June 9, 2017

Tactical Considerations

Is 'FANG' mispriced?

Equity Research

A Factor, Portfolio and Risk Case Study

Unintended Consequences of Outperformance

While FANG has dominated investor focus, the nature of the acronym has expanded more broadly to encompass mega-cap tech. Indeed, the bigger story in our view is FAAMG – Facebook, Amazon, Apple, Microsoft and Alphabet – a group of five stocks which have been the key drivers of both the SPX & NDX returns year-to date. This outperformance, driven by secular growth and the death of the reflation narrative, has created positioning extremes, factor crowding and difficult-to-decipher risk narratives (e.g. FAAMG's realized volatility is now below that of Staples and Utilities).

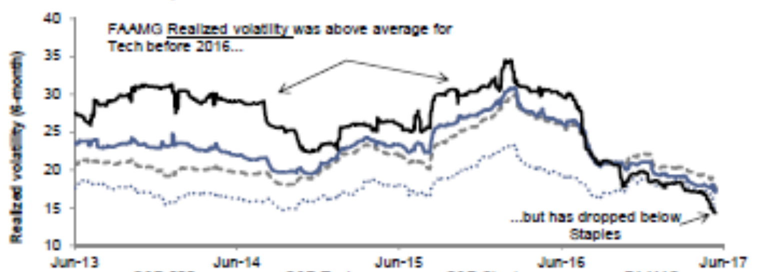
Through the Factor Looking Glass: Mega Tech's Impact

FAAMG, as well as Tech more broadly, is increasingly correlated with both Growth and Momentum. While this phenomenon may persist given portfolio managers' "FOMO," passive carry and the lack of any pro-cyclical policy wins or movement in risk assets (e.g. 10-year) mean reversion risk is increasing. Also worth watching: the current P/E of our long/short Momentum factor is 1.8 std. deviations above its 3-year average – a level last seen in early 2016 prior to "Factormageddon." We see factor valuation is a useful gauge of investor sentiment and crowdedness with downside risk increasing when factor valuations are stretched vs. history.

Is FAAMG the New Staples? Remember "Min Vol" – its Back…

FAAMG stocks are cyclical growth stocks that have increasingly been treated like stable Staples with a similarly negative correlation to interest rates and even lower realized volatility. These "min vol" characteristics could draw incremental flow into the stocks but can just as easily reverse.

FAAMG realized vol is not only below the SPX, but is also below Staples
6M realized volatility



Source: Goldman Sachs Group Inc. As of June 5, 2017.

Goldman Sachs & Co. LLC

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Goldman Sachs & Co. LLC

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Tale of the Tech Tape

FAAMG vs. Tech Bubble

A head-to-head comparison of the top 5 TMT names in the S&P 500, now vs. then

SIZE
Advantage: A Draw
(SPX weight: 13% vs. 16%)

VALUATION
Advantage: FAAMG
(23x vs. 60x)

CASH BALANCES
Advantage: FAAMG
(8x more cash)

FCF
Advantage: FAAMG
(400bps higher on a yield basis)

ASSET PRODUCTIVITY
Advantage: Tech Bubble
(32% vs. 45%)

PM Summary: Is Resistance to Mega-Tech Futile?

In the absence of growth, you buy growth. Makes sense. Indeed, notions of fiscal stimulus, pro-cyclical policy and central bank tapering have fallen to the wayside as quickly as they came into the narrative in Q4:16. It is against this backdrop that five companies poised to dominate disruption – Facebook, Amazon, Apple, Microsoft and Alphabet – have added a total of $600 bn of market cap this year (Exhibit 1) or the equivalent GDP of Hong Kong and South Africa combined. Parallels to the "Nifty-Fifty" and 1999-2000 are growing as their performance is even more pronounced on a risk-adjusted basis. However with this success have come unintended portfolio consequences for investors. To help frame the debate for investors, we note:

- **Ownership.** Per our US Portfolio Strategy team, all five stocks are currently in the top 10 of the Hedge Fund VIP basket with Facebook, Amazon and Alphabet holding the top 3 spots. Mutual funds across Core, Growth and Value are also overweight all but Apple and the five names combined are 11.8% of holdings vs. a blended benchmark of 11.2%.
- **FAAMG through the Factor Lens**: A strong relationship with our Investment Profile (IP) Growth and Momentum factors should come as no surprise, but FAAMG also increasingly trades like Low Vol. Indeed, FAAMG's correlation over the last 5 years to Growth, Volatility and Momentum sits in the 92%, 90% and 96th%ile. Further Momentum as a factor, in isolation, has built a valuation bubble underneath it not seen since 'Factormageddon' of last year.
- Realized Volatility (6m) for FAAMG has fallen over the last year and is currently not only below that of the average stock in the S&P 500 **but is also below the average Consumer Staples & Utilities stock** ignoring any potential cyclical, regulatory (e.g. antitrust, online activity) or tech disruption risk.
- Like many other asset classes, FAAMG is cueing off 10-year bond yields, but not in the direction you might expect. Post the election, **correlation turned negative**, which is more analogous to a bond proxy/yield sector such as Staples or Utilities.
- Within the NDX, Biotech is the largest non-Tech sector (now 8%). While the space tends to be positively correlated to Tech and secular growth, it has recently turned negative.

