Manipulation in Political Stock Markets

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Introduction

- ## What is a manipulation?
  - attempt to Δasset prices when no Δfundamentals
  - behave like insider possessing private info

- ## Common criticism for asset mkts
  - "large" investors routinely shift prices
  - particular worries with prediction mkts
      → Tradesports, 2004 -- **GRAPH**
  - concern with proposed terrorism market:

    "[PAM] was a small program that faced a number of daunting technical and market challenges. Can futures markets be manipulated by adversaries?" (DARPA press release, July 2003)
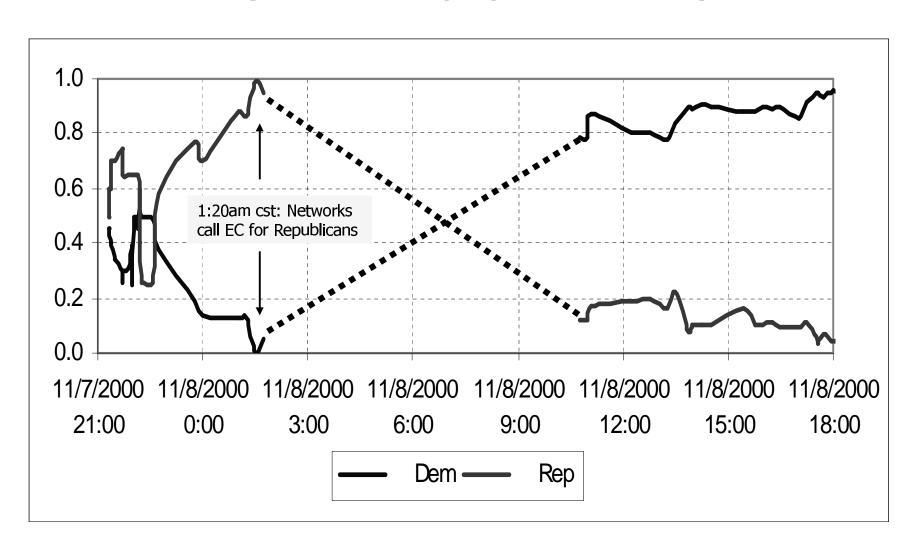
TradeSports Speculative Attack: 10/15/2004

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

Lifetime | Last Week | **Today**

8:27 PM 15/10

- Single trader's 10k order moves Bush shares from 55→10
- Shares bounce back in 6 minutes

Introduction – Importance of Manipulation

- Sheds light on rationality mkt participants
  - IEM 2000 WTA mkt:
    - "mistake" and reversal on election eve -- **GRAPH**
    - arbitrage opportunities

- Issue: permanent effect on prices? If so problems for efficiency in an asset market

Day After Election in 2000 IEM WTA
(based on popular votes)

1:20am cst: Networks call EC for Republicans

Legend: Dem — Rep

Types of Stock Market Manipulation

1. Action-based manipulation
   - actions which change value underlying asset
2. Information-based manipulation
   - spread false information or rumors
3. [*]Trade-based manipulation
   - buy/sell asset (what we study here)
   - examples:
     - "pump-and-dump" penny stocks in 1990s (AW, 2004)
     - stock pools in 1920s (MJM, 2004)

Allen and Gale (1992)
   - profitable trade-based manipulation possible even when agents have rational expectations and there is a finite horizon (no bubbles)
   - incomplete info key ...

Trade-Based Manipulation in Practice

- Field:
  - Common feature of *successful* manipulations: thin mkts; emerging mkts; supply constraint
  - Stock pools in 1920s (MJM, 2004)
  - Pump-and-dump penny stocks (AW, 2004)
  - Brokers trading on own behalf in Pakistan (KM, 2003)
  - Cornering in futures mkts (MNY, 2003)
  - Racetracks -- unsuccessful (C, 1998-- SEE next slide)

- Experiments with prediction mkts:
  - See other talks at DIMACS!

