Manipulating Political Stock Markets: A Field Experiment and a Century of Observational Data

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Introduction

- **Prediction markets:**
  - financial market with share payoffs based on futures event
  - aggregate info of investors to make forecast

- **Current event markets**
  - pay $1 if event occur, $0 otherwise <fixed-odds, not parimutuel>
  - price = \( pr(event|\Omega_{mkt}) \)

- **We focus on Political stock markets (PSMs):**
  - recently gained wide attention
  - superior forecasting over polls
Introduction—Manipulation

- Rising concern about speculative attacks/
  manipulation where market participants:
  - behave like insider possessing private info
  - attempt Δ asset prices when no Δ fundamentals

- Examples:
  - TradeSports -- GRAPH
  - PAM in Summer 2003
    - proposed mkt: on intl security events
    - fear could “be manipulated by adversaries” (DARPA, July 2003)
    - Stiglitz (2003) argues “could be subject to manipulation.”
TradeSports Speculative Attack: 10/15/2004

George W Bush is re-elected as United States President.

- Single trader’s sales for 4k shares moves Bush shares from 55→10
- Shares bounce back in 3 minutes
Introduction – Importance of Manipulation in PSMs

1. Motive for PSM manipulation may not be profits
   feedback effect on voters, media, financial markets

2. Episodes may shed light on rationality mkt participants
   IEM 2000 WTA mkt:
   - “mistake” and reversal on election eve – Figure 8
   - arbitrage opportunities

2. If speculative attack have permanent effect on prices,
   then efficiency/predictive capacity PSMs in doubt
THIS PAPER--
Alleged/Actual Speculative Attacks in Current/Historical PSMs

1. TradeSports (see text)

2. New York City betting markets
   - huge and formally structured markets, 1880-1940
   - $150M+ in current dollars wagered in one election
   - active and well-advertised participation of political insiders
   - examine instances of accused price rigging

3. Field experiment in the 2000 IEM
   - online PSM, operating since 1988
   - make controlled trades in 2000:
     - planned, random investments simulate large investor with inside info
     - 2% mkt volume
     - two IEM mkts linked to same fundamental (vote shares)
     - trades:
       - 1 mkt attack → non-attacked mkt serves as control
       - 2 mkt attacks → might better reflect behavior of insider
Conclusion:

- in all cases attacks significantly \( \Delta \) price
- but then revert to initial level. \textit{With IEM, trades largely do not affect control mkt.}
- \textit{manipulation appears difficult and expensive in PSM}
Quick Summary of Results

Figure 7c: Historical PSMs. Presidential Elections Manipulations

Figure 10: IEM 2000. Mean CR in the Attacked Market over the Full Set of Trades (N=11)
2. Historical Political Stock Markets – The Grandfather of All Prediction Markets

- Background

Rhode-Strumpf, 2004 JEP, documents the existence of large, active betting markets for Presidential candidates between Civil War and WW2. The largest market was centered on Wall Street in New York City (informal mkts also existed). Contracts were WTA.

- There were also active betting markets for other elective offices (NY Governor; NYC Mayor)

- Information (prices for contracts; bet volume, narratives) were published in newspapers virtually every day in the months preceding an election

→ we collect N>3k obs from 14 newspapers (microfilms + morgues + online archives) for almost every race 1880-1940
2. Historical Markets (Fig 4) – 5-10x TradeSports
2. Historical Markets –
New York Curb Market

Stock Trading on Broad Street

Markets pick the winner well in advance of election

<table>
<thead>
<tr>
<th>Year</th>
<th>Candidate</th>
<th>Absolute Popular Vote Margin</th>
<th>Days Before Election for Odds Prices:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.66</td>
</tr>
<tr>
<td>1920</td>
<td>Harding</td>
<td>26.2%</td>
<td>125 days</td>
</tr>
<tr>
<td>1924</td>
<td>Coolidge</td>
<td>25.2</td>
<td>120</td>
</tr>
<tr>
<td>1936</td>
<td>F. Roosevelt</td>
<td>24.3</td>
<td>3</td>
</tr>
<tr>
<td>1904</td>
<td>T. Roosevelt</td>
<td>18.8</td>
<td>49</td>
</tr>
<tr>
<td>1932</td>
<td>F. Roosevelt</td>
<td>17.7</td>
<td>36</td>
</tr>
<tr>
<td>1928</td>
<td>Hoover</td>
<td>17.3</td>
<td>138</td>
</tr>
<tr>
<td>1912</td>
<td>Wilson</td>
<td>14.4</td>
<td>111</td>
</tr>
<tr>
<td>1900</td>
<td>McKinley</td>
<td>6.2</td>
<td>133</td>
</tr>
<tr>
<td>1908</td>
<td>Taft</td>
<td>8.4</td>
<td>115</td>
</tr>
<tr>
<td>1896</td>
<td>McKinley</td>
<td>4.4</td>
<td>97</td>
</tr>
</tbody>
</table>

Notes: The dates show when the odds price permanently passed various odds prices thresholds. In each case the listed candidate won. The major party candidates in the races.
2. Historical Markets and Manipulations—Background

(1) Political operatives.

Politically-connected individuals actively invested includes Boss of Tammany Hall (the NYC Democratic machine) and officials of National Republican Party.

(2) Charges.

Many (N>40) charges that partisans manipulated odds Politicians from both parties at times charged that the reported odds were the result of conscious manipulation, arguing their adversaries sought to suppress turnout.

