

Trump vs. Paris: The impact of climate policy and climate risk on U.S. listed Oil and Gas firm valuation

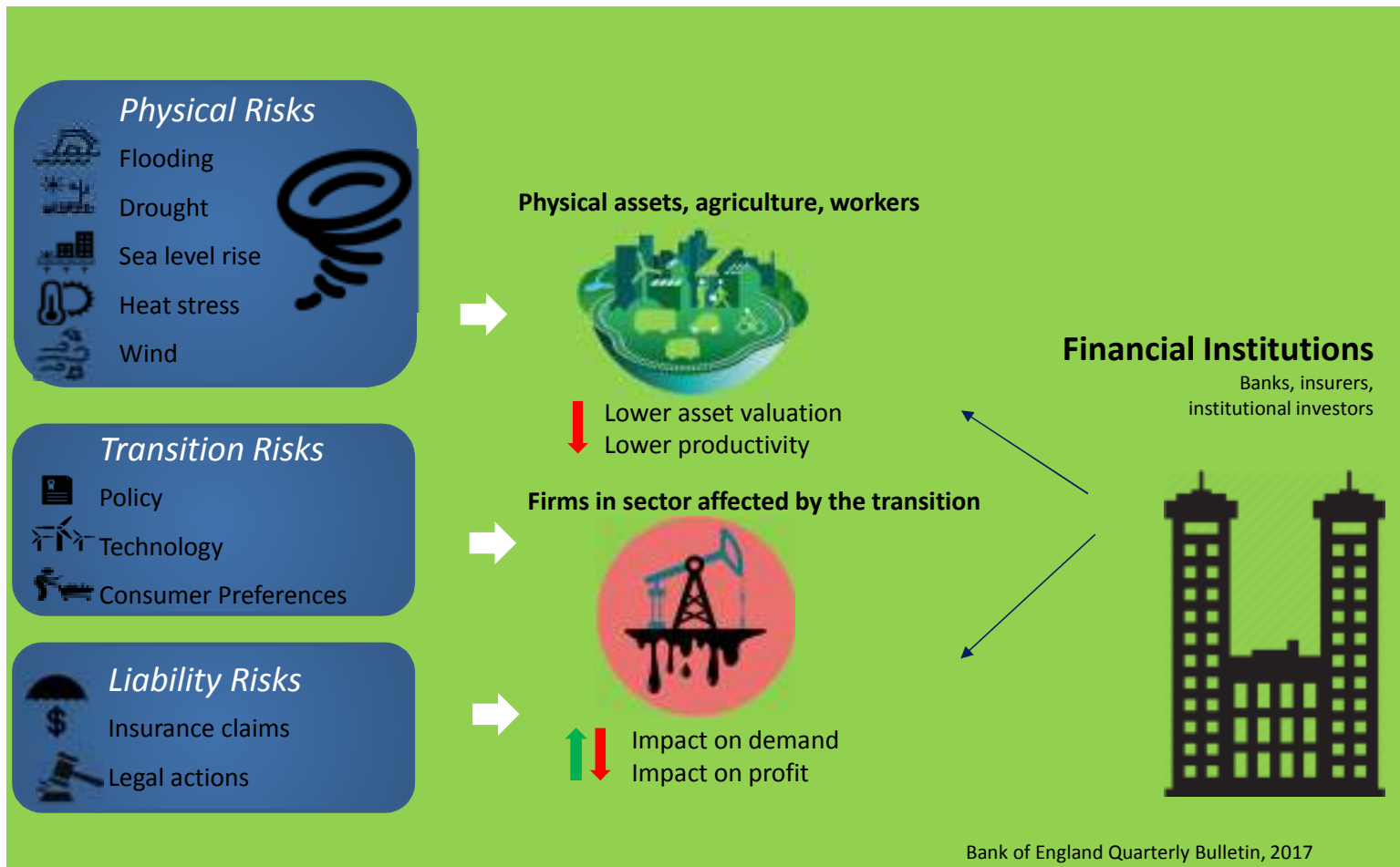
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Overview of Presentation

- Introduction
- Data
- Methodology
- Results: ST analysis
 - Event study results
 - PCR analysis
 - Breakpoints
- Conclusion
- Next steps
 - LT Panel data regressions



Climate Finance Risks



Oil & Gas - A Declining Industry?

- 39% of all new cars sold in Norway in 2017 were electric (IEA 2018)
- 8% of all new cars sold in China in December 2018 were EV's

	2016 Forecast	2018 Forecast	
IEA to 2030	23	127	5.52
BP to 2035	72	210	2.92
OPEC to 2040	46	253	5.50
BNEF to 2040	406	560*	

*one third of car fleet and half of all cars sold according to BNEF

FINANCIAL TIMES

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New wind and solar generation costs fall below existing coal plants

Estimates jeopardise Trump's hopes of reviving mining industry in US

Ed Crooks in New York NOVEMBER 9, 2018



Introduction

- Valuation of US listed O&G companies is changing due to
 - important policy events (S-T Pricing impact)
 - climate risk over time (L-T valuation reflecting transition risk)
 - EV's; BP peak oil *demand* 2030 vs Short reserve life ratios
- Importance:
 - ST analysis: is policy driving valuation?; which event matters?
 - LT analysis; Stranded asset/ carbon bubble risk (investors)
- Events with US focus (2015-2017)
 - Paris Agreement (**US agrees; did not sign Kyoto**)
 - US and China ratification
 - President Trump election
 - US announces withdrawal from the Paris Agreement
 - “[We are still in](#)” (9/19 trl); **United States Climate Alliance**

Research Questions

- RQ1: Which policy had the most impact; Paris or Trump!?
- RQ2: Is transition risk reflected in the long-term Oil & Gas company valuation? [contrasting views]



