

QES US Broad 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 broad US model includes fundamental, technical, macro, positioning, and alternative data factors that explain systematic risks and return dispersion for US stocks. Intended users include both fundamental and quantitative PMs, CIOs, risk managers, and traders.

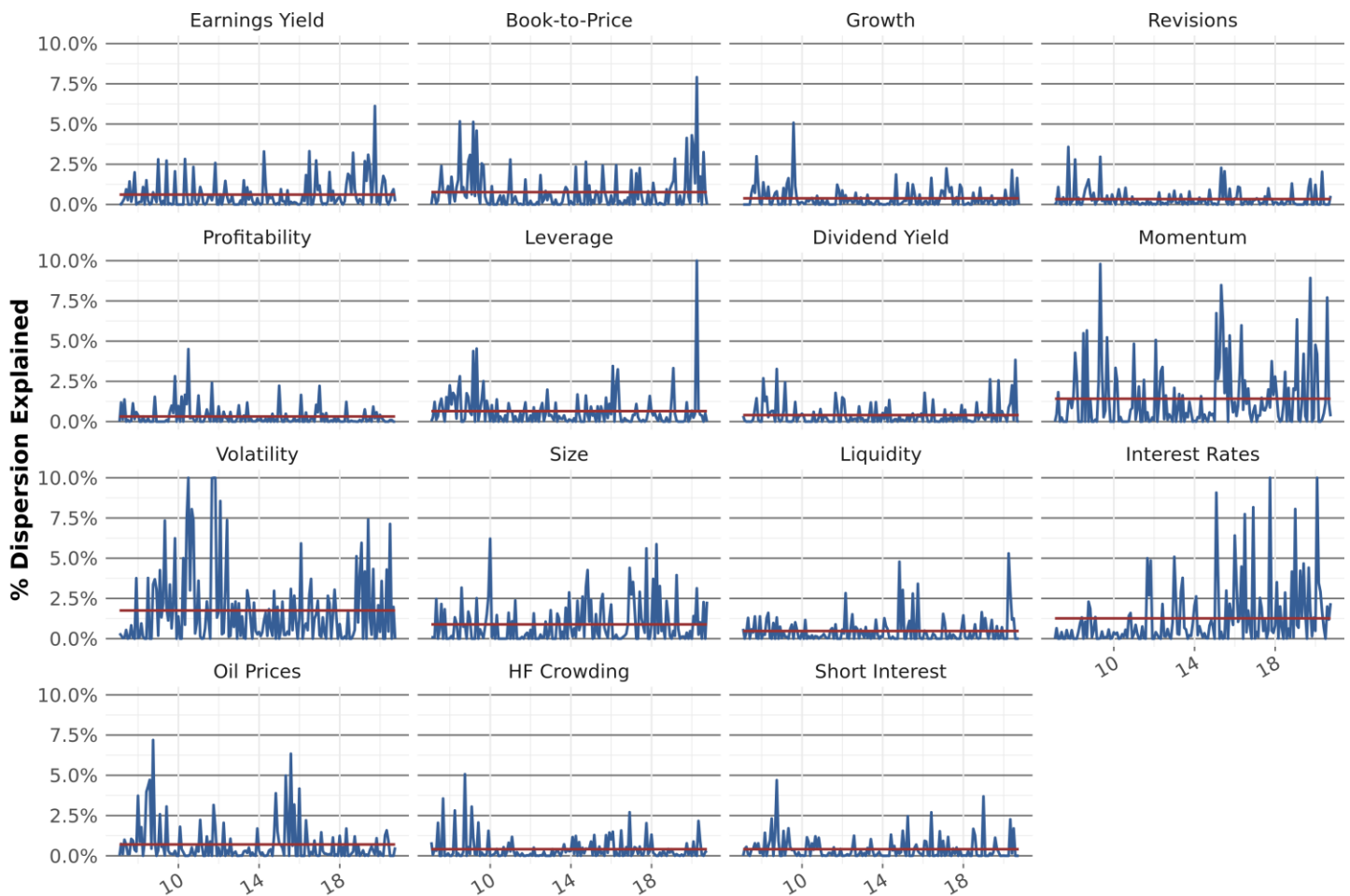
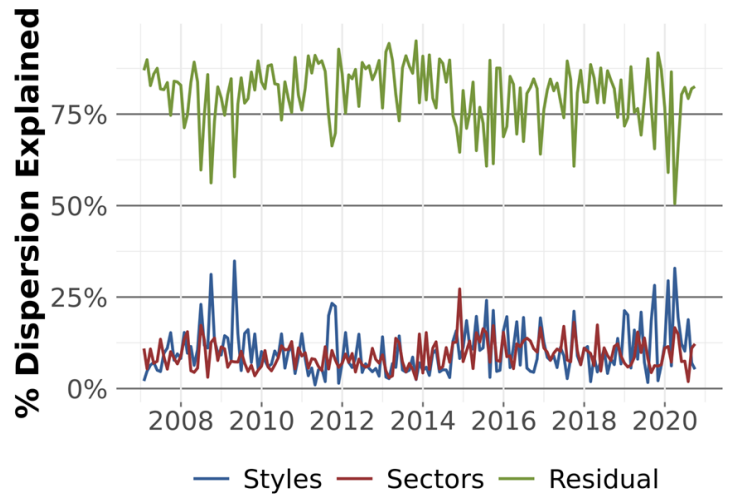
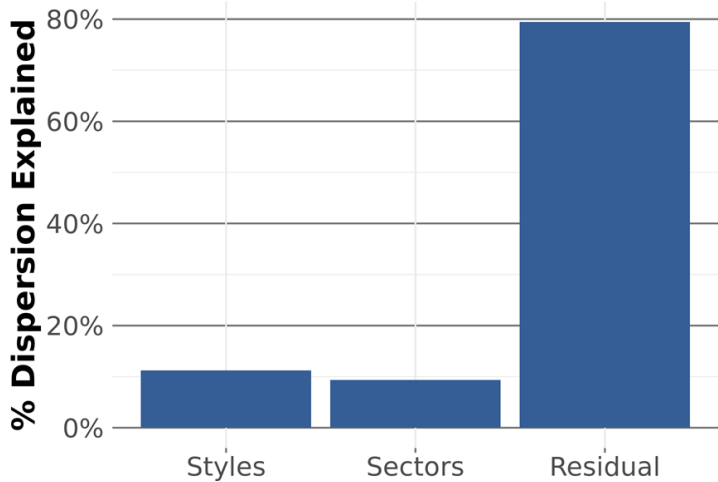
Coverage

