PREDICTION MARKETS VS. POLITICAL POLLS: FORECASTING ELECTION OUTCOMES

Item Type	Electronic thesis; text
Authors	LEISTER, HAILEY LYNN
Citation	LEISTER, HAILEY LYNN. (2021). PREDICTION MARKETS VS. POLITICAL POLLS: FORECASTING ELECTION OUTCOMES (Bachelor's thesis, University of Arizona, Tucson, USA).
Publisher	The University of Arizona.
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PREDICTION MARKETS VS. POLITICAL POLLS: FORECASTING ELECTION

OUTCOMES

By

HAILEY LYNN LEISTER

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A Thesis Submitted to The Honors College

In Partial Fulfillment of the bachelor's degree

With Honors in

Economics

THE UNIVERSITY OF ARIZONA

MAY 2021

Approved by:

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Dr. Julian Romeo

Abstract

This paper focuses on the race 2020 democratic presidential nomination and analyzes the effectiveness of polling scores and prediction market contract prices when responding to micro events and forecasting the overall outcome of the nomination. Thirteen "micro events" are highlighted to track important milestones in the race for the 2020 democratic presidential nomination. When analyzing the effectiveness of polling scores and prediction market contract prices predictions, timeliness and accuracy are evaluated. There is evidence that changes in prediction market prices are positively correlated with changes in polling scores. There is also evidence that prediction market prices are influenced by potential reference prices which are a potential bias in their effectiveness of predicting future outcomes. Despite the potential for bias, this research supports prior claims that prediction market prices react more quickly to new information, in this case micro events, when compared to the associated polling scores. Overall, both prediction market contract prices and polling scores both sources accurately predicted the winner of the nomination within the last few days of the race. But the prediction market contract price data more quickly responded to key milestones during the race for the nomination which allowed the market to predict a winner with larger margins when compared to the polling scores.

Introduction

Prediction markets are markets that are designed to mine and collect information scattered among traders. After the information is collected, a market price is set or adjusted for contracts to make predictions about specific future events. (Berg and Rietz, 2003) Prediction markets have been used to forecast the outcomes of many different future events most notably, political elections. According to the efficient market hypothesis the market price in a prediction market is the best predictor of future events. (Wolfers and Zitzewitz, 2006) With prediction markets' free market conditions, buyers and sellers can participate by buying or selling contracts that align with their predictions in real time. The market participant's decisions to buy and sell contracts at different prices is a direct reflection of their preferences. But the validity of measuring such preferences to predict future events are based upon the accuracy of information being obtained by market participants. Most prediction markets operate in a "winner takes all" market structure. As buyers and sellers trade contracts the price of a contract fluctuates between $0.00 and $1.00. If a contract is true at the market close, then the contract will pay $1.00. If a contract is false at the market close, then the contract will pay $0.00. In addition to forecasting the outcomes of political races, prediction markets have been used to forecast outcomes of sporting events, and macroeconomic conditions.

Another method to predict outcomes of political races are political polls. Political polls are a more traditional form of gathering public preferences, but such polls are known to have considerable bias. Each political polling source has a different method of gathering polling participants and has different questions that they ask their participants. Most political polls measure relative vote share for candidates, but they also can measure voter preferences. Political polls that measure voter preferences can ask participants three different types of questions: who

do you think will win, who are you planning to vote for, or who do you want to win? Each of these different questions yield different results and can be used to predict different election outcomes. But depending on how the poll asks participants questions and which participants get asked the questions it can alter the accuracy and meaning of polling data. Different polling methods are subject to different potential biases.

New research has shown that prediction markets are effective at predicting future events because of their timeliness and ability to adapt to new information more quickly than other forecasting and polling methods (Snowberg, Wolfers, Zitzewitz, 2012). Operationally, prediction markets are continuous as buyers and sellers can participate in the market by buying or selling contracts in real time. Since political polls are cross sectional datasets, they do not reflect changing conditions in real time. Furthermore, some research shows that efficient prediction markets are better at predicting elections than polling data and only contain about half of the potential for bias (Berg and Rietz, 2006). The concept of efficiency in a prediction market is a caveat, once bias is introduced into a prediction market it decreases the accuracy of the forecast.

Recently more research has been done to better understand the effectiveness of prediction markets when compared to polling data. A recent paper studied the 2008 elections and concluded that unbiased poll information was a better forecaster than raw prediction market data or raw polling data. Despite unbiased polls being a more accurate predictor, prediction market data did a better job of incorporating new and timely information (Rothschild, 2009). Although unbiased political polling data is a more accurate predictor it is difficult to collect such data to study. The potential bias for raw prediction market data can make its forecasts less accurate but they are typically more accurate when compared to biased political polls. One distinct difference between prediction markets and polls is in a prediction market buyers and sellers can buy or sell contracts

that align with their beliefs. In political polls, participants are asked which candidate they will vote for rather than which candidate they believe will win the election or nomination. In order for forecasts in prediction markets to be effective they rely on individual's ability to effectively process information and for that information to be unbiased.

When looking at individuals' actions in markets research has also shown that individuals are motivated by reference points or reference prices. A reference point or a reference price is a specific value where an individual's decision making makes a sizable marginal change when compared to their marginal change at other values. A recent paper looked at buyers' decision-making during car auctions and it showed that the average price of a car at auction dramatically changed at specific mileage points (Lacetera, Pope, and Sydnor, 2012). Such reference point behavior can create potential bias in the prediction market data in terms of the price of a contract. If individuals' contract trading decisions are substantially altered in response to a specific price rather than their preference for the contract it may affect the accuracy of the market's prediction.

The purpose of this paper is to continue past prediction market research to better understand the effectiveness of prediction market data when compared to political polling data when predicting election outcomes. This paper looks specifically at the race for the 2020 democratic presidential nomination and analyzes prediction market data from PredictIt.org and polling scores data from Real Clear Politics. First, it tests the relationship between changes in the PredicitIt contracts' prices and the Real Clear Politics polling scores. Then it investigates the different responses the polls and prediction markets data have to micro events like debates and state primary elections. By comparing PredicitIt market pricing data with Real Clear Politics polling data, and analyzing potential biases, it will be inferred which method is a more effective forecast for the race for the nomination.

2020 Democratic Presidential Nomination Background

The decision- making process for which candidate wins the democratic party's presidential nomination is based on the number of pledged delegates gained over the race for the nomination. Each candidate participates in state primaries and caucuses to win pledged delegates. Depending on the individual states' election rules, the election will either be a "winner takes all" structure or candidates are awarded delegates based on their relevant vote contract. Each state is responsible for how candidates are awarded or not awarded pledged delegates accordingly. Population size also affects how many pledged delegates each state has to offer. With this population structure, some states have more pledged delegates than others. To win the Democratic Presidential Nomination one candidate must receive at least 1,991 out of 3,979 pledged delegates.

The race for the 2020 democratic presidential nomination was historically significant. The 2020 race had a record number of candidates as twenty-seven democratic candidates ran to receive the democratic party nomination. The candidates that received pledged delegates during the race include: Joe Biden, Bernie Sanders, Elizabeth Warren, Mike Bloomberg, Pete Buttigieg, Amy Klobuchar and Tulsi Gabbard. Many other candidates did not receive pledged delegates and their candidacy was brief.

At the end of the race, Joe Biden won the democratic presidential nomination by receiving 2,687 pledged delegates. The candidate that received the second most delegates was Bernie Sanders with 1,119 pledged delegates.

During the democratic presidential nomination race there are several "micro events" that occur. Such micro events are directly associated with the overall outcome of which candidate will win the 2020 Democratic Presidential Nomination. Micro events include any democratic

debates and state's democratic primaries and caucuses. Figure 1 displays the micro events and

associated dates. Debates are included as micro events, even though candidates do not receive

pledged delegates, because the debates can alter voters decision making. At debates, the public is

exposed to each candidate's platform and performance compared to other candidates which can

alter which candidate the public expects to win the nomination. Figure 1 shows the different key

dates during the presidential democratic nomination.

