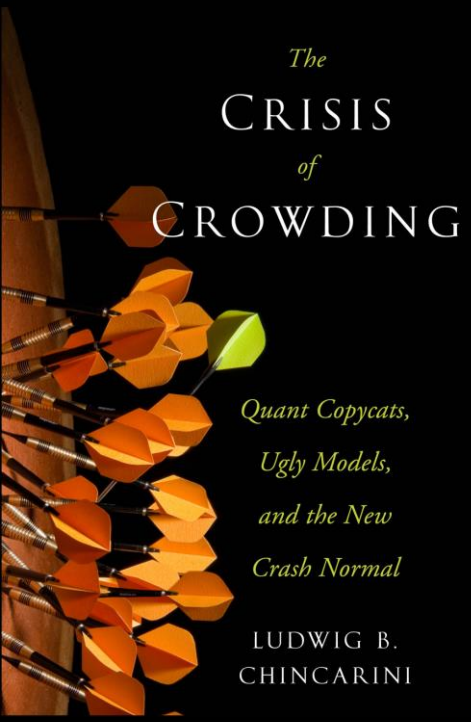
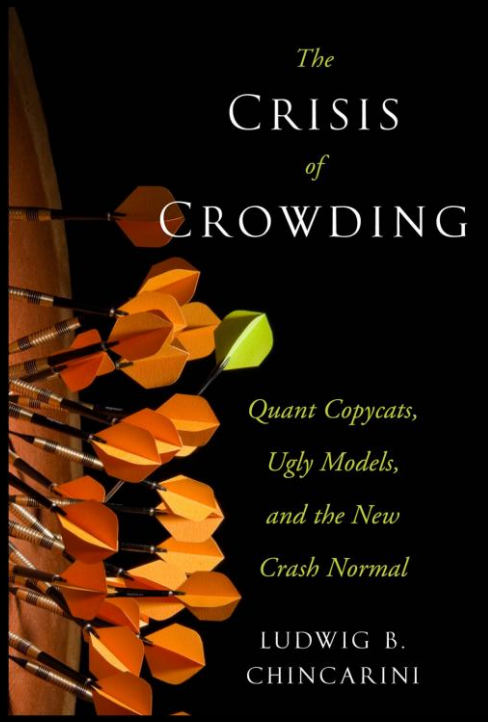


The Crisis of Crowding New Discoveries and Other Thoughts



November 6, 2019

Ludwig B. Chincarini, Ph.D., CFA
University of San Francisco
United States Commodity Fund Investments

UBS - Quantitative Investment Conference - Surfing the Crowd

November 6 & 7, New York, NY

- Thank you for coming. Thanks to UBS, Paul Winters, and Russ Wermers.
- And Gabriel Baracat for his updates on crowding.
- Also, I thank John Delano of CommonFund and Ann Larson and Inigo Fraser-Jenkins of Bernstein.

1. Crowding Idea is Spreading

- *The Crisis of Crowding* by Ludwig Chincarini.
- A new academic literature on crowding has been burgeoning in the last seven years.
- Practitioner research has also exploded and been very dedicated to crowding research.
- For more info, go to: http://ludwigbc.com/presentations/slides/

1. Crowding Idea is Spreading

Over the last few years, however, many quantitative types with similar ideas ... have emerged. The world is saturated with … [They] may not have estimated the effect that this could have on [their] strategies when other players were placing the same types of trades. In particular, a shock to the market, … could lead to a trigger effect, where all … began closing positions. … a self-fulfilling crisis emerged. …perhaps the correlation across strategies drastically changed because there were too many … playing the same game. …they must have underestimated this effect.

"The Failure of Long-Term Capital Management," Chincarini (1998)

1. Crowding Idea is Spreading

From The Crisis of Crowding, Chapter 8.

- The 2007 quant crisis came and went in about ten days, and no one really understands what triggered it or why it disappeared so quickly. The crisis's greatest lesson was that the **quantitative equity space was getting crowded** and that traders would need to consider the presence of copycats in the future.

- The market had already learned this lesson from the LTCM crisis–yet it was forgotten. Or maybe it's just difficult to measure copycats' presence and influence.

- Financial experts are still working on ways to accurately measure this risk. As of 2011, most risk models in the quant space have not changed.

2. Definition of Crowding

- Chincarini (1998), Stein (2009), Chincarini (2012), Chincarini (2017, 2018)
- Menkveld (2017), Zhong et al. (2016)
- Investment Banks – Sanford Bernstein group, Bank of America group, JP Morgan Chase, Credit Suisse, UBS, and others.

3. Elements of Crowding

1. The process that generates the crowding

    a. Copycat behavior of a good strategy (herding) (Chincarini (1998, 2012))

    b. System Structure (e.g. VaR models, risk models, (Chincarini (2018), Menkveld (2017))

    c. Regulation System (e.g. Basel II and Risk on home loans)

3. Elements of Crowding

2. The type of crowding

a. Types of Holders. Are all traders the same type or are they of different types? How will they behave to different types of shocks?

b. How is liquidity affected by the crowding?

c. What is the leverage-adjusted saturation or crowding?

3. Elements of Crowding

3. Interdependence Between Holders and Relationship to Prices

a. How do different holders affect each other in the system?

b. How does investor Type A's actions affect investor Type B's actions?

c. How does behavior affect liquidity and cascade effects?

3. Elements of Crowding

3. The Interdependence Between Holders and Relationship to Prices Matters - Examples

Table 1: Types of Crowded Spaces

Parameters	Verbal	Example
$N = 1, L = 1$	Only one type of holder with a similar trading strategy.	Retail investors buying PALM.
$N > 1, L = 1$	2 or more types of holders with similar trading strategy, but different motivations or risk appetites. Different behaviors.	Commercial banks banks and hedge funds making similar swap spread trade. Quant hedge fund long value stocks and short growth stocks, and multi-strategy fund focused on energy starting a new portfolio to do similar trade.
$N > 1, L > 1$	Different holders in terms of behavior and different trades, but despite being diferent trades lead to a crowding of the space.	A hedge fund long the swap spread (betting that spreads will widen, thus short swap rates and long Treasuries), and a commercial bank or macro hedge fund is long Treasuries. Although trades and motivations are different, they both lead to a rallying Treasury curve. The risk inherent in Treasuries is subject to the behavior of both groups. And both groups' positions are dependent on risk from the other group.

3. Elements of Crowding

4. How is the total saturation or crowding measured in the model? How can we take it to the data?

   a. The model should specify how one can measure the extent of crowding with full information and with partial information.

   b. Should be implementable and testable with real data.

3. Elements of Crowding

5. Empirical Findings on Crowding

a. Crowding can occur from system structure (margin in clearing account, risk models in portfolio management). Chincarini et al (2018), Chincarini (2017), Menkveld (2017)

b. Crowded mutual fund holdings (wrt liquidity) leads to factor returns not explained by Fama-French (i.e. short crowded securities, long uncrowded) Zhong et al (2016) & Macquarie & many others

c. Popular stocks or high concentration of hedge fund ownership leads to subsequent lower returns. Many studies.

3. Elements of Crowding

5. Empirical Findings on Crowding

d. Different types of equity factors might have different implications for crowding (some with natural anchors and some without). Baltas (2019)

e. Considering the "crowding" of a factor with a valuation metric leads to better investment outcomes. Chincarini (2012) [Footnote #38, Chapter 8] & Arnott, Beck, Kalesnik (2016)

3. Elements of Crowding

5. Empirical Findings on Crowding

f. Net positions are important because sometimes the net effect of different strategies is almost zero. (Blitz (2017))

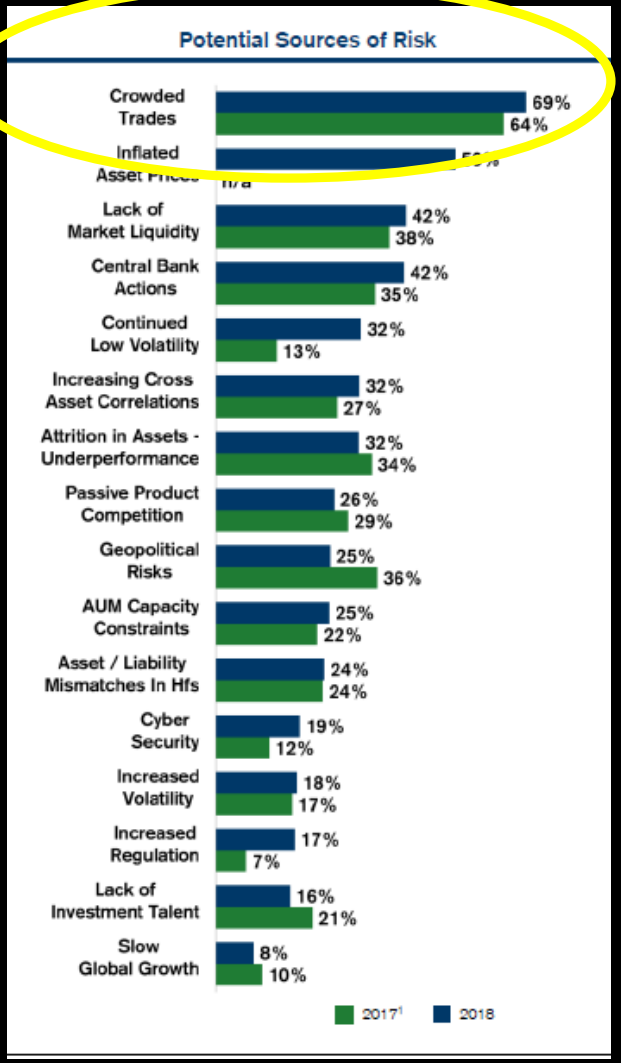
g. Shifting positions amongst oil futures demand (crowding on one side of market) might lead to contango and tracking error of oil futures versus spot oil. (Chincarini & Moneta (2019))

