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Political Fear and Loathing on Wall Street: Electoral Risk Hedging in the United States (1986–2020)

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ABSTRACT

To the extent that asset prices are responsive to unexpected political events, hedging against election risk should be valuable to investors. This study uses option prices to investigate market expectations of electorally-induced financial risk in the United States between 1986 and 2020. The evidence reveals that the sensitivity of asset prices to U.S. national election outcomes is quite large, statistically significant, and varied substantially over time. A comparison between the electoral risk estimates (based on option prices) and the actual post-electoral volatility of stock market returns, indicates that hedging against election risk has become increasingly expensive over time. Finally, an examination of the 2016 presidential election suggests that options markets may provide more reliable estimates of electoral uncertainty than election forecasts based on public opinion polls and/or prediction markets.

Keywords: Political risk; elections; option prices; election forecasts

On the day of the 2020 U.S. presidential election, the Chicago Board Options Exchange (CBOE) Volatility Index – known as Wall Street's "fear gauge" – stood at 35.55, indicating that anxiety loomed large in the minds of investors. By the end of the week, however, it sank 30%, to 24.86. This drop in the index suggests that, despite president Trump's refusal to commit to a peaceful

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transfer of power, investors became less worried about politically-induced market turbulence after the election day had passed. It also reveals that the market had more than priced in political risk. The index uses as inputs the prices of financial derivatives, called options, that can be used to hedge or speculate on future price changes. The combination of high pre-election premiums and lower-than-expected post-electoral volatility – reflected in the index reversal– rendered selling, rather than buying, options a profitable trading strategy on the days surrounding the election.

Several studies have examined the impact of electoral outcomes on equity market valuations (Herron, 2000; Leblang and Mukherjee, 2004; Füss and Bechtel, 2008).[1] Most of this research, however, examines the effect of elections on *realized* changes in asset prices. I depart from this work by focusing on investors' *ex ante* beliefs that an election outcome will foster increased variability in asset prices. Options prices on an underlying security account for both its current price as well as the market's expectation of its risk (i.e. implied volatility) until the option's expiration. Therefore, it is possible to see if the market is pricing in "election risk" by comparing the expected increased volatility on dates passing through a national election to the average volatility expected for all other time periods.

The effect of pre-scheduled news releases on asset prices has been the object of extensive inquiry, including investors' reactions to (i) earning announcements (Patell and Wolfson, 1979 & 1981; Ederington and Lee, 1996; Dubinsky *et al.*, 2019); (ii) Federal Open Market Committee (FOMC) meetings (Chen and Clements, 2007; Vähämaa and Äijö, 2011; Gospodinov and Jamali, 2012); as well as (iii) monthly employment report, CPI report, and PPI report dispatches (Nikkinen and Sahlström, 2004). Similar to these events, national elections usually have a predictable schedule. In this case, an important source of uncertainty is the outcome, which is only revealed with certainty after the election concludes. As such, the impact of elections on option-implied volatility has also received scholarly attention. For instance, Gemmill (1992) documents that the implied volatility of the FTSE 100 index increased substantially before the 1987 British parliamentary election.[2] Goodell and Vähämaa (2013) and Mnasri and Essaddam (2021) examine the implied volatility of the S&P 500 around US presidential elections between 1992 and 2008. Langer and Lemoine (2020) employ equity options data and synthesized variance swaps to estimate the 2016 U.S. election outcome. Using cross-national data for the period 1990–2012, Kelly *et al.* (2016) show that one-month at-the-money (ATM) options whose lives span national elections tend to be more expensive than neighboring

[1] See Ferrara and Sattler (2018) for a recent survey of the political science research on the effect of politics on financial markets. See also Wisniewski (2016) for a survey of the literature on election risk in the fields of finance/economics.

[2] Gwilym and Buckle (1994) update Gemmill's analysis for the 1992 British parliamentary election.

ones. Finally, Carvalho and Guimaraes (2018) study the effect of the 2014 Brazilian presidential election on options prices of state-controlled companies.

I investigate the pricing of election risk in the United States for the period between 1986 and 2020. I assume that elections induce a predictably-timed "shock" to security prices. The anticipated size of this electorally-induced "jump" – which can be estimated from option prices– captures the impact of all valuation-relevant news associated with the resolution of the electoral uncertainty. While electoral outcomes may reveal a myriad of information – including the identity of the winning candidates, the potential for far-reaching policy changes associated with the distribution of political power (i.e. unified versus divided government), as well as whether a period without clear winner would ensue–, a high level of excess variance priced into options whose lives span a national election would imply that the election's outcome is perceived to be a large source of risk. Following Dubinsky *et al.* (2019), I exploit the term structure as well as the time-series behavior of the market's expectation of electorally-induced asset price changes to estimate *election risk*. The evidence shows that the sensitivity of asset prices to election outcomes is considerable, statistically significant, and varies over time. The results reveal that electoral price risk nearly doubled during the period between 2012 and 2020, relative to the 1986–2010 era. These findings suggest that hedging against election risk has become more expensive over time.

The empirical results raise the question of whether the electoral outcomes of the past decade warranted higher option prices. A comparison between the electoral risk estimates (based on option prices) and the actual post-electoral volatility of stock market returns, indicates that exposure to post-electoral price movements did not fetch a significant premium between 1986 and 2010. After 2010, however, the actual post-electoral price change amounts to 3.3% on average, while the average post-electoral price jump estimated from option prices is 5.34%. To further explore the profits that could be obtained from market expectations of electorally-induced financial turbulence, I consider the returns to different volatility trading strategies. The analysis reveals that in recent years option sellers had an opportunity to profit from investors' fears of large post-electoral price changes.

Finally, I discuss how options prices, rather than public opinion polls and/or prediction markets, can be used to make election forecasts. I illustrate the proposed approach by comparing the probabilities of a Trump victory in the 2016 presidential election estimated from public opinion polls, from prediction markets, and from S&P 500 option prices. My analysis reveals that throughout most of the final month before the election public opinion polls underestimated the probability of a Trump victory by an average of approximately 11 percentage points (17.8% compared to the 28.7% winning chance predicted by option prices). In the case of prediction markets, they not only severely underestimated a Trump victory before October 26th, 2016,

but the election forecasts based on this source of information exhibited a much larger variance that their option-based counterparts. Unlike most public opinion poll respondents and/or prediction markets' participants, who have very little skin in the game, option traders have strong incentives to accurately predict the election outcome. Option markets are also more transparent than polls, which can be subject to bias and manipulation. In addition, options markets are more liquid and can respond quickly to changes in the political landscape. Therefore, my findings suggest that options markets may provide more reliable estimates of electoral uncertainty than public opinion polls or even prediction markets.