Motivation & Literature

- Oil and gas sector has large capital investments in reserves (proved, probable and possible), oil rigs, tankers and other assets that may become stranded under the Paris Agreement
- Valuation of oil and gas firms has depended on reserves
 - Ewing & Thompson (2016) – gas and oil
- **Investors will increasingly value cash generation over reserves**
 - Negative relationship between value and reserve-life ratios for oil and gas - Ewing & Thompson, 2016
 - Misund et al. (2008) growth of reserves positive but when interacted with recent period dummy (1998-2005) impact negatively on valuation

Unburnable Reserves

- McGlade and Ekins (2015; NCC)
- Based on P2 for oil and gas (P1 for coal)
- US only 9% (6%) for oil (gas) > low reserve life ratios
- US Companies will have non-US reserves

Table 1 | Regional distribution of reserves unburnable before 2050 for the 2 °C scenarios with and without CCS

Country or region	2 °C with CCS						2 °C without CCS					
	Oil		Gas		Coal		Oil		Gas		Coal	
	Billions of barrels	%	Trillions of cubic metres	%	Gt	%	Billions of barrels	%	Trillions of cubic metres	%	Gt	%
Africa	23	21%	4.4	33%	28	85%	28	26%	4.4	34%	30	90%
Canada	39	74%	0.3	24%	5.0	75%	40	75%	0.3	24%	5.4	82%
China and India	9	25%	2.9	63%	180	66%	9	25%	2.5	53%	207	77%
FSU	27	18%	31	50%	203	94%	28	19%	36	59%	209	97%
CSA	58	39%	4.8	53%	8	51%	63	42%	5.0	56%	11	73%
Europe	5.0	20%	0.6	11%	65	78%	5.3	21%	0.3	6%	74	89%
Middle East	263	38%	46	61%	3.4	99%	264	38%	47	61%	3.4	99%
OECD Pacific	2.1	37%	2.2	56%	83	93%	2.7	46%	2.0	51%	85	95%
ODA	2.0	9%	2.2	24%	10	34%	2.8	12%	2.1	22%	17	60%
United States of America	2.8	6%	0.3	4%	235	92%	4.6	9%	0.5	6%	245	95%
Global	431	33%	95	49%	819	82%	449	35%	100	52%	887	88%

FSU, the former Soviet Union countries; CSA, Central and South America; ODA, Other developing Asian countries; OECD, the Organisation for Economic Co-operation and Development. A barrel of oil is 0.159 m³; %. Reserves unburnable before 2050 as a percentage of current reserves.

Data

- 2 January, 2003 to 29 December, 2017
- News announcements
 - Paris Agreement: 12 December, 2015
 - China and US ratification of Paris Agreement: 3 September, 2016
 - President Trump elected: 8 November, 2016
 - US exit from Paris Agreement: 1 June, 2017
- U.S publicly listed oil and gas companies and oil and gas ETFs – daily stock price and ETF price data from CRSP and Bloomberg, respectively
- XLE ETF and integrated oil and gas company option data from OptionMetrics
- Fama-French factors from Kenneth French's website
- Annual financial and annual report data for Bloomberg

Method – Event Study

- 200 day estimation period, estimation window is $t = -245$ to $t = -46$
- Gap of 40 trading days prior to event date to avoid problem of information leakage
- $[-5,+5]$ event window to account for uncertainty of the announcement timing and possible market under-reaction
- Estimate Fama-French 5 Factor (Fama & French, 2015) plus Momentum (Cahart, 1997)

$$AR_{i,t} = R_{i,t} - [R_f + \hat{\alpha}_i + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \hat{\beta}_{2,i} * SMB_{i,t} + \hat{\beta}_{3,i} * HML_{i,t} + \hat{\beta}_{4,i} * RMW_{i,t} + \hat{\beta}_{5,i} * CMA_{i,t} + \hat{\beta}_{6,i} * MOM_{i,t}]$$

Method – Abnormal Returns

$$\triangleright CAR_{i,t} = \sum_{t=-\tau}^{t=\tau} AR_i$$

$$\triangleright CAAR = \frac{1}{N} \sum_{i=1}^N CAR_i$$

\triangleright Robustness check, we follow Griffin et al. (2015)

$$AR_{i,t} = R_{i,t} - [R_f + \hat{\alpha}_i + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \hat{\beta}_{2,i} * SMB_{i,t} + \hat{\beta}_{3,i} * HML_{i,t} + \hat{\beta}_{4,i} * RMW_{i,t} + \hat{\beta}_{5,i} * CMA_{i,t} + \hat{\beta}_{6,i} * MOM_{i,t} + \hat{\beta}_{7,i} * Percentage_Change_Oil_Price_{i,t}]$$

Method – Implied Volatility Event Study

- Investigate how option traders react to announcements in their short term volatility expectations
- At-the-money (ATM) Implied Volatility (IV) is extracted from option prices
- Event study follows Chen & Clements (2007)

$$\ln\left(\frac{IV_t}{IV_{t-1}}\right) = \frac{\alpha(\theta - IV_{t-t})}{IV_{t-1}} + \gamma_0 D^{before} + \gamma_1 D^{event} + \gamma_2 D^{after} + \varepsilon_t,$$

$$\varepsilon_t = \sigma_t \omega_t,$$

$$\sigma_t^2 = \beta_0 + \beta_1 (\ln(IV_{t-1}/IV_{t-2}))^2 + \beta_2 \sigma_{t-1}^2,$$

- Robustness checks using $D^{event} = 1$ if event is in $[-5,+5]$

$$\ln\left(\frac{IV30_t}{IV30_{t-1}}\right) = \frac{\alpha(\theta - IV30_{t-1})}{IV30_{t-1}} + \gamma_0 * D^{event} + \varepsilon_t = -\alpha + \frac{\alpha\theta}{IV30_{t-1}} + \gamma_0 * D^{event} + \varepsilon_t$$

Method – Bai Perron Structural Breaks

- Test for Bai-Perron break points in the Put-to-call ratios (PCRs)
 - daily time series
 - average monthly times series

