

Informed trading in oil futures market

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Preliminaries

Stylized facts and previous literature about oil futures market

THE IMPACT of MACRO or ENERGY-SPECIFIC NEWS on ENERGY PRICES

Some papers dealing with the impact of news on oil (and/or gas) prices

A number of contribution at lower frequency (daily data):

- Barnhart (1989): some impact of monetary surprises.
- Kilian and Vega (2011): no effect of macro news.
- Bu (2014) : effect of inventory shocks on volatility.
- Datta et al. (2014): events can be related to implied-density.
- Berk and Rauch (2016) study the impact of CFTC announcements.

THE IMPACT of MACRO or ENERGY-SPECIFIC NEWS on ENERGY PRICES

Some papers dealing with the impact of news on oil (and/or gas) prices

A number of contribution at higher frequency (intraday data):

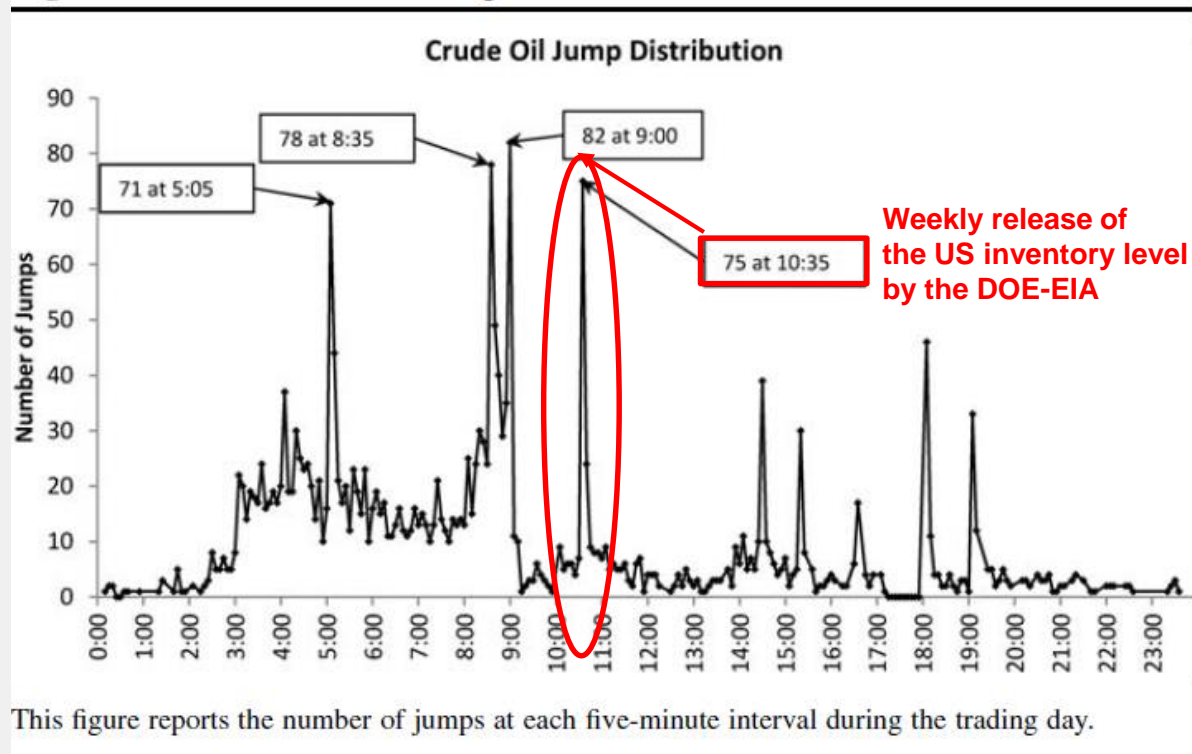
- Chatrath et al. (2012): very weak effect of macro news.
- Basistha and Kurov (2015) and Rosa (2014): significant intraday effect of monetary policy surprises.
- Chiou-Wei et al. (2014): effect on spot futures gas prices (effect on futures first).
- Halova Wolfe and Rosenman (2014): significant effect of oil and gas news on oil and gas prices.
- Ye and Karali (2016): strong impact of EIA announcement compared to API releases (short period of study: Aug. 2012 - Dec. 2013).

THE IMPACT of MACRO or ENERGY-SPECIFIC NEWS on ENERGY PRICES

Jumps following announcements (Elder et al., 2014)

- Most of the jumps can be matched with news (either macro or oil-specific)
- Sample Jan. 2005 - Dec. 2010.

Figure 1: Distribution of Jumps across Time Intervals



STOCK LEVEL ANNOUNCEMENT and OIL PRICE

Previous literature on the importance of inventories for oil price determination

A number of contribution at lower frequency:

- Deaton and Laroque (1992, 1996);
- A series of papers by Pindyck (1994, 2001, 2004);
- Knittel and Pindyck (2016);
- Kilian and Murphy (2013) and Kilian and Lee (2014) (global);
- Unalmis, Unalmis, Unsal (2012) (U.S.).

Recent availability of intraday data for most asset classes:

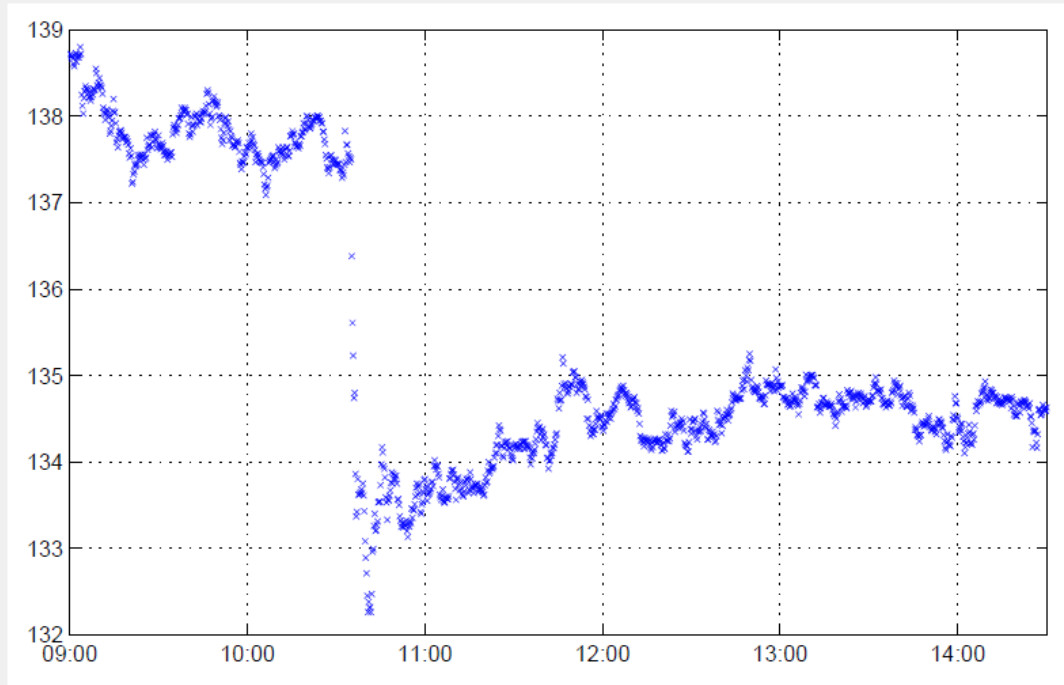
- Elder et al. (2014) match jumps with surprises.

The oil price on July 16th 2008

STOCK LEVEL ANNOUNCEMENT and OIL PRICE

An example: the oil price on July 16th 2008

- Announcement at: 10:35.
- Median estimate: -2,200; Actual value: 2,952 (thousands of bl.).
- The oil-inventory announcement was higher than expected → Important price drop!



The oil price on July 16th 2008

STOCK LEVEL ANNOUNCEMENT and OIL PRICE

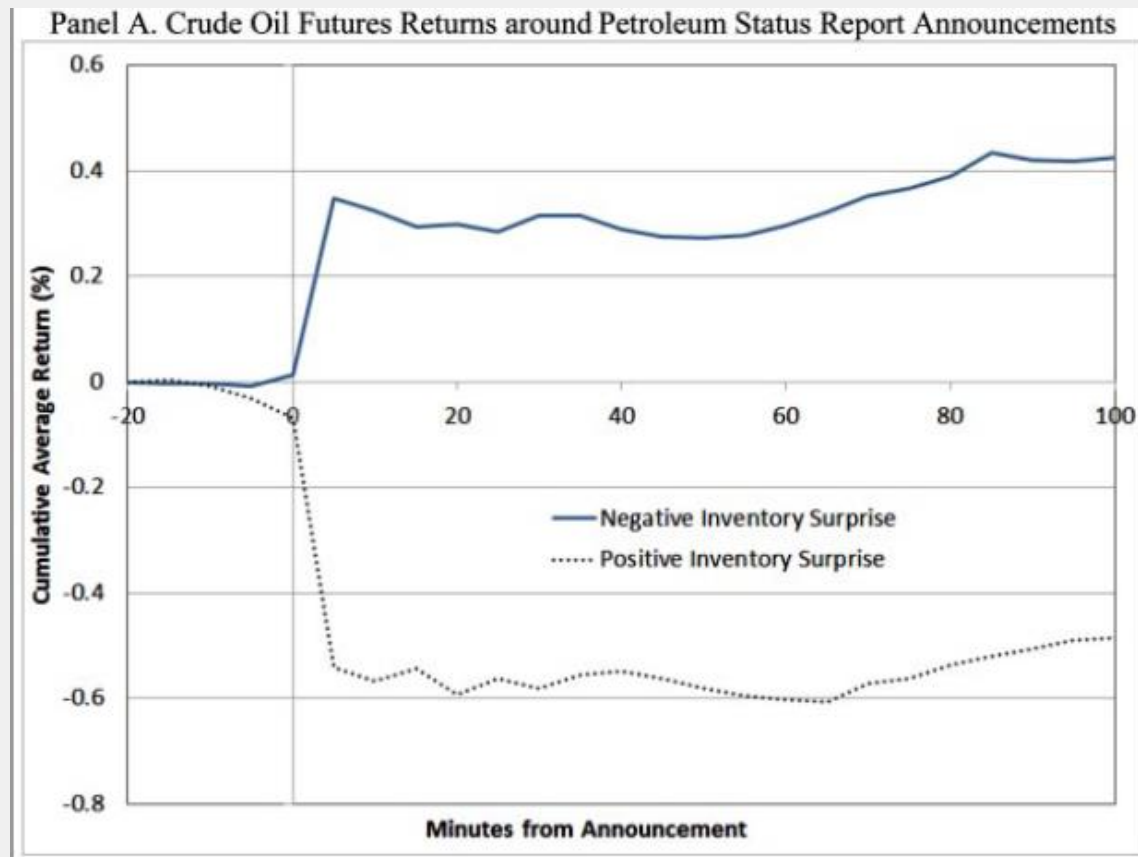
Sudden price variations (jumps) and inventory news

- Extending Andersen et al. (2003, 2007), some authors focused on oil to link surprises and large price variations.
- Elder et al. (2013): 64 jumps associated with announcements (not surprise) over the Jan. 2005 - Dec. 2010 period.
- Bjursell et al. (2015) found that jumps are not systematically associated with surprises. Over the May 2003 – Dec. 2007 period :
 - 234 announcements,
 - 75 surprises,
 - 20 jumps whose 11 are associated to surprises.
- Note that jumps can emerge without identified news but because of liquidity variations (Jiang et al., 2011).

STOCK LEVEL ANNOUNCEMENT and OIL PRICE

Cumulative average return around announcements (Halova et al., 2014)

- Sample period Jul. 2003 - Jun. 2012 with 468 releases of announcements.