Figure 1: Micro Events for the 2020 Presidential Democratic Nomination

Date	Event
6/26/2019-6/27/2019	First Debate
7/30/2019-7/31/2019	Second Debate
9/12/2019	Third Debate
10/15/2020	Fourth Debate
11/20/2019	Fifth Debate
12/19/2019	Sixth Debate
1/14/2020	Final Debate
2/3/2020	Iowa Caucus
2/11/2020	New Hampshire Primary
2/22/2020	Nevada Caucus
2/29/2020	South Carolina Primary
3/2/2020	Super Tuesday: Alabama primary, American Samoa caucus, Arkansas primary, California primary, Colorado primary, Democrats Abroad caucus, Maine primary,Massachusetts primary, Minnesota primary, North Carolina primary, Oklahoma primary, Tennessee primary, Texas primary, Utah primary, Vermont primary, Virginia primary
3/10/2020	Idaho primary, Michigan primary, Mississippi primary, Missouri primary, North Dakota caucus, Washington primary

PredictIt Market

This paper examines prediction market data from PredictIt's 2020 Democratic Presidential Nomination market. In a PredictIt market individuals can buy and sell contracts that align with their predictions of a given event. The 2020 Democratic Presidential Nomination market allows market participants to trade from thirty-three candidate contracts throughout the race for the nomination. The 2020 Democratic Presidential Nomination PredictIt market is defined as a 'multiple contract market'. In a multiple contract markets, individuals buy or sell contracts where there are multiple contract options. A contract in a multiple contract market only pays if it resolves to a 'yes' and all other contracts resolve to a 'no'. The PredictIt prediction market is a 'winner takes all' market. The contract only pays if the statement is true at market close and the candidate wins the 2020 democratic presidential nomination. If the candidate wins the nomination the contract pays $1.00. If the candidate does not win the nomination, then the contract pays $0. This prediction market does not consider relative vote share for candidates in the statewide primary elections. In this market, buyers and sellers buy and sell contracts based on their predictions of who will win the 2020 democratic presidential nomination. Since participants are making trading decisions based on their prediction, it can be inferred that candidates' market prices are a measure of participants' relative confidence that a candidate will win the nomination at any given time.

Thirty-three individual candidates are included in the 2020 Democratic Presidential Nomination PredictIt market. A majority of the candidates on PredictIt officially announced their candidacy, but some of the candidates in this market never officially ran for the nomination. Some of the candidates on PredictIt were only speculated to run for the nomination by the public. For example, Dwayne Johnson never officially announced he was running for president, but he

was included in the market. Figure 2 displays the candidates included in the 2020 Democratic

Presidential Nomination PredictIt market and their associated market opening price, market high

price and total volume of trades.

Figure 2: PredictIt Candidates Prices and Volume Data

Candidate	Market Starting Price	Market High Price	Total Volume Traded
Joe Biden	$ 0.10	$ 0.99	16,853,718
Bernie Sanders	$ 0.50	$ 0.65	15,250,656
Elizabeth Warren	$ 0.03	$ 0.52	10,914,611
Michael Bloomberg	$ 0.02	$ 0.33	10,854,233
Kamala Harris	$ 0.12	$ 0.29	7,392,138
Pete Buttigieg	$ 0.01	$ 0.23	9,264,754
Beto O'Rourke	$ 0.21	$ 0.22	3,726,274
Cory Booker	$ 0.10	$ 0.16	4,451,225
Kirsten Gillibrand	$ 0.03	$ 0.16	2,143,727
Andrew Yang	$ 0.04	$ 0.15	7,843,382
Amy Klobuchar	$ 0.03	$ 0.13	9,000,304
Hillary Clinton	$ 0.02	$ 0.11	9,899,315
Andrew Cuomo	$ 0.01	$ 0.09	4,010,067
Oprah Winfrey	$ 0.09	$ 0.09	1,821,861
Sherrod Brown	$ 0.02	$ 0.08	2,387,273
Mark Zuckerberg	$ 0.03	$ 0.06	274,928
Tulsi Gabbard	$ 0.01	$ 0.06	5,670,523
Tim Kaine	$ 0.10	$ 0.05	269,674
Chris Murphy	$ 0.02	$ 0.04	305,961
Dwayne Johnson	$ 0.10	$ 0.04	192,696
Julián Castro	$ 0.01	$ 0.04	2,319,030
Marianne Williamson	$ 0.01	$ 0.04	1,932,122
Tom Steyer	$ 0.01	$ 0.04	4,680,576
Deval Patrick	$ 0.03	$ 0.03	1,499,881
Steve Bullock	$ 0.02	$ 0.03	2,063,095
Jay Inslee	$ 0.01	$ 0.02	1,377,249
Jerry Brown	$ 0.02	$ 0.02	379,634
John Delaney	$ 0.02	$ 0.02	1,081,062
John Hickenlooper	$ 0.01	$ 0.02	887,171
Michael Bennet	$ 0.01	$ 0.02	1,245,588
Bill de Blasio	$ 0.01	$ 0.01	663,626
Eric Swalwell	$ 0.01	$ 0.01	248,466
Tim Ryan	$ 0.01	$ 0.01	270,038

The market starting price refers to the opening market price for each candidate's contracts on the first day their contracts were traded. The average starting price for PredictIt candidates is $0.05. The average starting price is influenced by a few candidates whose contracts started at a relatively high price between $0.50 and $0.10. However, the majority of candidates' contracts starting price is $0.01. The highest market starting price was Bernie Sanders and his contracts started trading at a price of $0.50. Since candidate contracts start at different prices, it is likely that PredictIt decides each candidate's starting price based on the expected demand for each candidate's contracts. PredicitIt wants to set the highest starting price that allows them to sell as many contracts as possible. PredicitIt favors setting a high starting price for contracts because they receive a higher profit from a higher priced contract. But if PredictIt sets too high of a starting price for contracts then there is the possibility that contracts will not sell.

The market high price refers to the highest price for each candidate contract reached during the entire duration of the market. The market high price indicates the market participants' confidence in that candidate winning the nomination. The higher the market high price is the more confidence the market participants had for that candidate winning the nomination. The average market high price is for PredictIt candidates $0.14. Only about a third of the candidates' contracts reached a market high price higher than the average. Joe Biden, Bernie Sanders, Elizabeth Warren and Mike Bloomberg at one time all had a market high price of $0.33 or higher. The highest market high price was Joe Biden's contract at a price of $0.99 when he officially won the nomination. The candidate with the second highest market high price was Bernie Sanders. His contracts reached a price of $0.65 the day after he won the Nevada Caucus. The candidate with the third highest market high price was Elizabeth Warren. Her contracts reached a high price of $0.52 between the second and third debate. The candidate with the fourth

highest market high price was Mike Bloomberg. His contracts reached a high price of $0.33 following the New Hampshire Primary. When these candidates' contracts reached a high price the market participants' confidence in that candidate reached its peak.

Total volume traded refers to the number of contracts that were bought or sold for each candidate while the market was open. The average total volume traded among all candidates is 4,278,026 trades. Joe Biden has the highest number of trades followed by Bernie Sanders, Elizabeth Warren and Mike Bloomberg which all had more than 10,000,000 trades.

Figure 2 is sorted by highest candidate market high price to lowest candidate market high price. Joe Biden, Bernie Sanders, Elizabeth Warren, and Micheal Bloomberg had the four highest market high prices along with the highest volume of trades out of all candidates in the PredicitIt market. Since the same four candidates had the highest market high prices and the highest volume of trades it can be inferred that market high price and volumes of trades are positively correlated.