- Risk Estimation Universe: US All-Cap 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

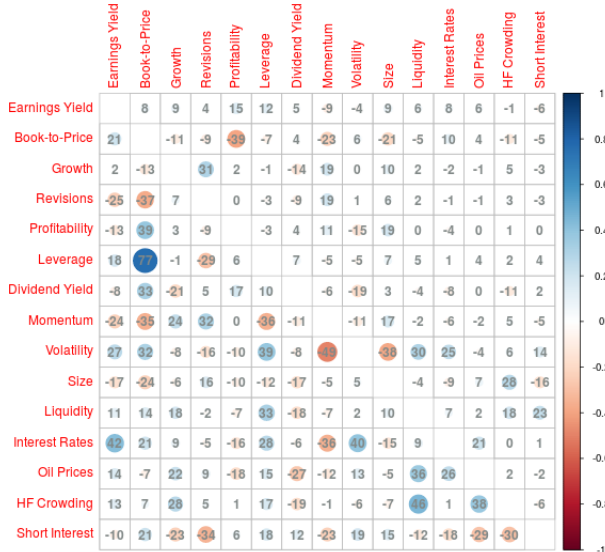
QES Factor Name	Signal Description
Earnings Yield	Next 12-month median consensus EPS divided by current share price.
Book-to-Price	Ratio of book value of equity to market value of equity.
Growth	Combination of median consensus EPS growth and sales growth over the next 12-months.
Revisions	Combination of 3-month changes in mean consensus EPS and Sales over the next 12-months.
Profitability	Combination of trailing ROE and net margin.
Leverage	Combination of debt-to-equity and debt-to-total capital at current market value.
Dividend Yield	Trailing 12-month dividend per share divided by current share price.
Momentum	Total return of the past 12-months excluding the most recent 1-month.
Volatility	Realized volatility, based on daily returns over the past 12-months.
Size	Market capitalization, common shares outstanding multiplied by the current share price.
Liquidity	Past 3-month average dollar volume divided by average market capitalization.
Interest Rates	Beta to interest rate changes for US Treasuries approximately equivalent to the 10Y.
Oil Prices	Beta to weekly returns of crude oil WTI Futures TR after controlling for market beta.
HF Crowding	Combination of hedge fund intensity (% of float) and level (market value) based on 13F filings.
Short Interest	Ratio of shares borrowed for shorting to inventory available for lending.
QES Industries	Binary one or zero values identifying each stock's QES Industry classification.

