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TRIVARIATE RESEARCH

TRIVARIATE'S QUANTITATIVE FRAMEWORK

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ADAM S. PARKER, Ph.D., FOUNDER
adam@trivariateresearch.com
646-734-7070

COLIN COONEY, HEAD OF SALES
colin@trivariateresearch.com
617-910-7934

ALBERT MISHAAN, ANALYST
albert@trivariateresearch.com
732-710-8996

BRAD ROCHE, SR. SALES CONSULTANT
brad@trivariateresearch.com
516-434-9623

TRIVARIATE'S PROPRIETARY QUANTITATIVE FRAMEWORK

We developed a database, signals, models and a risk management system to run a hedge fund – the data integrity and system checks passed allocator diligence – and we now use that approach to offer investment advice to bottom-up stock pickers and quantitative money managers (stock ideas on page 24)

The Trivariate frameworks consists of:

1. Proprietary stock level models with custom tags, cohorts, signals
2. Ingestion of 100+ macro factors to re-sort our model outcomes and improve recommendations on grossing / sizing
3. Systematic identification of fundamental factors, such as M&A, new management teams, etc. which increase volatility without commensurate alpha

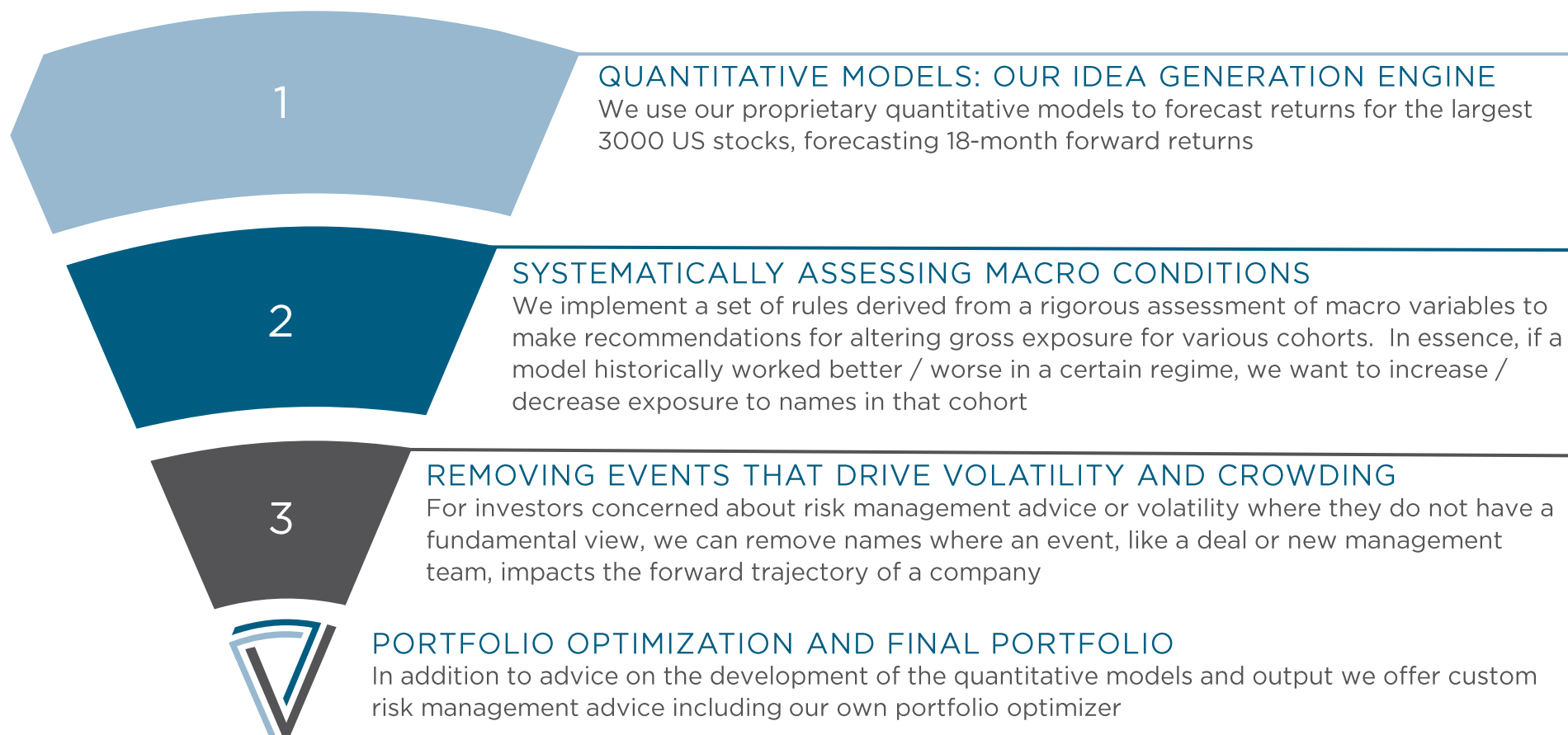
Following our idea generation, we advise on risk management in areas including:

1. Risk diagnostics
2. Portfolio optimization with customizable constraints
3. Identification of crowded ideas from proprietary 13-F “high conviction” analysis

Please reach out to us for custom risk management services and proprietary research projects

QUANTITATIVE MODEL OVERVIEW

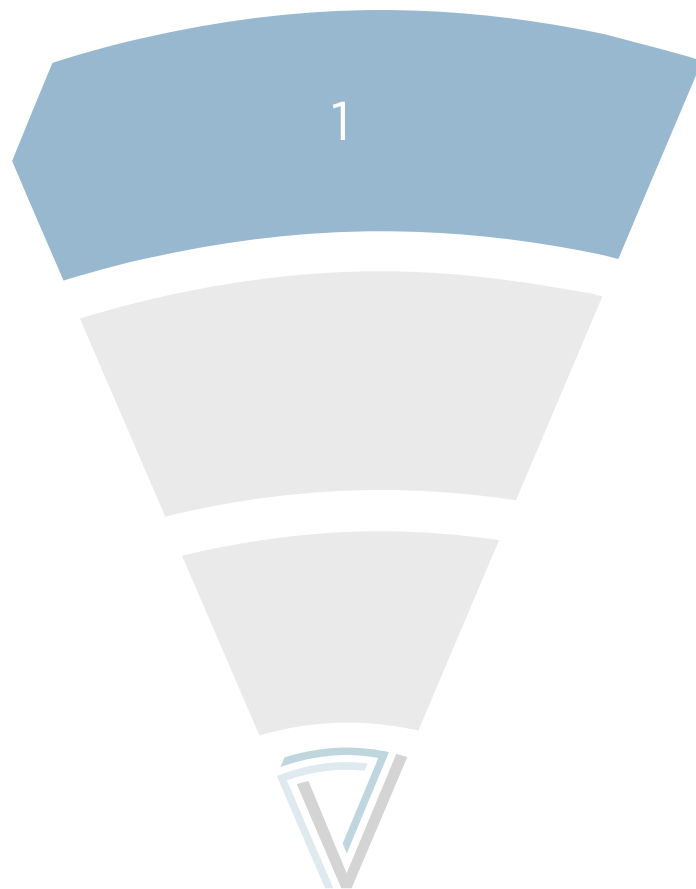
Trivariate Research's process for investment advice combines quantitative stock-level models, top-down rules designed to improve how investors make decisions about gross exposures, and a systematic identification of stocks where fundamental "events" create increased volatility. Our goals are to improve how CIOs use their judgment in forming their final portfolios, advise quantitative investors on some novel ways to add value in portfolio construction and signal formation, and importantly, to generate long / short stock ideas





QUANTITATIVE MODELS: OUR IDEA GENERATION ENGINE

The first and in our view, most critical step in the process is running our custom quantitative models to predict returns for the largest 3000 US stocks. The output of this quantitative process is a ranking of the stock universe by anticipated returns. When we ran our hedge fund we selected the top 20% as potential long ideas and the bottom 20% as potential short ideas. We often use quantitatively-derived stocks for idea generation to embody a theme in our research



