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Dear Partner,

The first quarter of 2019 offered positive performance results to global equities. During the quarter Alkeon Growth Partners, LP returned 18.17% (net of all fees, expenses and incentive allocation) versus an 11.61% return for the MSCI AC World Index. For the year, Alkeon Growth Partners, LP returned 18.17% (net of all fees, expenses and incentive allocation) versus an 11.61% return for the MSCI AC World Index. Since its inception (Jan. 1998) the strategy has annualized at 13.63% (net of all fees, expenses and incentive allocation) per year versus an annualized 3.85% return for the MSCI AC World Index. This translates into a total cumulative return of 1410.29% for the strategy versus 123.17% for the MSCI AC World Index.

	Q1 2019	2019 YTD	Alkeon Growth Strategy Since Inception (Cumulative)	Alkeon Growth Strategy Since Inception (Annualized)
Alkeon Growth Partners	18.17%	18.17%	1410.29%[1]	13.63%[1]
MSCI World	11.88%	11.88%	125.04%	3.89%
MSCI AC World	11.61%	11.61%	123.17%	3.85%

This quarter's performance marks a recovery from last year's correction, which, as we extensively discussed in our last quarterly letter, created some extraordinary opportunities as equity valuations had contracted substantially by year-end. Simply stated, more than 100% of the market losses last year were due to multiple contraction, as earnings actually grew double-digits! In other words, as often is the case, the correction had decoupled from underlying fundamental trends, and, as such, became highly exploitable. Indeed, in the US, 2018 reflected one of the largest declines in P/Es for the S&P 500 in over 40 years – only 2000 and 2002 were worse.

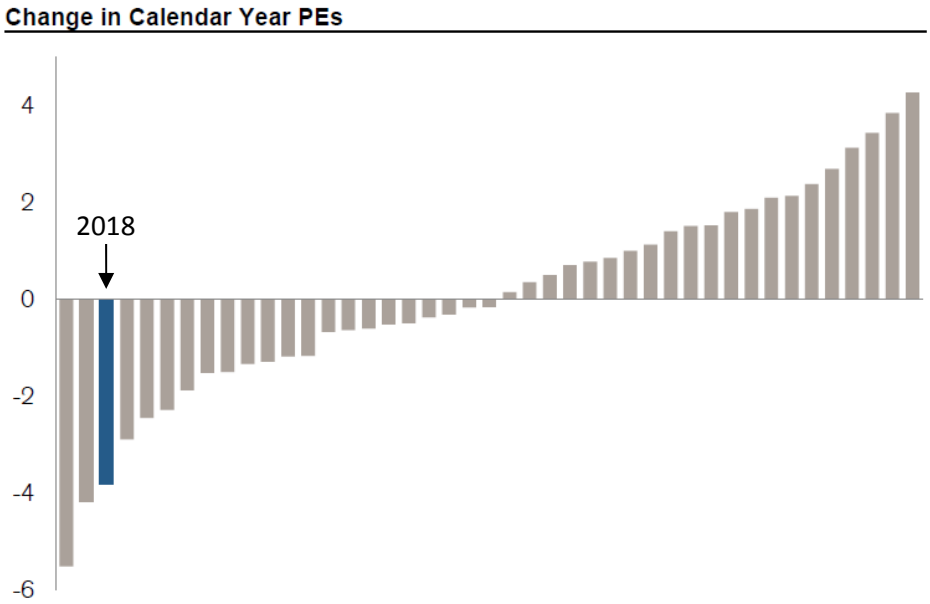

Exhibit 1. *Change in Calendar Year S&P 500 Index P/Es since 1975, source Credit Suisse.*

Most recently, Q4 reported results were strong, driven by continued top-line growth, another indication that equity fundamentals and stock prices often diverge, creating significant opportunities for long-term oriented investors.

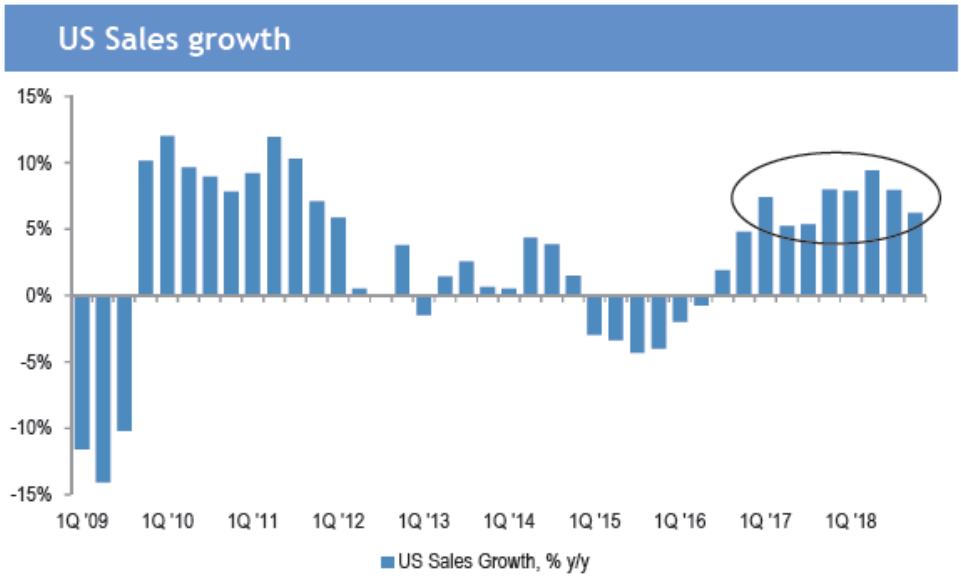

Exhibit 2. *US Sales Growth, source JP Morgan.*

Investors who stayed patient in Q4 of last year were nicely rewarded in Q1 of this year, as results were positive across all sectors.

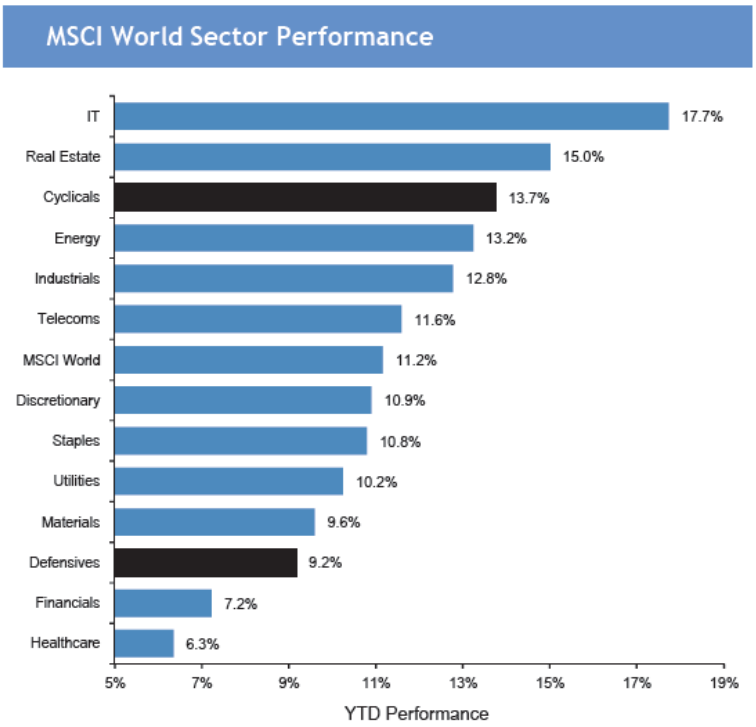

Exhibit 3. *MSCI World Sector Performance, as of 4/1/2019, source JP Morgan.*

We continue to find current valuations of equities to be broadly attractive, especially relative to fixed-income investments, and those of high quality growth equities to be compelling relative to low-volatility, low-growth or no-growth defensive equities. Moreover, we consider the current investment opportunity set to be equally attractive for both long and short investments globally, and, in that regard, we have identified what we believe to be strong investment opportunities in overseas markets, where performance has lagged US equities over the last decade.

Importantly, we continue to find remarkable sector-wide discrepancies between base sector valuations on one hand, and underlying fundamentals and associated earnings growth rates on the other hand. While individual security mispricing can be commonly found in all market environments, entire sector dislocations in valuation to growth ratios are uncommon. In particular, and as we detail in Section I of this letter, we consider many high quality growth sectors, such as technology and healthcare, to be remarkably undervalued and attractive relative to the market. This is most notable given these sectors' superior underlying fundamentals, stronger balance sheets and higher growth rates compared to the rest of the market.

This relative value opportunity is especially pronounced in the technology sector. We believe the timing of this opportunity is extraordinary, as we currently expect the technology sector's fundamentals to remain strong and anticipate its secular growth outlook to meaningfully accelerate over the next several years, as technology enters a large-scale, broad-scope, highly transformational and disruptive wave of innovation, similar to the internet wave of the 1990s. As we outline in Section II of this letter, we believe this new era of Machine Learning, Artificial Intelligence, the Internet of Things and a Fully Connected and Shared Economy (an era that has been referred to as the Fourth Industrial Revolution) will fundamentally transform the way we live, work and interact and will disrupt businesses globally.

At the same time, and in contrast to the fundamental and valuation tailwinds which we continue to see for high quality growth sectors, we regard defensive, low-growth and interest-rate sensitive sectors, such as utilities, consumer staples and REITs, to be overvalued and vulnerable to the downside, exhibiting elevated valuations with little or no earnings growth. As a result, we see sectors that used to be considered defensive now becoming rapidly susceptible to precipitous corrections. In our view, what used to be safe is becoming highly unstable and risky. This vulnerable market formation includes fixed-income investments, most of which are now expensive. In particular, as we will show in Section III of this letter, government bonds are currently as expensive relative to stocks as stocks were relative to bonds at the very end of 1999, right before the equity market collapsed.

In the following, we first review key investment opportunities –including opportunities in international stocks–, analyze attractive relative and absolute valuations, which we currently see in high quality growth equities relative to low-growth defensive sectors, and remark on the improving fundamentals of high quality growth stocks. We then discuss in detail our outlook for technology stocks and the secular growth opportunities we see in the sector. Finally, we close with an overview of the broader market.

I. Portfolio Opportunities and Market Anomalies

At a high level, current investment opportunities include, one, growth equity investments overseas, two, the potential for renormalization of relative valuation multiples of high quality growth stocks –and the resulting outperformance over low-growth, defensive stocks–, and, three, the strong fundamental performance of high quality growth stocks over the past two years. Furthermore, and looking forward, we believe such opportunities can be multi-year in nature, and, as a result, can be persistent and favorable to our strategy for years to come. It is therefore important to review each of them in detail.

Performance of International Stocks

International stocks are slightly underperforming the S&P 500 in 2019. Non-US stocks have now underperformed nine out of the last ten years (including 2019), making the cumulative performance gap since the end of 2009 quite wide, as shown below. As a result, it may take years for international stocks to close this gap, creating a potentially long tailwind for equities outside the US.

Exhibit 4. *MSCI World Index vs. S&P 500 Index, 2009 through 2019, source Bloomberg.*

During periods of volatility, such as Q4 of last year, our investment framework and disciplined approach to investing in high quality companies at attractive prices, while always maintaining a high level of liquidity and diversification, provides long-term stability to our portfolio and increases our staying power in individual investments. When the market corrects, our focus steadfastly remains on identifying strong businesses globally, typically monopolies or oligopolies, that can be bought at very attractive cash flow multiples during market dislocations.

As we discussed in our last quarterly letter, last year's market correction contracted equity multiples significantly and created some compelling investment opportunities in international equities specifically. And even after the Q1 rally, global stocks continue to remain attractive as the forward P/E multiple for the MSCI World still trades at a discount to its historical average, despite global sovereign bond yields being lower than their historical average.

To understand how unattractive bonds are relative to stocks, one only needs to look at global bond yields in the late 80's and early 90's when forward P/E multiples for the MSCI World index were similar.

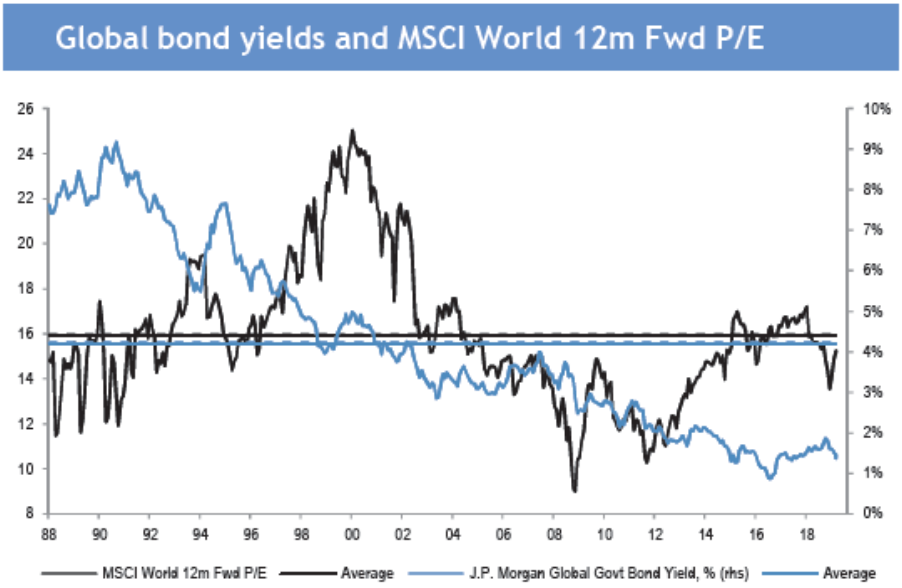

Exhibit 5. *MSCI World Index P/E and Global Sovereign Bond Yields, source JP Morgan.*

This relative value formation is creating substantial opportunities in global stocks. As a result, and in multiple markets overseas, we continue to find potentially attractive risk/reward opportunities in classic high quality growth investments that trade at compelling relative valuation levels.

Country Name	Index	P/E 2020 Est
US	S&P 500	15.7
UK	FTSE 100	12.1
France	CAC 40	13.2
Germany	DAX	12.2
Japan	Nikkei 225	14.6
Hong Kong	Hang Seng	10.7
China	Shanghai Composite	10.9
South Korea	Kospi	10.1
Taiwan	Taiwan	14.6
India	Sensex	15.8

Exhibit 6. *P/E 2020 by Country, April 2019, source Bloomberg.*

Last year's P/E multiple contraction was particularly severe in emerging markets whose forward P/E valuation level during the correction in December stood around 10.3x, placing it in the 18th percentile of the last thirty years. And although multiples have risen by approximately 10% from their depressed levels in December 2018, they continue to remain attractive.

	S&P 500 Index Fwd P/E	Stoxx 600 Index Fwd P/E	MSCI EM Index Fwd P/E
Current Level	15.7	13.2	11.3

Exhibit 7. *P/E Multiples by Index, April 2019, source Bloomberg.*

In particular, we see significant opportunities in China, where valuations are currently near 14-year lows and among the least expensive in emerging markets.

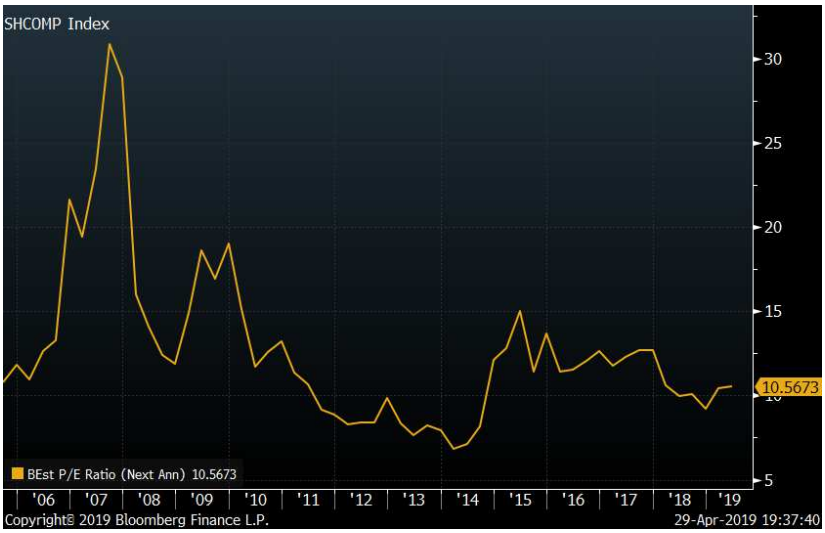

Exhibit 8. *Shanghai Composite Index Forward P/E, April 2019, source Bloomberg.*

Following the worst performance among all major markets in 2018 (the Shanghai Composite Index was down 26%), Chinese equities exhibited strong performance in Q1 of 2019. We believe this can continue, as China cut the reserve ratio requirement (RRR) for banks several times in 2018, which may lead to economic growth from an increased money supply, similar to what happened in 2015, the last time the RRR was reduced so dramatically.

