Liquidity Provision and Adverse Selection in the Equity Options Market

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Empirical Analysis of Signed Trading Volume by Investor Type

- DATA: Chicago Board Options Exchange (CBOE) and the International Securities Exchange (ISE) Open/Close Buy/Sell Trading Volume (more than 60% of equity options trading volume in the U.S)
- The volumes are categorized into open buy, close buy, and open sell, close sell for call and put contracts. Open buy volume means initiating a long position in a contract, and close buy means covering a previously open sell/written position. Similarly, open sell means initiating a short/written position, and close sell is covering previously open buy/purchased positions.
- Moreover, the exchanges also identify public customer (Customer originated orders) and firm originated (proprietary desks of institutions) orders for each volume category.
- No MMs volume

Why this is important?

- Where does informed trading first takes place (options vs stock market)?
- Who is informed in the options market (customers vs prop-desks) and who pays the costs?
- Can we construct a proxy for informed trading using options signed order flows?

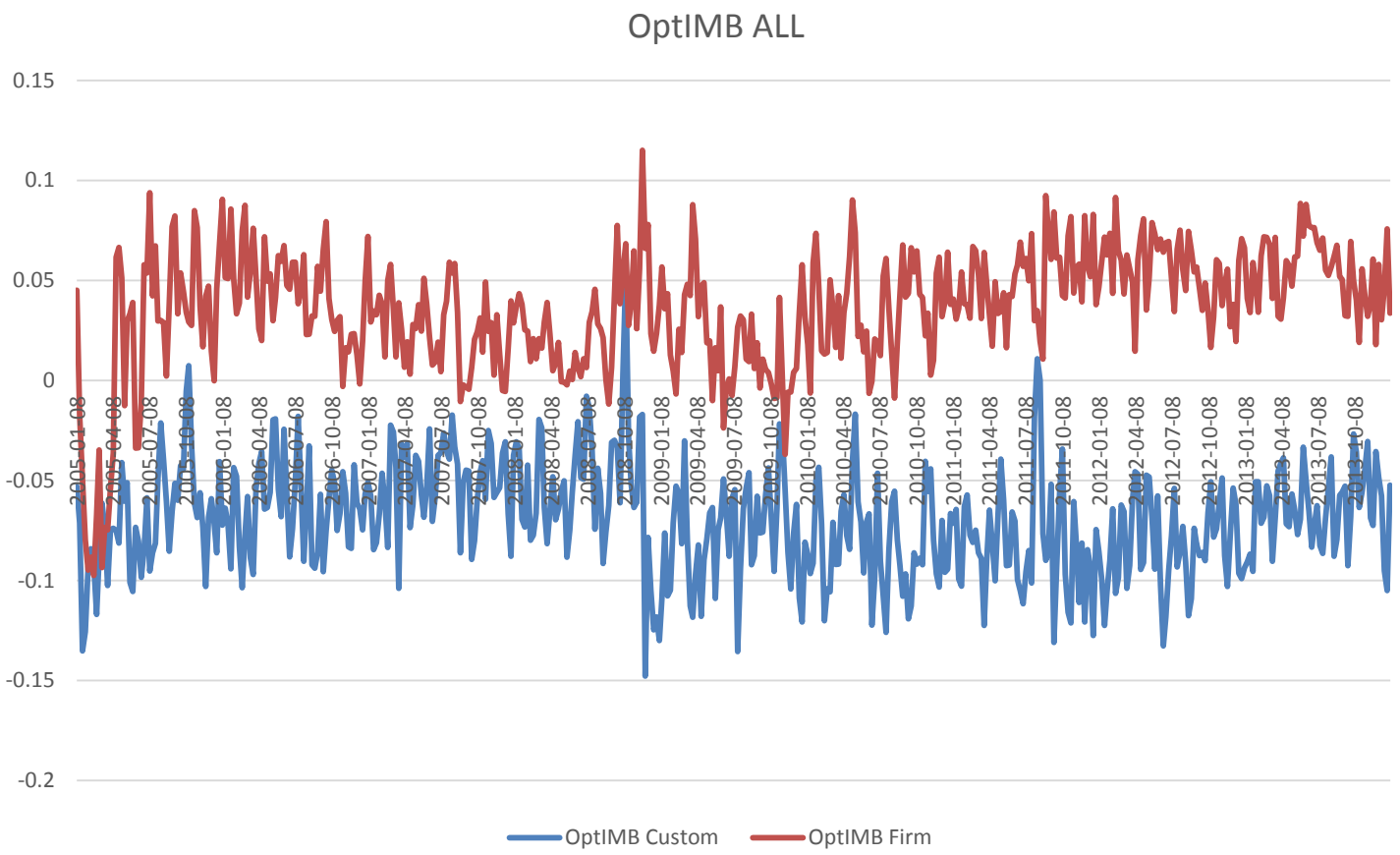
Literature

- Black (1975) argues that informed investors are attracted to the options market because they can gain higher leverage
- Vijh (1990) and Cho and Engle (1999) find that trading in options is largely driven by differences of opinions rather than private information
- Pan and Poteshman (2006), Easley, O'Hara and Srinivas (1998), Johnson and So (2012) → argue in favor of informed trading in the options market
- Muravyev, Pearson and Broussard (2013) → no price discovery in the ATM equity options, Chakravarty, Gulen and Mayhew (2004) → significant price discovery in OTM contracts
- Ge, Lin and Pearson (2015) argue that O/S (Johnson and So, 2012) does not capture negative private information