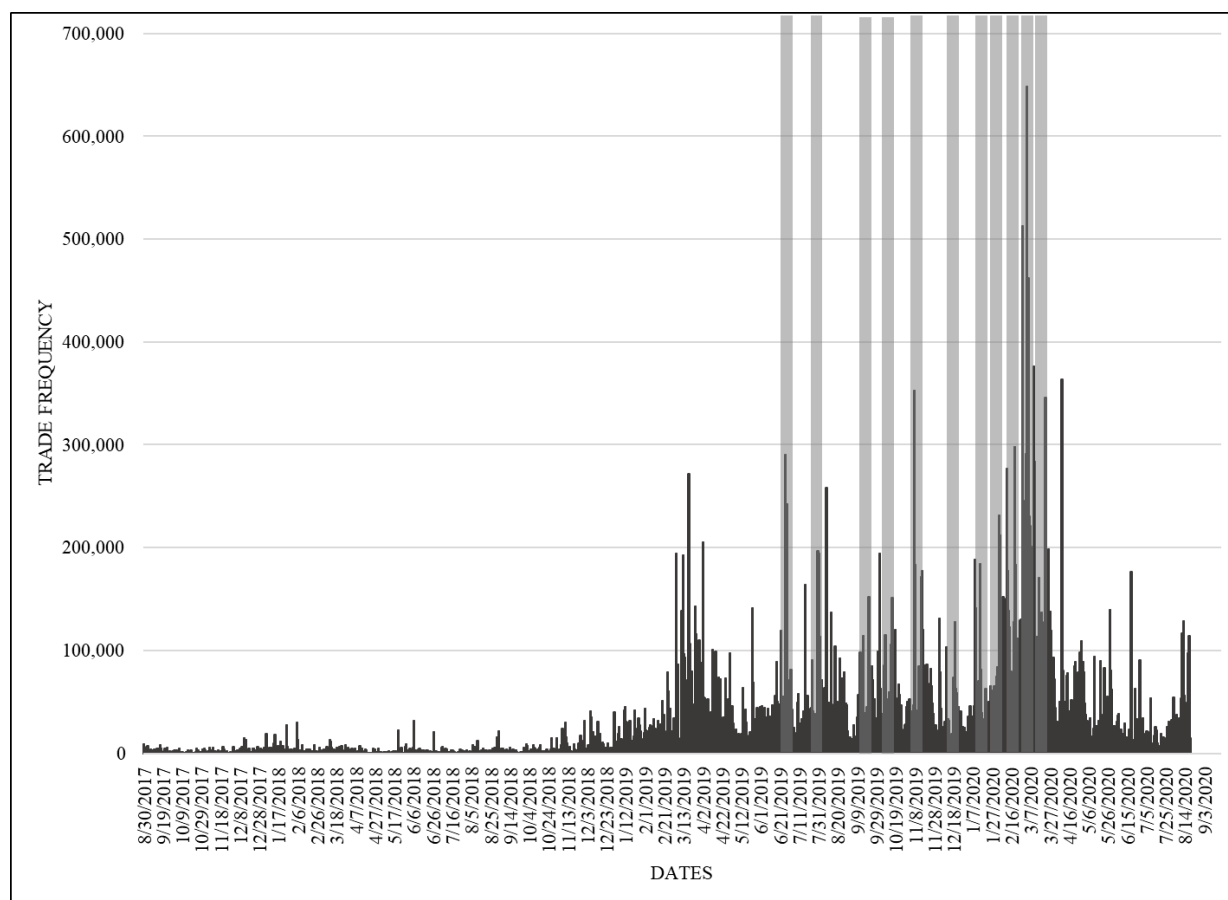Figure 3: Contract Trade Frequency by Date

Figure 3 shows the contract trading frequency every day while the PredictIt 2020 democratic presidential nomination market was in operation. Figure 3 also highlights micro events to highlight trading activity during such milestone events. The contract trade frequency is a measure of relative market activity on a given day. The day with the most contract trading activity was March 3rd which was "Super Tuesday". In general, the days that the market experienced high levels of contract trading align with the micro events displayed in Figure 1. This supports the notion that individual buyers' and sellers' trading decisions in the PredicitIt market were influenced by micro events such as debates, primaries, and caucuses. Furthermore, buyers and sellers were most influenced by the results of Super Tuesday making that specific event a potential turning point in the market.

Real Clear Politics Polling Score

Real Clear Politics aggregates polling data from several sources and gives each candidate a score based on their average performance in the polls. The Real Clear Politics scoring is based on relative vote share and is not a 'winner takes all' scoring system. Once a candidate receives a score greater than 50.1 that candidate is predicted to be the winner of the democratic nomination by the Real Clear Politics polling scores. Any score lower than a 50.1 signifies that the candidate is predicted to make up that percentage of the vote contract. For instance, if a candidate has a Real Clear Politics score of 33.3, they are expected to receive a third of the vote share. If a candidate has any score above a 50.1 that candidate is still considered the winner.

To improve accuracy of scores and prevent potential bias information from one polling source, Real Clear Politics aggregates polling information from eighteen different polling sources: ABC News/Washington Post, CBS News/YouGov, CNN, Economist/YouGov, Emerson, FOX News, Harvard-Harris, IBD/TIPP, LA Times/USC, Monmouth, NBC News/Wall Street Journal, NPR/PBS/Marist, Politico/Morning Consult, Quinnipiac, Reuters/Ipsos, SurveyUSA, The Hill/HarrisX, USA Today/Suffolk. Each polling source asks voters different questions to predict which candidate will win the democratic presidential nomination. Most of the polls ask participants which candidate they will be voting for the nomination, but question framing varies among polling sources. The CNN polls asked participants "Who would you MOST like to see win the Democratic nomination for president?" (CNN, 2020). Questions framed in this way gauge who the participant prefers to win rather than who the participant thinks will win the nomination. On the contrary, the YouGov/ The Economist polls asked participants "Who do you think is the most likely candidate to become the Democratic nominee for president in 2020?" (YouGov, 2020). Questions framed in this way give a better indicator of

who the participant believes will win the nomination. This comparison highlights the potential for framing bias due to the differences between the questions asked by different polling sources and how they can lead to different predictive conclusions.

Real Clear Politics polling data is not continuous, candidates polling scores are updated once a day based on polls that were gathered within that week. There is varied lag time among the different polling sources between when the poll is taken, when the results are posted, and when the average polling score is updated. Figure 3 represents all the candidates that received a score on Real Clear Politics for the 2020 Democratic Presidential Nomination. The candidates are sorted by highest to lowest high scores.

Figure 4: Real Clear Politics Polling Scores

Candidate	Starting Score	High Score
Joe Biden	29	60.8
Bernie Sanders	17.7	37
Elizabeth Warren	6	26.8
Mike Bloombeg	4.2	18
Kamala Harris	5.3	15.2
Pete Buttigieg	0.3	11.8
Beto O'Rourke	6.3	9.5
Amy Klobuchar	1.5	6.8
Cory Booker	4	5.3
Andrew Yang	1	4.9
Tulsi Gabbard	0.5	3.3
Tom Styer	1	2.6

Polling score is a measurement for the public's perceived confidence in a candidate during the race for the nomination. The higher the poll score reflects a higher confidence in the candidate gaining more of the vote share and potentially winning the nomination. The starting score reflects the public's initial confidence in that candidate winning the nomination. The average starting score for candidates was 6.4. The average Real Clear Politics high score is 16.8.

Only two candidates Bernie Sanders and Joe Biden had a starting score above the average and only four candidates ever had a high score higher than the average. In the Real Clear Politics polls Joe Biden received the highest high score of 60.8 when he officially won the nomination. Bernie Sanders had the second highest polling score of 37 on March 29th. Elizabeth Warren had the third highest polling score of 26.8 on October 9th, shortly before the fourth debate. Mike Bloomberg had the fourth highest polling score of 18 on March 3rd the day after Super Tuesday.
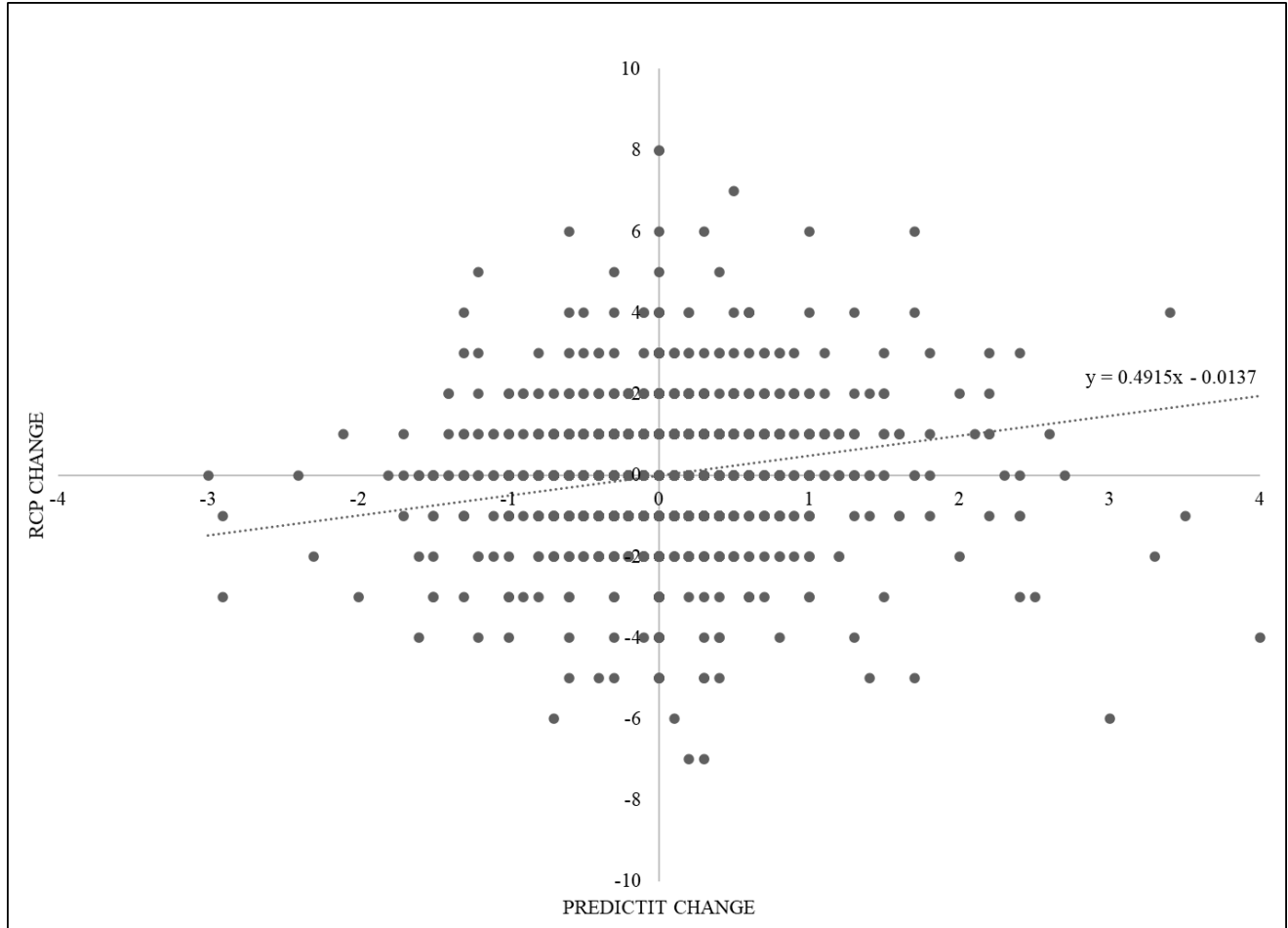
Correlation Results