4. Ideas on Modelling Crowding

1. http://ludwigbc.com/pres/Theory_Crowding_WEAI_2019_FINAL.pdf

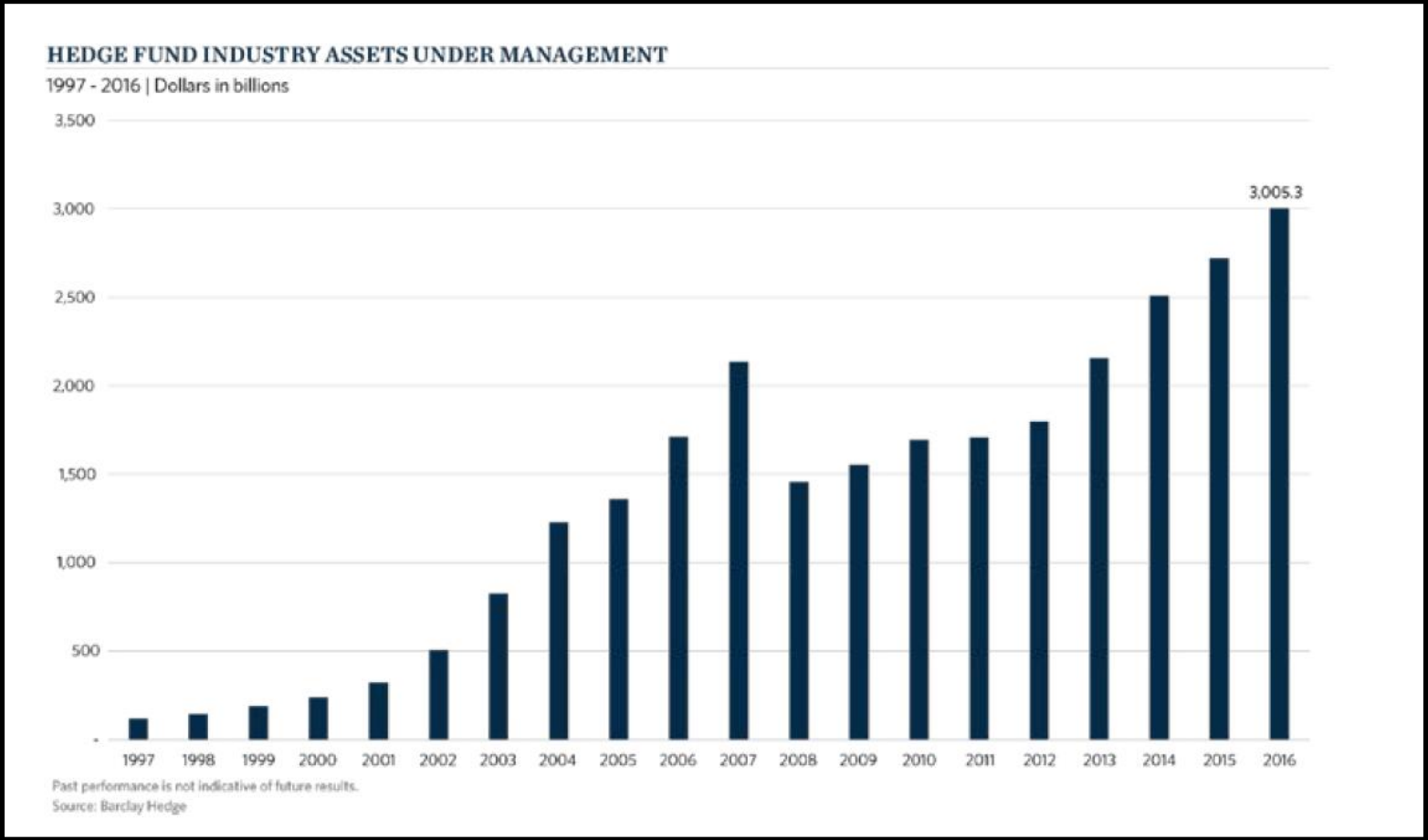
5. Recent Mentions of Crowding

Bernstein – March 2018



5. Recent Mentions of Crowding

August 2016 – Mark Hanson, CommonFund



5. Recent Mentions of Crowding

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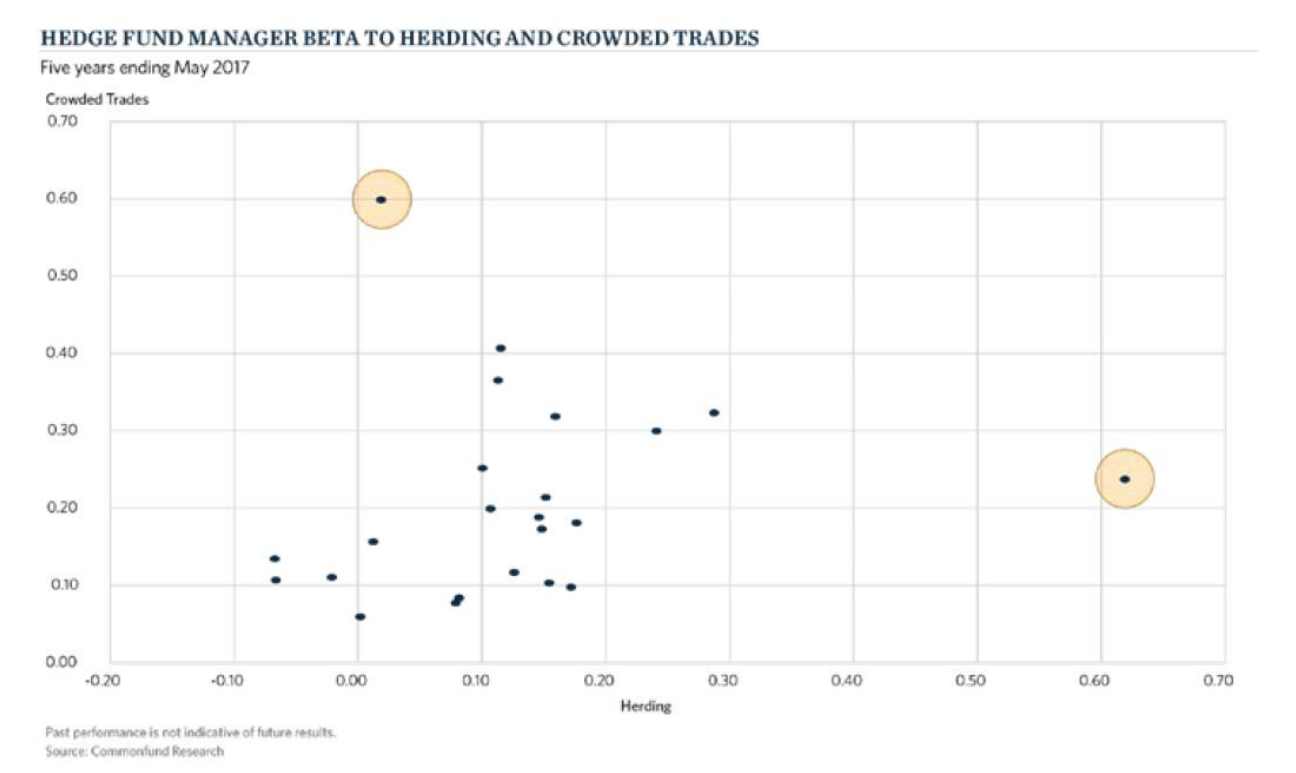
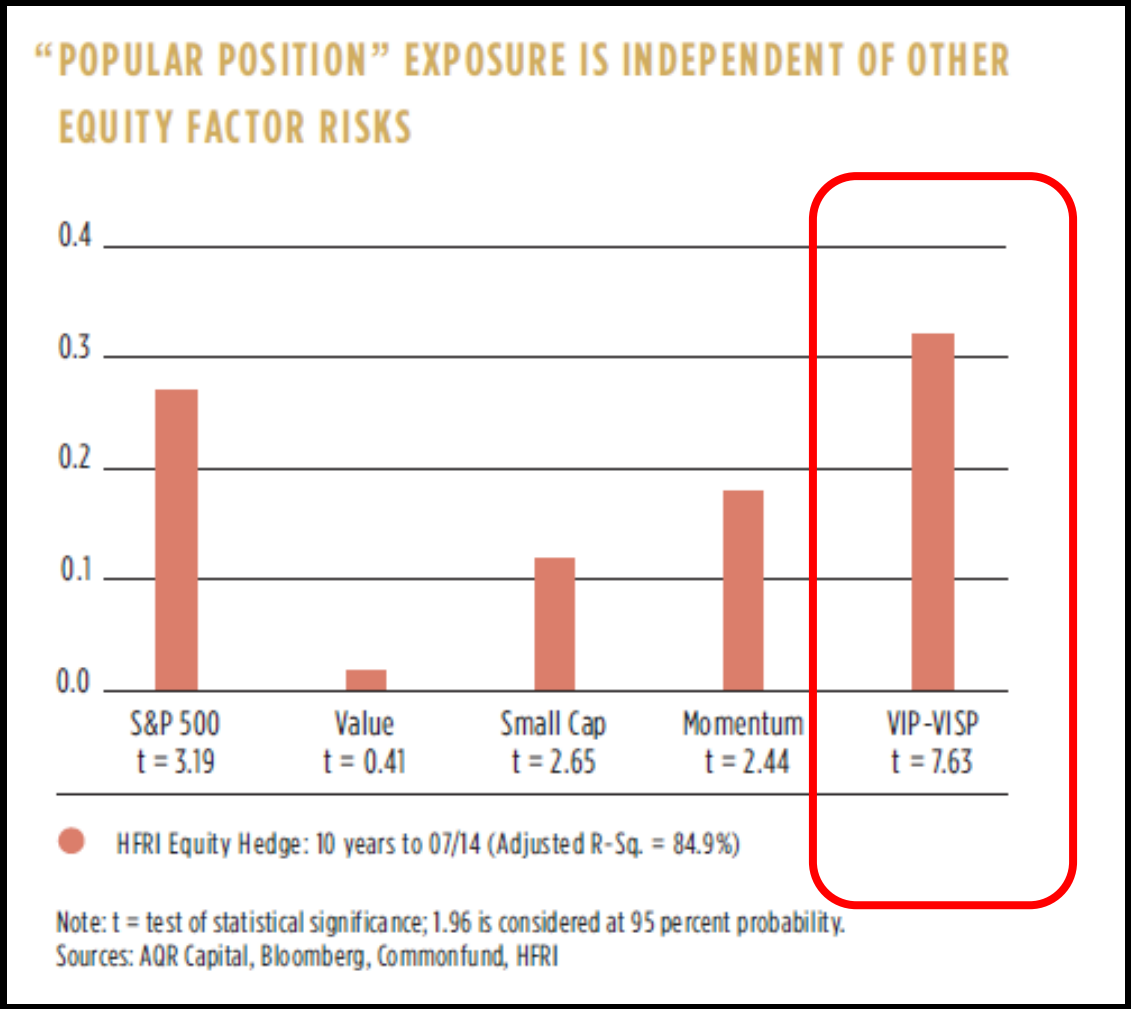


Crowding and Herding are made orthogonal, by running a regression of hedge fund returns against a H-L crowding factor and a momentum factor.

Very important – the distinction between herding and crowding. In this work, crowding (most held stocks), while herding is the exposure to continued outperformance of winner stocks – i.e. momentum.

5. Recent Mentions of Crowding

Fall 2014– Delano and Kwait, CommonFund



5. Recent Mentions of Crowding

Alarm bells over the perils of the ETF investing boom are ringing anew, with Societe Generale SA the latest to warn on brewing liquidity risks -- provoking a rebuke from the world's largest asset manager.

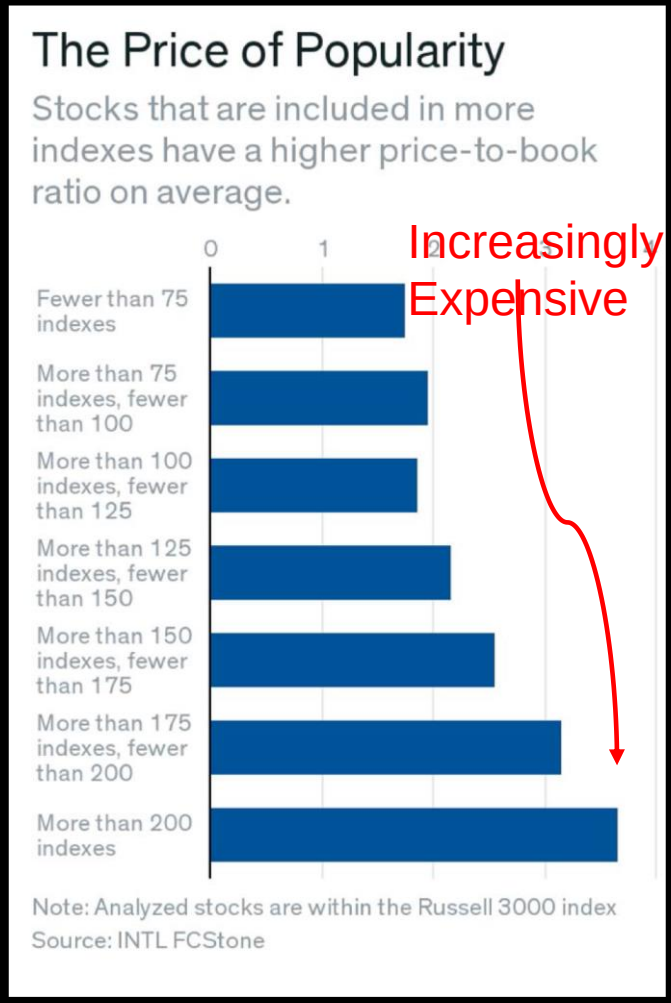
After stress-testing the fragility of 16,000 stocks, the French bank concludes small caps, dividend shares and gold miners are all acutely vulnerable in market downdrafts thanks to outsized ownership among passive investors.

In turn, those positions could prove more costly to exit. Given the Bank of Japan's massive purchases, the Nikkei 225 Index is also, in theory, particularly fragile.

"Crowdedness exists but is limited to a few stocks and strategies," SocGen analysts led by Sebastien Lemaire wrote in a report last week.

5. Recent Mentions of Crowding

Passive Investing & Crowding



Source: Barrons, Liu, August 16, 2018

5. Recent Mentions of Crowding

Quant Investing, Passive Investing, and Computer Drive Trading

- Quantitative hedge funds handle around 29% of trading.
- "The speed and magnitude of the move probably are being exacerbated by the machines and model-driven trading. "Human beings tend not to react this fast and violently." –Neil Berger
- System has higher likelihood to build copycat trading and to unwind quickly. (e.g. Momentum)

> The degree of correlation among high Momentum stocks has moved up higher also (despite the more balanced sector exposure) – there is a high level of fragility in the factor. US Momentum is also much more crowded than it usually is.

Source: Barrons & Bernstein Report

5. Recent Mentions of Crowding

Quant Investing, Passive Investing, and Computer Drive Trading

- Liquidity may be diminishing (less activity from investment banks or other reasons).
- Makes crowding more likely (too many players on one side of the trade)

Source: WSJ, Zuckerman, December 25, 2018

5. Recent Mentions of Crowding

Crowding is about risk … so what happens when earnings miss on crowded stocks?

Missed Estimates in Crowded Trades Take the Biggest Hit: Stocks that were crowded heading into earnings season were heavily penalized by -11% on misses, but beats were largely ignored (Exhibit 24). Uncrowded trades exhibited the opposite pattern, with beats up +4.3% on the print and misses down -1.6%.

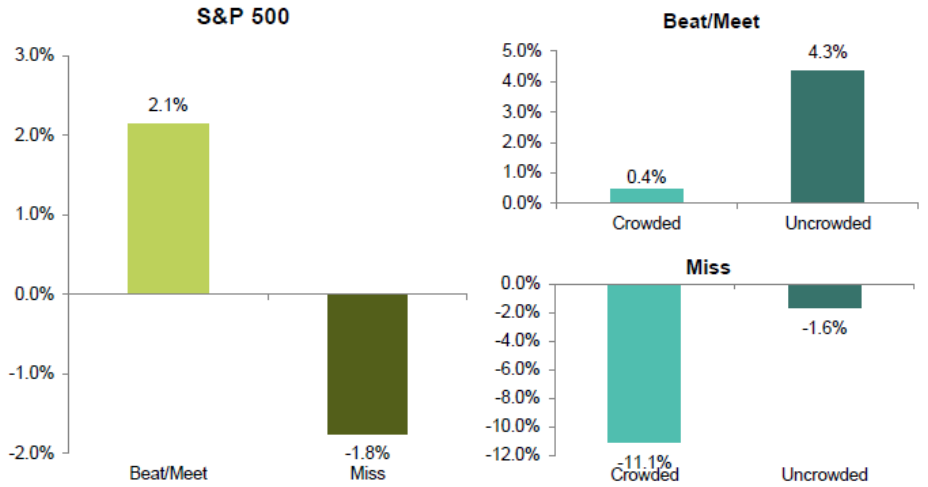
Source: Bernstein, Ann Larson and Sophie Fan, October 25, 2019

5. Recent Mentions of Crowding

Crowding is about risk … so what happens when earnings miss on crowded stocks?

