

Option Trading and Stock Price Movements

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Outline

- ◆ Information in option volume about direction of future stock price movements (joint work with Jun Pan at MIT)
- ◆ Expiration date clustering of underlying stock prices at strike prices (joint work with Sophie Xiaoyan Ni and Neil Pearson at UIUC)
- ◆ Other research on behavioral finance, options, and volatility

Does Option Volume Contain Information about Future Stock Prices?

◆ Natural idea:

- “Fact and Fantasy in the Use of Options” (Fischer Black, 1975)

Since an investor can usually get more action for a given investment in options than he can by investing directly in the underlying stock, he may choose to deal in options when he feels he has an especially important piece of information...And many potential information traders will trade on the options market when they wouldn't bother to trade at all if the options market did not exist.

◆ But: Previously, no evidence that option volume is informative

- Easley, O'Hara, Srinivas (1998), Chan, Chung, and Fong (2002), and Cao, Chen, and Griffin (2004)

Main Result

- ◆ Long-short stock portfolio formed from a put-call volume ratio get 40 basis points the next day and 100 basis points over the next week with very large t-statistics
- ◆ Why the difference in results?
 - Our data allow us to identify “open buy” option volume from non-market makers
 - We use all CBOE options from 1990-2001
 - ◆ EOS (1998): 50 firms for 44 trading days
 - ◆ CCF (2002): 14 firms for 58 trading days

Option Dataset

- ◆ Daily records of CBOE trading volume for all CBOE listed options from January 1990 through December 2001
- ◆ Each option is identified by its underlying stock or index, as a put or a call, and by its strike price and time to expiration
- ◆ A unique feature of our dataset is that the daily trading volume for each option is broken down into 16 categories defined by 4 trade types and 4 investor classes
 - Open buy, open sell, close buy, close sell
 - Prop. traders, public customers: discount, full-service, others

Information in Open Buy Volume

- ◆ Non-market maker buy volume to open new positions
- ◆ Build daily cross-sections of stocks with liquid option trading – at least 50 contracts of open buy volume (91 in 1990, 359 in 2001)
- ◆ On each day compute put-call ratio from open buy volume:

$$\text{open buy put - call ratio} \equiv \frac{\text{o. b. put volume}}{\text{o. b. put volume} + \text{o. b. call volume}}$$

- ◆ If investors with bad news buy new puts and investors with good news buy new calls, then high open buy put-call ratio stock portfolios should subsequently underperform low put/call ratio stock portfolios
- ◆ Put-call ratio has an average value of 30%. Breaking stocks into quintiles by put-call ratios there is little variation in size, BM, momentum, or analyst coverage.