The remainder of the paper is organized as follows. In Section "Election Outcomes and Asset Prices", I investigate how electoral risk is priced in the options market. In Section "Electoral Risk in the U.S.", I analyze electoral risk premiums in the United States during the period between 1986 and 2020. I examine the relationship between S&P option prices and electoral forecasts in Section ''Election Forecasts and Option Prices". A final section concludes.

Election Outcomes and Asset Prices

Options are a type of financial instrument that gives the holder the right, but not the obligation, to buy or sell an asset (such as stocks, commodities, or currencies) at a predetermined price within a specified time period. The buyer of an option pays the seller a certain sum, called the *premium*, in exchange for the rights granted by the option contract. If the difference between the underling security's price and the exercise price exceeds the premium, an option holder will turn a profit. Otherwise, the option will expire worthless, but the loss to its owner will be limited to the premium paid.

The premium serves as compensation to the option seller for taking on the risk associated with the option contract. It also provides the opportunity for investors to make potential profits by taking advantage of price movements in the underlying asset. Therefore, options prices reflect both the current price of a security as well the market's expectation of its risk (i.e. implied volatility) until the option's expiration. If we are concerned about the risk of a particular event – such as an impending election whose actual outcome is not yet known–, it would be possible to see if the market is pricing in "extra" risk by looking at changes in the security's implied volatility before and after the event. A high level of excess variance priced into options expiring around the time of the election would imply both that the outcome of the election is expected to have an effect on the value of the underlying security, and that the election is perceived to be a source of risk.

Option prices are determined by various factors, including the current price of the underlying asset, the strike price (the predetermined price at which

the option can be exercised), the time remaining until the option's expiration, the volatility of the underlying asset's price, and the risk-free interest rate. The Black-Scholes model takes these factors into account to calculate the fair value or theoretical price of an option.[3] Consider an extension of the Black-Scholes model with a single price jump occurring immediately after new information associated with the election outcome is revealed. Suppose that equity prices are log-normally distributed, and that the electorally-induced shock to equity prices is normally distributed with a volatility of $\sigma_e^{\mathbb{Q}}$ (where $\mathbb{Q}$ is the risk-neutral probability). The price of a European call with strike K and maturity T is given by

$$C(t, S_t) = C_{BS}\left(T - t, S_t; \sqrt{\sigma^2 + \frac{(\sigma_e^{\mathbb{Q}})^2}{T - t}}, K, r\right), 0 \leq t < T_e \tag{1}$$

where $C_{BS}(\tau, S; \sigma, K, r)$ represents the usual Black-Scholes formula with time to maturity τ and spot price S, and T_e is the first trading day after the election outcome is revealed.[4]

Figure 1 shows the expected price changes of the S&P 500 index in a window of seven trading days centered on the 2020 United States presidential election (October 29th-November 6th).[5] The solid black line shows the implied volatility for options expiring closer to the election date, while the dotted black line corresponds to those maturing at a later date.[6] The ordinate values represent the size of a one standard deviation move of the S& P 500 index over the remaining life of the options in annual percentage terms. So, for example, the options included in the calculation of the near-term implied volatility had three days until expiration. Their implied volatility of 56% means that option

[3]The model assumes that markets are efficient and that the price of the underlying asset follows a certain pattern called geometric Brownian motion. It also assumes there are no transaction costs or restrictions on trading, and that investors can borrow and lend at the risk-free interest rate.

[4]*European* options can only be exercised on the expiration date. *American* options can be exercised anytime before as well as on the expiration date.

[5]The days are identified in the horizontal axis as 3, −2, −1, 0, 1, 2, 3, with day zero denoting the trading day immediately before the election outcome is revealed (i.e. November 3rd, election day).The implied volatility (expressed as a percentage) corresponds to at- and out-of-the-money puts and calls with more than 2 days and less than 9 days to expiration.

[6]The data on shorter-dated options come from the near term SPX option series (VSTN) used by the Chicago Board Options Exchange (CBOE) to calculate their 9-Day Volatility Index (VIX9D). These include PM-settled weekly SPX options expiring on Friday November 6th, 2020 and on Friday November 13th, 2020. For the options maturing at a later date, I use the CBOE's S&P 500 far-term 9-Day Volatility Index (VSTF). In this case, the options used in the calculations include PM-settled weekly SPX options expiring on Friday November 13th, 2020 and on Friday November 20th, 2020. For more details, see https://www.cboe.com/us/indices.

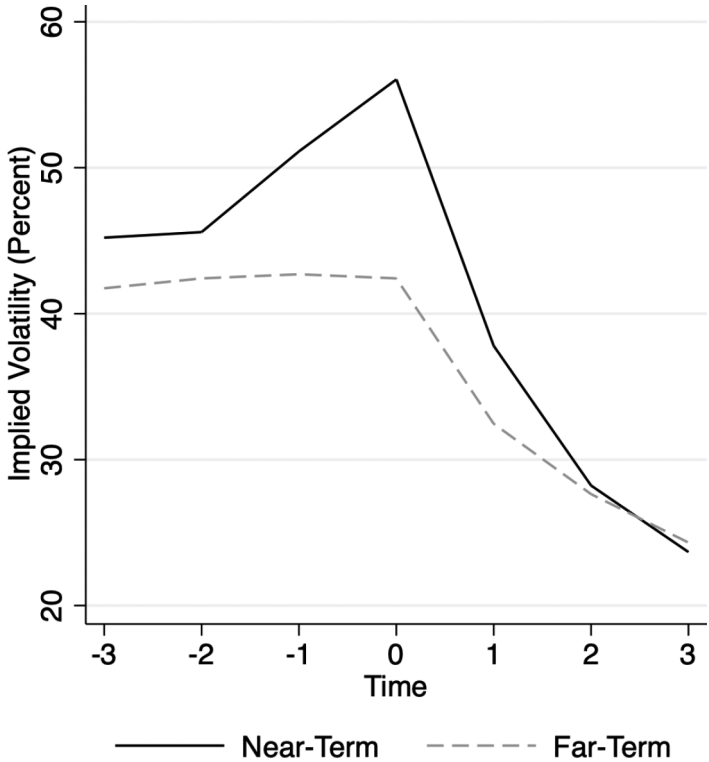

Figure 1: Option-Implied S&P Volatility: 2020 U.S. National Election.

traders were expecting the S&P 500 to have a daily change of at least 6% in one out of the three remaining days in the options' lives.[7]

The graph reveals that the option-implied volatility associated with the near-term contracts increased rapidly from 45.2% to over 56% as time approached the election. However, once the election outcome was revealed – and its effects were assimilated into stock prices–, the annualized implied volatility dropped significantly to 37.8% (and subsequently to 23.7%). Likewise, the implied volatility associated with the options maturing at a later date stood at 42.22% on November 3, 2020, but fell to 24.32% three days later.