Trade-Based Manipulation in Practice (cont) – *SKIP at DIMACS*

- Here:

  historical + contemporary evidence from political prediction markets
  - → observational evidence based on real bets

- Camerer (1998) is most closely related.

  Key differences:
  - clear control (two markets linked to same fundamentals; external valuation via polls)
  - Camerer's manipulation occur prior to most of bet activity
  - (final) prices known at all times—not pari-mutuel (efficiency conditions must hold at every instance)
  - no short-selling constraint

This Paper —
Trials from real-world political prediction mkts

1. Controlled manipulation in the IEM
   - well-known, online political futures mkt
   - operating since 1988
   - make "controlled" trades in 2000:
        planned and random investments (details below)
   - simulate large investor, perhaps with inside info

2. Observed manipulation in historical markets
   - huge and formally structured political bet mkts
   - $100M+ in current dollars wagered in one election
   - late 19th Century – WWII
   - examine instances of accused price rigging

1. Controlled Manipulation in the 2000 IEM -- Background

- Presidential markets:
  - VS
  - WTA

- Assets in 2000 IEM:
  - DEM
  - GOP
  - REF

- (VS, WTA) prices...
  - linked to same fundamentals (final vote share)
  - have eqbm relationship under efficient mkts
  - price in one can serve as "control" for price in other

1. Controlled Manipulation in the 2000 IEM — Trading Strategy

- 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
  - investments typically executed in 15-30min
  - trade time: 8pm cst/11:15pm cst
  - dates/mkts: listed below
  - codified in official trade strategy document

- 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
    AND $80 sell DEM at $.006 above last Bid (this expires sometimes)
  - VS identical but half the amount

Controlled Manipulation in the 2000 IEM — Aside: 1 Attack Vs. 2 Attacks

- Why simultaneously attack both VS and WTA?

- How would someone with inside information invest:
  - likely invest in both mkts
  - since prices linked to same fundamental

- Non-financially motivated trader might invest in just one mkt

1. Controlled Manipulation in the 2000 IEM – Are the Attacks Big Enough?
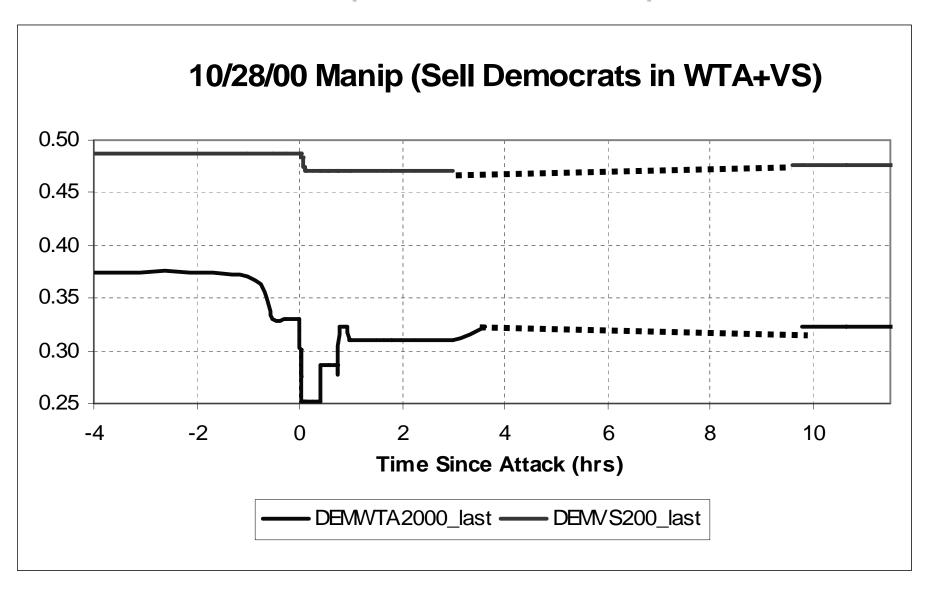
i. Size of bets

- total trade volume…
  - $3116 wagered
  - =2% total IEM trade volume

- biggest trade as % of current market cap…
  - VS: 3.0% of mkt cap
  - WTA: 2.7% of mkt cap
  - NB: this mechanically ↓ with time

