

Thinking About Technology

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Dr. G. Kevin Spellman, aka “Coach”

David O. Nicholas Director of Investment Management and Senior Lecturer
Investment Management Certificate Program, UW-Milwaukee

www.lubar.uwm.edu/IMCP

1-608-334-2110

spellmankg@gmail.com

www.coachinvesting.com

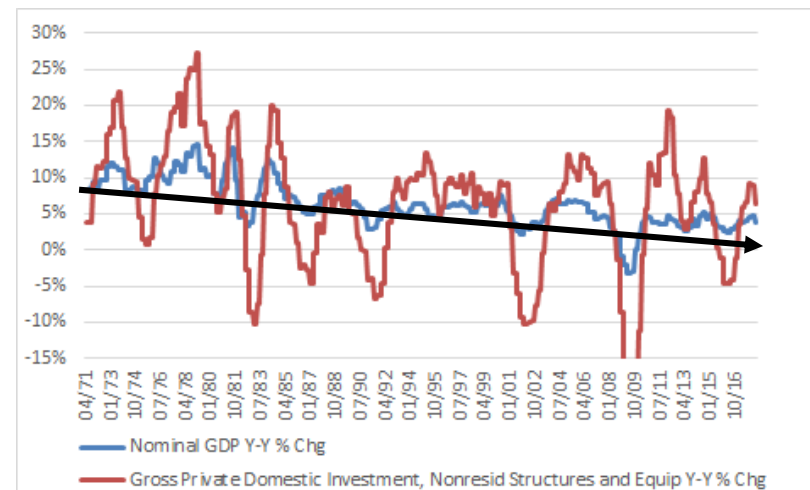


Conclusions

- Contrary to popular opinion
 - Investment spending is nearing a high
 - Long-term investment growth may be tied to productivity, but investment is a contrary short-term indicator
 - Today's big investments may not be leading to productivity gains, just disruptions
 - Investing in technology has not changed over the last 20+ years; large caps and moderation in uses of capital, profitability and growth, and valuation are normally the best performers
 - Technology's share of overall R&D spending is declining as the FAANGs grow in dominance
- Be aware that
 - Technology normally outperforms in up markets, as it is now
 - Earnings leads stocks, and the earnings model, which leads earnings, has peaked
 - Turnarounds in technology are becoming less common as large companies secure positions
 - Productivity is set to rise, which leads to wage growth, which leads to inflation
 - It is more difficult to improve productivity in a service economy
 - Higher profit margins were driven over time by low real wage growth (vs productivity) and lower taxes

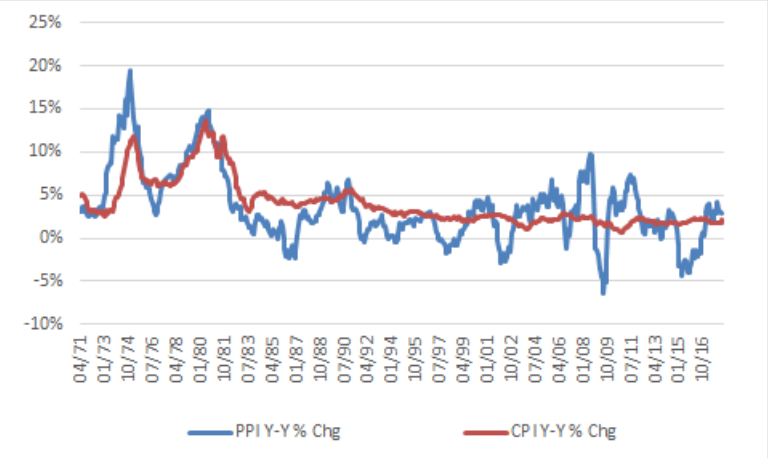
Larry Fink believes low investment spending has driven low economic growth

- 2016 annual letter
 - “Too many companies and governments have *prioritized short-term profits over investments in capital goods, infrastructure, and sensible retirement systems, threatening long-term value creation and economic prosperity.*”
- 2017 annual letter
 - “Without a sense of purpose, no company, either public or private, can achieve its full potential. It will ultimately lose the license to operate from key stakeholders. It will succumb to short-term pressures to distribute earnings, and, in the process, *sacrifice investments* in employee development, innovation, and capital expenditures that are necessary for long-term growth.”
- People believe low investments in structures and equipment is driving low GDP growth

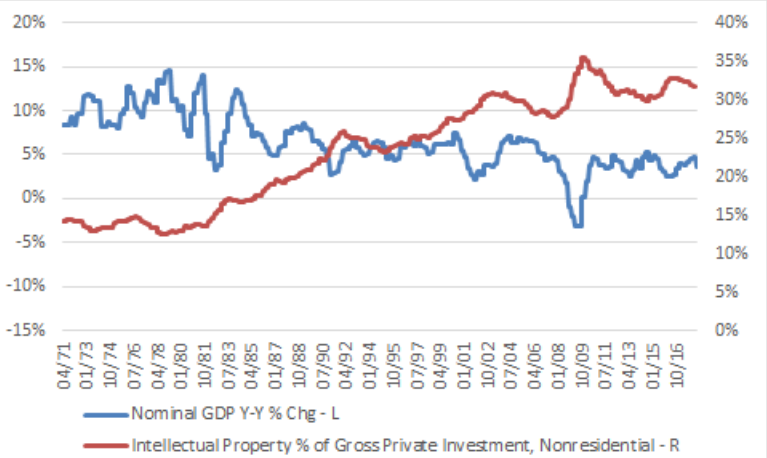


Larry Fink and others may fail to realize...

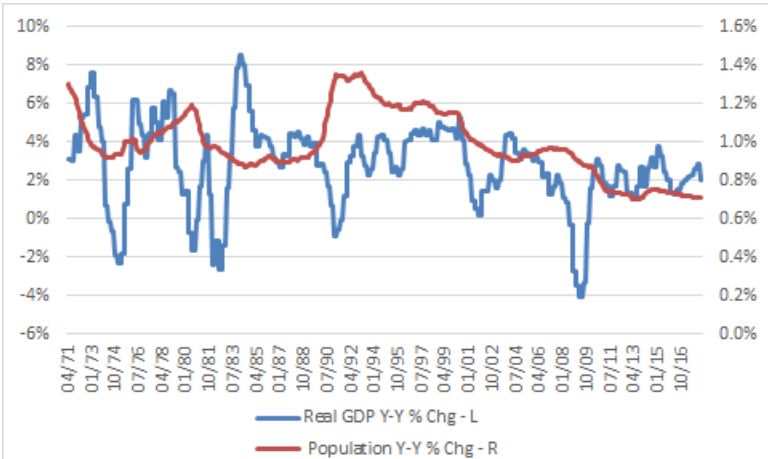
Inflation is much lower than the past, so nominal investment spend should slow



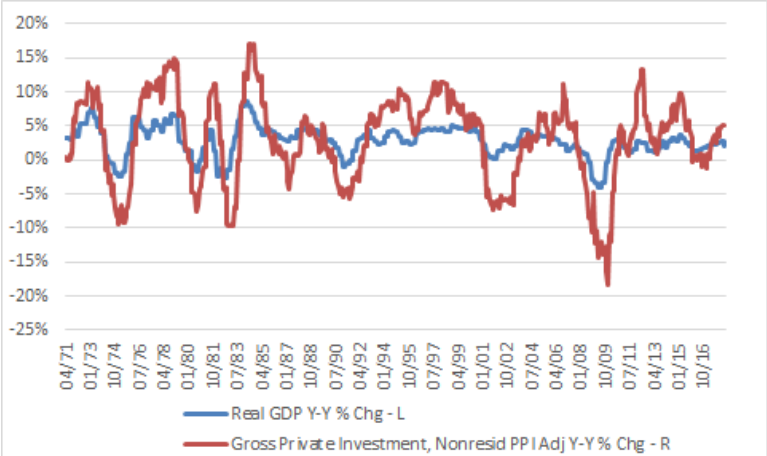
Intellectual investment is rising so you cannot just look at structures and equip



Population growth has slowed, so real GDP should slow



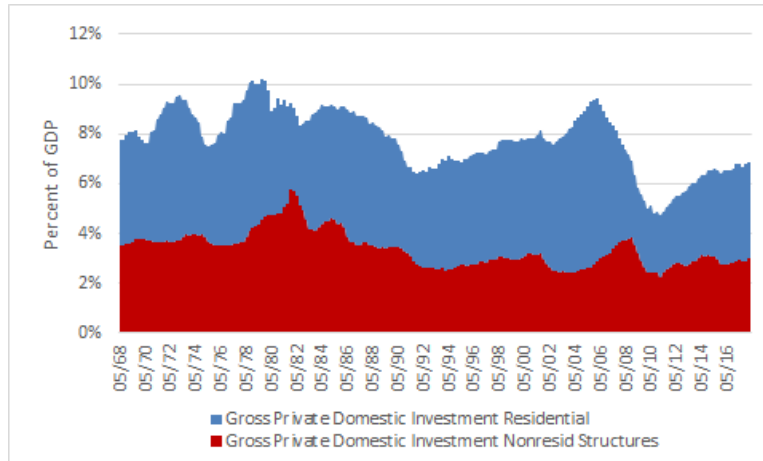
... So inflation adj total nonresid investment is most important and it peaks before recessions



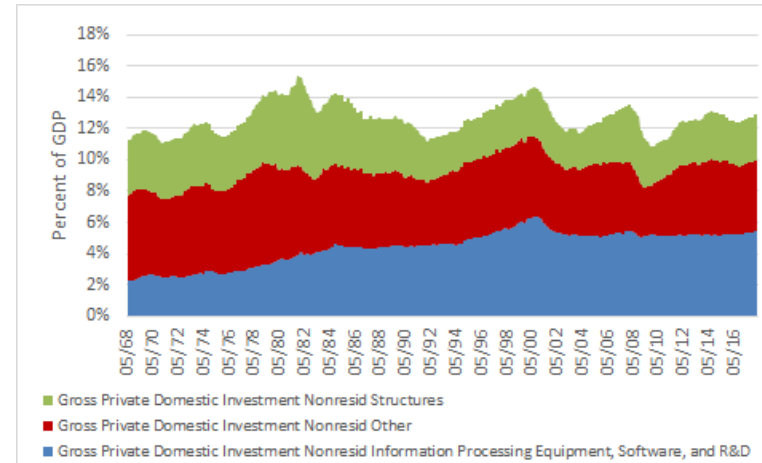
Source: Spellman, FactSet, BEA, Conference Board.