- 3-month windows before and after the event dates

Return Event Study – Paris Agreement

	Whole Industry		U.S. Firms Only		Non-U.S. Firms Only		U.S. Domestic		U.S. International	
	11-Dec-15	14-Dec-15	11-Dec-15	14-Dec-15	11-Dec-15	14-Dec-15	11-Dec-15	14-Dec-15	11-Dec-15	14-Dec-15
Panel A: Whole Sample										
Fama-French 5 Factor + Momentum	-9.66%***	-8.42%***	-9.33%***	-8.21%***	-11.07%***	-9.29%***	-9.74%***	-8.64%***	-5.77%**	-4.39%
FF5F + Momentum + Change in Oil Price	-8.88%***	-7.58%***	-8.54%***	-7.36%***	-10.33%***	-8.49%***	-8.98%***	-7.84%***	-4.66%*	-3.17%
Panel B: Oil & Gas Drilling										
Fama-French 5 Factor + Momentum	-10.37%**	-10.52%**	-6.56%	-7.85%	-14.65%***	-13.52%**	-2.75%	-5.08%	-14.18%**	-13.38%*
FF5F + Momentum + Change in Oil Price	-9.21%**	-9.23%**	-5.73%	-6.90%	-13.14%**	-11.84%**	-2.12%	-4.38%	-12.94%*	-11.96%*
Panel C: Oil & Gas Equipment and Services										
Fama-French 5 Factor + Momentum	-3.84%	-3.86%	-4.78%*	-4.46%	4.80%	1.64%	-4.45%	-4.05%	-8.25%*	-8.71%**
FF5F + Momentum + Change in Oil Price	-3.06%	-3.04%	-4.04%	-3.68%	5.90%	2.84%	-3.77%	-3.34%	-6.88%*	-7.25%*
Panel D: Integrated Oil & Gas										
Fama-French 5 Factor + Momentum	-5.37%**	-5.25%**	-7.35%**	-8.23%***	-4.47%	-3.89%	-15.65%***	-16.23%***	5.11%**	3.76%*
FF5F + Momentum + Change in Oil Price	-4.67%**	-4.48%*	-7.09%**	-7.99%***	-3.57%	-2.89%	-15.36%***	-15.97%***	5.32%**	3.98%*
Panel E: Oil & Gas Exploration and Production										
Fama-French 5 Factor + Momentum	-11.70%***	-12.18%***	-11.90%***	-12.40%***	-7.79%	-7.83%	-12.31%***	-12.77%***	-6.57%	-7.60%
FF5F + Momentum + Change in Oil Price	-10.42%***	-10.81%***	-10.66%***	-11.08%***	-5.73%	-5.64%	-11.07%***	-11.46%***	-5.28%	-6.15%
Panel F: Oil & Gas Refining and Marketing										
Fama-French 5 Factor + Momentum	-9.29%**	-9.13%**	-9.47%**	-9.18%**	-4.46%	-7.63%	-9.98%**	-9.67%**	-5.45%	-5.27%
FF5F + Momentum + Change in Oil Price	-8.98%**	-8.79%**	-9.19%**	-8.88%**	-3.46%	-6.49%	-9.85%**	-9.55%**	-3.88%	-3.51%
Panel G: Oil & Gas Storage and Transportation										
Fama-French 5 Factor + Momentum	-11.43%***	-6.60%**	-9.15%***	-3.86%	-16.49%***	-12.47%***	-9.86%***	-4.78%	-2.75%	4.43%
FF5F + Momentum + Change in Oil Price	-11.14%***	-6.29%**	-8.79%**	-3.46%	-16.37%***	-12.34%***	-9.54%***	-4.42%	-2.03%	5.21%
Panel H: ETF										
FF5F + Momentum	-3.36%*	-0.81%								
FF5F + Momentum + Change in Oil Price	-3.04%	-0.48%								
Panel I: 30-Day Implied Volatility										
Before [-5,-1]	0.025*	0.051***	0.016	0.055***	0.034	0.050**	0.011	0.047***	0.029	0.071**
Event Date t=0	0.087	0.028	0.087	-0.074**	0.084	0.048	0.085	-0.135***	0.096	-0.005
After [+1,+5]	-0.000	0.023***	-0.010	0.005	-0.001	0.015*	-0.015	0.059***	0.000	-0.011
Event Window [-5,+5]	0.020**	0.042***	0.010	0.026***	0.022	0.039***	0.004	0.037***	0.022	0.027

Return Event Study – Paris Agreement

1. The Paris Agreement negatively effects all oil and gas companies, *except...*
2. Oil & Gas Drilling U.S. domestic
3. Oil & Gas Equipment and Services excluding US international
4. Non-U.S. Integrated Oil & Gas companies
 - a) receive the most attention and investors already devalued these companies much earlier.
 - b) have shorter reserve life ratios, therefore less exposed to stranded asset risk.
5. Non-U.S. and U.S. international oil & gas (i) Exploration and Production and (ii) Refining and Marketing
6. U.S. international Oil & Gas Storage and Transportation
7. Significant implied volatility for domestic U.S. and non-U.S. firms