Exhibit 1: SPX and NDX returns are increasingly dependent on five Tech stocks
FAAMG YTD performance and index contribution, as of June 7, 2017

Ticker	YTD Price Perf (%)	% of SPX	% of SPX Move	% of NDX	% of NDX Move	Market Cap Created ($,bn)	Equivalent to the Mkt Cap of:
AAPL	34%	4%	13%	12%	18%	200.1	CMCSA
GOOGL	26%	3%	7%	9%	11%	145.4	IBM
AMZN	35%	2%	6%	7%	11%	125.1	UPS + KR
FB	33%	2%	5%	5%	8%	111.0	BA
MSFT	16%	3%	5%	8%	7%	78.7	MS
Top 5		13%	37%	42%	55%	660.4	
S&P 500/Total	9%					1,808.1	

FAAMG is 13% of the SPX but responsible for ~40% of the YTD perf.

FAAMG is 42% of the NDX but responsible for ~55% of the YTD perf.

Note: For purpose of this exercise we combine GOOGL and GOOG.

Source: FactSet, Bloomberg, Goldman Sachs Global Investment Research.

A note on NFLX and NVDA: Netflix and NVIDIA are often included in the acronym, but they are not large enough (yet) to have a significant impact on the SPX (current weights are 0.4% and 0.3% respectively). We discuss further on page 10.

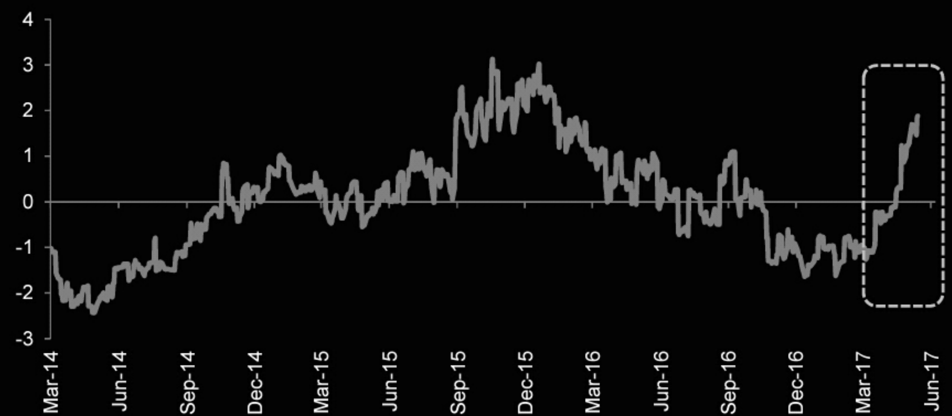
Note: For purposes of calculating correlations, FAAMG is market-cap weighted whereas it is equal-weighted for volatility.

Tale of the Factor Tape: When Momentum and Growth Become One

Our proprietary GS IP Factor Methodology and description is detailed in the Appendix.

Driven by the rise of mega-tech, Momentum, as a factor, has built a valuation air pocket underneath it creating cause for pause. Indeed, in our view, factor valuation is a useful gauge of investor sentiment and crowdedness. Our work shows that downside risk increases when factor valuations are stretched vs. history. To that end, the current P/E of the long/short Momentum factor is 1.8 std. deviations above its 3-year average, which is a level last seen in early 2016 just prior to "Factormageddon" – a period in late Q1:16 when the momentum factor fell sharply amidst a spike in factor volatility. See *"Factor Review & Outlook: The Value Trade, Momentum & Crowding," January 4, 2017.*

Exhibit 2: Momentum is becoming increasingly crowded
Valuation of Momentum (6 month Leaders vs. Laggards): # of Std. Dev. Above/Below 3-year avg.



Source: Goldman Sachs Global Investment Research.

What is driving this? Keep in mind that momentum will regularly be re-populated with the strongest performers across the market. So it should be no surprise that **Momentum is increasingly trading like Growth**, which is up 15% YTD, the best performing factor by a wide margin. Currently, **Growth has the highest correlation with Momentum** when compared to other long/short factors and is **in the 95th percentile** vs. the last five years.

In addition, the correlation between **Tech and both Momentum and Growth** is elevated vs. history, likely a reflection of investors seeking out secular opportunities not reliant on Washington DC's policy agenda. See Exhibits 3-4.

Exhibit 3: Growth's correlation with Momentum (3m) is at the highest levels relative to the last five years…
3-m Correlation (daily) between Long/Short factors with Performance Leaders (Top 20%) relative to coverage

	3 Month Correlation				
Factor & Market Leaders	Curr.	Pre-Elec (Nov 8)	Diff.	5Y Med.	5Y %ile
Growth	60%	24%	36%	10%	95%
Integrated	20%	-36%	56%	9%	65%
Balance Sheet	13%	-45%	58%	21%	36%
Financial Returns	5%	-37%	42%	16%	39%
Size	-12%	-41%	29%	10%	35%
Short Interest	-15%	-27%	12%	11%	22%
Volatility	-30%	-41%	11%	-4%	33%
Value	-47%	-19%	-28%	-28%	15%

Source: Goldman Sachs Global Investment Research. As of June 6, 2017.

Exhibit 4: …and so is Tech's correlation with Momentum and Growth
3-m Correlation (daily) between Long/Short factors with GICS Level 1 sectors. Top/bottom 5 pairs

	3 Month Correlation			1 Year Correlation		
Factor & Sector	Current Correl	5Y Med.	5Y %ile	Current Correl	5Y Med.	5Y %ile
Momentum vs. Tech	52%	6%	100%	20%	12%	94%
Volatility vs. Utilities	50%	41%	69%	58%	41%	83%
Volatility vs. Staples	46%	56%	21%	65%	57%	80%
Growth vs. Tech	46%	14%	96%	36%	11%	100%
Size vs. Utilities	45%	25%	83%	46%	25%	90%
Short Interest vs. Materials	-38%	-4%	5%	-17%	-1%	30%
Balance Sheet vs. Materials	-43%	-22%	21%	-31%	-21%	36%
Volatility vs. Materials	-44%	-33%	23%	-39%	-37%	36%
Size vs. Materials	-50%	-23%	4%	-32%	-23%	36%
Balance Sheet vs. Energy	-52%	-35%	29%	-51%	-24%	31%

Source: Goldman Sachs Global Investment Research. As of June 6, 2017.

