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WHAT CAN WE LEARN FROM FINANCIAL MARKET RESPONSES TO THE 2016 ELECTION?‡

The "Standard Error" of Event Studies: Lessons from the 2016 Election†

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The 2016 election offers an unusually stark warning about the limitations of event studies. A tumultuous election campaign yielded several events that sharply altered the odds of a Trump presidency. Each provides an ideal case for event study methods, as each occurred in narrow windows with few plausible confounders. And in each case, the aggregate stock market responded sharply, falling if an event raised the probability of Mr. Trump winning the election, and rising if it reduced his chances. Careful application of event study methods suggest that the market was responding as if stocks would be worth around 13 percent less under a Trump presidency.

And indeed, as early returns trickled in on election night, overnight futures markets fell sharply on news that Mr. Trump might win. But as the reality of a surprise Trump presidency set in, the market reversed course, recovering almost all of its loss by US market opening and closing up on the day after the election. As far as we can tell, post-election news was insufficient to explain this re-evaluation. It appears that the market responded to this event—the election of President Trump—quite differently to how the market had thought it would respond.

This case study points to instability in the market's expectation of the effects of an event. It vividly illustrates a distinction between the internal and external validity of an event study. The statistical methods used to do inference in event studies focus on internal validity, assessing the precision with which the estimate accurately captures the market's response to a piece of news. But most policy-relevant applications rely on external validity, which asks the deeper question of whether the event study captures the market's rational expectation about the effect of the event. As the instability of the market expectations of the effect of Trump's election illustrates, for many applications, the stability of the parameter being estimated is potentially as important as the precision with which it is estimated.

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I. Pre-Election Event Studies

Figure 1 shows the results from two sharply-identified electoral shocks. The top panel shows market prices before, during, and after the first Presidential debate in which Mr. Trump was trounced by his opponent, Hillary Clinton. The lower panel shows the reaction when the FBI announced that it was reopening its investigation into Ms. Clinton's emails.

In each case real-time prediction markets illustrated that these sharp shocks led to a re-evaluation of the likely next president. And in each case, it led to a parallel shift in the near-month S&P 500 future. (We analyze futures—which typically move in lockstep with the S&P 500—so that we can track overnight trading.) Further confirming that these market moves reflected election-related news, the Mexican peso—which was thought likely to plummet if Mr. Trump was elected given his anti-trade and anti-immigration platform—also moved sharply in each window.

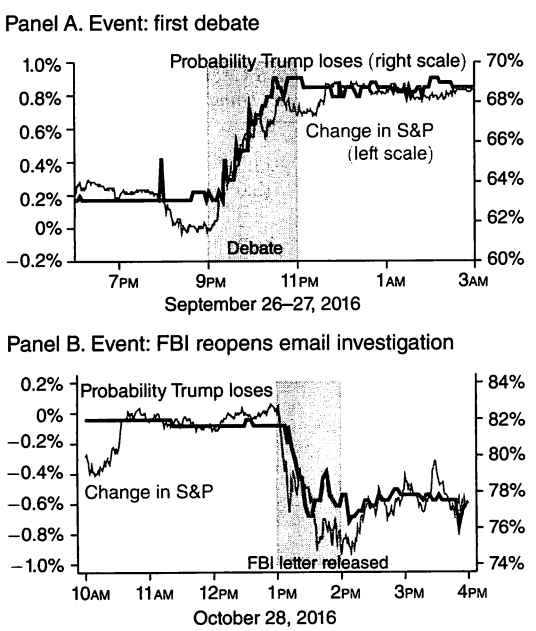

FIGURE 1. FINANCIAL MARKET RESPONSES TO CAMPAIGN EVENTS

For each of these events, a Wald Estimate of the implied effect of a Trump Presidency can be constructed as[1]

$$(1) \quad \beta^{Trump} = \frac{\%\Delta S\&P\ 500}{\Delta Probability\ of\ Trump}.$$

In Table 1 we report estimates of this "Trump effect" for the S&P 500 and the Mexican peso (relative to the US dollar). In addition, Table 1 lists two other major electoral events: the leak of Trump's Access Hollywood tape and the announcement that the FBI had not found any incriminating e-mail in its reopened investigation into Ms. Clinton. We don't show the corresponding graphs, because in each case the news was digested over the weekend when markets were closed. For these events we compare Friday afternoon prices with those when futures markets reopened on Sunday evening.