Over the race for the nomination candidates contract prices and polling scores change as the public's perception of each candidate's probability of winning the nomination changes. A correlation was run to better understand the relationship between changes in candidates' contract prices and changes in polling scores. Figure 5 shows the correlation results for a change in Real Clear Politics poll scores and a change in PredictIt candidate contract prices.

The null hypothesis is that there is no relationship between the change in Real Clear Politics poll score and the change in the price for contracts in the 2020 Democratic Presidential Nominee PredictIt market. Changes in polling scores and candidate contract prices are positively correlated.

There is a positive relationship between the change in polling data and the prediction market data. This positive relationship is statistically significant as $p < .05$. This relationship states that a one percent change in PredictIt contract price leads to roughly a half of a percent change in Real Clear Politics polling score. This analysis also signifies that PredictIt contract prices are more volatile when compared to Real Clear Politics polling scores.

Figure 5: Correlation between PredictIt Price Changes and Real Clear Politics Score Changes

PredictIt Price Distribution Results

To understand if there is a relationship between price and the frequency of trades and contract price number of trades and contract prices were analyzed. Figure 6 shows the distribution of prices of all contracts traded from all candidates participating in the PredictIt market. Since a majority of contracts traded at a starting price between $0.01 and $0.05 any prices in that range have been omitted from the price distribution results. By omitting a majority of the starting market prices from $0.01 to $0.05, the average contract among all candidates traded at a price of $0.13.

As prices fluctuate in prediction markets there is reasonable evidence that buyers and sellers are influenced by reference prices. Reference prices are specific prices where buyers and sellers' typical marginal behaviors change by either trading significantly more or significantly less at a specific price. A potential reference price occurs when trading substantially increases or decreases over a constant marginal change in price. One reference price occurs at a price of $0.10. There is evidence in the data that contracts trade more frequently at a price of $0.10 when compared to a price of $0.09 or a price of $0.11. A price of $0.10 occurs 521 times which is more trades than any other price. While contracts traded at a price of $0.09 and $0.11, 460 and 414 times, respectively. This suggests that buyers are more active at a price of $0.10 making it a possible target price for consumers. Another potential reference price occurs at below and above a price of $0.20.

Figure 6: PredictIt Price Distribution
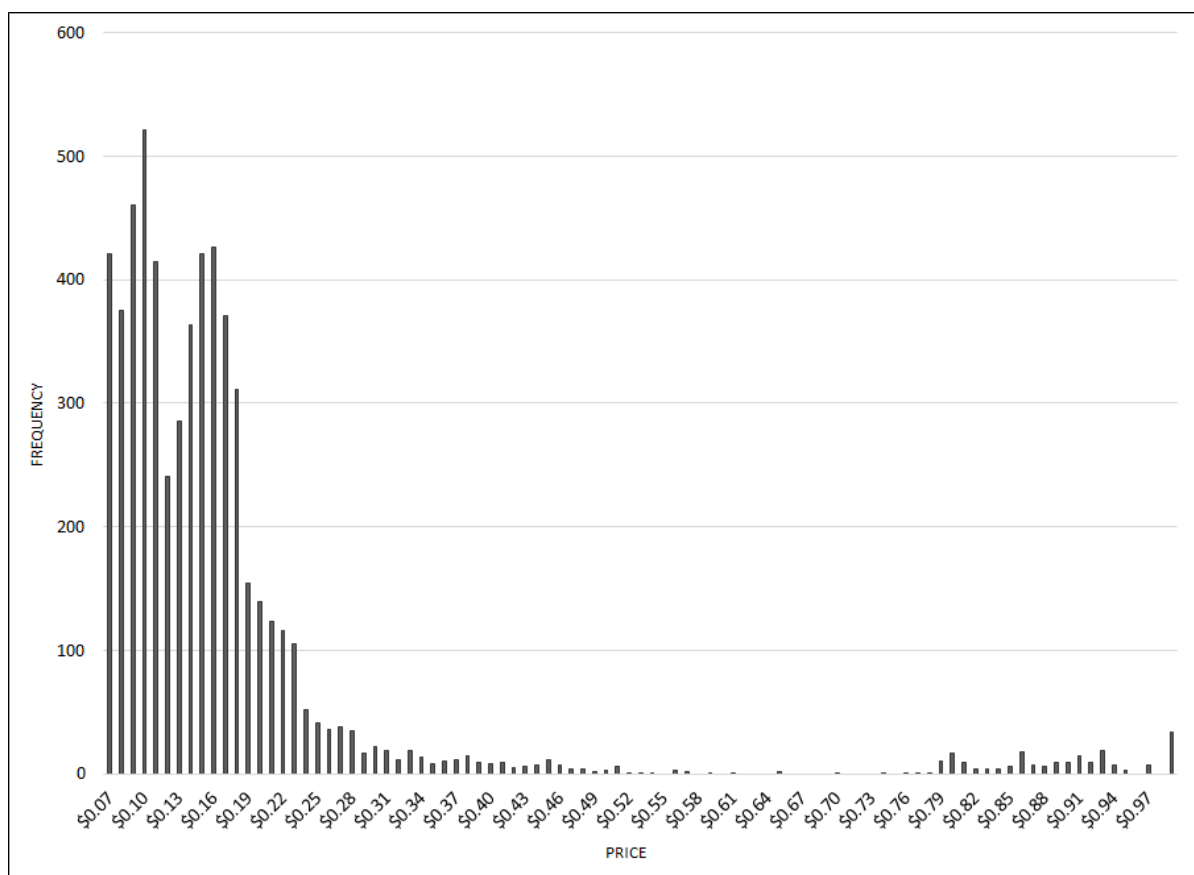
When buyers and sellers' behaviors change differently among the same marginal change in prices, it creates potential error in the accuracy of such prices. Potential reference prices for buyers in the PredictIt market can increase the variability in the market's predictions for future events.

Time Series Results

To understand how the top candidates' prediction market contract prices and polling scores changed over the race for the nomination each candidate's data was analyzed. The top four candidates that received the highest PredictIt market high prices, and the highest Real Clear

Politics polling scores were Joe Biden, Bernie Sanders, Elizabeth Warren and Mike Bloomberg.

These four candidates' data is displayed in Figures 7a-d. Along with candidates' contract price

and score, the several micro events listed in Figure 1 are highlighted on Figure 6a-d. The micro

events are highlighted on the candidates' charts to show the relative response of PredictIt close

prices and Real Clear Politics polling scores to key events during the 2020 Democratic

presidential primary season. Since not every candidate entered, or exited the race on the same

dates, their data's starting and ending dates vary by candidate.

