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TRIVARIATE RESEARCH

FAANGM – RISK MANAGEMENT NOT ALPHA

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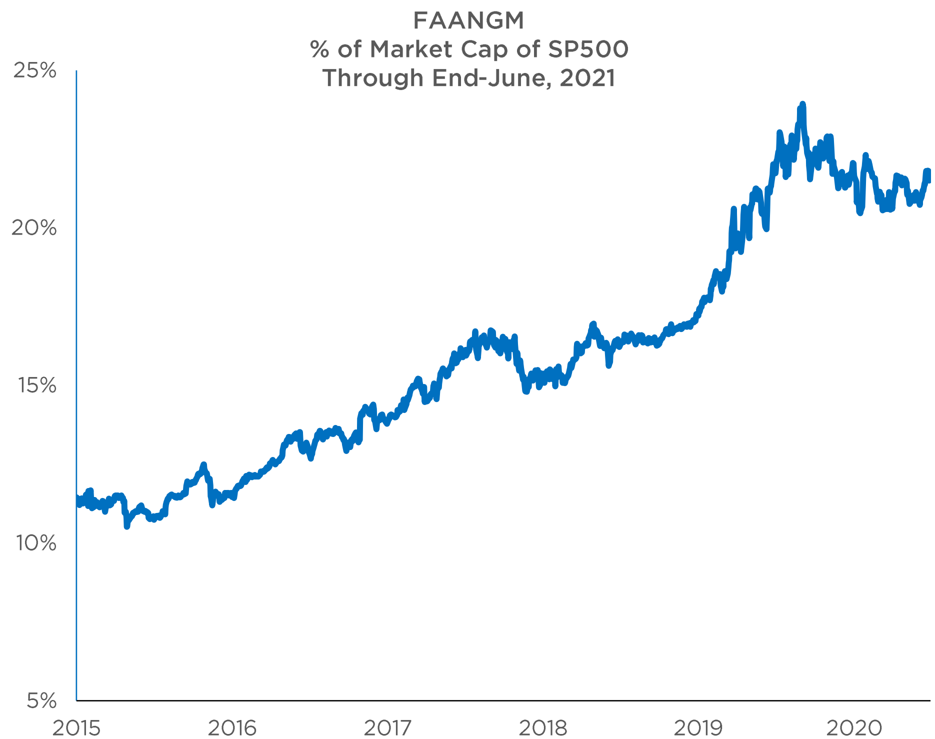
HOW SHOULD YOU THINK ABOUT FAANGM? RISK NOT ALPHA

- FAANGM (Facebook, Apple, Amazon, Netflix, Google, and Microsoft) is 22% of the market capitalization of the SP500 , the size of financials and consumer discretionary sectors combined. Would you own neither of those sectors?
- Macro factors now explain more than 60% of the average FAANGM stock's returns, and close to 80% for MSFT and AMZN. Being a "bottom-up" stock picker is not the answer when it comes to FAANGM exposure
- Given macro factors matter more than ever to their outlook, we searched for an explanation. We studied dollar, oil, rates, spreads and other variables for consistent and statistically significant relationships to FAANGM's returns and found only inconsistent and fleeting relationships. While there was recent bout of statistical significance around bear steepening, that has now dissipated. FAANGM now is barely a growth bet, and no longer a quality bet
- We then tried to isolate the stock-specific part of FAANGM's returns. We were able to find a 10-stock, monthly-rebalanced replication basket that, would require large overweight positions in relatively high correlation stocks, but require a lot of turnover and lag FAANGM. Identifying a basket that has a sustained low correlation to provide a hedge is not practical
- The drawdowns of FAANGM are less dramatic than the top five market capitalization names in most other sectors. Our conclusion is investors, including value investors, should own FAANGM near benchmark-weight for risk reasons and generate alpha per unit of risk elsewhere. You can't replicate the macro part, it's impractical to replicate the company-specific part, you can't hedge the company-specific part, and it is hard to have a differentiated view, given 231 buy ratings out of 263 total ratings on FAANGM

FAANGM IS 22% OF THE MARKET

Over the last five years FAANGM has grown from over 10% of the SP500 market capitalization, to over 20% (left exhibit). The net result is that they not only provide some support for the elevated market valuation, but they in and of themselves are now a risk management challenge. For any long-only firm, or even a net long hedge fund, it is a huge risk to have no exposure. If FAANGM were a unique sector it would be bigger than all but information technology, and roughly the size of financials and consumer discretionary combined (right chart). For some reason, there are investors that are comfortable being naked FAANGM, but would never own no financials and consumer discretionary. Thinking about them as risk not alpha is important

