Unlocking ESG Premium from Options

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January 2022
AFA 2022 Meetings

UNIL | Université de Lausanne
swiss:finance:institute

Motivation

Importance of ESG has grown over time

So have ESG-related risks.

Some studies document that risks are higher for poor ESG firms.

Limited research on the ‘pricing’ of these risks.

We study the pricing of this uncertainty via option markets.

ESG related uncertainty

Poor ESG performance increases risks in areas such as litigation, regulation, reputation, supply chain, etc.

- E.g., US Customs and Border Protection has issued “withhold release orders” to exclude merchandise under Section 307 of the Tariff Act of 1930, which prohibits import of merchandise mined, produced or manufactured by forced or indentured labor.

The content and timing of regulation changes are hard to predict.

Damages due to reputation risk are difficult to assess.

Pricing of ESG related risks

It is unclear when ESG risks will materialize or how severe they will be.

The directional impact of ESG uncertainty could even be positive (Cohen, Gurun, and Nguyen (2021)).

We conjecture that investors may be willing to pay to hedge against this uncertainty.

Option markets are a natural place for us to uncover these insurance premia.

- Similar to the pricing of political risks in Kelly, Pástor, and Veronesi (2016) and Pástor and Veronesi (2013).

Data

ESG data

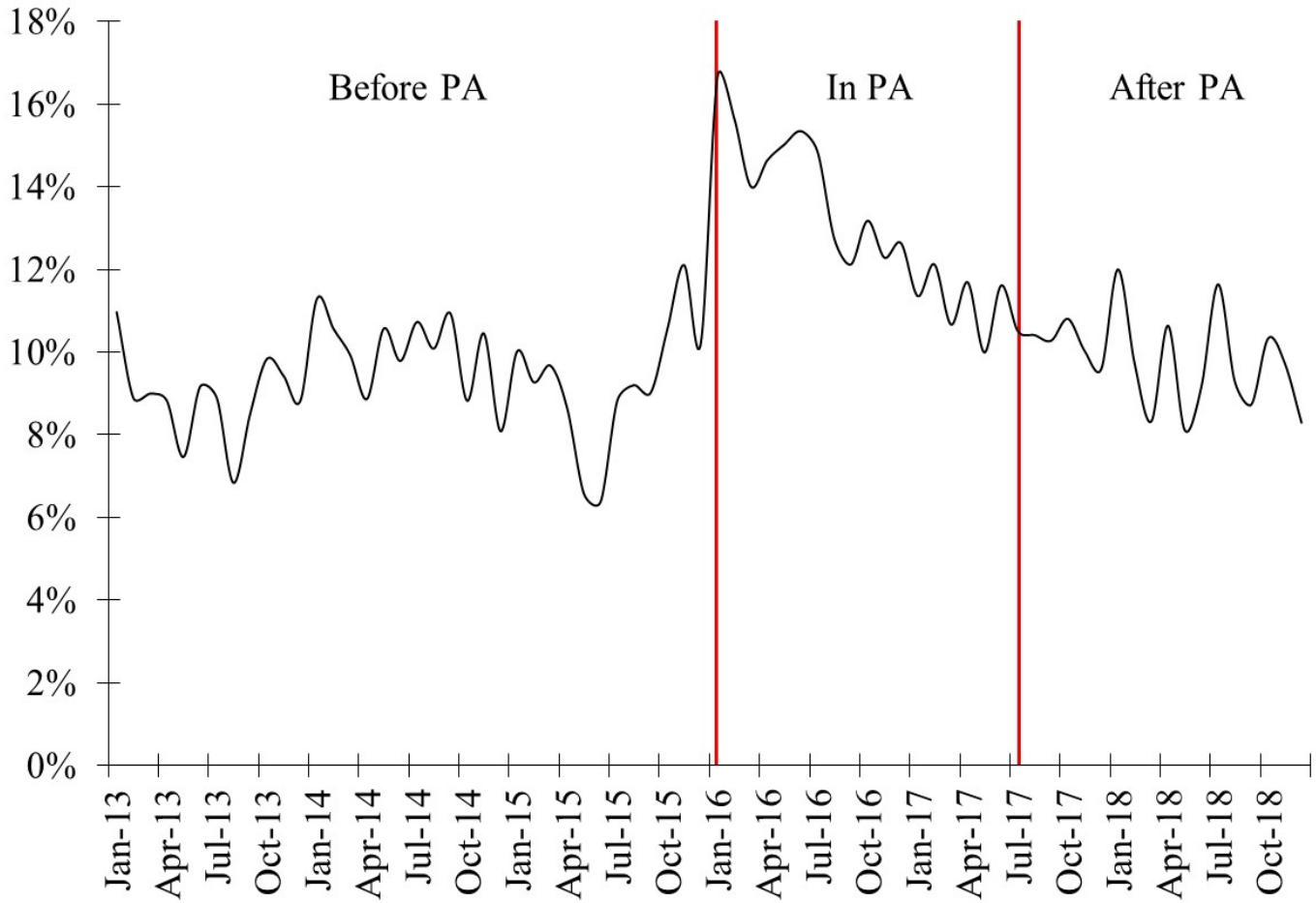
- Thomson Reuters Asset4 ESG.
- S&P 500 at the beginning and expanded to Russell 1000 index later.