EXHIBIT 24: **Crowded companies, which are typically priced for perfection, were largely ignored on positive surprises but heavily penalized on misses. Uncrowded trades exhibited the opposite pattern**

Relative Performance of Companies that Beat or Miss Earnings Consensus
Crowded vs. Uncrowded Stocks
Relative Perf. Vs. SPX SUE[1], as of 10/24/2019 market open



Note: 5-days surrounding report date, (-2d, +2d)

Source: Factset, CRSP and Bernstein analysis

Source: Bernstein, Ann Larson and Sophie Fan, October 25, 2019

5. Recent Mentions of Crowding

What's coming soon …

EXHIBIT 27: **S&P 500 most crowded companies with >= 10 % earnings growth expectations (to report over the next two weeks), as of October 24, 2019 market open**

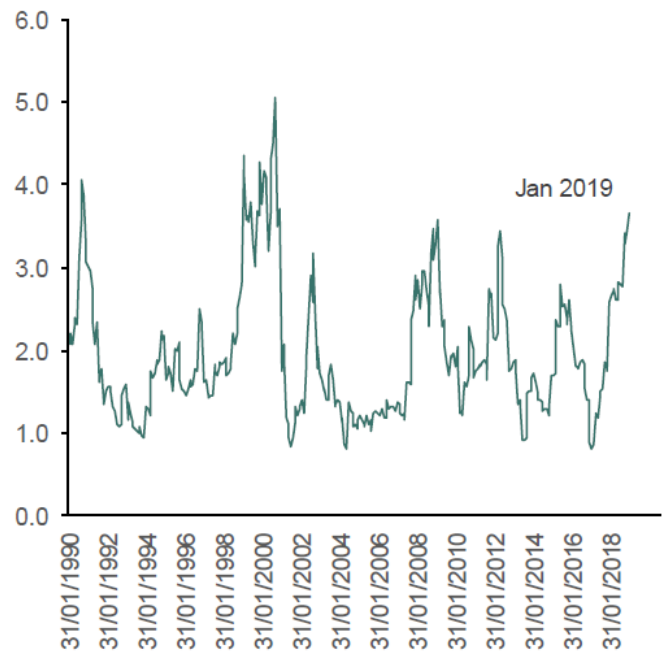
				EPS ($/share)			Sales ($ Million)		
Ticker	Name	Sector	Market Cap ($, Billion)	3Q 2018 Reported	3Q 2019 Consensus	Growth Forecast (%)	3Q 2018 Reported	3Q 2019 Consensus	Growth Forecast (%)
MA	MASTERCARD INC	Information Technology	268	1.78	2.01	13%	3,898	4,424	14%
FISV	FISERV INC	Information Technology	70	0.87	1	15%	3,436	3,640	6%
GPN	GLOBAL PAYMENTS INC	Information Technology	48	1.44	1.67	16%	1,025	1,162	13%
EL	LAUDER (ESTEE) COS INC -CL A	Consumer Staples	42	1.41	1.6	13%	3,524	3,845	9%
NEM	NEWMONT MINING CORP	Materials	32	0.33	0.38	15%	1,726	2,889	67%
IQV	IQVIA HOLDINGS INC	Health Care	29	1.42	1.57	11%	2,594	2,768	7%
TDG	TRANSDIGM GROUP INC	Industrials	28	4.44	5.23	18%	1,049	1,643	57%
SBAC	SBA COMMUNICATIONS CORP	Real Estate	28	0.14	0.34	143%	467	497	6%
FLT	FLEETCOR TECHNOLOGIES INC	Information Technology	26	2.68	3.05	14%	620	680	10%
BLL	BALL CORP	Materials	24	0.56	0.72	29%	2,946	3,045	3%
AME	AMETEK INC	Industrials	20	0.83	1.01	22%	1,193	1,278	7%
MGM	MGM RESORTS INTERNATIONAL	Consumer Discretionary	15	0.25	0.29	16%	3,029	3,326	10%
PWR	QUANTA SERVICES INC	Industrials	6	0.88	1.04	18%	2,985	3,188	7%

Source: First Call, Factset, and Bernstein analysis.

5. Recent Mentions of Crowding

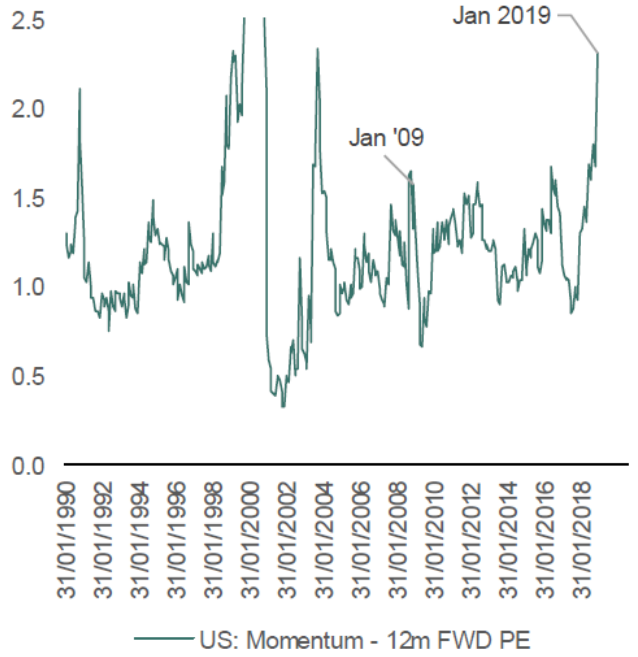
Momentum

EXHIBIT 1: **Relative valuation (P/B) of high vs. low momentum stocks - US**



Source: MSCI, Factset, Bernstein analysis

EXHIBIT 2: **Relative valuation (P/E) of high vs. low momentum stocks - US**

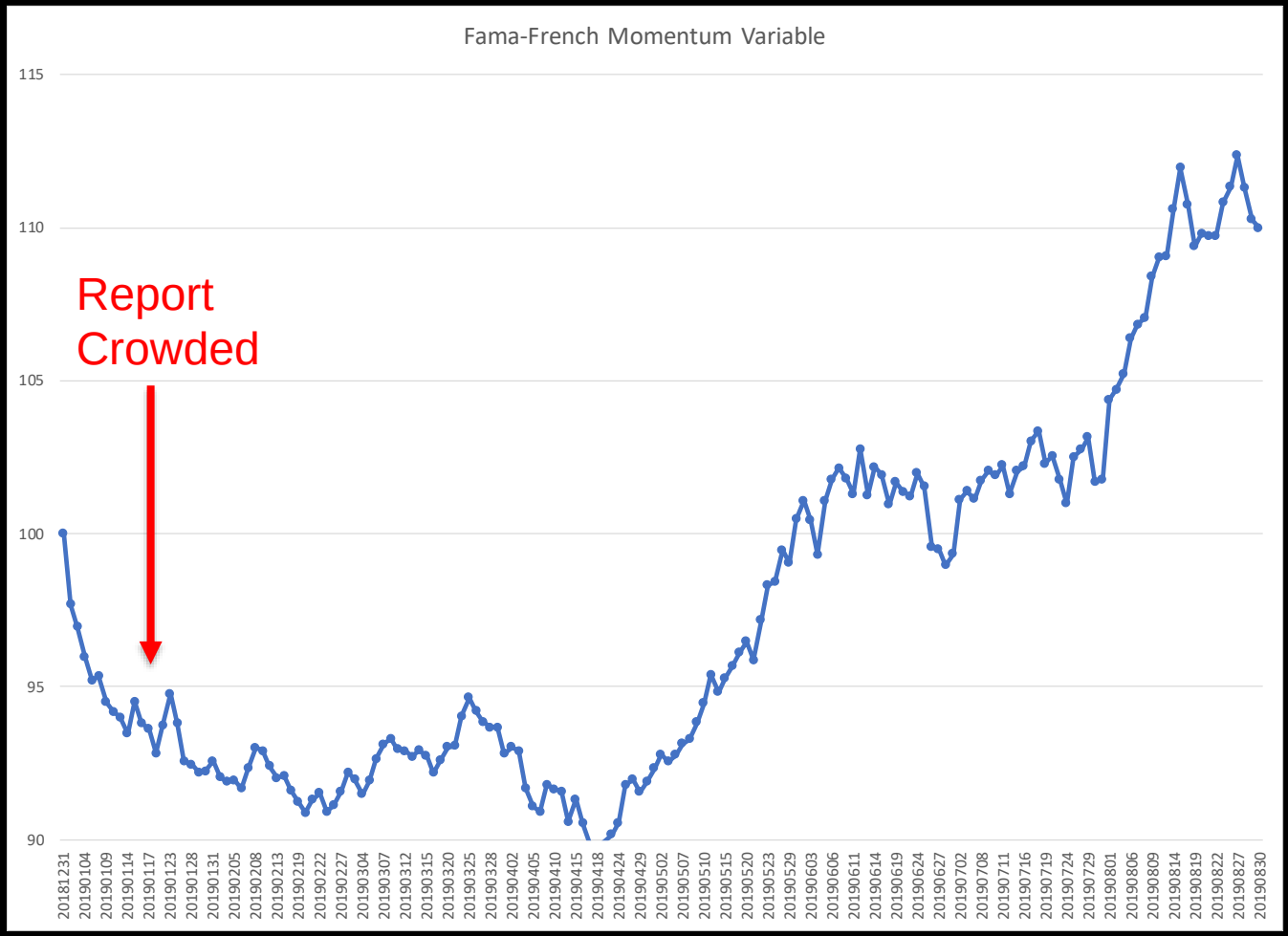


Source: MSCI, Factset, Bernstein analysis

Source: Bernstein

5. Recent Mentions of Crowding

Momentum



5. Recent Mentions of Crowding

- Banks cautious around being "too similar".
- MSCI advocates - Differentiate from "crowd"

Differentiating Yourself from the Crowd

Exhibit 4

			Peer Funds		
	Factor	Centre AM (active exposure)	Comparable Fund #1 (active exposure)	Comparable Fund #2 (active exposure)	Comparable Fund #3 (active exposure)
Value	Book-to-Price	-0.13	-0.43	-0.43	-0.30
	Earnings Yield	-0.06	-0.48	-0.52	-0.26
	Long-Term Reversal	+0.24	-0.32	-0.42	-0.09
Size	Mid Capitalization	+0.04	-0.12	+0.06	-0.06
	Size	-0.05	+0.15	-0.07	+0.07
Momentum	Momentum	+0.24	+0.61	+0.42	+0.34
Quality	Leverage	-0.08	-0.26	-0.48	-0.28
	Investment Quality	-0.06	-0.33	-0.59	-0.29
	Earnings Variability	+0.35	+0.09	+0.34	+0.16
	Earnings Quality	+0.35	-0.01	-0.04	+0.10
	Profitability	+0.19	+0.45	+0.61	+0.47
Yield	Dividend Yield	-0.29	-0.67	-0.84	-0.53
Volatility	Beta	+0.21	+0.32	+0.41	+0.25
	Residual Volatility	+0.21	+0.01	+0.18	+0.02
Growth	Growth	+0.20	+0.50	+0.77	+0.42
Liquidity	Liquidity	+0.24	+0.05	+0.36	+0.19

Data as at 06/30/18

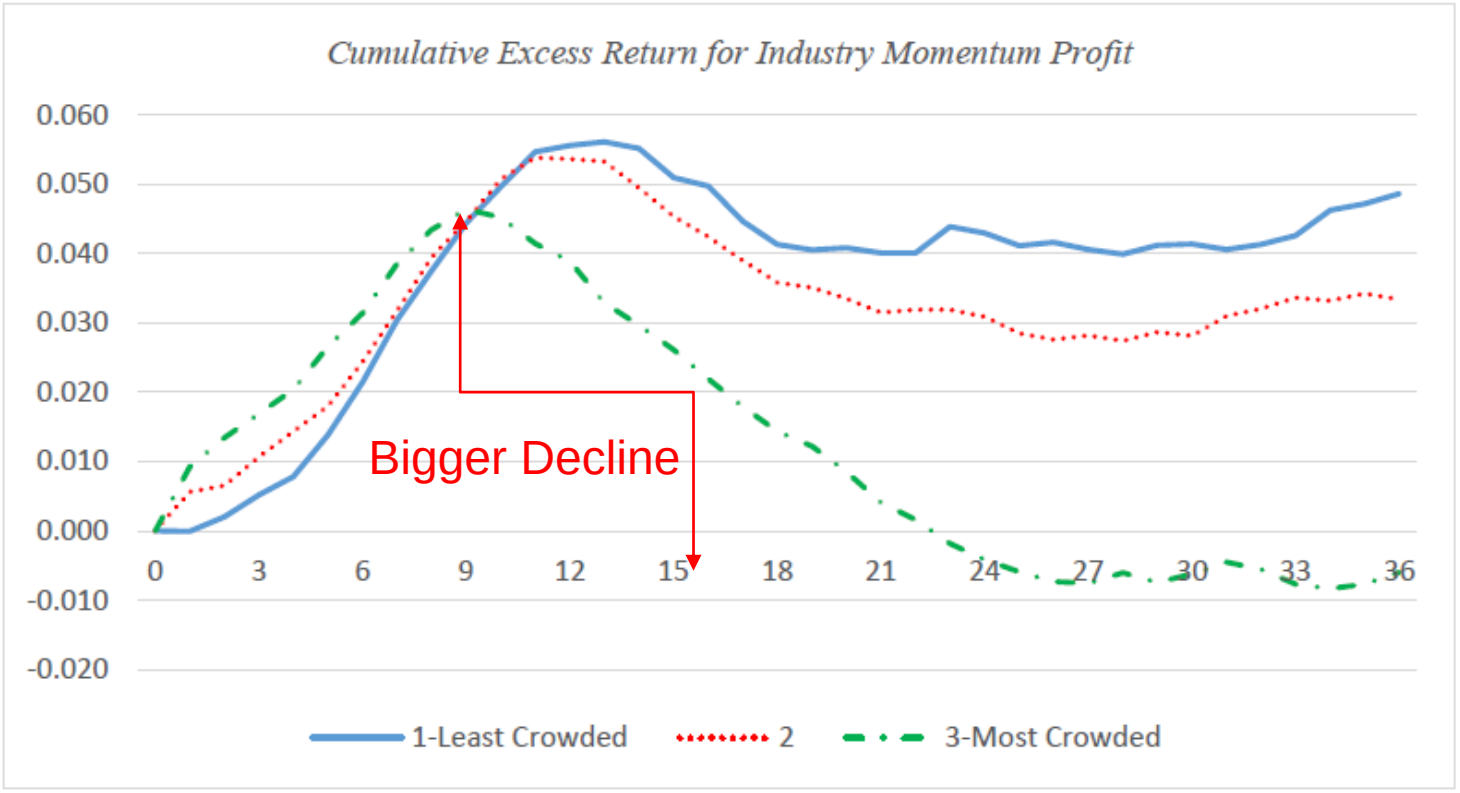
Source: Barra Global Total Market Equity Model for Long-Term Investors, MSCI Peer Analytics

Note: Index represented is MSCI USA

5. Recent Mentions of Crowding

- Crowded Momentum Behavior (Chen (2018))

Figure 1



5. Recent Mentions of Crowding

- Crowded Momentum Behavior (Chen (2018))

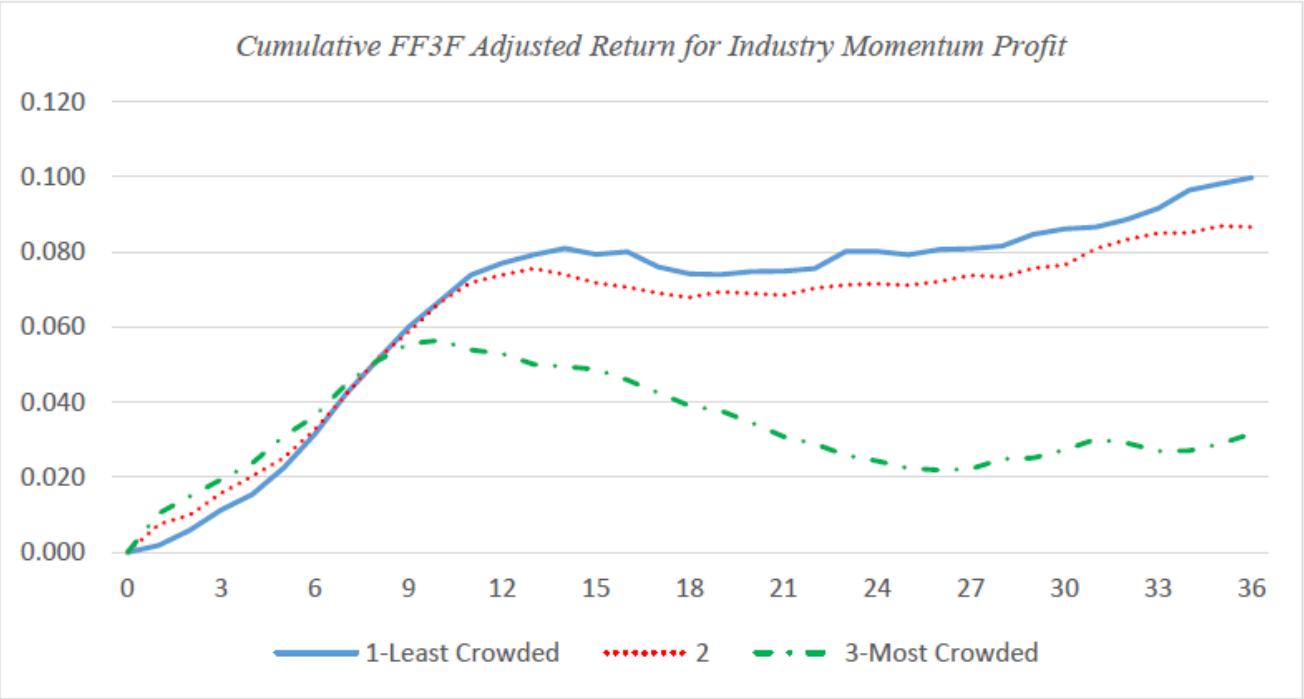


Figure 1 plots the average cumulative industry momentum profits (20% winner industry minus 20% loser industry) among industries with different levels of portfolio crowdedness (each of the three tercile portfolios) from sorting month: *t* up to three years post-formation month: *t+36* from July 1965 to Dec 2015. We plot both excess and benchmark-adjusted cumulative return.