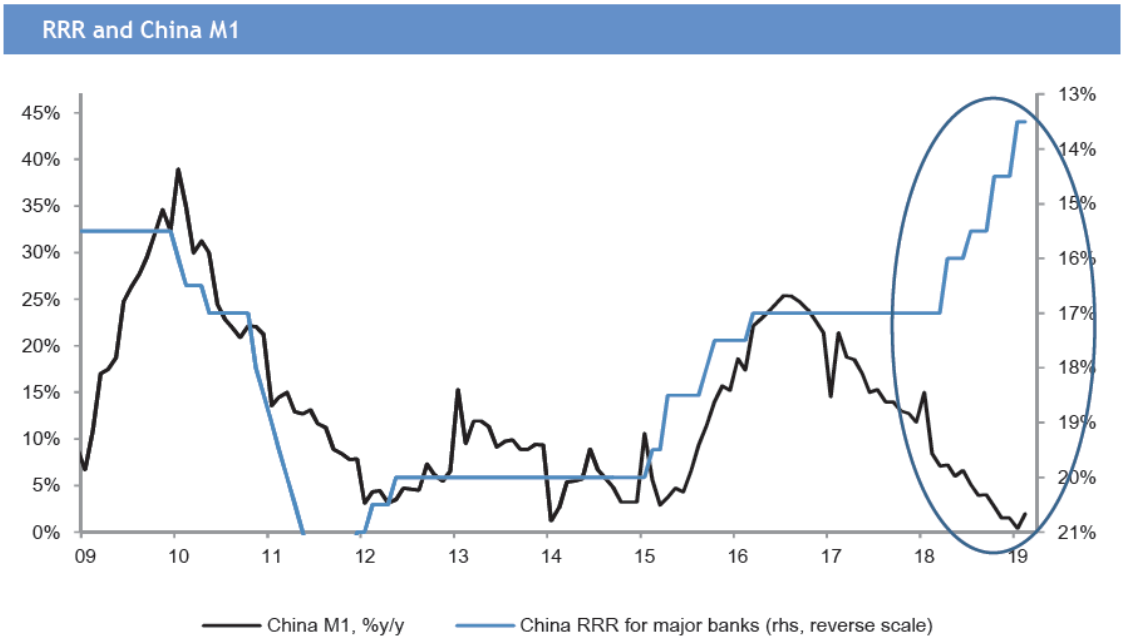

Exhibit 9. *RRR and China M1, reverse scale, source JP Morgan.*

China's 2018 stimulus measures are now having a positive effect on economic activity, with manufacturing PMI already inflecting positively.

Exhibit 10. *China Manufacturing PMI, source Bloomberg.*

Renormalization of Multiples for High Quality Growth Stocks

One of the most interesting aspects of market behavior in 2018, in our view, was the contraction in multiples of high quality growth stocks. In fact, last year's correction created a significant disconnect between fundamentals and stock market reaction, which remarkably further widened style dislocations that had persisted over the last few years. For example, the forward P/E spread between low volatility and growth stocks stood at 4.1x on November 20, 2018, placing it in the 100th percentile of the spread's historical range and surpassing even the extreme levels seen in 2016.

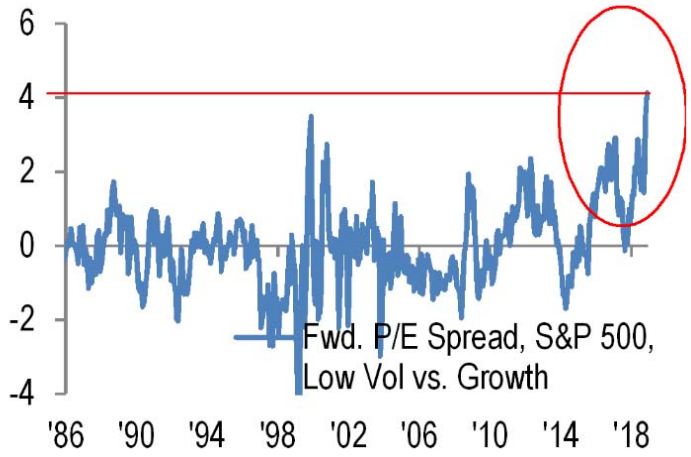

Exhibit 11. *LowVol-Growth Spread at 100th Percentile, November 20, 2018, source JP Morgan.*

Simply stated, low-volatility stocks became not just more expensive than growth stocks, in fact they became overvalued at an extreme and unprecedented relative level. And even though low-volatility stocks underperformed the market in Q1 of this year, high quality growth sectors such as technology and healthcare are still trading at a discount to the rest of the market while defensive sectors are trading at a premium. This creates a significant investment opportunity as, ultimately, such high quality, high free cash flow yielding growth sectors ought to trade at a premium to the market, in our view.

For evidence of these sectors' valuation anomalies in the current market, one only needs to look at the technology sector, which we believe remains undervalued on a relative basis. Among the S&P 500 sectors, information technology, a classic high quality growth sector, is currently trading at a discount to the market on a forward free

cash flow yield basis, despite having one of the strongest revenue growth prospects, the best balance sheet and the highest return on invested capital.

In theory and under steady-state normal market conditions, one would expect a sector with high growth, pristine balance sheet and high ROIC to trade at a valuation premium, not a discount, to the market. At the same time, and in contrast to communication services and healthcare, the utilities sector, a defensive and interest-rate sensitive sector that exhibits anemic growth, has significant debt and generates negative free cash flow, inexplicably trades at a premium to technology on a P/E basis.

Sector	ROIC LTM	Net Cash % Mkt Cap	P/E 2020	FCF Yield 2020
Consumer Discretionary	12.1%	-17.5%	20.0x	5.0%
Consumer Staples	14.2%	-19.4%	18.1x	5.4%
Energy	7.8%	-19.9%	15.0x	6.4%
Financials	5.9%	-71.6%	10.9x	
Health Care	10.7%	-13.8%	14.3x	6.9%
Industrials	12.4%	-21.9%	14.8x	6.3%
Information Technology	20.0%	-2.7%	17.6x	5.7%
Materials	8.9%	-20.7%	14.8x	6.2%
Real Estate	4.5%	-32.5%	18.7x	1.2%
Communication Services	9.9%	-12.4%	16.9x	7.7%
Utilities	5.1%	-64.9%	17.7x	-0.9%
S&P 500	**9.6%**	**-23.2%**	**15.6x**	**5.1%**

Exhibit 12. *Valuation Metrics by Sector, April 2019, source Bloomberg and Alkeon Estimates.*

A historic valuation comparison is equally revealing. Viewed in the context of a long time period, as shown below, the valuation level of technology stocks is below its historical average, even excluding the 2000 technology bubble. This is partly why we believe it may take years for multiples of high quality growth stocks to renormalize, as such periods of directional outperformance can typically be multi-year in nature. In turn, such a cycle of relative outperformance has the potential to serve as a powerful secular tailwind to our portfolio's technology investments going forward.

Furthermore, one could sensibly argue that technology could also be considered a defensive investment in light of its cost-cutting proposition to the end customer, superior balance sheet, low labor cost to sales, ongoing industry consolidation, and very low sensitivity to interest rates (as shown in Exhibit 25).

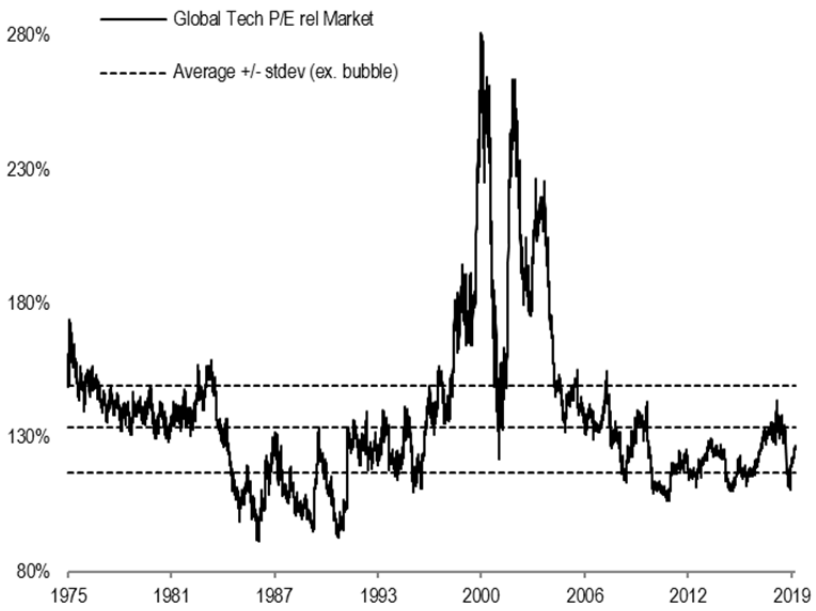

Exhibit 13. *Relative Forward P/E of Technology vs. S&P 500 Index, 1975 to April 2019, source Thomson Reuters and Credit Suisse.*

To better understand how we reached this point of wide-scale sector valuation discrepancies, one has to first contemplate the unprecedented thirty-seven year super-cycle for interest rates (shown below) that has yielded remarkable returns for fixed-income investors. This has been a very long cycle, decades in the making, implying that any change to this well-tenured cycle could be highly and conspicuously disruptive to the dynamics of the equities market.

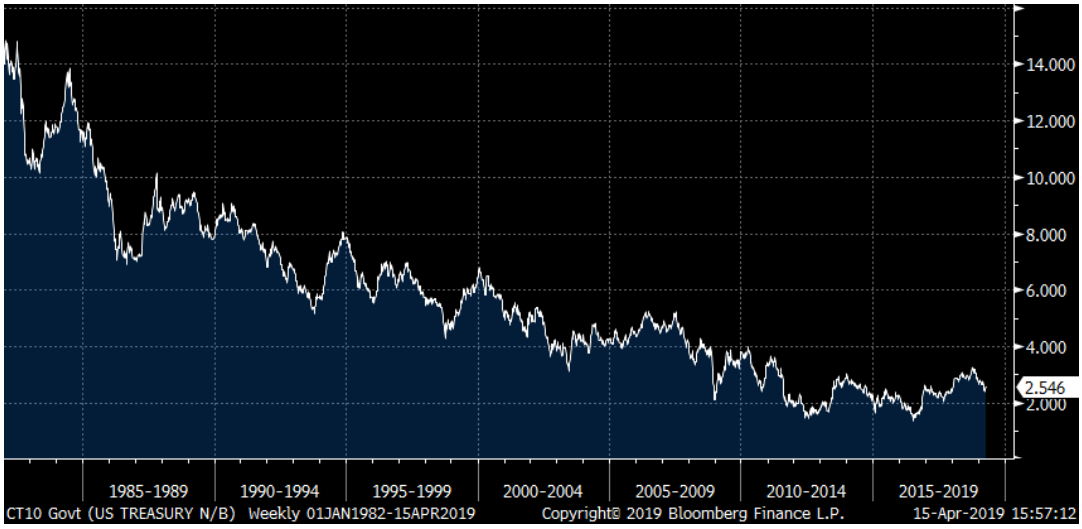

Exhibit 14. *US Treasury 10-Year Yield, source Bloomberg.*

We believe it is precisely this declining- and low-rate environment that has forced investors to seek defensive investments in "bond proxies" in the equity market in recent years, a behavior that has particularly and disproportionately benefitted shares of low-volatility, interest-rate sensitive, low-growth stocks, such as utilities, REITs and consumer staples, elevating their relative multiples and, along the way, creating significant valuation dislocations compared to other sectors.

But as inflation lifts and the secular bull market for bonds ends, broad sector valuation distortions now create unique opportunities for long-short, fundamentally oriented investors. Simply stated, low-volatility stocks have produced outsized returns and are becoming increasingly challenging to justify on fundamentals, in our view.

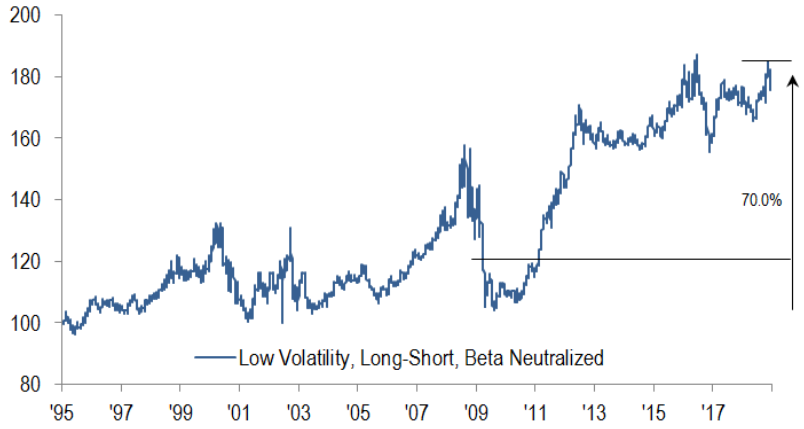

Exhibit 15. *Low Volatility Factor Performance, January 2019, source JP Morgan.*

This outperformance of low-volatility stocks versus high-volatility stocks has indeed been dramatic in scale and, in our view, resulted in the formation of a low-volatility equity bubble, the magnitude of which we have not seen since the 2000 technology bubble, during which growth stocks outperformed value stocks by a comparable amount, as shown below.

Exhibit 16. *Relative Performance of S&P 500 Growth Index vs. S&P 500 Value Index, January 1998 through March 2000, source Bloomberg.*

We believe this multi-year low-volatility, defensive-in-nature stock bubble has disproportionately benefitted low-volatility and defensive sectors at the expense of growth sectors, such as technology and healthcare (which are now trading at attractive relative and absolute discounts, in our view). This is now yielding a unique opportunity on both sides of the investment universe, creating an attractive fundamental backdrop for a long-short investor.

In short, we believe that when this low-volatility formation unwinds and prices renormalize, not only can the potential for alpha generation on the short side meaningfully improve, but also relative multiples for high quality growth compounders –which have contracted or not markedly expanded in recent years– can meaningfully expand, creating an investment cycle with potential for significantly above-average returns and double-alpha generation.

Strong Fundamentals for Technology Stocks

Overall, underlying fundamentals of our high quality long investments have remained strong over the last few years. In particular, our view on the technology sector remains positive for a number of reasons that we outline below. And in fact, we consider technology to be not only a growth investment but also a defensive one.

Moreover, despite strong performance over the past few years –which was driven by earnings growth– the technology sector remarkably remains one of the cheapest in the S&P 500, in our view. We believe this makes the risk/reward opportunity for technology investments particularly compelling ahead of a large-scale, broad-scope and highly impactful wave of technological innovation (which we discuss in detail in Section II below).

Looking closely at their underlying fundamentals, we believe one of the reasons technology stocks have consistently grown earnings above market rates is their high level of business reinvestment as a percent of sales, a level that has allowed these companies to maintain high barriers to entry and high margins. This model is a perfect archetype of the high quality growth companies we seek to identify, analyze and invest in. The level of business reinvestment by technology stocks has re-accelerated recently and has approached an all-time high level of 18%.

TECH+: Capex + R&D as a % of Sales

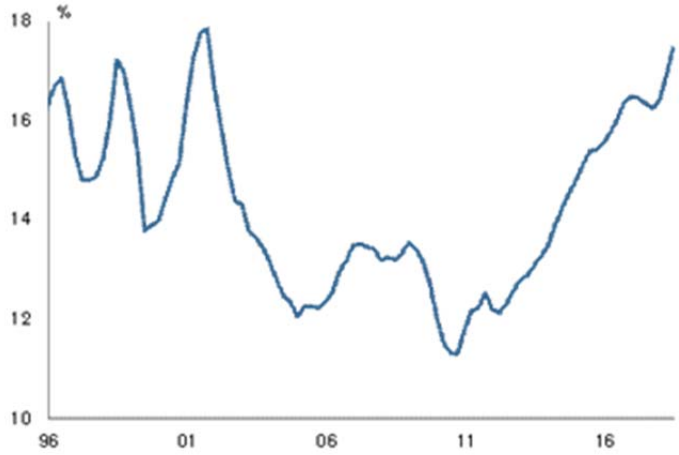

Exhibit 17. *Technology Capex plus R&D as a % of Sales (Trailing 4Q Basis), 1996 to September 2018, source Credit Suisse.*

In contrast, the amount of business reinvestment for consumer staples has been disappointing and declining for over two decades.

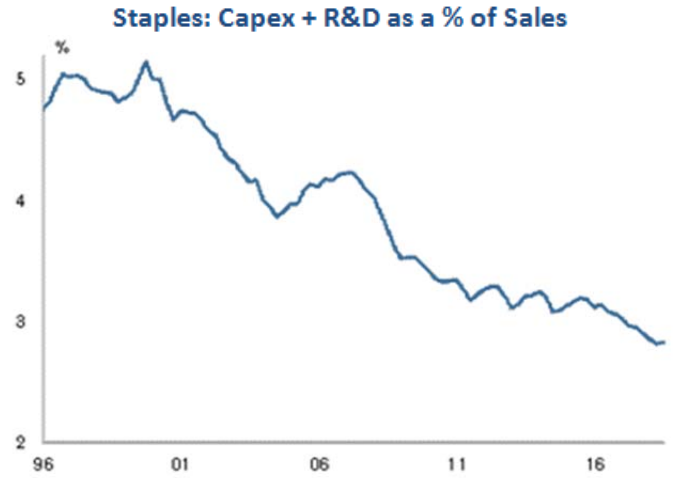

Exhibit 18. *Consumer Staples Capex plus R&D as a % of Sales (Trailing 4Q Basis), 1996 to September 2018, source Credit Suisse.*

The high level of business reinvestment among technology companies provides fundamental investors (such as Alkeon) with additional opportunities to research and evaluate newly emerging business units that have the

potential to contribute meaningfully to company revenues and earnings in future years but can often be a drag to profitability (and thus consensus expectations) in the near term. Take as an example Alphabet Inc., whose non-advertising revenues ("other revenues" that include apps and content, hardware such as Pixel phones and Google Home, and Google Cloud) were estimated to be approximately 15% of total revenues in 2018. From a profitability standpoint, these other businesses are expected to grow much faster than the company's average, generating gross profit that is expected to grow from $5b in 2018 to $30b in 2022.

