

Do Derivatives Matter?: Evidence From A Policy Experiment

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- Evidence is mixed:
 - ▶ Yes, they do impact:
 - ▶ Positive impact on underlying stock: Market completion (Ross 1976), enhance informational efficiency (Cao 1999, Easley et al. 1998, Roll et al. 2009, Naiker et al. 2012, Blanco and Wehrheim 2015), improve liquidity (Berkman and Eleswarapu 1998), reduce volatility (Damodaran and Lim 1991)
 - ▶ Negative impact on underlying stock: Alleviate short-sale constraints (Sorescu 2000, Danielsen and Sorescu 2001, Ho and Liu 1997)



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 - ▶ Negative impact on underlying stock: Alleviate short-sale constraints (Sorescu 2000, Danielsen and Sorescu 2001, Ho and Liu 1997)
 - ▶ No, they do not impact: No additional information conveyed (Muravyev et al. 2013), no impact of large options trades on stock prices and liquidity (Vijh 1990)

Motivation

- Identification problem in the prior literature:
 1. A number of papers study the impact of options around the listing and delisting from the options market
 - ▶ Mayhew and Mihov (2004, 2005) show that the decision to list options is endogenous
 2. Other studies examine the impact of the extent of derivative trading on the underlying stock. The cross-sectional variation in trading may be due to unobservables
- Ni et al. (2005) conclude that extant literature has not shown if equity option trading significantly impacts the underlying stock



Motivation

- On July 23, 2012, SEBI changed the criteria for continued listing in the Futures & Options (F&O) segment in India
- The next day, the National Stock Exchange of India (NSE) announced a list of 51 stocks that would stop trading in the F&O segment once the existing set of contracts expired (July, August, and September expirations)
- We use July 25, 2012 and the expiration date of the September (September 27, 2012) contracts as our event dates



The criteria – definitions

1. Market Wide Position Limit (MWPL): The MWPL of open positions in the F&O segment is 20% of the number of shares (in value terms) held by non-promoters (free-float holding)
2. Median Quarter Sigma Order Size (MQSOS): It is the median order size (in value terms) over the last six months required to move the bid-ask midpoint by one-quarter of the historical standard deviation of returns
3. Minimum Monthly Turnover (MMT): The average monthly turnover (in value terms) over the prior three months must meet this criterion



Table 1: Changes in criteria for continued listing in the F&O segment

	Earlier	Revised
MWPL	600	2,000
MQSOS	0.2	0.5
MMT	NA	1,000

All numbers in millions ₹

Table 2: Number of stocks excluded

Reasons for exclusion	Number of Stocks
Excluded due to MQSOS	5
Excluded due to MWPL	30
Excluded due to MMT	4
Excluded due to MQSOS/MWPL	2
Excluded due to MQSOS/MMT	8
Excluded due to MWPL/MMT	0
Excluded due to MQSOS/MWPL/MMT	1



Hypotheses

Price impact

- *Hypothesis 1a*: Prices increase after exclusion from the F&O segment due to increase in short-sale constraints and/or due to consolidation of order flow in the underlying stock market
- *Hypothesis 1b*: Prices decrease after exclusion from the F&O segment due to reduced liquidity in the underlying stock market
- *Hypothesis 1c*: Prices decrease temporarily after exclusion from the F&O segment due to selling pressure from F&O market makers who no longer need to hold long positions in the stock to hedge their derivatives exposure



Hypotheses

Price efficiency

- *Hypothesis 2a*: Price efficiency improves after F&O exclusion as short-term noise traders exit the market
- *Hypothesis 2b*: Price efficiency worsens after F&O exclusion as derivatives tend to have greater level of informed trading on account of their leverage and lower transaction costs



Data sources

- NSE Web site: List of firms excluded due to the change in criteria, historical data on MWPL, MQSOS, and MMT as well as F&O segment trading volume
- CMIE Prowess: Price, volume, market capitalization, turnover and some company-level financial information, like sales, total assets, and price-to-book ratio
- SEBI Web site: Relevant circulars on F&O listing and delisting norms
- Bloomberg: Analyst coverage at a quarterly frequency