5. Recent Mentions of Crowding

- RBC's Hot Dogs and Hotels of Crowding (March 2019)

said. The top 5 biggest holdings on the list that RBC dubs its "Hedge Fund Hot Dogs" didn't change their order from the previous quarter, with Microsoft Corp. MSFT, -0.08% topping the list, followed by Google-parent Alphabet Inc. GOOG, +1.04% GOOGL, +0.99% Amazon.com Inc. AMZN, +1.05% 21st Century Fox Inc. FOXA, +0.03% FOX, -0.04% and Facebook Inc. FB, +0.31%

A second list, dubbed "Hedge Fund Hotels," looks at S&P 500 names with heavy hedge-fund ownership and captures stocks that investors might not realize have high hedge-fund exposure, saw more turnover, with seven new names added to the list.

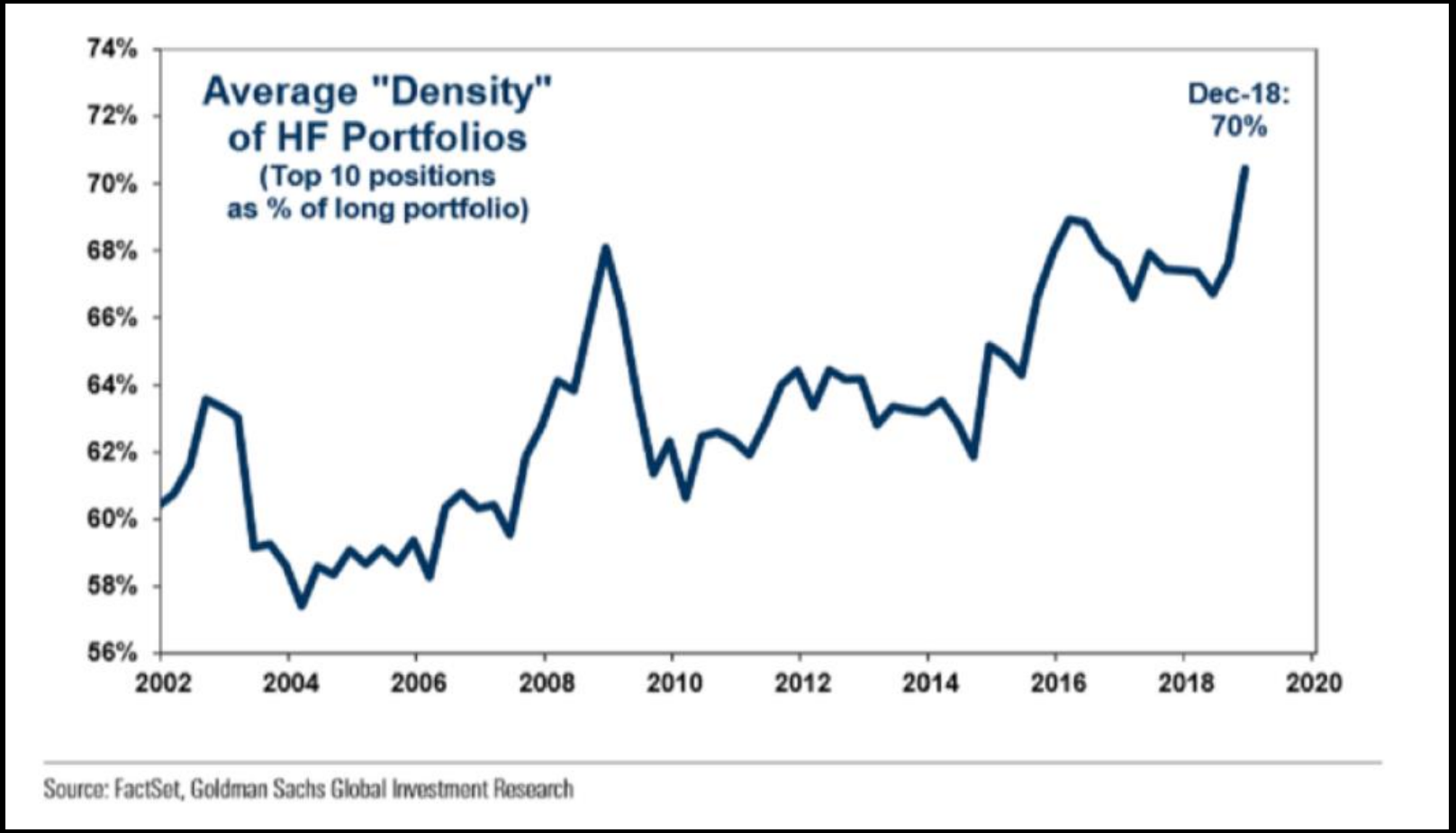
The top of the list is made up of Iqvia Holdings Inc. IQV, +1.86% with 23.5% of market value owned by hedge funds; Incyte Corp. INCY, +1.21% 23.1%; Take-Two Interactive Software TTWO, +0.80% 19.4%; TripAdvisor Inc. TRIP, -1.11% and Arconic Inc. ARNC, -0.52%

The purpose of the exercise, in part, is to give investors a sense of where crowded trades may be located as well as how positioning has evolved. The analysts note that "crowded names among active managers, including hedge funds, are usually crowded for a reason (good fundamentals)" and that most of RBC's baskets of crowded names have outperformed since they started tracking data at the end of 2010.

At the same time, positioning is a risk factor worth monitoring, they said, as the unwind of crowded positions can be quite painful when they occur.

5. Recent Mentions of Crowding

- Concentration of HF Holdings (Goldman Sachs, Feb 2019)



5. Recent Mentions of Crowding

- The GS Most Favored Stocks Portfolio

5. Recent Mentions of Crowding

- March 2019 – FAANG and Crowding

Crowding Risk

Just look at the FANG block for the pain of darling stocks going sour

Source: Bloomberg

"Hedge funds once again appear to have crowded into similar stocks, and have done so with increased leverage. That momentum typically feeds on itself," said Christopher Hillary, chief executive officer and portfolio manager at Denver-based Roubaix Capital, which has about $120 million under management. "When the market reverses, however, you have the equal and opposite reaction as everyone runs for the exits at the same time. That is what occurred in late 2018, and we see no less risk in the market today."

5. Recent Mentions of Crowding

- March 2019 – Outperform, but watch out …

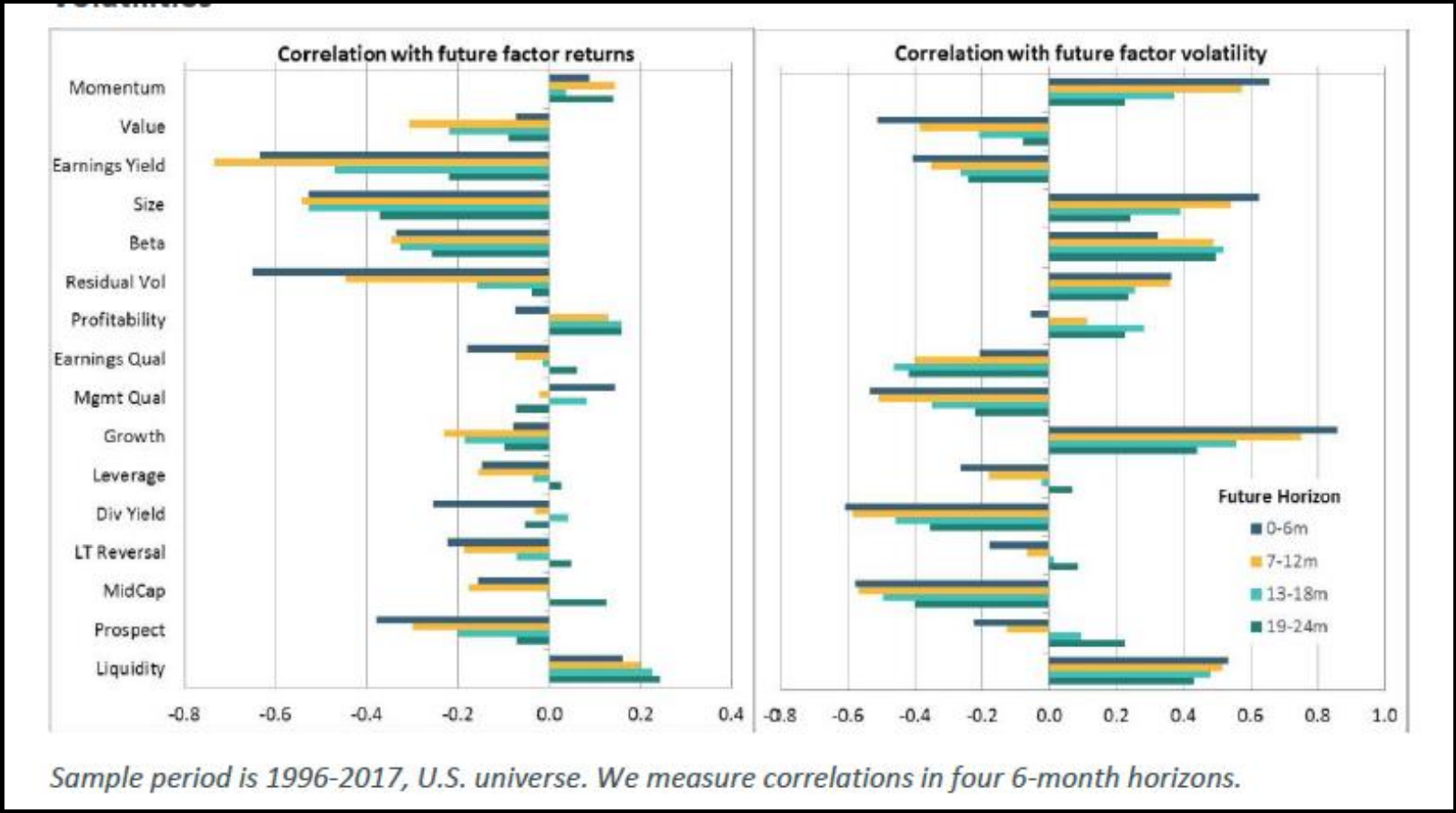
5. Recent Mentions of Crowding

- MSCI Crowding Indicators – MSCI Integrated Factor **Crowding Model** – June 2018

Metric	Description
Valuation spread	Valuation of top vs. bottom quintile stocks of a factor, combining B/P, Sales/P, and forecasted E/P
Short Interest spread	Difference in short interest utilization ratio of bottom vs. top quintile stocks of a factor
Pairwise correlation	Average return correlation of stocks in top and bottom quintiles of factor to corresponding quintile average portfolio
Factor volatility	MSCI Barra model forecast factor volatility relative to forecast market volatility
Factor reversal	Cumulative trailing factor return over last 36 months

5. Recent Mentions of Crowding

- MSCI Crowding Indicators – MSCI Integrated Factor Crowding Model – June 2018

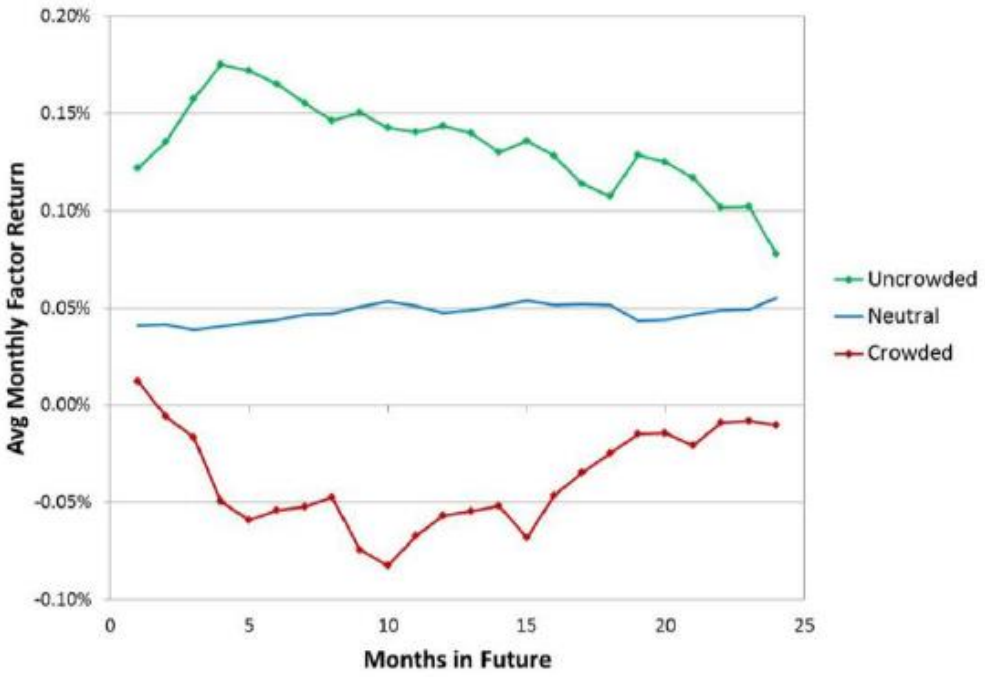


Sample period is 1996-2017, U.S. universe. We measure correlations in four 6-month horizons.