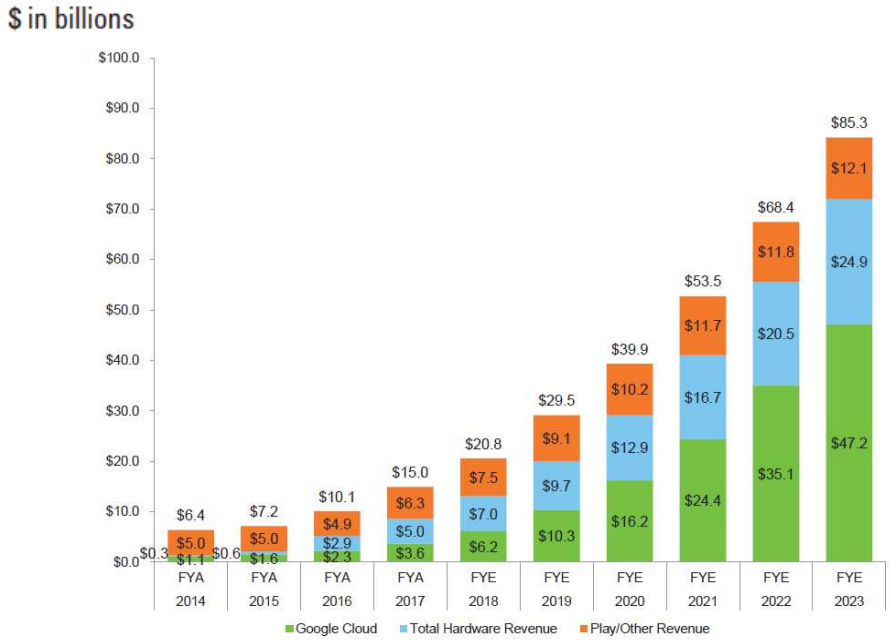

Exhibit 19. *Expected Revenue Contributions from Alphabet's "Other", source Goldman Sachs.*

In particular, the Google Cloud Platform, which has produced negative profits so far, is expected to contribute meaningfully in future years.

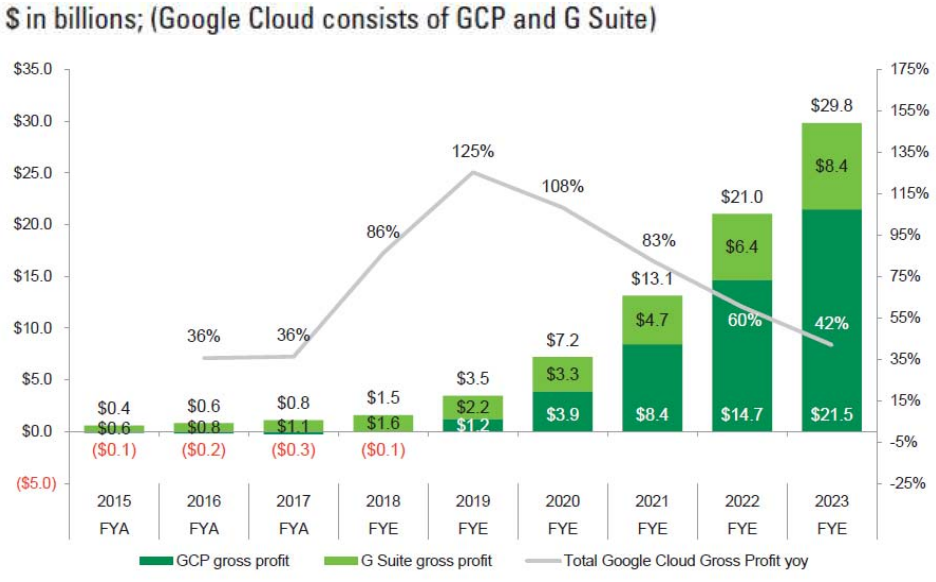

Exhibit 20. *Estimated Google Cloud Gross Profit Contribution, source Goldman Sachs.*

Notably, these other businesses do not include other longer-duration investment projects, which themselves have the potential for meaningful revenue and earnings contributions in future years. For example, Waymo, which we consider to be the most advanced autonomous vehicle, has the potential to become a business worth $175 billion.

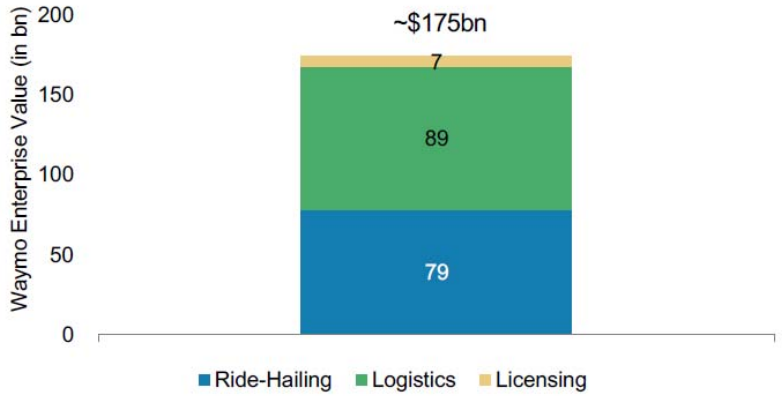

Exhibit 21. *Estimated Waymo Enterprise Value, source Morgan Stanley.*

To put this in perspective, Softbank's recent investment in GM's Cruise subsidiary valued the autonomous startup at $11.5 billion. Meanwhile Waymo has driven more miles than any other autonomous vehicle, which gives it an advantage in testing advanced machine learning algorithms, recently reaching 9 million miles, the equivalent of driving around the earth 361 times.

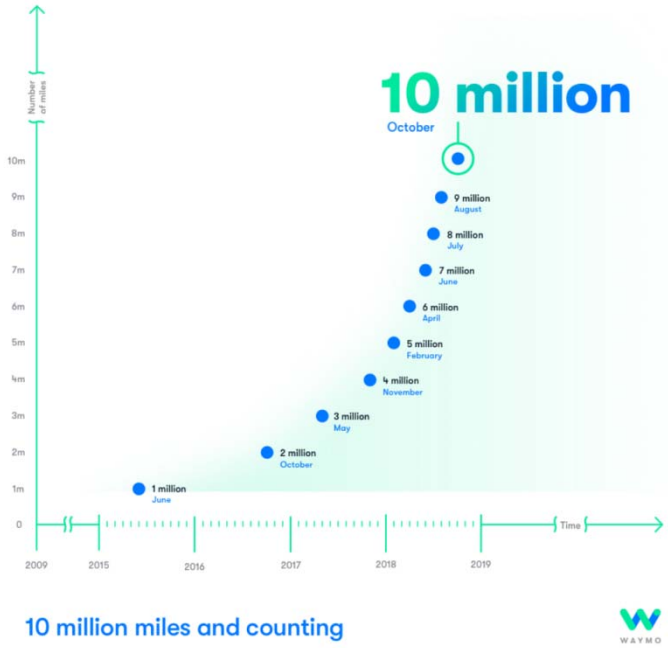

Exhibit 22. *Waymo Miles Driven in Millions, source Waymo.*

Additionally, Waymo has an incredible strategic advantage in leveraging Alphabet's advanced capabilities in machine learning, cloud compute power, computer vision and mapping.

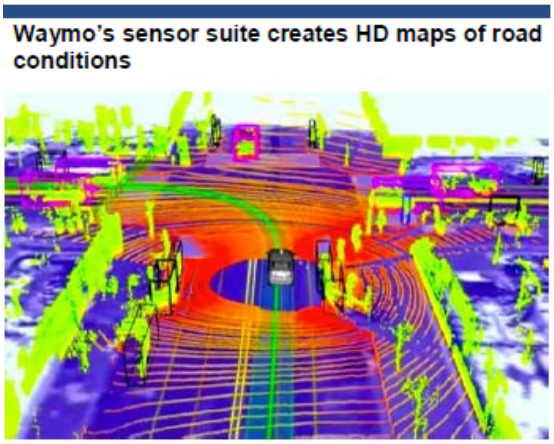

Exhibit 23. *Waymo's Sensor Suite HD Road Maps, source Waymo and ISI Research.*

This advanced dynamic goes beyond the capabilities of Google Maps and Waze, which in and of themselves represent another strategic advantage in the consumer evolution of Waymo in the ride hailing market.

Exhibit 24. *Google Maps and Waze, source Alphabet and Merrill Lynch.*

Furthermore, and worth noting in light of the current interest rate environment –particularly post tax reform and ahead of potential infrastructure investments (both of which are inflationary)– technology investment performance has historically been largely yield-agnostic, as statistically there has been almost zero correlation between the performance of technology subsectors and bond yields.

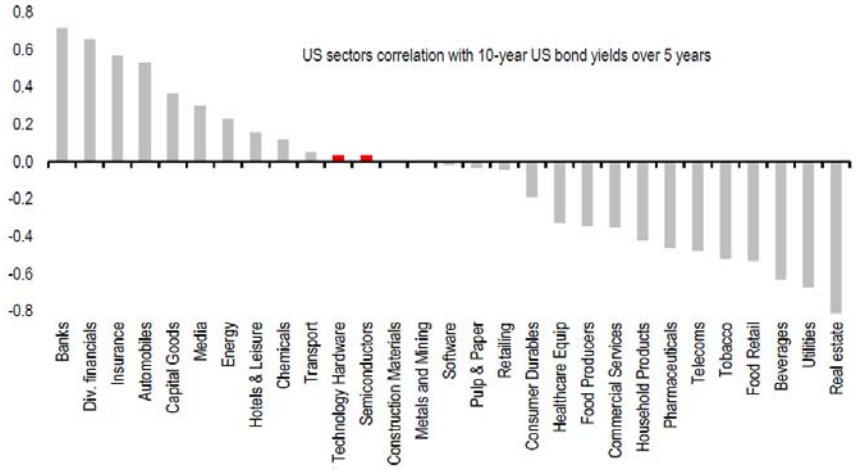

Exhibit 25. *US Sector Correlation with 10-Year US Bond Yields, over Five Year Period, April 2018, source Credit Suisse.*

As a result, historically technology has been able to outperform against backdrops of both falling and rising bond yields, as shown below. In our view, this is reflective of the product-specific nature of earnings growth for many technology stocks, which often makes their growth trajectory largely decoupled from the economic cycle, particularly for major industry disruptors – as innovation often overwhelms the economic cycle.

	Bond yields		US Tech relative performance		Bond yields		US Tech relative performance
Major peak	Major trough	Change in yields	Peak to trough performance	Major trough	Major peak	Change in yields	Trough to peak performance
Apr-10	Oct-10	-161	0.0%	Oct-10	Feb-11	134	4.0%
Feb-11	Sep-11	-201	1.6%	Sep-11	Mar-12	66	3.8%
Mar-12	Jul-12	-97	-5.1%	Jul-12	Mar-13	66	-10.1%
Mar-13	May-13	-43	-1.7%	May-13	Sep-13	134	1.8%
Sep-13	Oct-13	-48	-0.9%	Oct-13	Dec-13	52	2.6%
Dec-13	Jan-15	-137	5.1%	Jan-15	Jun-15	85	2.4%
Jun-15	Sep-15	-45	0.8%	Sep-15	Nov-15	29	3.1%
Nov-15	Jul-16	-96	-5.3%	Jul-16	Dec-16	122	7.2%
Dec-16	Today	-40	11.2%				
	Average	-96	0.6%		Average	86	1.9%
	% of times positive		44%		% of times positive		88%

Exhibit 26. *US Technology Sector Performance in Periods of Rising and Falling Bond Yields, source Credit Suisse.*

In addition to underlying valuations being attractive relative to the market, and earnings and cash flow revisions beginning to inflect positively and being largely decoupled from changes in interest rates, the technology sector also stands likely to benefit for years to come from increased spending due to an emerging labor shortage in the US. Specifically, the growth rate of the US population pool (ages 16-64) is set for a steep decline within the next few years and is expected to turn negative by late 2060, something our country has never seen before.[2]

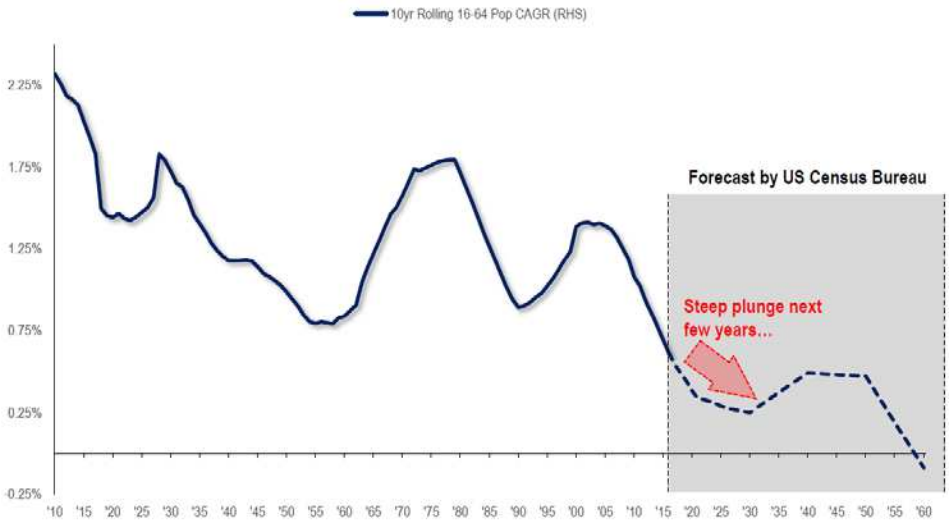

Exhibit 27. *10-Year Rolling Change of US Worker Population Pool, source Fundstrat.*

In past labor shortages, technology spending spiked, and it is estimated to rise to 5.5% of GDP (an all-time high) from 3.5% currently.[3] Remarkably, this incredibly strong demographic tailwind is independent of and incremental to the upcoming wave of technological innovation, which is in itself transformative. The result is a potentially powerful dual engine of secular growth for technology stocks that can lift consensus expectations meaningfully over a multi-year period.

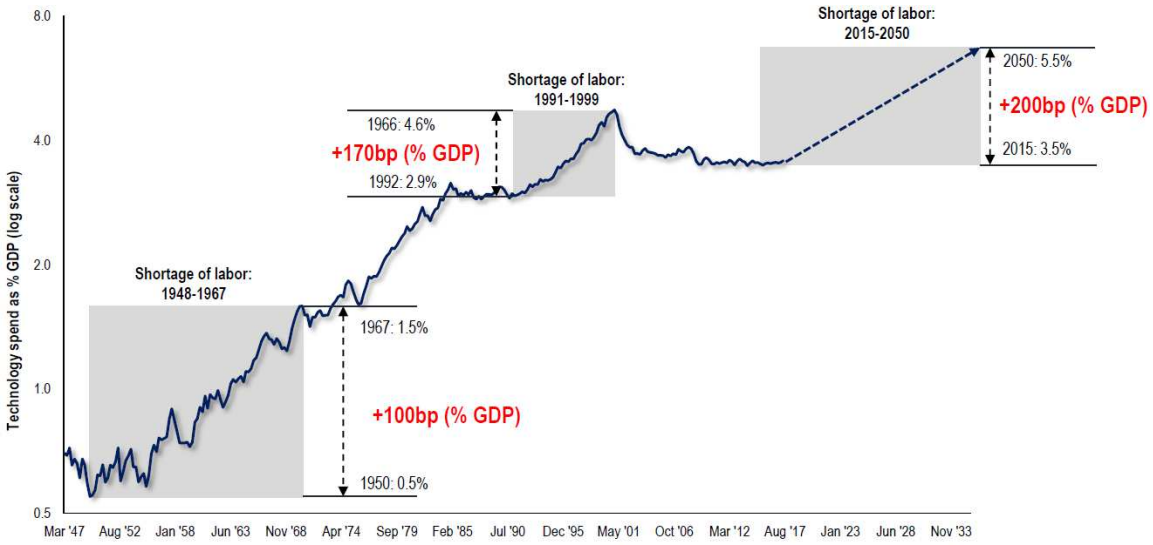

Exhibit 28. *Technology Spending as a Percent of GDP, source Fundstrat.*

Looking deeper at US demographics, Millennials, who represent the largest population cohort ever and have an average age of 26.5, are about to enter their prime working years. This is an important group to watch, as Millennials –who have helped the auto market in recent years and are already having a positive impact on the housing market– are very early in their investment activities, and therefore their full impact on the stock market has yet to be seen.[4]

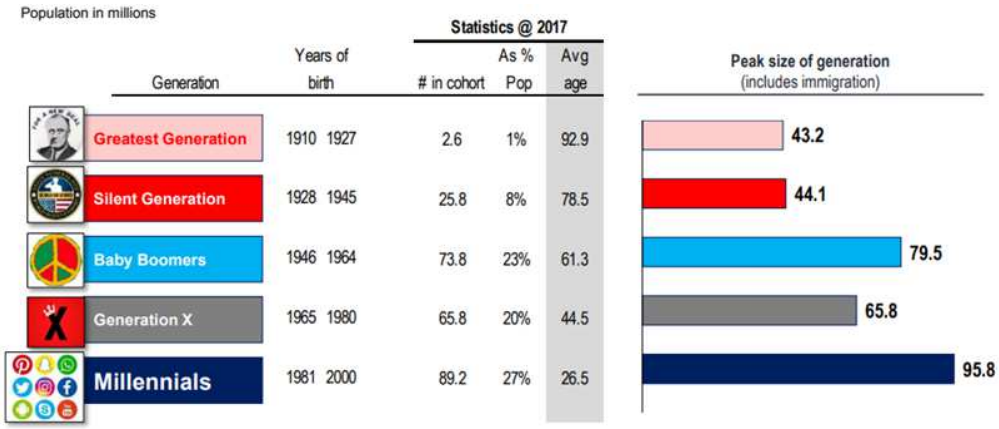

Exhibit 29. *Comparative Size of US Generations (in millions), source Fundstrat.*

Importantly, Millennials are the first truly all-digital generation. Digital data is the backbone of Artificial Intelligence (AI) and Machine Learning, two key drivers behind the wave of technological innovation that we see forming. Every generation has embraced innovation and supported disruptive emerging companies that have challenged the status quo, and we expect Millennials, whose experiences are built on digital data, to be no different and fully endorse and accelerate this upcoming technological revolution, one that has the potential to fundamentally and structurally alter the way we work and interact with each other. Simply stated, the investment implications of this generational sea change are difficult to overstate.