[7]The VIX is reported as an annualized number. Because volatility is statistically defined as the square root of variance, the 3-day volatility implied by index can be calculated by dividing its level by the square root of 84 (there are 84 3-day periods in a year of 252 trading days). One would expect that approximately 68.2% of the time until expiration (one standard deviation), the daily change in the S&P 500 index would be 6% or less and 31.8% of the time it would be 6% or more.

Given the price formula in Equation (1), the implied volatility can be expressed as the deterministic function:

$$I(t;K,t) = \begin{cases} \sqrt{\sigma^2 + \frac{(\sigma_e^{\mathbb{Q}})^2}{T-t}} & \text{if } 0 \leq \text{t} < T_e \\ \sigma & \text{if } T_e \leq t < T, \end{cases} \tag{2}$$

where σ is the diffusive volatility, and $\sigma_e^{\mathbb{Q}}$, captures the anticipated size of the electorally-induced price "jump" under risk neutrality. A sample analog of $\sigma_e^{\mathbb{Q}}$ in Equation (2) can be empirically estimated using options of different maturities (i.e. the term structure), as well as the post-electoral decrease in the implied volatility (i.e. the time-series) (Leung and Santoli, 2014; Dubinsky *et al.*, 2019).[8]

In the case of the U.S. illustrated in Figure 1, new information associated with the election outcome did not materialize until after market close on November 3, 2020. On that date, the implied volatility of the S&P 500 index options expiring in 3 and 10 days was 56.06% and 42.42%, respectively, implying that the market anticipated a price "jump" of approximately 4.52% in response to the election outcome. With regard to the post-electoral decrease in the implied volatility, the near-term option fell to 37.8% on November 4, 2020. This drop in implied volatility implies that options were pricing a post-electoral price change in the S&P 500 index of approximately the same size (4.51%).

Electoral Risk in the U.S.

To examine the impact of national elections on asset prices in the United States I rely on changes in implied volatility around elections using various indexes developed by the CBOE. For example, its VIX index provides a 30-day expectation of volatility given by a weighted portfolio of out-of-the-money European options on the S&P 500. While the VIX index is reported for a 30-day maturity, the formulas used to calculate its value are valid at any horizon. In addition, the CBOE uses the same methodology to compute volatility indexes on broad-based stock indexes, exchange traded funds, as well as individual stocks and commodities.[9] For each of these indexes, the sample is restricted by CBOE data availability. For instance, the S&P 500 9-Day Volatility Index (VIX9D) starts on January 4th, 2011. Nonetheless, the price history for the S&P 30-day index is available from January 2nd, 1986 to the present. Therefore, it is possible to examine electoral price risk for national elections in the United States between 1986 and 2020.

[8] See Online Appendix A for further details.

[9] For the technical details on the calculation of the VIX index, please see the CBOE VIX white paper: https://cdn.cboe.com/resources/vix/vixwhite.pdf.

Note that, as illustrated in Equation (2), using two options with identical maturity would not allow one to estimate the diffusive volatility and the electorally-induced price jump separately, but only the aggregate value $\sigma^2 + \frac{(\sigma_e^{\mathbb{Q}})^2}{T-t}$. Unfortunately, the coverage of the CBOE volatility indexes that distinguish between short- and far-dated options is limited to the national elections that took place between between 2004 and 2020. Therefore, the analysis in this section is based on electorally-induced price jumps estimated using the post-electoral decrease in implied volatility. Specifically, let σ_{IV,t_1} and σ_{IV,t_2} represent the implied volatilities of two options at times t_1 and t_2, with identical maturity at time T. Assuming that the election outcome is revealed after the close on date t_1 (or before the open on the next trading date, t_2), then applying Equation (2) and solving for $\sigma_e^{\mathbb{Q}}$, the electorally-induced price jump is given by:

$$\sigma_e^{\mathbb{Q}} = \sqrt{(T-t)(\sigma_{IV,t_1}^2 - \sigma_{IV,t_2}^2)}. \tag{3}$$

From Equation (3), it is clear that the estimator is well-defined as long there is a decrease in the implied volatility between the day of the election and the following day. An empirical examination reveals that the hypothesis of a post-electoral decrease in implied volatility is sometimes violated. These cases are thus excluded from the analysis.

Table 1 provides the estimated electoral-induced price "jumps" for different asset classes. Jensen's inequality implies that the average of the standard deviations is less than the square root of the average. Therefore to be conservative, and following Dubinsky *et al.* (2019), I average the estimators in volatility units. I report summary statistics over the sample period from 1986 to 2020, including the average (Mean), and the standard error (SE) of all observations without errors. The column Error counts the number of elections on which the estimator is not defined. The last column provides the number of elections under consideration (Obs.). The empirical evidence indicates that national elections in the United States have a statistically significant effect on diversified portfolios, including those offering exposure to stocks in Emerging Markets (MSCI EEM), as well as specific asset classes (such as oil or gold). Using the Wilcoxon signed-rank test, the null that large post-electoral price moves are not priced in options can be rejected for most cases. The two exceptions (marked in grey) are given by the 30-day S&P 500 between 1986-2010, and the MSCI EAFE that provides exposure to companies in Europe, Australia, Asia, and the Far East.

The results also reveal that the sensitivity of asset prices to election risk is also economically important. To place these estimates in context, consider the S&P 500 intra-day returns between 1986 and 2020 (excluding the day immediately after a national election). Their mean value was 0.04%, with a standard deviation of 1.16%. The estimated post-electoral price change is substantially higher, with a variance ratio larger than six, on average. A simple value at risk (VAR) calculation indicates that the probability that

Table 1: Electoral Price Risk, 1986–2020.