5. Recent Mentions of Crowding

- MSCI Crowding Indicators – MSCI Integrated Factor Crowding Model – June 2018

Exhibit 8: Returns for Crowded, Uncrowded and Neutral Factors over Next 24 Months



Sample period is 1996-2017. Data includes all long-term factors from the Barra USTMM.

5. Recent Mentions of Crowding

- Bernstein – **Crowded Short Model**

Quantitative Research

Quantitative Research: Crowded Shorts, Part 2 - Introducing the Bernstein Crowded Shorts Model

EXHIBIT 1: **With the combination of short interest, institutional ownership, sentiment and expectations indicators, we have established a more comprehensive means of identifying crowded shorted companies**

Potential Indications of Crowded Shorts	
Factor	**Crowded Indication**
Short Interest Composite	High short interest demand combined with limited lending inventory and considerable borrowing costs
Trade Persistence	Several consecutive quarters of net sales by aggregated institutional investors
Long-Term Price Momentum	Severe underperformance over the trailing two years
Sell-Side Analyst Buy Ratings	A low share rated "buy" or equivalent by sell-side analysts
Low Expectations with Doubtful Achievability	Aggressive downward revisions in short- and long-term earnings estimates vs. two years ago combined with compressed forward P/E multiples

Source: Bernstein analysis

5. Recent Mentions of Crowding

- Bernstein – **Crowded Short Model** (October 2019)

EXHIBIT 2: **The most crowded shorts have higher run-up risks over forward one through six month periods. The magnitude of the maximum run-up is larger and the duration is shorter**

Forward Maximum Price Run-up During One- to Six-Month Horizons: Magnitude and Probability By Overall Crowding Short Deciles

Global, 2004 - August 2019

		Forward 1-Month Interim Price Run-up				Forward 3-Month Interim Price Run-up				Forward 6-Month Interim Price Run-up			
		Maximum Price Run-up	Share of Stocks with Substantial (>=12%) Price Run-up		Average Length of Run-up (Days)	Maximum Price Run-up	Share of Stocks with Substantial (>=25%) Price Run-up		Average Length of Run-up (Days)	Maximum Price Run-up	Share of Stocks with Substantial (>=40%) Price Run-up		Average Length of Run-up (Days)
			Raw	Normalized			Raw	Normalized			Raw	Normalized	
Crowding Short Score	D1 (Least Crowded Shorts)	9.4%	24.2%	+0.01	8.7	19.5%	23.1%	-0.00	28.5	31.1%	22.1%	-0.03	59.6
	D2	9.0%	21.8%	-0.48	8.6	18.6%	20.6%	-0.54	28.1	29.6%	19.7%	-0.56	59.1
	D3	8.9%	21.6%	-0.71	8.6	18.4%	20.5%	-0.79	27.6	29.4%	19.5%	-0.84	58.4
	D4	8.8%	21.2%	-1.12	8.6	18.5%	20.5%	-1.05	27.8	29.4%	19.5%	-1.09	58.3
	D5	9.0%	22.2%	-0.89	8.6	18.8%	21.0%	-0.87	27.6	29.9%	20.1%	-0.94	58.1
	D6	9.0%	22.1%	-0.74	8.6	18.8%	21.0%	-0.80	27.3	30.0%	20.1%	-0.90	57.5
	D7	9.3%	23.3%	-0.27	8.5	19.3%	22.2%	-0.30	27.2	30.9%	21.6%	-0.22	56.9
	D8	9.5%	24.7%	+0.15	8.4	19.9%	23.6%	+0.13	27.0	32.0%	23.0%	+0.17	56.0
	D9	10.0%	26.8%	+0.59	8.3	21.1%	26.2%	+0.61	26.4	33.8%	25.5%	+0.68	54.0
	D10 (Most Crowded Shorts)	11.4%	32.2%	+1.08	8.0	24.1%	32.0%	+1.14	25.1	39.1%	31.5%	+1.19	51.7

Source: IHS Markit, MSCI, Factset and Bernstein analysis

Note: "Normalized probability" is calculated as the spread between share of stocks witnessing large price increase in the group ("raw probability") versus market, divided by the standard deviation of this relative share spread. A normalized share of run-up substantially higher than 0 means the group has consistently more future large run-ups than market average.

5. Recent Mentions of Crowding

- UBS Report (2016)

Q-Series®

What crowded positions are bubbling up in equity markets?

The storm clouds are gathering

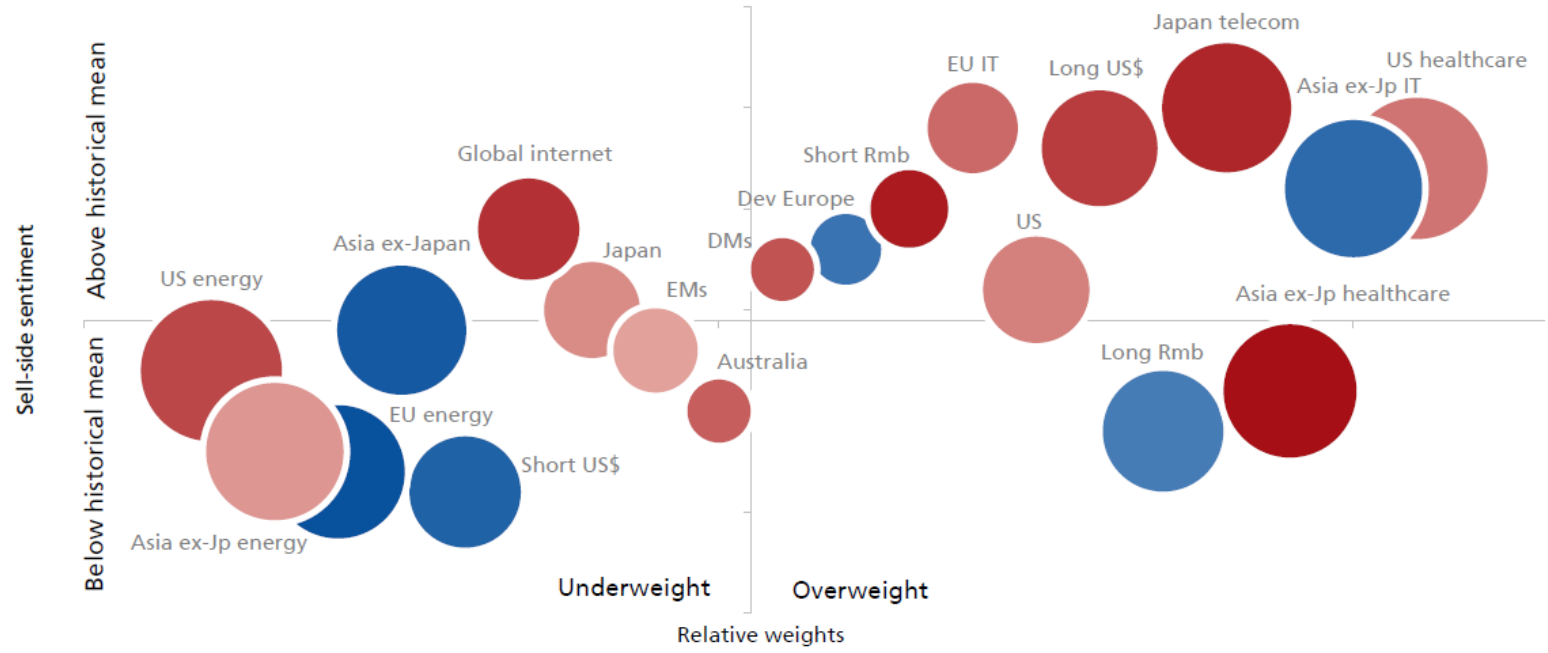
Unprecedented capital market conditions, quantitative easing and divergence in monetary policies have led to large flows of cheap money into equity markets globally, inflating thematic investment bubbles and increasing the risk of trade-crowding, in our view. We think key questions at the forefront of investors' minds are: where are these crowded trades forming and for how much longer can they be sustained?

5. Recent Mentions of Crowding

- UBS Report (2016)

Which positions are most crowded now?

Figure 1: Where are the bubbles?



Note: The size of the bubbles represents the transformed relative weights; their colour represents the crowdedness in the past quarter measured by PCI; blue means sell and red means buy. The darker the colour, the more crowded the investment theme.
Source: MSCI, IBES, FactSet, UBS Quantitative Research

5. Recent Mentions of Crowding

- UBS Report (July 2015)

Quantitative Monographs

The madness of crowds

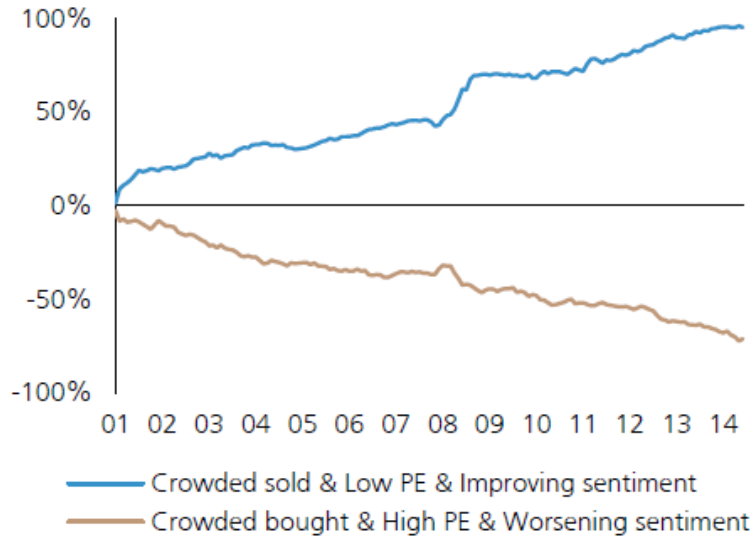
Institutional crowded trades result in mid- to long-term performance reversals

After an initial one to two months, the performance of stocks that are heavily bought or sold by institutional investors tends to reverse. Heavily sold names start to outperform whilst crowdedly bought names start to underperform. The reversal trend could last for 12 months post the initial transactions. This phenomenon has become much stronger and more consistent in recent years.

5. Recent Mentions of Crowding

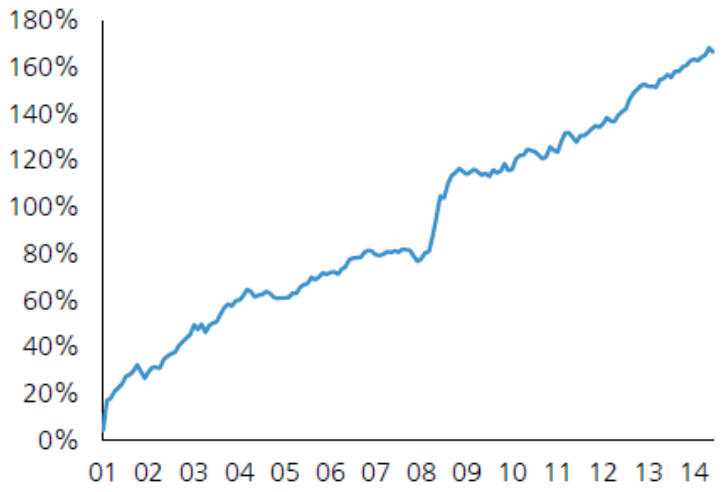
- UBS Report (July 2015)

Figure 1: Relative performance - MSCI AC World



Source: MSCI, IBES, FactSet, UBS Quantitative Research

Figure 2: Long short performance - MSCI AC World



Source: MSCI, IBES, FactSet, UBS Quantitative Research

5. Recent Mentions of Crowding

- UBS Report (July 2015)

Measures of crowded trades

Here we define three measures to gauge the level of crowdedness. Measure 1 is based purely on the number of funds that bought or sold in the previous period, whilst measures 2 and 3 take into account the actual amount of trades.

Measure 1. The proportion of institutional investors buying a stock relative to the total number of institutional investors trading the stock over the same period. A fund is considered as buying or selling a stock if the number of shares it holds in the stock increased or decreased over one month. Stocks with a proportion greater than 50% are classified as being bought and those with a proportion less than 50% are classified as being sold[1].

Measure 2. Changes in the proportion of shares outstanding held by institutional investors.

Measure 3. The rolling 12-month Z-score of Measure 2.

When we calculate month over month changes for all three measures, we only consider the funds that exist in both months. By doing so, we remove the impact of changing numbers of funds in the market as well as changing coverage of the database itself. Changing coverage of the database adds 'noise' to our analysis. Newly established funds need to build-up their positions while funds that are closing down will liquidate all their positions. Neither case is related to the crowded trades we want to capture.

5. Recent Mentions of Crowding

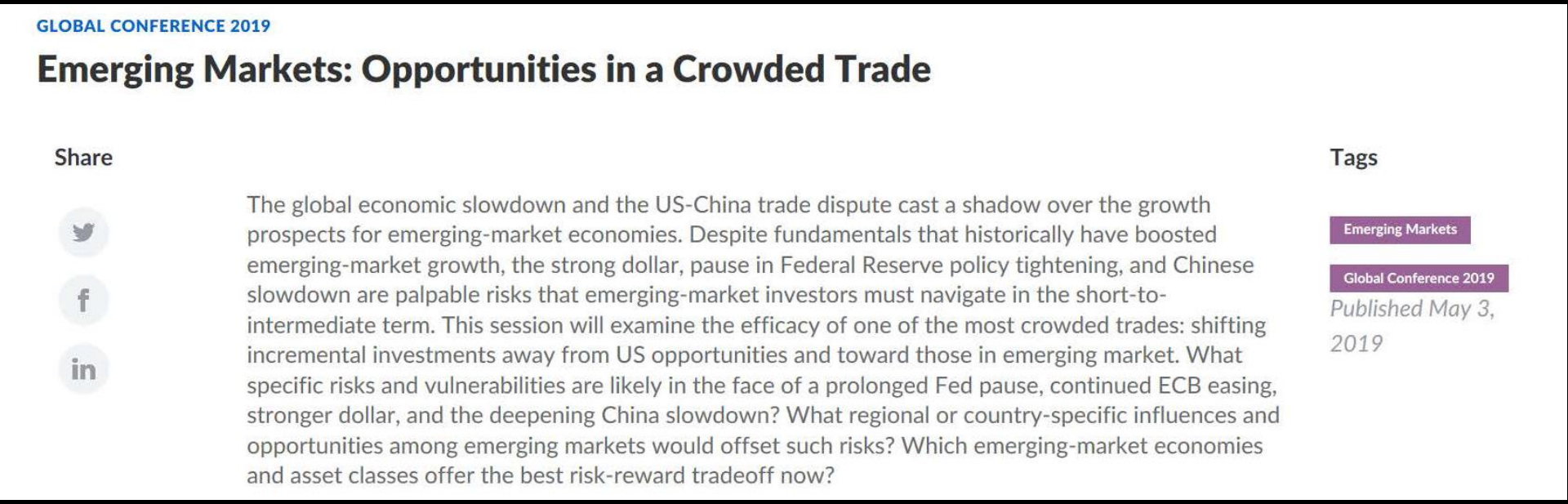
- Interview with Nigol Koulajian's $1.35 billion Quest Partners (May 16, 2019 Bloomberg, Bielski)

Where is the crowding today?