[1] The standard error of the asset price change in an event window can be proxied using the standard deviation of price changes in similar windows (e.g., 9 PM to 11 PM on the last 100 Mondays). This ratio is then adjusted for any imprecision in the estimate of the probability change, analogous to the standard errors for instrumental variables. See Wolfers and Zitzewitz (2016) for further discussion.

The estimates from all four event windows are similar, and indeed statistical tests fail to reject the null that the estimated "Trump effect" on the S&P 500 is identical in all four episodes (and for the peso for events 1, 2, and 4). The debate and first FBI event yield more precise effect estimates than the other two, because they yielded sharp changes in electoral odds in particularly brief event windows.

Table 1 also includes two windows in which electoral probabilities shifted on election night: a short window in which Clinton took an early lead in Florida (the blip from around 7:45 PM to 8:05 PM in Figure 2), and the subsequent window from 8:05 PM to 11:50 PM in which it became clear that Trump would win. These election-night estimates are about half the magnitude of those from the pre-election windows, but still large and negative.

All told, six different event studies over a six-week period yielded remarkably consistent estimates. In parallel analyses (Wolfers and Zitzewitz 2016; Zitzewitz 2016a), we found similarly large and negative impacts on a range of other US and global stock indices. Events that made Trump less likely to become President also led to declines in Treasuries, volatility futures, and precious metals. These movements all appeared to point to expectations of a weaker global economy and more uncertainty under President Trump.

II. A Post-Election Surprise

A precision-weighted average of the four pre-election estimates suggests that markets expected the S&P 500 to be worth around 13 percent less under President Trump than Clinton. Prediction market prices when US markets closed on Election Day suggested only around an 18 percent chance that Mr. Trump would win. Together, these imply that the S&P 500 would have been forecast to drop by $\Delta p \times \beta^{Trump} = 11\%$ when Mr. Trump unexpectedly won.

Indeed, there was an initial drop in the overnight futures of nearly half this magnitude before circuit breakers in overnight markets briefly suspended trading at around midnight. But then equity markets began to rally around 2 AM eastern standard time, and the S&P 500 ultimately closed up by 1.5 percent on the day after the election.

TABLE 1—ELECTION EVENT STUDIES: IMPLIED EFFECTS OF A TRUMP WIN

Event	Trump win probability	$\frac{\%\Delta S\&P\ 500}{\Delta p(Trump)}$	$\frac{\%\Delta Peso}{\Delta p(Trump)}$
Pre-election event windows			
1. Clinton wins first debate (September 26, 9 PM to 11 PM)	37% to 31%	−11.3	−26.9
		(3.0)	(2.3)
2. Access Hollywood tape released (October 7–9 weekend)	26% to 20%	−2.9	−26.9
		(6.2)	(3.1)
3. FBI reopens email case (October 28, 1 PM to 2 PM)	18% to 23%	−19.2	−36.5
		(4.4)	(3.3)
4. FBI announces no new findings (November 4–6 weekend)	24% to 16%	−16.4	−24.4
		(4.6)	(2.3)
Precision-weighted average of pre-election events		−13.2	−27.6
		(2.1)	(1.3)
Election-night windows			
Clinton takes early lead in FL (November 8, 7:45 PM to 8:05 PM)	18% to 8%	−6.3	−10.7
		(0.8)	(0.3)
Trump wins (November 8, 8:05 PM to 11:50 PM)	8% to 97%	−6.1	−13.4
		(0.3)	(0.2)

Notes: The table reports estimates of the expected effect of a Trump election victory from six event windows. Estimates are the ratio of asset price to changes in electoral probability during each window. Electoral probabilities are from the Betfair prediction market. Standard errors are in parentheses.