All Elections						
Index	Maturity	Mean	S.E.	Error	Obs.	Period
S&P 500	30-day	2.99	0.41	6	12	1986–2020
S&P 500	30-day	2.37	0.31	5	8	1986–2010
S&P 500	30-day	4.25	0.81	1	4	2012–2020
S&P 500	9-day	4.37	0.82	1	4	2012–2020
Russell 2000	30-day	3.81	0.65	1	5	2010–2020
DJIA	30-day	3.72	0.59	1	5	2010–2020
NASDAQ-100	30-day	3.72	0.69	1	5	2010–2020
MSCI EAFE	30-day	3.13	0.63	3	4	2008–2020
MSCI EEM	30-day	4.59	0.53	2	3	2012–2020
Crude Oil ETF	30-day	3.79	0.84	1	5	2010–2020
Gold ETF	30-day	2.88	0.26	1	5	2010–2020
Presidential Elections Only						
S&P 500	30-day	3.64	0.56	3	6	1988–2020
S&P 500	30-day	2.81	0.27	2	4	1986–2010
S&P 500	30-day	5.31	0.42	1	2	2012–2020
S&P 500	9-day	5.57	0.11	1	2	2012–2020

a hypothetical USD 100 investment in the S&P 500 would lose more than USD 3 in a single day during this period was roughly 1.2%. The evidence in Table 1 also reveals that electoral risk varied substantially over time, ranging from 2.37% between 1986 and 2010 to approximately 4.25% during the 2012-2020 period, respectively. In addition, the average electoral risk is higher for presidential, rather than congressional races.

The cases where the hypothesis of a post-electoral decrease in implied volatility is violated deserve more scrutiny. As Dubinsky *et al.* (2019) note, event-induced jumps are harder to identify during low volatility regimes, as well as when the level of volatility-of-volatility is high. Two of the elections where the estimator is not defined (1994 and 2012) took place during low-volatility periods. In both cases, the VIX in the month prior to the election was below 17%. In contrast, the 2008 election took place in an overly volatile environment originated in the global financial crisis.

The estimator calculated using options of different maturities is less sensitive to different volatility regimes. As noted above, the electorally-induced price jump cannot be calculated in this way prior to 2004 due to data restrictions. Nonetheless, it is possible to do it for the 2008 and 2012 elections. In these cases,

the market anticipated an electorally-induced price "jump" of approximately 3.26% and 2.5%, respectively. Two of the remaining three elections where the time series estimator is not defined – and the term structure estimator cannot be calculated due to lack of data –, correspond to the 1990 and 2002 midterm elections. In both cases, there were no significant changes in the composition of Congress. It is thus possible that market participants did not anticipate that a sizeable electorally-induced price "jump" would take place. The third one corresponds to the 2000 presidential election. Given that in this case, the electoral uncertainty was not immediately resolved, it is not surprising that the implied volatility did not significantly decreased the day after the election.

Electoral Volatility and Risk Premiums

The evidence presented in the previous section indicates that election risk in the United States is often priced by the option market. The findings also reveal that, in the last decade, insuring against election risk has become more expensive. An important question is whether the electoral outcomes of the past ten years warrant the higher option prices. If options market participants correctly forecast the magnitude of the post-electoral price changes, then no significant difference between the expectation of future realized variance under the risk-neutral measure and the expectation under the physical measure should exist. Otherwise, a discrepancy between them would indicate that investors demand a premium for bearing the electoral risk of an option position (Bollerslev *et al.*, 2009).

How much compensation did investors require in the form of electoral risk premium? A comparison between the option-implied electoral risk estimate ($\sigma_e^{\mathbb{Q}}$) and the realized post-electoral volatility of returns can shed some light on this question. Following Dubinsky *et al.* (2019), I compute the expected 1-day volatility derived from option prices by adding to the post-electoral jump volatility the 1-day's diffusive volatility, and compare it to the realized volatility (measured as squared returns). In the case of the S&P 500, the average actual jump (3%) is indistinguishable from the average estimated post-electoral jump for the 1986–2010 period. After 2010, however, the average actual jump amounts to 3.3%, while the average estimated post-electoral jump is 5.34%, implying an average risk premium of roughly 204bps.

Variance Swap Returns

The post-2010 electoral risk premiums suggest that option traders had an opportunity to profit from investors' fears of large electorally-induced price movements. To further examine this issue, I analyze S&P 500 variance swap returns between 2011 and 2020. A variance swap is an instrument which

allows investors to trade future realized (or historical) volatility against current implied volatility (see Online Appendix B for more details).

Selling a variance swap will be profitable if the market delivers less realized volatility than that implied by the option's exercise price. It can thus be likened to selling insurance, with a steady income punctuated with occasional large drawdowns. Conversely, the buyer of a variance swap will profit if the subsequent realized volatility is above the level set by the option's exercise price.[10] Therefore, buying a variance swap is like buying insurance: paying a relatively small premium for a potentially large payout if things go wrong, but expecting to forfeit some, or all, of the premium on most occasions. Given these insurance-like characteristics, long volatility positions on an underlying index (such as the S&P 500) are usually biased to make a loss, while short volatility positions are, on average, profitable. This bias is referred to as the volatility risk premium.[11]

I am interested in the reward required by a risk averse investor for being exposed to the post-election jump risk. Most market participants think in terms of volatility. Therefore, the profit/loss of holding a variance swap is usually expressed in *vega notional*, which represents the average profit or loss for a 1% (1 vega) change in volatility.[12] Following Kelly *et al.* (2016), I compare the payoffs of variance swap contracts in a "treatment" group to those in two neighboring "control" groups. The first group contains contracts whose expiration includes the day when the outcome of a national election is revealed. The latter two consist of contracts initiated around elections, but whose expiration excludes that date. Denoting the trading day immediately following the election day as $t = 1$, the treatment group includes the payoffs of contracts, $p_{\tau,m}^{Treat}$ initiated at time $\tau \in \{-m - t < \tau < t\}$. The pre-treatment group includes the payoffs of contracts, $p_{\tau,m}^{Pre}$ initiated at time $\tau \in \{-2m - t < \tau < -m\}$, and the post-treatment group is consists of the payoffs of contracts, $p_{\tau,m}^{Post}$ initiated at time $\tau \in \{t - 1 < \tau < m + 1\}$. While the contracts in each of these groups have different expiration dates, all of them have the same time to maturity. Therefore, the average payoffs for each of these groups are fully comparable.