Return Event Study – US and China Join

	Whole Industry		U.S. Firms Only		Non-U.S. Firms Only		U.S. Domestic		U.S. International	
	2-Sep-16	6-Sep-16	2-Sep-16	6-Sep-16	2-Sep-16	6-Sep-16	2-Sep-16	6-Sep-16	2-Sep-16	6-Sep-16
Panel A: Whole Sample										
Fama-French 5 Factor + Momentum	-1.48%	-2.55%	-1.45%	-2.60%	-1.60%	-2.36%	-1.07%	-2.24%	-4.64%	-5.58%
FF5F + Momentum + Change in Oil Price	-0.71%	-1.31%	-0.66%	-1.32%	-0.92%	-1.26%	-0.27%	-0.94%	-3.97%	-4.51%
Panel B: Oil & Gas Drilling										
Fama-French 5 Factor + Momentum	-6.71%	-9.10%	-5.41%	-7.31%	-8.17%	-11.11%	-6.94%	-9.86%	-2.36%	-2.23%
FF5F + Momentum + Change in Oil Price	-5.98%	-7.91%	-4.74%	-6.22%	-7.37%	-9.81%	-6.29%	-8.81%	-1.65%	-1.06%
Panel C: Oil & Gas Equipment and Services										
Fama-French 5 Factor + Momentum	-4.80%	-5.57%	-4.91%	-5.69%	-3.84%	-4.58%	-4.87%	-5.72%	-5.35%	-5.34%
FF5F + Momentum + Change in Oil Price	-4.32%	-4.79%	-4.41%	-4.87%	-3.51%	-4.05%	-4.34%	-4.86%	-5.09%	-4.92%
Panel D: Integrated Oil & Gas										
Fama-French 5 Factor + Momentum	-0.19%	-1.02%	1.03%	0.71%	-0.74%	-1.81%	2.20%	2.17%	-0.73%	-1.49%
FF5F + Momentum + Change in Oil Price	0.44%	0.00%	1.68%	1.77%	-0.12%	-0.80%	3.04%	3.54%	-0.36%	-0.89%
Panel E: Oil & Gas Exploration and Production										
Fama-French 5 Factor + Momentum	-0.53%	-2.59%	-0.42%	-2.48%	-2.52%	-4.48%	-0.27%	-2.07%	-2.17%	-7.30%
FF5F + Momentum + Change in Oil Price	0.55%	-0.84%	0.66%	-0.74%	-1.43%	-2.72%	0.81%	-0.33%	-1.08%	-5.53%
Panel F: Oil & Gas Refining and Marketing										
Fama-French 5 Factor + Momentum	2.21%	2.95%	2.48%	3.32%	-4.43%	-6.25%	5.19%	5.72%	-17.42%*	-14.30%
FF5F + Momentum + Change in Oil Price	2.65%	3.65%	2.89%	3.99%	-3.52%	-4.81%	5.64%	6.45%	-17.24%*	-14.02%
Panel G: Oil & Gas Storage and Transportation										
Fama-French 5 Factor + Momentum	-0.97%	-1.51%	-1.68%	-2.55%	0.53%	0.72%	-1.53%	-2.56%	-3.08%	-2.42%
FF5F + Momentum + Change in Oil Price	-0.25%	-0.34%	-0.93%	-1.33%	1.18%	1.77%	-0.78%	-1.34%	-2.33%	-1.21%
Panel H: ETF										
FF5F + Momentum	-1.83%	-2.90%								
FF5F + Momentum + Change in Oil Price	-1.24%	-1.95%								
Panel I: 30-Day Implied Volatility										
Before [-5,-1]	0.045***	-0.230***	0.016	-0.001	0.059***	0.040***	0.016	0.011	0.010	-0.014
Event Date t=0	-0.075***	-0.015	-0.064	0.015	-0.095***	-0.016	-0.033	0.005	-0.090	0.020
After [+1,+5]	0.051***	0.063***	0.037***	0.048***	0.047***	0.061***	0.047***	0.056***	0.023	0.040**
Event Window [-5,+5]	0.035***	0.041***	0.015*	0.024***	0.039***	0.045***	0.026**	0.035***	0.005	0.014

Return Event Study – U.S. Ratification

- The ratification by US and China has minimal effect on the oil and gas industry.
- Implied volatility increases for the whole industry and for non-US firms (including Chinese firms) before, during and after the announcement (ratification may have been a bigger shock for Chinese firms)
- Higher implied volatility for US domestic firms post ratification

Return Event Study – Trump Elected

	Whole Industry	U.S. Firms Only	Non-U.S. Firms Only	U.S. Domestic	U.S. International
Panel A: Whole Sample	8-Nov-16	8-Nov-16	8-Nov-16	8-Nov-16	8-Nov-16
Fama-French 5 Factor + Momentum	-8.48%**	-8.79%**	-7.26%*	-8.61%**	-10.26%**
FF5F + Momentum + Change in Oil Price	-3.18%	-3.36%	-2.44%	-3.10%	-5.56%
Panel B: Oil & Gas Drilling					
Fama-French 5 Factor + Momentum	-13.86%*	-15.51%**	-12.00%	-11.84%*	-22.85%*
FF5F + Momentum + Change in Oil Price	-8.07%	-10.23%	-5.64%	-6.47%	-17.74%
Panel C: Oil & Gas Equipment and Services					
Fama-French 5 Factor + Momentum	-7.41%*	-7.95%*	-2.44%	-8.35%*	-3.84%
FF5F + Momentum + Change in Oil Price	-3.62%	-4.11%	0.87%	-4.33%	-1.76%
Panel D: Integrated Oil & Gas					
Fama-French 5 Factor + Momentum	-14.79%***	-12.09%**	-16.01%***	-19.41%**	-1.12%
FF5F + Momentum + Change in Oil Price	-10.55%***	-7.29%	-12.02%***	-13.09%	1.40%
Panel E: Oil & Gas Exploration and Production					
Fama-French 5 Factor + Momentum	-12.59%**	-12.65%**	-11.64%*	-12.03%**	-19.85%**
FF5F + Momentum + Change in Oil Price	-5.06%	-5.12%	-4.08%	-4.48%	-12.50%
Panel F: Oil & Gas Refining and Marketing					
Fama-French 5 Factor + Momentum	-6.06%	-4.63%	-41.87%***	-4.07%	-8.74%
FF5F + Momentum + Change in Oil Price	-3.16%	-1.90%	-34.68%***	-1.28%	-6.39%
Panel G: Oil & Gas Storage and Transportation					
Fama-French 5 Factor + Momentum	-3.38%	-4.26%	-1.52%	-4.63%	-0.86%
FF5F + Momentum + Change in Oil Price	1.25%	0.46%	2.91%	0.06%	4.18%
Panel H: ETF					
FF5F + Momentum	-4.32%				
FF5F + Momentum + Change in Oil Price	-0.49%				
Panel I: 30-Day Implied Volatility					
Before [-5,-1]	0.013	-0.005	0.017	0.001	-0.013
Event Date t=0	0.011	0.019	0.006	0.028	0.008
After [+1,+5]	0.007	0.009	0.002	0.003	0.017
Event Window [-5,+5]	0.010	0.003	0.009	0.004	0.002