Investments in structures appears low, but add technology and spending is robust

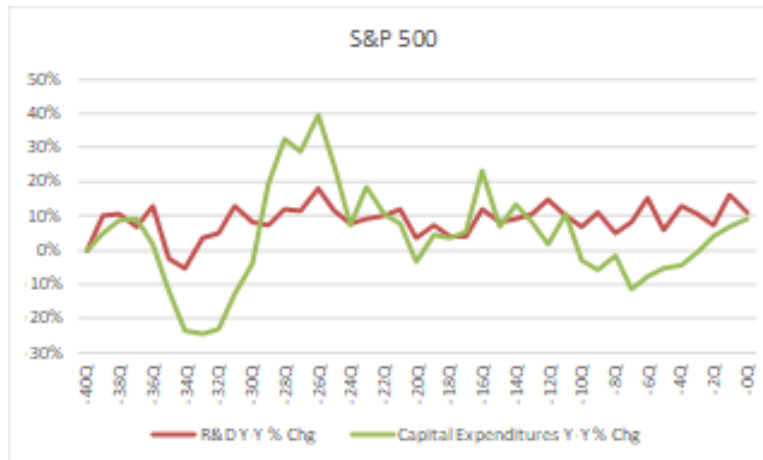
Structure investment is low, primarily driven by residential



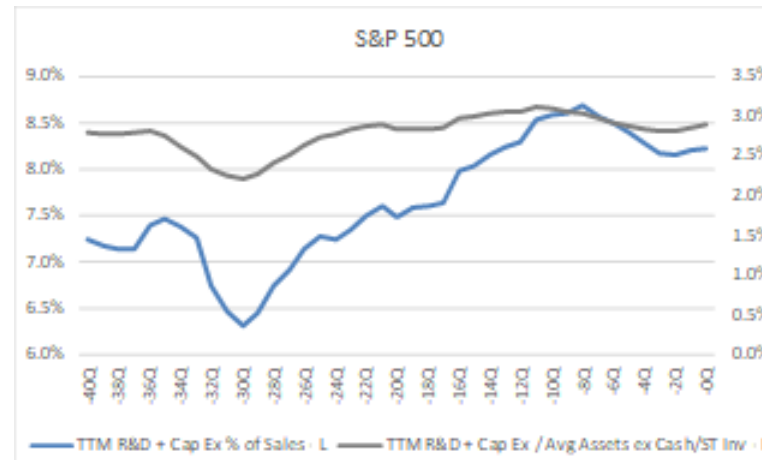
Overall investment with technology is moderate (last three peaks were bubbles or experienced rampant inflation)



R&D spending has not slowed for approx. eight years, and cap ex is coming back



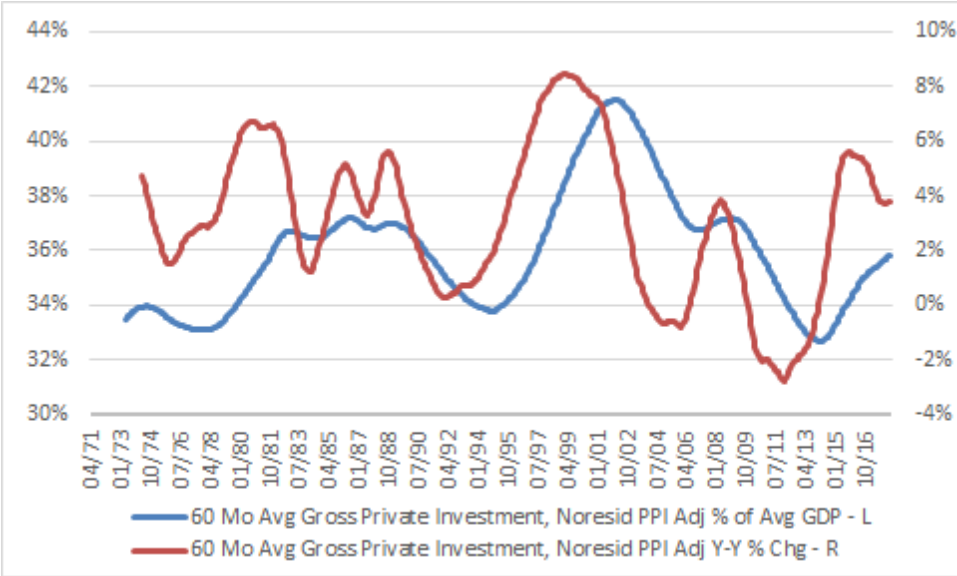
... And total investment as a percent of sales and assets ex cash is pretty high



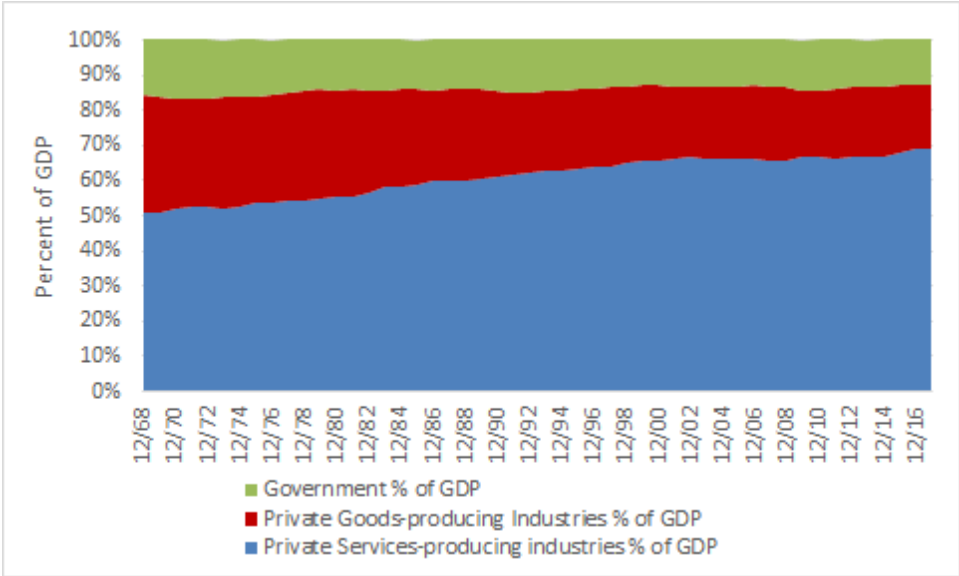
Source: Spellman, FactSet, BEA.

Inflation-adjusting investment high despite movement away from manufacturing

This expansion has been long, and so overall real investment as a percent of GDP is near a peak, and long-term growth has been robust



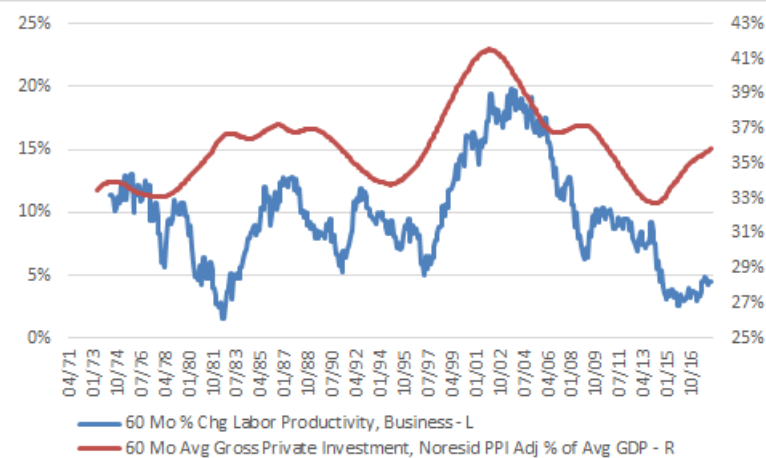
This is despite the fact that as economy continues to move to services it becomes more asset light and needs fewer big asset (e.g., plant) investments



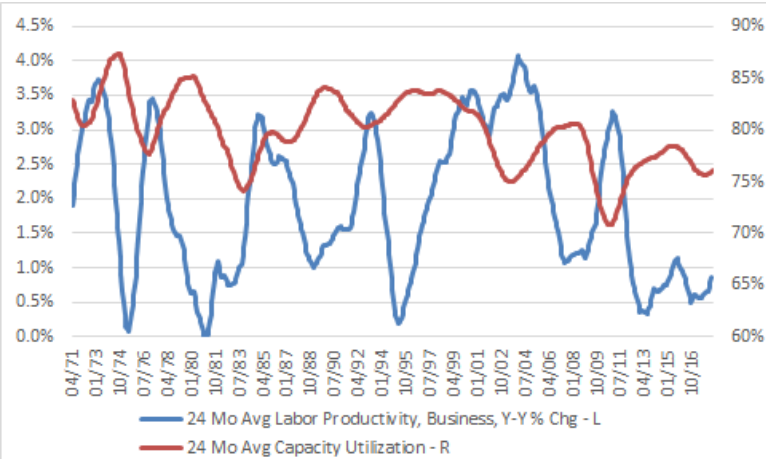
Source: Spellman, FactSet, BEA, Conference Board.

Investment boosts long-term productivity, but it is a short-term contrary indicator

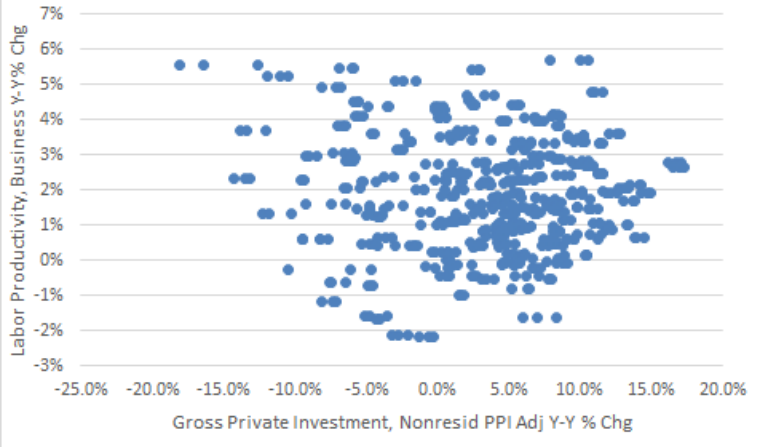
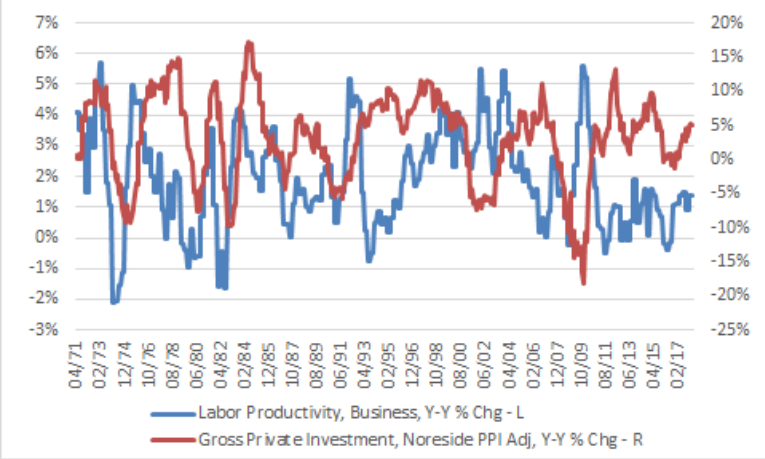
Fink is right that long-term investment is linked to productivity, and it looks like productivity should take off...



Productivity peaks late cycle as utilization rises and vice versa



Investment peaks with GDP (slide 4), so high investment precedes recessions and low investment during recessions is associated with high productivity



Source: Spellman, FactSet, BEA, Conference Board, US Department of Labor.