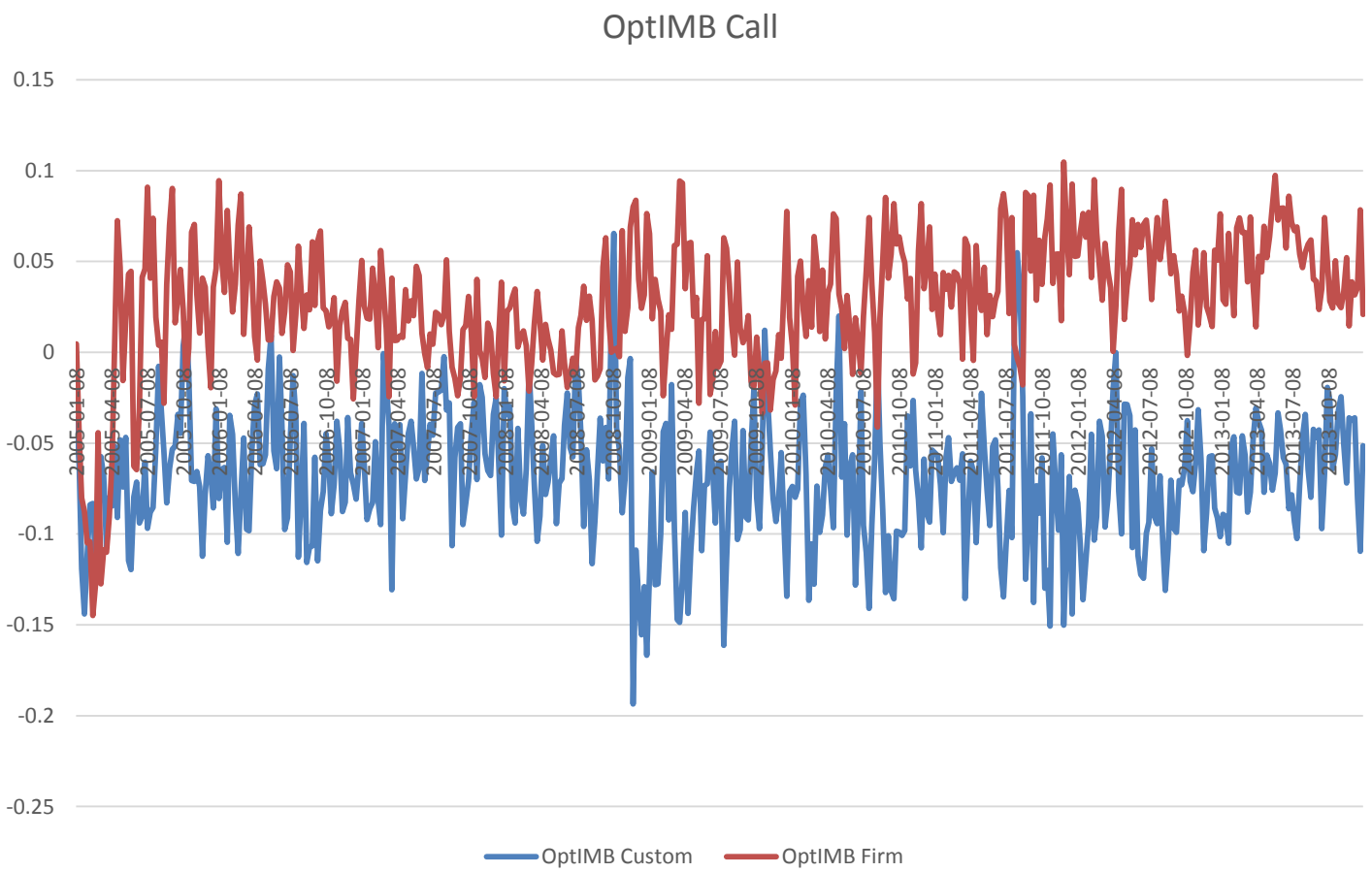
Methodology

- Options order imbalances are computed on a firm level similar to Bollen and Whaley (2004):
- $OptIMB_k = \frac{\sum_{i=1}^{N}(\Delta Buy_i - \Delta Sell_i)}{\sum_{i=1}^{N}(Buy_i + Sell_i)}$
- where buy volume is Buy_i=*Open Buy*$_i$ +*Close Buy*$_i$, and sell volume is $Sell_i$=*Open Sell*$_i$ +*Close Sell*$_i$ for options series *i*. Δ is the absolute value of option's daily delta from OptionsMetrics.
- Construct Options IMB by investor type (customer vs firm/prop-desk)