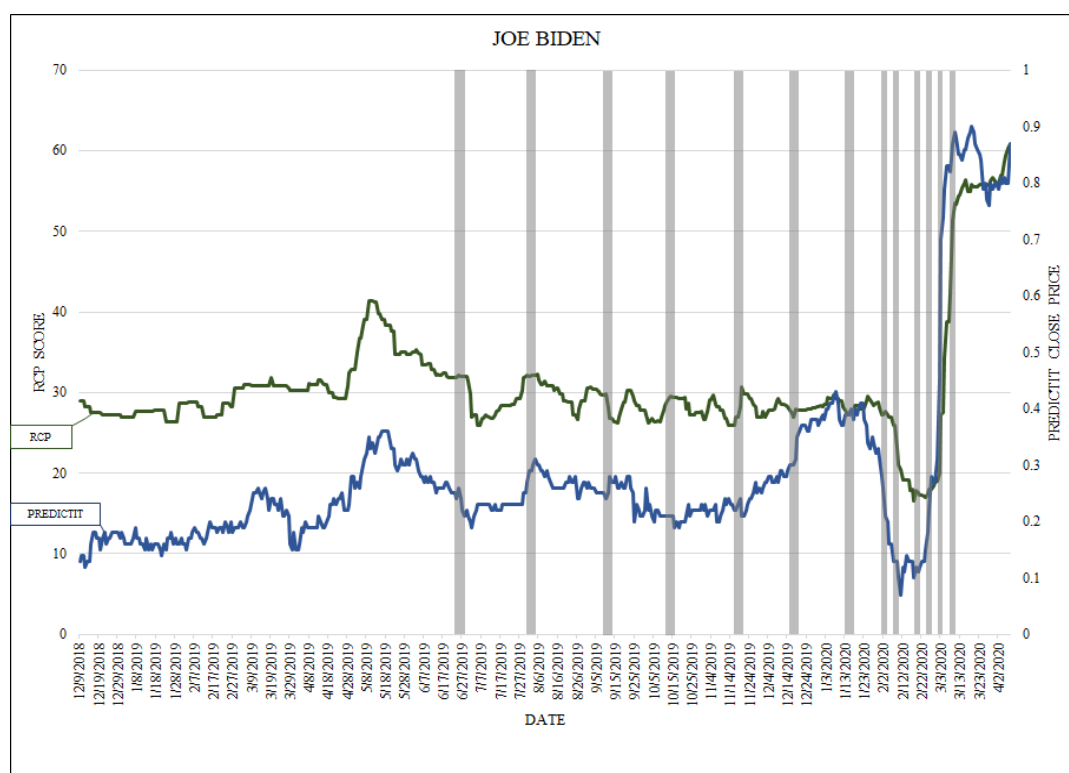Figure 7a: Joe Biden PredictIt and Real Clear Politics Results

Figure 7b: Bernie Sanders PredictIt and Real Clear Politics Results
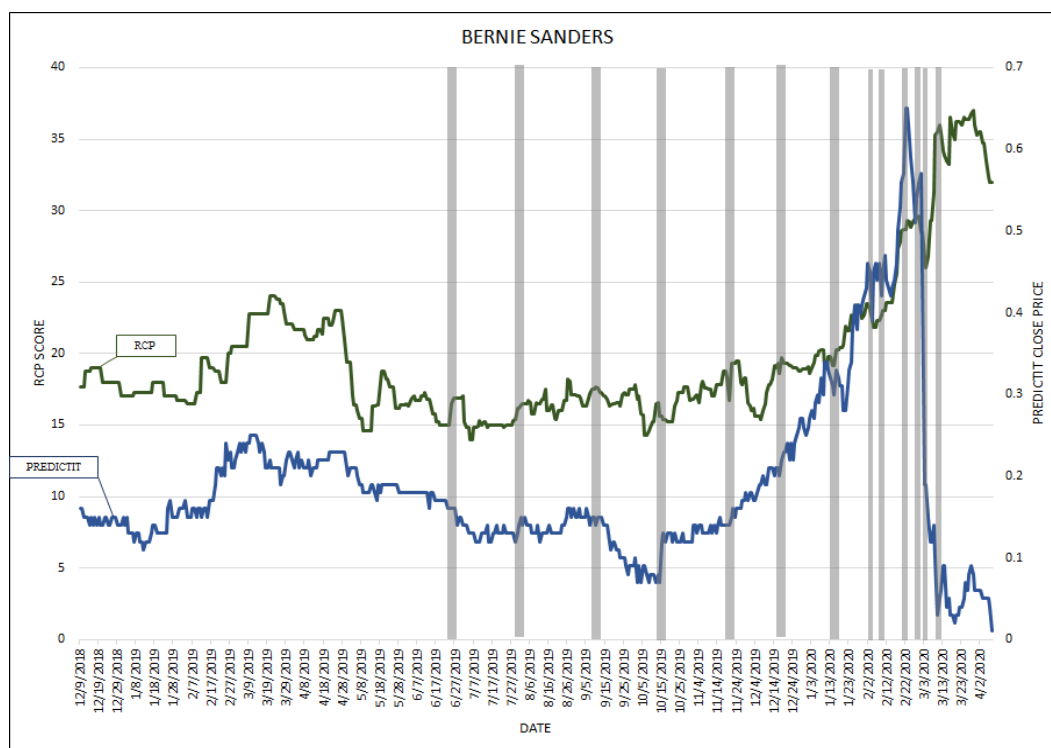

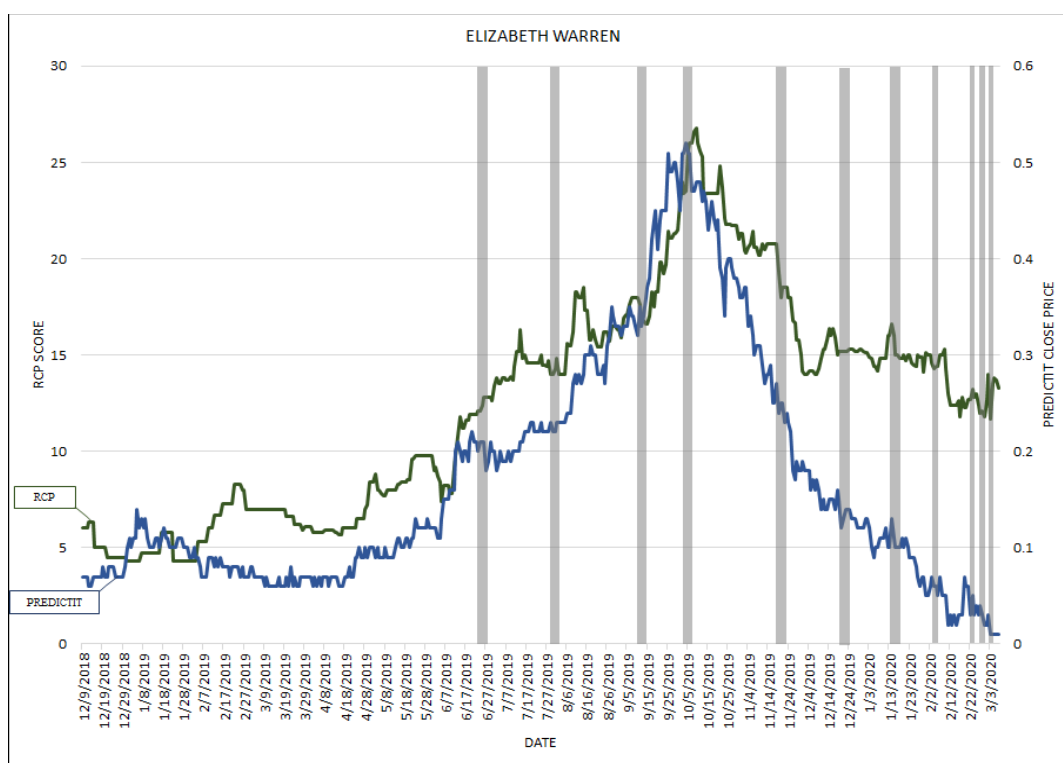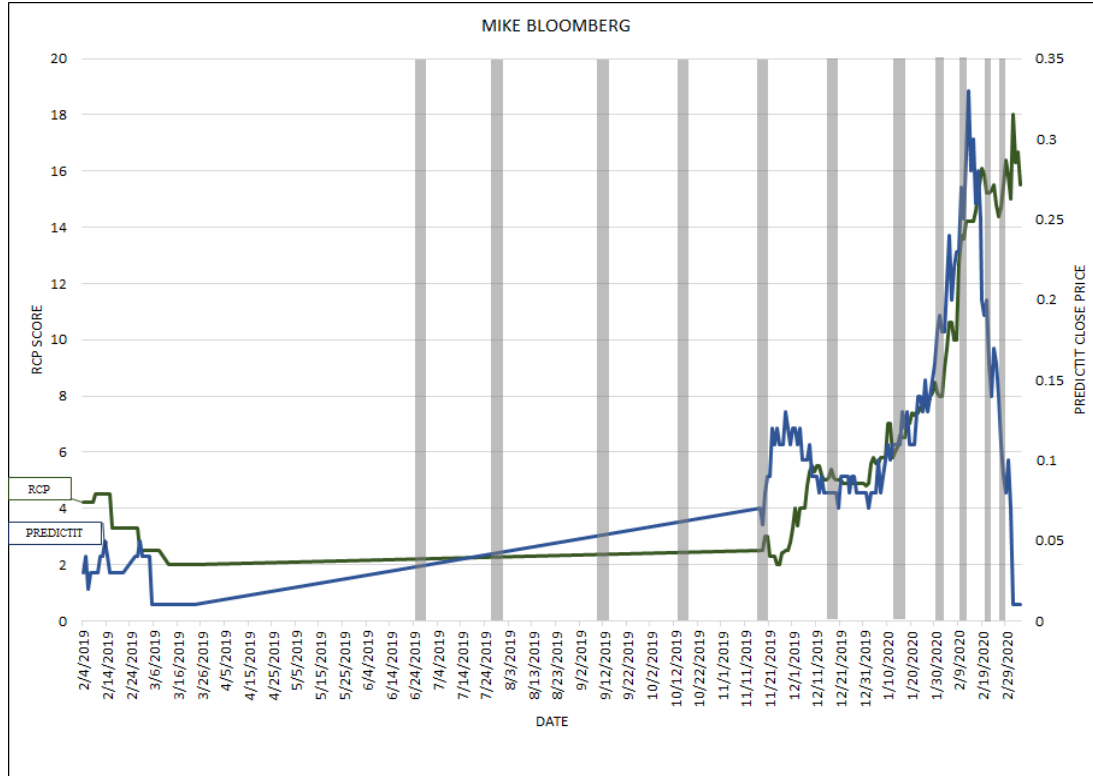Figure 7c: Elizabeth Warren PredictIt and Real Clear Politics Results