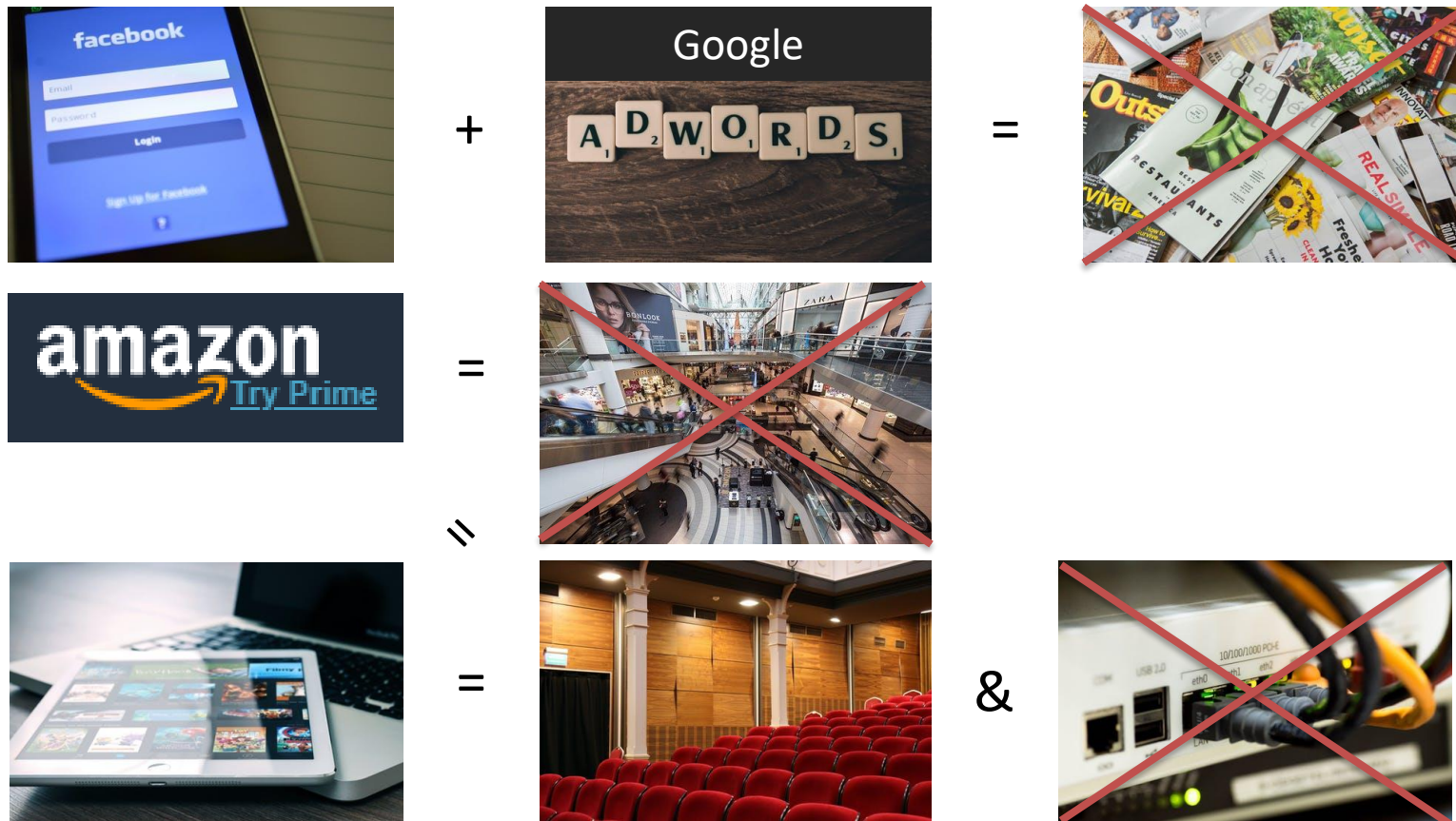
Several opportunities to boost productivity

- Lower regulation boosts investment
 - Be careful – as memories of crisis fade, risks and unwise risk-taking rises
- Autonomous driving cars
 - Could you work while driving?
- Biotechnology and health care
 - Healthy people are probably more productive
 - Older people, who work longer and have more acquired skills and knowledge, are more productive than younger individuals?
- Big data
 - Directs investments to best uses (less waste)
 - Solves problems quicker (less waste)
 - But is this only for larger firms that can afford it which drives out smaller companies?
- Artificial intelligence and quantum computing



However, do the FANGs create net stuff, or just drive down stuff sold by others?

- Productivity is essentially units (stuff) per worker hour
 - Facebook and Google take advertising stuff away from other advertisers
 - Amazon captures sales (stuff) from brick and mortar, but it may be more efficient (lower worker hours)
 - Netflix takes away stuff from others as it drives Blockbuster out of business, harms movie theaters, and leads to cable cord cutting



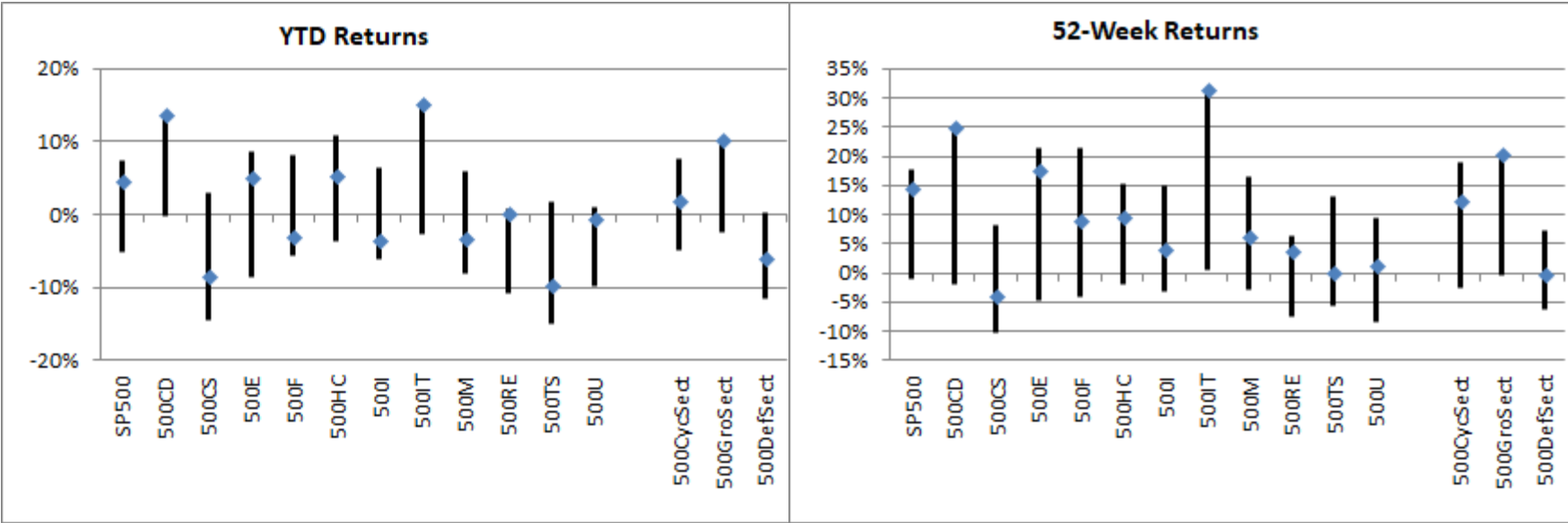
Speaking of FANGs, technology normally outperforms in rising markets

Tech normally outperforms in rising markets, and consumer staples and utilities normally lag

	Sector										
	CD	CS	E	F	HC	I	IT	M	TS	U	
% Annual Outperformance	61%	44%	51%	48%	52%	52%	63%	54%	37%	43%	
% Outperformance if S&P 500 Up	59%	24%	43%	47%	40%	54%	70%	52%	38%	38%	
% Outperformance if S&P 500 Down	66%	95%	72%	52%	83%	45%	45%	58%	33%	56%	
Difference	-6.5%	-71.5%	-29.2%	-4.6%	-43.2%	9.0%	24.8%	-5.4%	5.6%	-17.8%	
S&P 500											
% Annual Periods Up	72%										

Source: Spellman, FactSet; last 19 years, annual returns measured monthly.

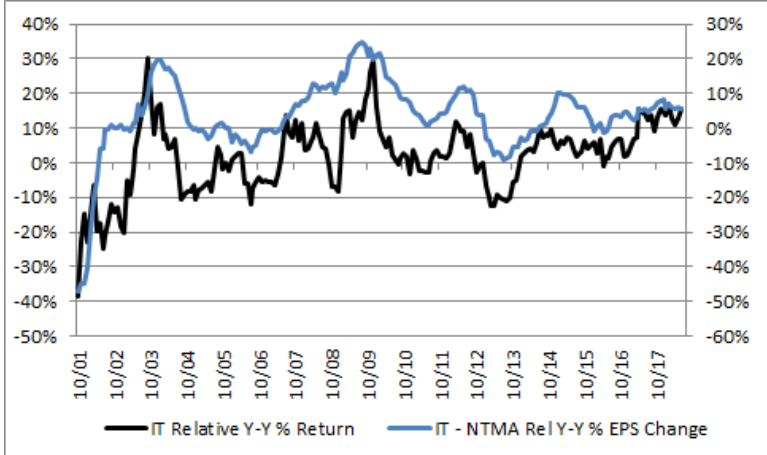
So recent performance is not surprising



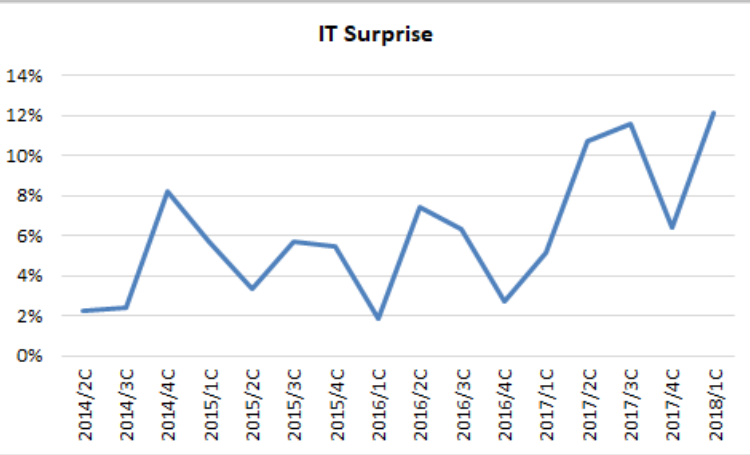
Source: Spellman, FactSet, through May 18, CD = Consumer Discretionary, CS = Consumer Staples, E = Energy, F = Financials, I = Industrials, IT = Information Technology, M = Materials, RE = Real Estate, TS = Telecommunication Services, U = Utilities, table data is for last 19 years with annual returns measured monthly, data is for S&P 500 sectors.

And tech outperformance may be deserved based on fundamentals

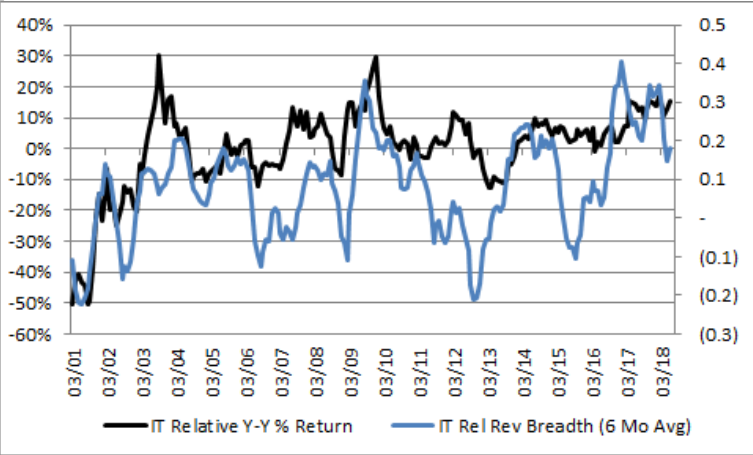
Technology NTM EPS is rising faster than market