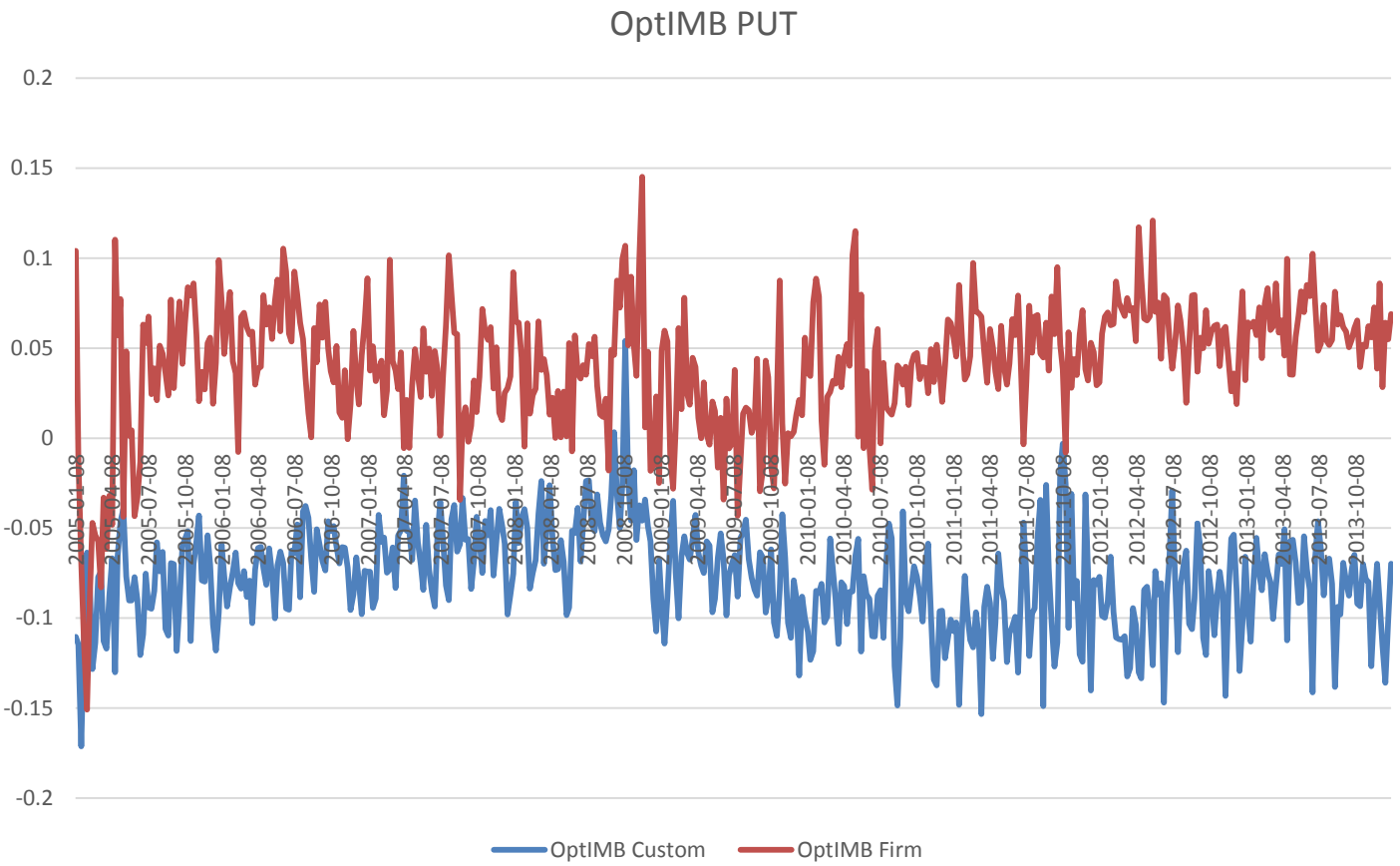
Options Order Imbalances across all Call and Put contracts