Figure 7d: Mike Bloomberg PredictIt and Real Clear Politics Results

Joe Biden's PredictIt contract price and Real Clear Politics polling scores are displayed in

Figure 6a. Over the course of the race for the nomination his contracts in PredicitIt traded at an

average price of $0.28 and his Real Clear Politics scoring average was 30.8. Biden's contracts

reached the highest market price in PredicitIt at $0.99 and the highest Real Clear Politics polling

score of 60.8 when he was announced the winner of the nomination. For the first four debates,

Biden's PredictIt contract price and the Real Clear Politics score stayed relatively steady. Shortly

after each of the first four debates both Bidens' contract prices and polling scores decreased.

After the fifth debate the trend in contract prices began to change and increase. Despite an

increase in contract prices following the fifth debate, Biden's polling score remained steady

around 25-30 points. Then after the final debate both Biden's polling scores and contract prices

began to decrease. This decreasing trend continued and following the New Hampshire Primary Biden's polling score was 16.5 and contract price was 0.07 which was an all-time low. Biden's contract price and polling score stayed low for a few days began to rise following the Nevada Caucus and continued to stay high until he officially won the nomination.

Bernie Sanders' PredictIt contracts price and Real Clear Politics polling scores are displayed in Figure 6b. Throughout the race for the nomination, Sanders' PredictIt contracts traded at an average price of $0.18 and his Real Clear Politics scoring average was 19.7. During the race Sanders' contract prices and polling scores stayed relatively steady until after the fourth debate his contracts began to steadily increase over time. Sander's contracts reached a high price of $0.65 the day after he received 24 delegates by receiving the most votes in the Nevada Caucus. After the peak in prices his contracts price dropped off. Despite Sander's contract prices decreasing after the Nevada Caucus his polling scores continued to increase and reached a high of 37 shortly before he dropped out of the race.

Elizabeth Warren's PredictIt contracts prices and Real Clear Politics polling scores are displayed in Figure 6c. Warren's contract prices traded at an average of $0.17 and her average polling score was 12.4. Throughout the race Warren's polling scores and contract prices follow similar trends over time. Initially Warren's contract prices and polling score steadily increased and then they both reached a peak following the fourth debate. After the fourth debate, Warren's contracts rose to a high of $0.52 and the poling score reached a high of 26.8. Shortly after reaching a peak, Warren's polling score and contract price began to steadily decline over time. Another considerable change in contract price and polling score occurred after the fifth debate.

Mike Bloomberg's PredictIt contract prices and Real Clear Politics scores are displayed in Figure 6d. Throughout the race Bloomberg's contracts traded at an average price of $0.12 and

his polling score average was 7.89. Unlike the other candidates being compared, Bloomberg's contract prices and polling score started off relatively low. Initially, Bloomberg's contracts traded at a price of $0.03 and his poll score was 4.2. Following the fifth debate Blooberg's contract prices and polling score increased over time. In general, Bloomberg's contract price and polling score followed similar trends following the micro events that occurred throughout the race. His contracts reached a high of $0.33 after the Iowa Caucus. After the Iowa Caucus, Bloomberg's contract prices began to trend downwards and drop following the remaining primaries and caucuses.

Overall, the data shows that both the PredictIt prices and the Real Clear Politics polling data responded to the micro events. However, the PredictIt price seems to respond more quickly to microevents when compared to the Real Clear Politics scores. For instance, shortly before Bernie Sanders renounced his candidacy his contract prices dropped to less than $0.10 but his polling score remained steady around 30 to 35 points. A similar trend occurred for Elizabeth Warren and Mike Bloomberg shortly before they renounced their candidacy. The biggest changes in candidates' polling scores and contract prices seem to occur following the state primary and caucus elections. For Joe Biden, his contract price and polling score stayed steady until the New Hampshire Primary.

Conclusion

There is evidence that changes in the candidates' prediction market contract prices are positively correlated with candidates associated polling scores. Since contract prices and polling scores are positively correlated it can be inferred that if there is an increase/decrease in a candidate contract price the associated polling score will also increase/decrease.

The results in this paper support prior research done regarding potential biases in raw prediction market data. There is evidence that prediction markets have potential bias resulting from participants' change in behavior in response to potential reference prices. Despite the potential for bias in prediction market data, there is evidence that it is a better forecaster for political outcomes. Both the Real Clear Politics polling scores and the PredictIt contract price data correctly predicted the winner of the 2020 democratic presidential nomination, but the polling scores leave a smaller margin when compared to prediction market data. Generally, prediction market data had a larger response to micro events and towards the end of the race correctly forecasted the future winner by a larger margin. The biggest contributor to prediction markets being able to forecast future winners with higher margins is its ability to aggregate information more quickly when compared to political polls.

More research can be done to understand how different individuals make different pricing decisions in prediction markets or how prices in prediction markets change throughout a given day. With individual trader data it would be possible to study if different demographic groups make different predictions or see if different groups are more sensitive to changes in contract prices when compared to others. With minute trading data it would be possible to understand on high volume trading days how volatile prediction market prices are. Through gaining more understanding of activity on high volume trading days it is more helpful to understand how timely prediction market data is.

Appendix

Figure 7e: Kamala Harris PredictIt and Real Clear Politics Results

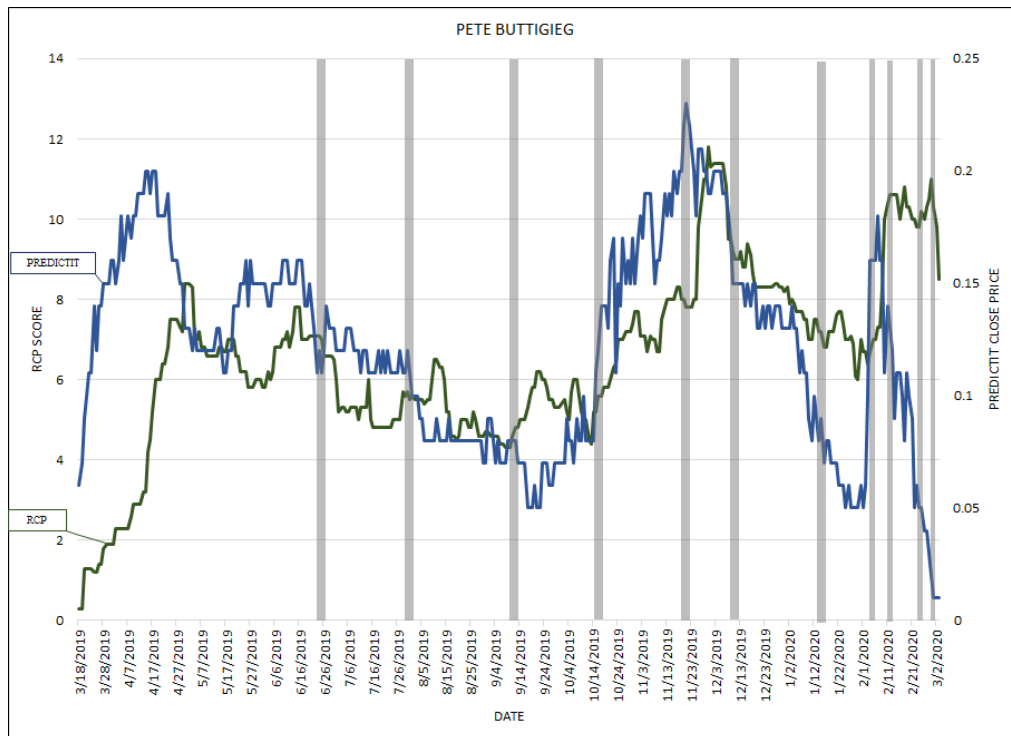Figure 7f: Pete Buttigeig PredictIt and Real Clear Politics Results