Regression results

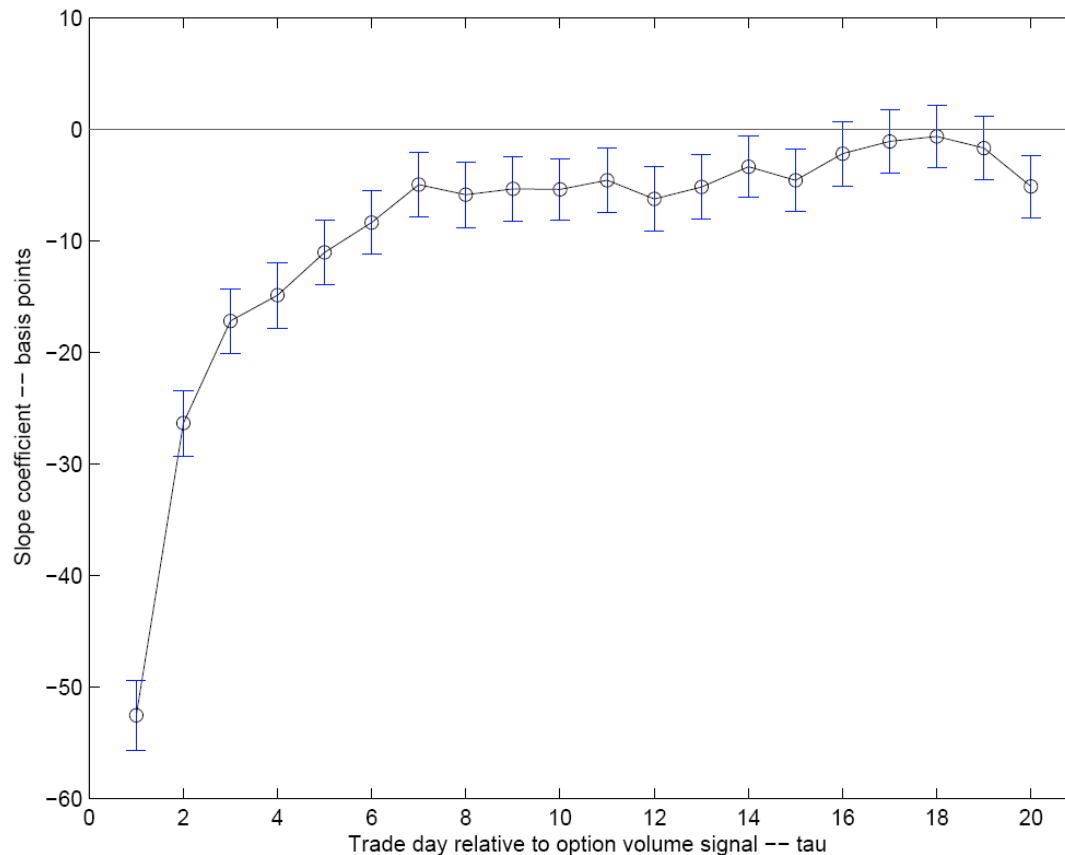
- ◆ Regression: τ -day ahead stock returns on open-buy put-call ratios:

$$R_{it+\tau}^{\text{four-factor adj.}} = \alpha + \beta PC_{it}^{\text{open-buy}} + \varepsilon_{it+\tau}, \quad \tau = 1, 2, \dots$$

$\beta = -53$ basis points (t-stat = -32.9 FM s.e.'s)

- ◆ Portfolios:
 - 15.7 bps next day for bottom PC quintile
 - -26.6 bps next day for top PC quintile
- ◆ Robust to removing trade days within +/- 5 days of earnings announcements.
- ◆ Slightly smaller for raw returns

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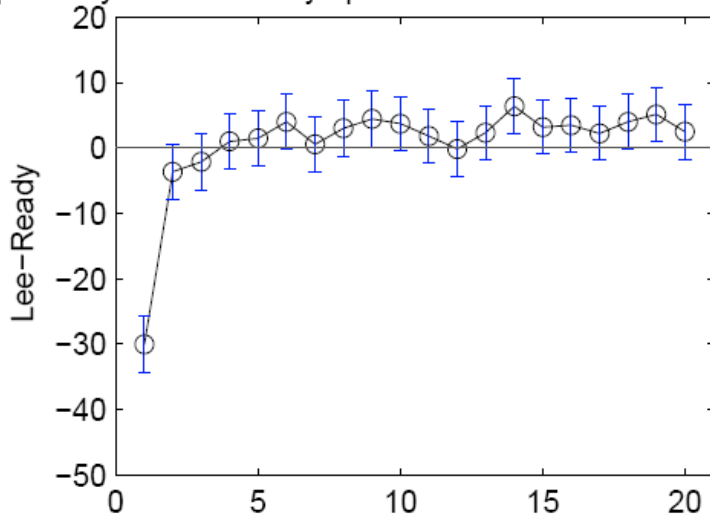
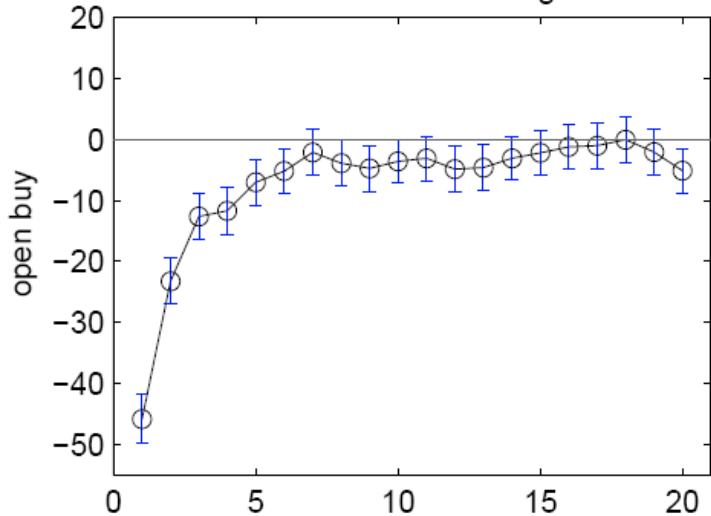