Too much money has flowed into factor strategies like momentum, value, and low volatility. And now they're providing very consistent negative returns, although the market environment hasn't changed. So being contrarian means evaluating how crowded a strategy is and going short something that's always made money just because people believe in it. It also means not believing academia no matter how many research papers have been written. It's more about evaluating what the supply and demand is for the factors.

5. Recent Mentions of Crowding

- Milken Institute Global Conference (May 2019)



GLOBAL CONFERENCE 2019

Emerging Markets: Opportunities in a Crowded Trade

Share

The global economic slowdown and the US-China trade dispute cast a shadow over the growth prospects for emerging-market economies. Despite fundamentals that historically have boosted emerging-market growth, the strong dollar, pause in Federal Reserve policy tightening, and Chinese slowdown are palpable risks that emerging-market investors must navigate in the short-to-intermediate term. This session will examine the efficacy of one of the most crowded trades: shifting incremental investments away from US opportunities and toward those in emerging market. What specific risks and vulnerabilities are likely in the face of a prolonged Fed pause, continued ECB easing, stronger dollar, and the deepening China slowdown? What regional or country-specific influences and opportunities among emerging markets would offset such risks? Which emerging-market economies and asset classes offer the best risk-reward tradeoff now?

Tags

Emerging Markets

Global Conference 2019

Published May 3, 2019

5. Recent Mentions of Crowding

- The growth in passive investing.

FINANCE

Passive Investing Resumes Its March

After slowing last year, a stream of cash into funds that track markets is picking up again

By Dawn Lim

July 18, 2019 5:30 am ET

5. Recent Mentions of Crowding

- The growth in passive investing.

The Big Short's Michael Burry Explains Why Index Funds Are Like Subprime CDOs

By Reed Stevenson
September 4, 2019, 3:41 AM PDT

- Investor from 'The Big Short' is worried about passive funds
- 'The longer it goes on, the worse the crash will be'

Liquidity Risk

"The dirty secret of passive index funds -- whether open-end, closed-end, or ETF -- is the distribution of daily dollar value traded among the securities within the indexes they mimic.

"In the Russell 2000 Index, for instance, the vast majority of stocks are lower volume, lower value-traded stocks. Today I counted 1,049 stocks that traded less than $5 million in value during the day. That is over half, and almost half of those -- 456 stocks -- traded less than $1 million during the day. Yet through indexation and passive investing, hundreds of billions are linked to stocks like this. The S&P 500 is no different -- the index contains the world's largest stocks, but still, 266 stocks -- over half -- traded under $150 million today. That sounds like a lot, but trillions of dollars in assets globally are indexed to these stocks. The theater keeps getting more crowded, but the exit door is the same as it always was. All this gets worse as you get into even less liquid equity and bond markets globally."

5. Recent Mentions of Crowding

- "They [LTCM] went down because the exit door got very crowded." Jimmy Cayne Interview, *The Crisis of Crowding*, Chapter 5.

5. Recent Mentions of Crowding

- Crowded stocks – WSJ 07/29/2019

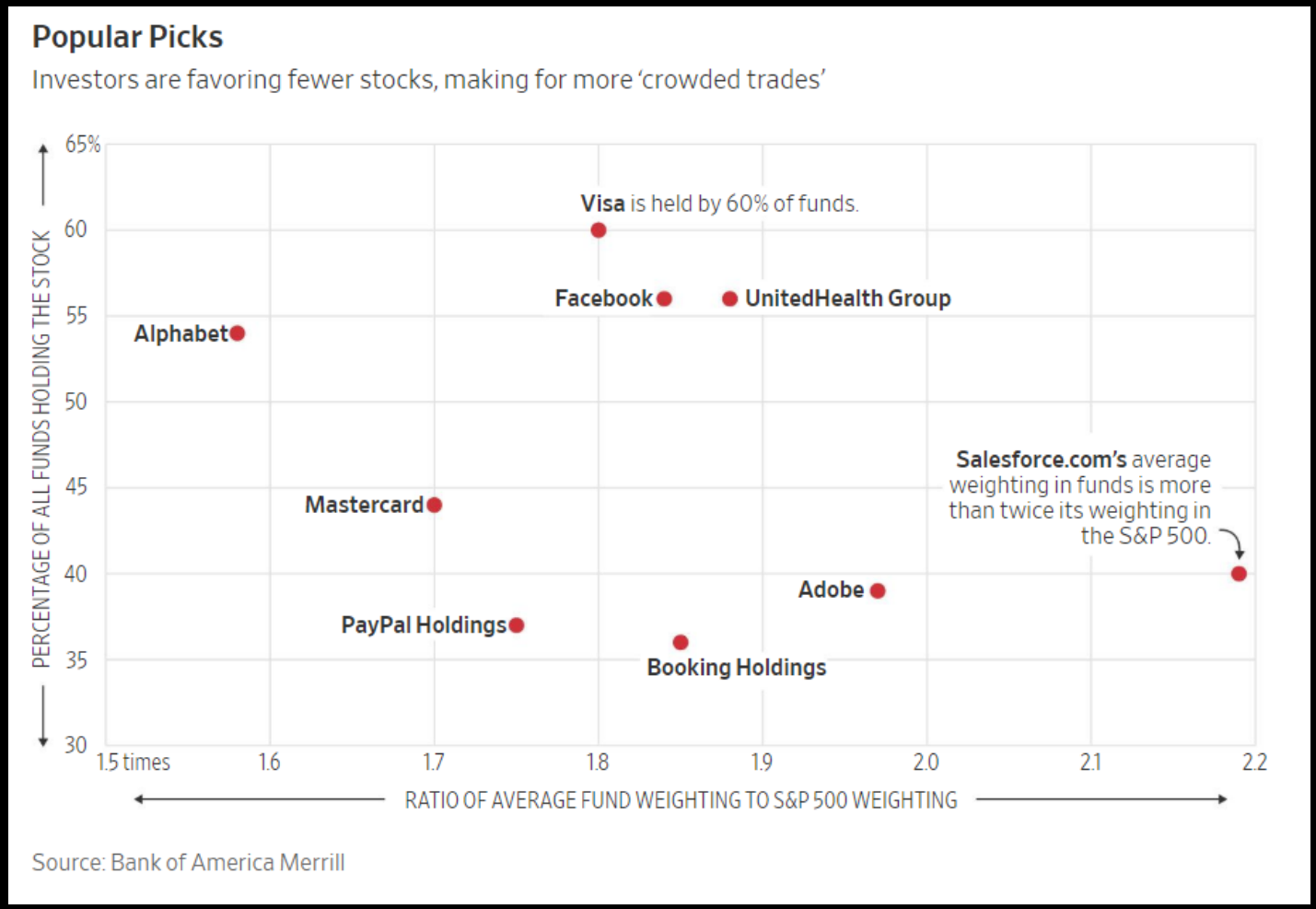
MARKETS

With Stocks at Fresh Highs, Investors' Portfolios Look Alike

Mastercard, Microsoft, Amazon and PayPal are among market's most crowded trades

5. Recent Mentions of Crowding

- Crowded stocks – WSJ 07/29/2019



5. Recent Mentions of Crowding

- Crowded Bonds?

MARKETS

Government bonds are now the 'most crowded' market trade, more popular than technology stocks

PUBLISHED TUE, JUN 18 2019•8:30 AM EDT UPDATED TUE, JUN 18 2019•11:27 AM EDT

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SHARE

5. Recent Mentions of Crowding

- Quality Factors and Crowding October 29, 2019

Investors need to be cautious about valuation when investing in ETFs focused on quality, says John Davi of Astoria Portfolio Advisors, who started moving money into quality stocks during last year's fourth-quarter market rout. QUAL trades at a price-to-earnings ratio of 19.8, while DGRW trades at 18.21. The S&P 500's P/E is around 19.1.

Although companies with strong balance sheets and good fundamentals typically command a premium from investors, Mr. Davi says "quality has gotten expensive relative to the market," in some cases.

6. Recent Academic Crowding Articles

1. The Impact of Pensions and Insurance on Global Yield Curves, Greenwood & Vissing-Jorgenson (2018)

   Net Demand of Pension funds reduced 30-10 year yield spread – preferred habitat or holder determined – related to crowding.

   Mentioned also in The Crisis of Crowding (2012) in chapters 12 and 15.

2. *Institutional Selling of Stocks with Illiquidity Shock (feedback loops – sell bad liquidity, but good liquidity in following period – note: effect is small) PhD thesis - Krystaniak (2016)*

6. Recent Academic Crowding Articles

3. *Crowdedness (as measured by co-momentum) has bigger crashes. (Chen (2018))*

We find that cross sectional industry momentum strategy among less crowded industries suffers delayed realization but is more profitable and stabilizing later, especially following periods of low comomentum. On the other hand, profits among highly crowded industries tend to overshoot over short horizons but crash and reverse over long horizons, especially following periods of high comomentum.

4. CopyCat Behavior. Cao et al. (2018) Funds that check SEC filings of other investment managers are more likely to initiate trades in successful ideas of other funds (use of IP addresses).

6. Recent Academic Crowding Articles

5. Crowded Trades and Tail Risk (Brown et al (2019))

Using a large database of U.S. equity position-level holdings for hedge funds, we measure the degree of security level crowdedness. We construct a new factor by taking the difference between returns of high and low crowdedness portfolios. The average return on the crowdedness factor is sizable, and its variation is distinct from other traditional risk factors for U.S. equities. When hedge fund returns are regressed onto other risk factors and the crowdedness factor, the exposures to the latter are statistically and economically significant in explaining hedge fund return variation.

Measure – *total hedge fund ownership/ADTV*

Consistent with other studies

6. Recent Academic Crowding Articles

Table 3: Days-ADV Factor Regressions

	Equal Weighted	Value Weighted
Average	9.08%	2.79%
Standard Deviation	8.04%	6.25%
Sharpe Ratio	0.98	0.26
Market β	−0.25	−0.13
CAPM	11.22%	3.87%
	(0.00)	(0.02)
FF3	10.97%	4.18%
	(0.00)	(0.01)
+Mom	10.62%	4.36%
	(0.00)	(0.01)
+Reversal	9.76%	4.04%
	(0.00)	(0.02)
+Pastor Stambaugh	9.78%	4.05%
	(0.00)	(0.02)
+ILLIQ	3.20%	3.33%
	(0.03)	(0.03)
+Fung Hsieh	3.03%	2.67%
	(0.04)	(0.11)
+BAB+DVL+QMJ	4.07%	3.71%
	(0.00)	(0.01)
Stepwise	4.62%	4.24%
	(0.00)	(0.00)

All statistics annualized. Market beta is the factor's loading when regressed onto the market return. Alphas from model regressions and P-values in parenthesis are shown. P-values calculated using HAC robust standard errors. CAPM includes the market return. FF3 adds size and value factors. +Mom adds momentum. +Reversal adds short and long-run reversal. +Pastor Stambaugh adds traded liquidity factor. +ILLIQ adds illiquidity turnover factor. +Fung Hsieh adds bond, FX, commodity, interest rate and stock trend following factors. BAB is betting-against-beta, DVL is devil-in-the-details, and QMJ is quality-minus-junk. Stepwise is the final specification from performing stepwise regression with all factors.

Alphas positive when regressing crowded portfolios.

6. Recent Academic Crowding Articles

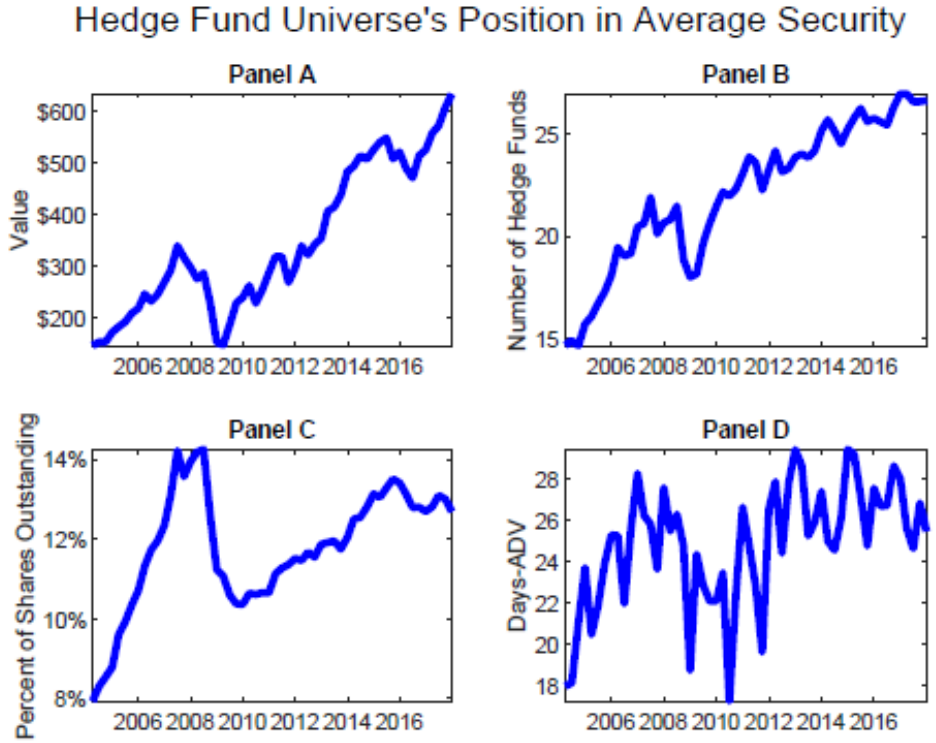


Figure 1: Value ($MM) is value held by the hedge fund industry. Days-ADV is shares outstanding held by hedge funds divided by average daily trading volume

Growth in Hedge Funds…

6. Recent Academic Crowding Articles

6. Granularity and Downside Risk in Equity Markets (Ghysels et al (2018))

Using 13-F filings, measure a HHI of concentration. They find that low HHI – high HHI provides excess returns.