FAAMG through a Factor Lens

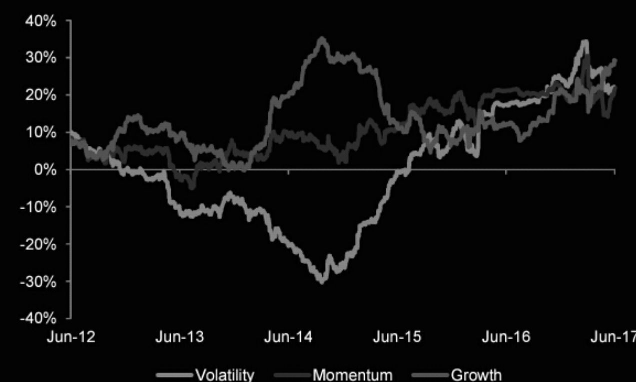
While not exactly a Fields Medal worthy observation, we note that FAAMG is positively correlated with Growth and Momentum and this relationship has strengthened in recent months. The bigger anomaly, however, is that FAAMG is almost as highly correlated with Low Vol (as measured by standard deviation of 1Y daily price returns), which is not a characteristic typically associated with cyclically driven TMT names. There is a rationale behind this uptick in correlation as these companies have actually some of the lowest vol names across the market. This is another key area where FAAMG should be differentiated from "N" (Netflix) and "N" (NVIDIA) where volatility is higher than the average stock.

Exhibit 5: FAAMG Correlation with Growth, Momentum and Volatility is high relative to the last five years…
Correlation based on daily returns, trailing 12 months

	1 Year Correlation (Based on Daily Returns)			
FAAMG vs. GS IP Factor	Current Correl	Pre-Elec (Nov 8)	5Y Median	5Y %ile
Growth	**29%**	15%	12%	92%
Returns	**27%**	30%	7%	82%
Volatility	**22%**	22%	0%	90%
Momentum	**22%**	22%	9%	96%
Size	**20%**	22%	-1%	81%
Integrated	**18%**	21%	4%	75%
Balance Sheet	**18%**	31%	9%	78%
Short Interest	**16%**	15%	5%	81%
Value	**-35%**	-30%	-16%	2%

Source: Goldman Sachs Global Investment Research. As of June 5, 2017.

Exhibit 6: …and is now positively correlated with Low Vol, which is an anomaly
Correlation based on daily returns, trailing 12 months



Source: Goldman Sachs Global Investment Research. As of June 5, 2017.

Exhibit 7: How FAAMG stacks up relative to Sectors and the Broader Market
GS Investment Profile Quintiles (1=Top 20%, 5=Bottom 20%), as of June 6, 2017

	Sector Relative								
	Fundamental					Technical			
Ticker	Growth (1=High; 5=Low)	Financial Returns (1=High; 5=Low)	Value (1=Cheap; 5=Expensive)	Integrated (1=High; 5=Low)	Balance Sheet (1=Strong; 5=Weak)	Momentum (1=High; 5=Low)	Size (1=Big; 5=Small)	Volatility (1=Low; 5=High)	Short Interest (1=Low; 5=High)
FB	3	2	3	2	2	3	1	2	1
AAPL	5	1	2	2	3	1	1	1	1
AMZN	2	1	4	1	4	2	1	1	1
MSFT	4	3	2	1	4	3	1	1	2
GOOGL	3	3	2	2	1	3	1	1	2
NFLX	2	3	5	3	5	1	1	3	3
NVDA	1	1	5	2	1	1	1	5	1

	Coverage Relative								
	Fundamental					Technical			
Ticker	Growth (1=High; 5=Low)	Financial Returns (1=High; 5=Low)	Value (1=Cheap; 5=Expensive)	Integrated (1=High; 5=Low)	Balance Sheet (1=Strong; 5=Weak)	Momentum (1=High; 5=Low)	Size (1=Big; 5=Small)	Volatility (1=Low; 5=High)	Short Interest (1=Low; 5=High)
FB	1	1	5	1	1	1	1	1	1
AAPL	5	1	1	2	1	1	1	1	1
AMZN	1	2	5	2	1	1	1	1	1
MSFT	2	1	4	1	1	2	1	1	1
GOOGL	1	2	4	1	1	1	1	1	1
NFLX	1	4	5	4	4	1	1	4	4
NVDA	1	1	5	1	1	1	1	5	1

Based on our Investment Profiling framework detailed in the appendix. (1) Sector relative refers to a market neutral and sector neutral position vis a vis our coverage, (2) Coverage relative removes the sector overlay.

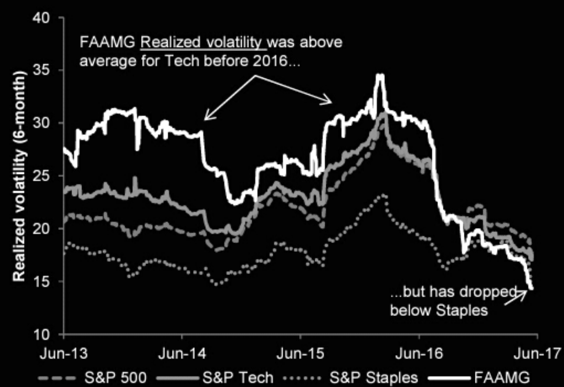
Source: Goldman Sachs Global Investment Research.