Option data

- Option-Metrics.
- We construct delta-hedged option returns.

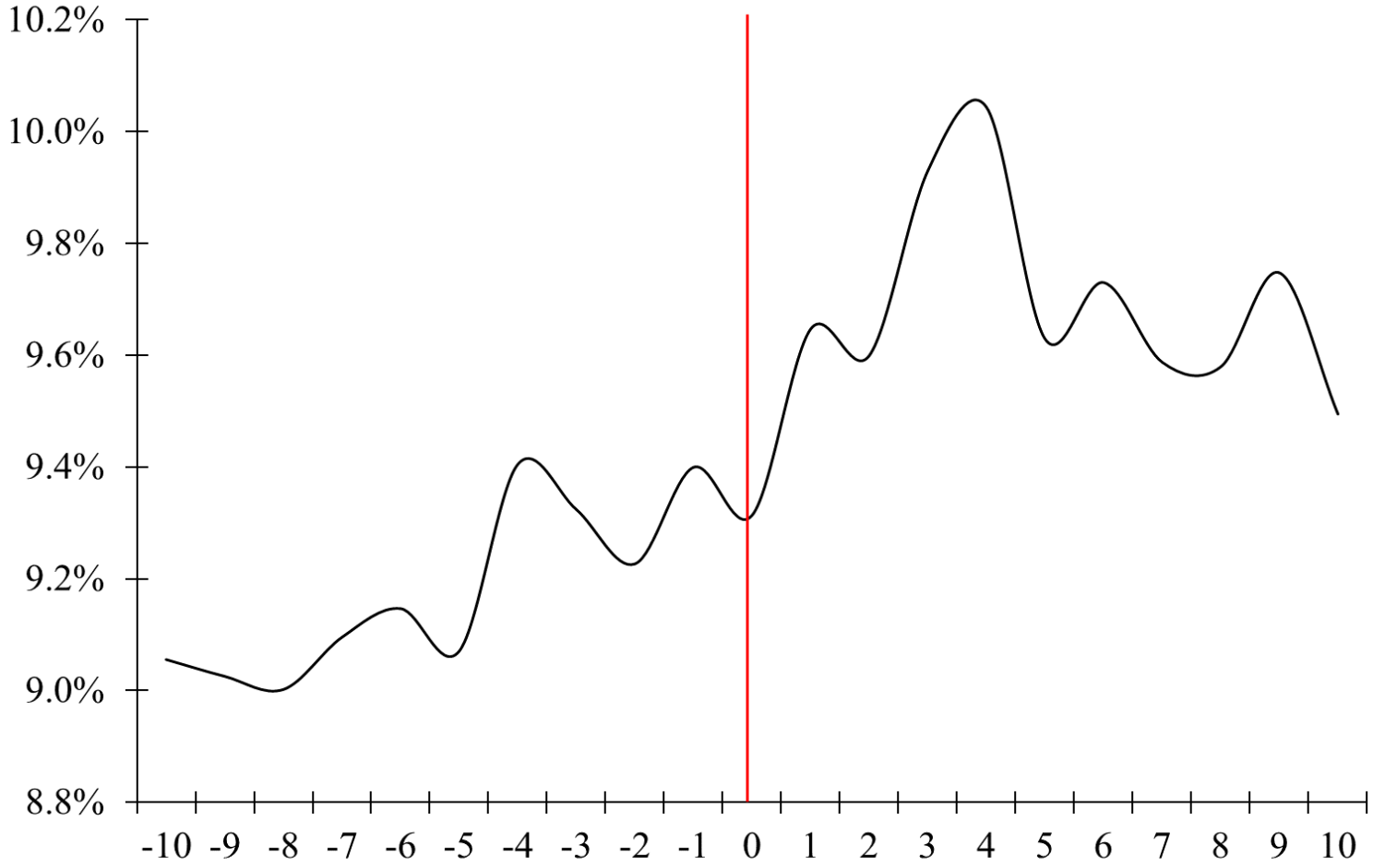
Preliminary evidence (1)