◆ Conclusion: No evidence of price pressure (e.g., from market maker hedging)

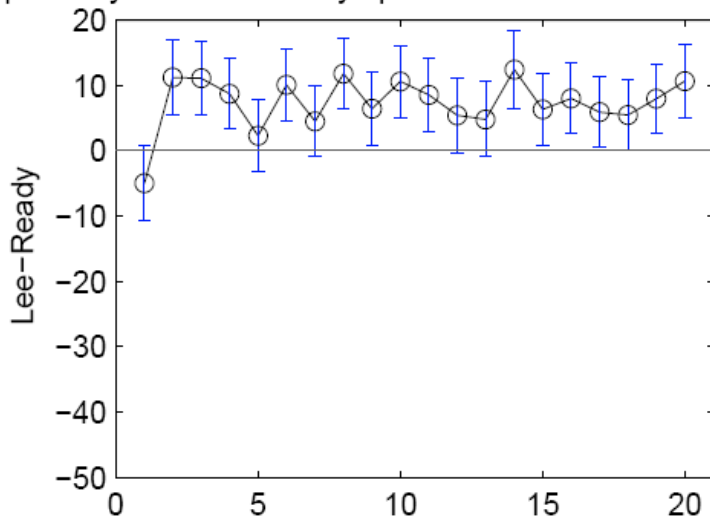
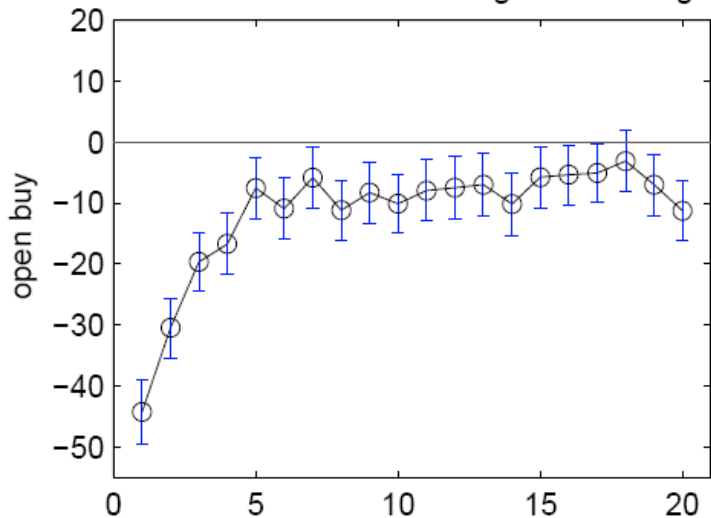
Empirical Findings on Aspects of Information-Based Models

- ◆ Speed of price adjustment
 - Non-public open buy volume is predictive for several weeks into future (no reversion)
 - Publicly observable volume is predictive for only next day (also reverts)
- ◆ Concentration of informed traders
 - Option volume is more informative for stocks with higher concentrations of informed investors
- ◆ Leverage
 - Volume from more highly levered option contracts is more informative
- ◆ Investor Types
 - Volume of public customers of full-service brokers is most informative; volume of proprietary traders is uninformative