Extensive data on quoted prices for S&P 500 variance swaps across multiple national elections are difficult to obtain. But, the VIX index is equal to the

[10]Variance swaps, however, are convex in volatility: a long position profits more from an increase in volatility than it loses from a corresponding decrease.

[11]If an investor has a long position, it means that the investor has bought and owns the variance swap. If the investor has a short position, it means that the investor sold the variance swap to someone else.

[12]So, for instance, suppose a 9-day variance swap is stuck at 20 with a vega notional of USD 100. An investor holding a long position will be delivered the difference between the realized variance over the next seven trading days and the current strike price, multiplied by the variance notional. If the index only realizes 15%, the payoff will be equal to $100 \times \frac{15^2 - 20^2}{40} = -437.5$, a loss of 4.375 vegas.

square root of a variance swap on its underlying, the S&P 500. Therefore, variance swap strikes can be easily inferred from VIX levels. To minimize the presence of contaminating information, I restrict my attention to a small window around each electoral contest. Specifically, I use the CBOE 9-Day Volatility Index (VIX9D), which is based on the entire strip of option contracts, as a proxy for the prices of variance swaps on the S&P 500 that mature in seven trading days.[13] Because the VIX tends to trade slightly above variance swap prices, and to account for capped variance swaps (which usually trade below uncapped variance swaps), I estimate the variance swap strike prices at 175bps below the VIX9D. Using these estimated values, and the sum of squared daily log returns of the S&P 500, I calculate the payoffs $p_{\tau,m}$ for the variance swaps contracts included in the "treatment" group as well as the two neighboring "control" groups.

Figure 2 shows the average profit/loss (p/l) of long variance swap contracts initiated around the five national elections that took place in the United States between 2011 and 2020. The vertical axis displays the the average p/l of the variance swap contracts, expressed in terms of vega notional. The contract initiation dates, τ, are shown in the horizontal axis, with day one denoting the trading day immediately after a national election. Therefore, while the calculation of payoffs of contracts initiated at $-8 < \tau < 1$ (treatment group) includes price changes in the S&P 500 on the day when the election outcome is revealed, contracts initiated outside of that window (control groups) do not. The solid circles, connected by a black line, indicate the average p/l of contracts in the treatment group, whereas the p/l of the contracts in the control groups are represented by the hollow circles, connected by a grey line. For reference, the average p/l of long variance swaps of in the full sample (excluding the three-weeks window around national elections used to calculate the average payoffs in treatment/control groups), -1.63, is represented by the horizontal dashed grey line.

The evidence reveals that the average loss of long variance swap contracts with an expiration date immediately preceding the resolution of electoral uncertainty (i.e. initiated at $\tau = -6$) was -3.19, compared to -4.31 for a similar variance swap initiated the day after. Likewise, the average loss of long variance swaps initiated the day when the election outcome was revealed (i.e. $\tau = 1$) was -5.96, compared to -7.14 for a similar one initiated the day before. This loss of roughly one additional vega (illustrated by a dotted grey line) represents the average exposure to the election outcome. The evidence also indicates that the bias of long volatility positions on the S&P 500 in the treatment group were larger (i.e. the expected returns from receiving the fixed rate in variance swaps were more negative), compared to variance swaps in

[13]The CBOE uses calendar days rather than trading days in the VIX calculations, thus the discrepancy between 9 and 7 days.

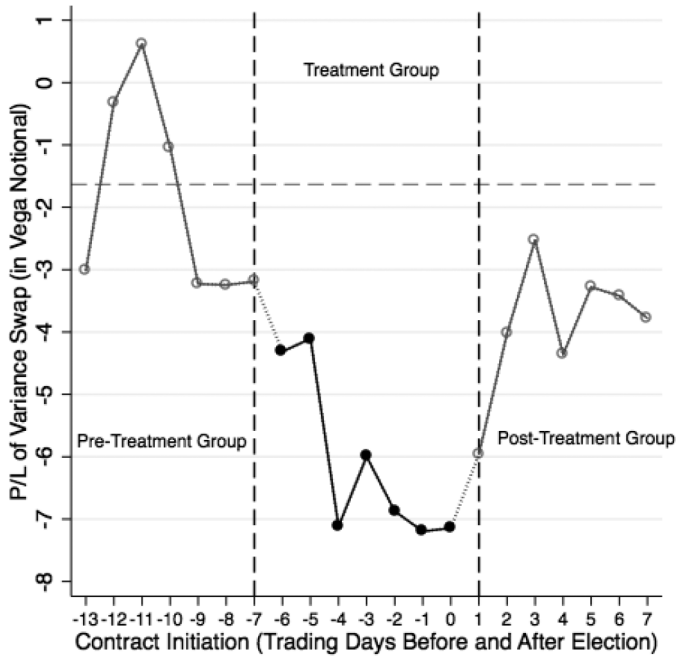

Figure 2: P/L of Long Variance Swap Contracts around Elections, 2012–2020.

the control groups. This electoral volatility risk premium (EVRP) can be calculated as:

$$EVRP = \overline{p_{\tau,m}^{Treat}} - \frac{1}{2}(\overline{p_{\tau,m}^{Pre}} + \overline{p_{\tau,m}^{Post}}), \tag{4}$$

where $\overline{p_{\tau,m}^{Treat}}$, $\overline{p_{\tau,m}^{Pre}}$, and $\overline{p_{\tau,m}^{Post}}$ are averages of the payoffs associated with the variance swap contracts included in the treatment, pre-treatment, and post-treatment groups, respectively. The average EVRP across all five elections amounts to -3.17 (t-statistic $= -3.49$), indicating that variance swap holders were willing to pay a larger premium to hedge against electoral price risk during the 2011–2020 period. This finding is not only statistically but also economically significant. Selling volatility has historically been profitable; but selling *electoral* insurance in the past 10 years has been even more lucrative, raking in more than six times the variance swap contract's vega notional.

Electoral Volatility Trading

The returns from long variance positions – which are typically negative– should increase in absolute terms (i.e. they should be even more negative) whenever variance swap strike levels are excessively high. To further probe into the

expensiveness of options around elections, following Gao, Xing, and Zhang (2018), I look at the profitability of a *strangle*. This is a trade that involves combining a put and a call on the same asset, with different exercise prices – not necessarily at-the-money – and time to maturity.[14] The strategy is particularly appealing when one expects a security or an entire index to make a large move following an event, but one is unsure about the direction of this move. National elections fit this description very well. They are recurring, have a predictable schedule, and have the potential to trigger large price movements. It is often difficult, however, to predict the direction of the movement.