Motivation

Informed trading in oil futures market

INFORMED TRADING and NEWS ANNOUNCEMENTS

Previous literature

- Most of the literature focuses on the impact of news on returns.
- We extend this literature in examining potential informed trading in the CME futures contracts for WTI in relation with a burgeoning field:
 - Christophe et al. (2010) provide evidence of abnormal short-selling before corporate downgrades.
 - Hendershott et al. (2014) show abnormal institutional trading before unscheduled earning announcements
 - Kurov et al. (2016) demonstrate that news are partly incorporated in price before the announcement time for half macro news in the U.S.
 - **Bernile et al. (2016) show that informed trading occurs during lock-up periods of FOMC announcement.**

INFORMED TRADING and NEWS ANNOUNCEMENTS

Our study

- We investigate potential suspicious trading behavior **before** the release of inventory level by the DOE each Wednesday.
- We show average price patterns consistent with informed trading → 25 bps mean drop in the 2.5 hours before the news release.
- We provide evidence of large (and significant) order imbalances in days with positive surprises.

Empirical approach

Inventory announcements, expectations and surprises

DATA

Expectations

- Data from Bloomberg from January 2007 to October 2014.

News announcements

- Weekly Petroleum Status Report (WPSR) from the DOE-EIA.
- Each Wednesday at 10:30 a.m. (Thursday or Friday if Wednesday corresponds to a holiday).
- 401 announcements.
- Only commercial inventory is considered. Strategic Petroleum Reserves held by the US government are excluded.

Surprise definition

- Surprise definition: actual inventory is above a +/- 3 standard deviation limit.
- 45 surprises (23 positive; 22 negative); 356 no surprise days.
- No pre-release/embargo to any outside entities(confirmed by the EIA).
- Futures prices data from TickData stamped at the second; a continuous time series is formed using the nearby futures contract.

DATA**Bloomberg survey content****DOEASCRD Index**

Release Date	7/16/2008
Time	10:35
Country	US
Event	DOE U.S. Crude Oil Inventories
Period	juil-11
Actual	2952
Prior	-5840
Revised	NaNQ

Summary

Median Estimate	-2200
Average Estimate	-1863
High Estimate	3000
Low Estimate	-3900
Number of Estimates	14
Qualified Economists	11
Standard Deviation	1670

Economist Estimates

<u>Economist</u>	<u>Firm</u>	<u>Estimate</u>	<u>As of</u>
Jim Ritterbusch	Ritterbusch & Assoc.	0	15-juil-08
Drew Wozniak	ICAP Energy	-2700	16-juil-08
Brad Samples	Summit Energy	-3400	14-juil-08
Addison Armstrong	TFS Energy	-2200	15-juil-08
Kristi Jones	J.P. Morgan Chase	-3600	15-juil-08
Andy Lebow	Man Financial Inc.	-1000	16-juil-08
Peter Beutel	Cameron Hanover Inc.	-2500	14-juil-08
Tim Evans	Citi Futures Perspective	-1500	14-juil-08
Remy Penin	Societe Generale	-2280	16-juil-08
James Crandell	Lehman Brothers	-1800	15-juil-08
Kyle Cooper	IAF Advisors	-2000	15-juil-08
Phil Flynn	PFGBest	3000	14-juil-08
Antoine Half	Newedge USA	-3900	14-juil-08
Mike Fitzpatrick	MF Global	-2200	15-juil-08

DATA**Summary statistics of US oil inventories****Table 1**

Summary statistics of U.S. oil inventory actual values and analysts' forecast errors

	N	Mean*	Std dev.*	Median*	Min*	Max*
Actual values	402	124.97	3846.58	466.50	-11120.00	10013.00
Median estimates	402	241.73	1740.00	750.00	-4950.00	3200.00
Forecasting errors	402	-116.76	3255.74	94.50	-10120.00	9033.00
Absolute forecasting errors	402	2533.28	2048.39	1990.50	11.00	10120.00

* Thousands bbl.

The table reports sample statistics of oil inventories for the period between February 7th 2007 and October 22nd 2014. "Actual values" refer to the EIA actual oil inventory data, "Median estimates" are the median forecasts from the weekly Bloomberg survey, "Forecasting errors" are the difference between the actual value and the median forecast of each weekly oil inventory, and "Abs forecasting errors" are the absolute value of this difference.