Figure 1: Possibility of regulatory targeting

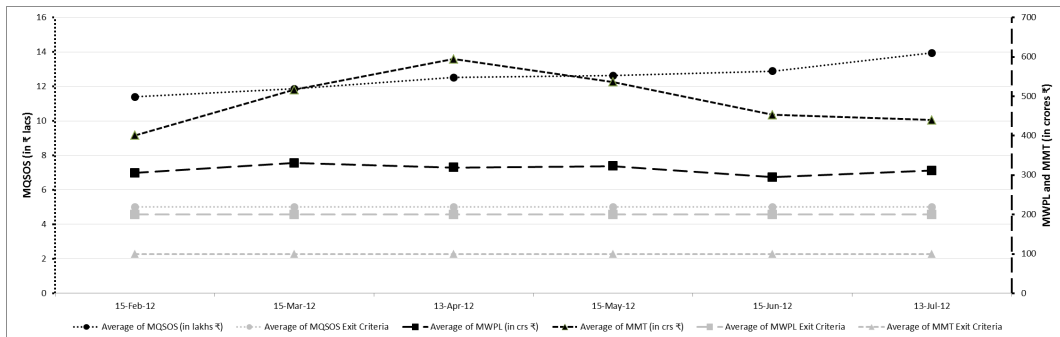




Table 3: Summary statistics

	Excluded Firms			Continuing Firms			Mean Diff	Median Diff
	N	Mean	Median	N	Mean	Median		
Total Assets	50	2,853.9	713.0	154	7,441.4	2,860.0	-4,587.5*** -3.2	-2,147.0*** -4.5
Sales	50	64,593.8	25,233.4	154	214,745.9	73,741.0	-150,152.1*** -3.4	-48,507.5*** -5.0
Market Cap	50	44,561.7	21,337.3	154	292856.2	117804.3	-248,294.6*** -6.5	-96,467*** -7.2
MMT	50	4,464.8	3237.3	154	26,018.9	8,959.5	-21,554.1*** -4.8	-5,722.2*** -6.2
MQSOS	50	1.4	0.8	154	3.9	2.3	-2.5*** -5.5	-1.6*** -6.3
MWPL	50	3,114.3	1,560.5	154	26,261.4	10,558.9	-23,147.2*** -5.8	-8,998.5*** -8.5
Price-to-Book	47	2.8	1.3	153	3.0	1.9	-0.2 -0.2	-0.6 -1.5
Profit-to-Sales	50	0.3	0.2	154	0.4	0.3	-0.1*** -3.0	-0.08*** -2.7
Volume CM	50	79.4	49.9	154	407.5	187.0	-328.1*** -5.6	-137.08*** -6.3
Volume F&O	50	269.9	150.1	154	1,679.3	578.7	-1,409.4*** -4.7	-428.6*** -5.8



Event-study methodology

- Standard market model with CNX200 Index as a proxy for the market
- Estimation window is over $[-275, -26]$ relative to the announcement date
- t-stats calculated using method from Boehmer et al. (1991), which is further adjusted for event-clustering using methodology from Kolari and Pynnönen (2010)



Table 4A: Market reaction to announcement

Event Day	N	CAR				AR			
		Mean	Median	Std CS test	SR test	Mean	Median	Std CS test	SR test
-5	50	0.24%	0.22%	0.61	178.5*	0.24%	0.22%	0.46	178.5*
-4	50	-0.02%	-0.17%	-0.04	-51.50	-0.26%	-0.55%	-0.57	-228.5**
-3	50	0.39%	0.58%	0.56	122.50	0.41%	0.16%	0.94	215.5**
-2	50	0.89%	0.87%	1.04	205.5**	0.50%	0.16%	1.00	156.50
-1	50	0.85%	0.71%	0.75	138.50	-0.04%	-0.19%	-0.06	-79.50
0	50	-1.24%	-0.97%	-0.85	-221.5**	-2.09%	-1.96%	-2.46**	-492.5***
1	50	-1.74%	-1.60%	-0.90	-301.5***	-0.49%	-0.35%	-0.38	-162.50
2	50	-3.99%	-3.84%	-1.94*	-482.5***	-2.25%	-1.91%	-2.83***	-521.5***
3	50	-3.46%	-3.53%	-1.74*	-441.5***	0.53%	0.53%	0.42	238.5**
4	50	-3.95%	-4.46%	-1.84*	-446.5***	-0.49%	-0.78%	-0.72	-229.5**
5	50	-2.82%	-2.34%	-1.26	-352.5***	1.13%	1.00%	1.55	369.5***