Univariate Regressions using open-buy or Lee-Ready option volume



Bivariate Regression using both open-buy and Lee-Ready option volume



Trade day relative to option volume observation

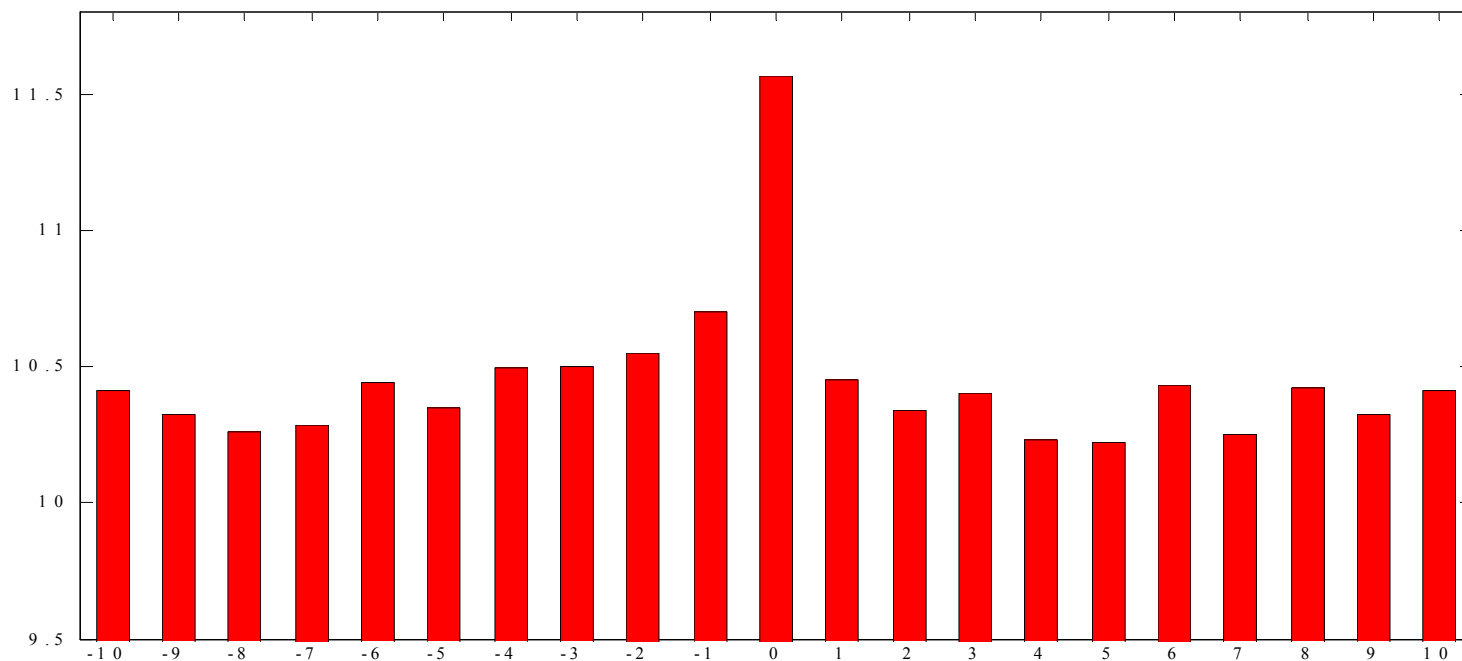
Stock Price Clustering on Option Expiration Dates

- ◆ Previous research has failed to find much convincing evidence that trading of equity options impacts underlying stocks
- ◆ I will present results which document that option trading alters underlying stock prices
 - Over 1996-2002 period optionable stocks cluster at strike prices on expiration dates
- ◆ Investigates the causes of the clustering
 - Partially caused by rebalancing of delta hedge on existing option positions
 - Several pieces of evidence that option traders manipulate stock prices