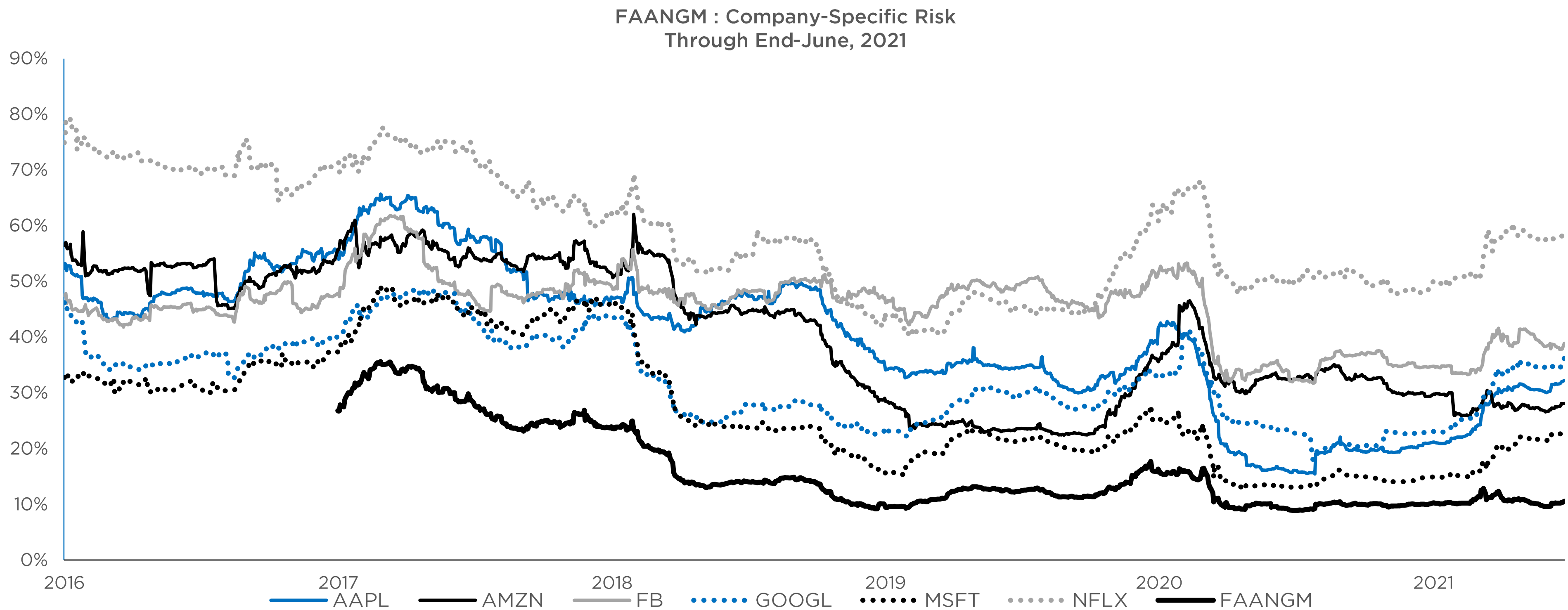


**Percentage of Top 3000 US Equities Market Cap.
Through End-June, 2021**

Sector	Percentage of Market
Information Technology	26.4%
FAANGM	**21.8%**
Health Care	13.0%
Consumer Discretionary	12.7%
Financials	11.5%
Communication Services	10.7%
Industrials	9.3%
Consumer Staples	5.7%
Real Estate	3.2%
Materials	2.8%
Energy	2.7%
Utilities	2.2%