Suppose someone considers that option prices are overestimating the magnitude of a post-electoral price movement. She could then write a strangle (i.e. sell both calls and puts) ahead of the election to capture the volatility premium impounded in option prices. Her profit will be limited to the total premiums received, whereas her potential loss will be unlimited if the price of the underlying asset rises, and substantial if it falls. Therefore, the strategy's success depends on the magnitude of price movement (regardless of its direction) and the change in implied volatility. If the option market had correctly priced the post-electoral price change, then she will likely lose money. In contrast, her position will be profitable if the price reaction of the underlying asset to the revelation of the election outcome is smaller than what is implied by the (combination of both) option prices.

I calculate average strangle returns around U.S. national elections for the period between 2006 and 2020 using the CBOE's VIX Strangle Index (VSTG). The index tracks the value of a hypothetical portfolio which overlays a short strangle of VIX options and a long VIX call on one-month Treasury bills.[15] I consider positions that are opened and closed over different windows around the election day. Based on the implied volatility dynamics around elections uncovered above, I focus on buy-and-hold strategies that cover the running up of electoral uncertainty until electoral uncertainty is partially or fully resolved. Specifically, the starting date is chosen on day −2, and the ending dates are either days 0, or 1, with day zero denoting the trading day immediately before the election outcome is revealed. So, for the strategy over [2,0], the VSTG index is bought on day −2 (the Friday before the election) and sold on election day (a 3-day holding period). In the strategy over [2,1], the VSTG index is

[14] In the case of a strangle, the exercise price of the put should be less than the exercise price of the call. When the put and the call have the same exercise price, the position is called a *straddle*.

[15] VIX options did not exist until 2006, so the VSTG is only available after March 21st, 2006. The short VIX put and call have strikes set at the 5th and 95th percentile values of the forward distribution of VIX. The long VIX call has a strike set at the 99th percentile. The number of capped short VIX strangles is set to ensure that 80% of the value of the portfolio at the previous rebalancing date is preserved. For more details on the calculation of the index, please go to: https://cdn.cboe.com/api/global/us_indices/governance/VSTG_Methodology.pdf.

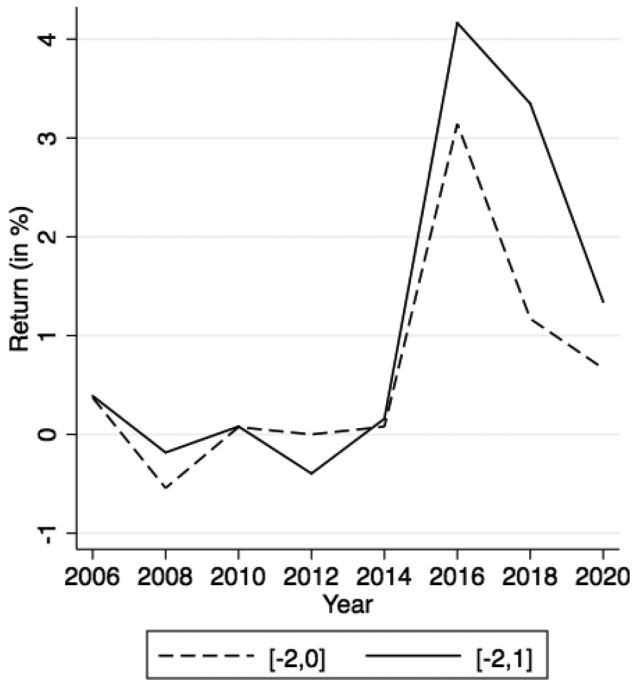

Figure 3: VSTG Index Returns, 2006–2020.

also bought on day −2 (the Friday before the election), but it is sold the day after the election day (a holding period of 4 days).

The distinction between the ending dates should capture two different effects around elections: the pre-electoral effect and the post-electoral one. The first effect is relevant for the strategy ending on day zero, which is strictly before election outcomes are revealed. The value of the VSTG index might increase before the election day due to electoral uncertainty (an unforeseen outcome). The second effect should capture the actual exposure to the election outcome. If the magnitude of the post-electoral price change is small enough, the strangle returns will be positive, leading to a further increase in the VSTG index.

Figure 3 shows the returns associated each of the two hypothetical VSTG trading strategies for all the national election held in the United States between 2006 and 2020. The dashed line corresponds to the strategy over [−2,0] (i.e. the pre-electoral effect), and the solid line to the strategy [−2,1] (i.e. the post-electoral effect). The average return of the [−2,0] strategy for the five elections that took place between 2006 and 2014 was −0.003%, compared to 1.66% (with a significant t-statistic of 2.84) for the three following ones (2016,

2018, and 2020). In the case of the [−2,1] strategy, the average four-day return for the five elections that took place in the 2006–2014 period was 0.01%, but rose to 2.95% (with a significant *t*-statistic of 4.60) thereafter. As a benchmark, the average return for a 3-day (4-day) holding period over all trading days (excluding the positions opened/closed around the election day) was 0.059 (0.088) between 2006 and 2014, and 0.001 (0.001) in the post-2014 period.

The post-2014 returns associated with the two hypothetical VSTG *electoral* trading strategies are both statistically as well as economically significant, indicating that option prices overestimated both electoral uncertainty as well as post-electoral price jumps in the last three U.S. national elections. In the former case, there is usually not much that the investment community does not already know in the final two days before the contest regarding the election's outcome. Nonetheless, as Figure 3 shows, while the option market slightly underestimated the likelihood of Barak Obama's victory in 2008, it significantly overestimated electoral uncertainty in the Trump era.

The difference between the returns to the VSTG [−2,1] strategy before and after the 2016 U.S. presidential election are even more pronounced. It is thus possible to compute difference-in-differences (DD) estimates of the post-electoral effect on VSTG returns. Before 2016, both strategies deliver similar returns (the average difference between the [−2,1] and [−2,0] strategies is 0.01% with a *t*-statistic of 0.11). In contrast, after the 2014 election, the average difference is 1.29% (with a *t*-statistic of 2.84) in favor of the [−2,1] strategy. These findings indicate that since 2016, investors have not only been concerned about electoral uncertainty (an unforeseen outcome), but also about the realization of extreme negative events (an undesirable outcome).

