

## QES US Industrials & Materials Risk Model – Model Summary

### Introduction

The Luo's QES team has been top-ranked in the Institutional Investor magazine's research surveys in the Quantitative Research, Portfolio Strategy, Economics, and Accounting & Tax Policy categories in the past decade. The QES risk model suite leverages our expertise in factor construction, our experience with risk model design, and our understanding of systematic drivers of equity risk. This US Industrials & Materials model includes fundamental, technical, macro, positioning, and alternative data factors that explain systematic risks and return dispersion in the sector. Intended users include both fundamental and quantitative PMs, CIOs, risk managers, and traders.

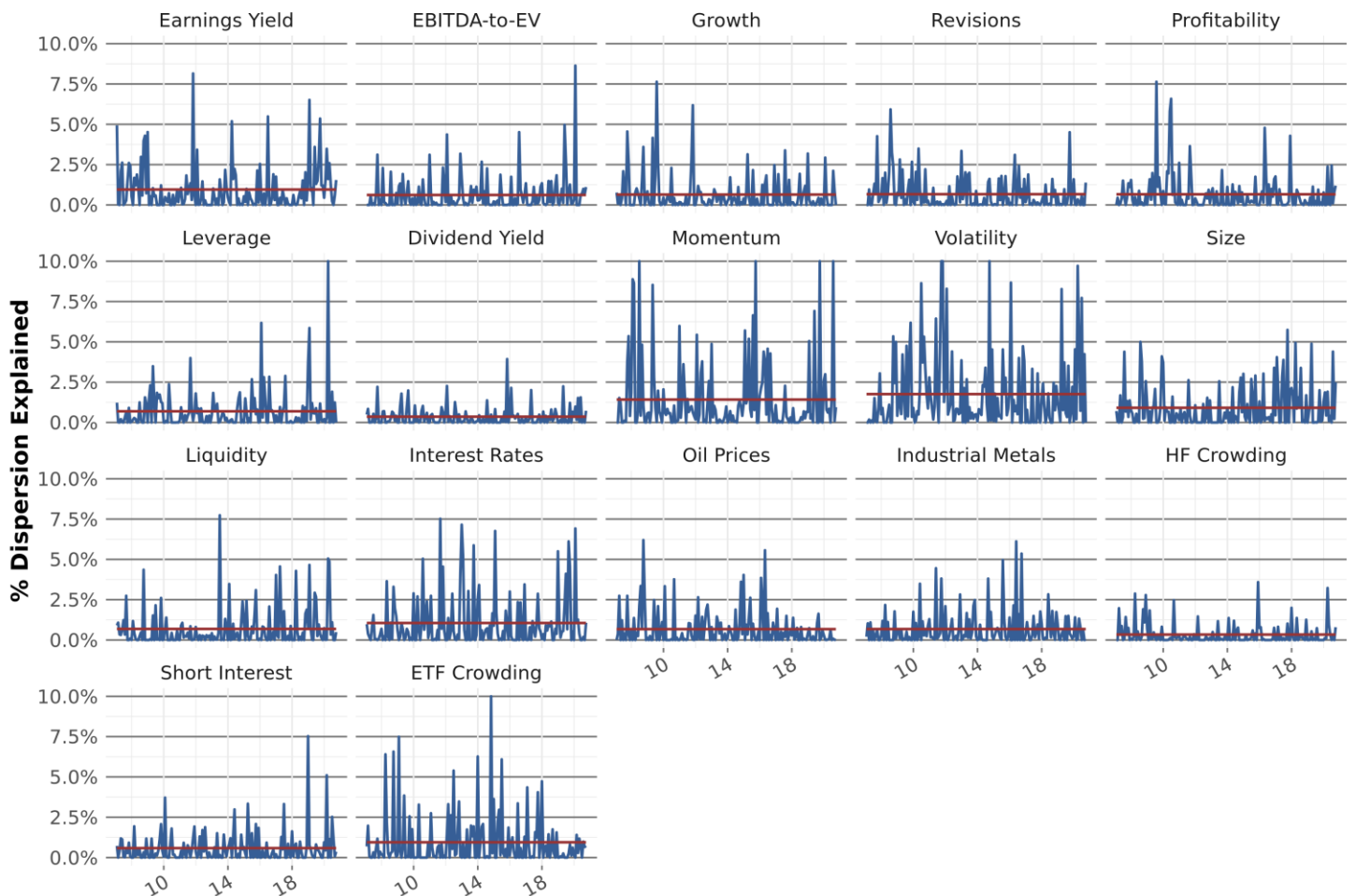
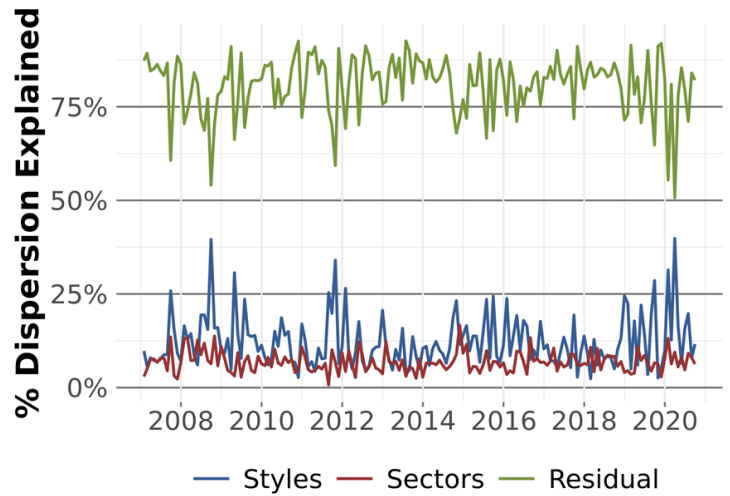
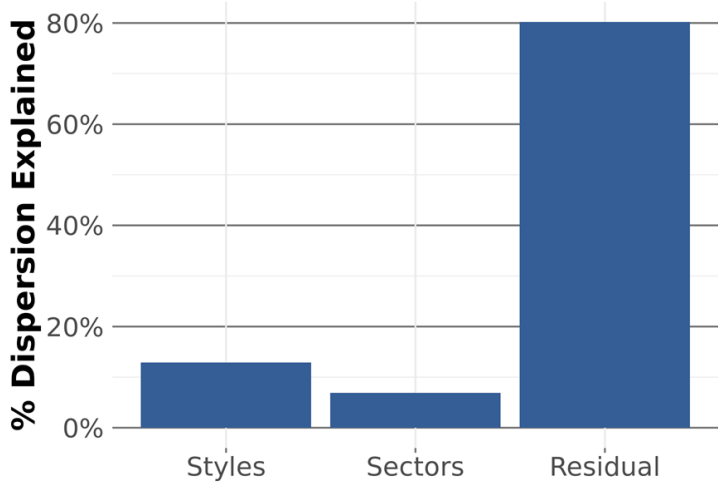
### Coverage