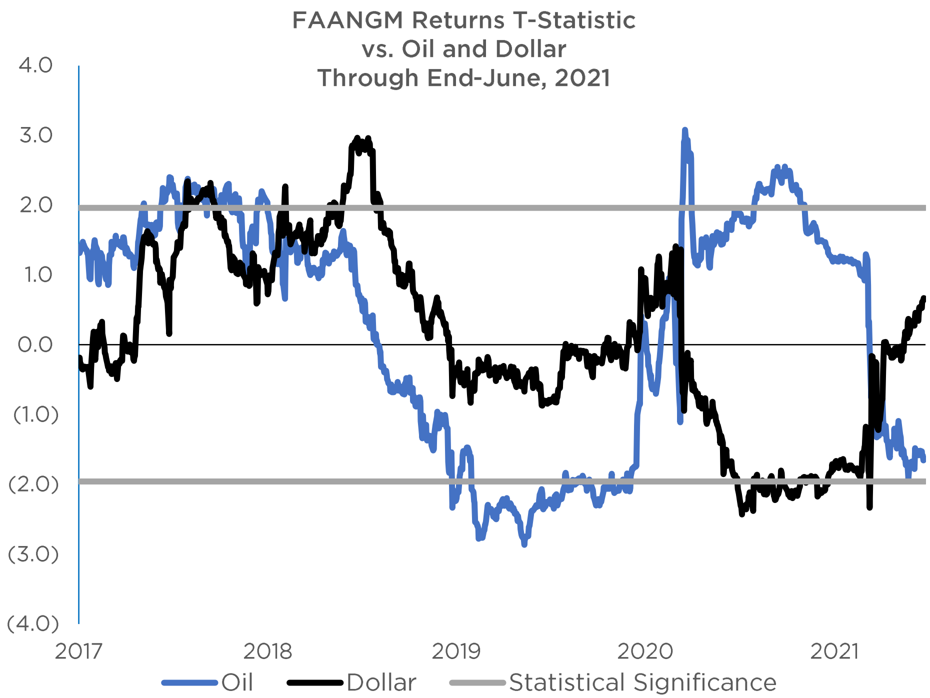
IF YOU OWN FAANGM, YOU AREN'T JUST A BOTTOM-UP STOCK PICKER

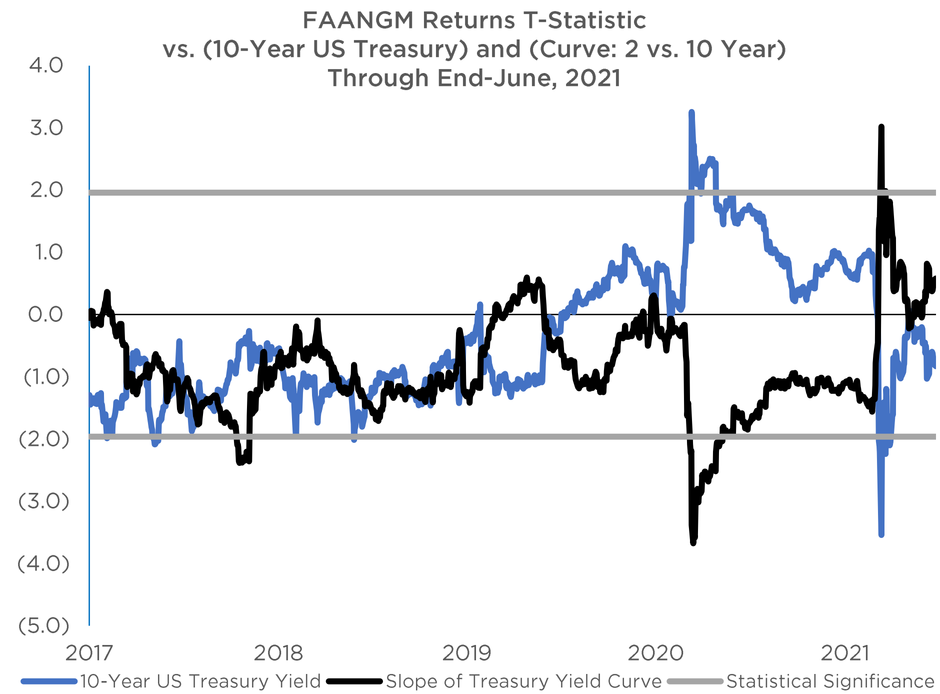
We silently protest when we meet someone who says, "I am a bottom-up stock picker and don't do any macro or quant", and then details their huge positions in FAANGM stocks. Why? We analyzed the amount of each of the stocks' returns we could explain from macro factors using our proprietary seven-factor model (equity market beta, two size factors, style, substance, liquidity, and price momentum).and what is left over we refer to as "company-specific risk." We can explain well more than 60% of each of FAANGM's returns through these basic macro factors, and closer to 80% of AMZN and MFST's. NFLX, which is way smaller and probably should be dropped from the acronym, remains the most idiosyncratic of the lot. In fact, the combined cap-weighted basket is now 89% explained by these macro factors. If you own FAANGM, you cannot say you are just a bottom-up stock picker!