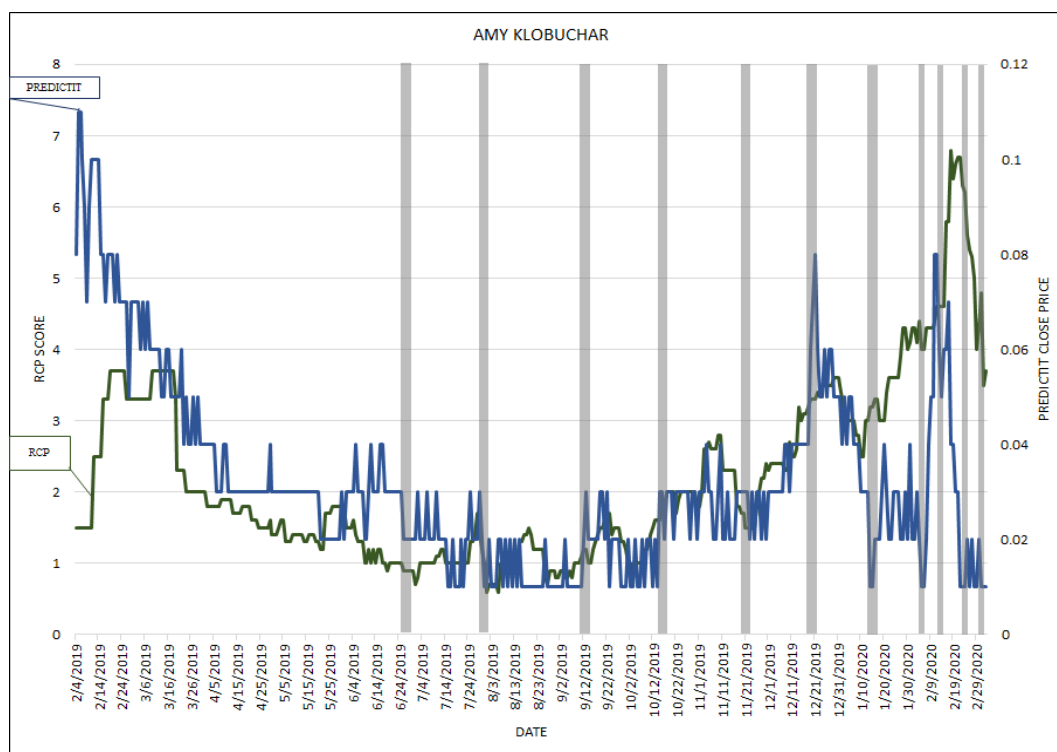Figure 7g: Amy Klobuchar PredictIt and Real Clear Politics Results

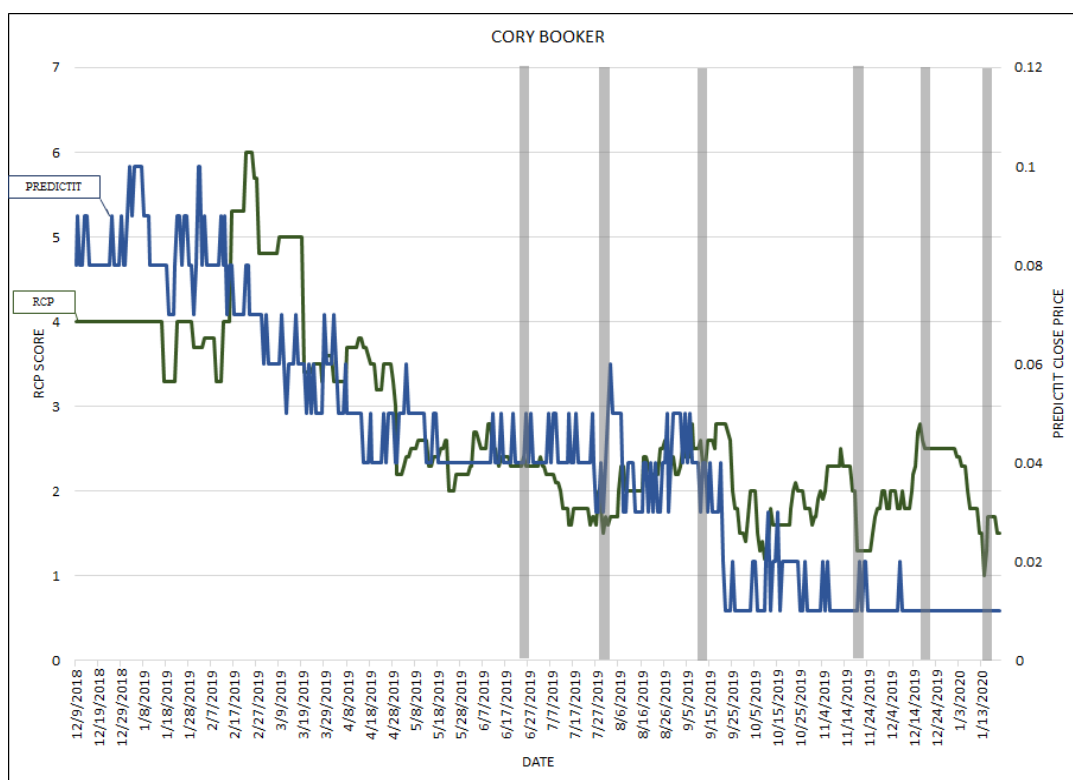Figure 7h: Cory Booker PredictIt and Real Clear Politics Results

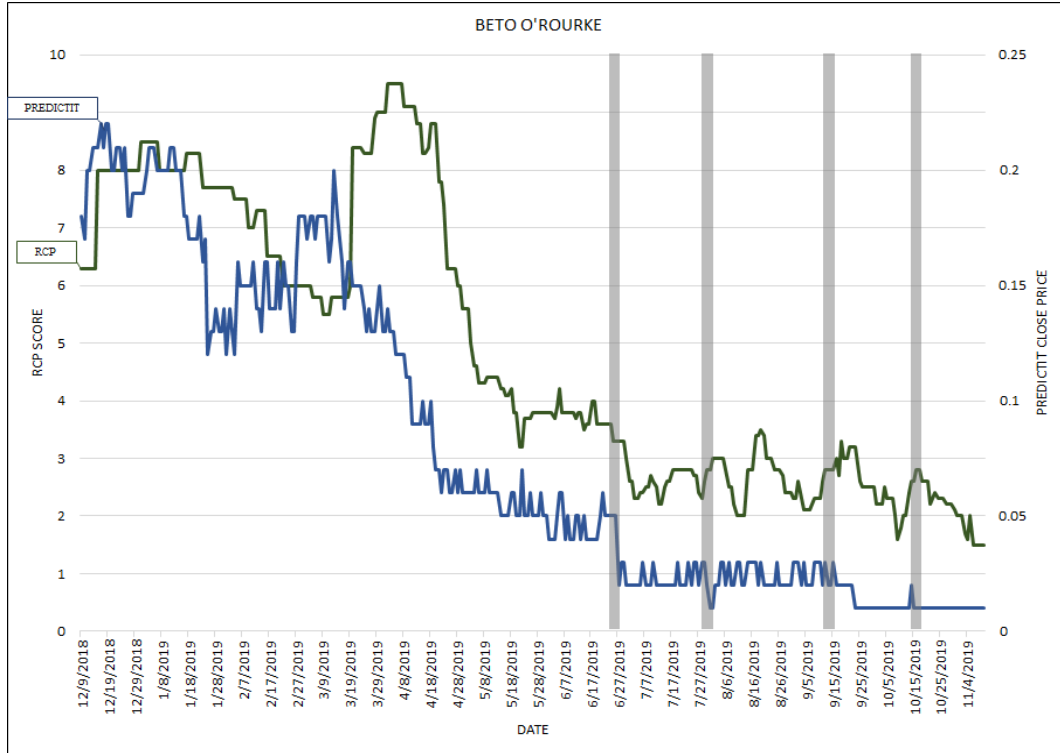Figure 7i: Beto O'Rourke PredictIt and Real Clear Politics Results