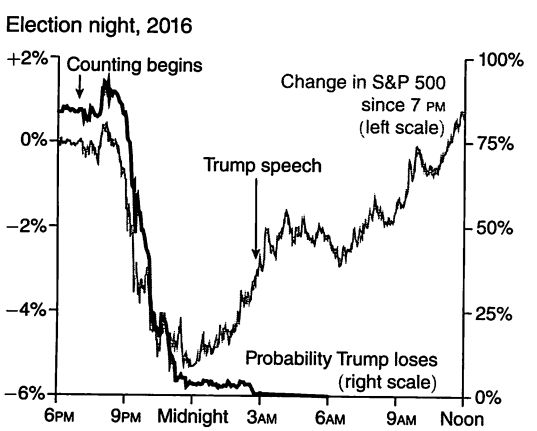

FIGURE 2. STOCK MARKET RESPONSE FOLLOWING THE ELECTION

It appears that many of the market's pre-election and initial post-election beliefs about the consequences of Trump's election were reassessed once the reality of a Trump presidency set in. The immediate aftermath of this news also led other developed stock markets, Treasuries, volatility futures, oil, precious metals, and cyclically sensitive industries like financials and construction to move in the opposite direction to that suggested by our pre-election event studies. A few financial prices—emerging market stocks and currencies, and specific industries (e.g., biotech, hospitals, for-profit prisons)—moved in the same direction as suggested by pre-election event studies, but the movements were much smaller. Zitzewitz (2016b) provides a summary.

III. Explaining the Post-Election Rally

Why would the expectations of the Trump Effect have been so stable prior to the election and then changed once Trump was elected?

It can be helpful to think about β^{Trump} as if it were an asset price—and indeed, as we show in Wolfers and Zitzewitz (2016), it is conceptually equivalent to a position that is long a conditional future that pays the value of the S&P if Trump wins (and all trades are reversed otherwise), and short the equivalent Clinton-linked security. Each pre-election event permits us a noisy observation of this asset price, and then the response to the election permits a final observation. Inconsistency in our pre- and post-election estimates could be due to a mismeasurement either before or after the election or to a sudden shift in the market's expectations.

We start by evaluating—and rejecting—three measurement-related explanations that are often raised in the context of event studies.

A. *Mismeasurement*

Pre-election Misidentification.—Perhaps our pre-election event studies failed to accurately capture market expectations. Our identification strategy requires that: (i) each event shifts the odds of a Trump presidency; (ii) it have no direct effect on financial markets except through these electoral consequences; (iii) that alternative sources of market-moving news be no more prevalent than typical; and (iv) that prediction markets accurately reflect how market participants interpreted changing electoral probabilities.

As we evaluate these possibilities, we conclude: (i) The four pre-election event studies reflect pivotal moments in the campaign that clearly shifted the Presidential race. (ii) These events were purely political shocks. Our initial event was the first Presidential debate, where no new policy was discussed. The remaining three events each involve the release of politically embarrassing material of no direct relevance to financial conditions. (iii) We read carefully for other significant market-relevant news during these event windows and failed to find any. (iv) Prediction markets reacted to these events in a manner consistent with public opinion polls. (Wolfers and Zitzewitz 2016 elaborate on these points.)

Moreover, our estimates—at least those taken before the election—are remarkably consistent across quite different events. It is unlikely that these assumptions would have been violated so as to produce a similar bias in each window.

Risk.—Journalists sometimes explain market rallies as due to reduced uncertainty. But this is a case where casual intuition is misleading, as the 2016 election did not lower risk. The response of VIX futures to our pre-election events suggests that Mr. Trump was perceived to be the riskier candidate. His election meant that markets now faced a certainty of the riskier candidate, rather than a mere probability of the riskier candidate winning. This increase in risk cannot explain the post-election market rally.

Other Political News.— The Republicans went into election night with a 50 percent chance of winning the Senate, so their Senate victory was also news. However it became clear very early on election night that they would retain control, so the timing does not fit with the rally.

Having rejected these alternatives, we're left to evaluate explanations of why market expectations changed. There are two puzzles: why the market response to Trump reversed, and why this occurred only when confronted with the certainty of a Trump presidency.

B. *Changes in Expectations*

Post-election News.—The only real news throughout the post-election rally was Trump's 3AM victory speech. The speech was generally well-received and mentioned a single policy priority: infrastructure. Trump's pre-election platform contained an unusual mix of policies that were bullish for stocks (corporate tax cuts, infrastructure spending) and others that were bearish (protectionism). As such, his first post-election comments may have been especially closely watched as an indication of which policies he would prioritize.

But is one speech really sufficient to explain such a sharp reversal in expectations? This doubt leads us to consider less conventional explanations.

Psychological Factors.— Perhaps investors failed to anticipate their own reaction to Trump's election.