7. The Impact of Crowding in Alternative Risk Premia Investing (Baltas (2019)) The analysis shows that divergence premia, such as momentum, are more likely to underperform following crowded periods. Conversely, convergence premia, such as value, show signs of outperformance as they transition into phases of larger investor flows.

6. Recent Academic Crowding Articles

Table 2. Performance of Divergence Premia Conditional on the Level of Asset Excess Comovement

Asset Class		Obs.	Month 1	Months 1–6	Year 1	Year 2
Equity momentum	High	173	0.64%	−2.25%	−5.91%**	1.42%*
	Low	173	1.21%**	4.58%**	6.86%**	−0.52%
	H – L		−0.57%	−6.83%**	−12.78%**	1.63%
Equity low beta	High	173	−2.25%	−13.75%**	−20.11%**	−6.97%
	Low	173	0.40%	3.61%**	8.74%**	9.26%**
	H – L		−2.66%	−17.36%**	−28.85%**	−16.25%*
Equity quality	High	173	−0.11%	−3.64%**	−4.74%**	−0.60%
	Low	173	0.61%	4.16%**	8.72%**	0.53%
	H – L		−0.72%	−7.80%**	−13.47%**	−0.76%
FX momentum	High	248	0.17%	−0.21%	−1.05%	−0.04%
	Low	248	0.20%	1.04%**	1.38%**	1.46%**
	H – L		−0.04%	−1.26%**	−2.44%**	−1.43%*
Commodity momentum	High	260	0.33%	1.28%	−3.21%*	5.59%**
	Low	260	0.64%*	0.77%	2.32%	5.43%**
	H – L		−0.31%	0.51%	−5.53%**	−0.18%

Notes: This table shows average returns of buy-and-hold long–short divergence strategies in equity, currency, and commodity markets following periods of high and low levels of asset excess comovement. Newey–West (1987) robust standard errors were used to account for heteroskedasticity and serial correlation.

*Statistically significant at the 5% level in a two-tailed test.

**Statistically significant at the 1% level in a two-tailed test.

6. Recent Academic Crowding Articles

Table 3. Performance of Convergence Premia Conditional on the Level of Asset Excess Comovement

Asset Class		Obs.	Month 1	Months 1–6	Year 1	Year 2
Equity value	High	111	0.69%*	5.85%**	5.45%**	–4.64%**
	Low	111	–0.85%*	–5.71%**	–11.61%**	–6.91%*
	H – L		1.54%**	11.56%**	17.05%**	0.54%
Equity size	High	173	0.86%**	2.19%**	3.55%**	–4.63%**
	Low	173	0.87%	4.76%**	7.67%**	2.19%
	H – L		–0.00%	–2.58%	–4.12%*	–7.41%**
FX value	High	186	0.62%**	2.72%**	5.04%**	2.26%*
	Low	186	0.29%**	0.94%**	1.32%**	0.97%**
	H – L		0.33%	1.78%**	3.72%**	1.29%

Notes: This table shows average returns of buy-and-hold long–short convergence strategies in equity and currency markets following periods of high and low levels of asset excess comovement. Newey–West (1987) robust standard errors were used to account for heteroskedasticity and serial correlation.

*Statistically significant at the 5% level in a two-tailed test.

**Statistically significant at the 1% level in a two-tailed test.

6. Recent Academic Crowding Articles

8. Mutual Fund Herding after 13-D Filings (Agapova and Rodriguez (2019))

Using 13-F filings, measure "toehold" activity of funds (more than 5%) and documents how copycat behavior forms.

9. Optimal Timing and Tilting of Equity Factors (Dicthl et al. (2019))

Using an optimization algorithm for portfolios based on characteristics, including CROWDING, leads to an underweight of crowded stocks.

10. Systematic Investment Strategies (Giamourdis (2017))

Reiterates that we need more research on crowding of investors.

11. Trading in Crowded Markets (Gorban et al. (2018))

Attempts to model crowding and market fragility.

6. Recent Academic Crowding Articles

12. Institutional Consensus: Information or Crowding? (Klein et al. (2019))

Earnings announcements and firm behavior. Similar behavior.

13. Stochastic investor sentiment, crowdedness and deviation of asset prices from fundamentals (Zhou and Yang (2019))

Builds a model of investor sentiment and naivity that results in crowding of stocks.

14. Modelling Transaction Costs when Trades May Be Crowded: A Bayesian Network Using Partially Observable Orders Imbalance (Briere et al. (2019))

Insitutional trading and transaction costs related to crowding

15. Trading in Crowded Markets (Gorban et al. (2018))

Attempts to model crowding and market fragility.

6. Recent Academic Crowding Articles

16. Everybody's Doing It: Short Volatility Strategies and Shadow Financial Insurers," (Bhansali and Harris).

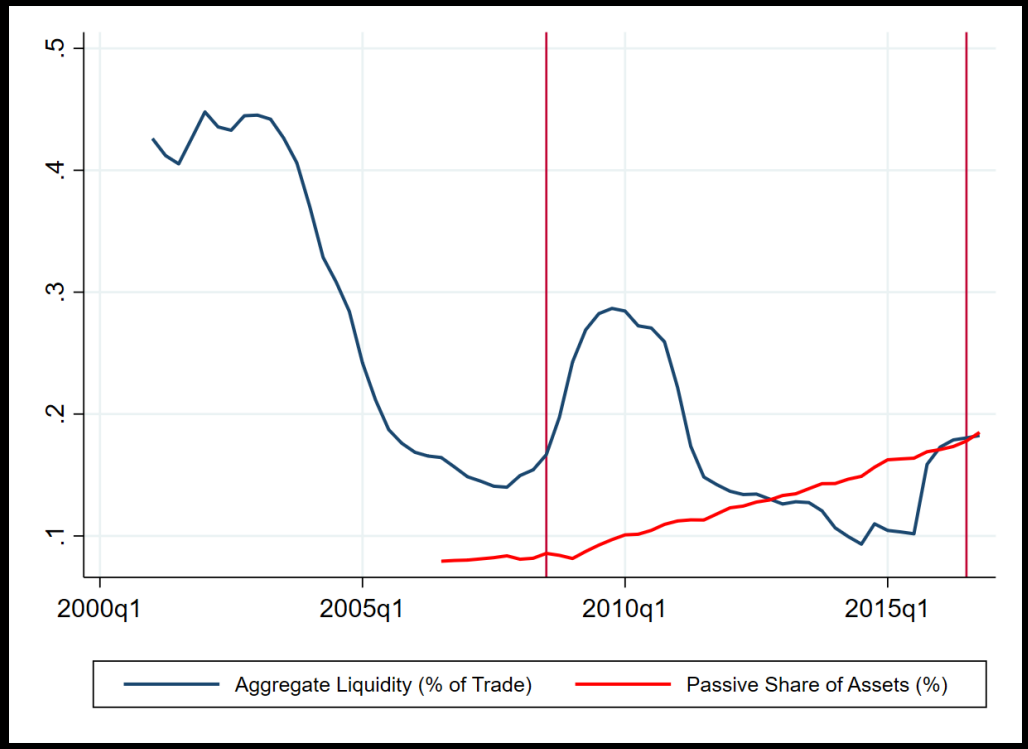
Many different investors might effectively have similar position. In terms of modelling, rho is low (investors are different), but concentration is high.

7. Some Little Investigations on Crowding

1. Liquidity and Passive Investing
2. Liquidity and Factor Movement
3. Goldman's Special List

7. Some Little Investigations on Crowding

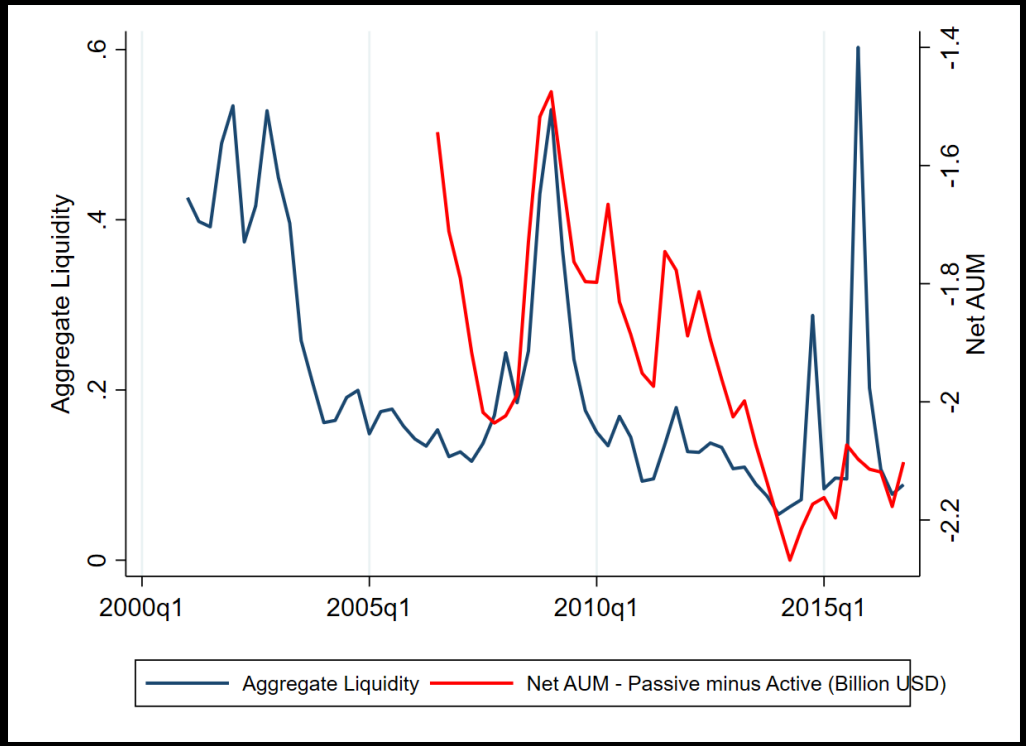
Aggregate Liquidity versus Passive Share



Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity

7. Some Little Investigations on Crowding

Aggregate Liquidity versus Net AUM (Passive – Active)



Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. Using flows from BIS study Shusko and Turner.

7. Some Little Investigations on Crowding

Aggregate Liquidity versus Passive Share

1. Regression: Liquidity on Net Change AUM (Passive-Active)

Coefficient: 0.254 Change in $1Trillion new Passive AUM leads to 0.254% increase in aggregate liquidity measure.

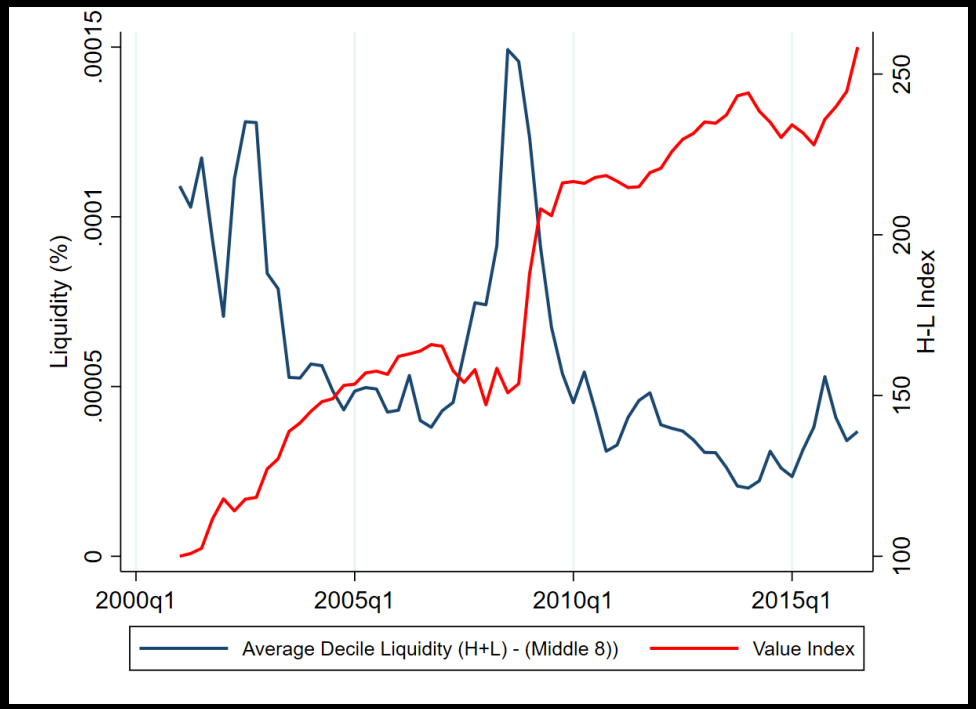
2. Regression: Liquidity on Net Change in Flows

No significance

Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. Regressions done on quarterly data 2006 - 2016