- each trade relative to average daily volume…
  - VS: 181% (=$120/$66)
  - WTA: 28% (=$240/$870)

1. Controlled Manipulation in the 2000 IEM – Are the Attacks Big Enough? (cont)

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

- average *intraday* price range…
  - WTA: 3.8¢
  - VS: 0.5¢

- average price range in hour before trades …
  - WTA: 0.5¢
  - VS: 0¢

- ½ hr after our trade starts, price change…
  - WTA: 2.5¢
  - VS: 0.3¢ (includes two "unsuccessful" manips)

- Case study -- GRAPH

An Example of IEM Manipulation

10/28/00 Manip (Sell Democrats in WTA+VS)

Legend: DEMWTA2000_last, DEMVS200_last

X-axis: Time Since Attack (hrs)

2. Historical Political Stock Markets – The Grandfather of All Prediction Mkts

- Background

  Rhode-Strumpf, 2004 JEP, documents the existence of large, active betting markets for Presidential candidates between the Civil War and World War Two. 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, including the Governor of New York State and the Mayor of New York City.

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

2. Historical Markets –
as big as 10x TradeSports

Table 1: New York Election Betting Volume

| | New York Betting Volume | | |
	2002 dollars (millions)	Dollars per Votes Cast	Dollars per Campaign Spending
1884	13.7	1.36	0.278
1888	37.6	3.30	0.907
1892	14.8	1.23	0.185
1896	10.7	0.77	0.124
1900	63.9	4.57	0.876
1904	50.3	3.72	0.894
1908	7.7	0.52	0.174
1912	4.6	0.30	0.087
1916	165.0	8.90	2.116
1920	44.9	1.68	0.726
1924	21.0	0.72	0.373
1928	10.5	0.29	0.086
Average	37.0	2.28	0.532

Notes: These figures report newspaper estimates of total bet volume over the course of

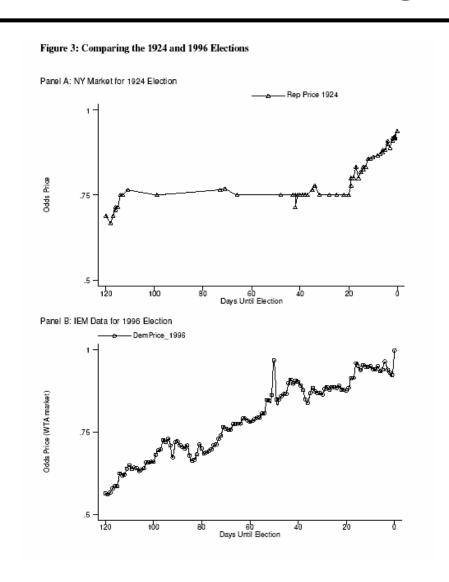the election cycle. See Rhode and Strumpf (2004) for details.

2. Historical Markets – Impressive Predictive Ability

Table 2: Date of Permanently Crossing Odds Price Thresholds in Selected Elections

Year	Candidate	Absolute Popular Vote Margin	Days Before Election for Odds Prices:		
			0.66	0.75	0.80
1920	Harding	26.2%	125 days	49	43
1924	Coolidge	25.2	120	42	18
1936	F. Roosevelt	24.3	3	--	--
1904	T. Roosevelt	18.8	49	22	18
1932	F. Roosevelt	17.7	36	8	4
1928	Hoover	17.3	138	46	1
1912	Wilson	14.4	111	63	1
1900	McKinley	6.2	133	28	21
1908	Taft	8.4	115	115	6
1896	McKinley	4.4	97	7	1

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 – comparable to IEM in "calling" an election

Figure 3: Comparing the 1924 and 1996 Elections

2. Historical Markets And Manipulations

(1) Predictions.

"Wall Street odds" were generally considered the most accurate predictor of the election outcome.
- common statement was these odds were "never wrong."
- recall: no polls, radio, ... limited information available to aggregate

(2) Political operatives.