Election Forecasts and Option Prices

The analysis of long variance swaps' returns as well as short strangles' earnings yield two important results. First, selling protection against election risk has become increasingly profitable in recent years. Second, the source of those profits can be traced not only to electoral uncertainty, but also to investors' fears of large post-electoral price changes. In this section, I examine the relationship between S&P option prices and electoral forecasts.

Implied volatility can be interpreted as the market's expectation of the average return volatility over the life of an option contract. Consequently, semi-strong form efficiency requires that market participants correctly estimate how an anticipated news release will affect the valuation of asset prices. In the context of a presidential election, option prices should thus reflect all publicly available information regarding the election's outcome. Otherwise, a discrepancy between the option market and public opinion polls would indicate that electoral risk pricing is not informationally efficient.

The 2016 Presidential Election

As in Gemmill (1992), I rely on the simple one-step binomial pricing framework introduced by Cox *et al.* (1979) to analyze if S&P option prices were consistent with electoral forecasts in the 2016 U. S. presidential elections (see Online Appendix C for more details). According to Wolfers and Zitzewitz (2018), markets expected the S&P 500 to be worth around 11% less under President Trump than Clinton when U.S. markets closed on November 8th, 2016 (election day). At the same time, public opinion polls suggested only a 28.6% chance that Trump would win.

Were option prices consistent with the electoral forecasts? To answer this question, I calculate the probability of a Trump victory derived from option prices and compare them with Trump's winning probabilities according to public opinion polls. I place my focus in the closing month of the campaign; namely, the period between October 10th, 2016 and November 8th, 2016. I rely on the *Fivethirtyeight* election forecasts to obtain daily predictions of Trump's winning probabilities based on public opinion data.[16] Next, I estimate the daily values of the probability of a Trump victory derived from option prices using Equation (C2) in Online Appendix C. I rely on the VIX index to capture the market's expectation of S&P 500 returns' volatility. The index is reported for a 30-day maturity, so time to expiration (in years) is set to $\frac{30}{365} = 0.082$. Finally, as a proxy for the risk-free interest rate, I use the 1-Month U.S. Treasury par yields.[17]

The left panel of Figure 4 shows the probabilities of a Trump victory estimated from public opinion polls (dashed line) and from S&P 500 options (solid line) for the period between October 10th, 2016 and November 8th, 2016. The findings indicate that, in the closing days of the campaign the electoral forecasts based on public opinion data were consistent with option prices. Indeed, for the last three observations (Nov. 4-Nov. 8), the options' and polls' probabilities are almost identical. The information in opinion polls, however, was inconsistent with the behavior of option prices throughout most of the final month of the campaign. As noted above, market professionals were expecting a 11% decline in the S&P 500 if Trump won the election. The estimated values of the up and down move multipliers on election day (not shown), are 1.055, and 0.948, respectively. These figures imply that markets expected the S&P 500 to be worth roughly 10.7% less under President Trump than Clinton, which is very similar to the expected fall estimated by Wolfers and Zitzewitz (2018). Before November 4th, 2016, public opinion polls underestimated the probability of a Trump victory by an average of approximately 11 percentage points (17.8% compared to the 28.7% winning chance predicted by option prices).

[16] https://projects.fivethirtyeight.com/2016-election-forecast/.
[17] https://www.treasury.gov/resource-center/data-chart-center/interest-rates/.

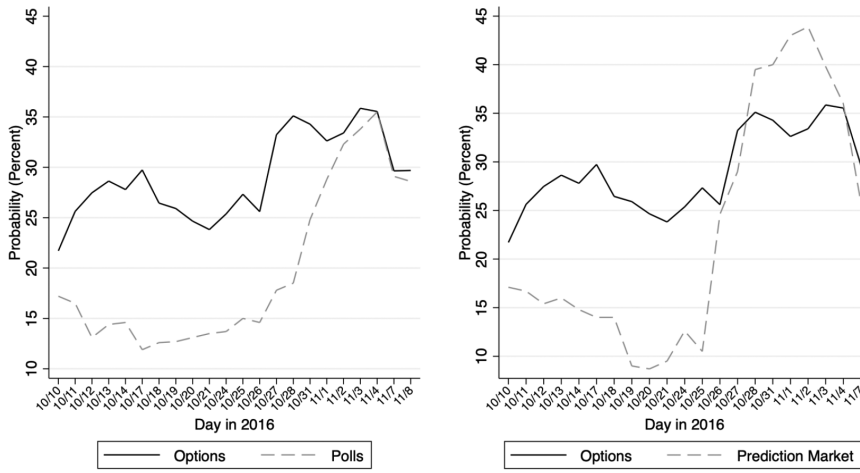

Figure 4: Probability of Trump Victory: 2016 U.S. Presidential Election.

The existing evidence shows that, when forecasting more than 100 days in advance, prediction markets significantly outperform public opinion polls in predicting U.S. election outcomes (Arrow *et al.*, 2008; Berg *et al.*, 2008). The right panel of Figure 4 shows the probabilities of a Trump victory estimated from S&P 500 options (solid line) and those calculated using data from the Iowa Electronic Markets (dashed line) for the period between October 10th, 2016 and November 7th, 2016.[18]

Once again, the contrast between the estimated probabilities of a Trump victory calculated using option prices rather than prediction markets is remarkable. While these probabilities were quite similar in the two trading days before the election, they displayed significant differences in the previous three weeks. Not only did prediction markets severely underestimated a Trump victory before October 26th, 2016, but the election forecasts based on this source of information also exhibited a much larger variance that their option-based counterparts.

The use of prediction markets in the United States has been greatly deterred due to Federal and state laws limiting gambling. As a result, current prediction markets – such as the Iowa Electronic Markets–, are only intended to provide results for academic research and limit bets to modest amounts. In the case of

[18]The Iowa Electronic Markets is a futures market run for research and teaching purposes. Traders can buy and sell real-money contracts based on their belief about the outcome of an election or other event. On election day, trading began at 12:00:01 am and ended at 11:59:59 pm, when the outcome of the election was already known. Therefore, I exclude November 8th, 2016 from the comparison presented in Figure 4. For more information go to https://iemweb.biz.uiowa.edu/.

the prices depicted in the right panel of Figure 4, the average daily volume was 880 dollars, or approximately 50 cents per contract. This lack of liquidity can reduce the accuracy of prediction markets as an information aggregation mechanism. In contrast, there is much more skin in the game in options markets than in polls or even prediction markets. Therefore, as Figure 4 shows, options markets may provide a more reliable estimate of electoral uncertainty.