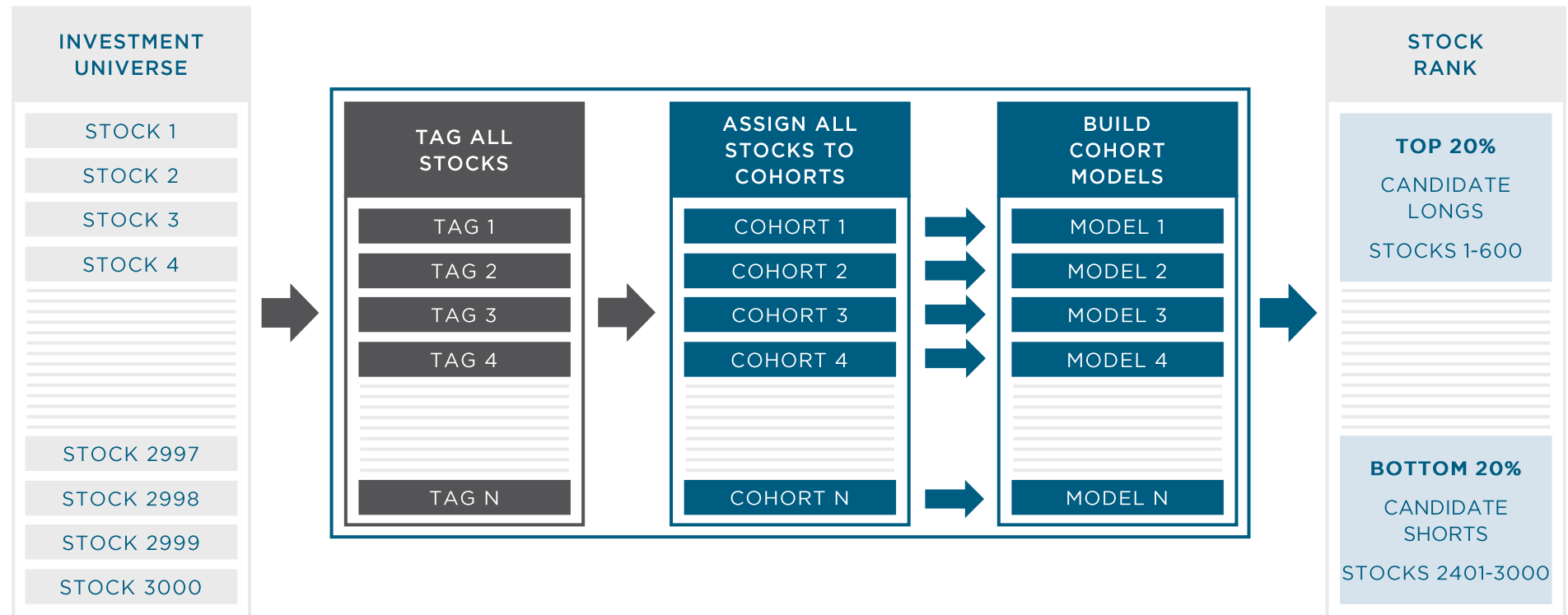
QUANTITATIVE MODELS – WHAT ARE WE DOING?

- **Breaking the market into distinct cohorts:** We parse the universe into 21 proprietary cohorts that are the result of years of research and multiple model-building iterations. Examples include: “hyper growth”, “high yield junk”, “cheap for a reason”, and other non-traditional classifications. We think there is little if any alpha left in traditional GIC-based long-dated models, and novel approaches like this are key to adding value
- **Infusing fundamental knowledge:** A significant source of our differentiation is our experience in combining both the quantitative and fundamental disciplines. The goal in using growth, yield, and quality in forming modeling cohorts is to infuse our fundamental knowledge into the signal selection in those areas and enhance our ability to pick winners from losers
- **Differentiating our time horizon:** We build models to predict 18-month forward returns for each US stock
- **Limiting variable overlap:** We use variables to predict returns in our models that come from categories like balance sheet, income statement, cash flow, sentiment, valuation, and accounting, with several custom definitions and a low overlap of variables between cohorts. However, signal formation is key, and rank ordering is no longer the exclusive approach – distance from median or even perverse implementation is now prevalent. In the end, we have 90 distinct signals in our 21 cohort models, or 4.5 unique signals per model with a maximum of 4 total uses in the 21 models. We don’t want to die with one signal.



OVERVIEW OF OUR QUANTITATIVE MODELS

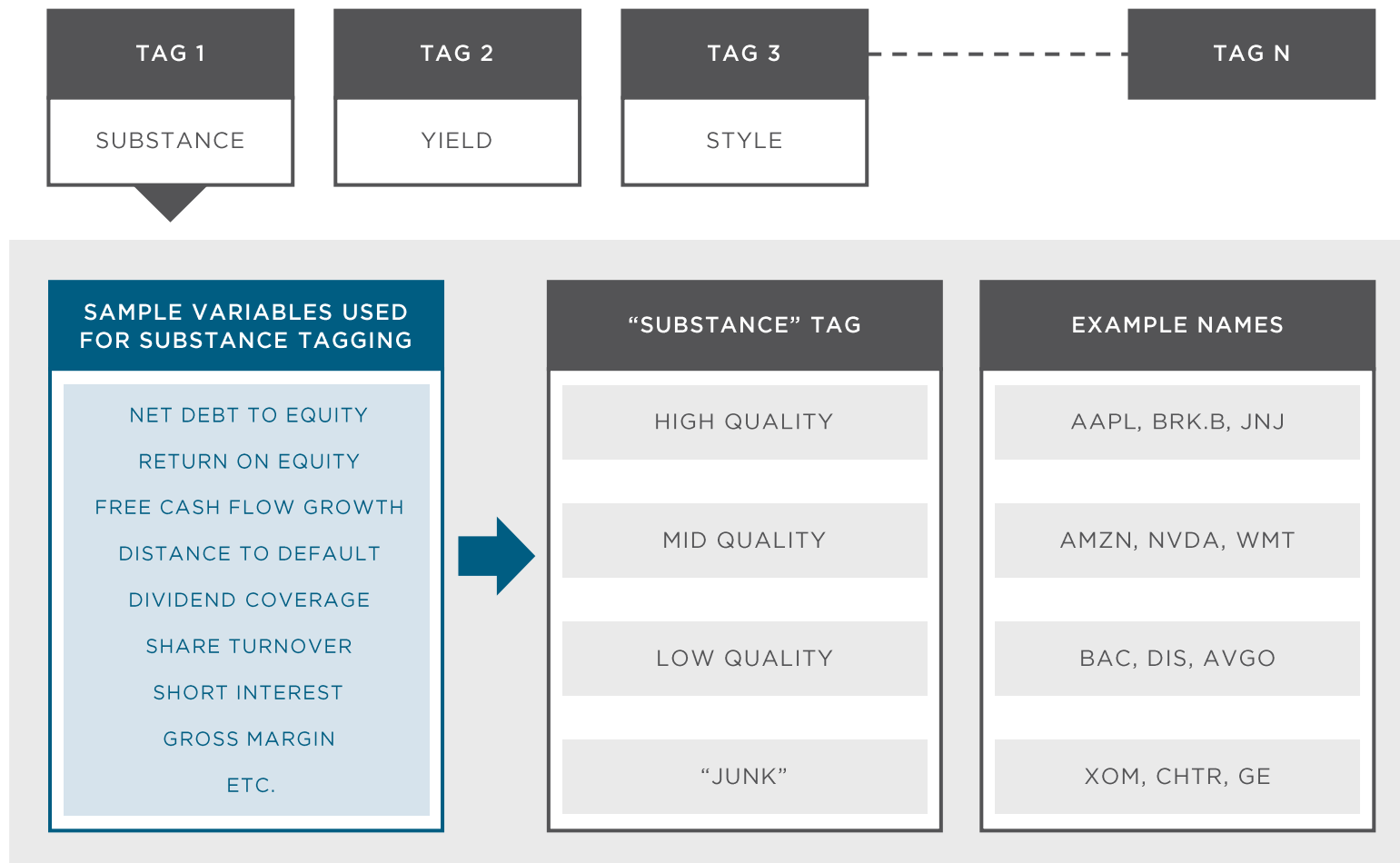
Each stock receives several tags which are systematically used to determine its cohort. These cohort groupings are critical as model development improves when stocks in a cohort share common characteristics. We then build different models in each cohort, using distinct variables to predict future stock-level returns. Finally, we rank the universe from 1 to 3000 on the forecasted return from the models, with the top 20% becoming potential long ideas and the bottom 20% potential short ideas





SUBSTANCE TAG - WHICH STOCKS ARE “JUNK”?