Explanatory Power for Opportunity Set



Factor Correlations

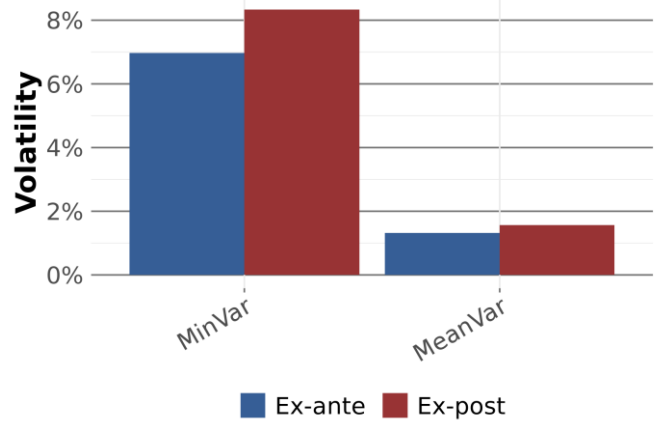
*Signal Rank (Upper) and FMPs Ex-Post (Lower)



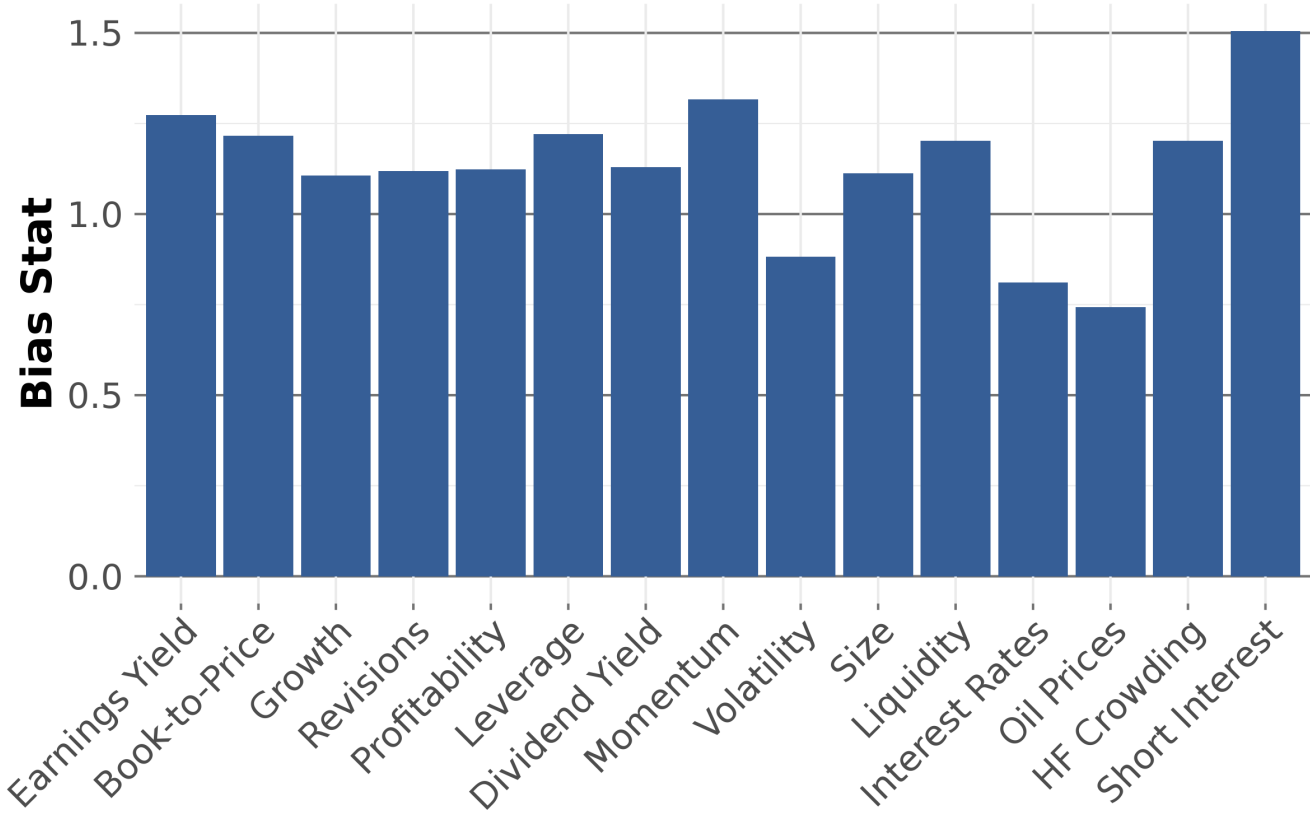
Portfolio Optimization Tests

*Minimum Variance

*Mean-Variance



Bias Statistics



DISCLOSURE SECTION

Other Disclosures:

Wolfe Research, LLC does not assign ratings of Buy, Hold or Sell to the stocks it covers. Outperform, Peer Perform and Underperform are not the respective equivalents of Buy, Hold and Sell but represent relative weightings as defined above. To satisfy regulatory requirements, Outperform has been designated to correspond with Buy, Peer Perform has been designated to correspond with Hold and Underperform has been designated to correspond with Sell.

Wolfe Research Securities and Wolfe Research, LLC have adopted the use of Wolfe Research as brand names. Wolfe Research Securities, a member of FINRA (www.finra.org) is the broker-dealer affiliate of Wolfe Research, LLC and is responsible for the contents of this material. Any analysts publishing these reports are dually employed by Wolfe Research, LLC and Wolfe Research Securities.

The content of this report is to be used solely for informational purposes and should not be regarded as an offer, or a solicitation of an offer, to buy or sell a security, financial instrument or service discussed herein. Opinions in this communication constitute the current judgment of the author as of the date and time of this report and are subject to change without notice. Information herein is believed to be reliable but Wolfe Research and its affiliates, including but not limited to Wolfe Research Securities, makes no representation that it is complete or accurate. The information provided in this communication is not designed to replace a recipient's own decision-making processes for assessing a proposed transaction or investment involving a financial instrument discussed