DATA

Summary statistics of surprises

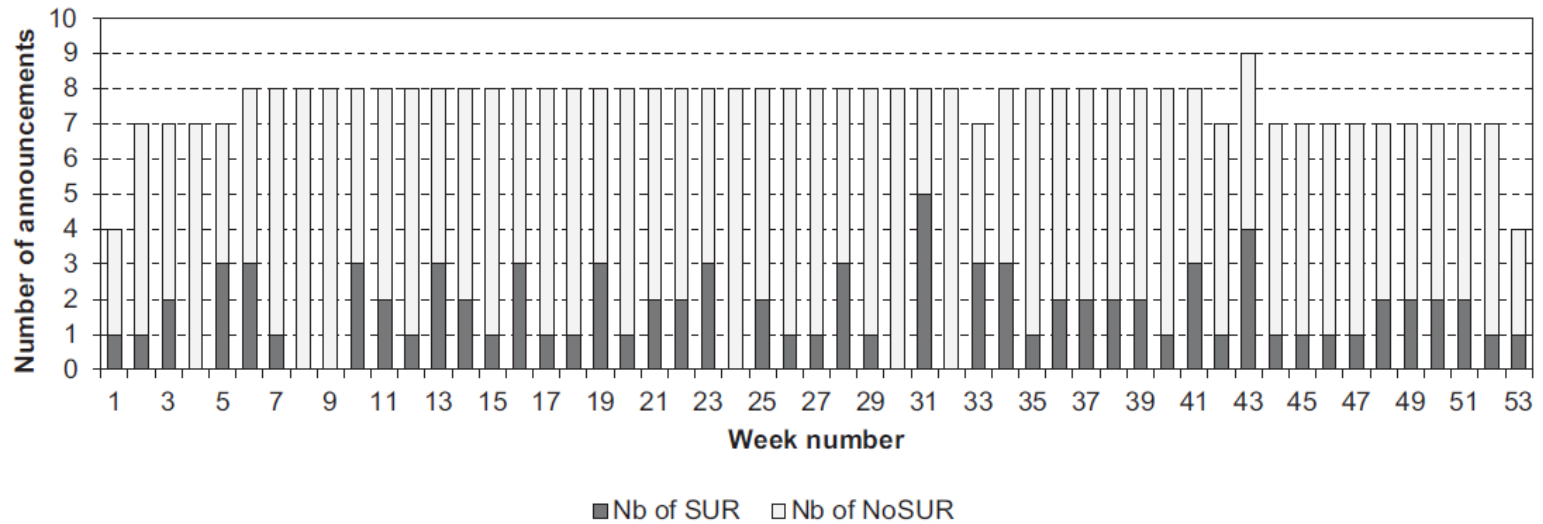


Figure 2

Number of 3σ surprises vs. no surprise by week-of-the-year

→ No particular pattern over the year

DATA

Summary statistics of surprises

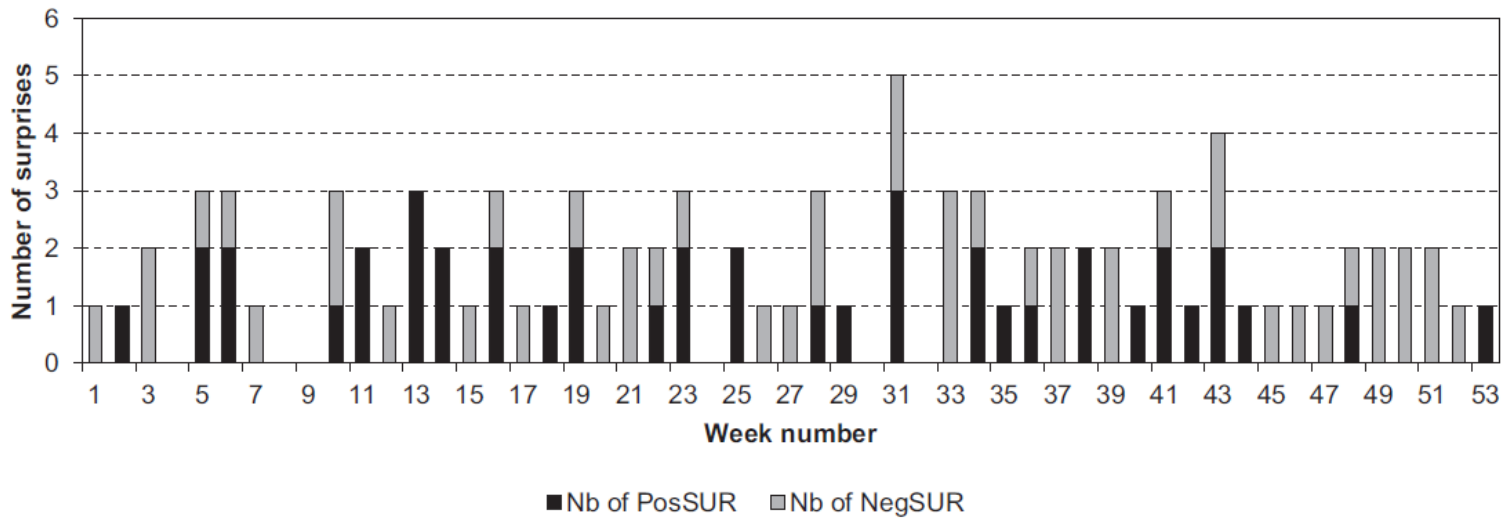


Figure 3

Number of 3σ positive surprises vs. negative surprises by week-of-the-year

→ No particular pattern over the year

DATA

Summary statistics of surprises

→ No particular pattern over the sample period

Table 2

Summary statistics for U.S. oil-inventory surprises

Year	2007	2008	2009	2010	2011	2012	2013	2014	Total
No. of news items	47	53	51	52	52	52	52	43	402
3σ NoSUR	37	40	40	43	40	41	39	32	312
SUR	10	13	11	9	12	11	13	11	90
PosSUR	3	8	5	4	5	6	5	7	43
NegSUR	7	5	6	5	7	5	8	4	47
% NoSUR	78.72%	75.47%	78.43%	82.69%	76.92%	78.85%	75.00%	74.42%	77.61%
% SUR	21.28%	24.53%	21.57%	17.31%	23.08%	21.15%	25.00%	25.58%	22.39%
% PosSUR	6.38%	15.09%	9.80%	7.69%	9.62%	11.54%	9.62%	16.28%	10.70%
% NegSUR	14.89%	9.43%	11.76%	9.62%	13.46%	9.62%	15.38%	9.30%	11.69%

The table shows the sample statistics for oil-inventory surprises (SUR) over the period February 7th 2007 to October 22nd 2014. SUR refers to the actual inventory announcement being +/-3 or 4 standard deviations away from the median forecast of the weekly Bloomberg survey. A positive surprise (PosSUR) is defined as a forecasting error over +3 or +4 standard deviations and a negative surprise (NegSUR) as a forecasting error over -3 or -4 standard deviations. NoSUR refers to all the other cases where the actual inventory is in the range between the lowest and highest economists' estimates, or not much over this range.