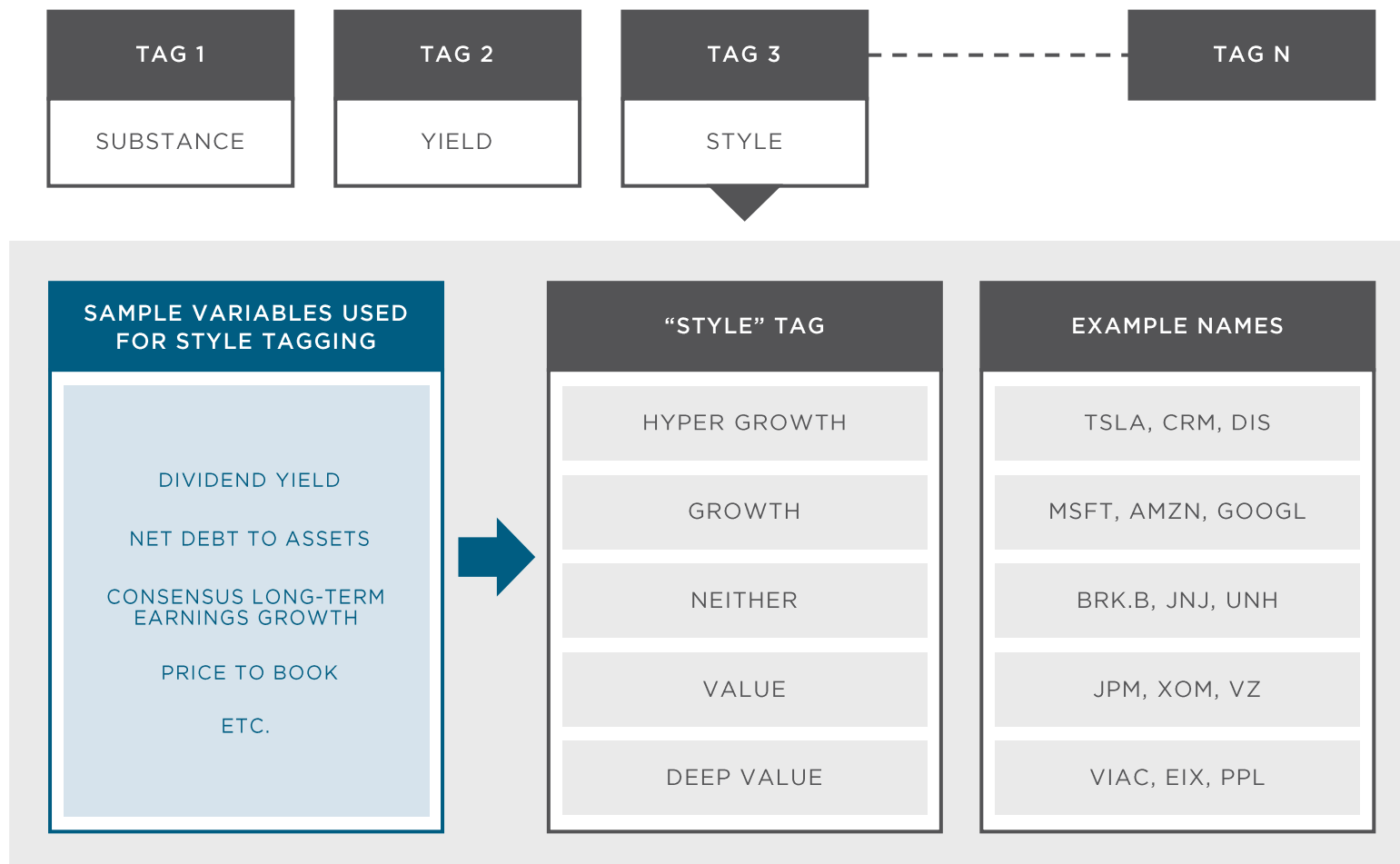
The first step in building our distinct cohorts is assigning multiple tags to each stock in the universe. Each tag is systematically generated based on a series of input variables. As an example, every stock will be labeled with a “substance” tag which has five potential categories as shown below. In particular, we care if stocks are in the bottom quartile, which we call “junk”, as our ability to pick winners from losers in this group is strong





STYLE TAG - WHICH STOCKS GROW REALLY FAST?

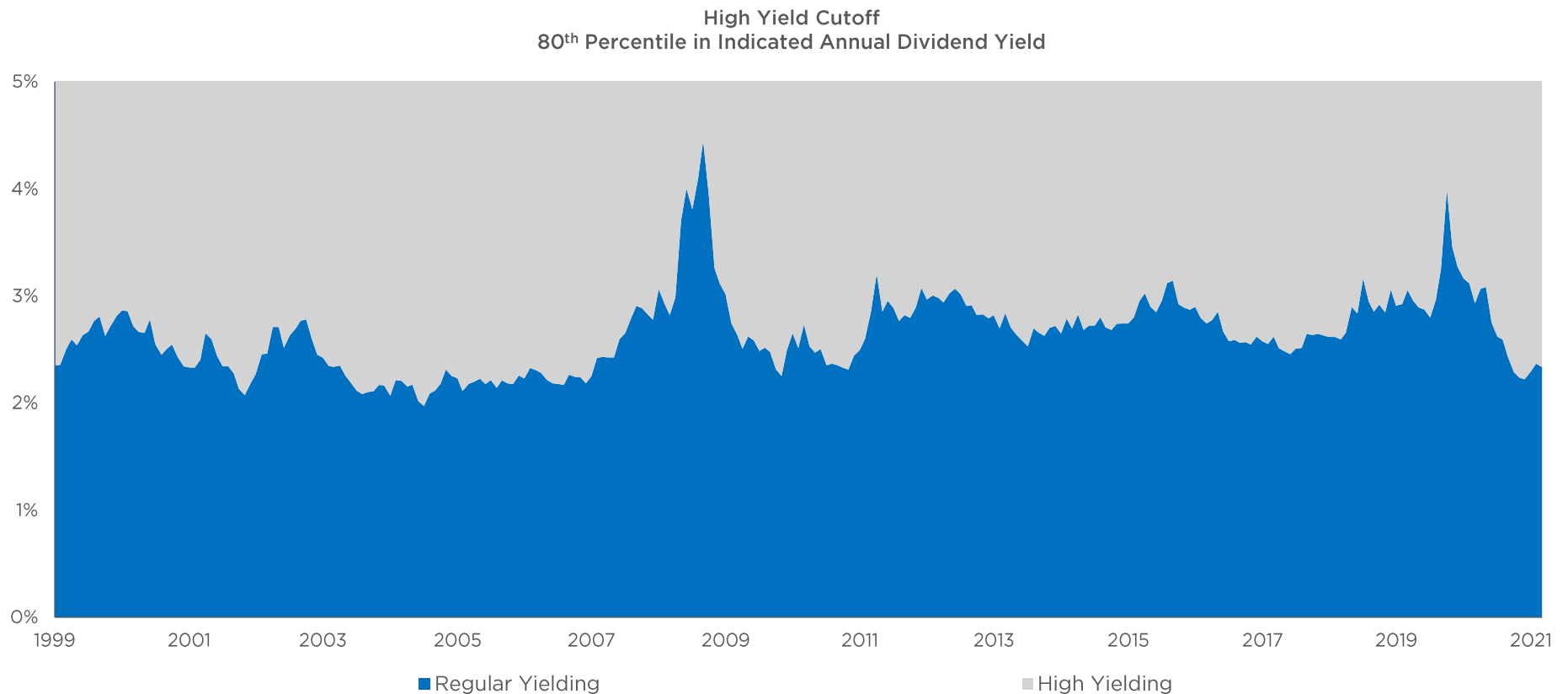
Another tag we need to create our modeling cohorts is style. Our framework systematically labels stocks as growth, “neither”, or value. The fastest growth parts of growth we call “hyper” growth, and the very cheap parts of value we use to create a “deep value” universe, that is a pre-cursor to our “cheap for a reason” cohort





DIVIDEND YIELD TAG

One additional tag we need is “high yield” which we define as the top 20% of dividend yielding stocks. We know that there is a large class of investors who value income, and that these stocks trade around fundamental attributes related to the growth and maintenance of the dividend, more than their sector or industry constitution. Today the high yield cohort is defined by stocks with a dividend yield above 2.3%





ASSIGNING EACH STOCK TO A COHORT

Once the tagging is complete for our stock universe, we systematically assign each stock to a cohort. We have six specialty cohorts where stocks are assigned in a hierarchy. Cheap for a reason first, then down through other junk (blue column). This process is rules-based, mutually exclusive and exhaustive. Stocks are tagged and assigned to cohorts on a monthly basis. Below is an illustration of how several large cap stocks were tagged and assigned to their Trivariate cohorts