Are FAAMG the New Staples?

FAAMG stocks are cyclical, growth stocks that have increasingly been treated like stable Staples. Indeed from 2013-2016, FAAMG stocks had a realized volatility that was 5 pts higher than the average Tech stock. Steady sales growth, rising cash balances and limited market shocks have dampened realized volatility to the point that they now look more like Consumer Staples than Tech stocks. While volatility is subdued across the market, **if FAAMG was its own sector, it would screen as having the lowest realized volatility in the market.**

How can low vol create a problem? Investors are increasingly focused on "volatility-adjusted" returns as they are deciding which stocks to invest in. We believe low realized volatility can potentially lead people to underestimate the risks inherent in these businesses including cyclical exposure, potential regulations regarding online activity or antitrust concerns or disruption risk as they encroach into each other's businesses. Mechanically, we expect that as the realized volatility of a stock drops, more passive "low vol" strategies buy the stock, pushing up the return and dampening downside volatility. The fear is that if fundamental events cause volatility to rise, these same passive vehicles will sell and exacerbate downside volatility.

Exhibit 8: FAAMG realized vol is less than Staples
Average 6m realized volatility, as of June 5, 2017



Source: Goldman Sachs Group Inc., Bloomberg.

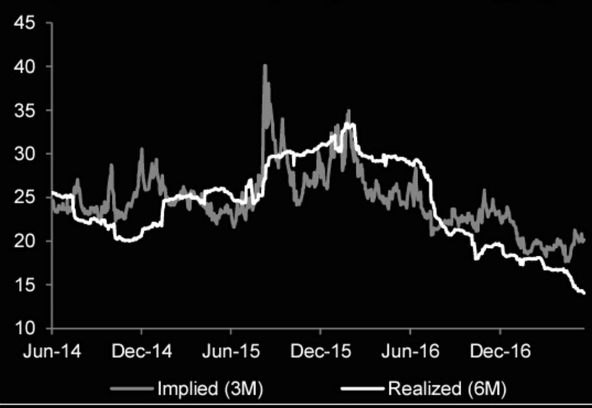
Exhibit 9: Realized vol is depressed across sectors
Average 6m realized volatility, as of June 5, 2017

		Realized Volatility (6m)		
Sector	**Ticker**	**Current**	**1Y %ile**	**5Y %ile**
Energy	XLE	20.8	1.0%	14.7%
Materials	XLB	19.2	0.2%	3.8%
Health Care	XLV	17.5	0.2%	0.0%
Discretionary	XLY	17.9	0.6%	0.1%
Financials	XLF	17.9	0.6%	8.9%
Tech	XLK	16.9	0.2%	0.0%
Industrials	XLI	16.8	0.2%	1.2%
Staples	XLP	14.6	0.2%	0.0%
Utilities	XLU	14.2	0.2%	18.8%
FAAMG		**14.0**	**0.6%**	**0.1%**
S&P 500	**SPX**	**17.1**	**0.2%**	**0.0%**

Source: Goldman Sachs Group Inc., Bloomberg.

Does the market expect FAAMG low volatility to continue? The options market is not pricing FAAMG volatility to remain this low. FAAMG average 3-mo implied volatility of 20% is 6 points above recent realized and has been rising after hitting a low in May. Investors are pricing that FAAMG volatility over the next three months will be above the average stock in 6 of the 9 major sectors, including the S&P Tech sector (XLK).

Exhibit 10: The Implied vs. Realized Disconnect
3M implied vol based on cap-weighted FAAMG aggregation



Source: Goldman Sachs Group Inc.

Exhibit 11: FAAMG Implied Vol is in-line with the XLK
3M implied volatility, as of June 5, 2017

		Implied Volatility (3m)		
Sector	**Ticker**	**Current**	**1Y %ile**	**5Y %ile**
Discretionary	XLY	21.5	18%	7%
Energy	XLE	21.4	6%	10%
Materials	XLB	20.8	7%	11%
FAAMG		**20.3**	**27%**	**6%**
Tech	XLK	20.0	24%	5%
Financials	XLF	19.2	9%	20%
Industrials	XLI	18.8	10%	11%
Health Care	XLV	18.4	7%	2%
Staples	XLP	16.2	9%	13%
Utilities	XLU	14.0	1%	8%
S&P 500	**SPX**	**19.2**	**9%**	**7%**

Source: Goldman Sachs Group Inc.

Staples (XLP) and Utilities (XLU) as a Proxy … Biotech as a Bonus

While FAAMG continues to be most closely tied to Tech (XLK) and Discretionary (XLY), it has also started trading more closely with Staples (XLP) and Utilities (XLU). This correlation turned positive following the US Presidential Election and is near the highest level in five years. This is a departure from history when the relationship was inverted.

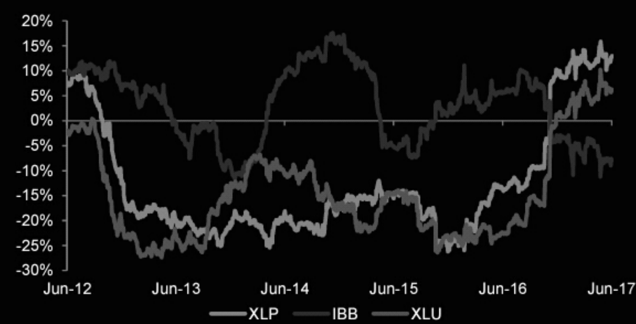
A side note on Biotech: Within the NDX, Biotech is the largest non-Tech sector (now 8%). While the space tends to be positively correlated to Tech, it has recently turned negative. See Exhibit 13.