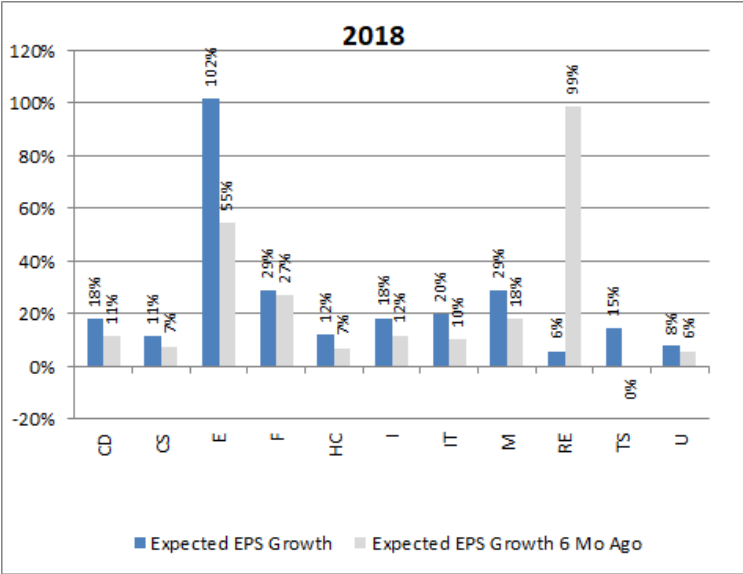
Surprises are strong



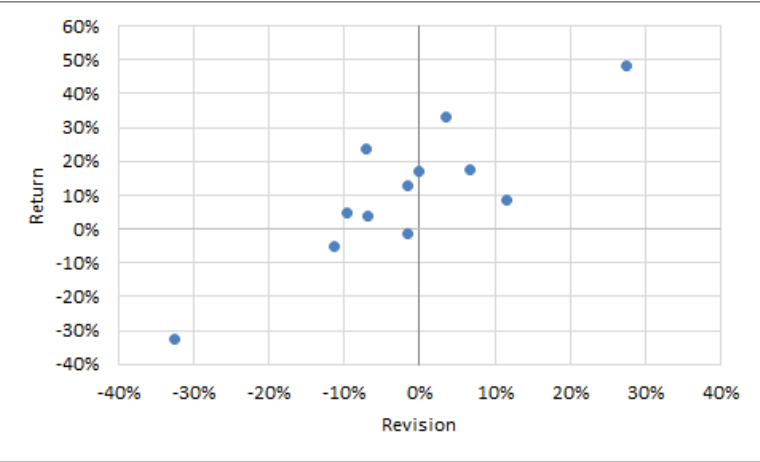
Revision breadth is above market, but declining



Tech revisions strong



...and revisions are related to returns



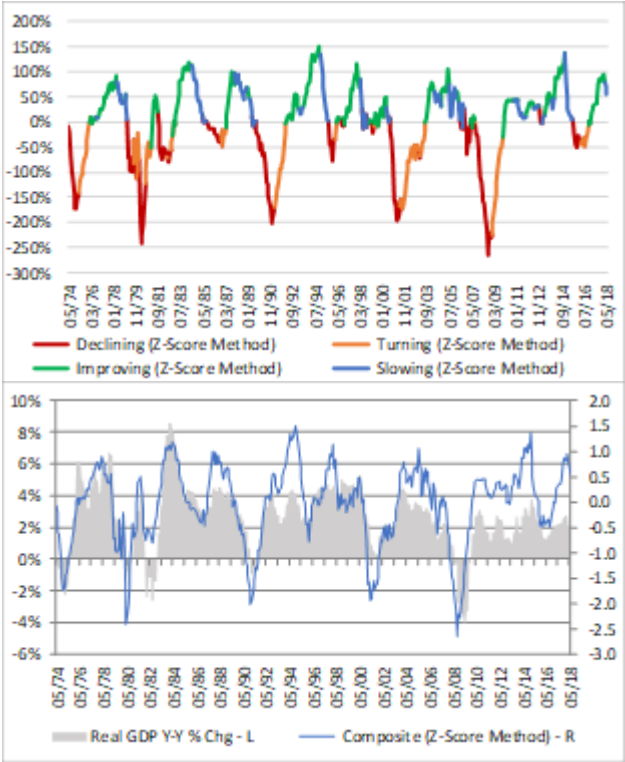
Source: Spellman, FactSet.

Risk-on best during improving economic phase, but are we moving to slowing?

Risk-on last 12 months

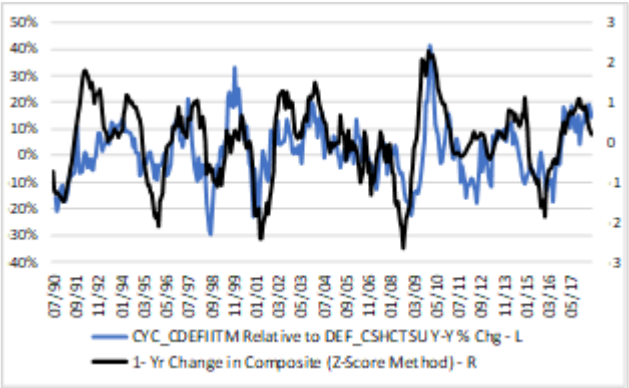
12-Month Return through 6/30/2018		
Asset 1	Asset 2	Difference
Russell 3000	Bloom Barclays US Agg Gov	15.4%
14.8%	-0.6%	15.4%
Russell 3000 Growth	Russell 3000 Value	15.2%
22.5%	7.3%	15.2%
Russell 2000	Russell 200	2.1%
17.6%	15.4%	2.1%
Bloom Barclays US Agg HY	Bloom Barclays US Agg Gov	3.2%
2.6%	-0.6%	3.2%
Cyclical Stocks	Defensive Stocks	15.6%
14.6%	-0.9%	15.6%
Russell 3000	FTSE NAREIT	10.0%
14.8%	4.8%	10.0%
MSCI EM	MSCI World	4.3%
11.4%	7.1%	4.3%
GSCI	Gold	30.0%
30.9%	0.9%	30.0%

But movement to slowing



When defensives perform best

Annual Correlation	
Sector	Cycle Model
Consumer Discretionary	0.50
Consumer Staples	0.17
Energy	0.38
Financials	0.44
HealthCare	0.33
Industrials	0.52
Information Technology	0.55
Materials	0.39
Telecommunication Services	0.45
Utilities	0.33

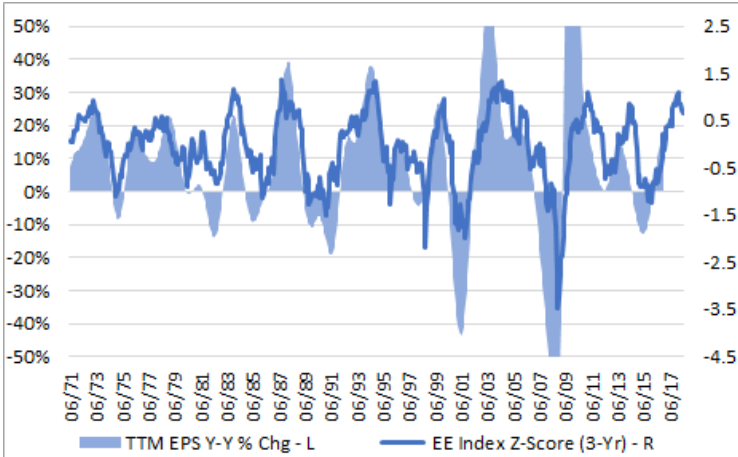


... And last month defensives up 2.6% and cyclicals down 0.3%

Source: Spellman, FactSet, Barclays, BEA, CRB, Federal Reserve, FTSE NAREIT, MSCI, Russell, S&P, S&P GSCI, cyclical includes consumer discretionary, energy, financials, information technology, industrials, and materials, whereas defensive includes consumer staples, health care, telecommunications services, and utilities.

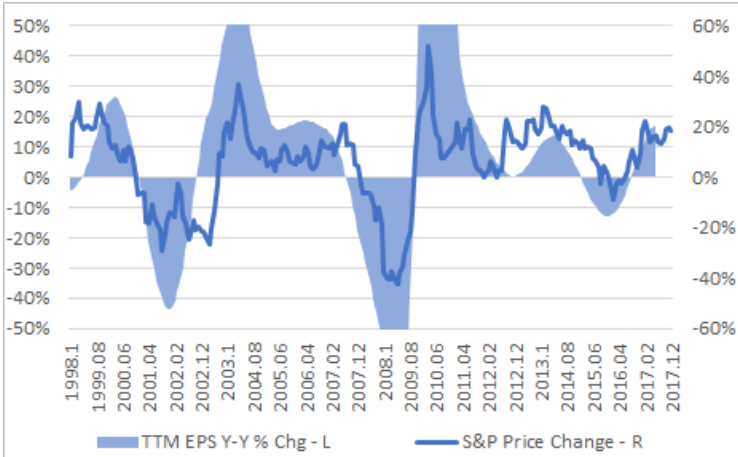
But the earnings model is peaking, which leads earnings, which leads stocks

Earnings model is peaking, and leads earnings by 12 months



Earnings Expectations (EE) Model (12-Month Leading Indicator)
Yield Curve
Credit Spreads
Manufacturing Outlook Diffusion Index
Capacity Utilization
Change in Unemployment Rate
Capital Expenditure Outlook
Inventory/Sales Ratio
Charge-Offs Consumer Loans
Dollar
CPI Growth

And S&P leads earnings by six months, so returns should be lower going forward

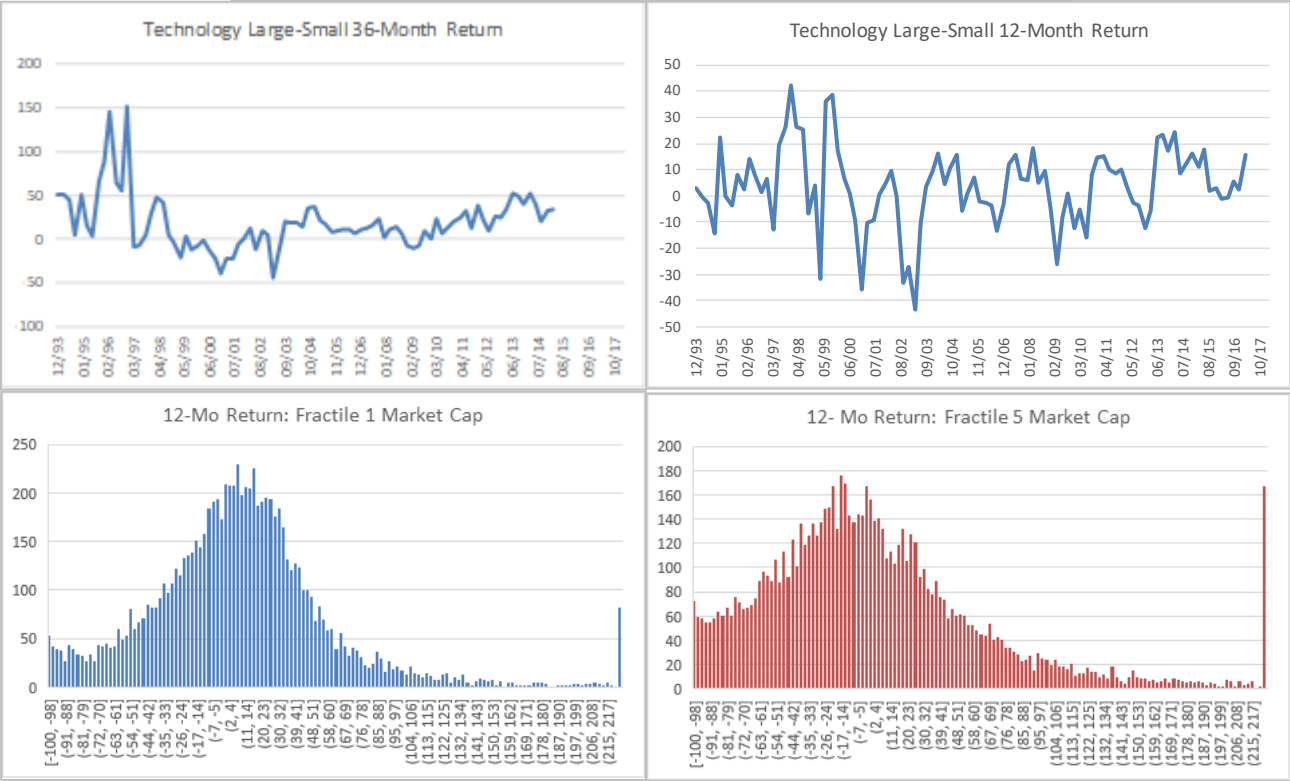


Consensus: S&P 500 quarterly Y-Y growth over 20% from 1Q-3Q 2017, before drop to 7% in 1Q 2018 and about 10% rest of year

Source: Spellman, FactSet, Shiller data, see <https://coachinvesting.com/2018/01/31/positioning-the-cycle/> for description of the earnings model.