Table 4B: Market reaction to actual exclusion

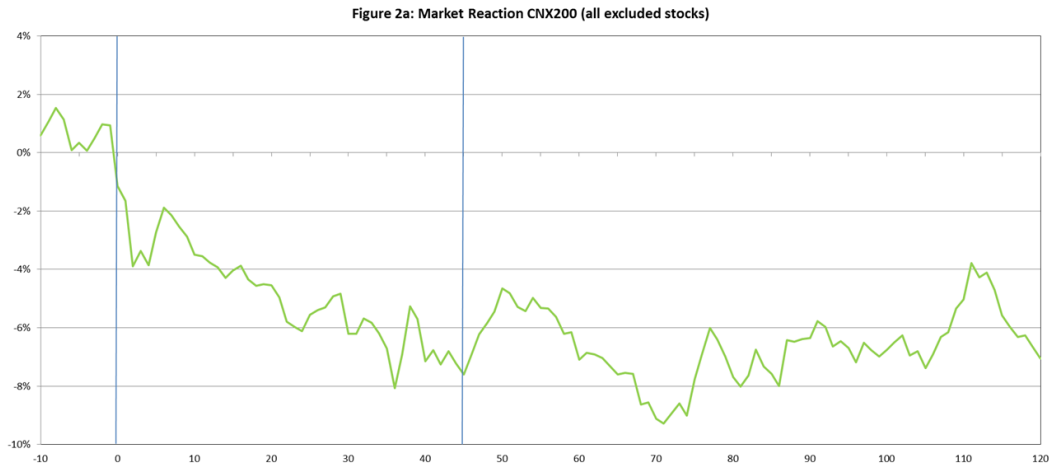
Event Day	N	CAR				AR			
		Mean	Median	Std CS test	SR test	Mean	Median	Std CS test	SR test
-5	50	-1.45%	-1.19%	-1.92*	-410.5***	-1.45%	-1.19%	-1.8*	-410.5***
-4	50	-1.06%	-0.97%	-0.84	-242.5**	0.39%	0.34%	0.21	115.50
-3	50	-1.55%	-1.61%	-1.12	-316.5***	-0.49%	-0.70%	-0.71	-227.5**
-2	50	-1.11%	-1.44%	-0.77	-185.5*	0.44%	0.26%	0.67	128.50
-1	50	-1.51%	-1.75%	-0.88	-244.5**	-0.41%	-0.29%	-0.32	-87.50
0	50	-1.89%	-1.78%	-0.98	-258.5**	-0.38%	-0.31%	-0.30	-131.50
1	50	-1.25%	-0.68%	-0.68	-162.50	0.65%	0.58%	1.09	242.5**



Table 4C: Market reaction combined – announcement and actual exclusion

Event Day	N	CAR				AR			
		Mean	Median	Std CS test	SR test	Mean	Median	Std CS test	SR test
-5	50	0.24%	0.22%	0.61	178.5*	0.24%	0.22%	0.46	178.5*
-4	50	-0.02%	-0.17%	-0.04	-51.50	-0.26%	-0.55%	-0.57	-228.5**
-3	50	0.39%	0.58%	0.56	122.50	0.41%	0.16%	0.94	215.5**
-2	50	0.89%	0.87%	1.04	205.5**	0.50%	0.16%	1.00	156.50
-1	50	0.85%	0.71%	0.75	138.50	-0.04%	-0.19%	-0.06	-79.50
0	50	-1.24%	-0.97%	-0.85	-221.5**	-2.09%	-1.96%	-2.46**	-492.5***
1	50	-1.74%	-1.60%	-0.90	-301.5***	-0.49%	-0.35%	-0.38	-162.50
2	50	-3.99%	-3.84%	-1.94*	-482.5***	-2.25%	-1.91%	-2.83***	-521.5***
3	50	-3.46%	-3.53%	-1.74*	-441.5***	0.53%	0.53%	0.42	238.5**
4	50	-3.95%	-4.46%	-1.84*	-446.5***	-0.49%	-0.78%	-0.72	-229.5**
5	50	-2.82%	-2.34%	-1.26	-352.5***	1.13%	1.00%	1.55	369.5***
40	50	-4.28%	-5.05%	-1.87*	-431.5***	-1.45%	-1.19%	-1.8*	-410.5***
41	50	-3.88%	-3.19%	-1.58	-375.5***	0.39%	0.34%	0.21	115.50
42	50	-4.37%	-3.33%	-1.75*	-386.5***	-0.49%	-0.70%	-0.71	-227.5**
43	50	-3.93%	-3.26%	-1.55	-364.5***	0.44%	0.26%	0.67	128.50
44	50	-4.34%	-4.61%	-1.83*	-373.5***	-0.41%	-0.29%	-0.32	-87.50
45	50	-4.71%	-5.12%	-1.91*	-383.5***	-0.38%	-0.31%	-0.30	-131.50
46	50	-4.07%	-5.02%	-1.78*	-365.5***	0.65%	0.58%	1.09	242.5**