Implied volatility difference between low-ESG and high-ESG stocks around the Paris Agreement (PA).



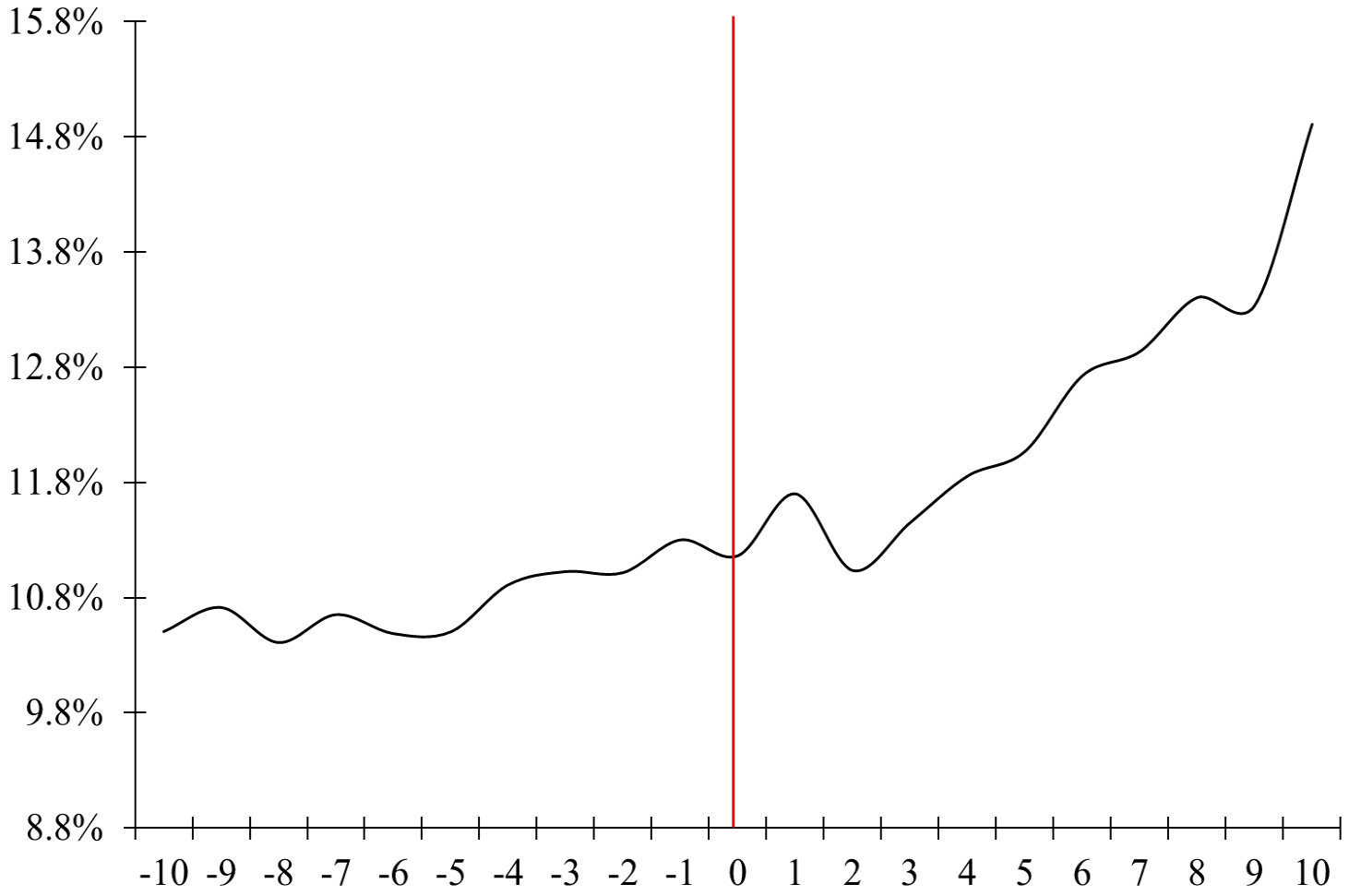
Preliminary evidence (2)