FAANG outperformance is not new – large-caps normally outperform in tech

Market Cap	12-Month		36-Month	
	12/31/93-3/29/18	12/31/06-3/29/18	12/31/93-3/29/18	12/31/06-3/29/18
Summary	8.08%	7.73%	24.44%	34.92%
1	10.42%	10.77%	32.54%	44.27%
2	9.15%	8.82%	28.24%	35.08%
3	8.11%	8.43%	19.44%	35.67%
4	5.47%	6.06%	19.38%	33.24%
5	5.50%	3.63%	17.56%	23.42%



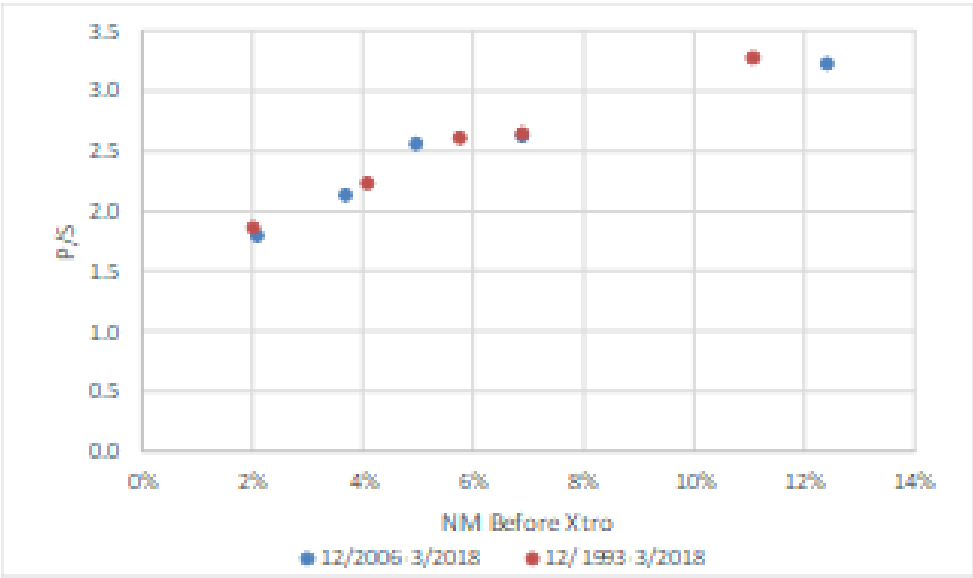
Small cap are often hyped for potential, and they do have a higher chance of windfalls, but they are also much more likely to have low returns

Source: Spellman, FactSet, 1 = largest 1/5 of technology firms, 5 = smallest of technology firms, 12/31/1993 through 3/29/2018 and 12/31/2006 through 3/29/2018.

Large-cap tech returns driven by growth, and valuation by profitability and growth

12/31/1993-3/29/2018									
Market Cap	Market Value	Past 36-Month Price Chg	Past 36-Month Sales Gr	S/P 3-Yr Earlier	S/P Ending	P/S Multiple Change	3-Yr Share Change	P/S	Net Margin ex Xtro
Summary	887	39%	31%	0.43	0.40	8%	0.8%	2.56	6.3%
1	8,210	51%	35%	0.31	0.31	0%	0.0%	3.29	11.1%
2	1,820	51%	39%	0.41	0.38	10%	1.6%	2.66	6.9%
3	887	39%	33%	0.43	0.39	11%	1.0%	2.62	5.8%
4	519	28%	29%	0.50	0.45	12%	1.5%	2.24	4.1%
5	315	15%	21%	0.59	0.53	12%	2.5%	1.86	2.0%

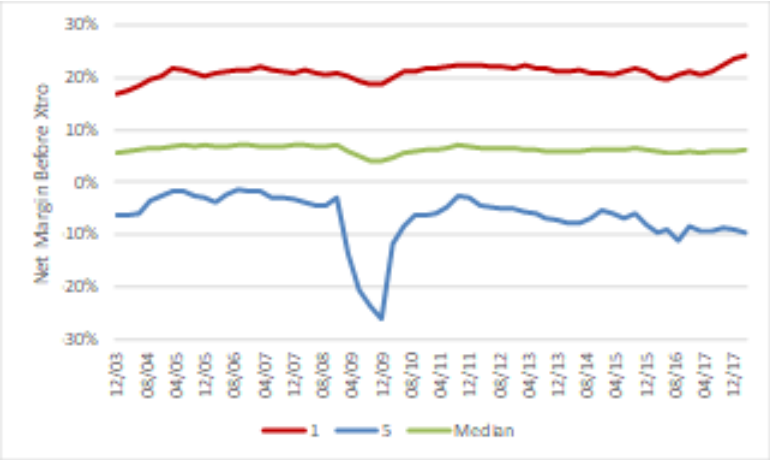
Large-cap tech companies have much higher profit margins, and their advantage is growing



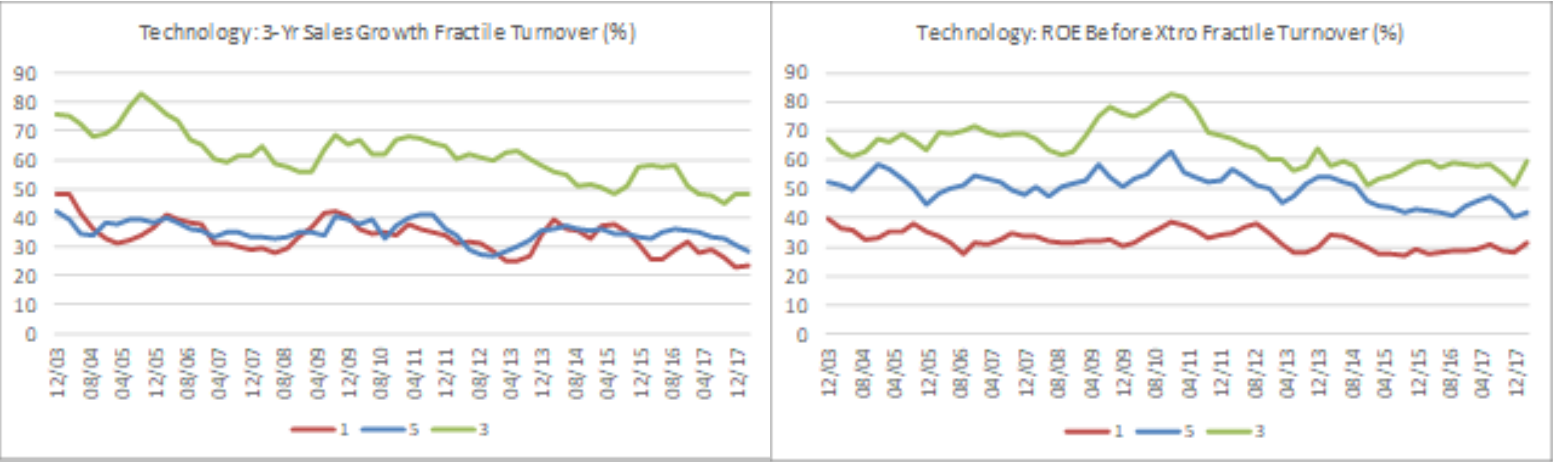
Source: Spellman, FactSet, 1 = largest 1/5 of technology firms, 5 = smallest of technology firms, NM Before Xtro = net profit margin before extraordinary charges, technology firms greater than or equal to \$250 mil market cap.

Large-cap tech's advantage is growing and performance turnover is declining

Small-cap margins are getting worse, while large-cap's are getting better



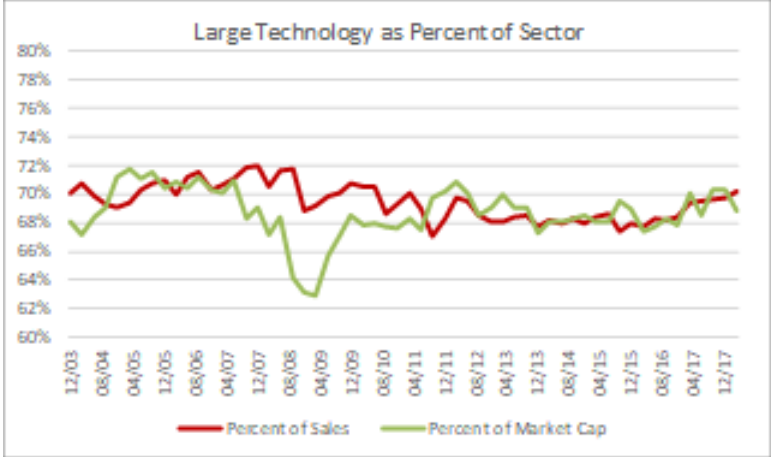
Quintile turnover is declining, which means the dominant are maintaining their advantage (note: the decline in turnover for sales growth is not unique to technology)



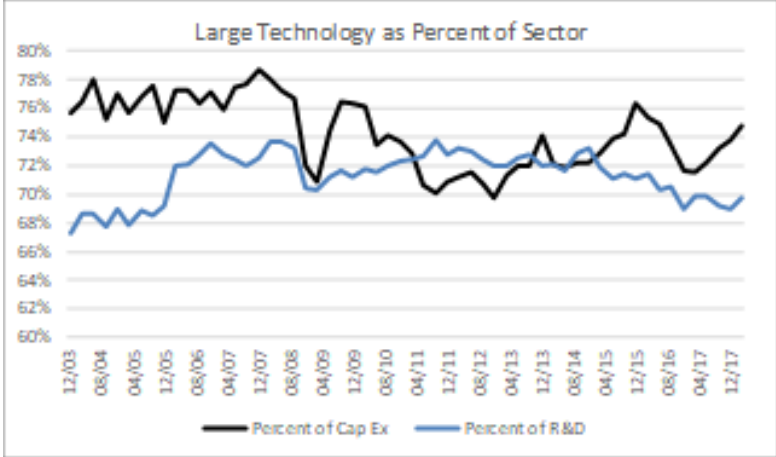
Source: Spellman, FactSet, 1 = largest 1/5 of technology firms, 5 = smallest of technology firms, NM Before Xtro = net profit margin before extraordinary charges, technology firms greater than or equal to \$250 mil market cap.

