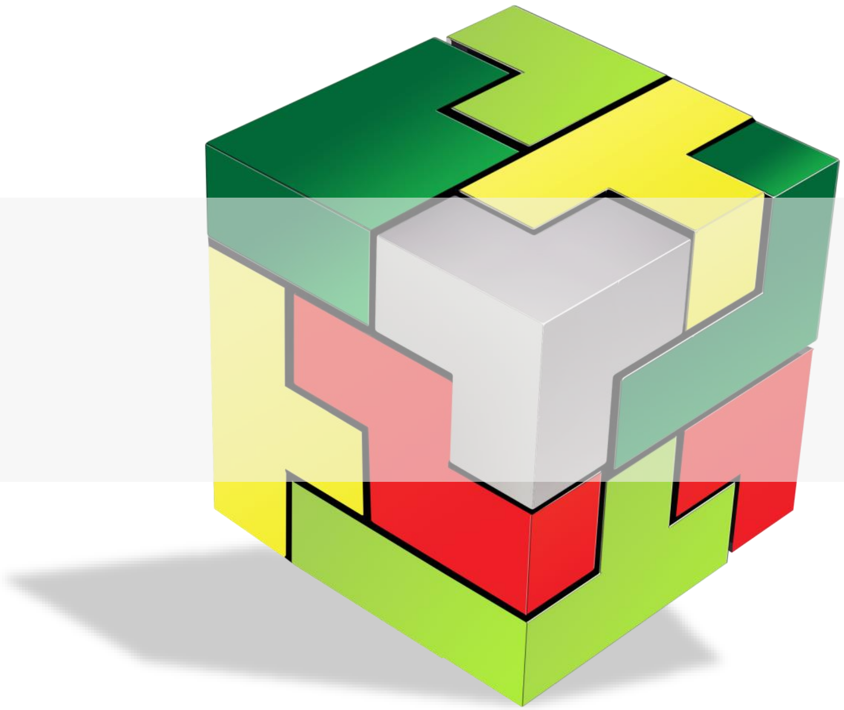
SIGNAL
ANALYTICS



CROWDING MODEL OVERVIEW

January 2022

Overview

Signal Analytics, an independent analytics firm dedicated to delivering alpha generating tools to institutional investors, employed several unique, proprietary techniques to build a model that provides superior identification of crowded equities among L/S hedge funds. The model has a correlation of 76% versus a common hedge fund performance index, and tests as clearly significant. A biproduct of our analysis showed crowded stocks, as we define them, deliver significant risk adjusted returns versus the universe we tested.

Model methodology:

- Our model was constructed using factors that produce returns that are highly corelated to L/S hedge fund performance data. Care was taken to use factors across a spectrum of factor families.
- Short interest is only a small part of our model.
- Backtests extend back to Jan 1, 2007, providing full market cycle analysis.

Model results:

- Excellent predictor of HF ownership with a correlation of 76% and a r-squared of ~58% versus a common hedge fund performance index.
- By using a variety of factors from different factor families, variance of returns is reduced vs. using short interest alone.
- Crowded names, as we calculate them, outperform the universe, even on a risk adjusted basis. Portfolio constructed using the top 10% crowded longs and bottom 10% crowded shorts delivered a 10 year in-sample annualized return of 17.76% with a 1.97 Information Ratio.
- A complete full sample portfolio (in-sample plus out-of-sample) constructed using the top 10% crowded longs and bottom 10% crowded shorts delivered a 15-year annualized return of 13.02% with a 1.34 Information Ratio.