Politically-connected individuals, including the Boss of Tammany Hall (the NYC Democratic machine) and officials of National Republican Party, actively and visibly wagered in these markets.

(3) Charges.

Politicians from both parties often charged that the reported odds were the result of conscious manipulation, arguing their adversaries sought to suppress turnout.

(4) Accused.

Almost all charges were levied against partisans supporting the favorite. Accused were typically political operatives (Dems) or Wall Street finance-types (Reps)

We consider cases where charges of manipulation are levied (more on this below)

2. Historical Markets And Manipulations— Why Would It Be Done?

(1) If the betting odds affected beliefs about the outcome and these beliefs affected the willingness to vote, then rational politicians should invest in manipulating the odds.

- example of betting odds affecting turnout
  bandwagon effect thought to dominate (NEXT SLIDE)
- Andrew Carnegie 24 October 1904
  "From what I see of the betting, I do not think that Mr. Roosevelt will need my vote. I am sure of his election…" NYTimes p. 1

(2) Politicians as a matter of loyalty could be expected to bet publicly for their party's candidate, even when they did not favor them.

  Croker bets for William Jennings Bryan against his own preferences.

2. Historical Markets And Manipulations— Some Examples

$5,000,000 BET HERE TO DATE ON ELECTION

Estimated That $1,000,000 More Will Be Wagered in Wall St. Tomorrow.

STILL 10 TO 7 ON HUGHES

Large Amounts of Money from the West Bet on Wilson—Talk of "Rigged" Odds.

New York Times, 5 Nov 1916

"I have heard too that a huge sum of money was sent into the financial district by Coolidge backers for the purpose of influencing the odds on the theory that some voters will be influenced by these figures. It seems to me that the public might find much to interest and amuse it if the Senatorial investigating committee would call on the so-called 'odds makers' to open their books and disclose the funds on hand, if any, and the persons from whom they received such funds."

New York Times, 1 Nov 1924

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

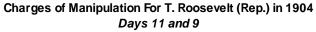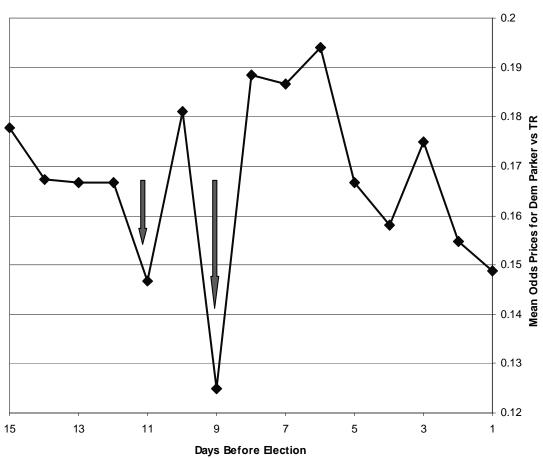Open Charge That Republican Campaign Funds Have Been Used to Hammer Odds Encounters No Denial.

"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.

Claim of Manipulation 11 Days Before the Election – **SEE GRAPH BELOW**.
NYT, 28 Oct 1904

Well known Republican politician accuses Tammany Hall of manipulating the odds.
NYT, 1 Nov 1926

2. Historical Markets And Manipulations— associated with large price changes

Charges of Manipulation For T. Roosevelt (Rep.) in 1904
Days 11 and 9

2. Historical Markets And Manipulations— The Data

We can identify from NY newspapers charges of manipulation in favor of:
- Republicans on specific days in 1896, 1900, 1904 (multiple), 1916, 1924
- Democrats in 1884, 1916, 1932.
- there are charges on both sides at different days in 1916.