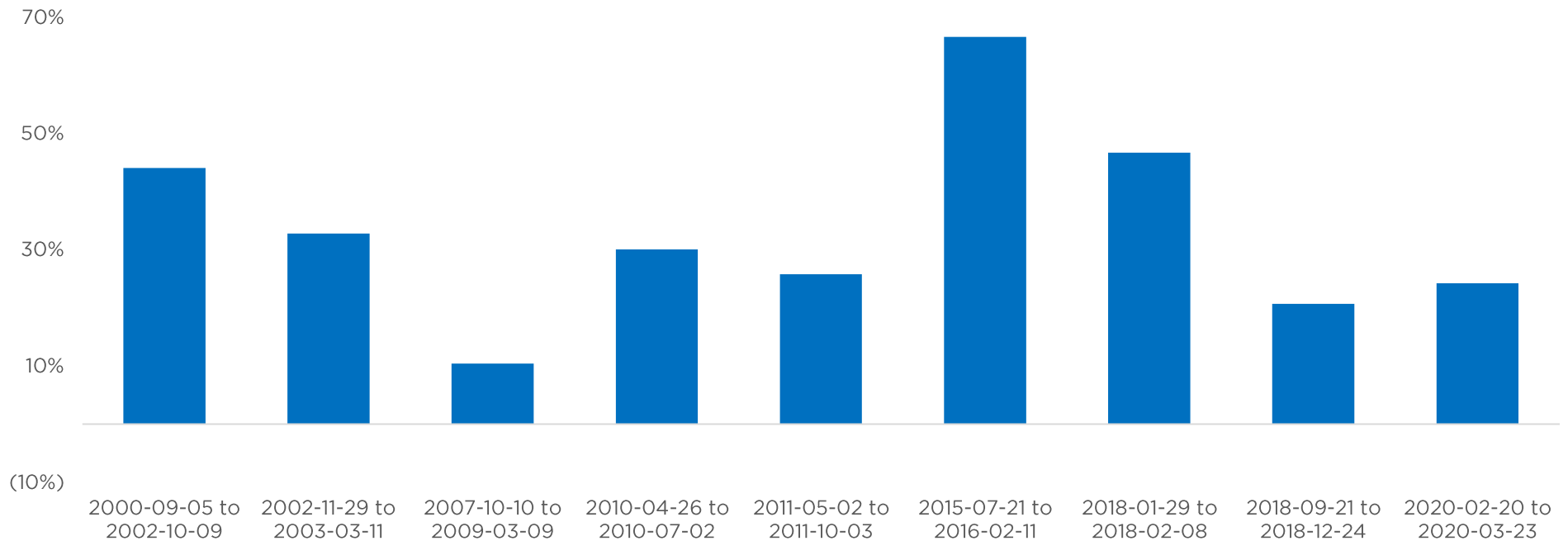
TICKER	SUBSTANCE TAG		DIVIDEND YIELD TAG		STYLE TAG		TRIVARIATE COHORT	GICS SECTOR
VIAC	Junk	+	High	+	Deep Value	➔	Cheap For A Reason	Communication Services
TSLA	Junk	+	Regular	+	Fast Growth	➔	Hyper Growth Junk	Consumer Discretionary
CRM	High Quality	+	Regular	+	Growth	➔	Hyper Growth	Information Technology
XOM	Junk	+	High	+	Value	➔	High Yield Junk	Energy
JNJ	High Quality	+	High	+	Neither	➔	High Yield	Healthcare
TMUS	Junk	+	Regular	+	Neither	➔	Other Junk	Communication Services



CHEAP FOR A REASON – VALUATION DOESN'T OFFER PROTECTION

We call one of our specialty cohorts “cheap for a reason” or CFAR. CFAR is a subset of our deep value style stocks that also have poor recent price momentum. Previously, the conventional wisdom was that the stocks that had the most multiple expansion prior to market corrections would be the ones with the most to lose during market pullbacks. However, that is not true – it is those with the most multiple contraction prior to market corrections that still perform poorly. It seemed clear to us as the result of that work that valuation would not be effective at separating winners from losers among very cheap stocks. As such, we analyzed whether price-to-forward earnings was efficacious at picking winners from losers during the last nine SP500 corrections of ten percent or more and compared efficacy for CFAR stocks relative to the rest of the universe. Each time, price-to-forward earnings performed worse for CFAR stocks, meaning that valuation does not offer protection during downturns for very cheap stocks

Relative Annualized Factor Efficacy of Price-to-Forward Earnings
Overall Universe Excluding “Cheap for a Reason” vs. “Cheap for a Reason”
During SP500 Drawdowns of 10% or More Since May 2000

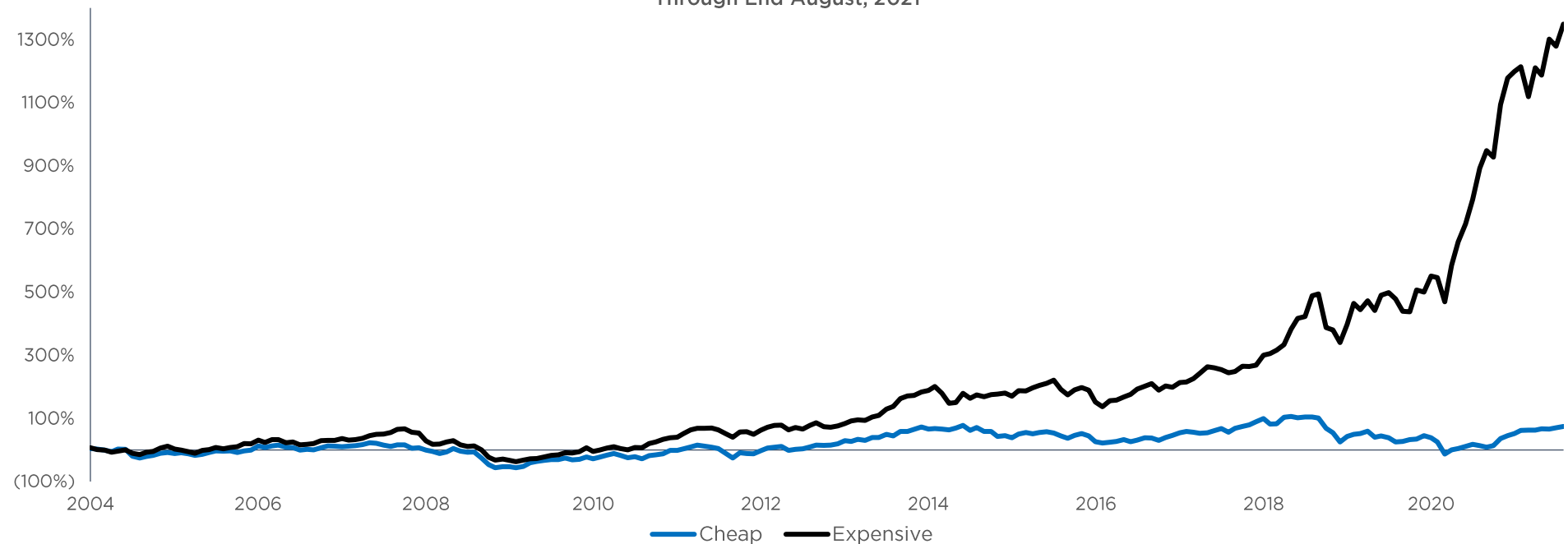




HYPER GROWTH: EXPENSIVE OUTPERFORMS CHEAP

Valuation motivated us, in part, to create a special cohort for fast-growing stocks, called Hyper Growth. We know that fast growing stocks that are cheap underperform fast growing stocks that are expensive. If a stock is fast growing and cheap, the market on average is right to be concerned, as cyclical, or technological obsolescence, or looming competition are among the potential fundamental concerns. Below we show the performance of the cheap quintile in blue and the most expensive quintile in black on price-to-forward earnings since 2004 among the hyper growth stocks. Clearly this is not spurious – more expensive is better than cheap among fast growing stocks

Hyper Growth Universe
Price-to-Forward Earnings Mean Quintile Returns
Through End-August, 2021