Summary – Full Data Set (In and Out-of-Sample)

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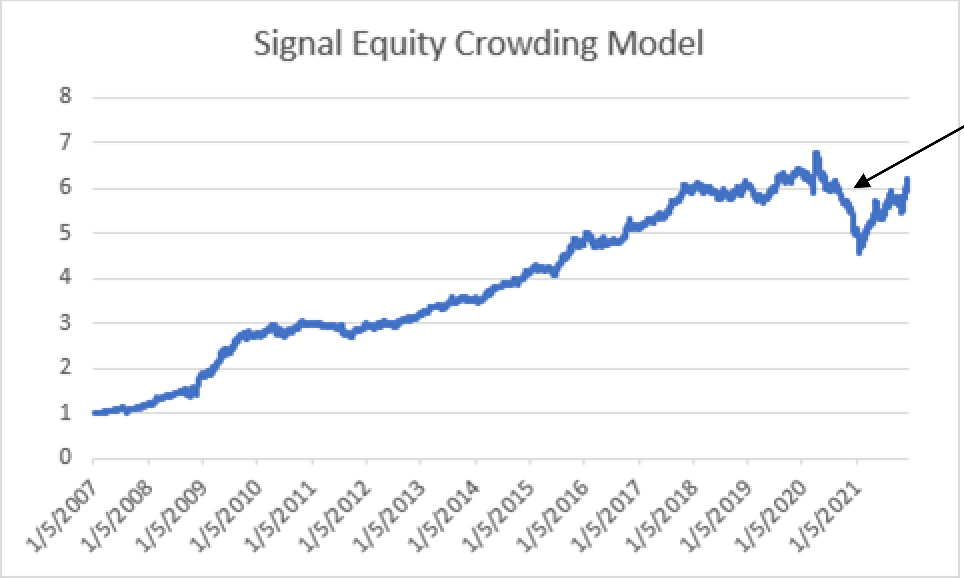
Cumulative Dollar Neutral Returns - ($1 portfolio, 100% Long/100% Short)



As expected, the crowd suffered during the Covid unwind; The Signal Crowding Model was down ~27% from *4/7/20 to 3/9/21.*

	FULL HISTORY (Jan 2007 - Dec 2021)	BACKTEST (Jan 2007 - Dec 2016)	OUT-OF-SAMPLE AND LIVE (Jan 2017 - Dec, 14 2021)
Annualized Return	13.02%	17.76%	3.95%
Standard Deviation	9.69%	9.91%	9.22%
Information Ratio	1.34	1.79	0.43

Returns are based on the Top/Bottom 10% of Crowding Z-score. Universe is top 2000 U.S. listed securities by market capitalization, including ADRs (excluding China & Russia). Portfolio is dollar neutral, 100% long / 100% short and does not include transaction costs or slippage.

Full Data Set - Monthly Returns

Monthly data clearly demonstrates the model is a consistent alpha generator and accurate gage of market stress, unwinds, and deleveraging events – see 2011, 2016, 2018 and 2020.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2007	1.4%	0.1%	1.0%	2.8%	1.4%	2.9%	1.1%	-2.3%	1.1%	1.9%	3.7%	2.1%	**18.4%**
2008	1.7%	9.8%	0.0%	2.5%	1.4%	4.8%	0.6%	1.2%	-2.1%	6.8%	1.9%	19.7%	**58.0%**
2009	1.2%	-1.4%	7.8%	9.9%	8.1%	0.5%	4.8%	3.9%	2.7%	-0.6%	2.3%	0.4%	**46.9%**
2010	-0.2%	2.8%	3.3%	1.5%	-5.3%	-2.5%	5.6%	-0.1%	-0.3%	4.8%	-0.5%	0.1%	**8.9%**
2011	1.0%	-1.0%	-0.8%	-0.9%	0.1%	-1.1%	-0.1%	-4.5%	-2.6%	4.0%	2.3%	2.3%	**-1.4%**
2012	0.5%	-1.6%	3.1%	0.1%	-1.9%	1.1%	0.5%	1.8%	0.8%	0.8%	0.0%	3.8%	**9.1%**
2013	1.6%	0.5%	2.5%	0.4%	-1.3%	1.6%	5.1%	-2.6%	2.1%	-0.2%	-0.8%	0.7%	**9.8%**
2014	-1.1%	1.5%	3.8%	1.7%	1.7%	0.2%	0.7%	1.2%	1.6%	0.4%	1.9%	2.1%	**16.8%**
2015	2.5%	0.2%	-0.1%	0.1%	-0.8%	-0.6%	3.9%	2.2%	5.3%	2.7%	-1.3%	1.1%	**15.9%**
2016	3.8%	-1.4%	-2.1%	-0.4%	-0.3%	1.3%	0.2%	-0.3%	2.4%	5.3%	-0.6%	-0.6%	**7.3%**
2017	1.6%	2.2%	-0.3%	1.2%	0.7%	-1.1%	2.0%	4.6%	0.1%	4.2%	-0.4%	-0.3%	**15.4%**
2018	3.4%	-0.7%	-1.1%	-0.1%	-1.2%	-2.1%	1.5%	-1.8%	1.9%	0.3%	0.3%	2.3%	**2.5%**
2019	-0.7%	-4.2%	0.5%	0.1%	1.4%	1.7%	4.5%	0.7%	-1.1%	0.3%	1.5%	0.9%	**5.6%**
2020	-2.5%	-0.1%	3.5%	2.8%	-6.9%	-2.5%	1.7%	-2.9%	-3.6%	-0.7%	-3.7%	-8.3%	**-21.3%**
2021	-7.1%	4.5%	5.6%	4.4%	2.5%	-3.0%	6.4%	1.3%	-0.1%	-2.0%	5.5%	4.0%	**23.1%**