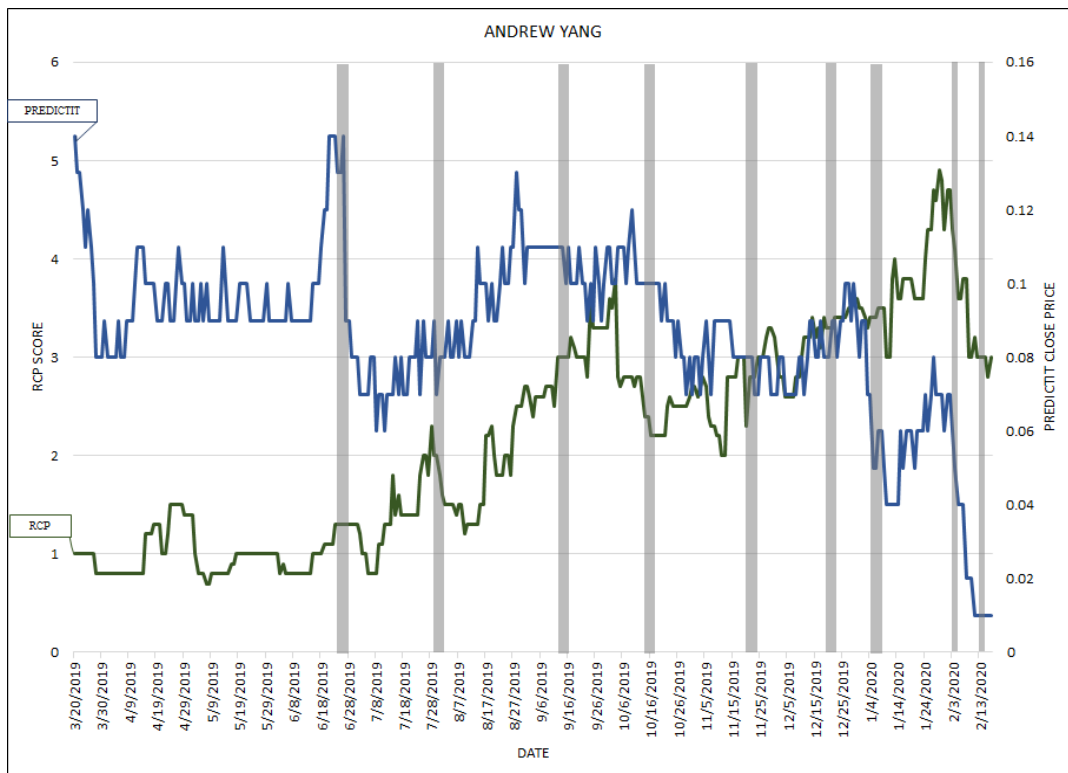Figure 7j: Andrew Yang PredictIt and Real Clear Politics Results

Figure 7k: Tulsi Gabbard PredictIt and Real Clear Politics Results
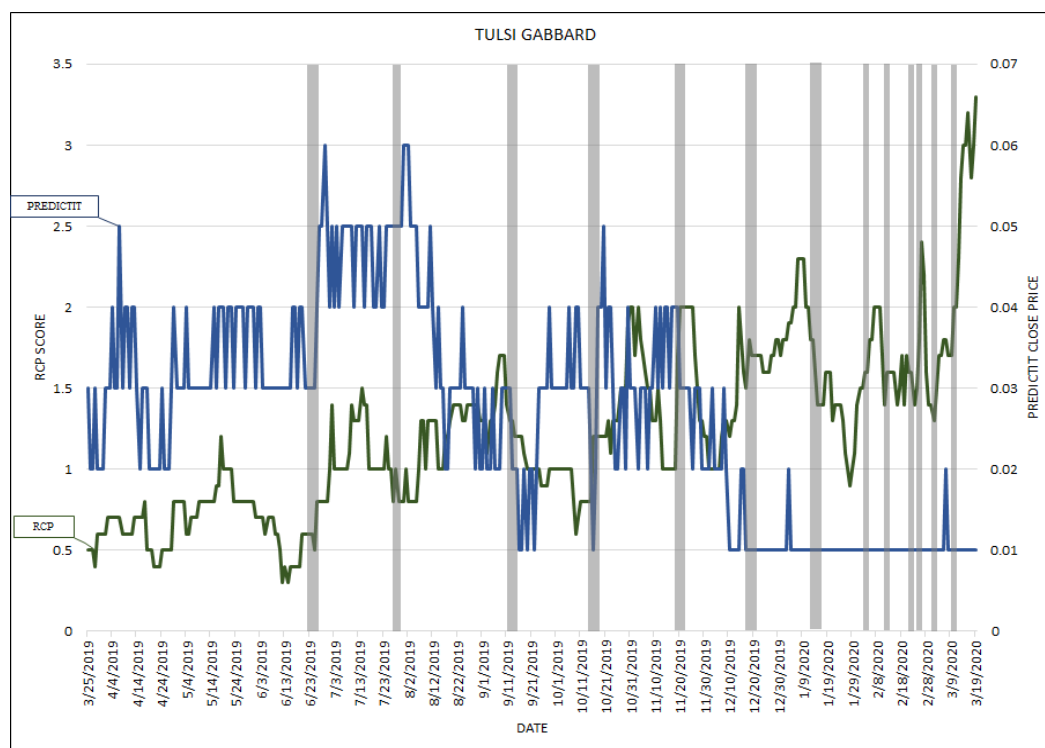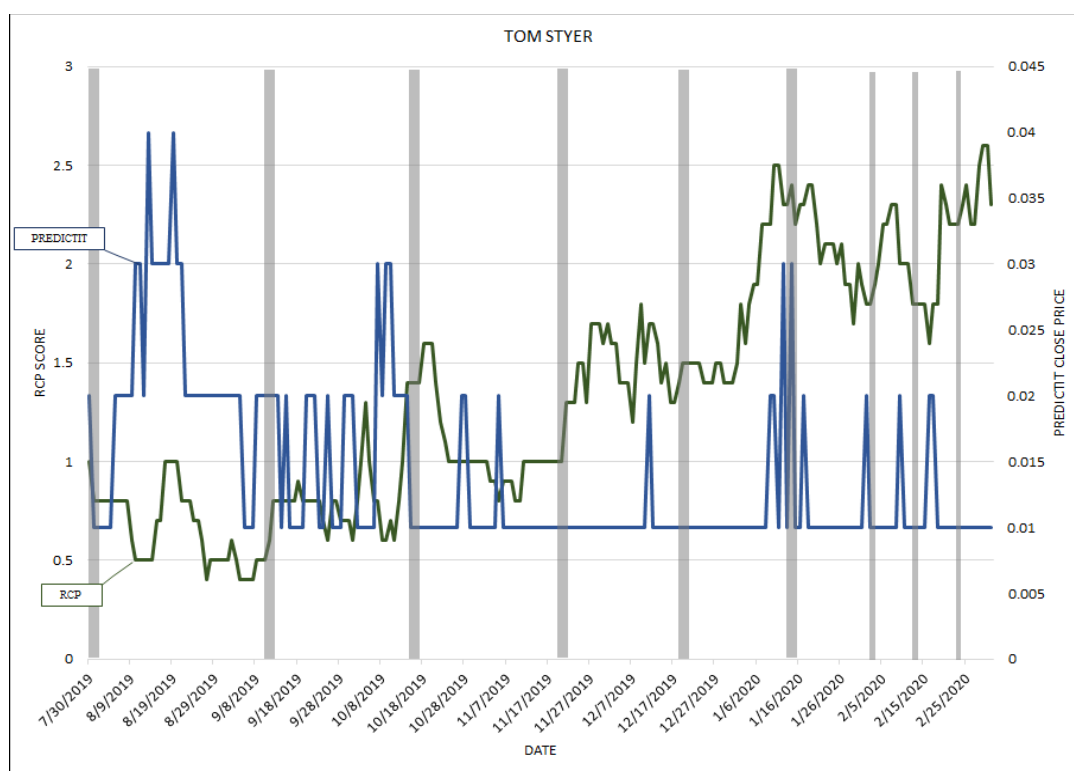

Figure 7l: Tom Syter PredictIt and Real Clear Politics Results

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