Implied volatility difference between low-ESG and high-ESG stocks around ten of Greta Thunberg's speeches.



Preliminary evidence (3)

Implied volatility difference between low-ESG and high-ESG stocks around Oct 15th, 2017 (launch of the Me-Too movement).



Delta-hedged option returns and ESG

FM regressions of delta-hedged option returns on ESG score:

$$DeltaHedgedGain_{it} = ESG_{it-1} + Controls_{it-1} + e_{it}.$$

	Call options			Put options		
	(1)	(2)	(3)	(4)	(5)	(6)
ESG score	0.706	0.280	0.293	0.591	0.240	0.207
	(7.76)	(2.36)	(2.46)	(9.38)	(3.11)	(2.69)
Average adj-R^2	0.005	0.043	0.051	0.007	0.047	0.059
# observations	51,691	48,464	48,464	51,691	48,464	48,464

Control variables: firm size, book to market ratio, idiosyncratic volatility, reversal, momentum in column (2) & (5); further control illiquidity, option open interest and option bid-ask spread in column (3) & (6).

Increase of ESG score from quartile 1 to quartile 3 (0.39 to 0.85), delta-hedged gain increases by 0.32% for call options, equivalent to 13.4% stdev.

Additional tests

Paris Agreement

- Impact of ESG on option prices should be amplified after PA, and mitigated after announcement of withdrawal.
- We find that coefficients of ESG score increase in-PA, and decrease after withdrawal, though the number of observations is limited.

Exogenous shock on firm-level ESG risks (DiD tests)

- We use RepRisk (a news-based database) to identify firms with sudden increase of ESG incidents; these are the treated firms.
- Control groups are identified via propensity score matching
- We find that option returns are lower for treated firms than those for control firms after severe ESG incidents.

E, S, or G

All three aspects matter, although E and S are more important.

	Call options			Put options		
	(1)	(2)	(3)	(4)	(5)	(6)
E-score	0.340			0.242		
	(3.01)			(2.72)		
S-score		0.281			0.214	
		(2.00)			(3.05)	
G-score			0.282			0.202
			(1.51)			(1.68)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Average adj-R^2	0.051	0.051	0.051	0.059	0.059	0.059
# observations	48,464	48,464	48,464	48,464	48,464	48,464

Magnitude of ESG premium

Portfolio sorts

ESG score rank	P1	P2	P3	P4	P5	P5−P1
Panel A. Daily rebalanced delta-hedged option returns						
	Call options					
Average return	−0.71	−0.62	−0.54	−0.49	−0.43	0.28
	(−5.67)	(−5.33)	(−4.70)	(−4.39)	(−4.26)	(6.12)
6-factor alpha	−0.68	−0.60	−0.51	−0.46	−0.41	0.26
	(−6.07)	(−5.98)	(−5.49)	(−5.05)	(−5.02)	(5.23)
7-factor alpha	−0.51	−0.43	−0.38	−0.31	−0.28	0.23
	(−3.90)	(−4.06)	(−3.44)	(−2.90)	(−2.98)	(4.09)
	Put options					
Average return	−0.66	−0.53	−0.44	−0.40	−0.34	0.32
	(−5.49)	(−4.42)	(−3.78)	(−3.46)	(−3.34)	(8.05)
6-factor alpha	−0.64	−0.50	−0.42	−0.36	−0.32	0.32
	(−5.99)	(−4.81)	(−4.33)	(−3.87)	(−3.86)	(6.72)
7-factor alpha	−0.47	−0.34	−0.29	−0.22	−0.19	0.29
	(−4.05)	(−3.05)	(−2.62)	(−2.04)	(−2.04)	(5.59)