Data Description

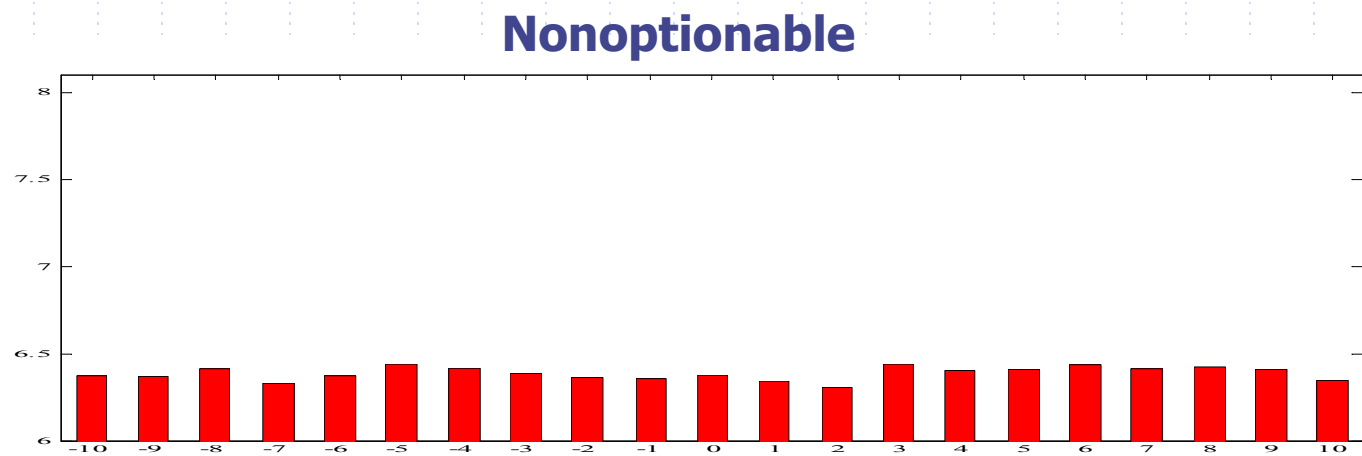
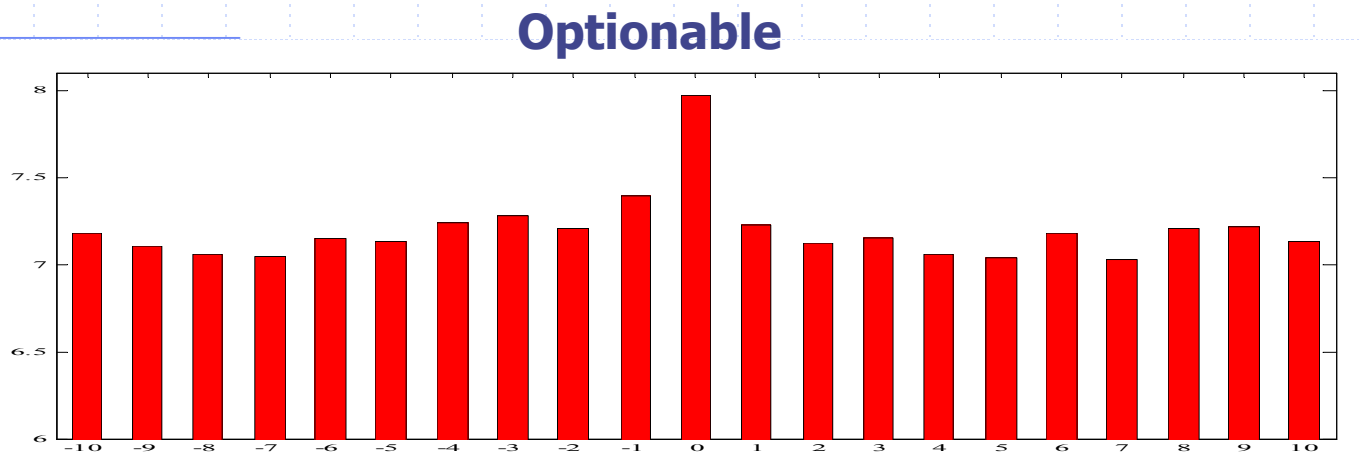
- ◆ Data obtained from OptionMetrics and CBOE
- ◆ 80 option expiration dates from 1/1996 – 8/2002
- ◆ Stock is optionable on a given trade date if it has an option with $OI > 0$
- ◆ 4395 stocks are optionable on at least one expiration day
- ◆ 184,449 optionable stock-expiration date pairs across 80 expiration days
- ◆ 12,001 stocks are non-optionable on at least one expiration date
- ◆ 417,007 non-optionable stock-expiration date pairs across 80 expiration dates

Figure 1: Percentage of optionable stocks closing within \$0.125 of a strike price