Backtest (in-sample)

Out-of-Sample and Live

Covid drawdown of ~27%

Returns are based on the Top/Bottom 10% of Crowding Z-score. Universe is top 2000 U.S. listed securities by market capitalization, including ADRs (excluding China & Russia). Portfolio is dollar neutral, 100% long / 100% short and does not include transaction costs or slippage.

Driven by the unwind of Q1 2016, which was a very difficult period for hedge funds, Signal set out to build a model to better prepare our clients for major deleveraging events. We recognized that equity hedge funds, whether fundamental or quant, too often utilize many of the same factors to select stocks and construct portfolios. As self-described “factor geeks”, we realized there was an opportunity to construct a better mousetrap to identify equity crowding – one built on factor analysis rather than short interest alone. While our factor-based approach does identify hedge fund crowding better than simple short interest, we were surprised to find that a portfolio of crowded stocks, despite a slight uptick in volatility, does “work” over time. Below are the key takeaways from our crowding model and analysis:

- Signal’s Crowding Model has a 76% correlation to a commonly used HF performance data.
- We believe crowding, as calculated by Signal, is a “good” standalone factor offering quality risk adjusted returns.
- Getting 78% of in sample IR which is above our 33-50% estimate for out of sample returns

Prospective clients are welcome to our full in-sample and out-of-sample data. *To request a file, please contact Signal’s head of sales, Patrick Quill, at 917-597-3920 or pquill@signal-inc.com. Clients receive a weekly file that includes long and a short crowding score for the largest 2000 stocks on the American stock exchanges including ADRs (excluding Chinese or Russian companies).*

About Signal Analytics

- Signal Analytics produces a proprietary suite of tools, data and analytics that help clients make timely, informed, and accurate investment decisions.

- Founded in 2012 by Stephen Davis and Geoff Kieburtz, Signal Analytics provides institutional investors with macroeconomic, quantitative and technical tools to complement the fundamental research process. These tools are synthesized to generate specific investment recommendations for almost 1200 large cap stocks across most sectors of the US market.

- Signal Analytics understands the needs of intuitional investors because the team has been there. Each member of the Signal development team has multiple decades of institutional buy-side experience.

- Signal Analytics is proud to count the world's largest intuitional investors among its clients, including over 50 prominent hedge and asset managers in the U.S. and U.K.

- For more information, please contact Signal's head of sales, Patrick Quill at 917.597.3920 or pquill@signal-inc.com.

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Additional Disclosure:

Stephen Davis, the CEO of Signal Analytics shares an office space with Goose Hill Capital LLC. Our computer systems and office space are separated.