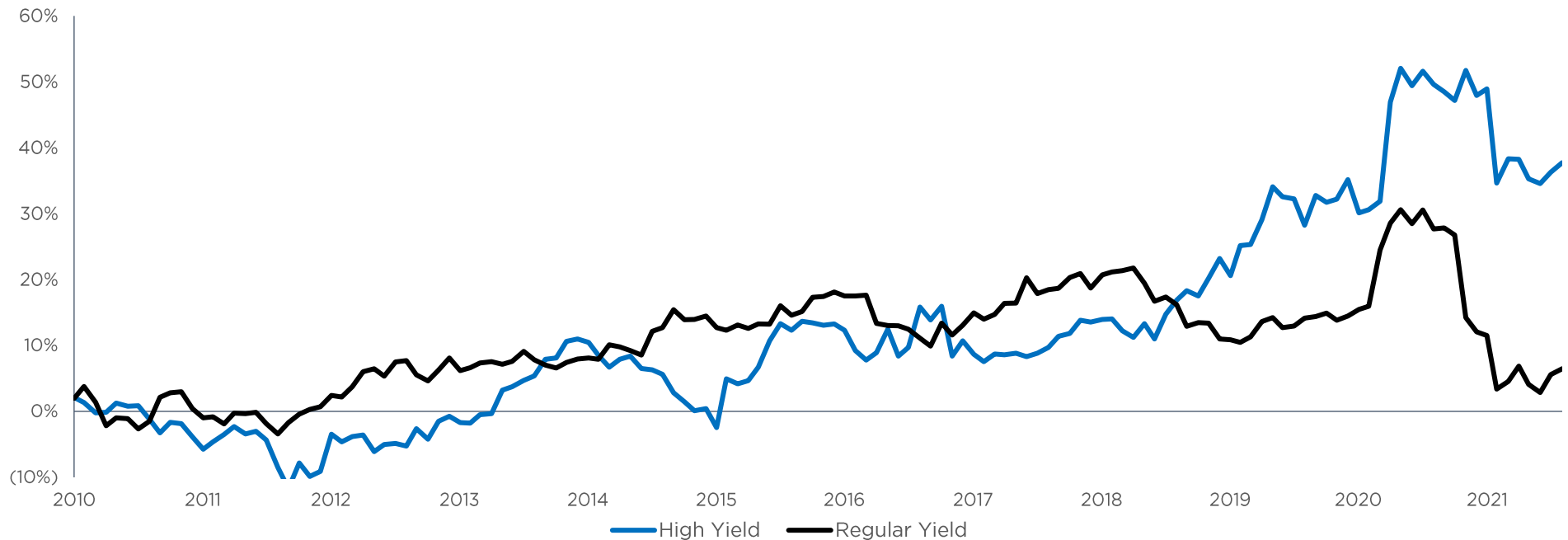




DIVIDEND GROWTH IS MORE EFFECTIVE IN HIGH YIELD

Using dividend yield to cluster stocks can also be highly effective, as yield-focused investors care about different fundamental metrics than non-yield-focused investors. For instance, a signal like high indicated dividend growth outperforms low dividend growth by ~4% per annum (blue line) whereas this metric generates negligible spread among stocks that do not have high dividend yields (black line). Hence, we have a cohort called “High Yield”

Efficacy of Indicated Dividend Growth Through End-August, 2021





SIGNAL DIVERSIFICATION IS KEY

Stocks that are not in our specialty cohorts are combined into more traditional GIC industry-like cohorts, with some exceptions. Below we show the example of signals used and tickers in 11 out of 21 of our models – we intentionally build models with a small overlap in signals, to diversify our factor exposure

Trivariate Quantitative Models

Select Model	Example of Signals Used	Example of Tickers
Banks & Consumer Finance	Price-to-Tangible Book, Loan Loss Coverage Ratio, Provision for Loan Loss Ratio Growth	JPM, BAC, MS
Cheap For A Reason	Revenue Growth Acceleration, Total Debt Stability, Total Revenue Stability	VZ, T, WBA
Discretionary	Receivables Growth, Gross Margin Growth, Sell-Side Consensus Recommendation (Opposite)	HD, MCD, LOW
High Yield	SG&A Stability, Net Income Stability, Dividend Growth	JNJ, PG, PFE
High Yield Junk	Forecasted Revenue Growth, Receivables Stability, Quick Ratio Growth	XOM, COP, DOW
Hyper Growth	Price-to-Forward-Earnings (Opposite), Change in Trading Volume, Revenue Growth Acceleration	AMZN, FB, TSLA
Hyper Growth Junk	Momentum Stability, Percent Upside to Sell-Side Analyst Target (Opposite), Return on Invested Capital	DIS, SQ, MELI
Insurance	Statutory Surplus Ratio, Underwriting Leverage, Net Income Stability	MMC, CB, AON
Other Junk	EV-to-Gross Profit, Buyback Yield, Accruals	CHTR, GE, GM
Real Estate	Distance to Default, FFO Growth, PP&E Accruals	AMT, PLD, CCI
TMT	Revenue Growth, R&D Stability, Sales Estimate Revisions	MSFT, GOOGL, V



A STOCK ILLUSTRATION OF THE POWER OF SPECIALTY COHORTS

The differentiation of the cohort definitions we use to segment the market and build our models is a key aspect of our modeling approach. On the left side we show stocks that are in our high yield cohort, which can be in nine different traditional GIC sectors. On the right we show stocks that are all in the GIC consumer discretionary sector that could be in nine different Trivariate modeling cohorts – we think combining HD with AMZN and GM into one consumer model would be highly ineffective

TRIVARIATE HIGH YIELD COHORT*	
TICKER	GICS SECTOR
OMC	Communication Services
BBY	Consumer Discretionary
PG	Consumer Staples
CVX	Energy
CME	Financials
JNJ	Health Care
RTX	Industrials
CSCO	Information Technology
SCCO	Materials

GICS CONSUMER DISCRETIONARY	
TICKER	TRIVARIATE COHORT
SMP	Cheap For A Reason
HD	Discretionary
NKE	Durables
BBY	High Yield
VFC	High Yield Junk
AMZN	Hyper Growth
MELI	Hyper Growth Junk
APTV	Industrials
GM	Other Junk

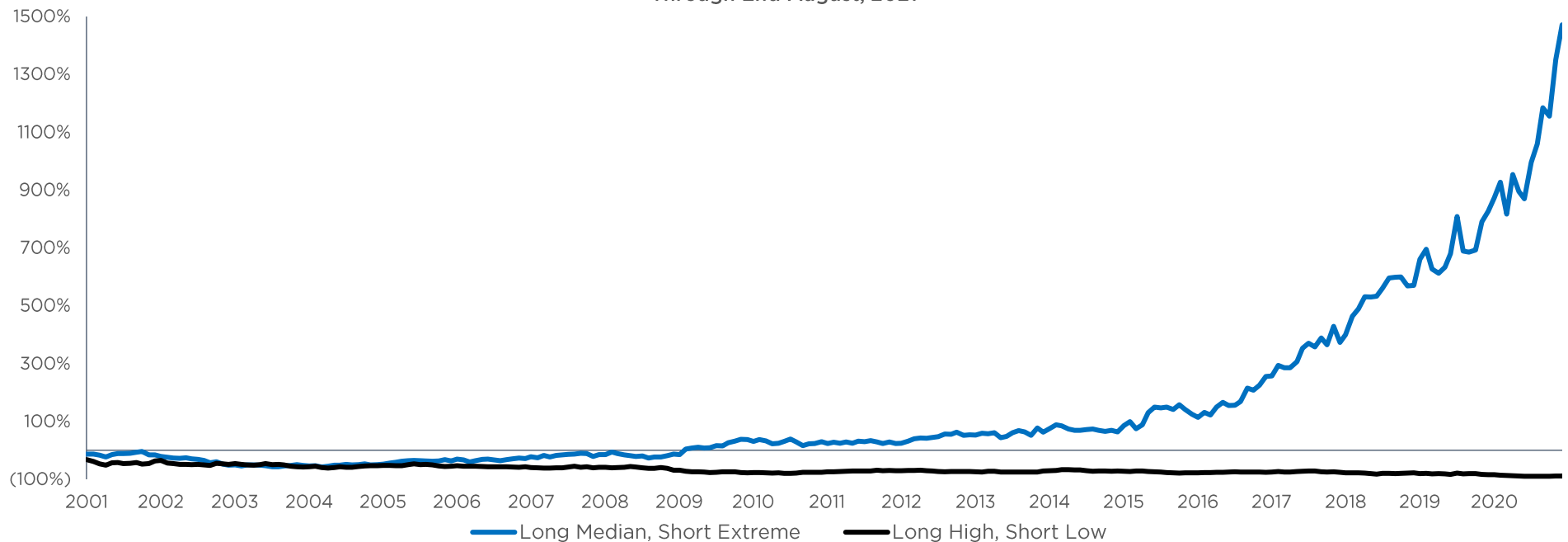
* As of September 10th, 2021



SIGNAL FORMATION REALLY MATTERS

In addition to our specialty cohorts for model development, signal formation for building intra-cohort models has progressed a lot. Solely using traditional “ranked” metrics is now becoming increasingly passe. Below we show return on invested capital (ROIC) for our pharma / biotechnology cohort (see note below). The blue line shows that the performance of stocks with median ROIC is far greater than stocks with extreme (low or high) ROIC. On the flip side, if we just bought high ROIC and shorted low ROIC stocks in this cohort (black line) the signal lost money!