Conclusions

A number of scholars have examined the impact of electoral outcomes on equity market valuations. Most of this work, however, focuses on the effect of electoral outcomes on realized, or *post-electoral*, changes in asset prices. This study shows that option prices can be used to investigate investors' ex-ante assessments of election risk exposure. Based on changes in option-implied volatility around national elections in the United States between 1986 and 2020, my findings indicate that hedging against election risk has become increasingly expensive over time.

The electoral risk premiums uncovered here are not only statistically significant, but they are also fairly large in economic magnitude. For example, selling a 9-day S&P 500 variance swap on election day in 2020 with a vega notional of USD 100,000 would have turned a profit of approximately USD 1,637,444. These findings are particularly noteworthy because they uncover the effects of political risk on asset prices as reflected by the option market. In contrast to many securities, option prices are closely tied down by arbitrage considerations. In addition, whereas trading in stocks and/or bonds has become increasingly common among retail investors, most of the option trading strategies examined in this study require a significant degree of financial experience, as well as considerable funding in terms of margins and collateral.

Given these high stakes, one would not expect election risk to be overestimated in the option market. Nonetheless, as the findings in this study show, the greater sensitivity of asset prices to electoral outcomes has led to a significant increase in how much investors have to pay to insure themselves against electoral risk. This rise in premiums, in turn, has allowed option traders to profit from selling protection against election risk.

References

Arrow, K. J., R. Forsythe, M. Gorham, R. Hahn, R. Hanson, J. O. Ledyard, S. Levmore, *et al.* 2008. "The promise of prediction markets". *Science*. 5878: 877–878.

Berg, J. E., F. D. Nelson, and T. A. Rietz. 2008. "Prediction market accuracy in the long run". *International Journal of Forecasting*. 24: 285–300.

Bollerslev, T., G. Tauchen, and H. Zhou. 2009. "Expected stock returns and variance risk premia". *The Review of Financial Studies*. 22: 4463–4492.

Carvalho, A. and B. Guimaraes. 2018. "State-controlled companies and political risk". *Journal of Public Economics*. 159: 66–78.

Chen, E.-T. (and A. Clements. 2007. "S&P 500 implied volatility and monetary policy announcements". *Finance Research Letters*. 4: 227–232.

Cox, J. C., S. A. Ross, and M. Rubinstein. 1979. "Option pricing: A simplified approach". *Journal of Financial Economics*. 7: 229–263.

Dubinsky, A., M. Johannes, A. Kaeck, and N. J. Seeger. 2019. "Option pricing of earnings announcement risks". *Review of Financial Studies*. 32: 646–687.

Ederington, L. H. and J. H. Lee. 1996. "The creation and resolution of market uncertainty". *Journal of Financial and Quantitative Analysis*. 31: 513–539.

Ferrara, F. M. and T. Sattler. 2018. "The political economy of financial markets". *Oxford Research Encyclopedias*. URL: https://doi.org/10.1093/acrefore/9780190228637.013.628.

Füss, R. and M. M. Bechtel. 2008. "Partisan politics and stock market performance: The effect of expected government partisanship on stock returns in the 2002 German federal election". *Public Choice*. 135: 131–150.

Gao, C., Y. Xing, and X. Zhang. 2018. "Anticipating Uncertainty". *Journal of Financial and Quantitative Analysis*. 53: 2587–2617.

Gemmill, G. 1992. "Political risk and market efficiency: tests based in British stock and options markets in the 1987 election". *Journal of Banking & Finance*. 16: 211–231.

Goodell, J. W. and S. Vähämaa. 2013. "US presidential elections and implied volatility: The role of political uncertainty". *Journal of Banking & Finance*. 37: 1108–1117.

Gospodinov, N. and I. Jamali. 2012. "The effects of Federal funds rate surprises on S&P 500 volatility and volatility risk premium". *Journal of Empirical Finance*. 19: 497–510.

Gwilym, O. A. and M. Buckle. 1994. "The efficiency of stock and options markets: tests based on 1992 UK election opinion polls". *Applied Financial Economics*. 4: 345–354.

Herron Michael, C. 2000. "Estimating the economic impact of political party competition in the 1992 British election". *American Journal of Political Science*. 44: 326–337.

Kelly, B., L. Pástor, and P. Veronesi. 2016. "The price of political uncertainty: Theory and evidence from the option market". *The Journal of Finance*. 71: 2417–2480.

Langer, A. and D. Lemoine. 2020. "What Were the Odds? Estimating the Market's Probability of Uncertain Events". *NBER Working Papers 28265, National Bureau of Economic Research*.

Leblang, D. and B. Mukherjee. 2004. "Presidential elections and the stock market". *Political Analysis*. 12: 296–322.
Leung, T. and M. Santoli. 2014. "Accounting for earnings announcements in the pricing of equity options". *Journal of Financial Engineering*. 1: 1–46.
Mnasri, A. and N. Essaddam. 2021. "Impact of US presidential elections on stock markets? volatility". *Finance Research Letters*. 39: 101622–.
Nikkinen, J. and P. Sahlström. 2004. "Impact of the federal open market committee's meetings and scheduled macroeconomic news on stock market uncertainty". *International Review of Financial Analysis*. 13: 1–12.
Patell, J. M. and M. A. Wolfson. 1979. "Anticipated information releases reflected in call option prices". *Journal of Accounting and Economics*. 1: 117–140.
Patell, J. M. and M. A. Wolfson. 1981. "The ex ante and ex post price effects of quarterly earnings announcements reflected in option and stock prices". *Journal of Accounting Research*. 1: 434–458.
Vähämaa, S. and J. Äijö. 2011. "The Fed's policy decisions and implied volatility". *Journal of Futures Markets*. 31: 995–1010.
Wisniewski, T. P. 2016. "Is there a link between politics and stock returns? A literature survey". *International Review of Financial Analysis*. 47: 15–23.
Wolfers, J. and E. Zitzewitz. 2018. "The "Standard Error" of Event Studies: Lessons from the 2016 Election". *AEA Papers and Proceedings*. 108: 584–589.