Return Event Study – Trump Election Results

1. Trump election has a surprisingly negative impact overall but not significant after FF5F + momentum + change in oil price
 - a) Trump supports the domestic production of shale oil
 - initially produced by smaller companies not the large publicly traded companies we are studying.
 - b) Or any news is bad news.
2. Bad for Non-U.S. Integrated Oil & Gas firms and Non-U.S. Oil and Gas Refining and Marketing (shale boom did not benefit U.S. integrated Oil & Gas companies)

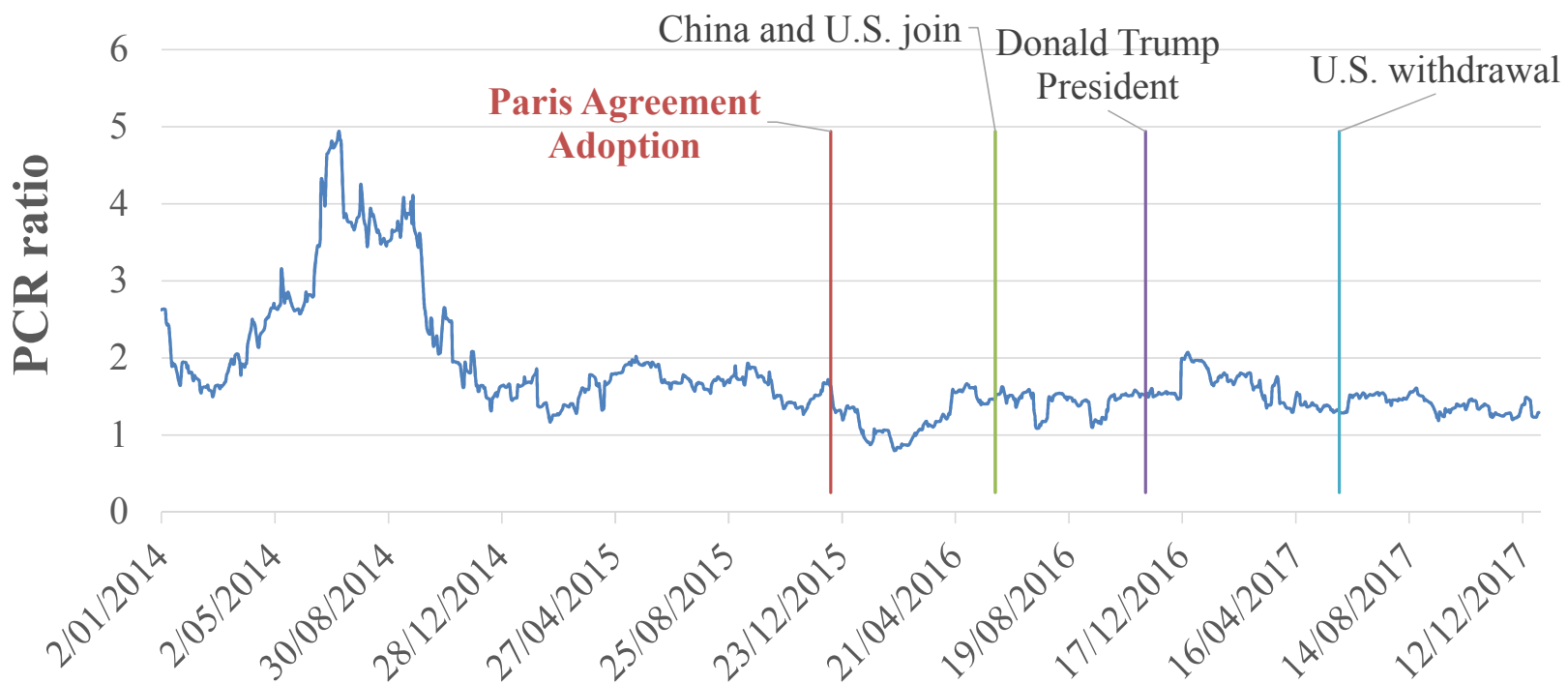
Return Event Study – US Exits Paris Agreement

	Whole Industry	U.S. Firms Only	Non-U.S. Firms Only	U.S. Domestic	U.S. International
Panel A: Whole Sample	1-Jun-17	1-Jun-17	1-Jun-17	1-Jun-17	1-Jun-17
Fama-French 5 Factor + Momentum	-5.54%***	-5.26%**	-6.71%**	-5.46%**	-3.61%
FF5F + Momentum + Change in Oil Price	-4.35%**	-4.04%**	-5.57%**	-4.23%**	-2.52%
Panel B: Oil & Gas Drilling					
Fama-French 5 Factor + Momentum	-4.11%	-1.63%	-0.0729	-3.32%	1.75%
FF5F + Momentum + Change in Oil Price	-1.50%	0.88%	-0.0455	-0.96%	4.56%
Panel C: Oil & Gas Equipment and Services					
Fama-French 5 Factor + Momentum	-5.25%	-5.55%	-2.47%	-5.74%	-3.49%
FF5F + Momentum + Change in Oil Price	-3.95%	-4.22%	-1.45%	-4.37%	-2.66%
Panel D: Integrated Oil & Gas					
Fama-French 5 Factor + Momentum	-4.62%*	-4.39%	-4.72%*	-6.92%	-1.87%
FF5F + Momentum + Change in Oil Price	-3.57%*	-3.22%	-3.71%	-4.84%	-1.61%
Panel E: Oil & Gas Exploration and Production					
Fama-French 5 Factor + Momentum	-5.25%*	-5.09%*	-7.97%*	-5.00%	-6.30%
FF5F + Momentum + Change in Oil Price	-3.52%	-3.38%	-6.04%	-3.30%	-4.42%
Panel F: Oil & Gas Refining and Marketing					
Fama-French 5 Factor + Momentum	-2.46%	-1.95%	-14.72%**	-2.52%	2.03%
FF5F + Momentum + Change in Oil Price	-2.18%	-1.69%	-13.95%**	-2.13%	1.38%
Panel G: Oil & Gas Storage and Transportation					
Fama-French 5 Factor + Momentum	-7.28%***	-7.17%***	-7.49%**	-7.23%***	-6.62%**
FF5F + Momentum + Change in Oil Price	-6.66%***	-6.58%***	-6.80%**	-6.65%***	-6.01%**
Panel H: ETF					
FF5F + Momentum	-4.39%***				
FF5F + Momentum + Change in Oil Price	-3.85%***				
Panel I: 30-Day Implied Volatility					
Before [-5,-1]	-0.026***	0.002	-0.037***	0.008	-0.009
Event Date t=0	-0.046	-0.035	-0.055	0.005	-0.073
After [+1,+5]	0.010	0.007	0.007	0.022	-0.016
Event Window [-5,+5]	-0.014***	0.000	-0.024***	0.016	-0.019