Compounded Median Monthly Return of ROIC
Pharma Biotech Cohort
Through End-August, 2021



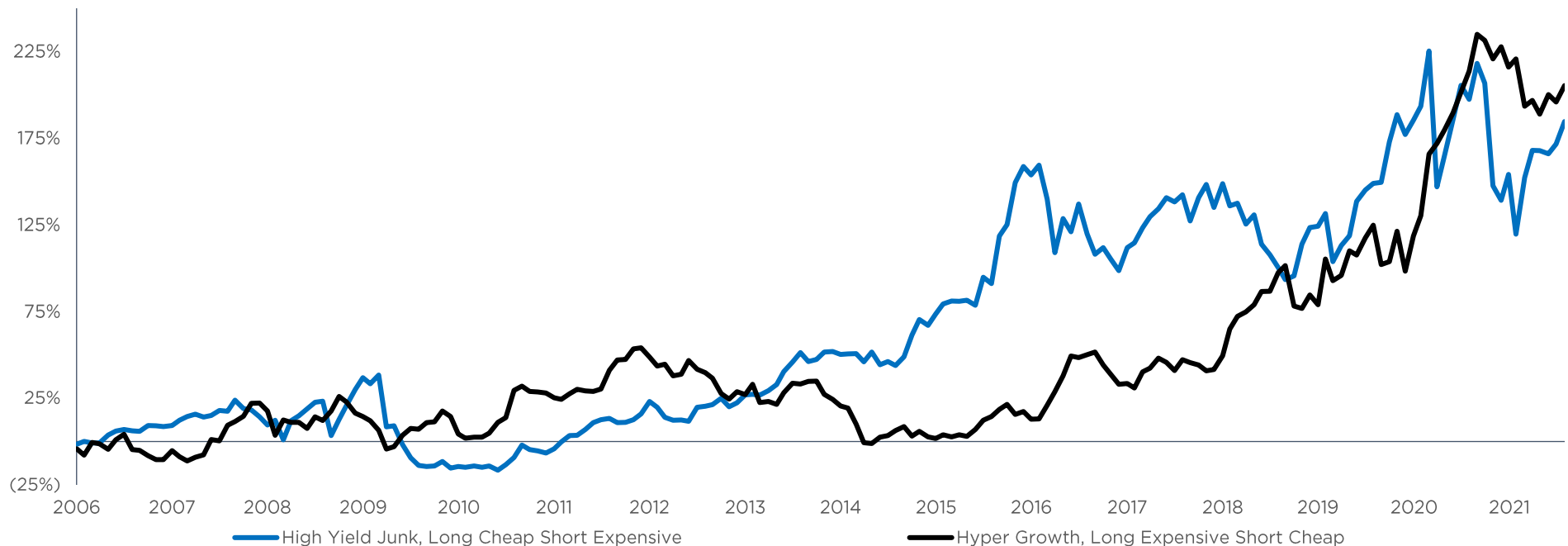
Note: Our pharma / biotechnology cohort excludes mid, small, and micro-cap biotechnology stocks, which we do not model quantitatively. Also, given our modeling cohort formation hierarchy, these stocks are all pharma / biotech that are NOT cheap for a reason, hyper growth, high yield, or junk - it is the rest of the pharma / biotech cohort that we reference here



EXPENSIVE CAN BE BAD OR GOOD

In addition to forming signals by using distance-from-median transforms instead of a simple ranking in some circumstances, we also used the opposite sign for the same signal in some of our models. Below we show the efficacy of price-to-forward earnings for our high yield junk model in blue and our hyper growth model in black. For high yield junk, we are buying cheap stocks and shorting expensive. For hyper growth, we are buying expensive and shorting cheap. We implemented some “perverse” signs to certain signals where we felt the consistency of the efficacy was not spurious

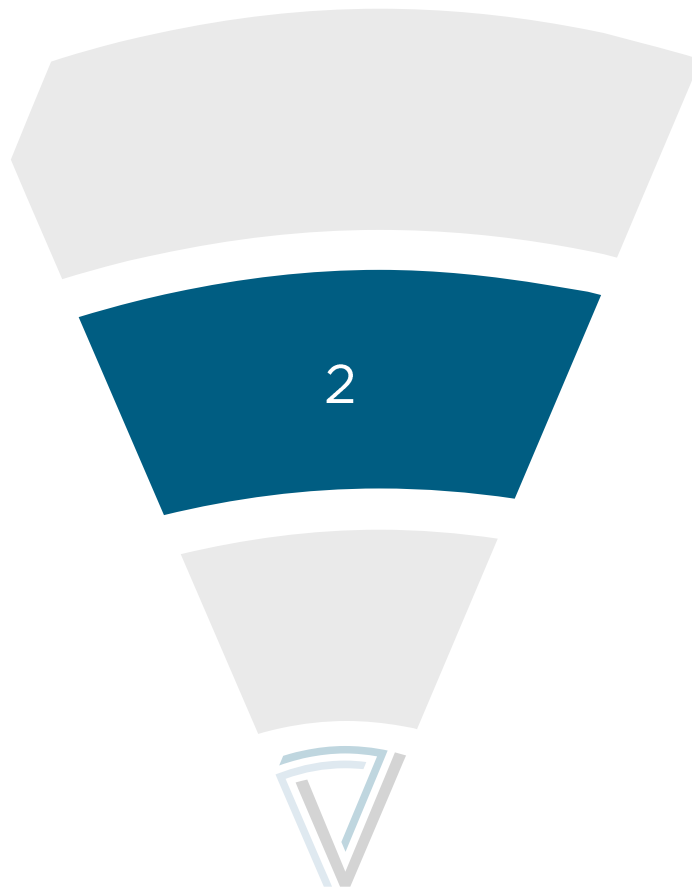
Performance of Price-to-Forward Earnings Signal
Through End-August, 2021





SYSTEMATICALLY ASSESSING MACRO CONDITIONS

The second step in the Trivariate process is a systematic assessment of top-down variables. We use this information to improve the probability of identifying and sizing portfolio candidates – this informs how we make recommendations about gross exposure



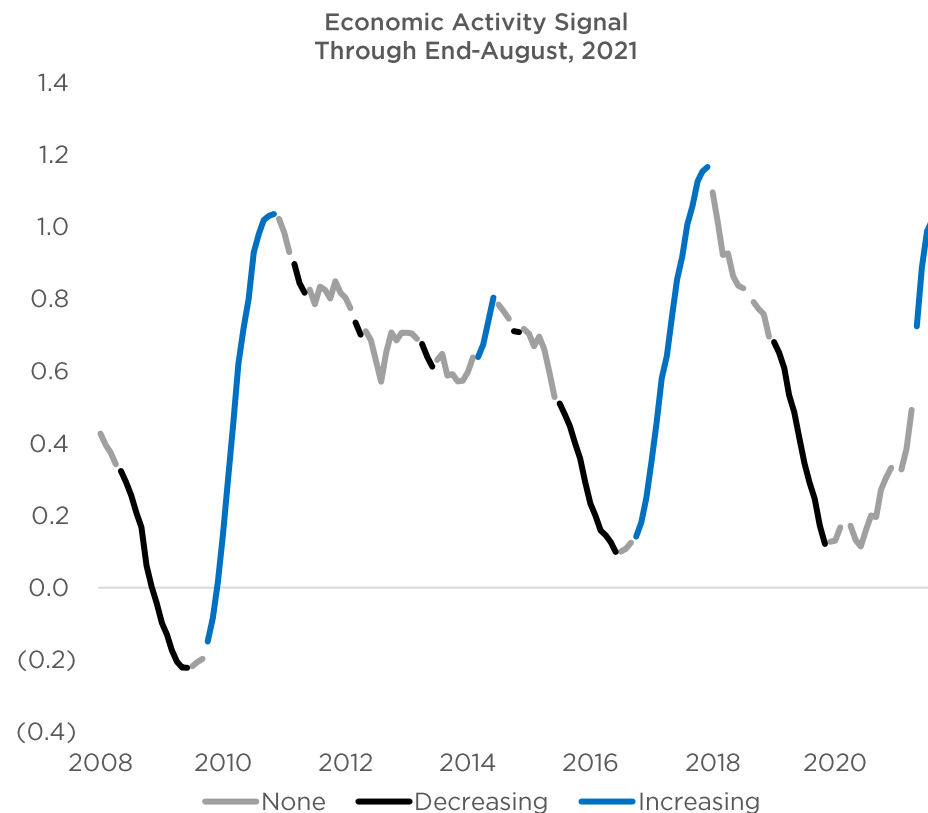
ASSESSING MACRO CONDITIONS – WHAT ARE WE DOING?