Options Order Imbalances for Call contracts



Options Order Imbalances for Put contracts



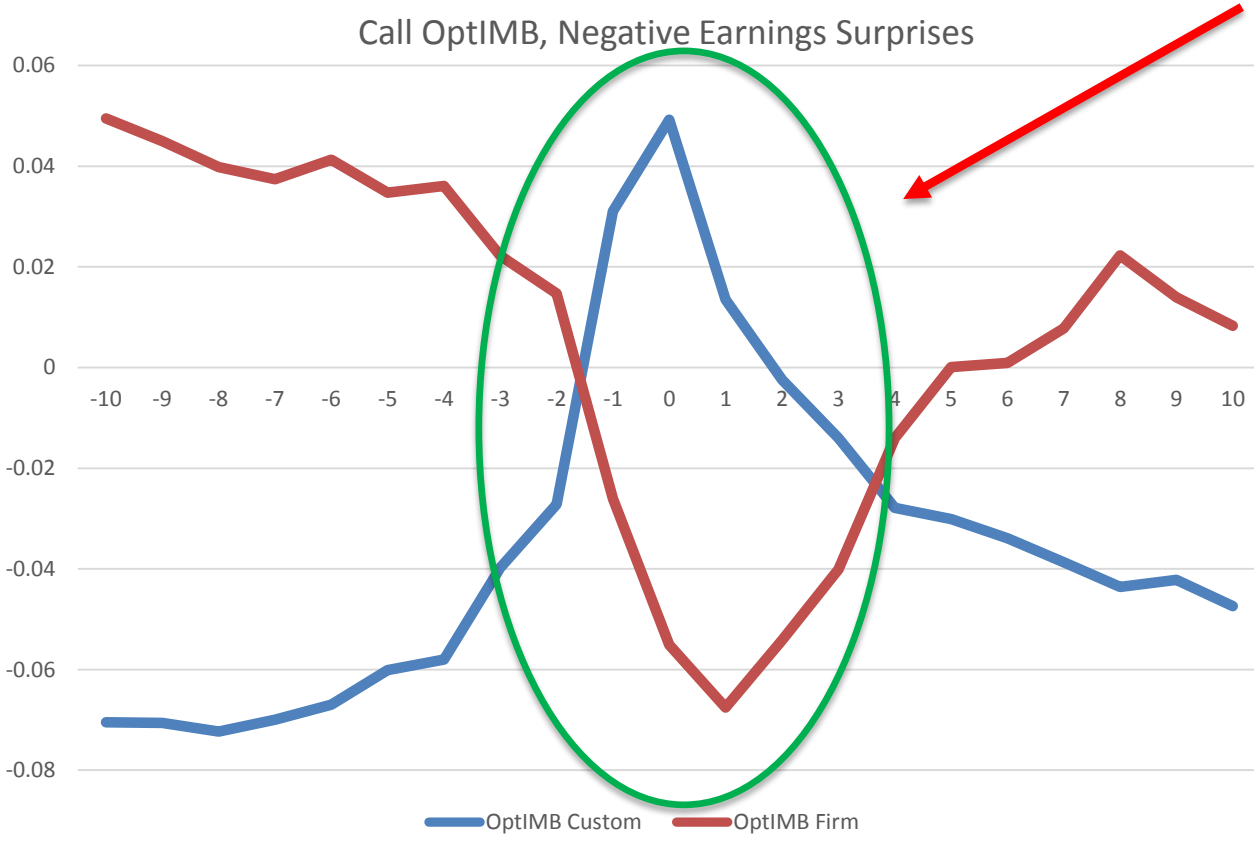
Customer vs Firm Order Imbalances

- On aggregate, both call and put imbalances are negative
- Customer Imbalances are negative (-7%)
- Firm Imbalances are positive (3.6%)
- *Corr*(*CustImbal*, *FirmImbal*) = -0.34

Does it hold at all times? Evidence from Information events: Earnings Surprises

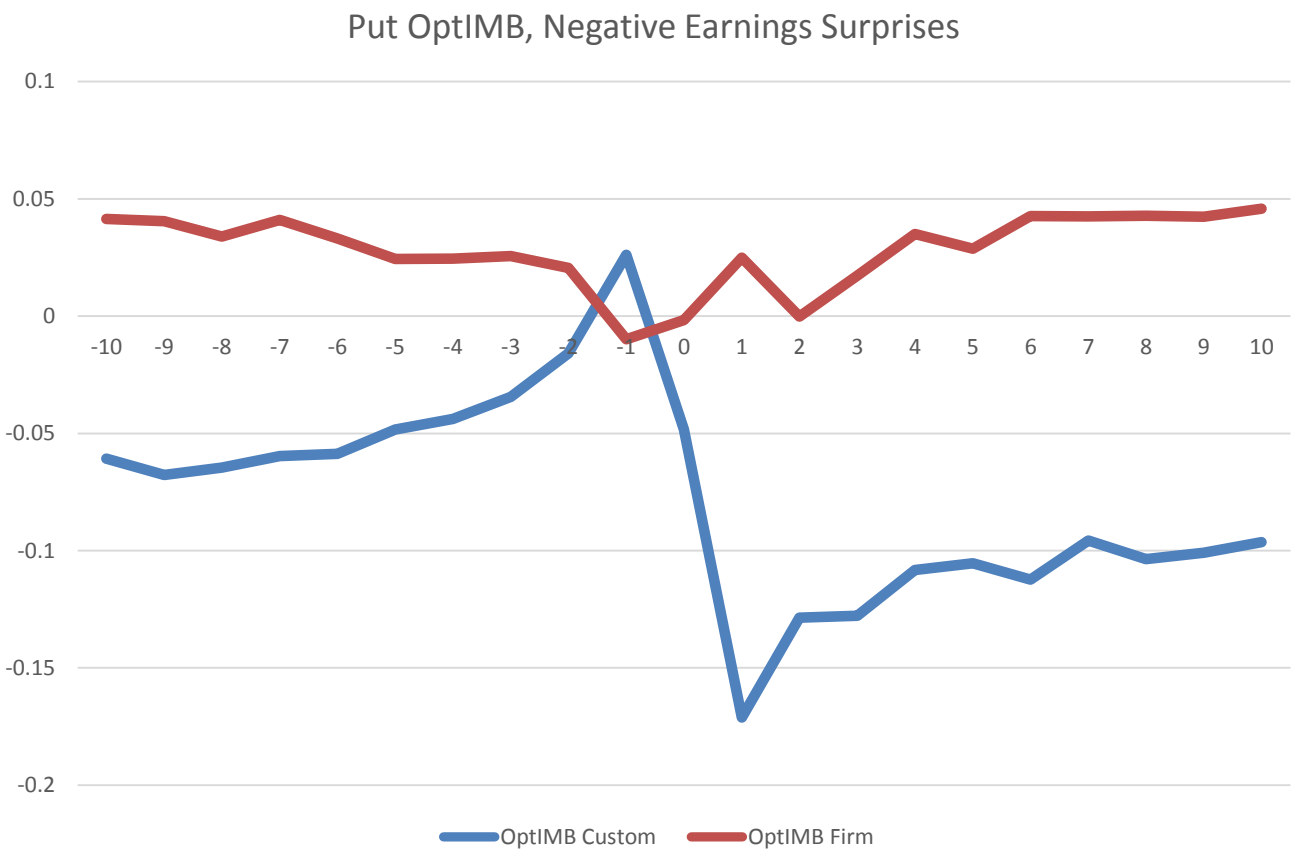
- Event Study:
- *CAR* is computed over three-day event window [-1,1] as:
- $CAR_i = \sum_{t=-1}^{1}(R_{i,t} - R_{m,t})$
- The cumulative abnormal return is standardized as
- $SCAR_i = \frac{CAR_i}{\sqrt{3\sigma_i}}$
- The even window is defined as [-10,10]
- The pre-event window is [-42,-21] relative to the announcement date.