DATA

Summary statistics of surprises

→ No particular pattern over the sample period

Table 2

Summary statistics for U.S. oil-inventory surprises

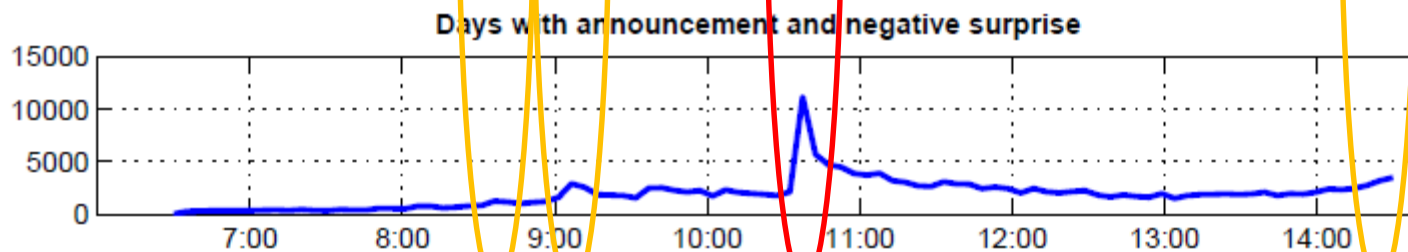
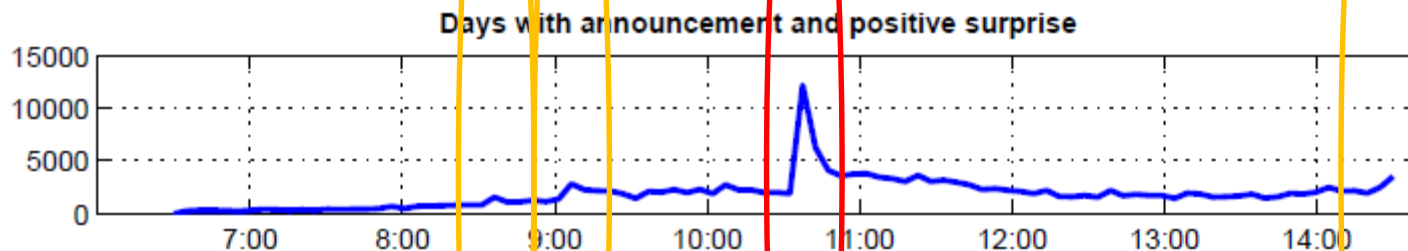
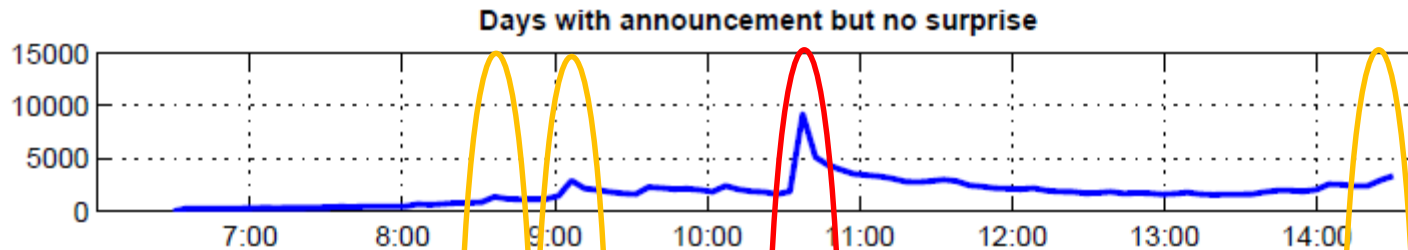
Year	2007	2008	2009	2010	2011	2012	2013	2014	Total
No. of news items	47	53	51	52	52	52	52	43	402
4σ NoSUR	40	46	46	48	47	47	46	37	357
SUR	7	7	5	4	5	5	6	6	45
PosSUR	3	4	2	2	1	4	2	5	23
NegSUR	4	3	3	2	4	1	4	1	22
% NoSUR	85.11%	86.79%	90.20%	92.31%	90.38%	90.38%	88.46%	86.05%	88.81%
% SUR	14.89%	13.21%	9.80%	7.69%	9.62%	9.62%	11.54%	13.95%	11.19%
% PosSUR	6.38%	7.55%	3.92%	3.85%	1.92%	7.69%	3.85%	11.63%	5.72%
% NegSUR	8.51%	5.66%	5.88%	3.85%	7.69%	1.92%	7.69%	2.33%	5.47%

The table shows the sample statistics for oil-inventory surprises (SUR) over the period February 7th 2007 to October 22nd 2014. SUR refers to the actual inventory announcement being +/-3 or 4 standard deviations away from the median forecast of the weekly Bloomberg survey. A positive surprise (PosSUR) is defined as a forecasting error over +3 or +4 standard deviations and a negative surprise (NegSUR) as a forecasting error over -3 or -4 standard deviations. NoSUR refers to all the other cases where the actual inventory is in the range between the lowest and highest economists' estimates, or not much over this range.