- **Analyzing macro data:** We systematically track and analyze over 100 economic and macro variables. Examples include economic activity, industrial activity, consumer activity, corporate profitability, and financial conditions
- **Assessing impact on performance:** We measure how changes in macro regimes alter the performance of our proprietary cohorts and our model efficacy
- **Creating exposure rules:** We create a set of rules that strive to increase our odds of identifying and sizing stocks correctly in the context of the relevant macro regime
- **Implementing our rules:** We execute our macro rules against the quantitative model rankings from the first phase of our investment process. This new model rankings, re-ordered by our macro rules, seek to have investors gross up or down exposures in parts of the market where macro signals dictate they historically would have been able to pick winners from losers BETTER than at other times
- **Avoiding macro bets:** We do not intend to make active directional macro bets and our process is not predicated on making accurate macro forecasts. Rather, we assume we will be late identifying a regime, and “ride it over the edge” and yet implementing a gross exposure recommendation still adds overall value



INCREASING ECONOMIC ACTIVITY MEANS GROSS UP TMT EXPOSURE

We show one of our 12 macro gauges, our economic activity signal below (left chart). We evaluate where we are in the economic activity cycle by looking at variables like Citi Economic Surprise, CEO Confidence, Philly Fed Business Outlook, Small Business Optimism, US Economic Surprise, US LEI, US 5y5y Forward Breakeven, etc. We then create this “sine wave” to assess where we are on economic activity today. We noticed (right chart) that our TMT model performs far better when economic activity is increasing than when it is not, fueling our recommendation to gross up TMT exposure today



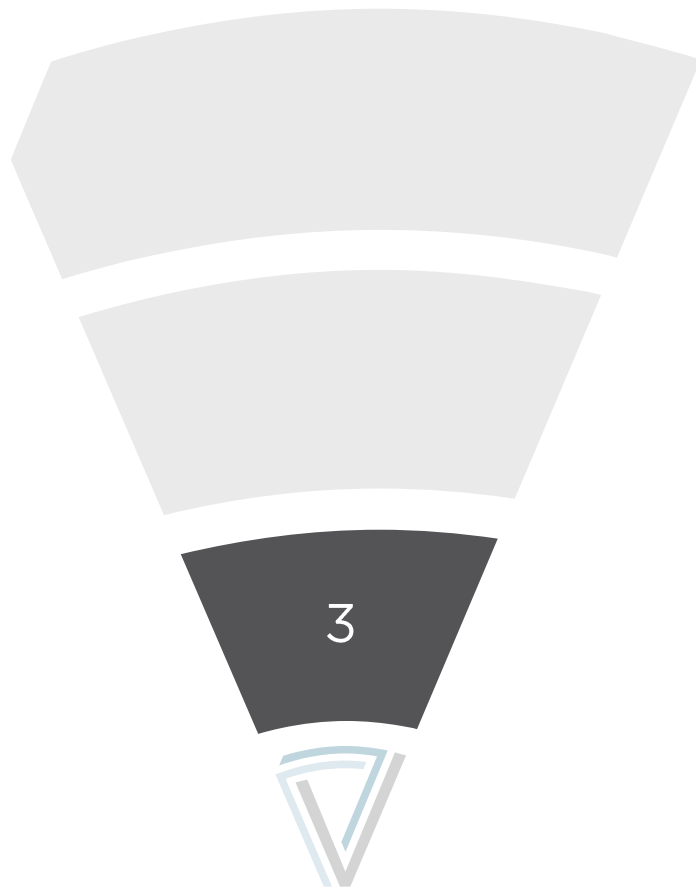
TMT Model Performance Through End-August, 2021

Stat (Beta-Adjusted)	Economic Activity Increasing	Economic Activity Not Increasing	Difference
Weighted Mean	17.6%	7.5%	10.1%
Weighted Median	17.9%	6.1%	11.8%
Weighted Information Ratio	2.01	0.82	1.19
Hit Rate	69.7%	57.3%	12.4%



REMOVING EVENTS THAT DRIVE VOLATILITY AND CROWDING

The third step in the process is to systematically remove events such as CEO changes or M&A that may significantly affect a company's outlook. Based on our research, we have found that these "catalysts" often increase stock volatility without a commensurate increase in alpha and are often crowded by traditional fundamental investors. We can remove these stocks from our back-tests and quantitative processes where necessary to create value



REMOVING EVENTS - WHAT ARE WE DOING?

- **Identifying material corporate events:** We systematically identify fundamental corporate activity like new CEOs, meaningful divestitures, spin-offs, mergers or acquisitions
- **Eliminating stocks for a sustained period:** We intentionally remove any stocks where these events occurred for at least one-year until their conditions normalize

REMOVING EVENTS - WHY ARE WE DOING THIS?

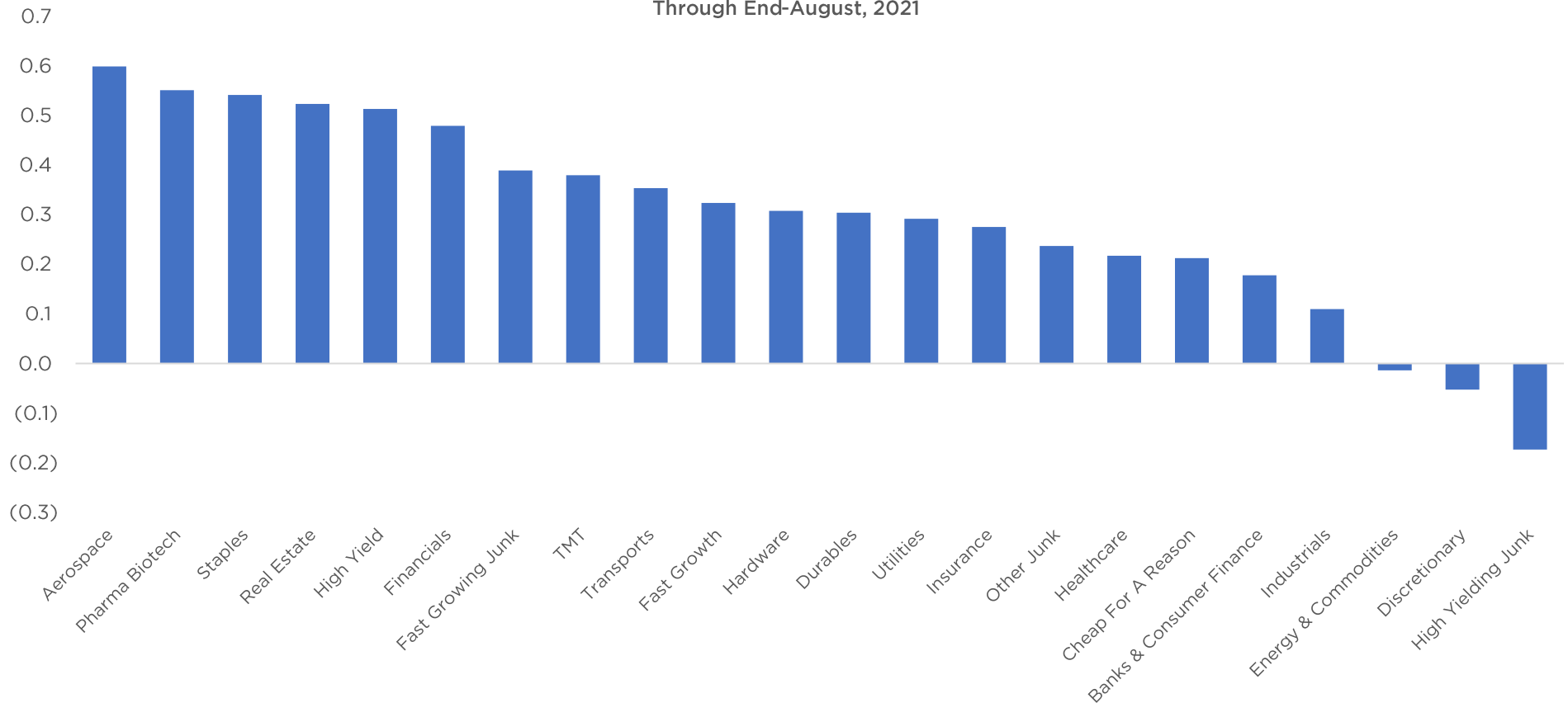
- **Seek to lower volatility of our model performance without losing alpha**
- **Seek to reduce correlation of our recommendations to other traditional L/S funds which often over-index their work to these fundamental events**



CEO CHANGES RESULT IN DECREASED INFORMATION RATIOS

Below we show how our model performance is impacted by stocks where there are new CEOs. Often, the new CEOs inherit a situation that is difficult to improve, and sometimes their prior track-record causes investors to be anticipatory of change. Either way, the efficacy of our models is largely enhanced by removing these stocks for six months