Negative Earning Surprise, CALLs

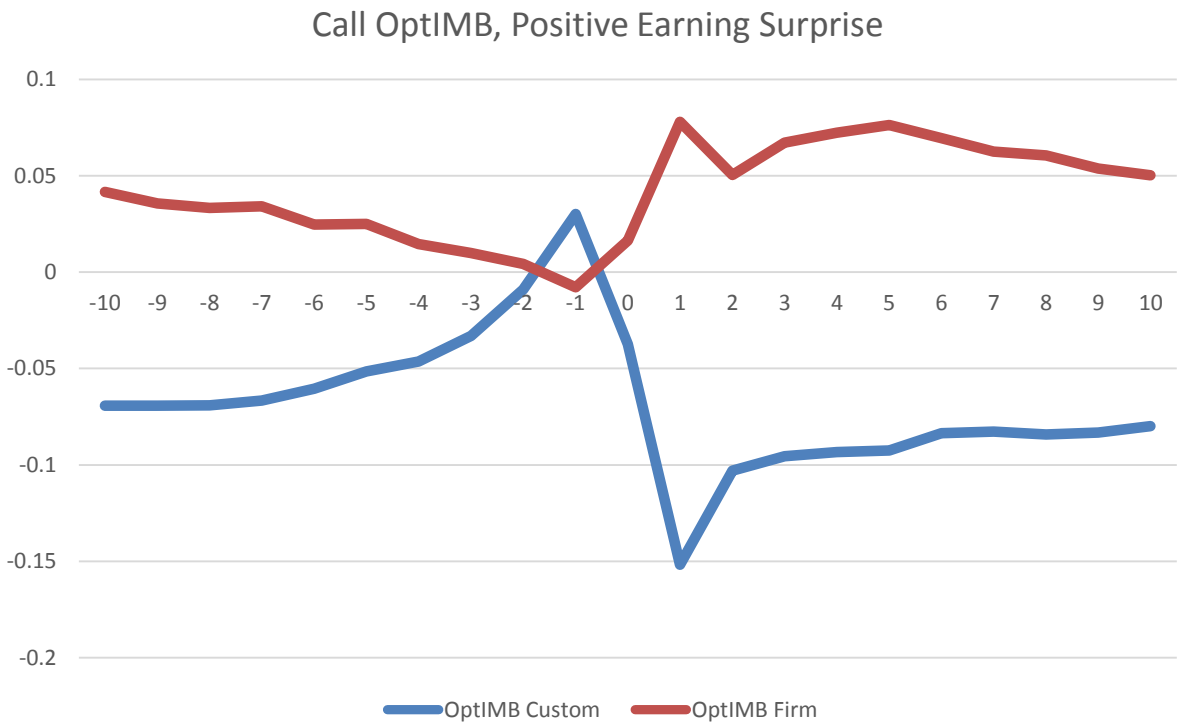


Abnormal imbalances flip signs for both, Customer and Firm

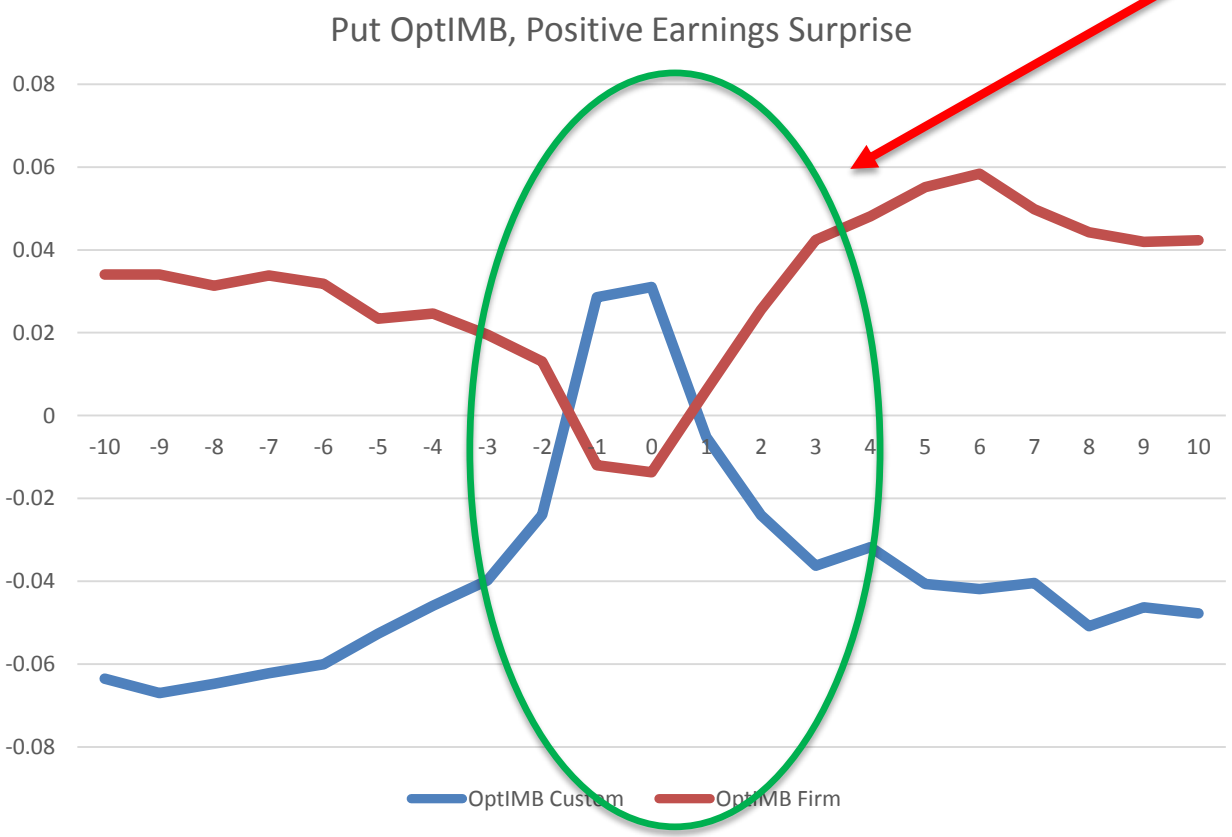
Negative Earning Surprise, PUTs



Positive Earning Surprise, CALLs



Positive Earning Surprise, Puts



Customer accounts always Buy more around information events, Firm accounts Sell more

Goyenko, Ornthanalai, Tang (2016) – asymmetric information measured by quoted and effective options bid-ask spreads increases around these events

Measures of Informed Trading

- Pan and Poteshman (2006) put-call volume ratio
- $PP_{i,t} = \frac{CustomOBP_{i,t}}{CustomOBP_{i,t}+CustomOBC_{i,t}}$ where $OBP_{i,t}$ and $OBC_{i,t}$ are **open buy of put and call** contracts respectively originated by customer accounts.
- O/S (Johnson and So, 2012)
- To measure the exposure of prop-desks to potentially loss generating trades:
- $SPC_{i,t} = \frac{FirmOSP_{i,t}}{FirmOSP_{i,t}+FirmOSC_{i,t}}$
- where $OSP_{i,t}$ and $OSC_{i,t}$ are **open sell of put and call** contracts respectively originated by firm/prop-desks accounts.

Options Disagreement Measure

- From Fournier, Goyenko and Grass (2017):
- $$DISC = \frac{(OBC\Delta+CBC\Delta+OSC\Delta+CSC\Delta)-|(OBC\Delta+CBC\Delta)-(OSC\Delta+CSC\Delta)|}{OBC+CBC+OSC+CSC}$$
- $$DISP = \frac{(OBP\Delta+CBP\Delta+OSP\Delta+CSP\Delta)-|(OBP\Delta+CBP\Delta)-(OSP\Delta+CSP\Delta)|}{OBP+CBP+OSP+CSP}$$
- $$DIS = \frac{\sum_k VolCall_k DISC_k+\sum_k VolPut_k DISP_k}{\sum_k VolCall_k+\sum_k VolPut_k}$$

Hypotheses

- ***H1***. *SPC should negatively predict future stock returns*

- ***H2***. *Given that out of the money contracts are supposed to attract informed traders more because of their higher leverage (Easley, O'Hara and Srinivas (1998)), we expect to find stronger predictability of SPC for stock returns in OTM contracts compared to ATM contracts.*