In total there were 10 days with manipulation: **SEE TABLE**

CAVEAT:
- these might not be information shocks rather than manipulations
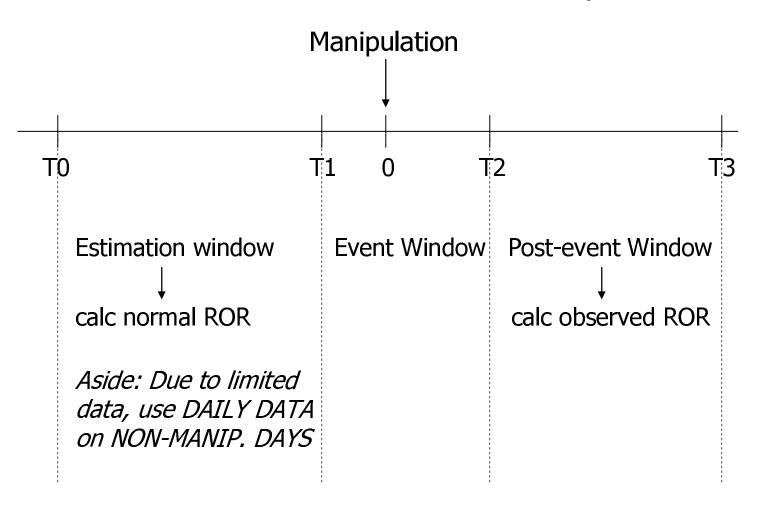- some suggestive counter-evidence given in results

Charges Against Republicans		Charges Against Democrats	
Year	Days Before	Year	Days Before
1896	7	1884	33
1900	19	1916	19
1904	9,10,11	1932	3
1916	2		
1924	4		

REMAINDER OF TALK.
Analysis of Manipulations

a) Start with IEM

   Develop and use case-study methodology

b) Then turn to historical markets

Case Study Framework (CLM, 1997)

ABNORMAL ROR after controlling for NORMAL ROR (Δasset fundamentals)

Manipulation

T0　　　　　　　　　T1　　0　　T2　　　　　　T3

Estimation window　　　Event Window　Post-event Window

calc normal ROR　　　　　　　　　　　calc observed ROR

Aside: Due to limited data, use DAILY DATA on NON-MANIP. DAYS

Case Study -- Details

1. Normal return

   - underlying support follows AR(1)
   $$VS^*_t = VS^*_{t-1} + e_t$$
   where $* \equiv$ inverse std normal; $e_t \sim N(0, \sigma^2)$ iid

   - presuming 2 assets and efficient mkts,
   $$WTA_t = Pr(VS_T > \tfrac{1}{2} | \Omega_t)$$
   $$= Pr(VS^*_t > -\Sigma_{s>t} e_s | \Omega_t)$$
   $$\rightarrow WTA^*_t = VS^*_t / ((T-t)^{\frac{1}{2}} \sigma)$$

   - estimate based on daily closing price,
   $$WTA^*_t = \beta_1 + \beta_2 \times VS^*_t / ((T-t)^{\frac{1}{2}} + \nu_t$$
   where $\beta_2 = \sigma^{-1}$, $\beta_1 \approx 0$

   Exclude: Manip days; 10 days before election

Case Study -- Details (cont)

1. Normal return (cont)
    - ROR

        From observed data

    - ROR^{Normal}:

        WTA/VS asset value based on above regression relationship (given the value in the other mkt)

2. Abnormal return

    $$AR_t = ROR_{tj} - ROR_{tj}^{Normal} \text{ where } j=WTA,VS.$$

    $$CAR_t \equiv \sum_{s \leq t} AR_s$$

    NB: sell manip $\rightarrow$ -ROR,-AR,-CAR

Case Study -- Details (cont)

3. Examine path of abnormal return during post-event window (after the manipulation)
   - qualitative (graphical)
   - formal tests

(i) Consider average CAR across manipulations,

$$J \equiv M^{-1}\sum_m CAR_{mt} / Var(CAR)^{0.5}$$

Under H0: manipulation has no impact on mean (or variance) of returns, $J \sim \mathcal{N}(0,1)$.