BUT THERE ARE NO PERSISTENT MACRO RELATIONSHIPS

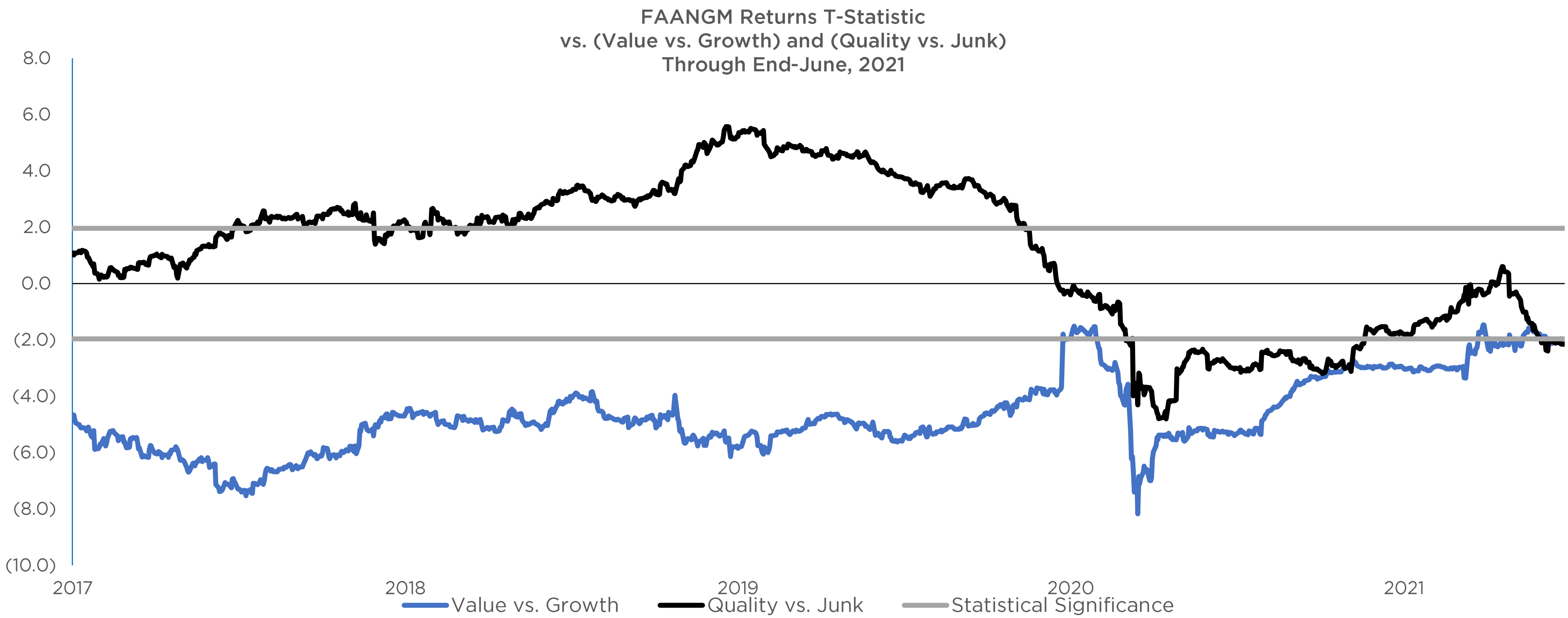
Since so much of the cap-weighted basket's returns are explained by macro variables, we evaluated FAANGM's returns to look for statistically significant relationships to macro variables, above and beyond our 7-factor model. Limited evidence exists for any sustained statistically significant relationships (t-stats +/- 1.96 are the thresholds below). We observe brief periods of oil being good or bad for FAANGM's returns, and brief periods of a strong dollar being good or bad for FAANGM's returns (left exhibit). On the right below, we show a limited historical relationship to the slope and level of the interest rate curve, until a strong relationship formed briefly at the beginning of COVID and again in late February during the initial states of the bear steepening, only to dissipate since. We do not think investors will be as nervous about FANNGM during any future bear-steepening "scares", as less of their overall value is in the terminal relative to other parts of the market. Frankly, using a macro hedge to isolate FAANGM's company-specifics is not sensible





A SHADE LESS GROWTH AND NOT AS HIGH QUALITY AS YOU THINK?