Exhibit 12: FAAMG correlation with Sectors
Correlation measured using daily performance (rel. to SPX)

	1 Year Correlation (Based on Daily Returns)				
FAAMG vs. Sector ETF	Current Correl	Pre-Elec (Nov 8)	Diff.	5Y Median	5Y %ile
XLK	**81%**	79%	2%	78%	81%
XLY	**16%**	37%	-21%	13%	57%
XLP	**13%**	-4%	17%	-17%	98%
XLU	**6%**	-11%	18%	-17%	97%
XLV	**-7%**	-12%	6%	-14%	80%
IBB	**-8%**	2%	-10%	4%	8%
XLE	**-26%**	-25%	-1%	-23%	15%
XLB	**-29%**	-38%	9%	-17%	24%
XLF	**-44%**	-27%	-16%	-24%	10%
XLI	**-46%**	-37%	-8%	-23%	7%

Source: Goldman Sachs Global Investment Research. As of June 5, 2017.

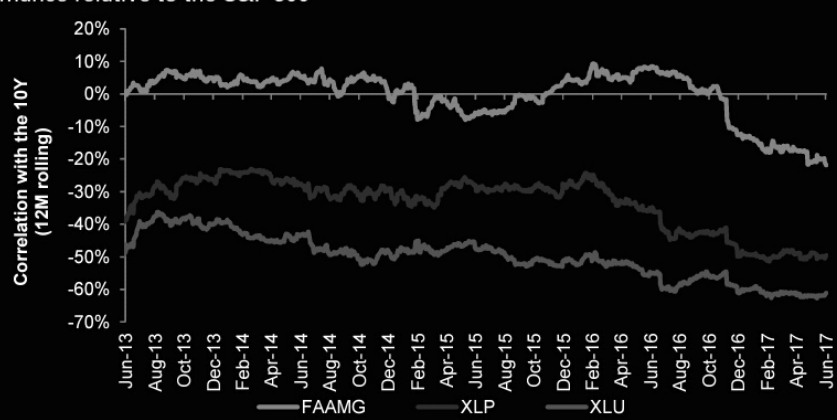
Exhibit 13: FAAMG vs. Biotech
Correlation measured using daily performance (rel. to SPX)



Source: Goldman Sachs Global Investment Research. As of June 5, 2017.

Similarly, Large-cap Tech stocks are not typically the first area investors think of as a yield proxy (especially as only AAPL and MSFT among the group even pay dividends), and yet they are increasingly trading like one. **Since November, correlation has turned negative suggesting that higher bond yields, typically associated with stronger growth, will weigh on stocks while falling bond yields are a good thing.** This runs counter to history when correlations have tended to run modestly positive, as one would expect for economically sensitive areas.

Exhibit 14: Staples/FAAMG Correlation with the 10Y
Performance relative to the S&P 500



Source: Goldman Sachs Global Investment Research. As of June 5, 2017.

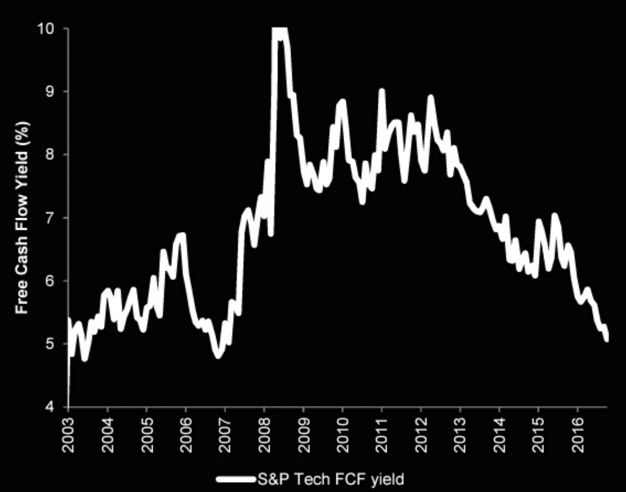
A Word on Cash (Flow) ….

There is no doubt that robust cash generation and the resulting war chests of liquidity have been a boon for investor interest in the tech sector. While materially respecting the sheer scope of dollars at work here, we note two things: 1.) Free Cash Flow growth has slowed as the "Race to the Cloud" has propelled Mega-Tech Tech to become some of the biggest Capex spenders across the market and 2.) Stocks prices have continued to go up, driving the FCF yield to the lowest level in a decade and Cash as a % of EV to plateau.

Free Cash Flow generation within the S&P Tech sector doubled from 2006-2016, but has since plateaued. While strong cash flow generation was supportive of equity valuations over the prior decade, we see the recent rise in equities as less supported by fundamentals.

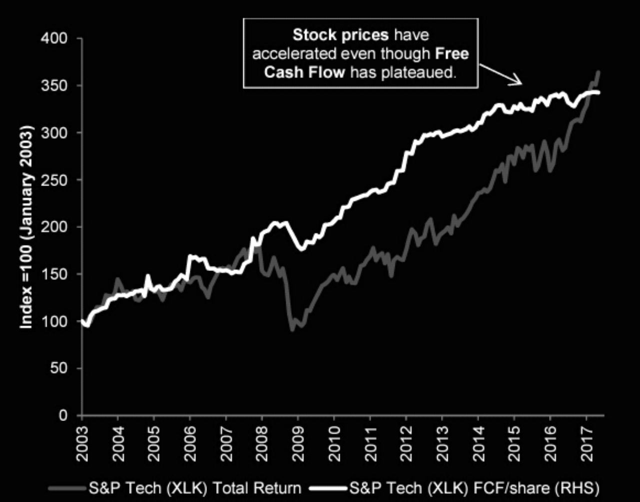
Over the decade ending in 2016, the S&P Tech sector generated an average FCF yield of 7%, fueling dividends, buybacks and cash balances on balance sheets. Over the past year, rising stock prices and more spending on Capex have eroded this annual cash generation.