(ii) Regression – period-by-period response,

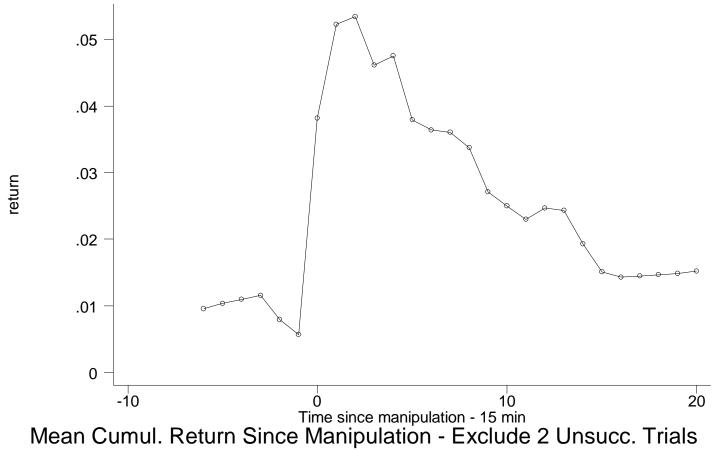$$AR_{mt} = \alpha_0 I(t=0) + \alpha_1 I(t=1) + \alpha_2 I(t=2) + \ldots$$

IEM – Data

- Data collection:
  - trader account provides basic stats on each asset at any time: last, bid, ask, high, low
  - web page updates information every 15 minutes
  - Collect information for 1+ hr before trades and for multiple hours after trade

- Data organization:
  - focus on last price for two main assets (DEM, GOP)
    work in progress: bid-ask bounce; composite asset
  - aggregate to fifteen minute intervals
    need consistent timing for CAR; trades take time to execute

IEM – Results
Mean CR for 9 Successful Trials

Mean Cumul. Return Since Manipulation - Exclude 2 Unsucc. Trials

IEM Results Wrap-Up

- Attempted manipulations largely undone by other traders

- WTA may be exception– seems that never fully undone (still investigating)

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

Historical Markets – The Data

- Data
  - 15 elections (1884-1940)
  - Prices come from thorough review of 10 major newspapers (and some minr ones)
  - N=1197 (newspaper-day prices)
        581 days with data
  - 10 manipulations (all from NYT or WSJ)

Historical Markets – The Estimates

- Approach: how do prices move around manipulation day (t=0),

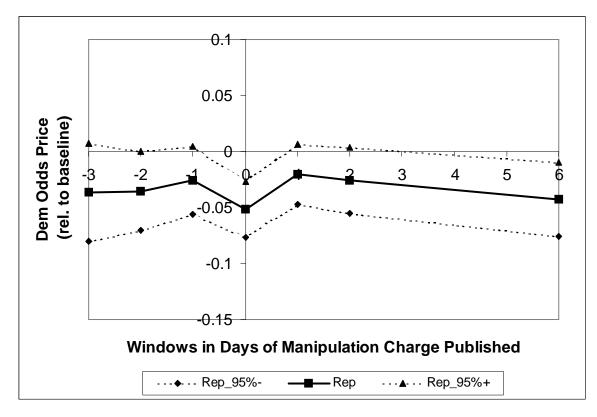 $Demprice_{it} = \sum_s \alpha_s I(t=s)I(DemM) + \sum_s \beta_s I(t=s)I(RepM) + v_i$

- H0: manipulations has no permanent effect

  $$\beta_s, \alpha_s = 0 \text{ for } s \gg 0$$

- Caveats:
  - reject H0 could simply be due to info shock
  - exact day of manipulation is blurry
    could be t=-1 or t=0

Historical Markets – Estimated effect of Republican Manipulation

Republican manipulation has real effect but quickly dissipates (… not sure why effect grows t=+7)

Fitted values from regression including I(0), I(±1), I(±2), I(-3), I(+3/9). StdDev(resid)=0.066

Historical Markets – Estimated effect of Democratic Manipulation

Democratic manipulation has real effect but quickly dissipates (… not sure why effect grows t=+7)

Window in Days of Manipulation Charge Published

···◆··· Dem_95%-   ■ Dem   ···▲··· Dem_95%+

Fitted values from regression including I(0), I(±1), I(±2), I(-3), I(+3/9). StdDev(resid)=0.066