7. Some Little Investigations on Crowding

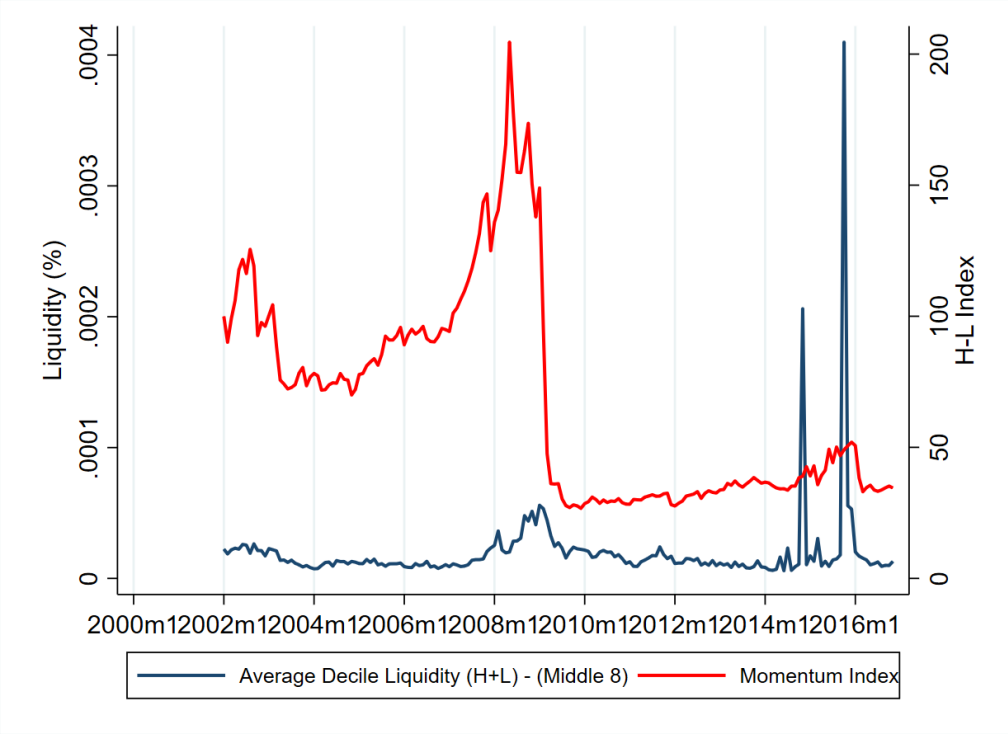
Liquidity of High-Low Portfolios Versus Value Factor Index



Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. High and Low deciles created every month of the sample period and returns are for t+1

7. Some Little Investigations on Crowding

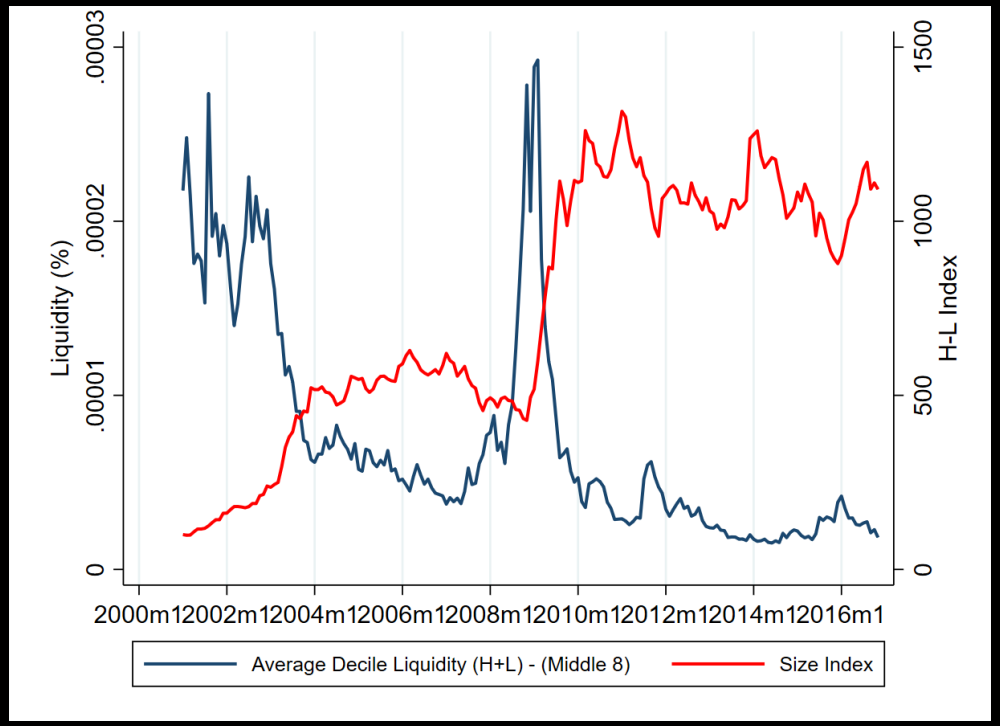
Liquidity of High-Low Portfolios Versus Momentum Factor Index



Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. High and Low deciles created every month of the sample period and returns are for t+1

7. Some Little Investigations on Crowding

Liquidity of High-Low Portfolios Versus Size Factor Index



Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. High and Low deciles created every month of the sample period and returns are for t+1

7. Some Little Investigations on Crowding

Liquidity of Goldman Sachs Top Hedge Fund Holdings (as of October 2019). Note: Liquidity measure stops in 2016. Would have liked to look forward.

Note: Using BBD data of Barardehi, Bernhardt, and Davies from Trade Time Based Measures of Liquidity. Goldman Components of VIP index.

Open Discussion for all Participants

1. Great comments from many people, including Larry Harris, Allen Whitt, and Shane Haas.

Future Research

- Theoretical model of crowding
- More clearly identify the unique risk of crowding

Thank you

- Dr. Ludwig Chincarini , CFA
- University of San Francisco
- United States Commodity Funds

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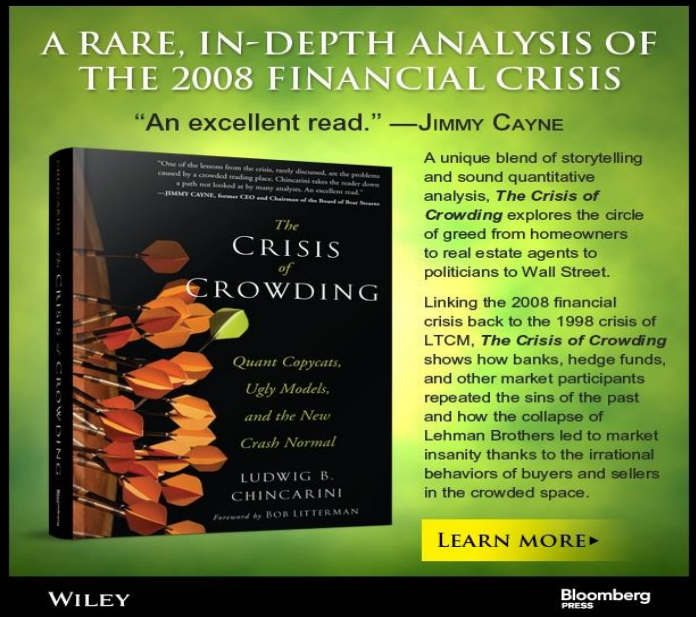
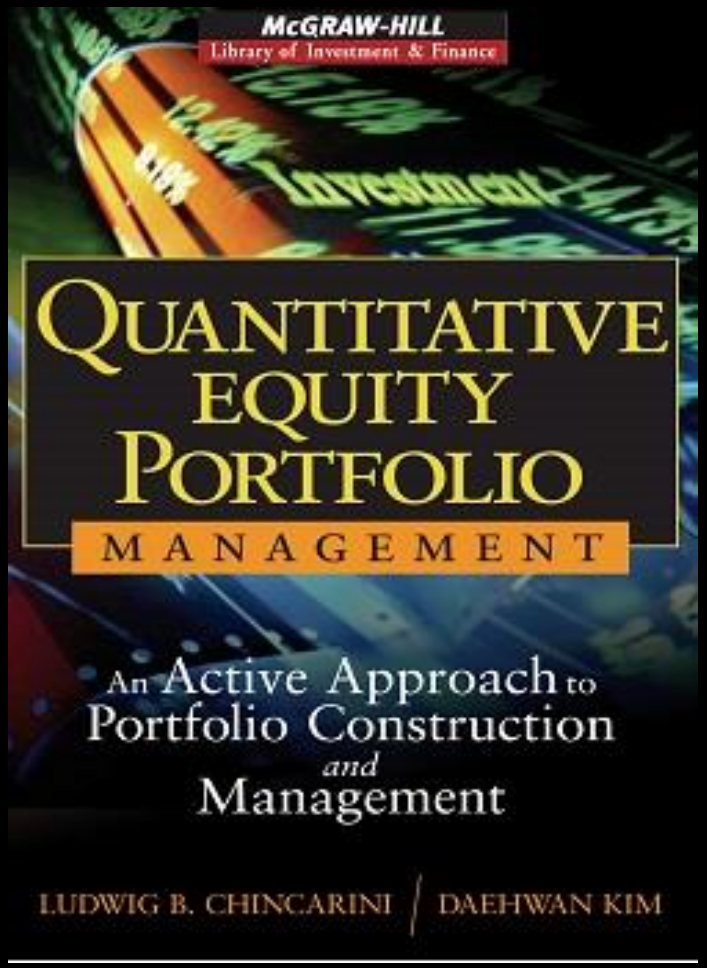
chincarinil@hotmail.com

For more information: Buy the books! ;)





Appendix A: Miscellaneous Academic References on Crowding

A. "The Failure of LTCM," Chincarini (1998)
B. "Sophisticated Investors and Market Strategy," Stein (2009)
C. *The Crisis of Crowding*, Chincarini (2012)
D. "The Externalities of Crowded Trades," Blocher (2013)
E. "Standing out from the Crowd. Measuring Crowding in Quantitative Strategies," Cahan and Luo (2013)
F. "Stock portfolio structure of individual investors infers future trading behavior," Bohlin and Rosvall (2014)

Appendix A: Miscellaneous Academic References on Crowding

G. "Dimensions of Popularity," Ibbotson and Idsorek (2014)).

H. "Crowded Trades: An Overlooked Systemic Risk for Central Clearing Counterparties," Menkveld (2014)

I. "The Effects of Short Sales and Leverage Constraints on Market Efficiency," Yan (2014).

J. "Omitted Risks or Crowded Strategies: Why Mutual Fund Comovement Predicts Future Performance," Chue (2015).

K. "Fire, Fire. Is Low Volatility a Crowded Trade," Marmar (2015)

L. "Days to Cover and Short Interest," Hong et al. (2015)

Appendix A: Miscellaneous Academic References on Crowding

M. "Portfolio Construction and Crowding" Bruno, Chincarini, Davis, and Ohara (2018).

N. "Transaction Costs and Crowding" Chincarini (2017)

O. "Mutual Fund Crowding and Stock Returns," Zhong et al. (2016)

P. "Hedge fund crowds and mispricing," Sias et al. (2016)

R. "Individual stock Crowded Trades, Individual Stock Investor Sentiment, and Excess Returns," Yang and Zhou (2016)

Appendix A: Miscellaneous Academic References on Crowding

S. "The Impact of Pensions and Insurance on Global Yield Curves", Greenwood and Vissing-Jorgenson (2018)

T. "Institutional Selling of Stocks with Illiquidity Shock", Krystaniak (2016)

U. "Arbitrage Crowdedness and Portfolio Momentum," Chen (2018)

V. "Copycatting and Public Disclosure: Direct Evidence from Peer Companies' Digital Footprints," Cao et al. (2018).

W. "Crowded Trades and Tail Risk," Brown et al (2019)

Appendix A: Miscellaneous Academic References on Crowding

X. "Granularity and Downside Risk in Equity Markets," Ghysels et al (2018)

Y. "The Impact of Crowding in Alternative Risk Premia Investing," Baltas (2019)

Z. "Mutual Fund Herding after 13-D Filings," (Agapova and Rodriguez (2019))

AA. "Optimal Timing and Tilting of Equity Factors," Dicthl et al. (2019)

BB. Systematic Investment Strategies (Giamourdis (2017))

CC. Trading in Crowded Markets (Gorban et al. (2018))

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DD. "Institutional Consensus: Information or Crowding?" Klein et al. (2019)

EE. "Stochastic investor sentiment, crowdedness and deviation of asset prices from fundamentals," Zhou and Yang (2019)

FF. "Modelling Transaction Costs when Trades May Be Crowded: A Bayesian Network Using Partially Observable Orders Imbalance," Briere et al. (2019)

GG. "Everybody's Doing It: Short Volatility Strategies and Shadow Financial Insurers," Bhansali and Harris (2018)

Appendix B: Banks are Incorporating Crowding in Management Tools – e.g. Bernstein

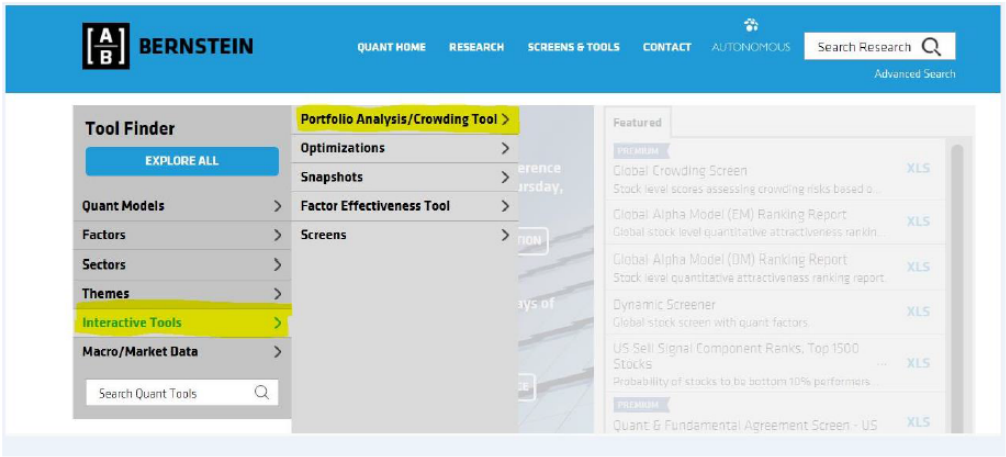
FAQ OF THE MONTH: HOW CAN I MONITOR THE CROWDING EXPOSURE IN MY PORTFOLIO?

We have recently launched a web-based portfolio crowding exposure analysis tool. This interactive tool (Exhibit 3) has three main functionalities built into it: i) assessing factor and sector exposures in your portfolio (crowding is featured as a factor along with other commonly used metrics such as valuation ratios, capital use, momentum, etc., ii) generating stock level screens of your porfolio or any stock list you enter, showing how attractive the stocks are on our alpha models and providing crowding scores so you can see which names are most exposed. You can then export your results to an Excel spreadsheet if you wish; ii) displaying time series data on historical crowding trends for individual stocks going back three years or sector crowding charts globally or by region covering the last two decades.

Most importantly, we do not see or capture the holdings that you enter into this tool or any of our other interactive quant website tools, so you can use them without concern about disclosing your portfolio. Please see the links on page three to access the tool as well as a short video demonstration on how to use it and interpret the results.

To launch the application go to the Bernstein Quant Website and choose INTERACTIVE TOOLS from the left side of the home screen and then choose PORTFOLIO ANALYSIS/CROWDING TOOL (Exhibit 2).

EXHIBIT 2: **The portfolio analysis tool can be found on the Bernstein Quant Website**



Source: Bernstein analysis