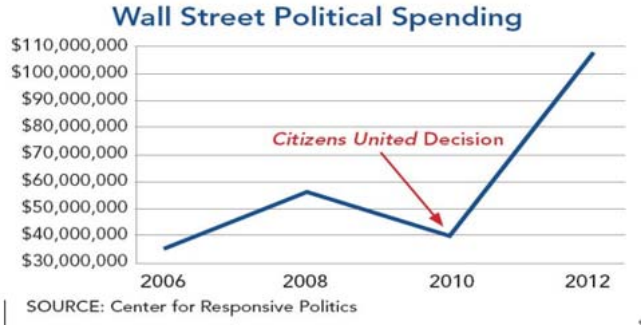
[26] "Elections and the stock market: History tells us economics matter more than politics. Could it be different this time?". Businessinsider, Oct. 15th, 2016.

[27] "President Obama made one of history's greatest stock market calls in March 2009". Businessinsider, Jan. 20th, 2017.

[28] Citizens United v. Federal Election Commission (FEC) is a controversial landmark on U.S. campaign finance regulations. It prohibits the government from restricting independent expenditures for communications by nonprofit corporations, for-profit corporations, labor unions, and other associations as long as they meet the public disclosure requirements. Also, the federal ban on direct contributions to candidate campaigns or political parties remain unchanged.

Figure VII: Historical record of political spending from Wall Street

This figure shows the time series of amount of fund that financial institutions spent on political campaign and in turn, on American politics. Before the 2010 Citizens United Decision which struck down the law restricting independent expenditure on political affairs, the number was moderate. After that the total expenditure became around three to four times when compared with before.



This can be mirrored in the early stages of Hillary's campaign. Not long after Hillary first issued a speech to accept the nomination of the Democratic Party that Trump opened fire at her, saying Hillary was the person of Wall Street, would never reform the Wall Street[29]. It is worth noting that although Hillary has been closely associated with the financial industry, in the face of such accuse, Hillary's Wall Street reform plan is actually much harsher than that of Trump's. Still many people on Wall Street think Hillary is a safer choice. In order to get even safer, Wall Street even take steps to intervene Hillary's campaign strategies and selection of running mate. Bankers feared that if Hillary choose Senator Warren as her running mate, they together would push the Wall Street reform even more "left" as the position of Warren's anti -Wall Street is very frightening to some donors. Some donors threatened to pull donations if Warren was chosen. Hillary finally gave up this choice.

Interestingly, though Hillary can be seen as a beneficiary of huge campaign funds, one of her campaign promises was to overturn Citizen United, curbing the influence of big money on American politics. She also planned to give small donors greater say. Besides, when talking about political donations from financial industry, hedge fund worth

[29] Trump's tweet, Jul. 28th, 2016.

special mentioning: huge amount of fund, only accessible to accredited investors, controlled by less SEC regulations. It goes similar for private firms or home offices, which mostly choose the LLC organization form. All these contribute to the opacity of situation and to what degree that election can be influenced by Wall Street money. While Trump has only received 230 thousand dollars from this source, hedge funds and private firms have raised 50 million dollars in support of Hillary's group and its campaign (Appendix II). Hillary's promise to end secret, unaccountable money in American politics seems a bit absurd when having her campaign fund structure in mind, as if she plans to be the very last beneficiary of huge campaign donations.

B When Prediction Market faced Black Swan

After short discussion on some facts about how and to what extent that financial sector tried to influence national politics, attention should be directed to the failed political prediction market under the setting of 2016 U.S. presidential election. Actually, he results from prediction market is "correct" this time in one way: Hillary Clinton was predicted to receive more votes, and she did receive around three million more popular votes than Trump in total as voters from Los Angeles, New York City, and the District of Columbia contributed to this. However, in U.S. presidential election it is not the popular vote but Electoral College that decides the final result. In fact, 2016 was one of the rare examples when popular vote results and final election outcome differ.

Anyway, Trump's final winning was astonishing and deemed to be the biggest setback up to now on scholars' belief. One explanation may be the sample selection bias: IEM participants tend to be scholarly, to belong to middle and upper income groups, and to be more politically interested and engaged (Forsythe et al. 1992), which largely coincide with the population that believes in Hillary's viewpoint. However, the "hidden majority" of the U.S. care more about the livelihood and a job, and Trump's promises

sound more inspiring. In the extreme case, the responsive and accurate record of IEM can be explained by coincidence to a certain degree, too, considering its rather short history.