Exhibit 15: XLK FCF Yield is at decade lows…
XLK FCF Yield, 2013-2017



Source: Goldman Sachs Global Investment Research.

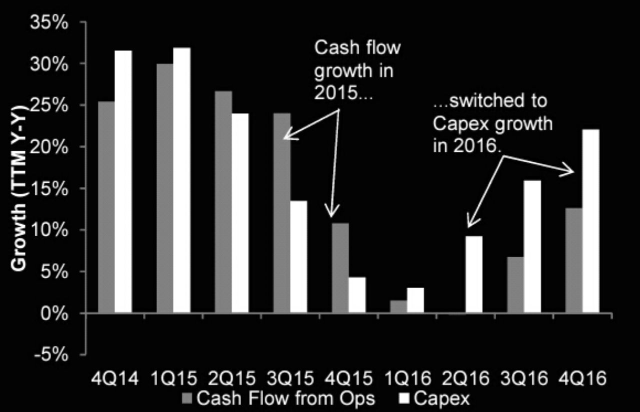
Exhibit 16: …as it has plateaued while prices are rising
XLK FCF vs. share price, indexed to 100



Source: Goldman Sachs Global Investment Research.

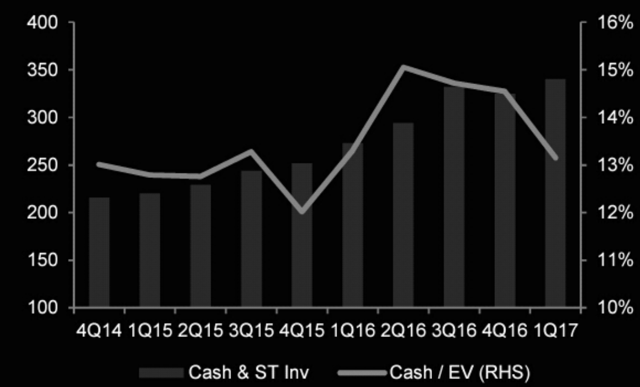
Digging deeper into the FAAMG fundamentals, we can see that strong growth in Cash Flow from Operations as recently as 2016 has now given way to a spending spree on Capex. Over the past 12 months, Capex grew at 17% y-y while Cash Flow from Operations grew at less than 10%. Investors are increasingly reliant on capex to drive future growth in earnings and cash flows. Given the length of the current expansion, we believe relying on expansion is increasingly risky. At the same time, cash levels have plateaued, both in absolute terms and as a percent of market cap.

Exhibit 17: Cash flow has slowed while spending is up
YoY growth in FAAMG Cash Flow vs. Capex



Source: FactSet, Goldman Sachs Global Investment Research.

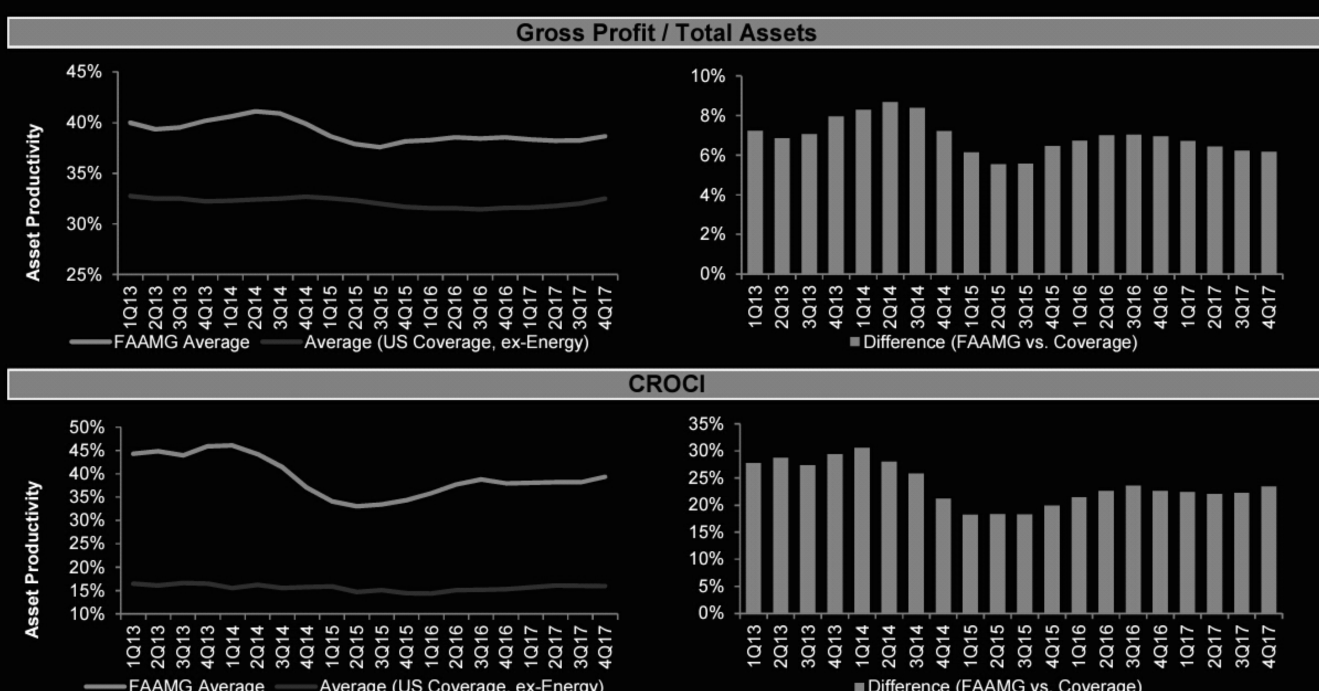
Exhibit 18: Cash has flat-lined
Total Cash ($ bn) vs. Cash / EV for FAAMG



Source: FactSet, Goldman Sachs Global Investment Research.