- The main regression model specification is (weekly Fama-MacBeth regressions)

- $$CAR_{i,t+1} = b_0 + b_1 SPCFirm_{i,t} + b_2 PP_{i,t} + b_3 DISFirm_{i,t} + b_3 DISCustom_{i,t} + \sum_i^N FirmChar_{i,t} + \sum_t^{t-4} R_t + \sigma(R_t) + \varepsilon_0$$

Results: OTM Contracts

	2005-2013				2010-2013			
	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat
$SPC\text{-}Firm_{i,t}$	-0.001	-3.41	0.000	-0.89	-0.001	-3.45	-0.001	-1.96
$PP_{i,t}$			-0.002	-2.8			0.000	0.64
$DIS\text{-}Firm_{i,t}$			-0.002	-0.87			-0.003	-0.85
$DIS\text{-}Custom_{i,t}$			-0.013	-2.85			-0.012	-2.07
$ILS_{i,t}$	-0.541	-1.45	-1.316	-2.09	-0.709	-1.49	-0.812	-0.91
$Size_{i,t}$	0.000	-0.69	0.000	0.48	0.000	-0.76	0.000	0.49
$OS_{i,t}$	0.002	0.66	0.005	1.82	-0.001	-0.39	0.002	0.7
$ImbalStock_{i,t}$	0.005	2.04	0.010	2.78	0.002	0.65	0.006	1.44
$R_{i,t}$	-0.006	-1.17	-0.007	-1.1	-0.015	-2.33	-0.017	-2.13
$R_{i,t-1}$	-0.004	-0.77	-0.005	-0.78	-0.004	-0.63	-0.006	-0.78
$R_{i,t-2}$	0.004	0.77	0.005	0.79	-0.002	-0.3	-0.003	-0.42
$R_{i,t-3}$	0.003	0.63	0.007	1.36	-0.004	-0.73	0.006	0.9
$\sigma(Ret_i)$	-0.033	-1.4	-0.016	-0.52	0.015	0.46	-0.019	-0.37
Adj. R^2	0.066		0.092		0.056		0.082	
Avg. # stocks	628		380		655		400	

Portfolio Sorting, SPC (2005-2013)

	value-weighted returns				equal-weighted returns			
	OTM		ATM		OTM		ATM	
portfolio	$Alpha_{t+}$	t-stat	$Alpha_{t+1}$	t-stat	$Alpha_{t+1}$	t-stat	$Alpha_{t+1}$	t-stat
Low	14.196	1.89	10.679	1.19	16.438	1.72	13.752	1.20
2	11.389	1.60	6.309	0.64	11.635	1.23	8.927	0.75
3	7.588	1.09	9.575	1.07	9.545	1.04	10.710	0.95
4	7.989	1.09	8.556	1.01	8.691	1.00	10.243	0.95
High	8.799	1.23	9.334	1.11	10.104	1.15	8.210	0.75
High-Low	-5.398	-3.24	-1.344	-0.57	-6.334	-3.16	-5.542	-2.46

H3. If informed trading first takes place in option markets, then SPC-Firm should have lower predictability on the firm-news dates, and high predictability for stock returns on no-news-firm dates.

	2005-2013				2010-2013			
	Firm News Weeks		No Firm News Weeks		Firm News Weeks		No Firm News Weeks	
	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat
$SPC\text{-}Firm_{i,t}$	-0.0005	-1.16	-0.0018	-3.86	-0.0009	-1.76	-0.0014	-2.2
$DIS\text{-}Custom_{i,t}$	-0.0092	-2.28	-0.0122	-2.86	-0.0113	-1.88	-0.0117	-1.99
$ILS_{i,t}$	-0.7876	-1.6	-0.5141	-1.16	-0.5558	-0.93	-0.7541	-1.27
$Size_{i,t}$	0.0001	0.26	0.0002	0.83	0.0000	0.13	0.0000	0.08
$OS_{i,t}$	0.0055	1.59	0.0015	0.45	0.0009	0.25	0.0010	0.21
$ImbalStock_{i,t}$	0.0073	2.34	0.0032	0.88	0.0024	0.64	0.0012	0.21
$R_{i,t}$	-0.0090	-1.58	-0.0084	-1.08	-0.0204	-2.23	-0.0220	-2.38
$R_{i,t-1}$	-0.0092	-1.48	0.0010	0.17	-0.0060	-0.68	-0.0053	-0.67
$R_{i,t-2}$	0.0065	1.12	-0.0022	-0.37	-0.0005	-0.07	-0.0056	-0.67
$R_{i,t-3}$	0.0046	0.75	0.0025	0.46	-0.0072	-0.82	-0.0025	-0.36
$\sigma(Ret_i)$	0.0366	1.06	-0.1814	-3.21	0.0385	0.62	-0.1418	-2.05
Adj. R^2	0.089		0.081		0.081		0.074	
Avg. # stocks	347		307		339		320	

What Kind of News?