VI Conclusion

Conducting a study from a combined perspective on 2016 U.S. presidential election, I started out linking the winning possibilities of each side from Iowa Electronic Market to the actual market data before the election. A form of political prediction market, IEM was proved to be effective in previous studies, which means the predicted results can serve as plausible guidance to the actual behavior of market participants. In this case, rational investors in real-life stock market would adjust their expectations and investments according to their own predictions and judgements, and this is how the market is made up of. Putting the performance of the market as a whole and prediction market results together, no obvious relationship was found, so the performances of different sectors were linked with prediction market respectively. Hillary and Trump made distinct campaign promises, which in turn would pose diverse expectation on different sectors. Sectors that are beneficial under either Hillary of Trump's reign were distinguished and analyzed.

In order to justify the real power of prediction market, prediction results should be tested under real market setting. So, abnormal returns of each sector after the election till year end were calculated with market model afterwards. The performances of different sectors are intuitive till the year end: heavy industries triumph while industries that rely on international trade are losing behind. Comparing the actual behavior of each sector with the IEM prediction results, it was found that though holding a winning record in previous studies, in the black-swan event of Trump's winning the prediction market lost its magic. This fact can be attributed partially to the relatively small size of IEM, and that the prediction market participants are not representative of U.S. citizens at all.

Among the performance of all sectors before and after the election, the ambiguous standpoint of financial sector catches my attention. Even though promises from

Trump's side are more beneficial, quite the opposite, this sector was doing much more to fund Hillary's campaign. Being extremely controversial, at the same time it only showed some mild (or next to none) co-movement with Hillary's success in prediction market. After the election day, the performance of financial sector went up steadily and ended up ranking third of all. The close interaction between financial institutions and political campaigns were discussed, too. Among these, Bank of America and Goldman Sachs were looked into more carefully considering their influences and special attitude/affiliation to the Trump's administration. Looking solely at their share prices, both outperformed the already striding financial sector. When industrial effect was considered, it was found that, however special the roles BofA and GS may play in either Wall Street as a whole or the Trump government, industrial influence was deemed to be the most important influential factor.

There are places that worth more in-depth discussion and further studies. For example, I only discussed how S&P 500 reacted under the influence of 2016 U.S. presidential election. However, being the most powerful nation in the world, event such as election of the new Head of States is almost certain to influence the world economy on the whole. There are countless other sources of data and markets which can serve as great subject to study, to name a few: prices of precious metals; prices of main forms of energy; VIX futures volatility; behavior of other international stock markets except for S&P 500 (FTSE 100; Hang Seng; Nikkei…); exchange rate of important trade partners; etc. Possibly there are other interesting findings hidden among such intricate relations.

Besides, after discussed briefly the industrial behavior, I feel financial sector is worthy of a second look both in its degree of influence on campaign outcome by pouring fund and how fast it's attitude changes when the seemingly unexpected event took place. Anyway, for more in-detailed study, I only chose two representative financial institutions. With 68 financial firms in S&P 500, in the ideal situation, if one wants to really dig into this niche, it is not a wild idea to closely follow the performance of each

firm through the year. And the idea of picking up individual firm to study may not be limited to financial firms: there exist huge companies with diverse businesses but only can be classified into one sector. Such firms require more attention as oversimplification in placement may cause mistake.

Except for the financial sector, there are also classifications such as “non-classifiable” and “other” in FF-17 classification system. While “non-classifiable” mainly consists of newly established internet service firms and “other” includes basically all firms that are hard to find a place in traditional classification method. I feel the mere word of “non-classifiable” or “other” is unclear, not to mention that firms in “other” sector represent do not represent a single industry at all. One simple example: there goes the saying that Trump won the election with the assistance of Facebook data, so are there any differences in its stock market performances before and after the election day? How about the attitude of its management team? More attention should be put into this part. To make it brief: either “higher-up” discussions, say the influence of the 2016 U.S. presidential election on international markets, or “down-below” studies, for example individual firm behaviors can add up to the study results on 2016 U.S. presidential election.