One could argue, however, that spending is likely to generate strong future growth as long as returns and asset productivity remain at high levels. FAAMG screens well on these measures relative to the rest of the market, though the relative advantage has narrowed somewhat over the last six quarters. CROCI (Cash Return on Cash Invested) remains our preferred financial returns metric given it negates the impact of a company's capital structure and depreciation policy. For measuring asset productivity we see Gross Profit/Total Assets as a better proxy for future profitability as items such as R&D and sales & marketing are more like investments than expenses, and discretion exists on how accounting is applied in these cases.

Exhibit 19: While Asset Productivity and CROCI are higher than average, the premium has recently narrowed/plateaued
Equal weighted average GP/TA and CROCI



Source: Goldman Sachs Global Investment Research.

A Lesson in History: FAAMG vs. the Tech Bubble

The recent run in large-cap tech stocks has evoked memories (nightmares?) for some investors of the last euphoric NASDAQ run including yours truly who was stationed out at the GS offices on Sand Hill Road. Below we offer a head-to-head comparison of the five largest Tech stocks at the peak to FAAMG today on a numbers of different metrics including size, valuation, profitability and free cash flow. We note:

- **Size – a draw**: While the current FAAMG stocks are almost 30% bigger than the Bubble stocks in market cap terms, they aren't as large a portion of the index (~16% of the S&P at the peak, vs. FAAMG at 13% today).
- **Valuation – Advantage: FAAMG**: During the Bubble, the five largest Tech stocks traded at almost 60x FY2 P/E with the "cheapest" stock (LU) trading at 36x. Currently, FAAMG trades at around 23 X FY2, with only one stock (AMZN) trading over 30x.
- **Cash balances – Advantage: FAAMG**: All the FAAMG stocks have significantly more cash than the Tech stocks did back in the Bubble by an order of almost 8x. The difference is also significant as a percentage of enterprise value (13% for FAAMG vs. 2% for Tech in the Bubble).
- **Free Cash Flow – Advantage: FAAMG**: As mentioned on page 7, FCF generation for FAAMG stocks is still relatively robust, though has plateaued recently. Despite this slowdown, FCF margins still stack up modestly better than Tech. However, the real difference emerges in favor of FAAMG on a yield basis (reflecting the stretched valuation levels), where the current aggregate is 400 bp higher.
- **Profitability– Advantage: Tech Bubble**: Asset productivity (Gross Profits / Total Assets) was significantly higher for the Tech Bubble stocks than FAAMG today, likely an indication that these businesses have gotten more capital intensive over time. Similarly, ROIC was higher though we note this could be skewed by accelerated depreciation practices today. **These strong profitability metrics suggest the Tech Bubble was more a valuation problem than an issue with fundamentals**.

Exhibit 20: The Tech Bubble vs. Now: A Head-to-Head Match-up
Data for the five largest TMT stocks, 1Q2000 vs. today

		Size		Valuation	Cash Balances		Cash Flow		Profitability	
		SPX Weight	Market Cap ($ bn)	P/E (FY2)	Cash + ST Inv.	Cash / EV	FCF Margin	FCF Yield	GP / TA	ROIC
Tech Bubble (as of 1Q00)										
Microsoft	MSFT	4.5%	581	55.1	21,205	4%	34%	1.6%	46%	22%
Cisco Systems	CSCO	4.2%	543	116.8	4,653	1%	31%	1.6%	54%	17%
Intel	INTC	3.6%	465	39.3	11,216	2%	27%	2.8%	43%	21%
Oracle	ORCL	1.9%	245	103.6	2,768	1%	22%	2.2%	95%	43%
Lucent	LU	1.6%	206	35.9	1,709	1%	-2%	-0.5%	47%	12%
Tech Bubble Aggregated		**15.8%**	**2040**	**58.3**	**45,157**	**2%**	**19%**	**1.6%**	**45%**	**16%**
FAAMG (as of 1Q17)										
Apple	AAPL	3.9%	815	14.9	67,101	9%	24%	8.7%	26%	18%
Alphabet	GOOGL	2.8%	587	25.0	92,439	18%	29%	5.1%	35%	15%
Microsoft	MSFT	2.7%	559	21.8	126,018	27%	33%	6.2%	25%	11%
Amazon	AMZN	1.9%	400	89.0	22,392	5%	7%	2.5%	67%	10%
Facebook	FB	1.7%	361	25.2	32,306	8%	43%	3.6%	42%	21%
FAAMG Aggregated		**13.0%**	**2723**	**22.7**	**340,256**	**13%**	**23%**	**5.6%**	**32%**	**15%**
Advantage		**Bubble**	**FAAMG**	**FAAMG**	**FAAMG**	**FAAMG**	**FAAMG**	**FAAMG**	**Bubble**	**Bubble**

Note: All data is aggregated by summing across the five companies. Tech Bubble SPX weights and market cap are as of 3/24/00 (the SPX peak). FAAMG SPX weights, market cap and valuation as of 6/7/17.

Source: FactSet, Bloomberg, Goldman Sachs Global Investment Research.