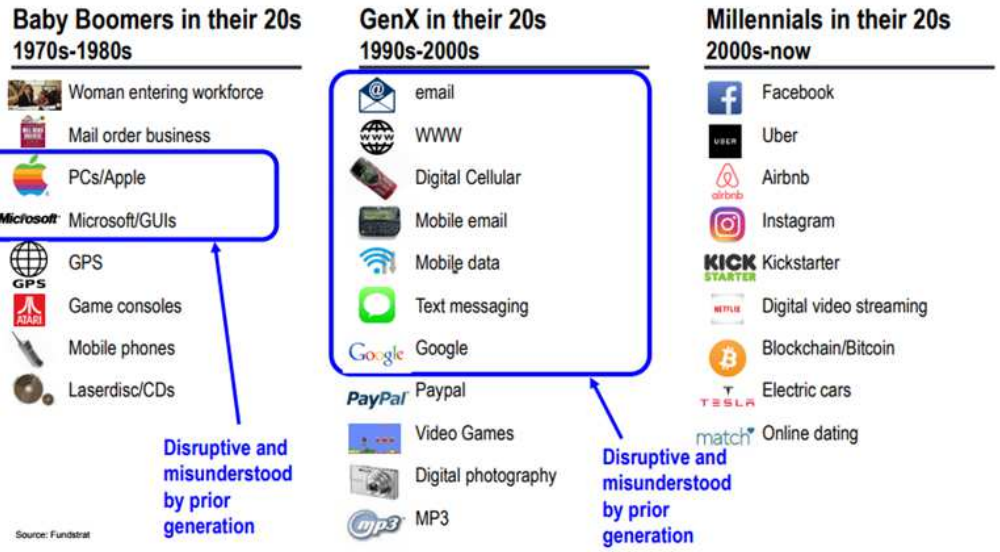

Exhibit 30. *Innovations Seen When Each Generation was in Their 20's, source Fundstrat.*

Remarkably, technology is trading at a discount to the market at a time when the long-term secular growth outlook for the sector is dramatically improving, in our view. This of course further elevates the attractiveness of the sector creating a compelling risk/reward opportunity ahead of a potential large-scale, broadly impactful wave of technological innovation, similar to the internet wave of the 1990s. But unlike this last innovation wave, technology stocks now are highly profitable and among the cheapest in the S&P 500.

The risk/reward opportunity presented by the technology sector is perhaps the most important investment aspect of this upcoming cycle of innovation for six key reasons. One, information technology and communication services are currently trading at a discount to the S&P 500 on a forward-free-cash-flow yield basis (see Exhibit 12). Two, in our view, analyst consensus expectations are not fully incorporating the secular five-year wave and growth upside of the upcoming technological revolution, and therefore what looks cheap or reasonably priced today may look even cheaper two to three years from now. Three, earnings revisions for technology companies have already been strongly positive, signaling that this technological wave of innovation is already under way. Four, technology stocks have historically been largely uncorrelated to interest rates (see Exhibit 25), and therefore they are more insulated against inflation. Five, we expect this technological revolution to be fully embraced by Millennials –a generation raised on digital data– who represent the largest population cohort ever, all at a time when they are just entering their prime working and spending years. And six, in addition to and independent from the wave of innovation, the upcoming severe and secular labor shortage in the US should dramatically boost technology spending in the next decade.

In summary, our continued positive outlook on technology stocks is based on strong underlying fundamentals. Many technology stocks are currently exhibiting consistent and strong earnings growth, have fortress balance sheets, great liquidity and free cash flow and are positioned to benefit from changing and highly supportive demographics. Remarkably, this is all happening at a time when we believe the technology sector is on the precipice of a large-scale wave of innovation, the likes of which has not been seen in decades. This powerful innovation cycle is discussed in detail in the following section.

II. Secular Outlook for Technology

> *"There have been four major historical eras defined by the way we work. The Hunter-Gatherer Age lasted* ***several million years****. And then the Agricultural Age lasted* ***several thousand years****. The Industrial Age lasted* ***a couple of centuries****. And now the Information Age has lasted just* ***a few decades****. And now today,* ***we're on the cusp of our next great era as a species****." – Maurice Conti, Director of Applied Research & Innovation, Autodesk*

We expect the upcoming wave of technological innovation to be wide in scope, transformative and highly disruptive. The digital foundation of the global economy is enabling disruption in a matter of months, as businesses can now reach millions of users in the shortest time ever. Disruption can now affect businesses almost overnight. As we have discussed in recent communications, we believe the investment implications of this upcoming wave of technological innovation are likely to be dramatic and to favor long-short strategies that can benefit not only from long investments in companies that innovate but also from short investments in companies trapped in an equally powerful cycle of technological obsolescence.

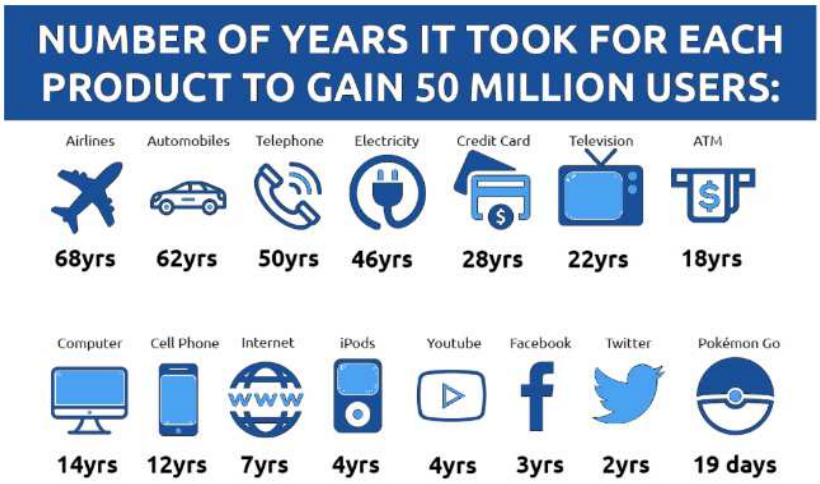

Exhibit 31. *Number of Years for a Product to Reach 50 Million Users, source Morgan Stanley.*

It took the airline industry 68 years to reach 50 million users. It recently took four months for Fortnite and just one month for Apex Legends to do the same. Apex reached one million players in the first eight hours, ten million in the first three days and 25 million in the first week.[5]

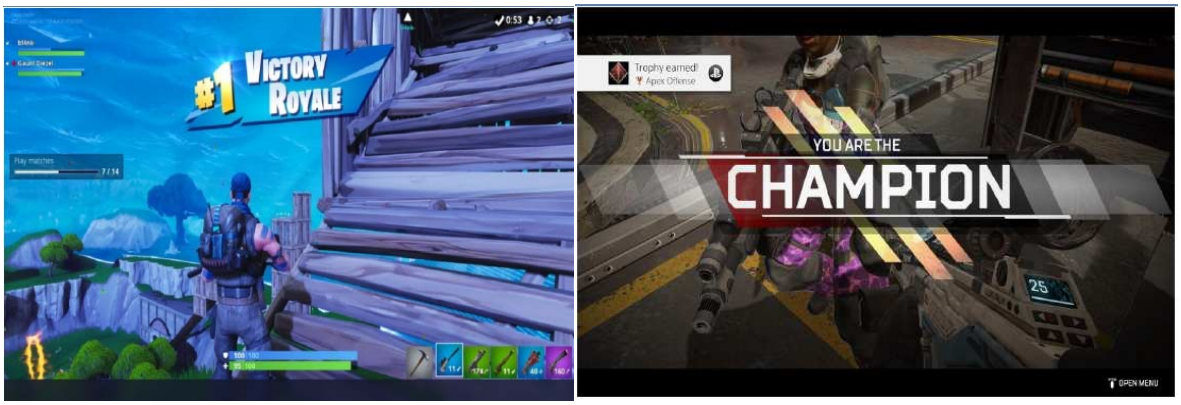

Exhibit 32. *Battle Royale Games, source Merrill Lynch.*

As a result, eSports as a category is growing rapidly in terms of viewership and engagement, surpassing most traditional professional sports.

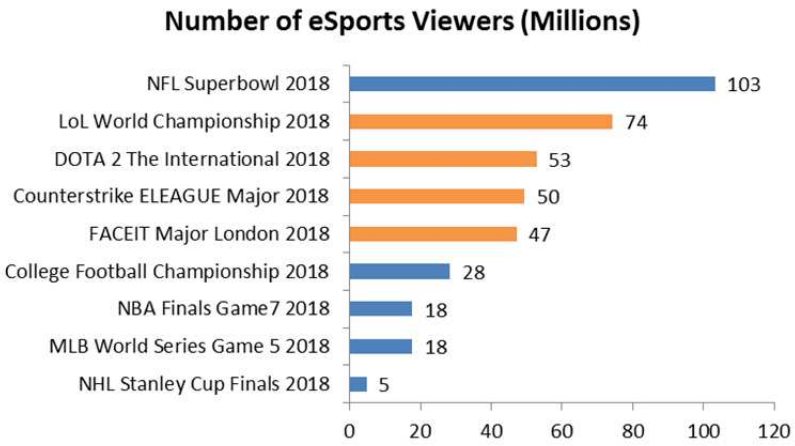

Exhibit 33. *Number of eSports Viewers in 2018, source Alkeon.*

Yet, the eSports industry is at its early stages of growth from an investment standpoint, as annual revenues are currently behind those of major league sports.

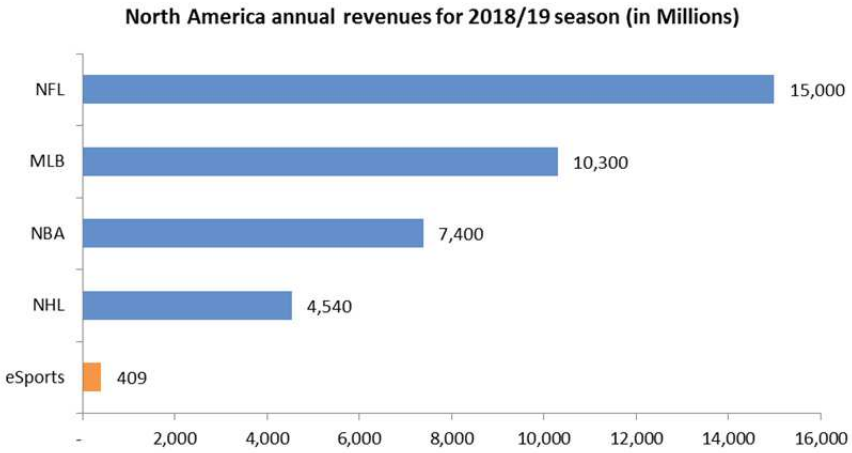

Exhibit 34. *Annual Revenue by Sport (North America only) in 2018/19, source Alkeon.*

The resulting disruption in traditional media and entertainment formats is astounding. For years, the CEO of Epic Games (creator of Fortnite), Tim Sweeney, has espoused the inevitability of "metaverse", an open 3D virtual world that will disrupt the traditional 2D social media world.[6] In February of this year, Epic staged an in-game Marshmello EDM concert within Fortnite Battle Royale, arguably the biggest concert in history, with attendance estimates reaching 10 million and estimates of merchandise sales reaching $30 million. According to 13D research, Fortnite makes twice as much in revenues per user per year than Google, Facebook, Twitter and Snapchat combined.

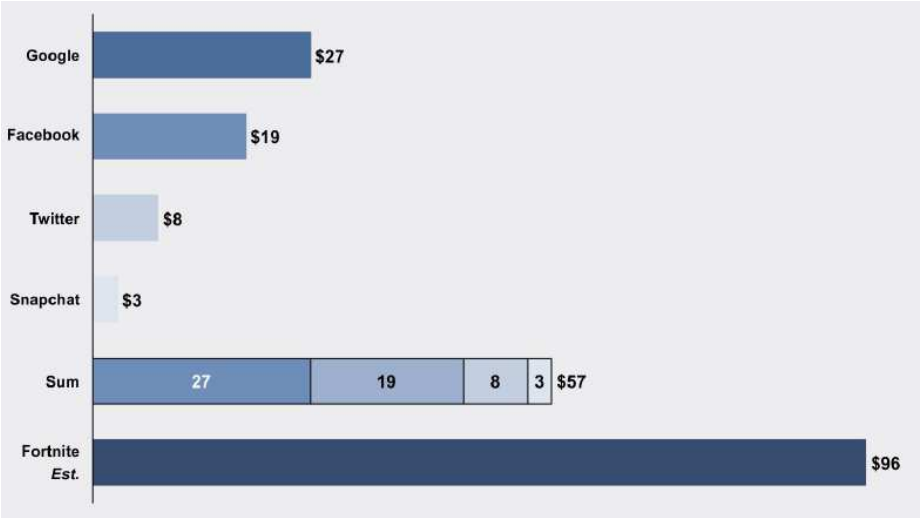

Exhibit 35. *Annual Revenue per User per Year, source 13D and MediaRedef.*

This unprecedented pace of technological change is also leading to rapid community formation overseas. For example, in China short video has emerged as a brand new nationwide entertainment format, with monthly active users reaching 800 million in early 2019 from zero users just a couple of years ago. Douyin –the leading short video app in China (known as TikTok in the West)– exceeded 500 million monthly active users and 250 million daily active users in December 2018 after being launched two years ago in January 2017. Moreover, this community formation is beginning to occur on "made-in-China" apps, which are rapidly gaining popularity in overseas markets. TikTok now ranks just behind Facebook and Facebook/WhatsApp messengers as the fourth most downloaded app globally ex-China, ahead of both Instagram and Youtube/Netflix.

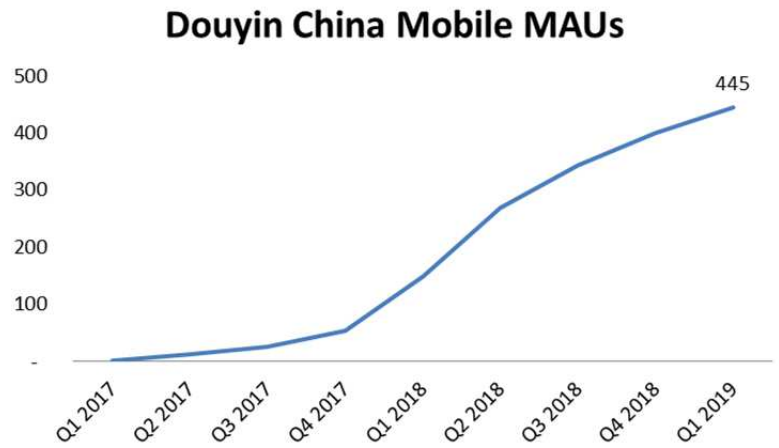

Exhibit 36. *Douyin China Mobile MAUs, source Quest Mobile.*

The upcoming disruption is likely to affect all sectors of the economy, in our view, not just media and entertainment. Merrill Lynch predicts that 50% of S&P 500 companies could be replaced over the next 10 years, as the average tenure of an S&P 500 company is forecast to contract from its high of nearly 40 years in 1977 to nearly 10 years by 2027, supporting our view of a highly favorable environment for stock picking and highlighting the need for investors to remain selective.

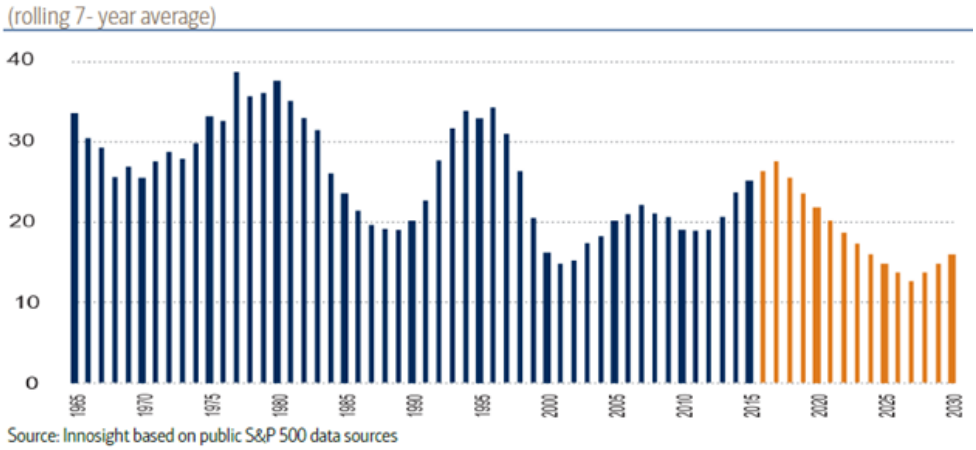

Exhibit 37. *Average Lifespan of S&P 500 Index Companies on the Decline, source Merrill Lynch.*

"We always overestimate the change that will occur in the next two years, and we underestimate the change that will occur in the next ten years" – Bill Gates

Against this backdrop of potential disruption, companies are rushing to invest, not only to seize the opportunity but also to survive the rapidly changing landscape of the Fully Connected Economy. Evidence of this investment can be seen in the steady acceleration of VC funding in Artificial Intelligence in recent years. We saw $24b invested in AI startups in the last five years, with funding in 2018 jumping 72% year over year in the US alone.