If the dominant stay dominant, they have less incentive to invest

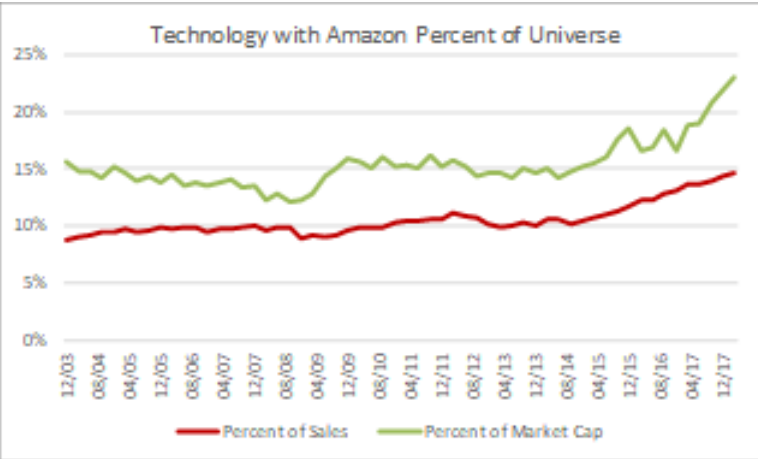
Large-cap tech is rising as percent of sector



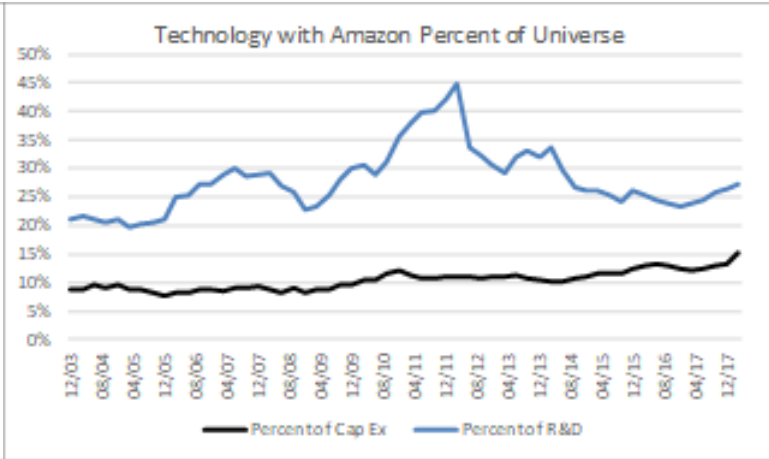
...and its share of R&D is declining



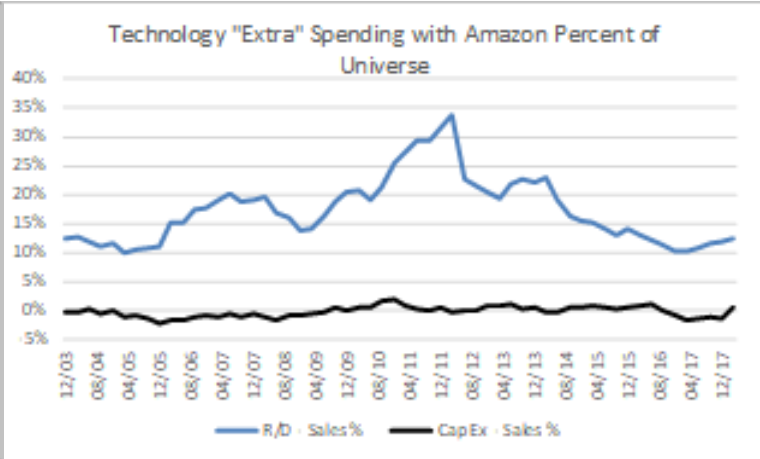
Technology (w Amazon) is growing as a percent of the market



...and its share of R&D is declining (cap ex is growing)



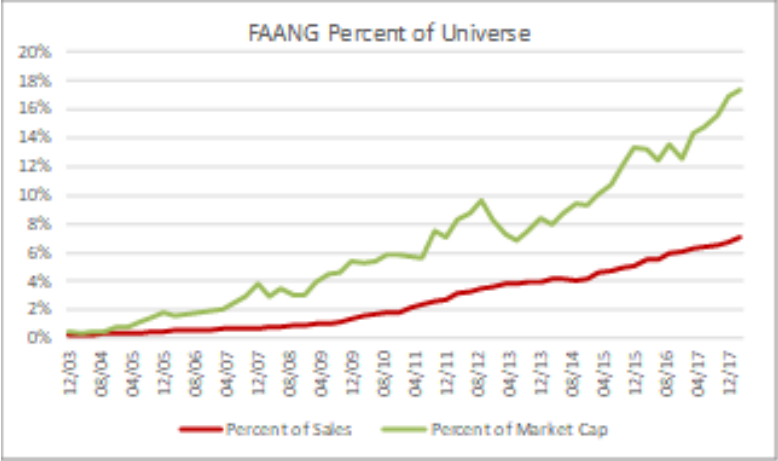
...and its extra spending (vs its percent of sales) is falling



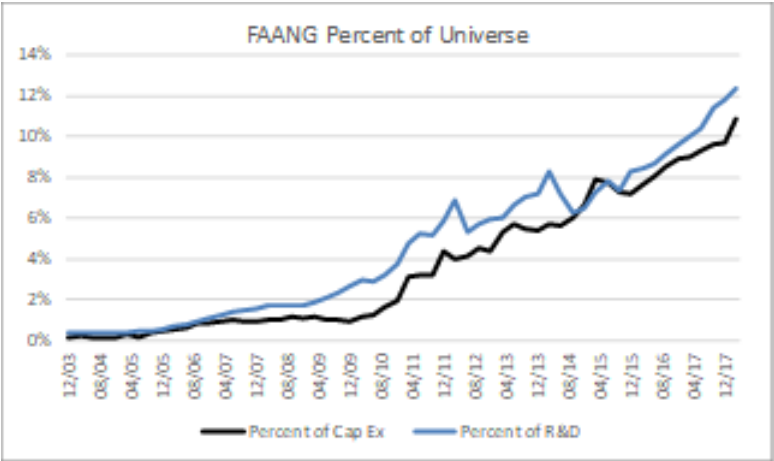
Source: Spellman, FactSet, firms greater than or equal to \$250 mil market cap.

The FAANG underinvest in R&D versus other technology

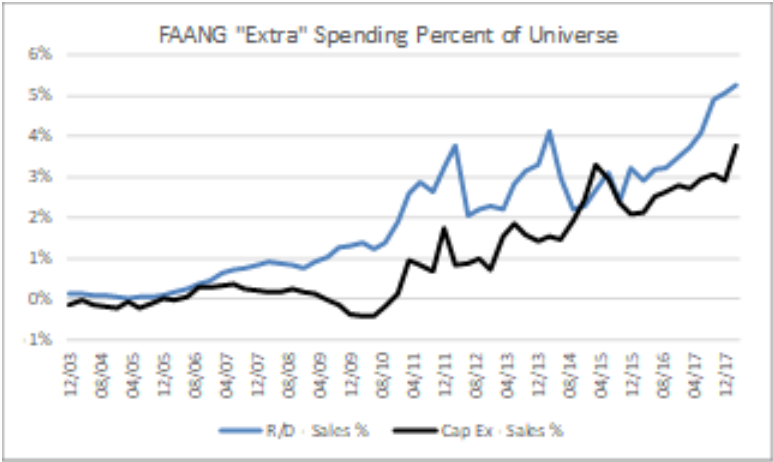
FAANG are growing in share of sales and market cap



...so its share of R&D and cap ex is rising



...but they underspend on R&D versus other tech, so their rising dominance explains why tech's extra spending is declining



...but they outspend on cap ex – could this be because of Amazon (warehouses)?

Source: Spellman, FactSet, firms greater than or equal to \$250 mil market cap.

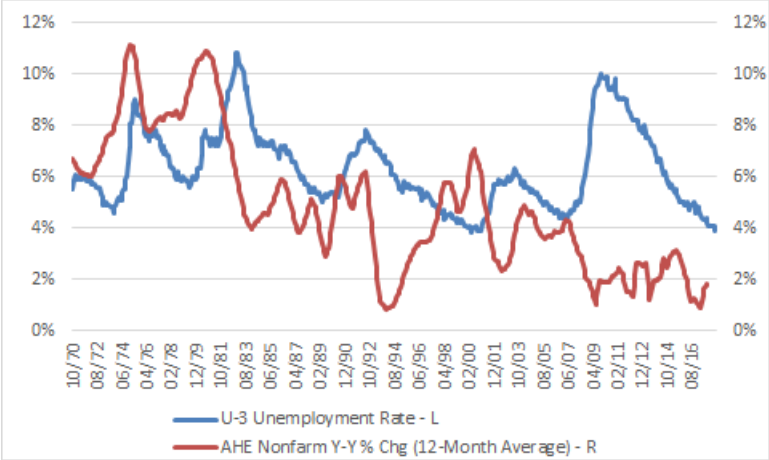
Is declining extra spend a bad thing? Is it a function of industry concentration?

- Are they not spending as much as before because of weakened competition?
- Is extra spending, which is declining, key for productivity and long-term economic growth?
- Are they not spending as much because they now benefit from rising incremental margins?

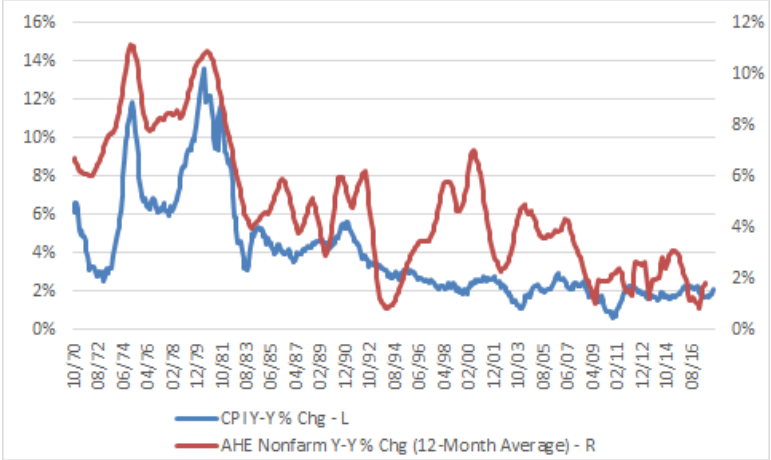


Is low wage growth – with low unemployment – due to low productivity growth?

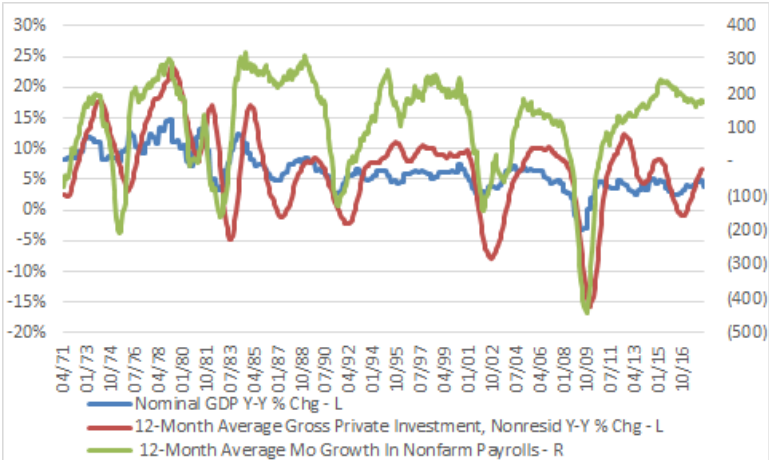
Wage growth is low despite low unemployment



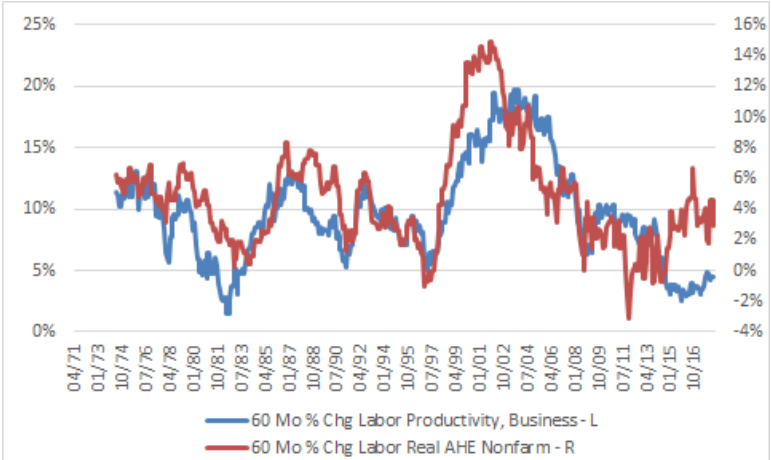
...perhaps caused by low inflation (but inflation is also driven by wage growth)