- Risk Estimation Universe: US All-Cap Industrials & Materials Equities
- Investment Horizon: Medium-term
- Securities Coverage: Global equities (~40,000) plus US-listed equity ETFs (~1,000)
- Model History: January 2007 to present

### Factors & Descriptions

QES Factor Name	Signal Description
<b>Earnings Yield</b>	Next 12-month median consensus EPS divided by current share price.
<b>EBITDA-to-EV</b>	Ratio of last 12-month EBITDA to sum of net debt, preferred shares, market cap, noncontrolling interest.
<b>Growth</b>	Combination of median consensus EPS growth and sales growth over the next 12-months.
<b>Revisions</b>	Ratio of next 12-month mean consensus EPS to this metric 3-months ago.
<b>Profitability</b>	Combination of trailing ROE and ROIC.
<b>Leverage</b>	Combination of debt-to-equity and debt-to-total capital at current market value.
<b>Dividend Yield</b>	Trailing 12-month dividend per share divided by current share price.
<b>Momentum</b>	Total return of the past 12-months excluding the most recent 1-month.
<b>Volatility</b>	Realized volatility, based on daily returns over the past 12-months.
<b>Size</b>	Market capitalization, common shares outstanding multiplied by the current share price.
<b>Liquidity</b>	Past 3-month average dollar volume divided by average market capitalization.
<b>Interest Rates</b>	Beta to interest rate changes for US Treasuries approximately equivalent to the 10Y.
<b>Oil Prices</b>	Beta to weekly returns of crude oil WTI Futures TR after controlling for market beta.
<b>Industrial Metals</b>	Beta to weekly returns of S&P GSCI Industrial Metals TR Index.
<b>HF Crowding</b>	Combination of hedge fund intensity (% of float) and level (market value) based on 13F filings.
<b>Short Interest</b>	Ratio of shares borrowed for shorting to inventory available for lending.
<b>ETF Crowding</b>	Ratio of gross flows from ETF creation/redemption to notional trading volume over trailing 3-months.
<b>QES Industries</b>	Binary one or zero values identifying each stock's QES Industry classification.

### Explanatory Power for Opportunity Set



### Factor Correlations

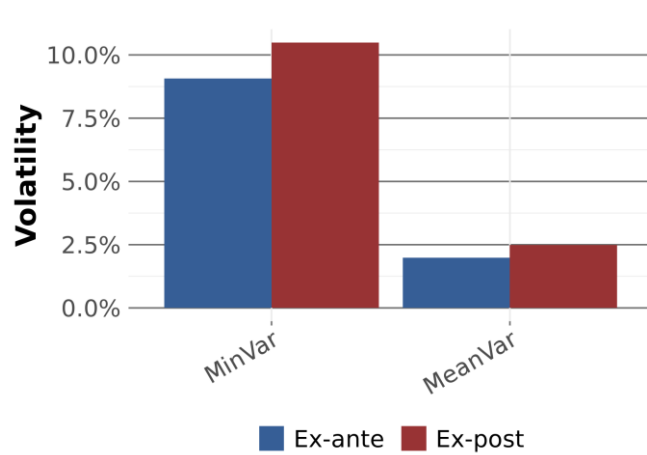
\*Signal Rank (Upper) and FMPs Ex-Post (Lower)

	Earnings Yield	EBITDA-to-EV	Growth	Revisions	Profitability	Leverage	Dividend Yield	Momentum	Volatility	Size	Liquidity	Interest Rates	Oil Prices	Industrial Metals	HF Crowding	Short Interest	ETF Crowding
Earnings Yield	1	5	3	19	23	10	-9	-1	7	8	10	-1	-1	8	-15	-8	
EBITDA-to-EV	-8	1	-23	-17	9	11	12	-18	7	-10	8	8	-4	0	3	-16	-2
Growth	-20	2	1	30	4	-3	-15	27	2	5	0	-2	-1	-2	3	1	-3
Revisions	-14	-6	-6	1	-1	-2	-9	27	1	6	-1	0	-1	-1	4	-6	-1
Profitability	-27	-19	3	17	1	-14	10	16	-27	30	-1	-8	-5	-5	7	-11	-3
Leverage	23	9	1	-13	30	-2	-6	9	5	12	9	2	-1	21	5	-21	
Dividend Yield	8	20	-14	-21	-18	-1	-5	-22	17	-5	-5	0	0	-9	-10	10	
Momentum	-11	-9	7	9	7	-22	-10	-12	19	-2	-6	-2	-3	6	-9	-1	
Volatility	1	22	-11	-12	-35	15	11	-27	15	27	8	4	-6	20	-12		
Size	-7	14	1	26	-15	-10	-12	-2	11	22	-5	0	3	32	-13	-24	
Liquidity	17	6	-3	-4	-18	19	6	-21	14	3	12	7	6	28	22	1	
Interest Rates	10	10	3	0	-21	15	-2	-8	31	-8	23	23	16	2	3	-9	
Oil Prices	17	-4	-1	14	-6	9	-21	10	7	2	-3	-3	37	4	4	-10	
Industrial Metals	12	-12	14	-2	-4	8	15	13	-3	-7	2	-25	5	3	-12		
HF Crowding	3	-11	6	-7	-2	15	-6	-1	15	-20	5	-7	16	9	-5	38	
Short Interest	-12	16	-2	-11	-16	-8	28	-5	3	17	-3	-20	3	0	4	-20	
ETF Crowding	-12	9	0	-5	-6	-2	13	3	0	-1	39	9	-16	-1	-5	11	