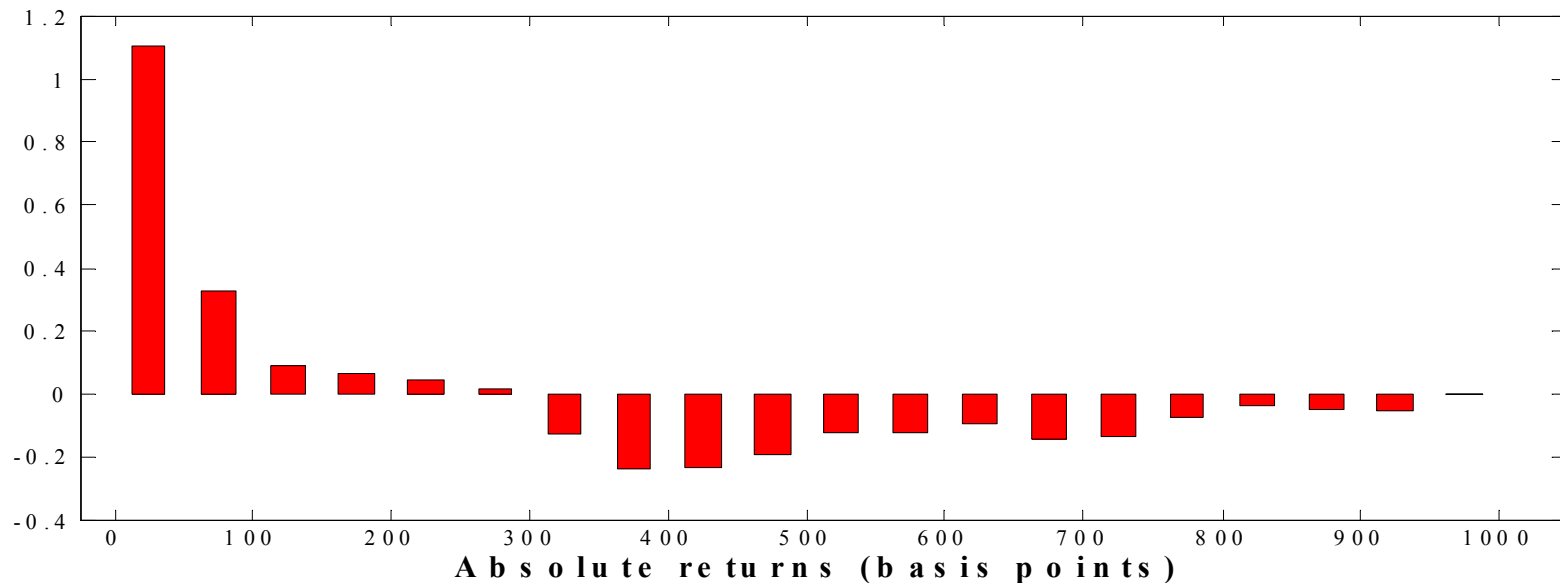
Relative Trading Date from Option Expiration Date

Figure 2: Percentage of optionable (top) and nonoptionable (bottom) stocks closing within \$0.125 of an integer multiple of \$5



Relative Trading Date from Option Expiration Date

Fig. 5: Absolute returns distribution difference between expiration Fridays and other Fridays



$$E \left| \hat{r}_i - r_i \right| \geq \left| \sum_{b=1}^B [\hat{p}(b) - p(b)] a(b) \right| = 16.57 \text{ bps}$$

Lower bound on market cap. impact per expiration date: \$ 9.1 billion

Potential Causes of Clustering

- ◆ Rebalancing of delta-hedges on existing option positions
- ◆ Stock price manipulation by option investors
- ◆ Delta Hedging of new option positions
- ◆ Stock trading by non-delta-hedging option investors