Hiring and investment spending are positively correlated with the economy



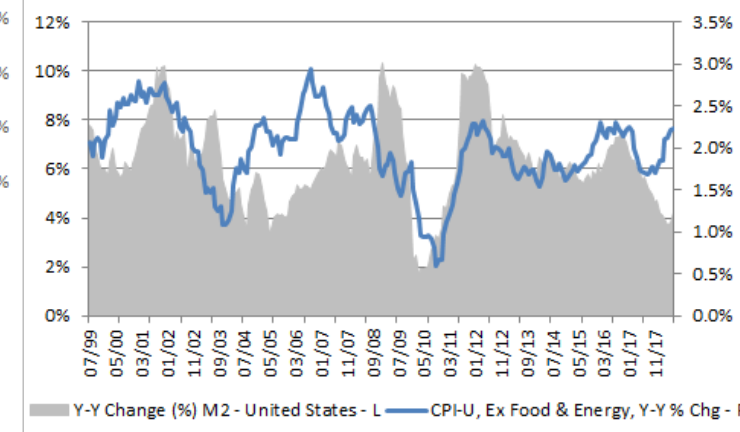
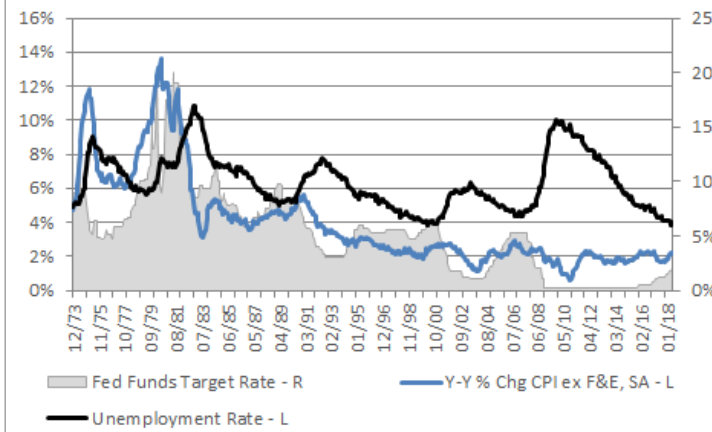
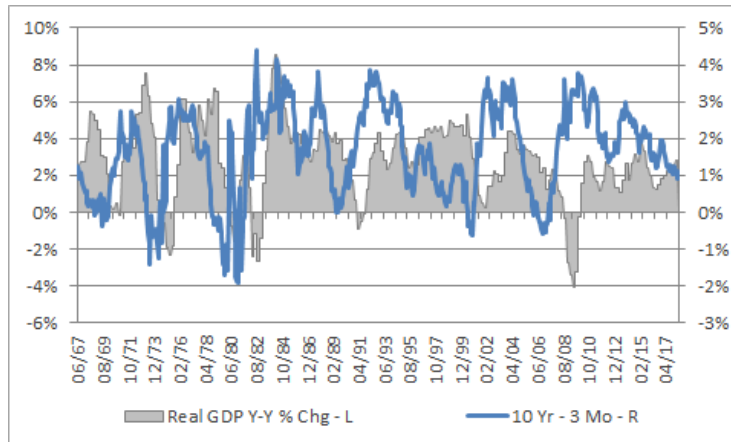
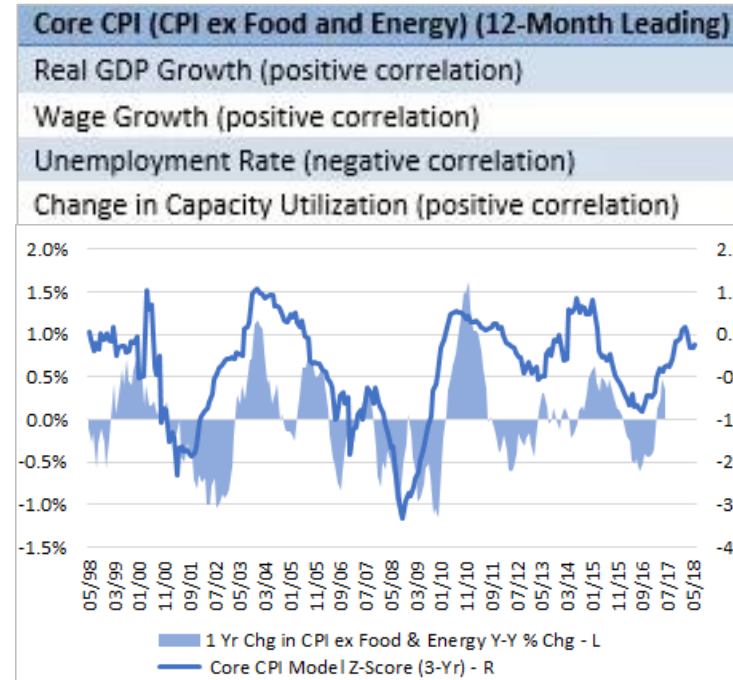
Maybe low wage growth is due to low productivity growth



Source: Spellman, FactSet, BEA, Conference Board, US Department of Labor.

Wages are tied to end of expansion

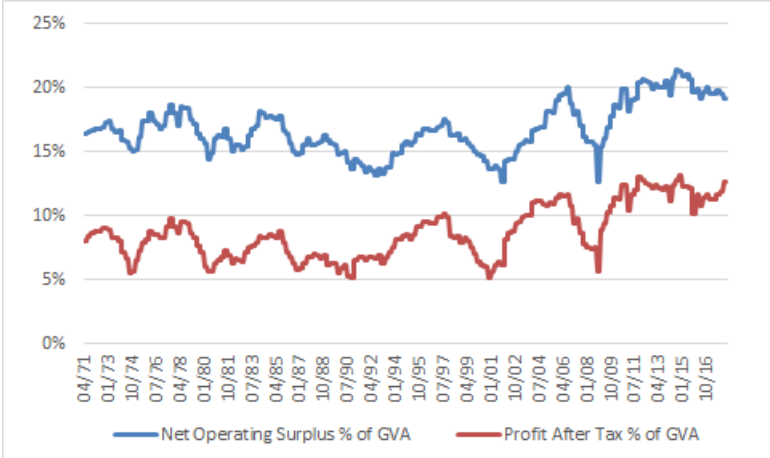
- Productivity set to rise
- So wages are set to rise
- So inflation is set to rise
- So Fed may get more aggressive
- So end of expansion



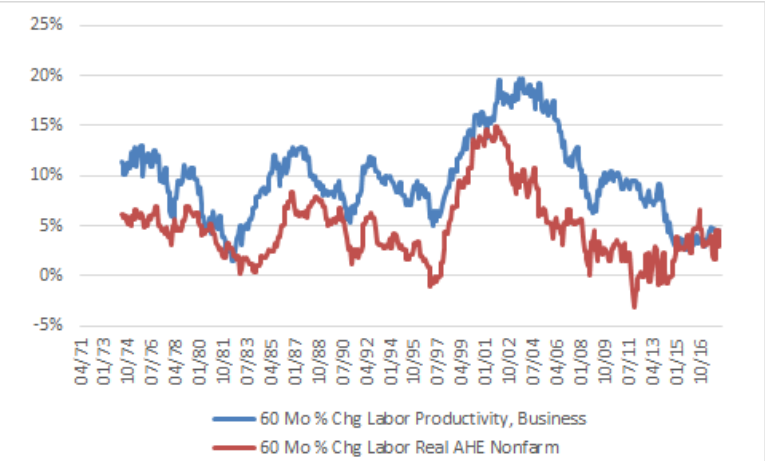
Source: Spellman, FactSet, Federal Reserve, US Department of Labor, see also <https://coachinvesting.com/2018/01/31/positioning-the-cycle/>.

Corporations have gained from productivity

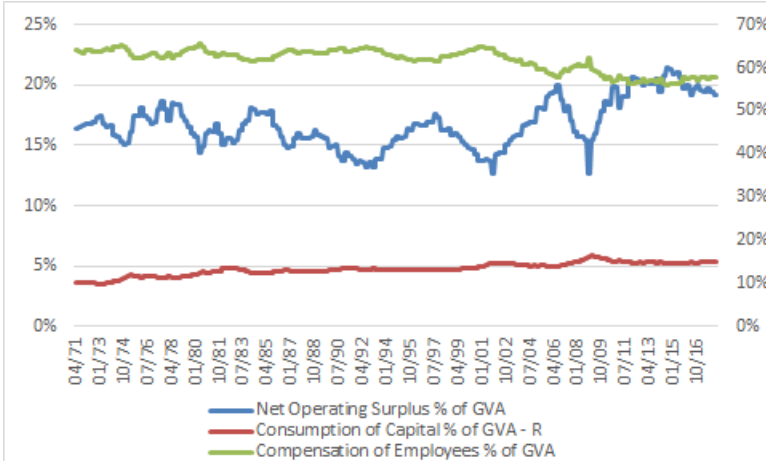
Profit margins have risen



Partly because productivity growth has been higher than real wage growth



As workers' share of GVA declines to capital

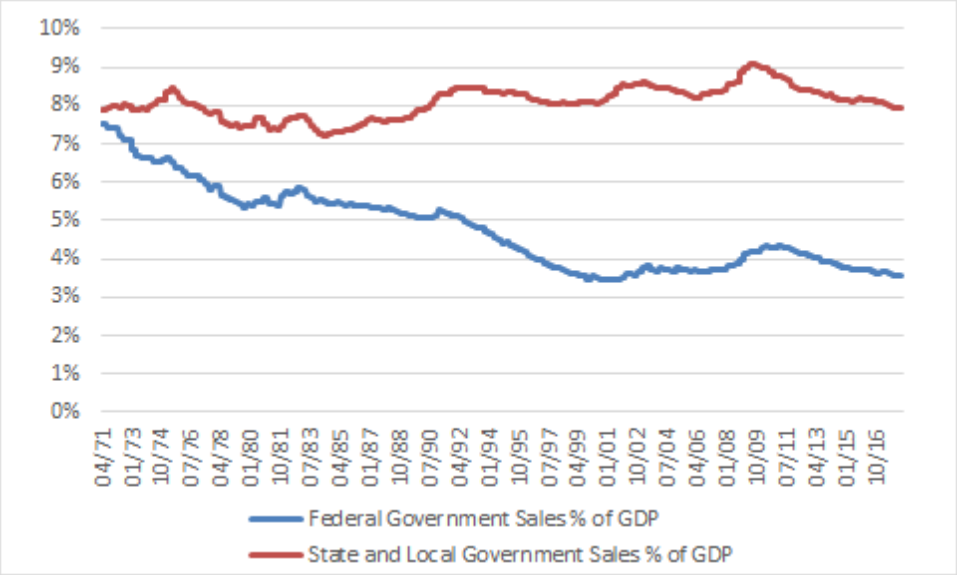


Which makes workers unhappy; hence the rise of socialism and xenophobia

Source: Spellman, FactSet, BEA, Conference Board, US Department of Labor.