DATA

Market liquidity in days with announcements

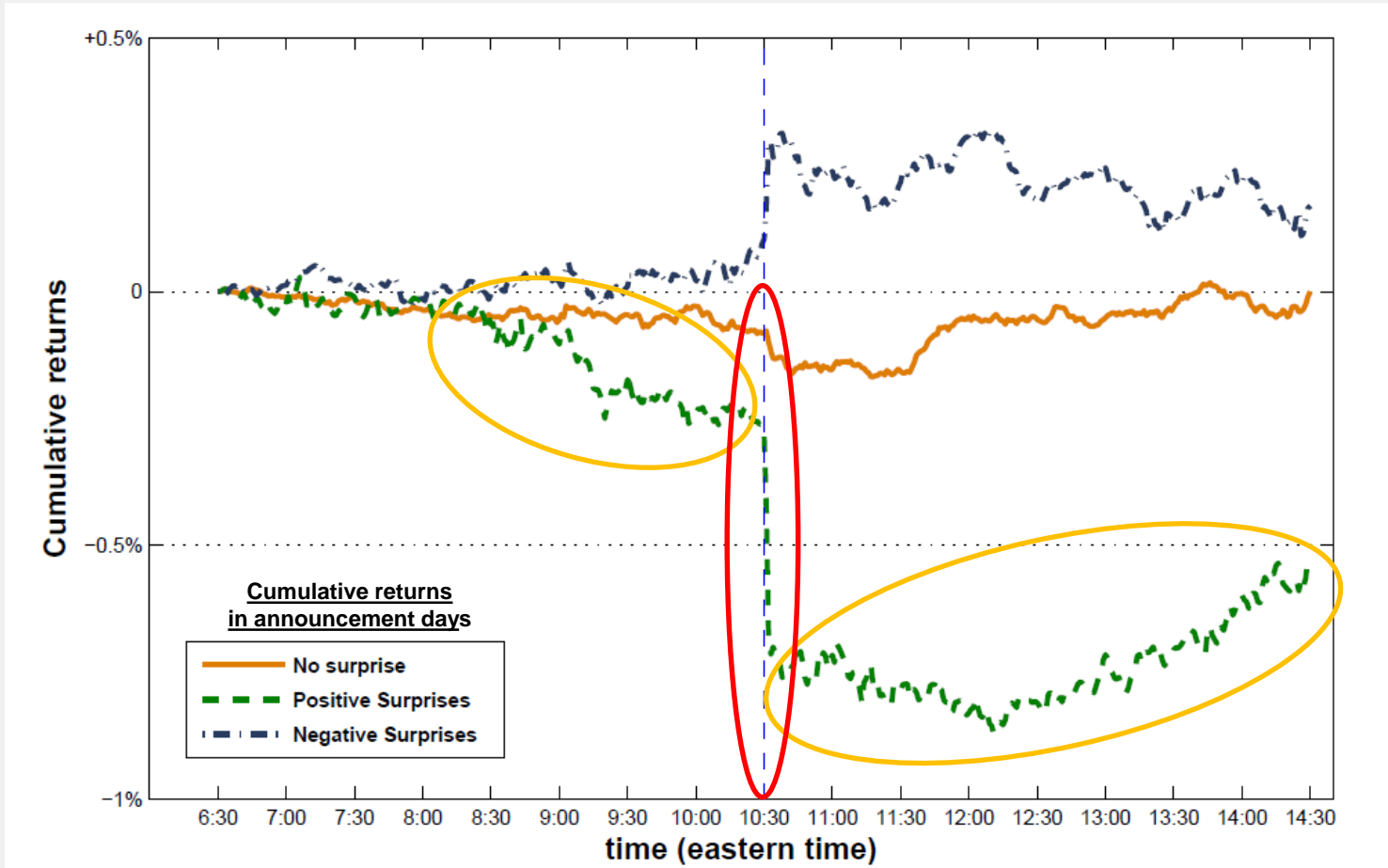
→ Huge spike at the time of the news release



DATA

Return patterns around the announcements

→ Large price variations around positive surprises with over reaction



DATA**Measuring informed trading empirically**

- As in Bernile et al. (2016), we compute the order-imbalance as:

$$OI = \frac{B - S}{B + S}$$

B is the buyer-initiated trading volume

S is the seller-initiated trading volume

- Volume can be either the notional value in dollars (OID) or the number of trades (OIN).

DATA

Computational method for OID and OIN

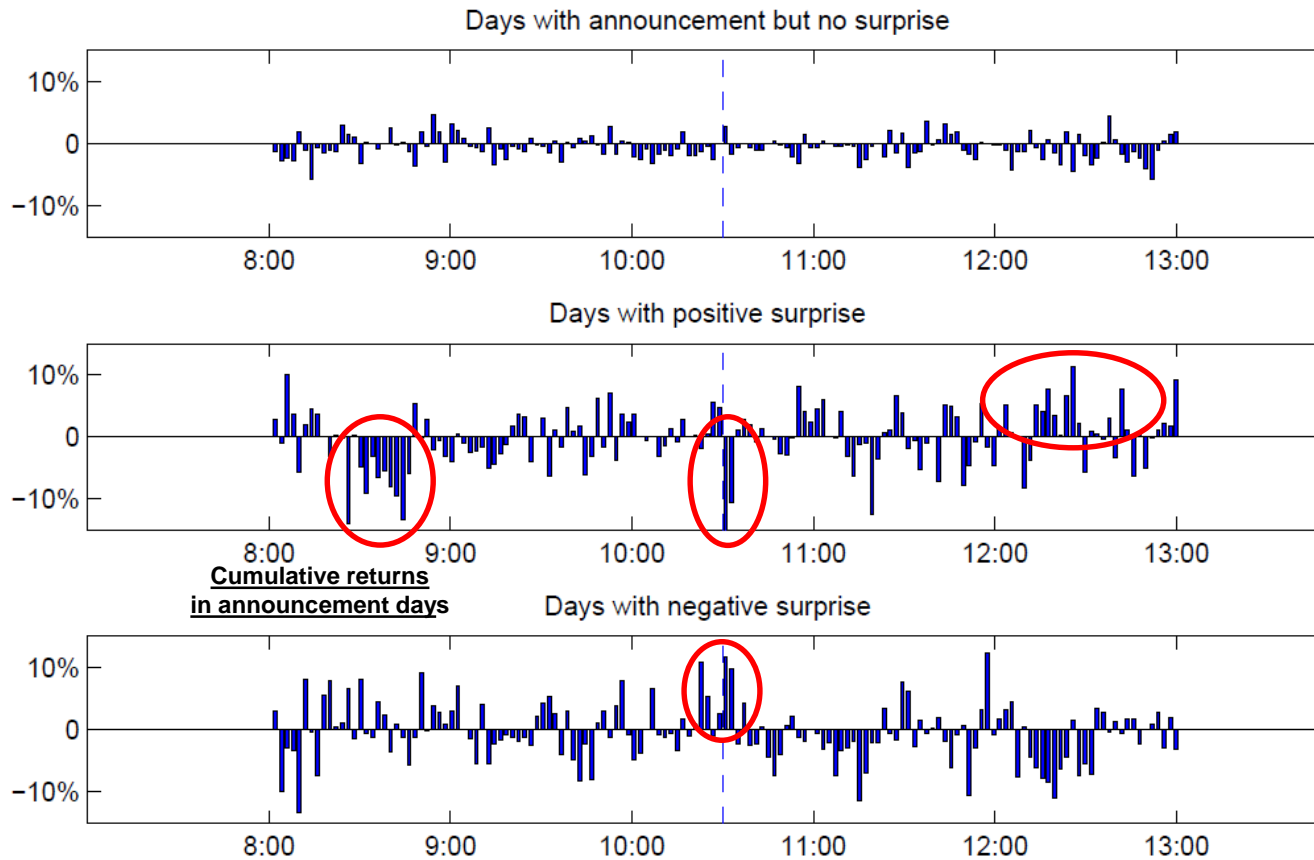
- The transaction-level data from the CME do not provide information about the direction of the transaction → we use the tick rule.
- Data are only stamped at the second → we compute the volume-weighted price and then apply the tick rule.
- OID and OIN are calculated for short period of time (1,2,5 minutes) from 2 hours and a half before to 2 hours and a half after the announcement time.