herein. Recipients are encouraged to seek financial advice from their financial advisor regarding the appropriateness of investing in a security or financial instrument referred to in this report and should understand that statements regarding the future performance of the financial instruments or the securities referenced herein may not be realized. Past performance is not indicative of future results. This report is not intended for distribution to, or use by, any person or entity in any location where such distribution or use would be contrary to applicable law, or which would subject Wolfe Research, LLC or any affiliate to any registration requirement within such location. For additional important disclosures, please see www.wolferesearch.com/disclosures.

The views expressed in Wolfe Research, LLC research reports with regards to sectors and/or specific companies may from time to time be inconsistent with the views implied by inclusion of those sectors and companies in other Wolfe Research, LLC analysts' research reports and modeling screens. Wolfe Research communicates with clients across a variety of mediums of the clients' choosing including emails, voice blasts and electronic publication to our proprietary website

Copyright © Wolfe Research, LLC 2017. All rights reserved. All material presented in this document, unless specifically indicated otherwise, is under copyright to Wolfe Research, LLC. None of the material, nor its content, nor any copy of it, may be altered in any way, or transmitted to or distributed to any other party, without the prior express written permission of Wolfe Research, LLC.

This document is limited for the sole use of clients of Wolfe Research. Authorized users have received an encryption decoder which legislates and monitors the access to Wolfe Research, LLC content. Any distribution of the content produced by Wolfe Research, LLC will violate the understanding of the terms of our relationship.