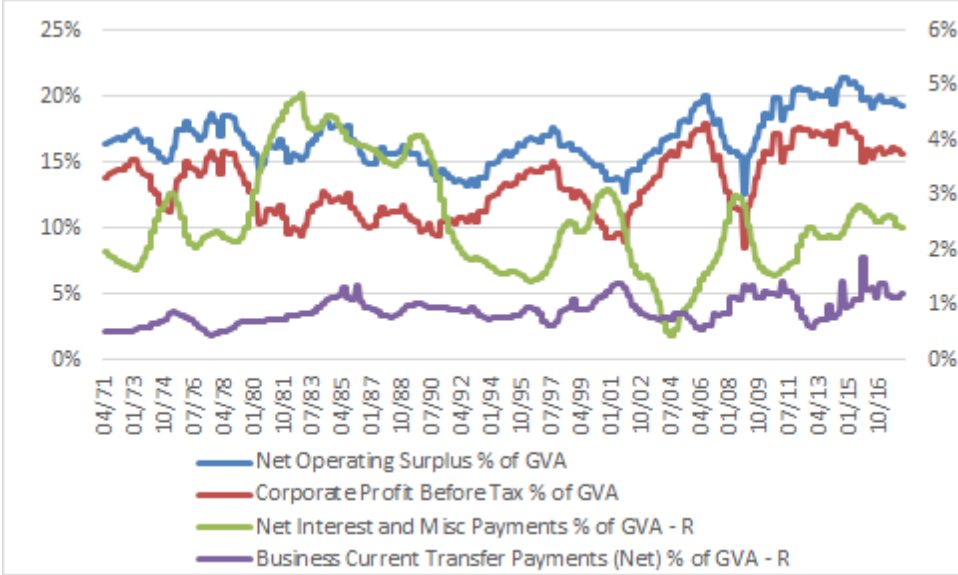
Corporations have gained from lower taxes and interest rates as well

Federal tax rates have declined for a long time



Does this lead to rising government debt and more risk?

Interest has declined over time

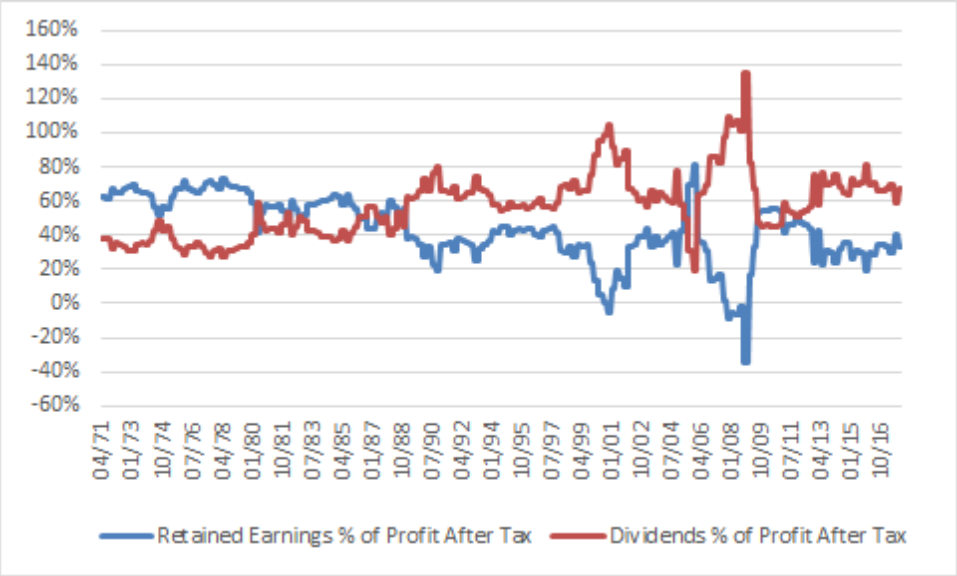


Does this lead to rising corporate debt and more risk?

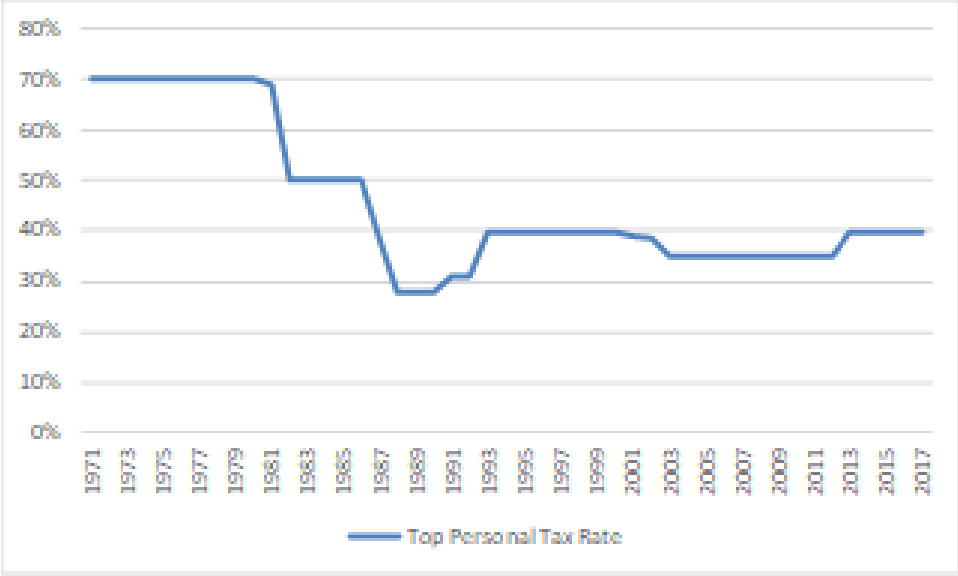
Source: Spellman, FactSet, BEA.

Dividends are growing at the expense of retained earnings

Dividends are growing at the expense of retained earnings (which finances growth?)



Could lower personal tax rates encourage owners to distribute earnings to themselves, instead of retaining them in the business for growth (and delayed taxes)?



Source: Spellman, FactSet, BEA, Tax Policy Center.

Most things in extremes can kill you, or at least get you in trouble!

- **In this presentation**

- Moderation in investments leads to a healthy economy, and too much investment, sometimes finance with debt, precedes recessions
- Moderation by avoiding sometimes over-hyped small cap tech is a good thing
- We solved the financial crisis by making it easier to borrow at low rates; is this a good thing?
- Moderation in distribution of sales and earnings to dividends, workers, and investments is a good thing
- Does the FANG's success lead to lower need for investment for growth?
- Moderation in inflation is a good thing



Moderation, even in technology, is best (capital uses)

Moderation in cap ex, R&D, dividends (vs no dividends), debt, cash, share change, asset, and goodwill provide the highest returns

Fractiles	12/31/1993-3/29/2018, 36-Month Returns						
	Cap Ex/ Sales	1-Yr Cap Ex Growth	R&D/ Sales	1-Yr R&D Growth	1-Yr Dividend per Share Growth	1=With Dividends 2 = No Dividend	Total Debt / Assets
1	22.40%	24.49%	25.91%	25.36%	32.57%	37.78%	32.29%
2	31.67%	34.42%	43.26%	36.30%	34.34%	28.38%	35.51%
3	39.64%	37.67%	37.14%	33.20%	28.32%		37.76%
4	42.82%	33.58%	29.64%	29.14%	41.14%		37.66%
5	29.46%	24.79%	23.68%	21.92%	36.89%		30.91%
	1-Yr Total Debt Growth	1-Yr Cash Growth	1-Yr Share Growth	1-Yr Share Buyback Growth	1-Yr Asset Growth	Goodwill/ Assets	1-Yr Goodwill Growth
1	11.86%	18.02%	8.94%	25.96%	27.41%	10.42%	19.28%
2	29.88%	39.60%	15.71%	42.67%	31.39%	17.78%	24.19%
3	41.39%	39.24%	28.94%	38.87%	35.10%	44.05%	31.53%
4	37.26%	32.54%	15.51%	38.91%	33.86%	22.41%	24.78%
5	30.85%	23.99%	18.53%	16.45%	31.15%	19.10%	15.17%

Source: Spellman, FactSet, median returns, intra-sector quintile sorting, three-month rebalancing, factors sorted high (1) to low (5): R&D/Sales, 1-Yr R&D Growth, 1-Yr Dividend per Share Growth, 1-Yr Buyback Growth, 1-Yr Cash Growth, factors sorted low (1) to high (5): Cap Ex/Sales, 1-Yr Cap Ex Growth, Total Debt/Assets, 1-Yr T Debt Growth, 1-Yr Share Growth, 1-Yr Asset Growth, Goodwill/Assets, 1-Yr Goodwill Growth.

Moderation, even in technology, is best (profitability and growth)

Moderation in FCF, ROE, margin, growth, and revisions lead to the highest returns

Fractiles	12/31/1993-3/29/2018, 12-Month Returns						
	FCF/ Sales	1-Yr FCF Growth	ROE Before Xtro	Net Margin Before Xtro	1-Yr Sales Growth	1-Yr EPS Growth	3-Mo FY1 EPS Revision
1	10.60	2.39	13.09	10.61	13.79	7.64	7.53
2	13.04	5.20	16.70	16.54	9.19	14.30	11.89
3	14.11	16.00	11.19	12.83	14.69	18.72	12.52
4	5.25	8.17	6.81	7.23	14.02	8.56	10.83
5	0.20	2.08	2.54	2.09	8.13	3.31	5.54

Since 2007, the highest ROE and FCF/Sales companies are best, 4s for sales growth are best, and high margin companies are second best

Source: Spellman, FactSet, median returns, intra-sector quintile sorting, three-month rebalancing, factors sorted high (1) to low (5): FCF/Sales, 1-Yr FCF Growth, ROE Before Extraordinary Charges, Net Margin Before Extraordinary Charges, 1-Yr Sales Growth, 1-Yr EPS Growth, 3-Mo FY1 EPS Revision.

Moderation, even in technology, is best (valuation and past returns)

Cheap valuation, moderate past short-term returns, and low long-term past returns are best

Fractiles	12/31/1993-3/29/2018, 12-Month Returns							
	E/P	B/P	S/P	FCF/P	3-Mo Price Change	6-Mo Price Change	12-Mo Price Change	36-Mo Price Change
1	11.18%	10.62%	11.18%	14.11%	6.40%	6.10%	3.54%	3.01%
2	12.85%	8.97%	11.30%	11.03%	9.46%	9.81%	9.79%	9.35%
3	9.74%	8.24%	10.02%	11.09%	9.36%	9.68%	9.23%	9.84%
4	7.61%	7.94%	9.65%	2.38%	7.79%	8.42%	9.15%	11.62%
5	3.36%	4.81%	4.58%	3.14%	6.07%	6.47%	10.11%	12.66%

Since 2007, moderate 12- and 36-month past returns are best, as are moderately valued stocks

Source: Spellman, FactSet, median returns, intra-sector quintile sorting, three-month rebalancing, annual returns, factors sorted high (1) to low (5): E/P, B/P, S/P, FCF/P, 36-Mo Price Change, 3-Mo Price Change, 6-Month Price Change, 12-Month Price Change.

Moderation, even in technology, is best (valuation and profitability)

The best stocks have moderate valuation and moderate+ profitability

		12/31/1993-3/29/2018, 12-Month Returns				
		ROE Before Extraordinary Expenses				
B/P		1	2	3	4	5
1		8.12%	12.14%	7.18%	6.70%	7.28%
2		10.89%	13.68%	10.02%	8.20%	-0.37%
3		9.40%	12.26%	9.27%	4.45%	0.96%
4		12.11%	11.39%	2.05%	-1.72%	-8.44%
5		9.93%	9.65%	2.88%	-3.71%	-2.95%
		ROE Before Extraordinary Expenses				
E/P		1	2	3	4	5
1		10.42%	15.11%	10.08%	-7.70%	3.36%
2		9.24%	11.76%	12.10%	1.03%	10.52%
3		10.15%	6.37%	4.81%	7.63%	-20.81%
4		5.32%	4.71%	4.89%	4.67%	-3.47%
5		-24.80%	24.56%	-0.75%	0.64%	2.44%

Source: Spellman, FactSet, median returns, intra-sector quintile sorting, three-month rebalancing, annual returns, factors sorted high (1) to low (5): B/P, ROE, and E/P.

Conclusions

- Avoid the hype; do not over- or underinvest
- Technology is leading, as it normally does during a rising market
- Investments in capital and R&D are moderate to high, which is a short-term contrary indicator
- Long-term productivity is driven by investments, and productivity which is set to rise, may help drive up wages and perhaps inflation
- Domination by large-cap tech is normal, which hopefully does not diminish incentives to invest
- Manage your expectations when investing in technology, and you will be better off long-term