The signals that have persistent statistically significant explanatory power of FAANGM's returns are style (value vs. growth) and substance (quality vs. junk). For instance, when value beats growth, that is typically directionally negative for FAANGM's returns (T-stat strongly above statistical significance threshold on average), and when quality beats junk FAANGM usually performs well. While these relationships were strong over the past few years, today, there is a modest NEGATIVE statistically significant relationship between FAANGM returns and quality vs. junk, a relationship that has totally reversed in the last 18 months. The growth-value relationship is at its lowest level in years, saving a short period in 2020, and is hovering right at the statistical significance threshold



THE DRAWDOWNS ARE NOT HIGH COMPARED TO TOP 5 IN SECTORS

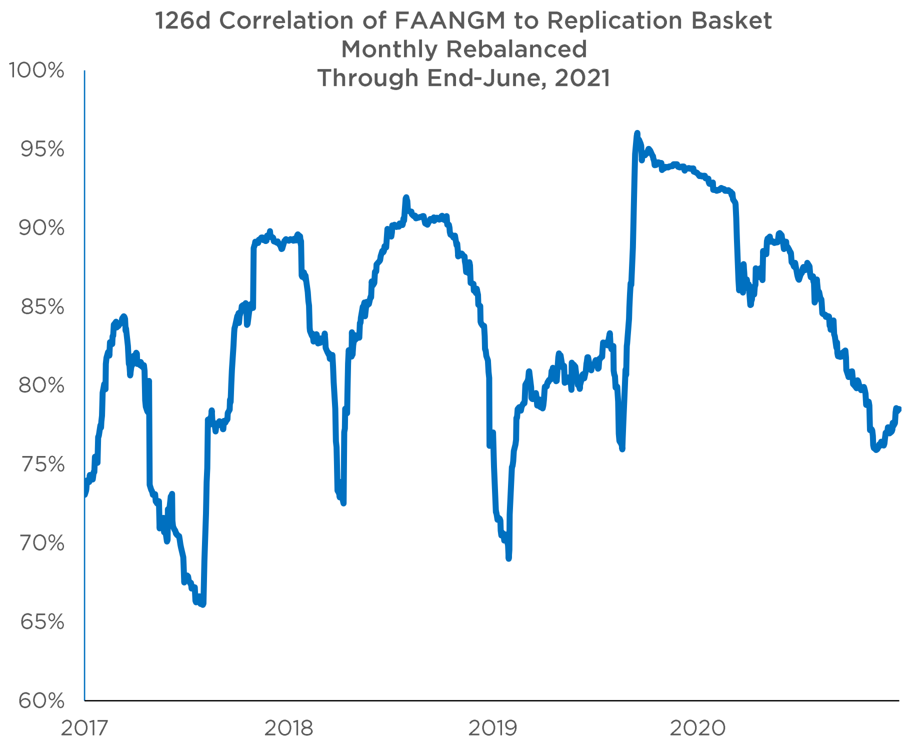
We looked at the maximum monthly beta-adjusted drawdowns of the biggest five stocks in any sector and compared that to the cap-weighted maximum monthly drawdown of FAANGM since the beginning of 2016. Below we show the median stock drawdown during the 3rd worst month (bottom 5%) of the 63 months we analyzed. The biggest five names in many sectors have had worse monthly drawdowns than FAANGM, suggesting the risk of holding FAANGM is not that substantial despite the size. Holding the largest five stocks in energy, REITS, or utilities was historically far worse

Top 5 Market Cap. Names Per Sector
2.5th Percentile Monthly Drawdown Since January of 2016

Sector	Beta-Adjusted Returns
Materials	(4.9%)
Consumer Discretionary	(5.3%)
Industrials	(5.6%)
Communication Services	(6.2%)
FAANGM (Cap-weighted)	**(6.3%)**
Information Technology	(6.4%)
Consumer Staples	(7.0%)
Health Care	(7.2%)
Financials	(8.0%)
Utilities	(8.6%)
Real Estate	(8.9%)
Energy	(14.0%)

THERE IS LIMITED POTENTIAL TO REPLICATE FAANGM

If the macro part isn't replicable, and the drawdowns aren't bad, can we at least replicate the company-specific part? We attempted to create a replication for FAANGM by taking the ten most correlated stocks to the basket each month. On average, 86% of the stocks remained in the basket for the next month, though that number has been lower recently (left chart). The correlation has oscillated materially, indicating there is some potential to replace some of FAANGM with an alternative basket, though high turnover is required, likely making implementation impractical. The most recent list of FAANGM replication stocks are largely in software and services, generally with very high betas (right chart)