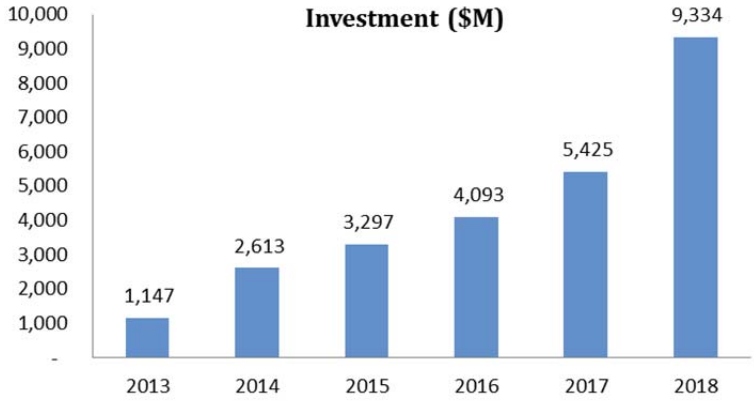

Exhibit 38. *Domestic VC Funding in AI, source CB Insights/PWC.*

This potentially historic and deeply transformative wave of innovation, the upcoming Fourth Industrial Revolution, is a beautiful "fusion of technologies that is blurring the lines between the physical, digital and the biological", "a technological revolution that will fundamentally alter the way we live, work and relate to one another".[7] It is exactly what Jen-Hsun Huang, visionary CEO of Nvidia, described as "one of the most important revolutions ever, whereas computer scientists used to specify every single instruction one line at a time, now algorithms write algorithms, software writes software, computers are learning by themselves, the era of [M]achine [L]earning", a historic time when "serendipity meets destiny".[8]

This is the era of "Deep Learning", the most advanced AI state in which machines can learn unsupervised by sifting through vast amounts of data, often unstructured. In the last few years, as the cost of compute and memory came down dramatically, Deep Learning breakthroughs advanced Machine Sensing (natural character recognition, speech recognition, image recognition, data discovery and extraction and predictive analytics) to new levels of machine cognition, and accelerated the feedback loop between data and algorithms.

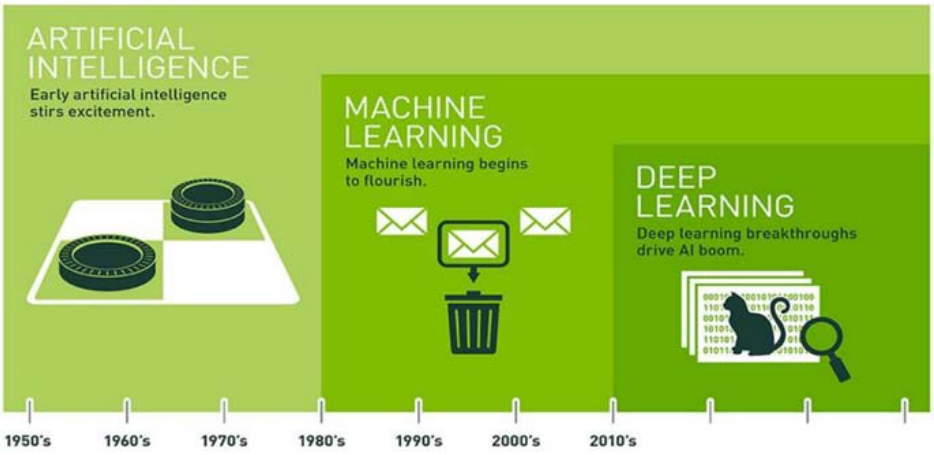

Exhibit 39. *The Era of Deep Learning, source Nvidia and JP Morgan.*

One of the simplest and yet most impressive examples of recent advances in machine learning is Alpha Zero, developed within the DeepMind division of Alphabet, that most recently obliterated the highest-ranked chess program (Stockfish)[9] and achieved superhuman performance in the game of chess by tabula rasa reinforcement learning from games of self-play! Given only the rules of the game, Alpha Zero learned how to play chess within four hours by playing against itself and convincingly defeated a world champion program.[10] No domain knowledge, no specialized search engines, no handcrafted evaluation functions, no move ordering heuristics, just a beautifully simple, general-purpose reinforcement learning algorithm!

Most recently, the DeepMind team at Alphabet attacked another major challenge for current deep learning algorithms, namely the tendency to forget things previously learned upon receiving new information, what is known as "catastrophic forgetting".[11] As Irina Higgins, senior research scientist at DeepMind, explained, "The capacity for life-long learning, the ability to acquire new knowledge from a sequence of experiences to solve progressively more tasks, an essential feature of biological intelligence, has indeed been a hurdle in our efforts to develop Artificial General Intelligence (AGI), the type of AI that is all-encompassing, empathetic and imaginative, such as the one we see on TV and in movies".[12] Catastrophic forgetting has been one of the top reasons researchers have not been able to achieve human-level AI.

It is important to note that we do not view this upcoming cycle of innovation as another mini-cycle, such as the 2007 smart-phone cycle, but rather as a broad-based wave of innovation driven by a unique set of new technologies, including, one, next-gen broadband mobility (5G and the Internet of Things (IoT)), two, on the consumer side, significant advances in display technologies (high-definition CMOS image sensors, OLED, 3D sensing and Virtual and Augmented Reality – VR/AR), the combination of which can provide a sizable uplift to the mobile video experience making it more pleasant and immersive, and, three, AI and autonomous driving (ADAS – Advanced Driver Assistance Systems, which is effectively a subset of AI).

This is a set of technologies that is highly synergistic and mutually reinforcing. And although AI is attracting most of the headline attention, other critical components of this upcoming Fourth Industrial Revolution, such as IoT, are equally sizable and are growing rapidly.

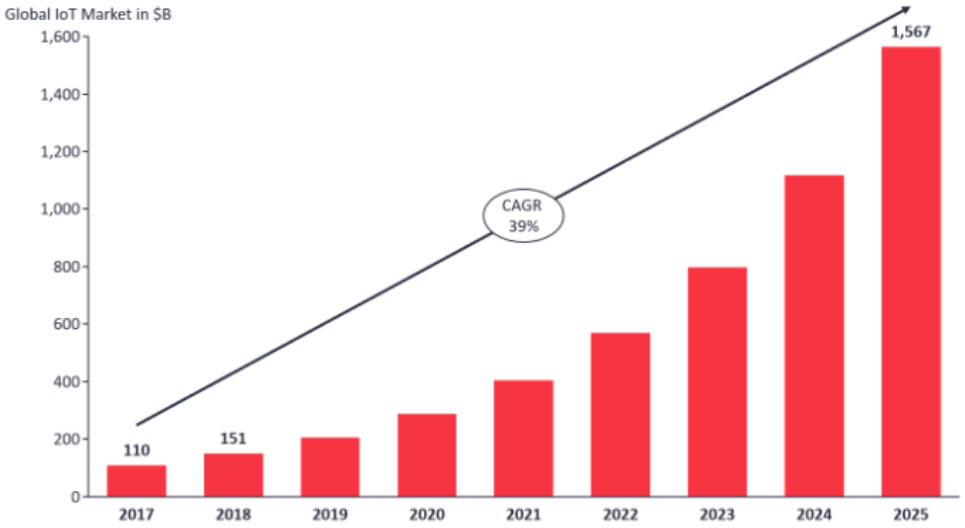

Exhibit 40. *Global IoT forecast (billions), source IoT Analytics.*

One can think of AI as the application layer of the Fourth Industrial Revolution, with advances in silicon technology and wireless connectivity represented in the infrastructure layer. One of the most important components of this innovation wave is 5G, the most critical enabling block of full connectivity – and a significant advancement over 4G, which will ultimately offer a "fiber-like" experience at speeds up to one hundred times faster than 4G.

5G is not only a major technology driver behind next-generation fully immersive mobile video applications but also a supportive platform for a variety of advanced commercial applications in an increasingly Connected Economy, whose bandwidth requirements are most demanding. For example, a fully connected car is expected to generate 25GB of data from its sensors (for comparison, an hour of HD video streaming currently generates less than 1GB of data).

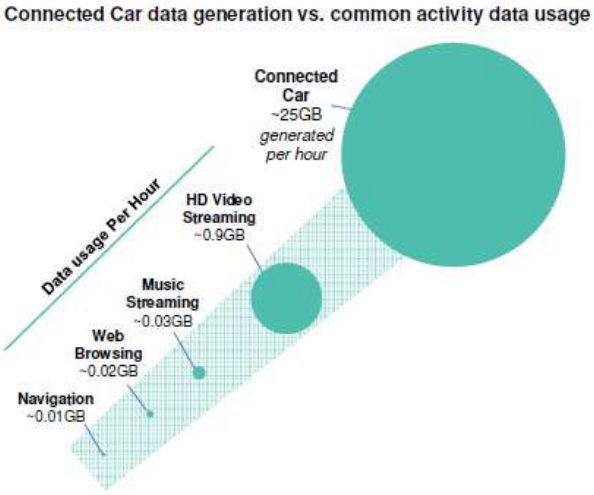

Exhibit 41. *Connected Car Data Generation vs. Common Activity Data Usage, source Bernstein.*

We believe a fully autonomous car will essentially be a computer server on wheels and the autonomous car market can be an order of magnitude bigger than the server AI market (currently there are approximately 80 million cars sold annually vs. 10 million servers). 5G will provide ubiquitous connectivity to this network of transportable car servers, and this network should grow exponentially as cars become fully connected. As an example, the ride-hailing industry alone is expected to grow eightfold to $285 billion by 2030.[13]

Exhibit 42. *Future Vehicles Will All be Autonomous, source Nvidia.*

This is why 5G is becoming such critical an infrastructure layer. Consider, for instance, a fully connected car ecosystem with three main technologies to transmit data to and from autonomous vehicles: one, vehicle-to-infrastructure, a technology that connects cars with urban infrastructure (such as roads, traffic lights and signs), two, vehicle-to-vehicle, a technology that allows cars to "talk" to each other, and, three, vehicle-to-network, a technology that connects vehicles with the rest of the world and the cloud using the 5G network.[14]

Exhibit 43. *Overview of Connected Car Ecosystem, source Morgan Stanley and Qualcomm.*

This ecosystem is data hungry. Connected cars need mobile networks and the pace of data generated by autonomous vehicles is likely to be unprecedented. Morgan Stanley estimates the massive amounts of data autonomous vehicles will generate will require data links ranging from 3 gigabytes per hour for Level 1 vehicles to 50 gigabytes per hour for Level 5 vehicles. Until now, autonomous vehicle platforms have involved cars that work with little network connectivity (e.g., Tesla's *AutoPilot* and Alphabet's *Waymo*). But in the future, local-processing within vehicles will not be sufficient, and therefore a fully-connected ecosystem and continuous access to the cloud become essential.[15]

	Today's iPhone	2050 Smart Car	Comparison
Data Produced (In Car)	~1-2 GB / Month	~40 TB / Hour	= 3,300 Years of iPhone Usage
Wireless Usage (Out of Car)	~1 GB / Month	~50-500 GB / Month	= up to 500x iPhone Usage
Total Wireless Data Transmission	~17 EB	~5,000 EB	= up to 300x Today's Transmission

Exhibit 44. *Data Comparison, Today's iPhone vs. 2050 Autonomous Vehicle, source Morgan Stanley.*

Generalizing, and at an industrial level, as this fully-connected ecosystem develops, access to the cloud via the wireless network brings real-time intelligent decision-making to the edge of the network. There is a virtuous circle here, as the emergence of AI applications and use cases will incentivize the crowd-sourcing of data and induce a massive installment of IoT access points and devices for Machine Learning.

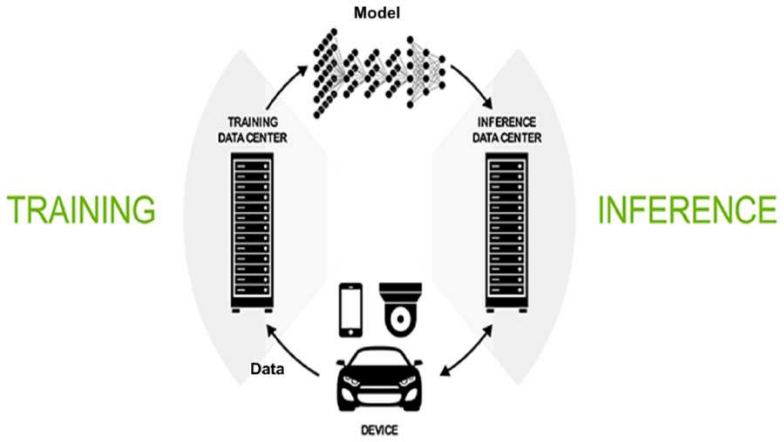

Exhibit 45. *Virtuous Circle of IoT Devices and Deep Learning, source JP Morgan.*

The amount of silicon investment required to build this 5G infrastructure and enable access points such as mobile devices, cars, IoT devices and sensors is most significant. 5G will enable an equally incredible collection of data via sensors. This will require significant investments in hardware content. For example, at least ten cameras and 32 sensors per car will be needed for Level 5 autonomous driving. Similar to the AI virtuous cycle shown in Exhibit 45 above, the innovation we are seeing with 5G is creating a cycle where hardware is enabling software that, in turn, requires more and more hardware to accommodate more advanced software applications.

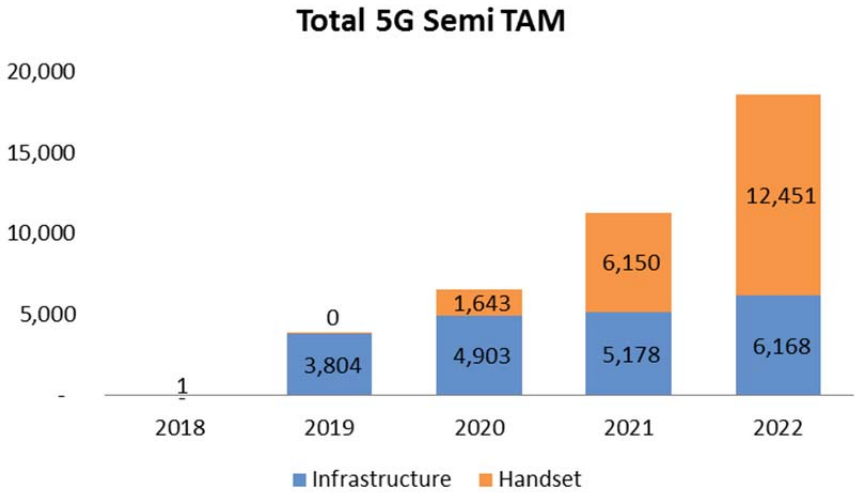

Exhibit 46. *Total 5G Semi TAM ($M), source Merrill Lynch.*

This confluence of expanded connectivity, IoT and advances in AI presents a new chapter in industrial automation and machine learning, a world in which robots, drones, cell-phones, cars and millions of devices are all connected – a potentially massive opportunity for the technology sector.[16] Any subset of this connected world, commercial drones for example, can have widespread applications, such as precision agriculture, search and rescue, transportation (package delivery and even human transport), inspection, 3D measurement and mapping, smart factories, surveillance, data connectivity and research, and so on.[17]

Exhibit 47. *Deep Learning and Inference Everywhere, source Arm Limited.*

Ultimately, we believe entire cities will become fully connected and fully intelligent. Enterprises will become more and more data driven and entire service industries will be disrupted. 5G will help support this massive growth of the IoT in smart cities, allowing devices to communicate with each other, sharing information and moving data and intelligence back and forth from devices to data centers seamlessly.

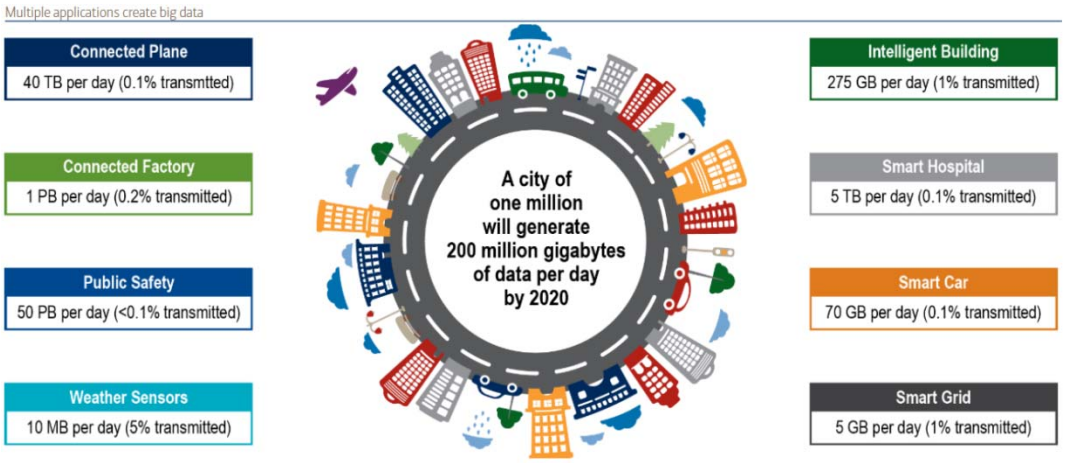

Exhibit 48. *Big Data Applications in a Smart City, August 2017, source Cisco and Merrill Lynch.*

In contemplating how early we find ourselves in this wave of technological innovation, it is instructive to review the recent progress that has been made in AI. For example, only in the last two years did machines begin to recognize images and words better than people. Yet, the theory behind parallel processing and computation, which is the foundation of Machine Learning, has been fully developed and taught in graduate schools for decades. During that time it was well-known that there is little algorithmic differentiation in AI, i.e., the value in AI is not in the algorithm. Instead, and what had been the hurdle for AI until recently, was the inability to cost-effectively deploy the tremendous amounts of processing power necessary to solve complex problems using relatively simple algorithms.

In other words, AI needed a tremendous amount of silicon optimized for Machine Learning. Enter the era of massive parallel processing graphic processing units (GPUs), which have now emerged as the dominant computing platform for AI and Machine Learning. As AI applications demanded massive amounts of computational power, high-performance GPUs emerged as the de-facto tool to meet such demand and solve major AI problems. On the front-end of this revolution, Nvidia has been able to boost GPU performance for Deep Learning by 60-fold in a few years, a blistering pace of innovation.

Exhibit 49. *The Most Exciting Time in Tech History, source Nvidia.*

The result has been a classic innovation cycle, the network effect and the dynamic of an unstoppable wave. More and more data feed AI platforms of massive processing power, which in turn enable major AI applications that consume more and more data and require increasingly more processing power.