Results

Order imbalance pattern around the announcements

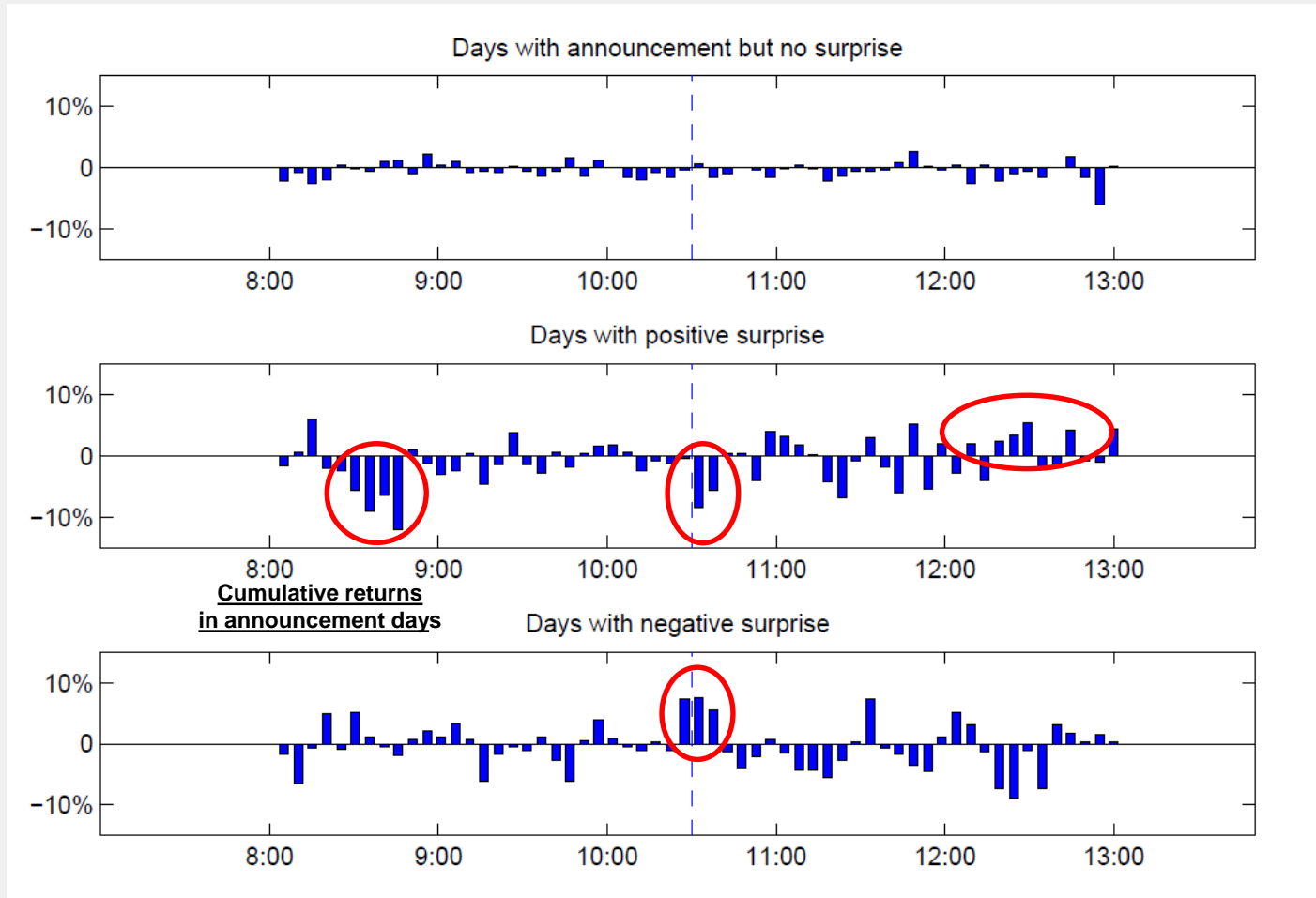
ORDER IMBALANCE PATTERN

OI based on number of trades considering 3σ surprises (2 minutes)