Figure 2: Market reaction – all excluded stocks





MWPL-based exclusion

- MQSOS and MMT are liquidity-based measures
- They may be on a downward trend over the six months prior to their exclusion (though Figure 1 does not show such a trend)



MWPL-based exclusion

- MQSOS and MMT are liquidity-based measures
- They may be on a downward trend over the six months prior to their exclusion (though Figure 1 does not show such a trend)
- MWPL is based on free-float and tends to be more sticky
- So we examine only the 30 stocks excluded because of a low MWPL



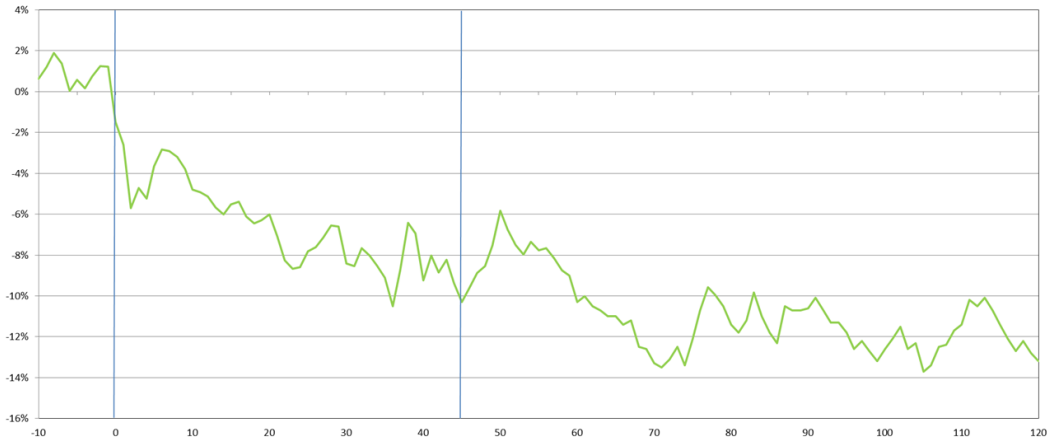
Table 5C: Market reaction combined for MWPL-based exclusions – announcement and actual exclusion

Event Day	N	CAR				AR			
		Mean	Median	Std CS test	SR test	Mean	Median	Std CS test	SR test
-5	30	0.55%	0.66%	1.00	109.5**	0.55%	0.66%	0.97	109.5**
-4	30	0.15%	-0.04%	0.24	1.50	-0.40%	-0.66%	-0.95	-116.5**
-3	30	0.73%	0.85%	0.77	92.5*	0.58%	0.32%	0.92	111.5**
-2	30	1.23%	1.37%	0.99	99.5**	0.50%	-0.07%	0.68	24.50
-1	30	1.20%	1.05%	0.73	67.50	-0.03%	-0.17%	-0.05	-33.50
0	30	-1.51%	-1.93%	-0.71	-88.5*	-2.72%	-2.78%	-2.41**	-181.5***
1	30	-2.62%	-1.83%	-0.88	-148.5***	-1.10%	-2.64%	-0.58	-100.5**
2	30	-5.72%	-5.72%	-1.95*	-202.5***	-3.10%	-3.12%	-3.99***	-227.5***
3	30	-4.75%	-4.74%	-1.67	-194.5***	0.97%	0.67%	1.47	141.5***
4	30	-5.25%	-6.09%	-1.68	-179.5***	-0.50%	-0.87%	-0.52	-96.5**
5	30	-3.70%	-4.05%	-1.08	-152.5***	1.56%	1.25%	2.03*	180.5***
40	30	-5.97%	-6.70%	-1.84*	-185.5***	-2.28%	-2.18%	-2.65**	-210.5***
41	30	-4.76%	-5.00%	-1.38	-162.5***	1.21%	1.03%	1.09	108.5**
42	30	-5.58%	-5.79%	-1.57	-163.5***	-0.82%	-1.24%	-0.86	-101.5**
43	30	-4.99%	-4.73%	-1.41	-160.5***	0.60%	0.28%	0.67	57.50
44	30	-6.12%	-5.15%	-2.01*	-173.5***	-1.13%	-1.12%	-0.86	-108.5**
45	30	-7.03%	-6.46%	-2.36**	-190.5***	-0.91%	-0.75%	-1.12	-128.5***
46	30	-6.38%	-6.31%	-2.35**	-196.5***	0.65%	0.60%	1.04	105.5**