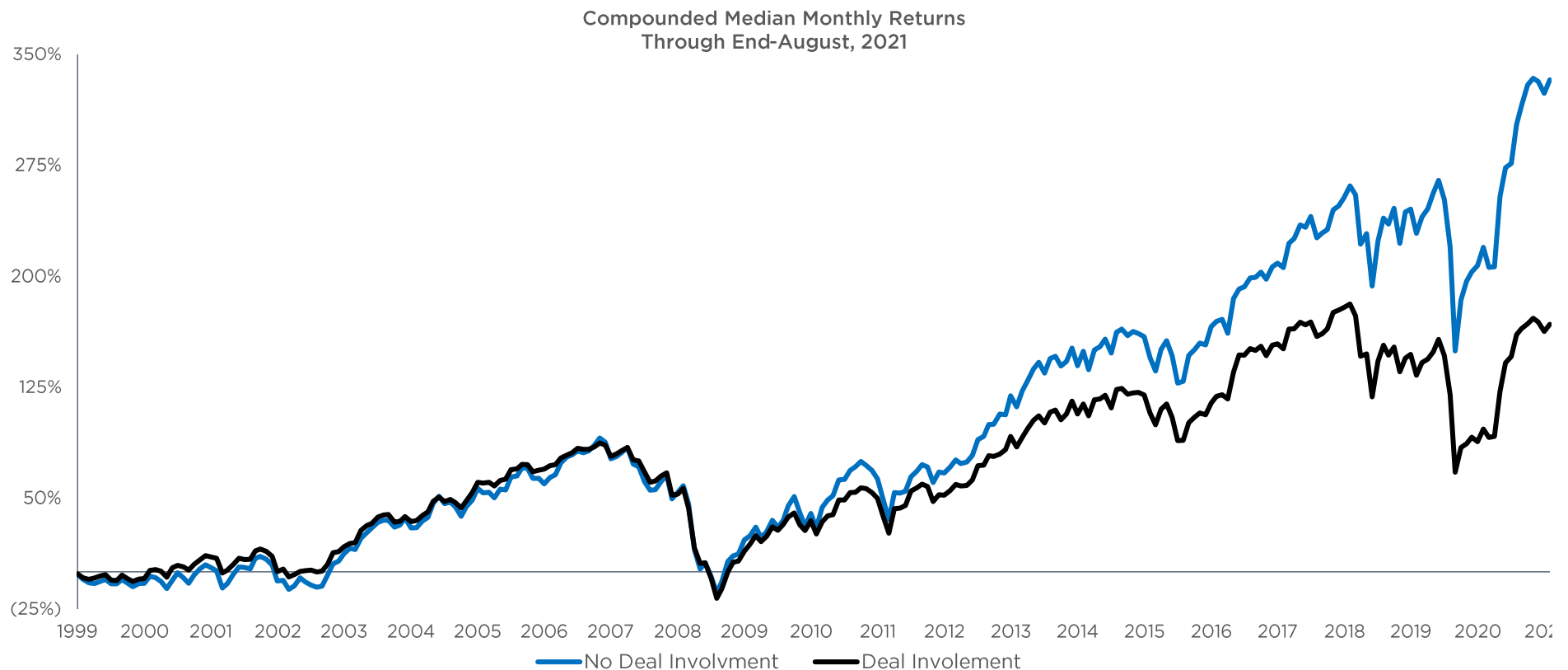
Difference in Information Ratio of Median Monthly Return
Names with CEO Unchanged vs. Changed, US T3000
Through End-August, 2021





DEAL STOCKS IN AGGREGATE UNDERPERFORM

In addition to removing new CEOs, we also know that quantitative models are less likely to work on stocks where there are large deals – basically the pro forma financials of the new entity render parts of our modeling process useless. In addition, the basket of stocks doing deals that are more than 20% of their market capitalization underperform the companies with no deal involvement, further supporting our judgment to “not be involved”





After our quantitative models, macro-enhancement and removal of systematic fundamental events, we can provide value to investors through customized risk management



FINAL INVESTMENT ADVICE- WHAT ARE WE DOING?

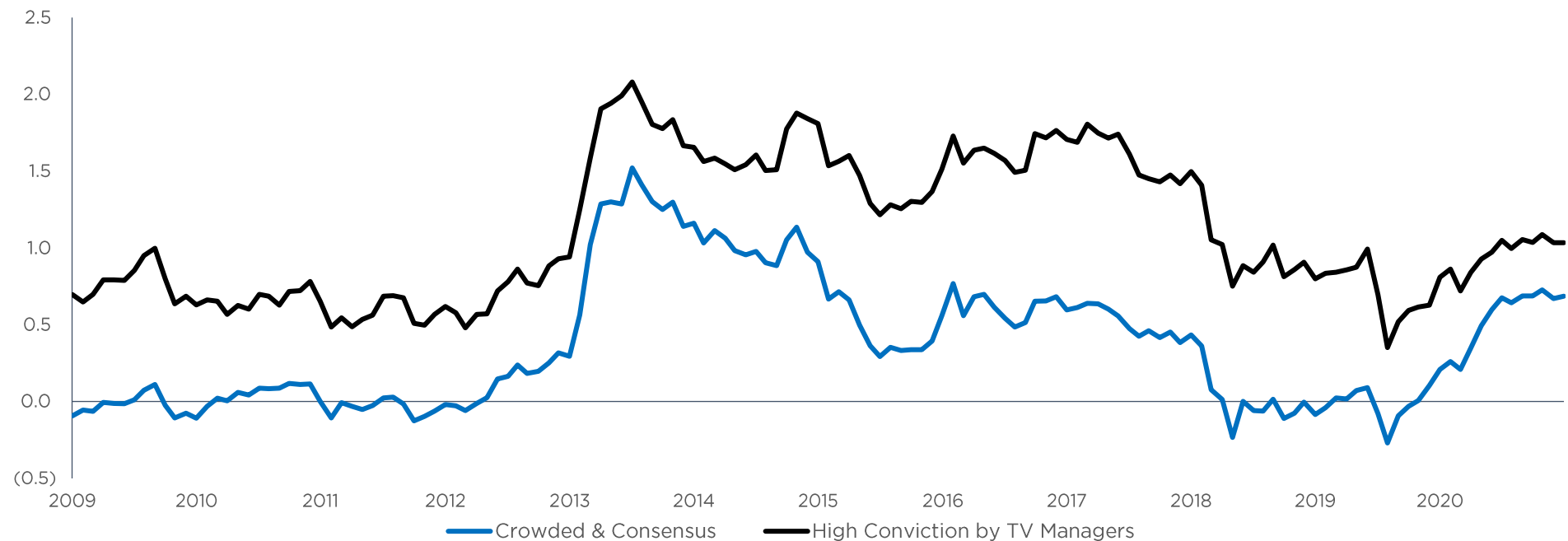
- **Analyzing 13F filings for crowding:** We created a proprietary universe of hedge fund managers that we know and respect and defined a basket of their “high conviction” ideas – we think investors should avoid certain crowded names, and buy other names that are “high conviction” and out of consensus
- **Optimizing portfolios:** we can run a client’s portfolio through our proprietary optimizer to make stock and sizing recommendations
- **Differentiating risk management:** We feel that using an optimizer makes our advice analytically rigorous relative to traditional long / short funds. Relative to quantitative funds, we believe creating our own custom approach lowers the probability that our recommendations are the same as those guided or forced by funds who buy the same store-bought code
- **We offer bespoke risk management to our clients – please contact us if interested**



FOCUS ON HIGH CONVICTION AND OUT-OF-CONSENSUS IDEAS

We analyze the high conviction (3% or more of long AUM) names from a select and custom group of 60 hedge fund managers. We then compare their holdings to the rest of the investment universe, and search for “out-of-consensus” high conviction ideas. This group (black line) has a substantially higher information ratio than the high conviction consensus names (in blue)

Rolling 5-Year Information Ratio of Median Monthly Returns
Through End-August, 2021



SELECT QUANTITATIVELY-DERIVED LONG / SHORT IDEAS



We offer 10 long and 10 short ideas derived from our models

Select Long and Short Ideas September 13, 2021

Longs				Shorts			
Ticker	Company Name	Industry Group	Market Cap (\$ US. Bil)	Ticker	Company Name	Industry Group	Market Cap (\$ US. Bil)
GOOGL	Alphabet Inc.	Media & Entertainment	1885.29	NET	Cloudflare, Inc.	Software & Services	39.83
PFE	Pfizer Inc.	Pharmaceuticals, Biotechnology & Life Sciences	255.61	KR	The Kroger Co.	Food & Staples Retailing	31.75
NOW	ServiceNow, Inc.	Software & Services	128.39	WY	Weyerhaeuser Company	Real Estate	26.03
CI	Cigna Corporation	Health Care Equipment & Services	69.62	SPLK	Splunk Inc.	Software & Services	24.85
COF	Capital One Financial Corporation	Diversified Financials	69.40	MPWR	Monolithic Power Systems, Inc.	Semiconductors & Semiconductor Equipment	22.69
CRWD	CrowdStrike Holdings, Inc.	Software & Services	59.79	BR	Broadridge Financial Solutions, Inc.	Software & Services	19.74
MNST	Monster Beverage Corporation	Food, Beverage & Tobacco	50.73	TAP	Molson Coors Beverage Company	Food, Beverage & Tobacco	9.93
IQV	IQVIA Holdings Inc.	Pharmaceuticals, Biotechnology & Life Sciences	49.92	YETI	YETI Holdings, Inc.	Consumer Durables & Apparel	8.73
CLR	Continental Resources, Inc.	Energy	13.95	VNO	Vornado Realty Trust	Real Estate	7.71
AEM	Agnico Eagle Mines Limited	Materials	13.44	TOL	Toll Brothers, Inc.	Consumer Durables & Apparel	7.46

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