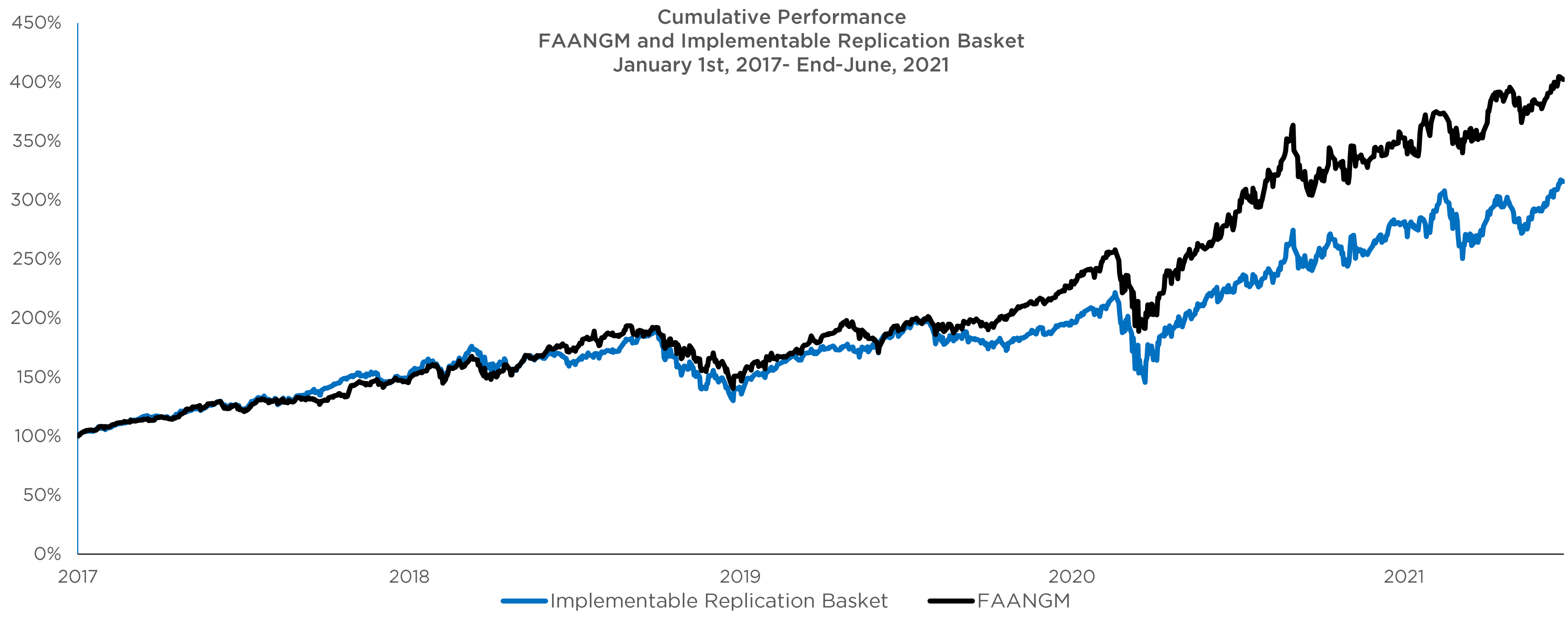


Ten Stocks With the Highest Correlation to FAANGM
End-June, 2021

Ticker	Company	Sector	Industry Group	Market Cap (US $ Bil.)	Beta
NVDA	NVIDIA Corporation	Information Technology	Semiconductors & Semiconductor Equipment	498.03	1.77
PYPL	PayPal Holdings, Inc.	Information Technology	Software & Services	344.96	1.38
ADBE	Adobe Inc.	Information Technology	Software & Services	282.23	1.26
AVGO	Broadcom Inc.	Information Technology	Semiconductors & Semiconductor Equipment	193.97	1.61
INTU	Intuit Inc.	Information Technology	Software & Services	133.07	1.29
IDXX	IDEXX Laboratories, Inc.	Health Care	Health Care Equipment & Services	53.89	1.14
SNPS	Synopsys, Inc.	Information Technology	Software & Services	41.80	1.53
CDNS	Cadence Design Systems, Inc.	Information Technology	Software & Services	38.15	1.55
ANSS	ANSYS, Inc.	Information Technology	Software & Services	30.43	1.45
VRSN	VeriSign, Inc.	Information Technology	Software & Services	25.75	0.87