The focusing illusion describes the idea that nothing in life is as important as you think it is, while you are thinking about it. By this view, before the election markets focused excessively on Mr. Trump's personal failings, but once they confronted the next day's reality, they focused instead on his policies, or alternatively, the robustness of American political institutions. Consistent with this, a client note from Bridgewater Associates attributed the rally to investors switching from "focusing on the man, to the man's policies." Indeed, Google searches for "Trump tax plan" shot up in the hours following his election.

Why might this illusion break so suddenly upon news of Mr. Trump's win? A famous poem by Piet Hein points to the difficulty of probabilistic and contingent reasoning. Referring to making a decision with a coin flip, he says: "the moment the penny is up in the air, you suddenly know what you're hoping."

The point is that an event study reveals what market participants expect future market participants to expect, but expectations about expectations might be limited by our imaginations, and as a result, the law of iterated expectations may not apply. By this view, an event study reveals $E\left[E\left[\beta^{Trump}\right]\right]$, rather than $E\left[\beta^{Trump}\right]$.

Sidelined Investors.—Behavioral finance offers other explanations for markets moving or no or minimal news, motivated by the excess volatility puzzle and asset price bubbles. In models of sidelined investors (e.g., Cao, Coval, and Hirshleifer 2002), fixed participation costs lead some rational traders to remain on the sidelines until price movements confirm their contrarian beliefs. In the electoral context, these costs may have led some investors not to trade in the wake of small changes in electoral probabilities, waiting instead until the election to trade their views about the Trump Effect. If these sidelined investors were Trump optimists to a degree not predicted by those reacting to pre-election news, it could help explain the immediate post-election stock rally.

Just as a natural experiment reveals only a local average treatment on those induced by the experiment to change their behavior, this view raises the possibility that the natural experiment of an electoral shock reveals only the expectations of those induced to trade on that news. As such, an event study reveals $E_{active\ traders}[\beta^{Trump}]$.

Multiple Equilibria.—Another possibility is that the complementarities between political and financial outcomes are strong enough to sustain multiple equilibria, as in a coordination game. By this view, a stock market crash subsequent to Trump's election would have so hobbled his presidency as to be self-fulfilling. Alternatively, a strong market endorsement of his presidency gives him the political capital needed to enact pro-market reforms. By this view, there's not one β^{Trump}, but rather two possibilities, β_1^{Trump} and β_2^{Trump}. An event study reveals some probability-weighted average of these: $p_t^1\,\beta_1^{Trump} + \left(1 - p_t^1\right)\beta_2^{Trump}$, but unless p_t^1 is observed, this identifies neither β_1^{Trump} or β_2^{Trump}. And if p_t can shift sharply, today's event study may not reveal tomorrow's market expectation.

IV. The Standard Error of Event Studies

Each of these explanations leads to the same conclusion: An event study does not simply reveal a static "market expectation of the effects of an event." Instead, it reveals an expectation that may vary across groups of investors, across equilibria, or across time.

To be slightly more formal, even if the market's *rational* expectation of the effect of an event is $E[\beta]$, during a particular window, its actual expectation may be $E[\beta] + \eta_t$, where η_t is an expectational error that reflects factors that are under- or over-weighted due to the focusing illusion, the missing expectations of sidelined investors, and so on.

Assuming risk neutrality, the price of a financial asset, y_t will reflect current market expectations about the probability (p_t) and expected consequences $([E[\beta] + \eta_t)$ of that event, and other idiosyncratic and orthogonal factors, ϵ_t:

$$y_t = p_t \times (E[\beta] + \eta_t) + \epsilon_t. \tag{2}$$

A standard event study focuses on a short window in which p_t is assumed to jump from 0 percent to 100 percent. The event returns are

$$\Delta y_t = E[\beta] + \eta_t + \Delta \epsilon_t. \tag{3}$$

There are two questions event studies are used to answer. The first is to ask the extent to which an event drove changes in asset prices. An event study yields an unbiased estimate of that effect, $E(\beta + \eta_t)$. For this question—which is really about the internal validity of an event study, the usual standard error equal to $\sigma^2_{\Delta\epsilon}$ applies.

But most interesting policy questions rely on event studies as estimates of $E[\beta]$. For this question—which is more about external validity—the event study still provides an unbiased estimate (assuming $E[\eta_t] = 0$), but the standard error is now $\sqrt{\sigma^2_{\Delta\epsilon} + \sigma^2_{\eta}}$.

It is the failure to account for this variation—and hence the potential instability of market responses to an event—that we term the "standard error of event studies."

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