Where does the ESG premium come from?

Straddle returns exposed to specific risks as dependent variable								
	Vega-positive, gamma-neutral (volatility risk sensitive)				Gamma-positive, vega-neutral (jump risk sensitive)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG score	1.754	2.001	2.182	2.129	2.328	2.080	1.863	1.878
	(1.68)	(1.98)	(1.98)	(2.01)	(2.37)	(2.13)	(1.85)	(1.89)
Implied variance		−8.903		−7.062		3.584		2.859
		(−1.50)		(−1.57)		(1.30)		(1.18)
Implied skewness			−1.973	−1.922			1.890	1.814
			(−1.83)	(−1.78)			(2.46)	(2.23)
Implied kurtosis			1.428	1.260			−1.082	−1.111
			(1.93)	(1.96)			(−2.04)	(−1.94)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average adj-R^2	0.056	0.057	0.056	0.058	0.045	0.046	0.044	0.046
# observations	44,100	43,655	43,655	43,655	44,100	43,655	43,655	43,655

Option end-user demand and ESG

We use signed option trading volume from International Securities Exchange (ISE) to measure end-user demand.

$$Signed\ Option\ Trading\ Volume_{it} = \frac{Total\ open\ Buy_{it} - Total\ open\ Sell_{it}}{Stock\ Trading\ Volume_{it}}.$$

ESG score rank	P1	P2	P3	P4	P5	P5−P1
Calls and Puts	0.81 (0.59)	0.16 (0.68)	−0.12 (−0.68)	−0.74 (−4.94)	−1.02 (−6.77)	−1.84 (−4.82)
Calls	1.05 (0.15)	0.16 (0.64)	−0.18 (−0.93)	−1.26 (−7.02)	−1.42 (−8.15)	−2.47 (−3.92)
Puts	0.59 (1.83)	0.16 (0.71)	−0.08 (−0.26)	−0.21 (−0.31)	−0.61 (−2.35)	−1.20 (−3.70)

Underlying channels

The results are stronger when

- Product competition intensity is higher.
- Investors' ESG awareness is higher.
- Firms do not have hedging activities.

Is the result driven by carbon risks?

Ilhan, Sautner, and Vilkov (2021) find that option-implied tail risks are larger for firms with more carbon-intense business models.

We control the carbon emission score, and still find significant effect on delta-hedged option returns of ESG performance.

	Call options				Put options			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carbon emission score	0.044	0.023	0.009	0.004	0.028	0.004	−0.003	−0.010
	(2.99)	(1.37)	(0.57)	(0.21)	(2.45)	(0.36)	(−0.33)	(−0.94)
ESG		0.622		0.242		0.645		0.282
		(4.08)		(2.08)		(5.72)		(2.97)
Controls	No	No	Yes	Yes	No	No	Yes	Yes
Average adj-R^2	0.001	0.007	0.056	0.060	0.001	0.010	0.065	0.069
# observations	33,618	32,874	31,877	31,193	33,618	32,874	31,877	31,193

Conclusion

Implied volatility is higher and delta-hedged option gain is more negative—both indicating option prices are more expensive—for firms with poor ESG performance.

All components of ESG contribute to option expensiveness.

We find the magnitude of the ESG premium to be about 0.3% per month.

- This premium derives from volatility ad jump risks, and possibly higher-moment risks.

The effect is stronger for firms that are closer to end-consumers, facing severer product competition, with higher investors' ESG awareness, and without corporate hedging activity.