Figure 3: Market reaction for all MWPL-based exclusions excluded stocks



Figure 2b: Market Reaction CNX200 (Stocks excluded due to MWPL)





Additional robustness tests – placebo event dates

- Use new criteria announced on July 23 to identify stocks that would have been excluded around 200 randomly selected placebo event dates between Jan 1, 2010 and Dec 31, 2011
- If reaching the criteria limits itself is information, then we should observe negative price reaction on these placebo dates
- Compute CAR around these placebo tests
- Unreported results – no significant price reaction



Additional robustness tests – false limit tests

- Keep the same event date (July 25), create false limits at increments of ₹10,000 for all three measures, identify stocks that would have been excluded
- The negative price reaction may have occurred even without the change in the limits for the criteria, due to other unobservable factors
- Compute CAR around July 25 for different samples
- Unreported results – no significant price reaction



Price effects

- Overall, prices *decrease* after a stock stops trading in the F&O segment
- And this *decrease* appears to be permanent, not reverting after even 120 days

Table 6: Market reaction – event study based on abnormal volume

Window	[-10, -1]	[0, +1]	[+2, +25]	[+26, +44]	[+45, +62]	[+45, +120]
Treatment	-0.009 (0.108)	0.503 (0.524)	-0.123 (0.104)	-0.377** (0.150)	-1.513*** (0.252)	-1.373*** (0.187)
Observations	200	200	200	199	199	198
R-squared	0.004	0.166	0.020	0.053	0.159	0.162
Adj R-squared	-0.017	0.148	0.000	0.034	0.142	0.144

Table 9B: Impact on liquidity

	Total Trades	Avg Daily Trade	Total Volume (CM)	Total Volume (CM, F&O)	Avg Trade Size	Turnover (CM)
Treatment	-0.081 (0.128)	-0.083 (0.128)	0.107 (0.132)	0.127 (0.109)	0.239*** (0.069)	0.123 (0.133)
Post event	0.121*** (0.031)	0.137*** (0.030)	0.052 (0.032)	0.176*** (0.045)	-0.057*** (0.016)	0.047 (0.032)
Interaction (Treat*Post)	-0.352*** (0.079)	-0.355*** (0.079)	-0.438*** (0.089)	-1.422*** (0.110)	-0.063* (0.034)	-0.435*** (0.087)
Observations	3,161	3,161	3,161	3,161	3,161	3,161
Adj R-squared	0.236	0.236	0.365	0.493	0.408	0.179
Number of Companies	204	204	204	204	204	204
Control Vars	Yes	Yes	Yes	Yes	Yes	Yes

Table 9B: Impact on liquidity

	Turnover (CM, F&O)	Avg Turnover (CM)	Avg Turnover (CM, F&O)	Amihud Illiquidity (CM)	Amihud Illiquidity (CM,F&O)	Roll Impact
Treatment	0.139 (0.110)	0.082 (0.140)	0.091 (0.114)	-0.296** (0.135)	-0.268** (0.109)	0.391* (0.236)
Post event	0.172*** (0.046)	0.064** (0.033)	0.179*** (0.048)	-0.092*** (0.030)	-0.205*** (0.046)	-0.211*** (0.058)
Interaction (Treat*Post)	-1.421*** (0.109)	-0.515*** (0.085)	-1.478*** (0.108)	0.450*** (0.076)	1.430*** (0.103)	1.228*** (0.148)
Observations	3,161	3,161	3,161	3,161	3,161	1,380
Adj R-squared	0.351	0.231	0.374	0.511	0.567	0.278
Number of Companies	204	204	204	204	204	204
Control Vars	Yes	Yes	Yes	Yes	Yes	Yes