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Internet Sorces

Iowa Electronic Markets:
https://iemweb.biz.uiowa.edu/

Opensecrets:
https://www.opensecrets.org/

Appendix I

Hillary	Type	Amount
Paloma Partners	Hedge fund	$21,613,800
Pritzker Group	Venture capital	$16,626,207
Renaissance Technologies	Hedge fund	$14,040,200
Saban Capital Group	Private equity	$12,283,375
Newsweb Corp	Media	$11,016,642
Soros Fund Management	Family office (hedge fund)	$10,554,093
S Daniel Abraham Center for Middle East Peace	Foundation	$6,008,215
Asana	High-tech	$6,005,556
Lone Pine Capital	Hedge fund	$5,015,300
Carpenters & Joiners Union	Union	$5,005,954
Laborers Union	Union	$4,753,623
DE Shaw Research	Institute	$4,058,757
Plumbers/Pipefitters Union	Union	$4,013,894
Herb & Marion Sandler/Sandler Foundation	Foundation	$4,002,700
Laurel Foundation	Fundation	$3,422,863
Operating Engineers Union	Union	$3,012,483
Bohemian Foundation	Foundation	$3,005,400
American Federation of Teachers	Union	$2,594,710
Bls Investments	Private equity	$2,530,400
Emerson Collective	Foundation	$2,509,535
Total		$142,073,707

Trump	Type	Amount
Renaissance Technologies	Hedge fund	$15,511,600
McMahon Ventures	Commercial Services	$6,002,700
GH Palmer Assoc	Real estate	$5,005,400
Mountaire Corp	Agriculture	$2,013,500
Houston Texans	Sports	$2,010,800
Cerberus Capital Management	Private equity	$1,492,560
Electroimpact Inc	Aerospace	$1,005,399
Buckley Muething Capital Management	Advisory	$1,000,000
Clarium Capital	Hedge fund	$1,000,000
Hawaiian Gardens Casino	Gaming & hospitality	$1,000,000
Auburn Manor Holding	Real estate	$705,400
Rhs Investments (Hank Seale)	Family office	$500,000
Murray Energy	Mining	$302,734
Hamilton Co	Manufacturing	$300,056
GEO Group	Healthcare	$281,360
WSJ Properties	Media & Real estate	$277,700
Skye Lane Properties LLC	Real estate	$250,000
Trusted Leadership Pac	Republican Super PAC	$210,963
National Investment Co	Specialty Finance	$210,800
Southeast QSR	Hospitality	$153,000
Total		$39,233,972

Above I listed top contributors of either Hillary and Trump with their name, what business they belong to, and the amount they pay for the election. The total amount donated by big contributors to Hillary is more than threefold to what Trump received. Besides, we see clearly that financial firms love Hillary, with private equity and hedge fund topped the list. (Original data from opensecrets.org)

Appendix II

Hillary	
Industry	**Amount**
Securities & Investment	$84,873,357
Retired	$68,811,162
Lawyers/Law Firms	$39,546,759
Education	$23,998,719
TV/Movies/Music	$23,627,663
Democratic/Liberal	$22,009,174
Non-Profit Institutions	$19,040,651
Women's Issues	$18,333,264
Building Trade Unions	$17,376,564
Printing & Publishing	$17,131,721
Real Estate	$14,933,080
Business Services	$13,207,186
Electronics Mfg & Equip	$12,706,097
Pharmaceuticals/Health Products	$12,137,835
Health Professionals	$10,654,920
Civil Servants/Public Officials	$10,321,705
Misc Finance	$8,180,556
Internet	$6,326,567
Human Rights	$5,901,191
Public Sector Unions	$5,569,600
sum	$434,687,771

Trump	
Industry	**Amount**
Retired	$33,058,465
Real Estate	$4,510,113
Misc Business	$4,252,506
Republican/Conservative	$4,181,567
Health Professionals	$3,366,475
Lawyers/Law Firms	$1,781,811
Misc Finance	$1,392,369
General Contractors	$1,356,988
Securities & Investment	$1,210,947
Crop Production & Basic Processing	$1,189,030
Business Services	$975,734
Oil & Gas	$921,123
Gun Rights	$901,868
Insurance	$865,162
Misc Manufacturing & Distributing	$848,695
Civil Servants/Public Officials	$780,018
Education	$776,019
Special Trade Contractors	$755,195
Automotive	$705,689
Hospitals/Nursing Homes	$683,193
sum	$64,512,967

This time I listed top contributors of each side from an industrial point of view. The total amount donated by these industries to Hillary this time is almost seven times to what Trump received. Besides, “Securities & Investment” sector topped the chart for Hillary. (Original data from opensecrets.org)