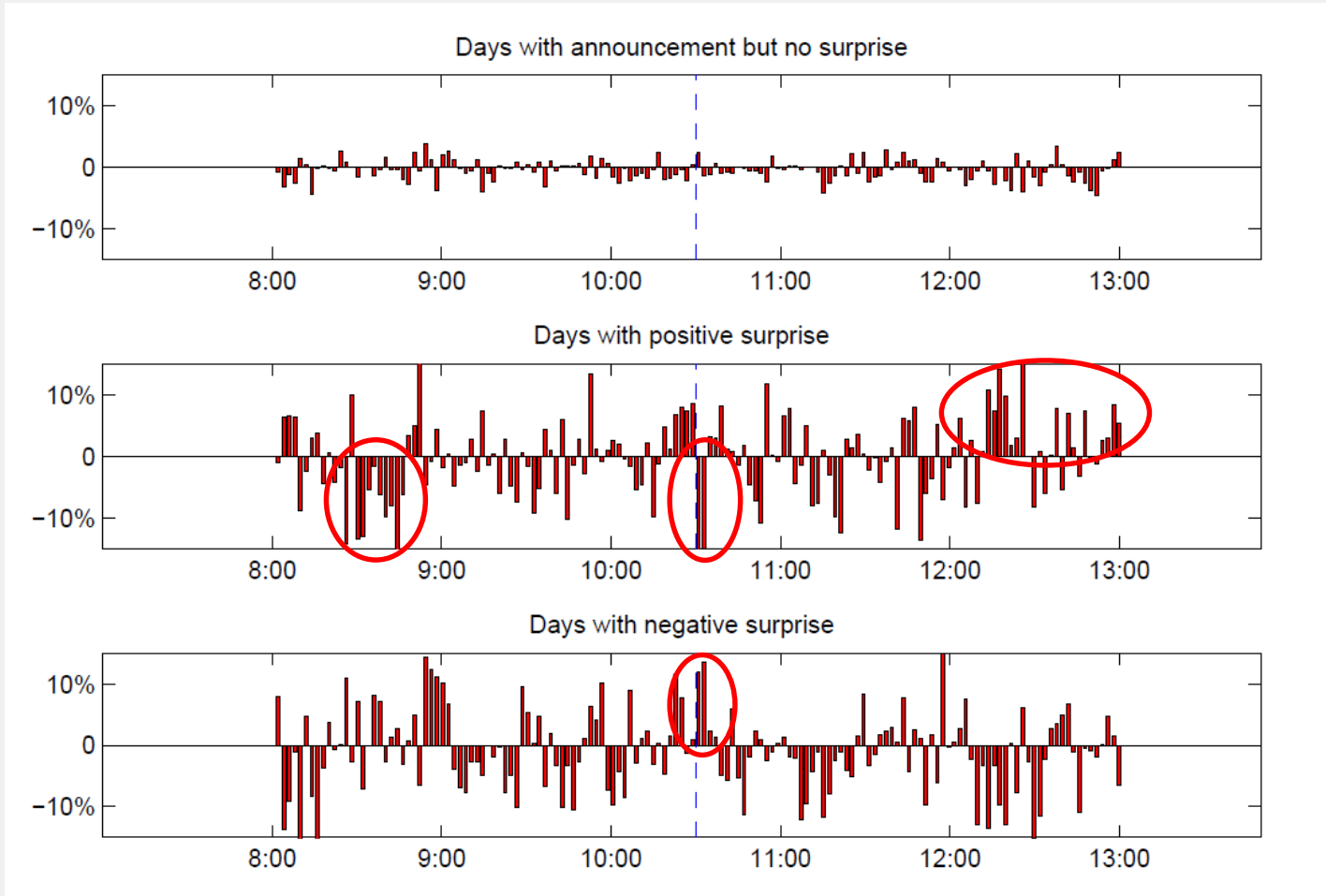
ORDER IMBALANCE PATTERN

OI based on number of trades considering 3σ surprises (5 minutes)



ORDER IMBALANCE PATTERN

OI based on number of trades considering 4σ surprises (2 minutes)



ORDER IMBALANCE PATTERN

Comments on OI

- More OI for days with surprises → Surprises really are surprises.
- Significant OI over the pre-open outcry session period during highly liquid period.
- More seller-initiated transactions for days with positive surprises (statistically significant).

STATISTICAL SIGNIFICANCE

Regression analysis of order-imbalance measures for 3σ and 4σ surprises

$$OI_t = \alpha + \beta.I(SUR > 0) + \gamma.I(SUR < 0) + \varepsilon_t$$

OLS estimates for 3σ surprises

Event windows	Intercept	PosSUR	NegSUR
[-240, -120]	-0.639	0.630	0.135
	-1.412	0.469	0.105
[-240, 0]	-0.438	-0.568	0.300
	-1.747	-0.767	0.420
[-120, -60]	0.212	-3.529	-0.009
	0.522	-3.154	-0.008
[-120, 0]	-0.221	-1.758	0.389
	-0.820	-2.304	0.588
[-60, 0]	-0.628	0.433	0.717
	-1.886	0.458	0.778

OLS estimates for 4σ surprises

Event windows	Intercept	PosSUR	NegSUR
[-240, -120]	-0.592	1.519	-0.694
	-1.413	0.951	-0.298
[-240, 0]	-0.446	-0.116	-0.278
	-1.891	-0.126	-0.244
[-120, -60]	0.060	-3.633	-0.372
	0.158	-2.441	-0.272
[-120, 0]	-0.270	-1.956	-0.118
	-1.063	-2.103	-0.152
[-60, 0]	-0.500	-0.350	-0.415
	-1.600	-0.278	-0.376

Conclusion

Informed trading or not?

CONCLUSION

Informed trading or not?

- Suspicious trading behavior in the pre-announcement period.
- Do we highlight information leakage or superior forecasting ability?
 - We do not consider systematic error in forecasts.
 - Chang et al. (2009) and Gay et al. (2009) show that best forecasters have not good performance.

LITERATURE

Relevant papers

- Bernile, G., Hu, J., Tang, Y., 2016. Can information be locked-up? Informed trading ahead of macro-news announcements. *Journal of Financial Economics* 121, 496-520.
- Bjursell, J., Gentle, J.E., Wang, G.H.K., 2015. Inventory announcements, jump dynamics, volatility and trading volume in U.S. energy futures markets. *Energy Economics* 48, 336-349.
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- Verstein, A., 2016. Insider trading in commodities markets. *Virginia Law Review* 102, 447-500.
- Ye, S., Karali, B., 2016. The informational content of inventory announcements: Intraday evidence from crude oil futures market. *Energy Economics* 59, 349-364.

Session1
Information and market efficiency

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