Price efficiency measures

- Measures are from Hou and Moskowitz (2005) and Saffi and Sigurdsson (2011)
- Estimate the following regression:

$$r_{i,t} = \alpha + \nu_i + \beta_1 * r_{m,t} + \beta_2 * r_{m,t-1} + \beta_3 * r_{m,t-2} + \beta_4 * r_{m,t-3} + \beta_5 * r_{m,t-4} + \epsilon_{ij}$$

where $r_{i,t}$ is the return on stock i in week t , $r_{m,t}$ is the return on the market (CNX200) in week t and the corresponding four lags on the market

- The above equation as well as a constrained version with all lag coefficients set to zero are estimated

$$D_1 = 1 - \frac{R_{constrained}^2}{R_{full}^2}$$

$$D_2 = \frac{|\beta_2| + |\beta_3| + |\beta_4| + |\beta_5|}{|\beta_1| + |\beta_2| + |\beta_3| + |\beta_4| + |\beta_5|}$$

Table 7B: Price efficiency

	D1	D2	D1	D2
Treatment	0.008 (0.022)	0.003 (0.014)	-0.056* (0.033)	-0.038* (0.020)
Post event	0.052*** (0.012)	0.037*** (0.007)	0.033 (0.031)	0.021 (0.016)
Interaction (Treat*Post)	0.073*** (0.026)	0.052*** (0.015)	0.096** (0.040)	0.071*** (0.021)
Observations	3,146	3,146	1,011	1,011
Adj R-squared	0.0384	0.0406	0.0728	0.0811
Number of Companies	204	204	68	68
Control Vars	Yes	Yes	Yes	Yes

Table 8: Price efficiency – Analyst coverage

	Analysts	Analysts
Treatment	-18.566*** (1.875)	-10.510*** (1.911)
Post event	3.054*** (0.564)	3.320*** (0.458)
Interaction (Treat*Post)	-4.132*** (1.157)	-2.675*** (1.023)
Observations	3,160	3,076
Number of companies	0.0808	0.192
Adj R-squared	204	203
Control Vars	No	Yes

Table 10: Volatility

	Std Dev	Return	Down	Up	Up or Down
Treatment	-0.004** (0.002)	-0.181*** (0.051)	0.008 (0.005)	-0.004 (0.003)	0.003 (0.004)
Post event	0.001 (0.001)	-0.003 (0.018)	-0.002 (0.004)	0.008*** (0.002)	0.006* (0.003)
Interaction (Treat*Post)	0.004* (0.002)	0.046 (0.048)	-0.013** (0.005)	0.009** (0.004)	-0.005 (0.004)
Observations	3,146	3,146	3,146	3,146	3,146
Adj R-squared	0.0589	0.0842	0.0183	0.0269	0.00485
Number of Companies	204	204	204	204	204
Control Vars	Yes	Yes	Yes	Yes	Yes

Table 10: Volatility

	Down Risk	Up Risk	High-Low	Skewness	Kurtosis
Treatment	-0.000 (0.000)	0.001 (0.004)	-0.263*** (0.095)	0.068 (0.048)	0.055 (0.105)
Post event	-0.000 (0.000)	0.001* (0.001)	-0.086*** (0.031)	0.079*** (0.030)	0.262*** (0.068)
Interaction (Treat*Post)	0.000 (0.000)	0.004 (0.007)	0.054 (0.078)	0.205*** (0.066)	0.339** (0.167)
Observations	3,141	275	3,146	3,146	3,146
Adj R-squared	0.0861	0.00630	0.105	0.0169	0.0135
Number of Companies	204	161	204	204	204
Control Vars	Yes	Yes	Yes	Yes	Yes



Conclusions

- Prices are negatively impacted when a stock is excluded from the F&O segment
- And this price change is permanent



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- Some evidence that volatility, in fact, increases after F&O exclusion



Conclusions

- Prices are negatively impacted when a stock is excluded from the F&O segment
- And this price change is permanent
- Liquidity worsens
- Price efficiency worsens
- Some evidence that volatility, in fact, increases after F&O exclusion
- From a policy perspective, derivatives are good for price efficiency and liquidity and not necessarily bad for volatility!