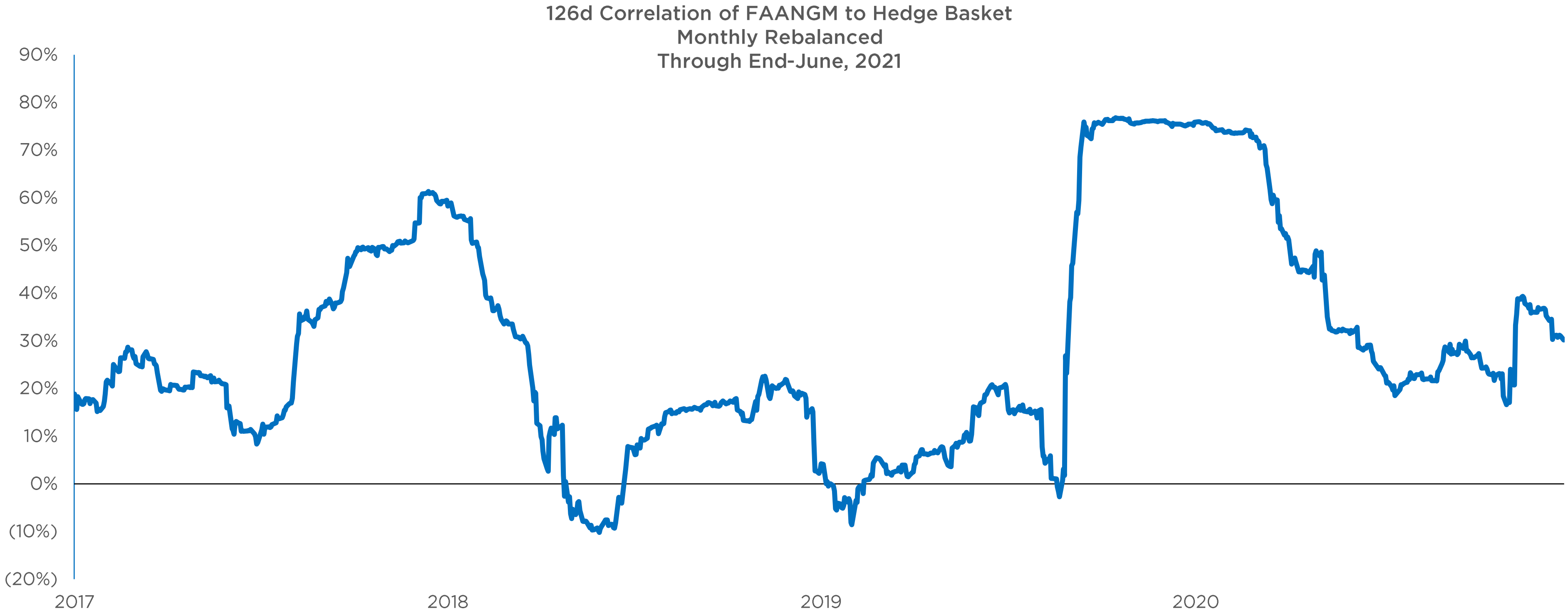
THE PERFORMANCE OF THE REPLICATION BASKET LAGS

From 2017 to present, the cap-weighted FAANGM basket is up 407%. Our monthly-rebalanced 10-stock replication basket, penalized a compounded 1bp a day for trading costs, performed 321% over that same time frame. Would anyone really want a high beta technology basket with high turnover to replicate far lower performance than FAANGM created, especially given how big the positions would have to be?