(3) Accused.

Accused were typically political operatives (Dems) or Wall Street finance-types (Reps).
2. Historical Markets And Manipulations—More Examples

- **Wall Street Betting**
  - Odds Manipulated
  - Methods Used by Brokers to Bring "Sure Thing" Profits.
  - Hard to Place Real Wagers
  - Open Charge That Republican Campaign Funds Have Been Used to Hammer Odds Encounters No Denial.

- Claim of Manipulation 11 Days Before the Election — NYT, 28 Oct 1904
  - "Their efforts for the next two days will be to conceal the real situation and they are trying the old and time-worn trick of rigging the betting odds. Their attitude in this connection reminds me of what happened two years ago when I was a candidate for Congress. I picked up a newspaper the Sunday before election and read that Darnell & Co. had $15,000 to bet against $10,000 that I would not be elected. As soon as their office opened on Monday I offered to take that bet but was told that it was not available. I then offered to bet $10,000 to $5,000 that I would be elected, but I could not even get a bet of $100 at odds of 2 to 1."

- Well known Republican politician accuses Tammany Hall of manipulating the odds. NYT, 1 Nov 1926
2. Historical Markets – Estimated effect of Republican Manipulation (Table 4; Fig 7)

GOP “manipulation” (t=0) has real effect but quickly dissipates
2. Historical Markets – Estimated effect of Democratic Manipulation (Table 4; Fig 7)

Pro-Democrat manip effects similar
3. 2000 IEM – Background

- 2000 IEM presidential markets:
  1. Background
     - limited investment (≤$500)
     - $167K trading volume; 1k active investors
  2. Contracts
     - Vote Share (VS)
     - Winner-Take-All (WTA)
  3. Assets
     - DEM, GOP, REF

- (VS, WTA) prices...
  - linked to same fundamentals (final vote share)
  - price in one can serve as “control” for price in other.
    e.g. eqbm relationship under efficient mkts,
    \[ \text{price}^{\text{WTA}}_{t} \times \sigma_{t}^{-1} = \text{price}^{\text{VS}}_{t} \times \]
3. 2000 IEM — Trading Strategy in Field Experiment

- Randomly attack one or both IEM markets.
  - randomly invest in DEM or GOP with real money side based on hundredth digit of Dow day before
  - objective is to mimic trades of insider with private info
  - N=11 trials → Table 6

- Size of investment
  - say it is buy GOP in WTA
    NB: Buy slate + short DEM if that is cheaper
  - initial investment:
    $160 buy at mkt prices
  - supporting limit orders:
    $80 buy GOP at $.006 below last Ask + $80 sell DEM at $.006 above last Bid (this expires sometimes)
  - VS identical but half the amount
3. 2000 IEM —
Make 1 Mkt Attack / 2 Mkt Attacks (Table 6)

- 1 market attack
  - only trade in one mkt (WTA or VS)
  - insider subject to investment limit might only trade in liquid mkt
  - allows test leading hypotheses of behavior (Table 5)

- 2 market attacks
  - simultaneously trade in WTA, VS
  - might better mimic trades of insider, e.g. likely invest in both markets since prices linked to same fundamental
3. 2000 IEM — Attacks Big Enough?
Table 6 has details on each trial

1. Size of bets: Trade volume
   $3116 wagered = 2% total IEM trade volume

2. Initial price change (DEM/REP)
   - 30 min after attack, Δprices comparable to daily range

<table>
<thead>
<tr>
<th></th>
<th>Average Price range</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>intraday</td>
</tr>
<tr>
<td>WTA</td>
<td>3.8¢</td>
</tr>
<tr>
<td>VS</td>
<td>0.5¢</td>
</tr>
</tbody>
</table>

- case study – Fig 9

- Fig 9
3. 2000 IEM — An Example of Attack (Fig 9)

October 28, 2000: A 2 Market Attack
3. 2000 IEM — Results
Mean CR All Trials, Attacked Mkt (Fig 10)

Calc CR following each attack (t=0):

- \( CR_t \equiv \sum_{s \geq t_{min}} R_s \) with \( CR_t \sim N(\cdot, \cdot) \) → \( \text{Var}(CR_t) \) from pre-trade periods
- 95% CI ≈ 2 StdDev interval
3. 2000 IEM — Results
1 Mkt Trials, Control Market (Fig 14)

- Control mkt unaffected if beliefs unchanged (same fundamentals)
- Mean CR (left): small CR and quickly revert
- Mean CAR (right):
  - $\text{CAR}_t = \text{CR}_t - \text{Normal}(\text{CR}_t)$, with Normal() from eqbm relation with other mkt
  - $\text{CAR}_t < 0$ and then revert $\rightarrow$ control mkt move less than in attack mkt
3. 2000 IEM Results — Wrap-Up

- Attempted manipulations largely undone by other traders

- Some slow reverting cases (late trials; two mkt attacks; Dem buys), though still undone — SEE Figs 11-13

- Largely a positive result — long-term market dynamics not influenced by uninformative trading
Conclusion

- Look at a range of markets...
  new & old; anonymous & non-anonymous
- From a range of perspectives...
  outsider & insider
- While many may try to manipulate emerging prediction markets, this appears to be difficult and expensive to do for more than a short period.
- Period required to undo manipulations appears to become shorter...
  TradeSports (mins) << IEM (hrs) << Historical (days)