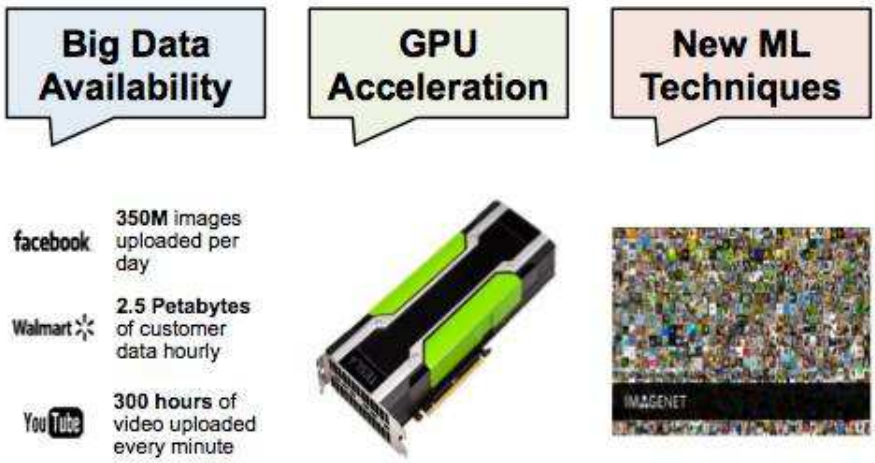

Exhibit 50. *Why Machine Learning Now, source Global Equities Research.*

This has created another interesting dynamic, namely, model complexity is now exploding. Jen-Hsun Huang gave some examples at Nvidia's GTC 2017 conference, describing the progression from Microsoft's ResNet –the deepest learning network as of a couple of years ago– that required 7 exaflops of processing, to Baidu's Deep Speech II model that required 20 exaflops, to Alphabet's Neuro-Machine Translator that requires 105 exaflops and does multi-language translation. To provide a sense of the computational processing involved here, it was also noted that it would take all the supercomputers in the world operating together 7 seconds to produce one exaflop.[18]

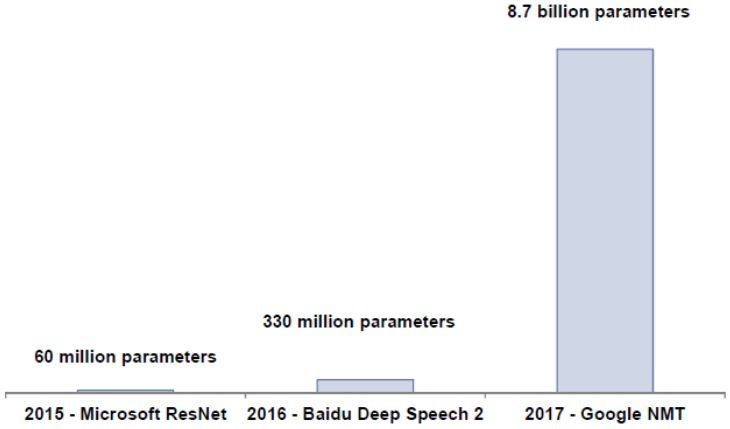

Exhibit 51. *AI Model Complexity is Exploding, source Nvidia and Goldman Sachs.*

To reiterate how early we believe we are in this large wave of technological innovation, it was only in 2016 that Nvidia's data center revenues started to show meaningful growth, actually growing at rates in excess of 100% annually and approaching 200%. Then a year later, in early March 2017, at the Open Compute Summit in Silicon Valley, two leading hyper scalers released Pascal-optimized server designs in which eight GPUs attach to a CPU. Namely, Facebook announced its next-gen CPU and GPU server reference architecture, while Microsoft announced its new HGX-1 offering.[19] These were important developments given the role powerful datacenters and cloud computing infrastructure will play in the rapid advancement of AI. In particular, we believe the role of the Cloud is underappreciated in AI's evolution, as increasingly the training part of Machine Learning will require tremendous computing power remotely (i.e., in the Cloud), while Inference AI development will take place locally, with training data sets being continuously transferred to the edge of the network.

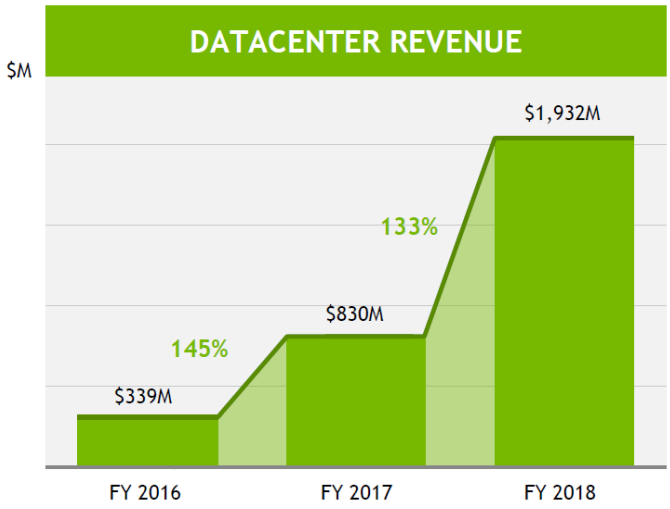

Exhibit 52. *YoY Datacenter Revenue Growth, source Nvidia.*

It took decades to reach this inflection point of change. Looking at the history of commercial AI, it is important to note that it was only in 2007 when Nvidia introduced its famous CUDA platform that included both the software and the GPU and only in the 2010s that AI researchers started to use GPUs for Machine Learning. In 2012, Alex Krizhevsky from the University of Toronto won the annual ImageNet computer image recognition competition (the Super Bowl of computer imaging) using GPUs for Machine Learning, beating the foremost computer vision experts by a wide margin, and since that moment the use of GPUs for AI training and highly parallel workloads in high performance surged, as scaling of CPU computing reached its limits.

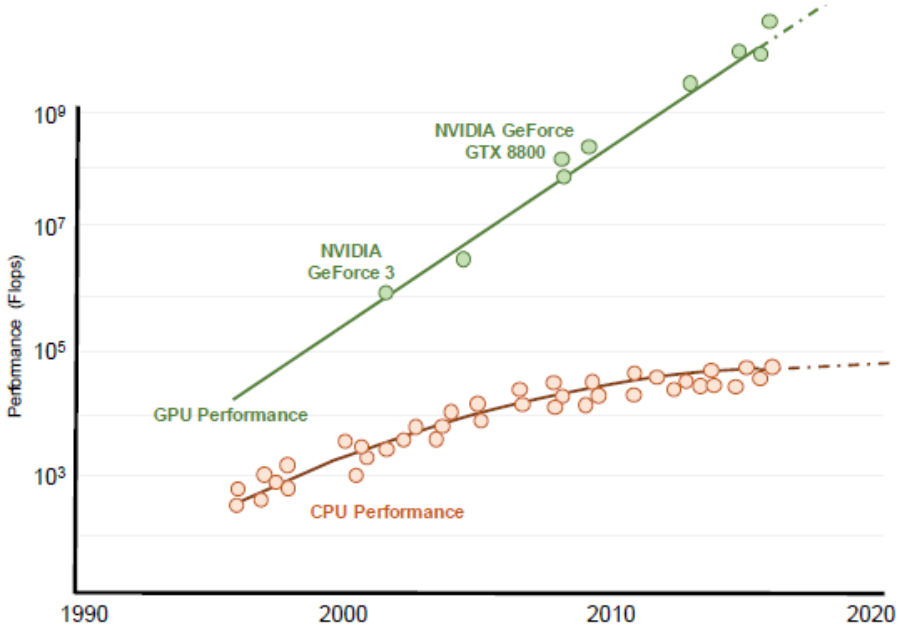

Exhibit 53. *GPU vs. CPU Performance, source Nvidia and Wells Fargo.*

And more recently, just a few years ago, another major milestone was reached: both Alphabet and Microsoft beat the best human score in the ImageNet challenge. Officially now, computers can recognize images better than people. This is a technological revolution, decades in the making, which, in our view, is now enabling an accelerated pace of growth and adoption of AI at a time when major milestones in image recognition, natural character recognition, natural language processing and speech recognition are regularly being reached.

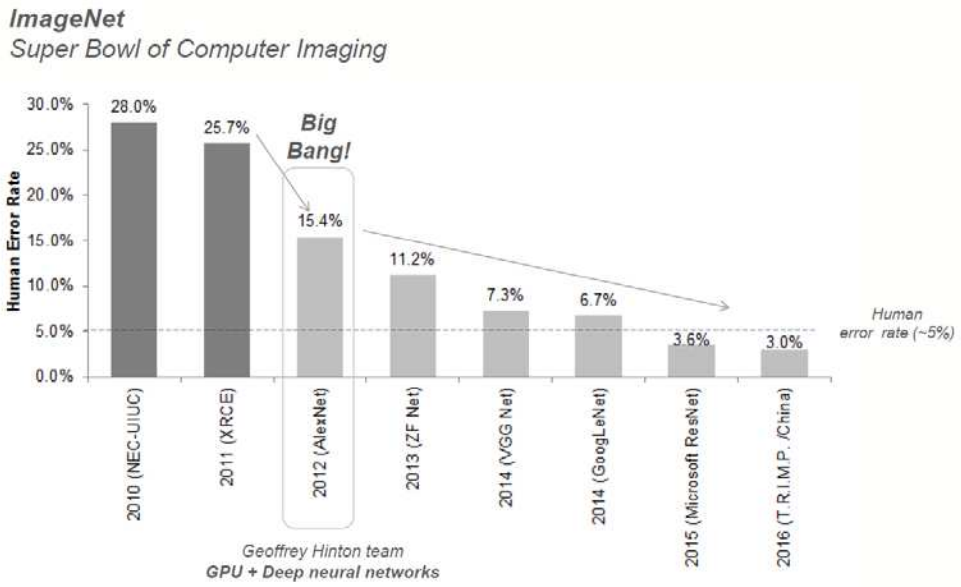

Exhibit 54. *ImageNet Competition, source Pacific Crest.*

For an AI system, being able to recognize images at a low error rate is a major step towards machine cognition and ultimately relational reasoning. Technology disruptors are quick to embrace the revolution. In 2016, Amazon introduced its new AI image recognition tool, Amazon Rekognition, which can detect objects, scenes and faces in images. Using Rekognition, one can locate faces within images and analyze face attributes, such as whether or not the face is smiling or the eyes are open.

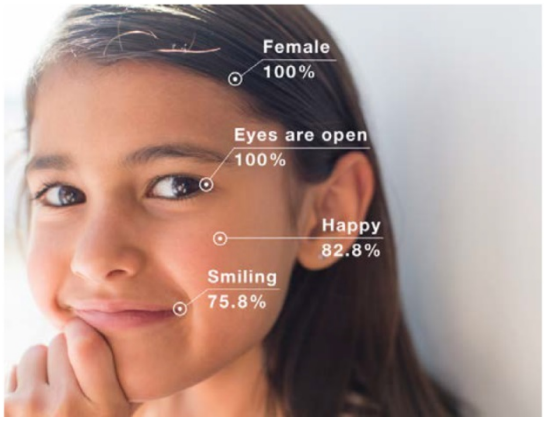

Exhibit 55. *Example of Facial Recognition, Facial Analysis, source Amazon.*

As AI models can now better understand visual information, computers can consequently rely heavily on machine vision to process information. For us humans, 80% of our information is derived by vision, far outweighing all other senses.[20] But now computers can read images better than we can! Capitalizing on this mega-trend, at its 2017 I/O conference, Alphabet introduced Google Lens that uses AI to let cameras understand what they see. For instance, pointing your phone camera at a flower will tell you exactly what species the flower is and pointing your phone camera at a restaurant will tell you what restaurant it is and provide reviews.

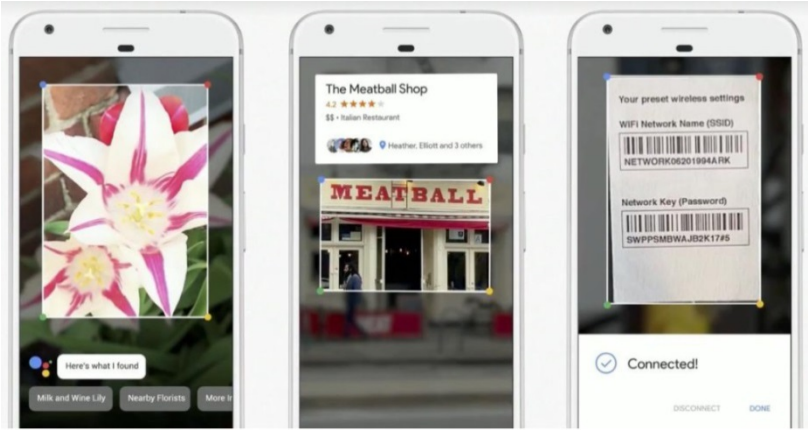

Exhibit 56. *Example of AI in Image Recognition, Google Lens, source Alphabet.*

Simply stated, computer vision is a major enabler of machine cognition and a fundamental component of AI sensing, giving machines the power to extract and intelligently process unstructured data to drive advanced decision-making. The potential commercial implications of this power are dramatic, impacting everything from how we drive to how we shop at the grocery store.

Source: Nvidia.

Source: Simbe Robotics.

Exhibit 57. *Object Identification and Classification and Retail Shelf Auditing, source Nvidia, Simbe Robotics and JP Morgan.*

Furthermore, 5G will enable an equally incredible collection of data via sensors. This will require significant investments in hardware content. Similar to the AI platform virtuous cycle mentioned above, the innovation we are seeing with 5G is creating a cycle where hardware is enabling software that requires more and more hardware to accommodate more AI applications.

It is not difficult to then anticipate the emerging virtuous cycle – more applications require more and more visual data, which in turn enables more and more applications. This raises the bar for hardware required for machine vision and AI, the combination of which is critical for enabling machine cognition. For example, with AI vision, it is not difficult to imagine a future smartphone having eight cameras.

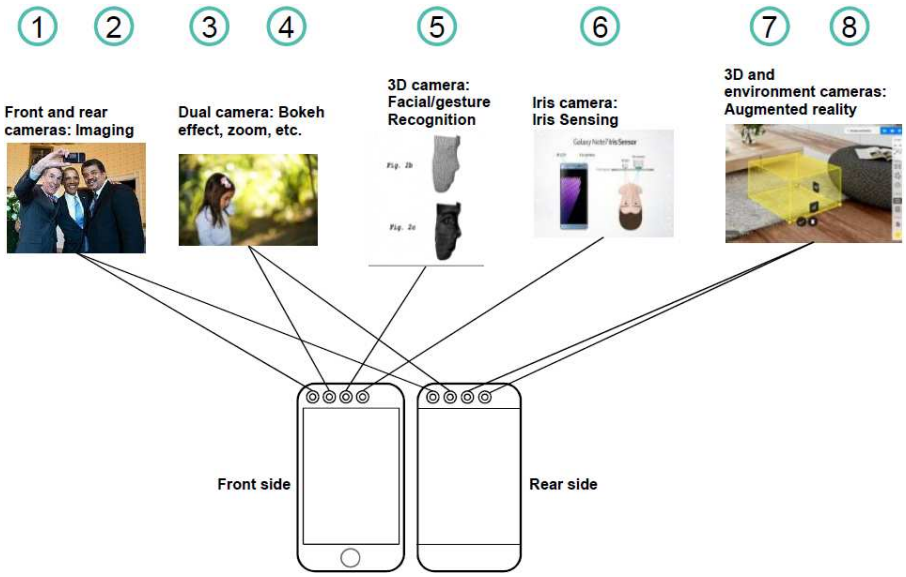

Exhibit 58. *Example of a Future Smartphone with Eight Cameras, source Bernstein.*

To visualize the incredible potential of AI applications, it is instructive to look at the computational graph of a Machine Learning system – this is a representation of the model the system builds. AI startup Graphcore has published an amazing set of images of the computational graphs mapped to its Machine Learning system, which strikingly look much like a brain scan.[21]

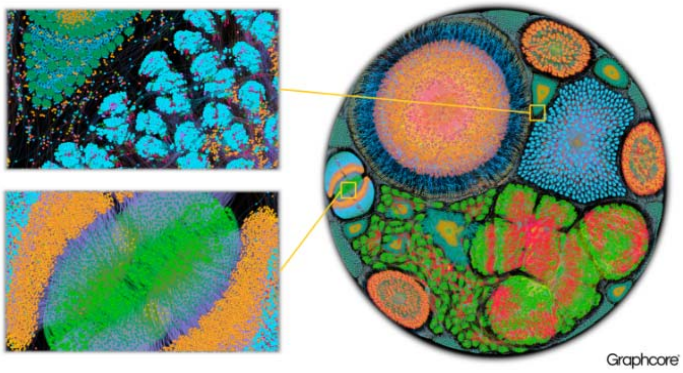

Exhibit 59. *Example of a Machine Learning Model Used in Data Analysis, source Graphcore.*

This is not a futuristic reflection of theoretical vision but rather a model visualization of near future developments. In March 2017, SpaceX and Tesla CEO Elon Musk backed Neuralink, a startup that attempts to connect brains to computers.[22] And in April 2017, Regina Dugan, head of Facebook's R&D division Building 8, describing how we have only begun to scratch the surface of what is possible, revealed that it has a team of engineers working on building a brain-computer interface that will allow people to type up to 100 words per minute, five times faster that typing on a phone, by just using their minds.[23]

These breakthrough developments in image and speech recognition over the past few years are about to change our relationship with machines and computers forever, as computers learn our language and understand what we

see and hear: "As that happens the human-computer interface [will] no longer exist. We will become the interface. We will talk to computers and they will talk back. We [will] see information directly in our eyes. The new form factor is VR/AR." [24]

This type of direct human-computer interaction is absolutely necessary for VR/AR to become an integral part of the knowledge economy, ultimately driving a new frontier market that can reach $692 billion by 2025. The potential for growth in this AR/VR market is difficult to overstate. AR Commerce alone is expected to represent 25% of online retailing by 2035, as shown below.