A Word on NVDA and NFLX

While both NVDA and NFLX have staged impressive rallies YTD (38% and 34%, respectively), neither name (at this point) is large enough to have a dramatic impact on the S&P 500. Despite strong performance, NVDA and NFLX are responsible for less than 3% of the move of the S&P 500 YTD and less than 4% of the move in the NDX (Exhibit 21).

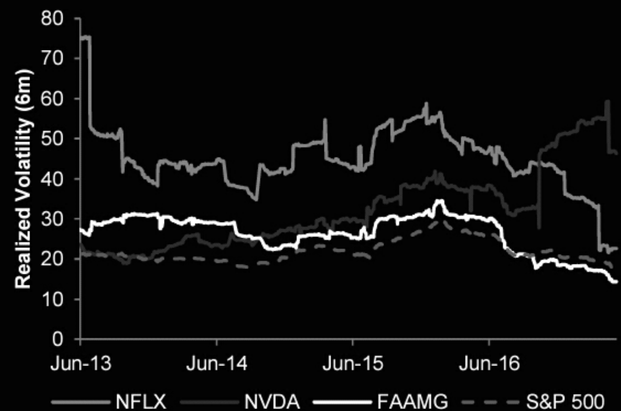
In addition, realized volatility in both NFLX and NVDA stands sharply above the FAAMG stocks as well as the broader market. As Exhibit 22 shows, NFLX realized vol has recently come down but at 22.6 is more than 8 points higher than FAAMG. NVDA realized vol by comparison has moved higher over the last year and is in the 85th percentile vs. the last five years, a rarity across the broader market.

Exhibit 21: NVDA and NFLX have had a smaller index impact than FAAMG
As of June 7, 2017

	NVDA	NFLX
Market Cap ($ bn)	88.7	71.4
YTD Price Perf (%)	40%	34%
Mkt Cap Created YTD ($ bn)	31.2	18.1
% of SPX	0.4%	0.3%
% of SPX Move	1.5%	1.1%
% of NDX	1.2%	1.1%
% of NDX Move	2.1%	1.5%

Source: FactSet, Bloomberg, Goldman Sachs Global Investment Research.

Exhibit 22: NFLX and NVDA realized volatility is higher than the XLK and SPX
6m realized volatility



Source: Goldman Sachs Group Inc.

Appendix: IP Factor Model Methodology

Calculation methodology for the GS Investment Profile (IP) scores:

- The Goldman Sachs Investment Profile (IP Scores) is a tool we use to better understand the investment context for a security by comparing key attributes of that security to the market (i.e., our coverage universe) and sector peers. We leverage our in-house analyst models and estimates, which we believe provide a more forward looking/accurate measurement of company expectations/performance.
- Financial Returns and Value use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters away. Growth uses the value for the fiscal year at least seven quarters away compared with the year at least three quarters away (on a per-share basis for all metrics).
- These metrics are normalized by assigning a Z-score based on the company's position within the overall distribution of all IP scores (assuming a normal distribution). The average of these normalized metrics is taken (or average of the applicable metrics in case of financials) and is then used to generate a percentile score from 1 to 100 for each factor.
- We bucket these company scores into highest quintile (Q1 or top 20%) and lowest quintiles (20%) within each coverage sector, and construct portfolios with an equal number of stocks under Q1 and Q5. The performance of these top and bottom quintile tails, as well as a sector-neutral portfolio (Buy Q1, Sell Q5) of the two, is tracked and rebalanced on a weekly basis.

Measures used in each factor:

- **Financial Returns:** Calculated using an average of return on equity (ROE), return on capital employed (ROCE), and cash return on cash invested (CROCI) for each stock. Only ROE is considered for financial stocks. Top Quintile (Q1): stocks with the highest 20% returns within their coverage sector; Bottom Quintile (Q5): stocks with the lowest 20% returns.
- **Growth:** Calculated using an average of a company's sales, EBITDA and EPS growth. For financials, we use only EPS and sales growth. Q1: stocks with the highest sector relative growth; Q5: stocks with the lowest growth.
- **Value:** Calculated using an average of price/earnings, price/book, dividend yield, enterprise value/EBITDA, enterprise value/free cash flow and enterprise value/debt adjusted cash flow. Only P/E, P/B and dividend yield are used for Financials. Q1: stocks with the lowest multiples within their sector; Q5: stocks with the highest multiples.
- **Integrated:** Calculated as an aggregate score based on Financial Returns, Growth and Value. Q1: stocks with the highest integrated score within their sectors; Q5: stocks with the lowest integrated score.
- **Balance Sheet:** Calculated using net debt/EBITDA (leverage). This is used only for nonfinancial stocks. Q1: stocks with the lowest leverage within their sectors; Q5: stocks with the highest leverage.
- **Momentum:** Based on stock performance over a 6 month look-back period (Q1-Q5). Q1: Sector leaders (top 20% performers); Q5: Sector laggards (bottom 20%).
- **Volatility:** Calculated as the standard deviation of daily total returns over a trailing 12-month period. Q1: stocks with the lowest volatility on a sector relative basis; Q5: stocks with the highest volatility.
- **Size:** Calculated using market capitalization. Q1: Largest 20% stocks on a sector relative basis; Q5: Smallest 20% stocks.
- **Short Interest:** Based on Short Interest Days (SI / ADTV). Q1: Lowest Days-to-Cover; Q5: Highest Days-to-Cover. Based on exchange data which is released with a lag.

Equity Basket Disclosure

The ability to trade the basket(s) discussed in this research will depend upon market conditions, including liquidity and borrow constraints at the time of trade