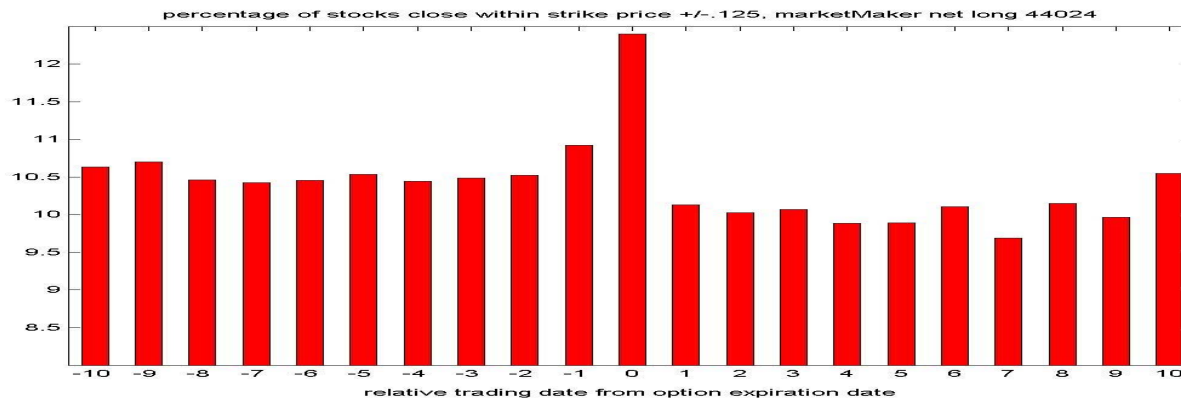
Delta Hedge Rebalancing

Avellaneda and Lipkin (2003)

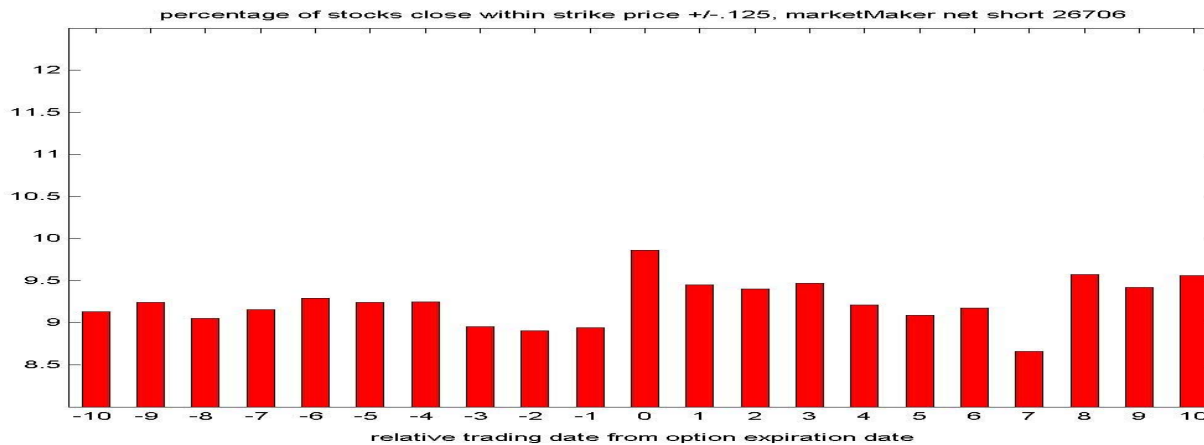
- ◆ If delta-hedging option investors have a **net purchased** option position, then near expiration hedge rebalancing drives stock **toward** the strike
 - $S > K \Rightarrow \partial\Delta/\partial t > 0 \Rightarrow$ Sell stock to stay delta-neutral
 - $S < K \Rightarrow \partial\Delta/\partial t < 0 \Rightarrow$ Buy stock to stay delta-neutral
- ◆ Similarly, if delta-hedging option investors have a **net written** option position, then near expiration hedge rebalancing drives stock **away from** the strike
- ◆ Use market makers or market makers plus firm proprietary traders as proxy for delta-hedgers