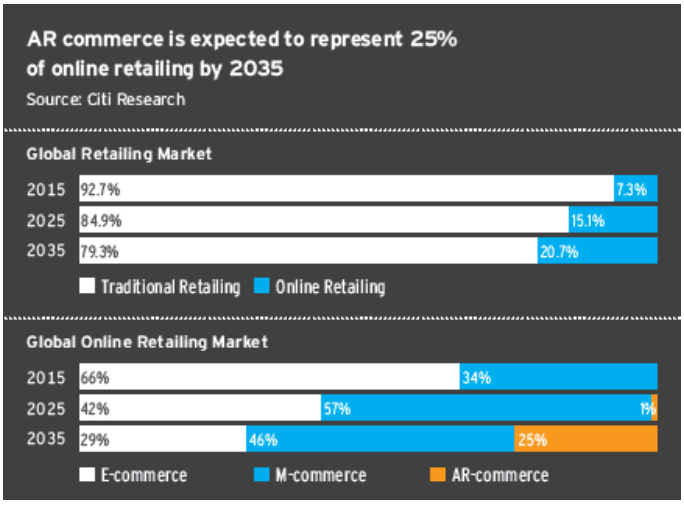

Exhibit 60. *AR Commerce Table, source Citi Research.*

What we have outlined above is a long, secular growth path, and we are still at the early stages of this technological revolution, as major milestones in AI applications such as image recognition, natural character recognition and speech recognition were reached only in the last few years. We do not yet have 5G broadly deployed, Level 5 autonomous cars roaming our streets, or self-taught robots stocking our supermarket shelves. 5G is currently just in trial phases in major metropolitan areas in the US, with services being offered more broadly in the coming years. We believe Level 5 autonomous driving will be a reality a few years from now, and 3D sensing, which is enabling facial recognition on smart-phones and currently sits on the front of the phone, will be soon enabling fully immersive AR applications and will be located on the back of the phone, as shown below.

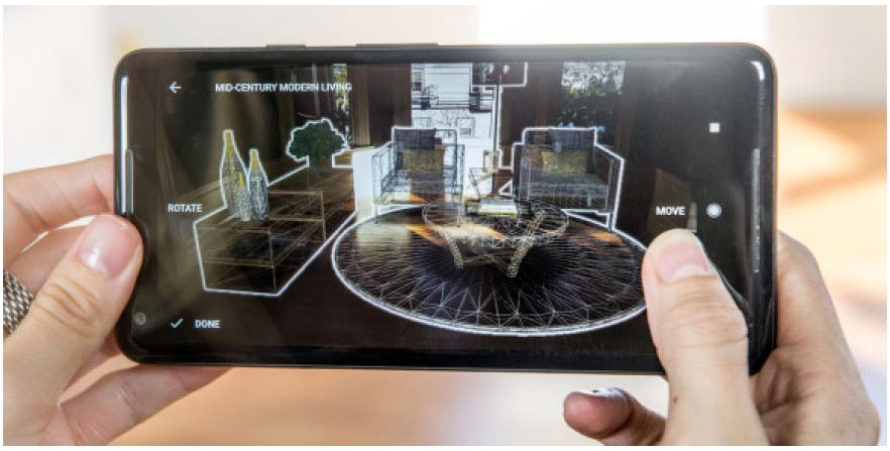

Exhibit 61. *Sotheby's AR Home Staging Application, Utilizing Google ARCore, source Merrill Lynch.*

Businesses are already investing to capitalize on these emerging technologies, aiming to offer a differentiated customer experience. For example, Volvo has teamed up with Microsoft to bring AR to car showrooms, creating models of the cars in virtual reality, using Microsoft's HoloLens technology, which displays virtual objects as holograms. In particular, the cars' sensor fields (which are invisible) are envisioned as colorful waves. This allows customers to see sensors that cannot be seen in a regular car showroom.[25]

Exhibit 62. *Microsoft and Volvo Bringing Augmented Reality to Car Shopping, source Morgan Stanley.*

The investment implications of this large-scale, broadly impactful wave of technological innovation are dramatic, as we are past the "big bang" of the AI era and are rapidly approaching the turning point of widespread adoption, in our view. And while some use cases for AI are still moving through the hype cycle, many applications such as image and speech recognition, GPU-based compute, knowledge databases and AR/VR are reaching a critical point of productivity. This is creating a strong secular growth market for silicon content needed in AI applications, including devices, data centers, and IoT.

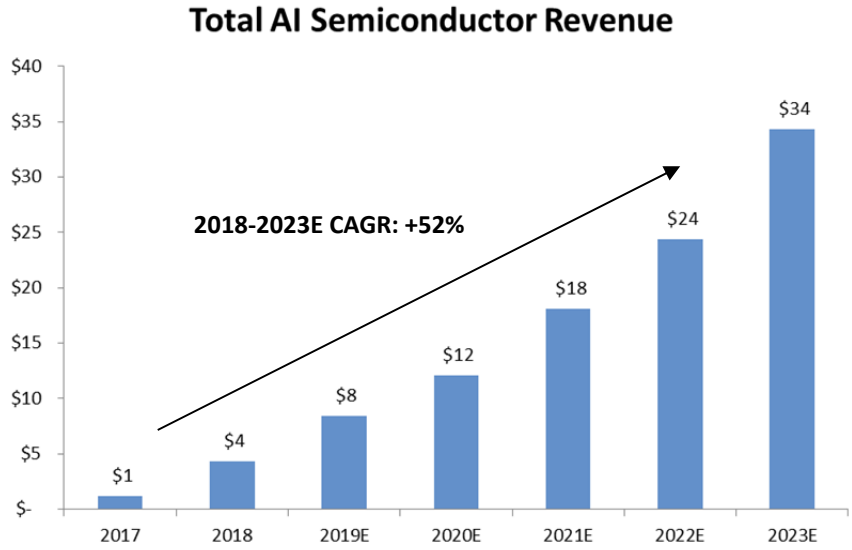

Exhibit 63. *Total AI Semiconductor Revenue, source Wells Fargo.*

This transformation is also rapidly impacting enterprise applications. Cloud software platforms, for example, are applying powerful AI and machine learning capabilities to massive data sets, unlocking tremendous value. Machine learning is even revolutionizing the sales process with next generation cloud models selling themselves frictionlessly, enabling customer discovery and use/test periods and allowing purchasing of software with minimal customer contact.

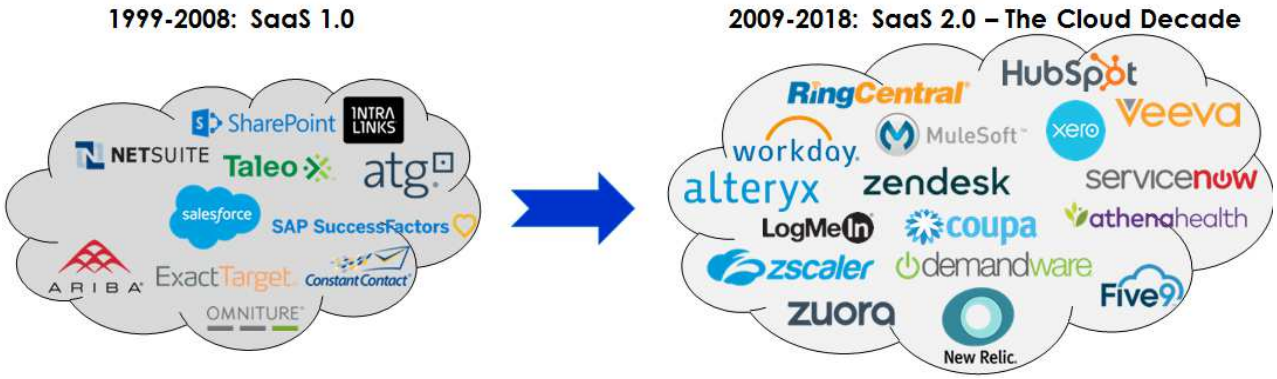

Exhibit 64. *SaaS 1.0 to 2.0 Evolution, source Alkeon.*

This ability to now handle big data seamlessly allows the modern enterprise software ecosystems to become ever-expanding and ever-connecting, powered by expansive API libraries and massive application/ISV exchanges. A dynamic ecosystem of people and APIs is making the enterprise rapidly intelligent and scalable, turning simple software tools into enterprise platforms. Once niche, these software solutions are now becoming critical infrastructure enterprise rails.

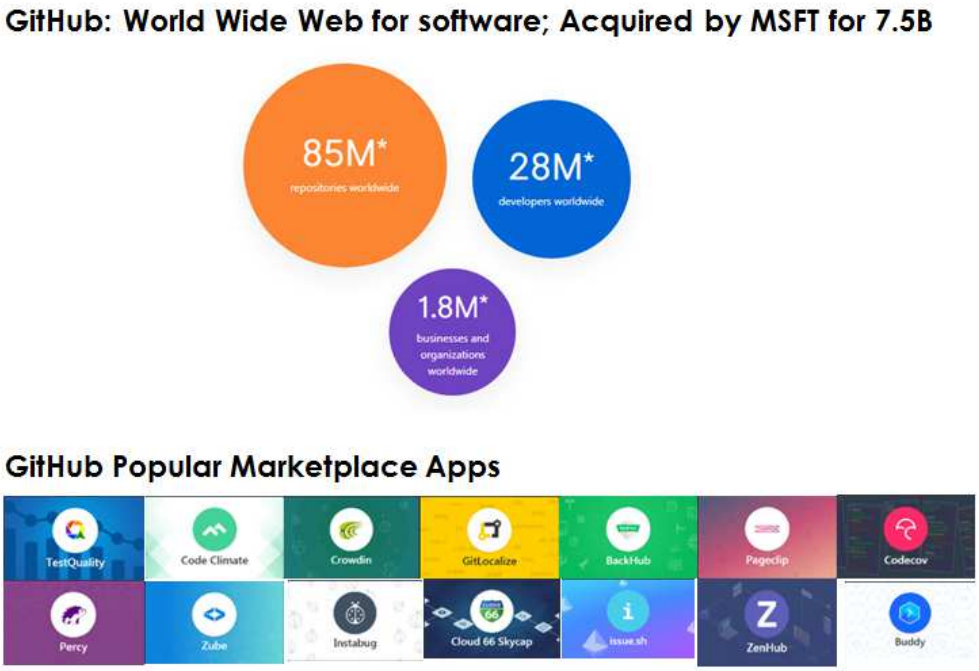

Exhibit 65. *GitHub Marketplace App Platform, source GitHub.*

As this new paradigm hits the tipping point, even laggard technology adopters such as construction and agriculture can be disrupted by third-generation software-as-a-service (SaaS) solutions. Construction, for example, is one of the last frontiers of software. Historically, the category has been plagued by laggard worker adoption, on-site bandwidth constraints and clunky software. As a result construction productivity has been flat and has not scaled to meet demand. A new generation of mobile-enabled software/technology providers are providing cloud based workflows, better on-site data visibility and improved planning solutions. As today's software and technology is narrowing the productivity gap, tomorrow's frontier technology may close it.

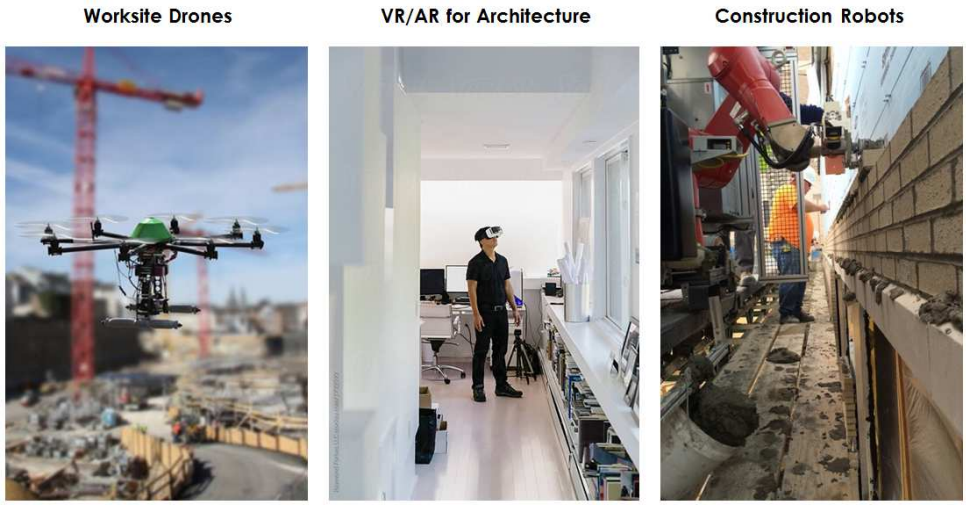

Exhibit 66. *Narrowing the Productivity Gap in the Construction Industry, source Alkeon.*

In summary, we believe we are at the early stages of potentially the most disruptive innovation cycle in technology ever: an AI-driven revolution that by 2030 has the potential to contribute up to $15.7 trillion to the global economy.

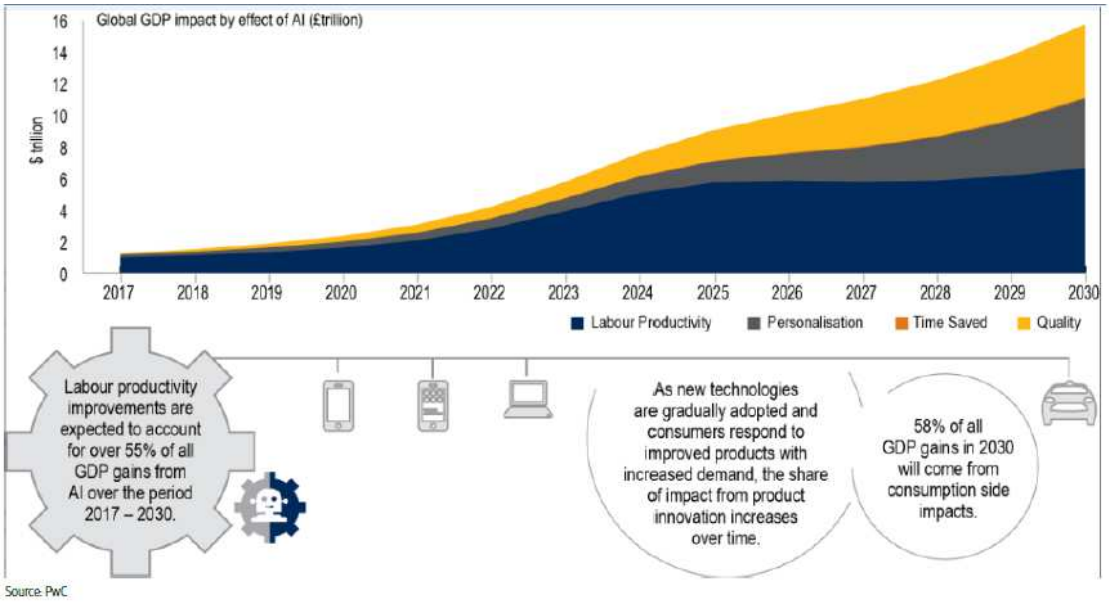

Exhibit 67. *Gains in AI, source PWC and Merrill Lynch.*

As a result, we are dedicating significant research resources to both fully evaluate and position our strategy to exploit this massive innovation wave. In particular, the investment implications for technology investments are most pronounced, as the resulting accelerated growth outlook for the sector along with its low recent relative valuation multiple, high profitability and free cash flow conversion, all give us reason to believe the current risk/reward proposition for the technology sector can be far superior to that of the internet wave of the mid 90's, the last broad-scale wave of innovation we have witnessed.

III. Broad Market Observations

Our current view on the broader equity market is constructive as global P/Es are still below historical average levels and overall risk/reward appears very attractive relative to fixed-income investments. We also believe that a slowdown in the economy does not necessarily equal a recession. The job market remains very tight, and wages are increasing. Capex to depreciation ratios are low. And both bank lending standards and default rates are still low.

Moreover and importantly, it is also imperative that one be selective, as major segments of the market are significantly overvalued, in our view. But, overall, stocks remain attractive relative to other asset choices. One only needs to compare the yield on junk bonds –the highest yielding segment of the bond market– shown below, against the free cash flow yield of high quality growth stocks shown in Exhibit 12. Remarkably, junk bond yields are almost equal to the free cash flow yield of high quality growth stocks, some of which are in high barriers to entry oligopolies.

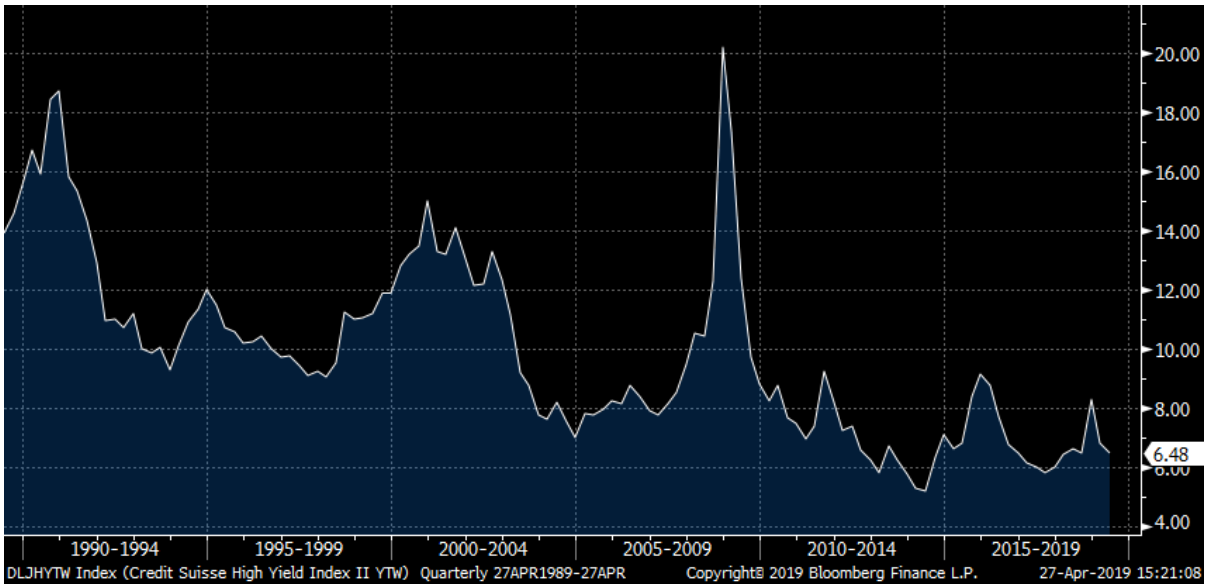

Exhibit 68. *Yield to Worst, Credit Suisse High Yield Index, source Bloomberg.*

This should not be surprising. The thirty-seven year super-cycle in fixed-income securities, that began back in 1982 when the ten-year treasury yield was almost 14%, has created a bubble in bonds in recent years. Importantly, high yield spreads remain low, and typically the economy does not experience a recession without high yield spreads widening.