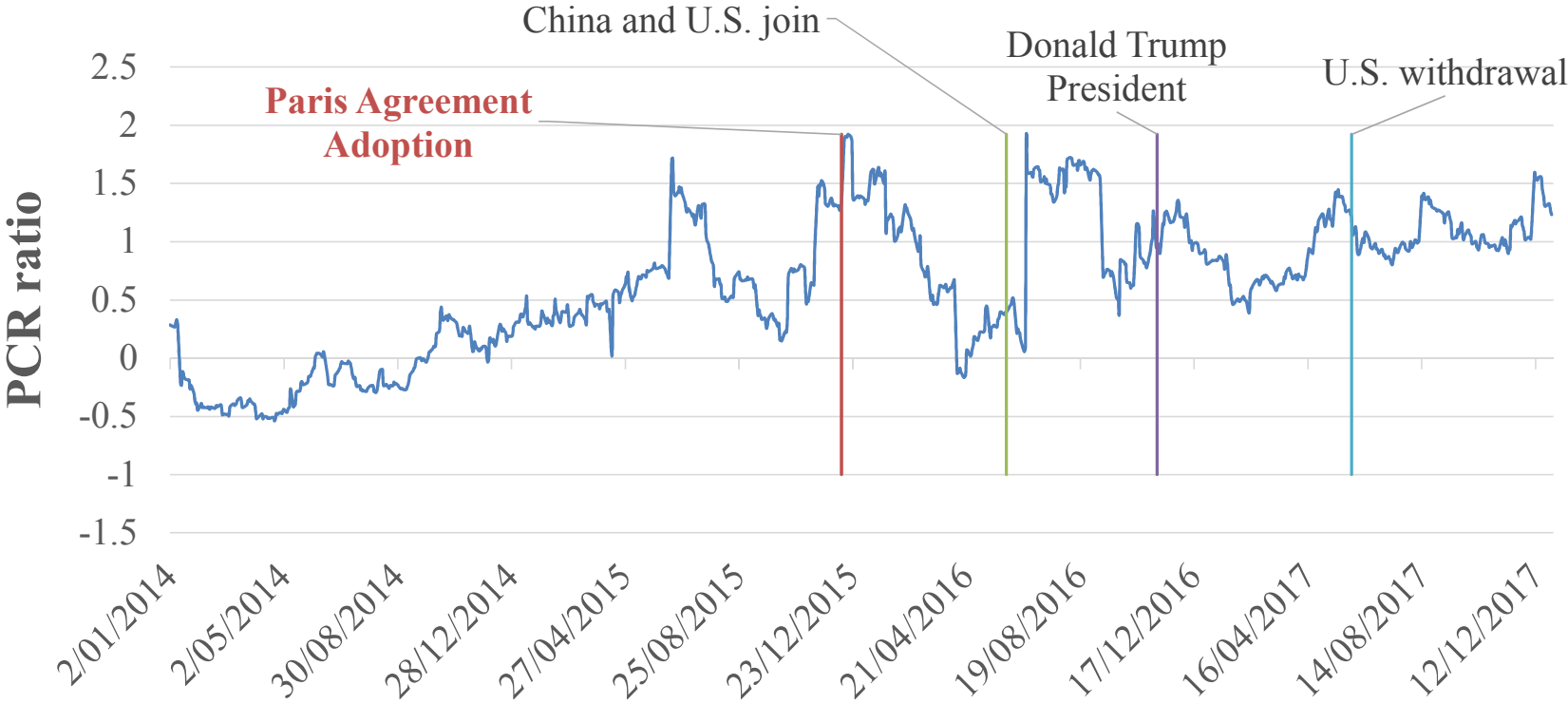
Return Event Study – US Exits Paris Agreement

1. Trumps exit from the Paris agreement is bad news for all firms except U.S. Internationals
 - a. Trump is in support of the shale oil and gas boom and domestic production, which is produced and consumed mainly domestically, therefore hurting the transportation firms.
2. Biggest impact is on Oil & Gas Storage and Transportation – Trump pushing for the U.S. to be an oil and gas net exporter
3. Non-U.S. firms report negative returns for Oil & Gas Refining and Marketing
4. Significant negative volatility for integrated Oil& Gas firms in the non-U.S. sample – Paris exit was anticipated to some extent
5. Integrated oil and gas company option traders were also more uncertain after the Paris agreement, even though these companies equity returns were not affected in one direction.