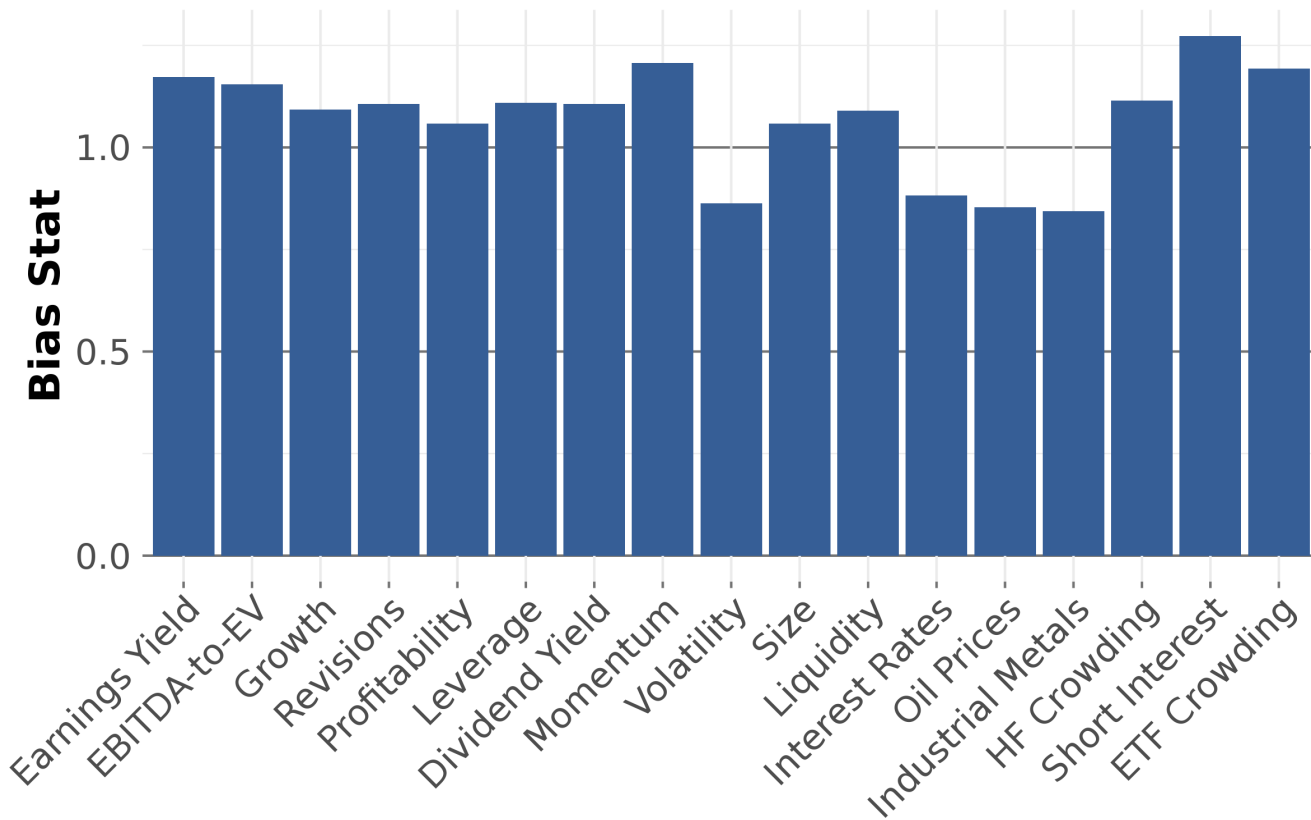
### Portfolio Optimization Tests

\*Minimum Variance

\*Mean-Variance



### Bias Statistics



## DISCLOSURE SECTION

### Other Disclosures:

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