Figure 6: Clustering with Market-Makers Net Purchased or Net Written

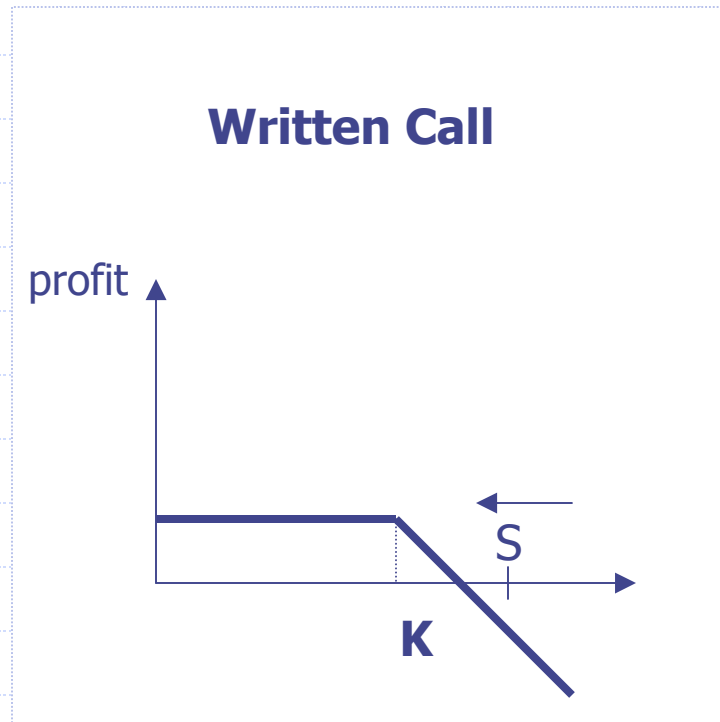
Market Makers Net Purchased



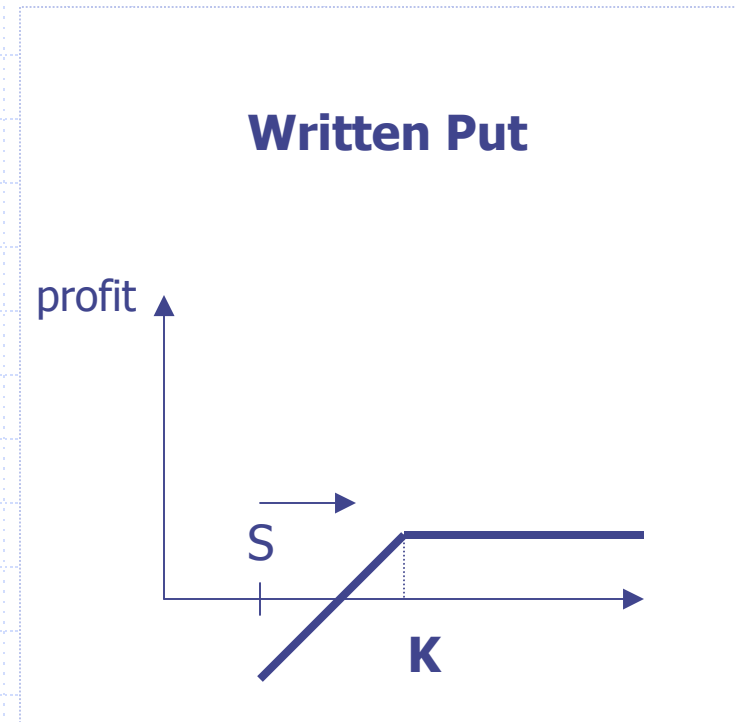
Market Makers Net Written



Option Investors with Written Positions Manipulate Stock Prices



$S > K$, call writers have incentive to push S down to K , call purchasers not exercise.



$S < K$, put writers have incentive to push S up to K , put purchasers not exercise.

Evidence on manipulation

- ◆ Clustering is more pronounced when firm proprietary traders (but not when public customers) write options during expiration week
- ◆ Profitability to firm proprietary option writing in expiration week:
 - Premium: \$118.8 million (1996 – 2001)
 - Liability: \$46.4 million (1996 – 2001)
- ◆ Manipulation:
 - Call writing results in stock price moving from above to the strike or being kept below the strike
 - Put writing results in stock price moving from below to the strike or being kept above the strike
 - We find evidence that support these two implications

Other Research

- ◆ Other option market papers (various co-authors)
 - “Clearly Irrational Financial Market Behavior: Evidence from the Early Exercise of Exchange Traded Stock Options”
 - “Underreaction, Overreaction, and Increasing Misreaction to Information in the Options Market”
 - “Unusual Option Market Activity and the Terrorist Attacks of September 11, 2001”
 - “Investor Behavior in the Option Market”
 - “Overreaction to Stock Market News and Miscalculation of Stock Prices by Unsophisticated Investors: Evidence from the Option Market”
 - Available at: <http://www.business.uiuc.edu/poteshma>
- ◆ Research in Progress:
 - “Demand-Based Option Pricing”
 - “Volatility Information Trading in the Option Market”