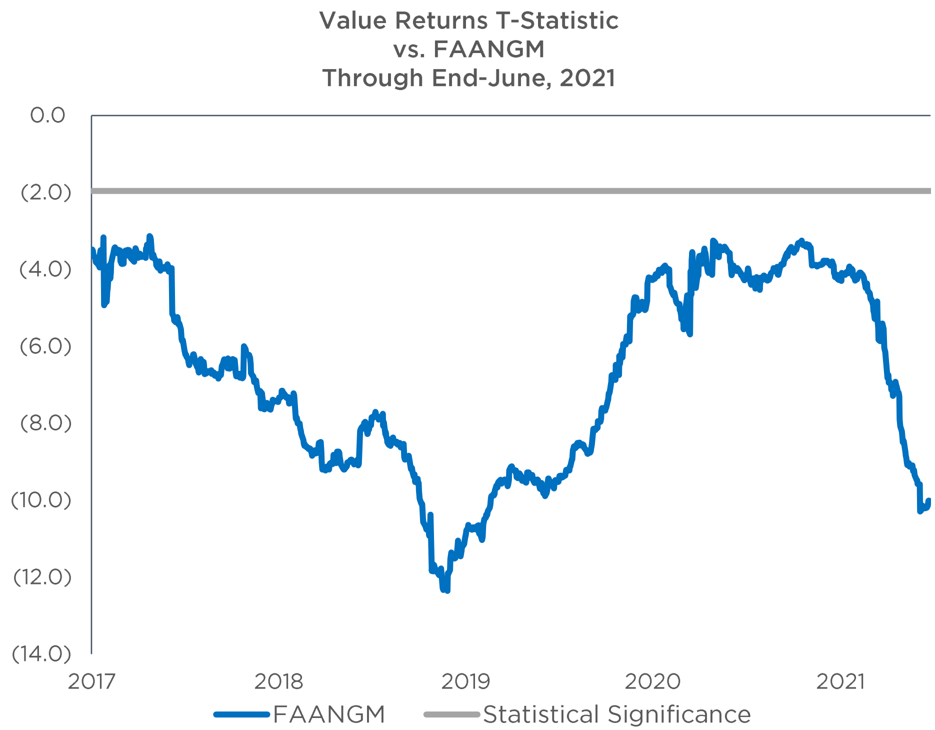
NO BASKET OF SUSTAINED LOW CORRELATION TO FAANGM EXISTS

We then thought if we can't find a sustained macro relationship, and we can't find a reasonably implementable replication basket, maybe there is another basket of low correlation stocks we can at least buy to hedge out some of the risk. Hence, we created a basket of stocks with the 10 most negative (or low) correlation to FAANGM, rebalanced monthly. While the correlation was averaging zero to FAANGM since 2017, the correlation went to 0.75 during the height of the pandemic, indicating that creating an anti-FAANGM basket is difficult, and even worse, a potential Texas hedge during bad market times. Moreover, if you run a long only portfolio, you would have massive positions in these stocks to create an effective hedge



VALUE INVESTORS SHOULD NOT IGNORE FAANGM

A value investor recently told us that the smaller part of FAANGM in their index was a signal to them they did not need to own any FAANGM. This motivated us to investigate the relationship between FAANGM and the value factor. FAANGM maintains a statistically significant relationship with the Value factor (left), above and beyond the equity market beta and two size factors. When FAANGM outperforms, value can be expected to underperform. Together, these four factors can explain nearly 90% of value universe's returns (right), though this has been increasing as we get further from the March 2020 bottom which drove idiosyncratic risk down everywhere. Our view is it is good risk management to own market-weight positions in aggregate of FAANGM for value investors as well to protect from large growth-stock outperformance



OUR CONCLUSION –FAANGM IS A RISK BET, NOT AN ALPHA ONE

We conclude from all our analysis that FAANGM is a risk bet, not an alpha one. Can a bottom-up analyst really have a differentiated view? Below we show the sell-side coverage, which is extensive and very optimistic. There are 231 buy recommendations and only 9 sell recommendations of the 263 current ratings on the FAANGM stocks. From the hedge fund perspective, we systematically access the high conviction (3% or more of their long AUM) basket of 60 hedge funds (2nd column from right) and see how many own each name. We do the same for the rest of the hedge fund industry (right column). 17 of the 60 we follow have more than 3% of their long AUM in MSFT and FB, 0 in AAPL. AMZN appears as the highest conviction among "other" hedge funds. Our own prior work on risky technology stocks shows some agreement with the analysts, as AAPL screens relatively risky on several metrics. As such, our view is to be market-weight the FAANGM group, with lower than that market-weight in AAPL and modestly higher in the rest

FAANGM Attributes
End-June, 2021

Ticker	Buy/Outperform	Hold	Underperform/Sell	Number of Trivariate Funds High Conviction	Other Funds High Conviction
AAPL	32	8	2	0	40
AMZN	46	1	0	16	83
FB	43	5	2	17	80
GOOGL	44	1	0	14	54
MSFT	36	2	0	17	75
NFLX	30	6	5	4	14

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