ESS is RavenPack Analytics (RPA) score for the news positivity (ranges from 0 – highly negative to 100 highly positive)

	2005-2013		2010-2013	
	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat
$ESS_{i,t}$	0.0000	0.06	0.0000	1.36
$SPC\text{-}FirmP_{i,t}$	-0.0001	-0.18	-0.0006	-0.87
$SPC\text{-}FirmN_{i,t}$	-0.0009	-1.78	-0.0016	-2.27
$DIS\text{-}CustomP_{i,t}$	-0.0084	-1.96	-0.0125	-2
$DIS\text{-}CustomN_{i,t}$	-0.0088	-1.87	-0.0075	-1.12
$ILS_{i,t}$	-0.7701	-1.56	-0.4757	-0.79
$Size_{i,t}$	0.0000	0.1	0.0000	0.05
$OS_{i,t}$	0.0049	1.49	0.0006	0.17
$ImbalStock_{i,t}$	0.0078	2.49	0.0027	0.71
$R_{i,t}$	-0.0101	-1.8	-0.0219	-2.41
$R_{i,t-1}$	-0.0087	-1.4	-0.0053	-0.59
$R_{i,t-2}$	0.0066	1.14	-0.0005	-0.06
$R_{i,t-3}$	0.0044	0.71	-0.0076	-0.84
$\sigma(Ret_i)$	0.0381	1.1	0.0413	0.67
Adj. R^2	0.090		0.083	
Avg. # stocks	347		339	

Short Sale Costs: if short-selling takes place in the options market then the effect of SPC should be stronger for more expensive to short-sell stocks (data: Loan Fees and Utilization rates from MARKIT)

	2005-2013		2010-2013	
	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat
$LoanFee_{i,t}$	-0.022	-3.47	-0.022	-3.46
$SPC\text{-}FirmLFH_{i,t}$	-0.002	-3.18	-0.003	-3.44
$SPC\text{-}FirmLFL_{i,t}$	-0.001	-2.56	-0.001	-2.14
$DIS\text{-}CustomLFH_{i,t}$	-0.005	-1.08	-0.004	-0.6
$DIS\text{-}CustomLFL_{i,t}$	-0.006	-1.51	-0.010	-2.26
$ILS_{i,t}$	0.059	0.16	0.206	0.43
$Size_{i,t}$	0.000	0.29	0.000	0.26
$OS_{i,t}$	0.002	0.75	0.000	-0.07
$ImbalStock_{i,t}$	0.004	1.75	0.001	0.26
$R_{i,t}$	-0.007	-1.4	-0.017	-2.42
$R_{i,t-1}$	-0.005	-0.98	-0.006	-0.91
$R_{i,t-2}$	0.004	0.8	-0.001	-0.09
$R_{i,t-3}$	0.004	0.76	-0.002	-0.46
$\sigma(Ret_i)$	-0.022	-0.93	0.018	0.55
Adj. R^2	0.077		0.069	
Avg. # stocks	620		646	

Hard-to-Borrow Stocks

	2005-2013		2010-2013	
	$CAR_{i,t+1}$	t-stat	$CAR_{i,t+1}$	t-stat
$UtilizationRate_{i,t}$	-2.00E-05	-1.91	-0.00002	-1.44
$SPC\text{-}FirmUH_{i,t}$	-0.00309	-2.8	-0.0050	-2.83
$SPC\text{-}FirmUL_{i,t}$	-0.00076	-2.52	-0.0007	-2.02
$DIS\text{-}CustomUH_{i,t}$	-0.01628	-1.97	-0.0168	-1.27
$DIS\text{-}CustomUL_{i,t}$	-0.00477	-1.4	-0.0072	-1.52
$ILS_{i,t}$	-0.18237	-0.5	-0.206	-0.43
$Size_{i,t}$	-0.00018	-0.79	-1.30E-04	-0.42
$OS_{i,t}$	0.001673	0.71	-3.60E-04	-0.13
$ImbalStock_{i,t}$	0.004356	1.75	0.000	0.03
$R_{i,t}$	-0.00653	-1.25	-0.016	-2.38
$R_{i,t-1}$	-0.0041	-0.83	-0.005	-0.82
$R_{i,t-2}$	0.003434	0.72	-0.002	-0.28
$R_{i,t-3}$	0.004653	0.99	-0.003	-0.49
$\sigma(Ret_i)$	-0.02254	-0.95	0.018837	0.56
Adj. R^2	0.077		0.069	
Avg. # stocks	620		646	

Conclusion

- This paper is an empirical analysis of trading activity by investor type: customer vs firm accounts
- Their order flows are negatively correlated → which is consistent with firm (prop-desks) providing liquidity to customers
- Who is more informed? → Not prop-desks → they provide liquidity to informed customer orders
- What kind of information? → Customers trade on negative private information
- The new measure of informed trading predicts stock returns (both statistically and in economic magnitudes) better than other proxies
- Informed Trading vs Disagreement Trading in the options market? → both co-exist, with more informed trading in OTM contracts, and disagreement in ATM contracts