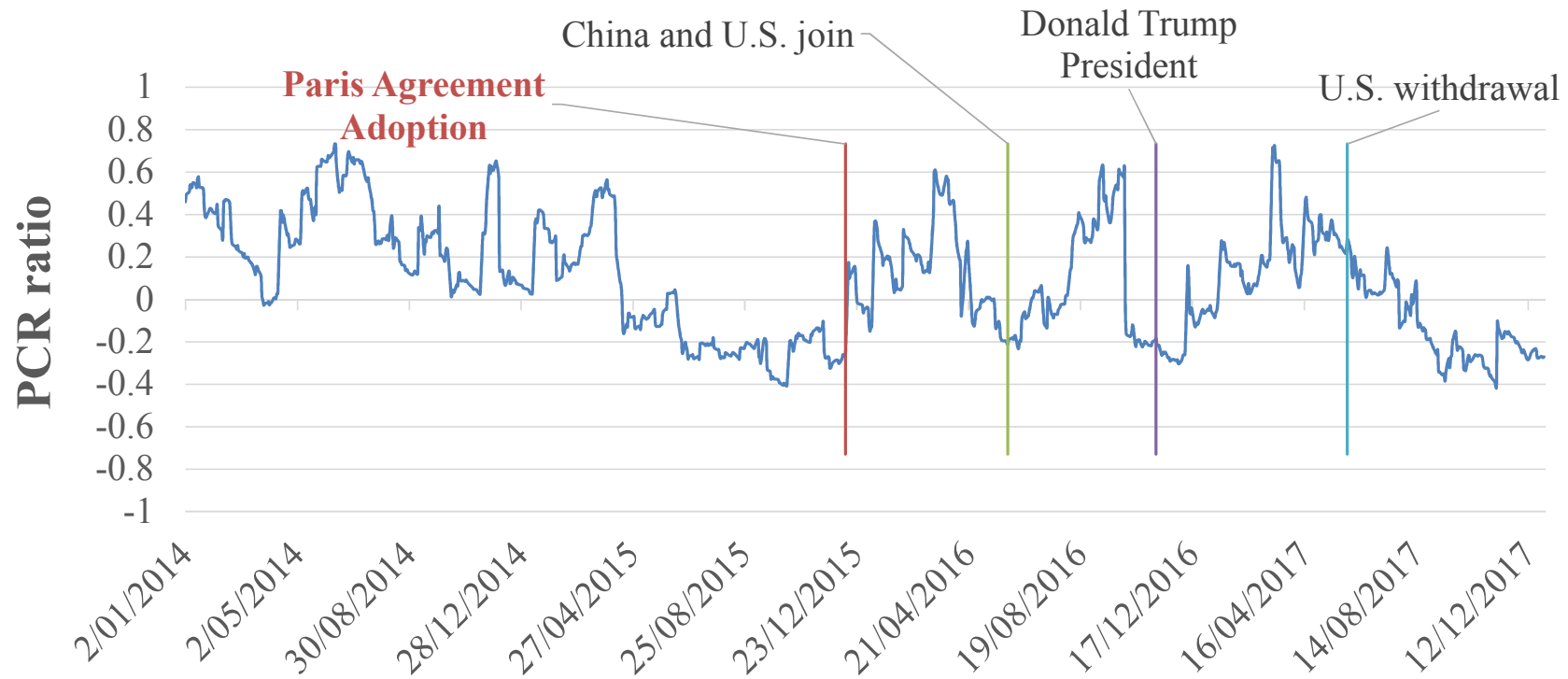
Sentiment (PCR) Time Series – XLE ETF



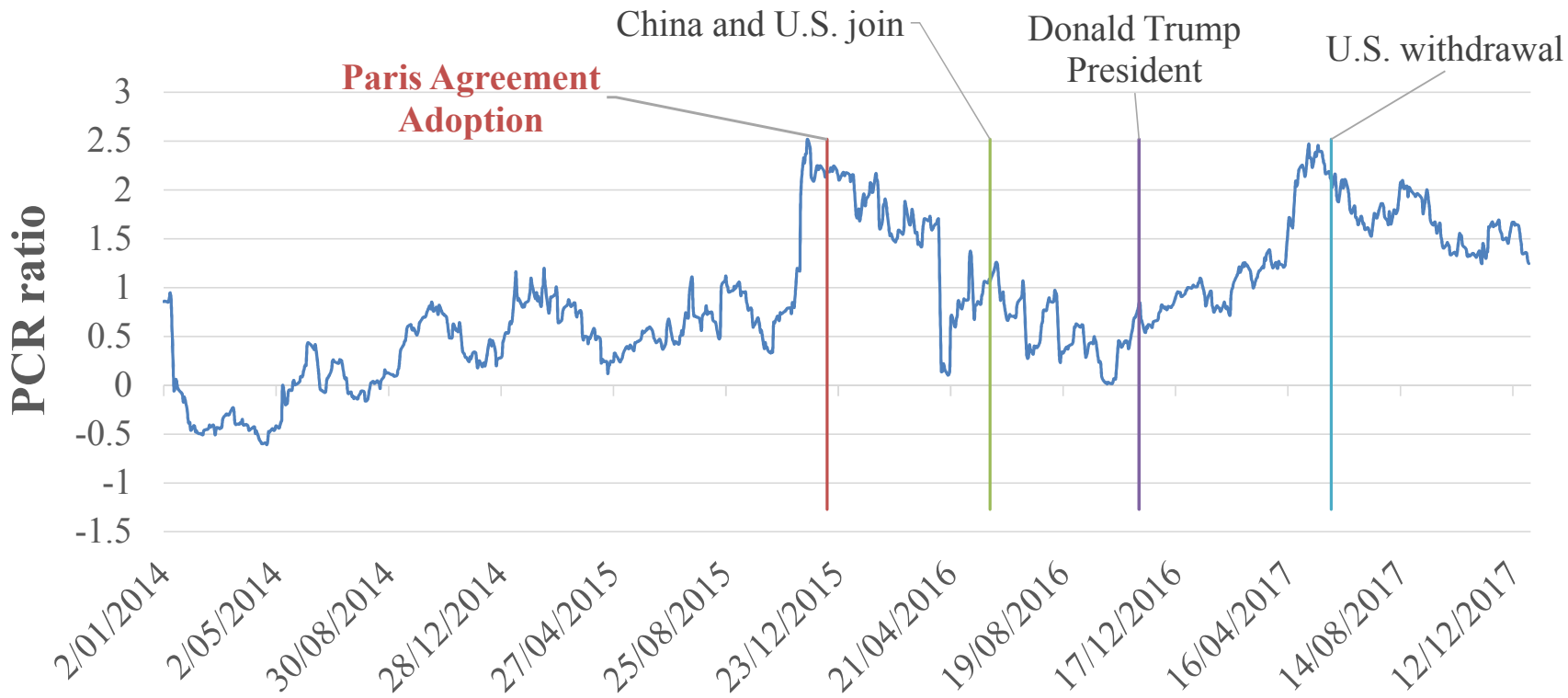
Equally-weighted Aggregate PCR for U.S. Firms



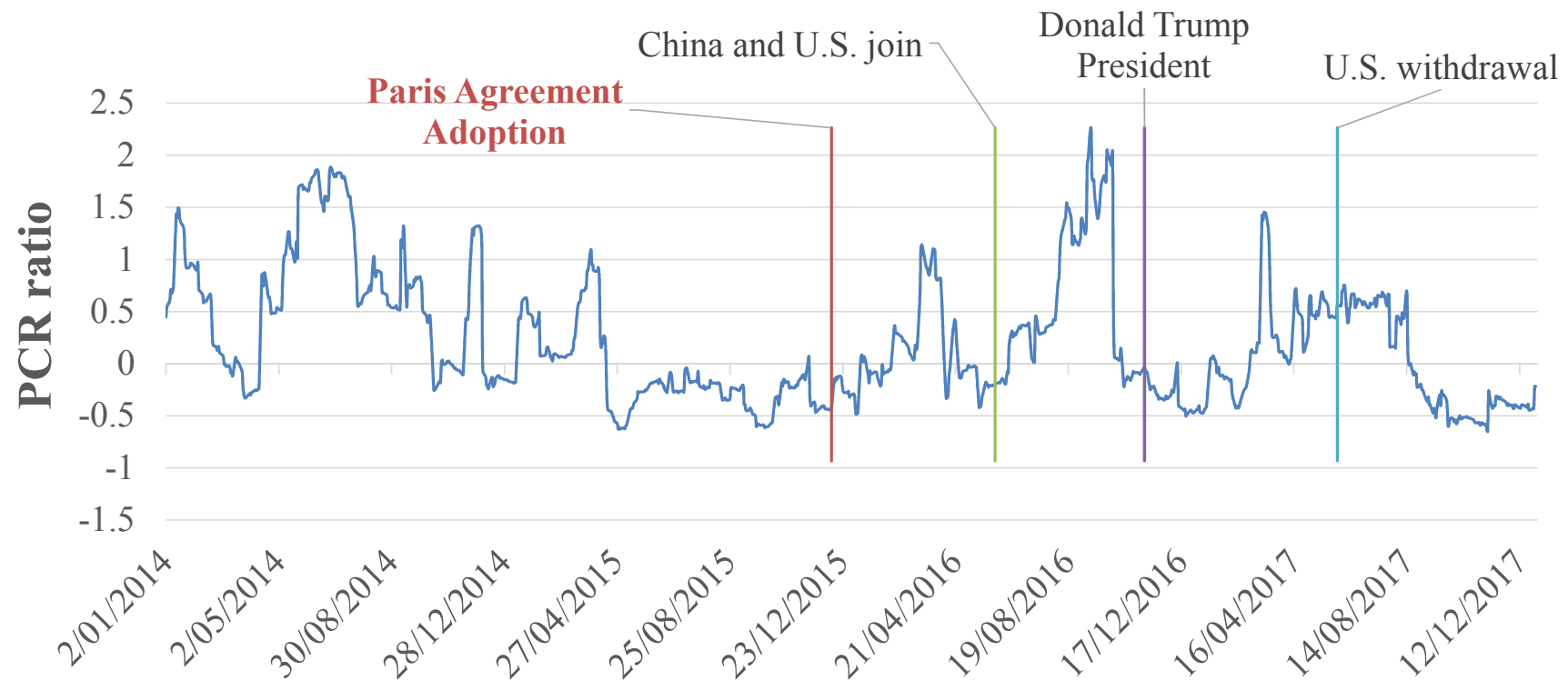
Equally-weighted Aggregate PCR for Non-U.S. Firms



Value-weighted Aggregate PCR for U.S. Firms



Value-weighted Aggregate PCR for Non-U.S. Firms



Results -Bai Perron Structural Break Tests

PCR Series	Evidence of Structural Breaks
Daily Time Series Full Sample	
Equally weighted average PCR non-U.S.	No breaks
Equally weighted average PCR U.S.	No breaks
Value weighted average PCR non-U.S.	No breaks
Value weighted average PCR U.S.	Paris Agreement break
Daily Time Series Beginning in 2014	
Equally weighted average PCR non-U.S.	Paris Agreement break
Equally weighted average PCR U.S.	No breaks
Value weighted average PCR non-U.S.	No breaks
Value weighted average PCR U.S.	Paris Agreement break
Monthly Time Series Full Sample	
Equally weighted average PCR non U.S.	No breaks
Equally weighted average PCR U.S.	No breaks
Value weighted average PCR non U.S.	No breaks
Value weighted average PCR U.S.	Paris Agreement break

Conclusion

- Paris Agreement is an important event for US Oil & Gas firms
- Strong negative response to the Paris Agreement except for Non-U.S. integrated Oil & Gas companies. Other categories more US focused (Paris first time US agrees to climate deal)
- Ratification of Paris Agreement by China and the US increased volatility for Non-U.S. and U.S. domestic firms
- Integrated oil and gas company option traders anticipated Trump's exit and experienced more uncertainty post exit
- Trump election – “all news is bad news” or promotion of shale oil that competes with larger producers?
 - **“We are still in”**; **United States Climate Alliance**
- Trump exit hurts transportation and storage and Non-U.S. Oil & Gas Refining & Marketing
- Paris vs. Trump: Paris wins!

QUESTIONS & COMMENTS