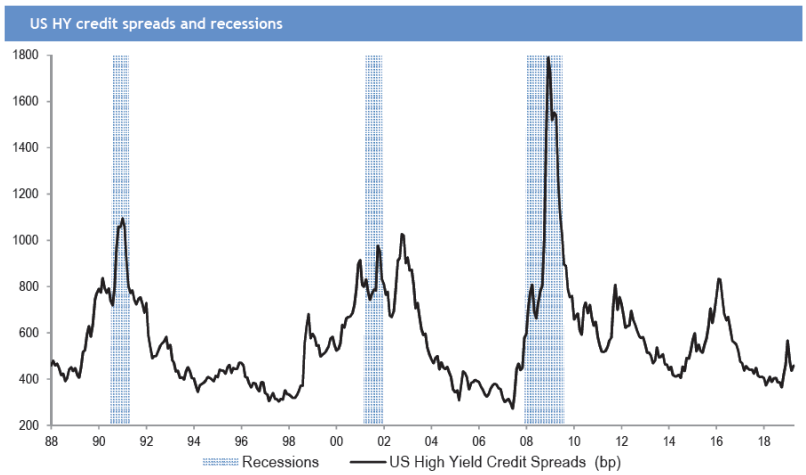

Exhibit 69. *US High Yield Spreads and Recessions, source JP Morgan.*

Moreover, US bank lending standards are still low; typically the economy has seen lending standards elevate before heading into prior recessions.

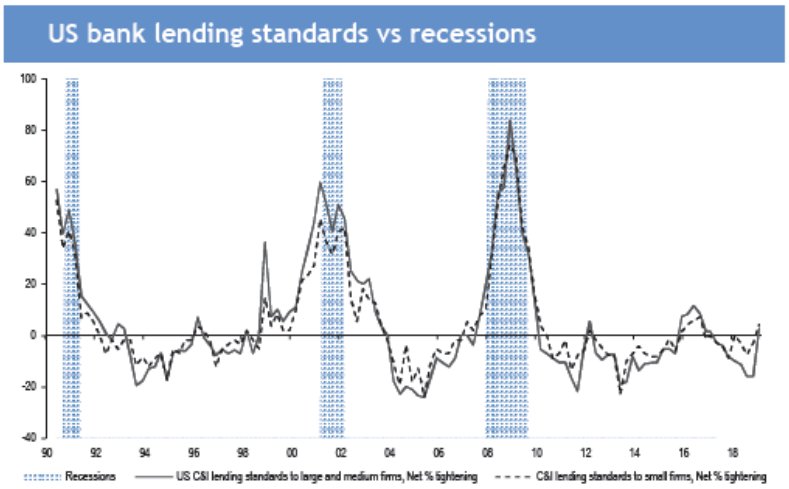

Exhibit 70. *US Bank Lending Standards and Recessions, source JP Morgan.*

And US credit growth is accelerating, growing around 10% on a year over year basis.

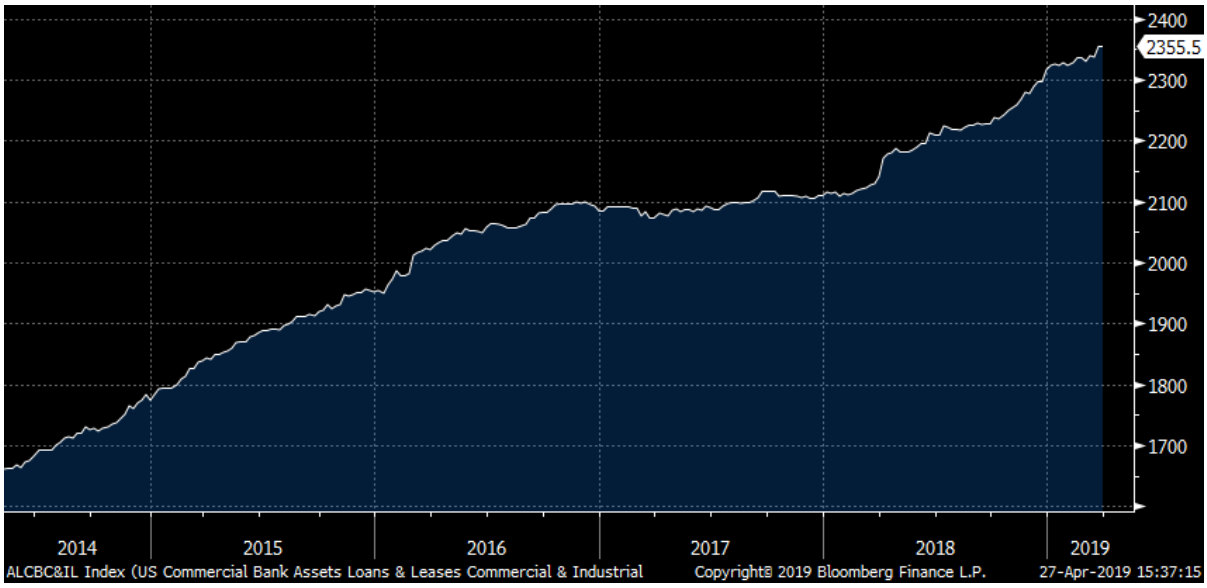

Exhibit 71. F*ederal Reserve, US Bank Assets, Loans & Leases, Commercial & Industrial, Bloomberg.*

Additionally, US default rates are moving lower.

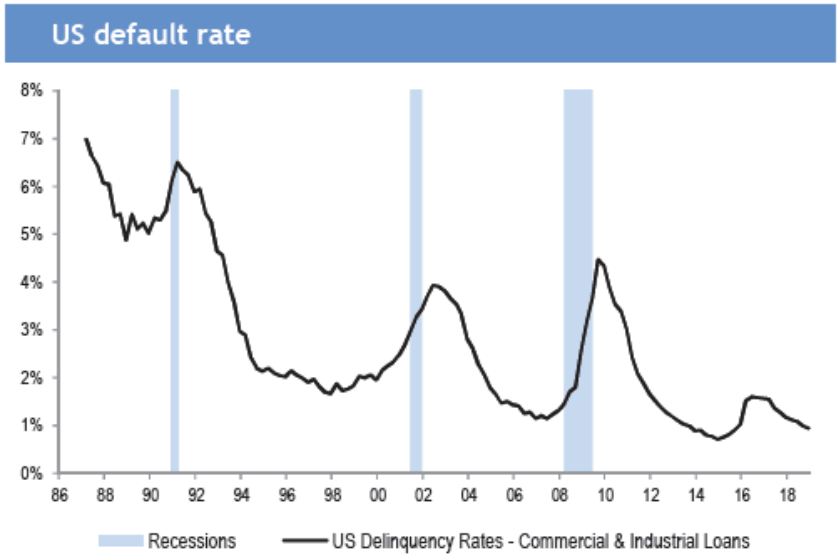

Exhibit 72. *US Default Rate, source JP Morgan.*

Lastly, activity indicators are firming (as discussed in more detail below) and jobless claims are the lowest since 1969.

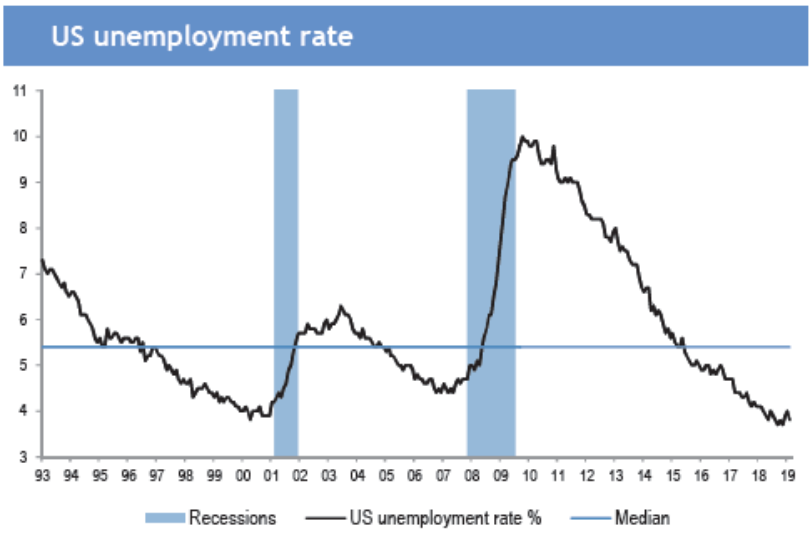

Exhibit 73. *US Unemployment Rate and Recessions, source JP Morgan.*

Overall, the fundamental backdrop remains healthy for both corporates and consumers.[26] Aided by tax cuts, corporates are experiencing improving cash flow generation, while capex/depreciation levels are closer to the start

of the cycle rather than the end of it, and consumers are seeing increasing wages, a tight labor market and rising home prices and equity values, all leading to record high consumer confidence.

This generally bodes well for equities, which we also believe are materially undervalued relative to bonds. Comparing the forward earnings yield on the S&P 500 against the 10-year US treasury yield is highly instructive. While the two have been tracking close to each other for decades, recently they have diverged significantly as monetary stimulus policies depressed bond yields.

A review of the Fed stock valuation model is revealing, unveiling a picture which is the opposite of the end of 1999 when rates were at 6.44%: bonds are currently in as much of a bubble formation (i.e., overpriced relative to stocks) as stocks were in 1999 (i.e., overpriced relative to bonds)!

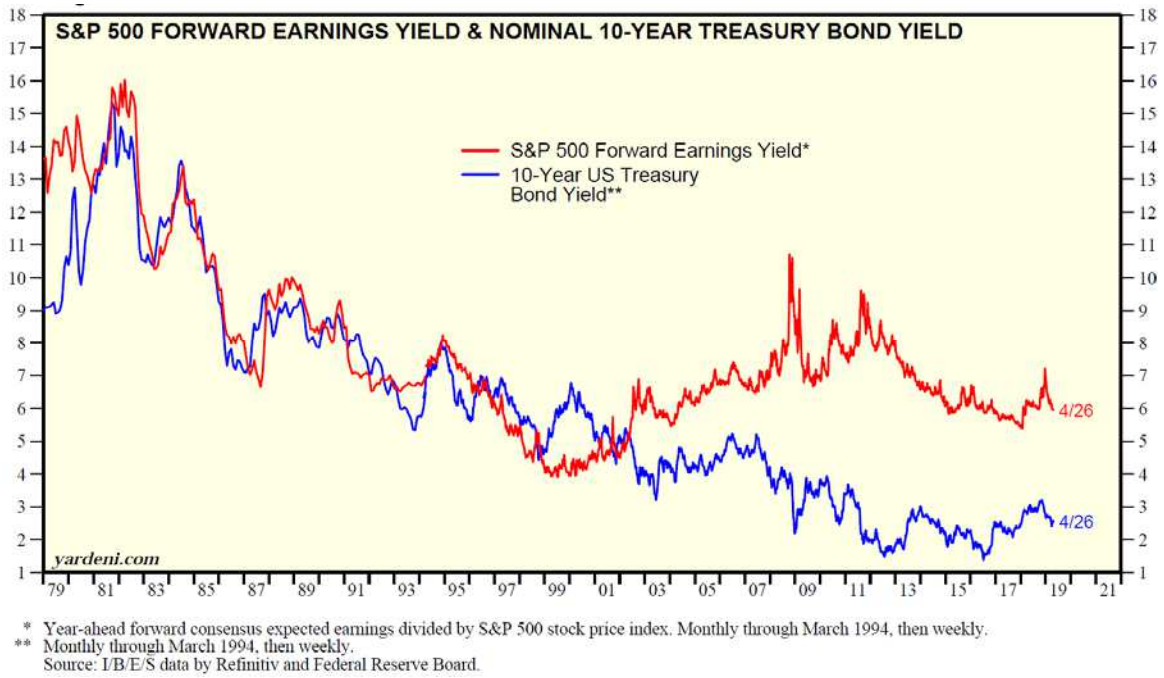

Exhibit 74. *Fed Stock Valuation Model, source Yardeni.com.*

Equity valuations are also attractive on an absolute basis. Global P/Es are at an outright discount to their 30-year median levels, and the gap versus bonds has substantially widened in recent years, as shown below. MSCI World P/E is at similar levels it held in the early 90's when bond yields were almost four times their current level, further supporting our belief that equities remain significantly cheaper than bonds on a global scale.[27]

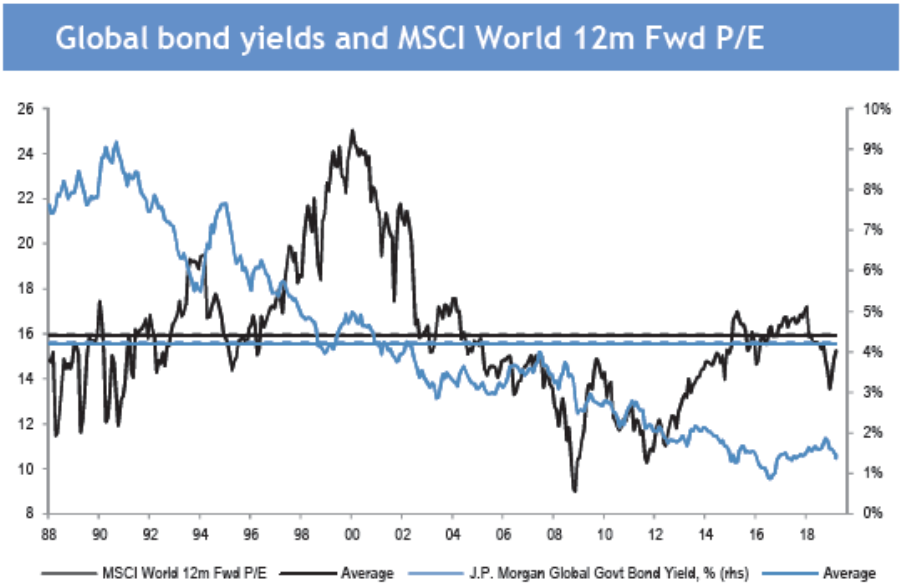

Exhibit 75. *MSCI World Index P/E and Global Sovereign Bond Yields, source JP Morgan.*

Putting aside the current valuation distortion between stocks and bonds both domestically and globally, it is remarkable that bond yields remain low in the face of generally healthy macroeconomic conditions, three of which we highlight below.

First, we remain in an environment of global economic expansion.

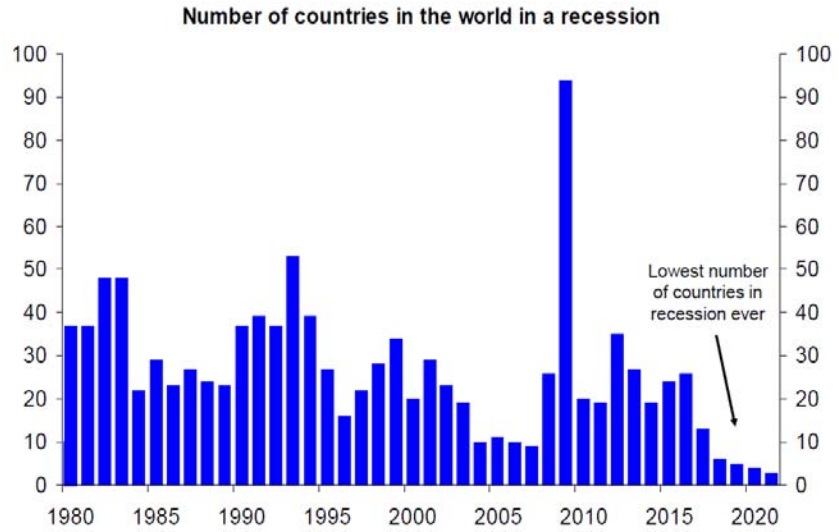

Exhibit 76. *Global Recession Comparison, November 2017, source Deutsche Bank Research.*

Currently the fundamental backdrop for corporates remains healthy and corporate spending seems to be closer to the beginning rather than the end of the cycle.

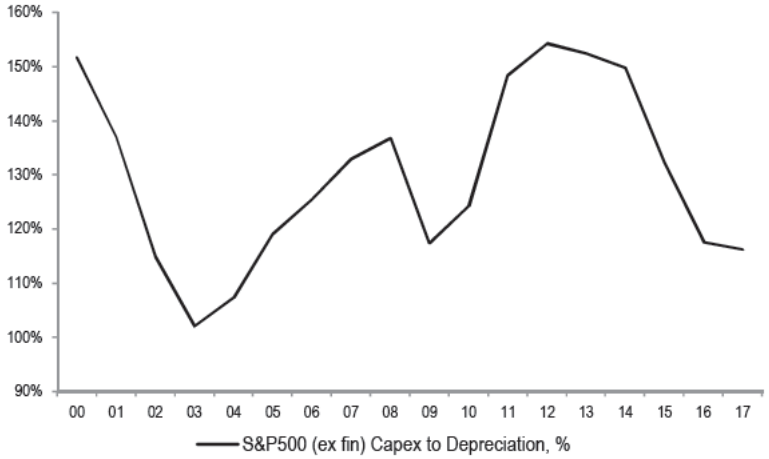

Exhibit 77. *S&P 500 Index CapEx to Depreciation, source JP Morgan.*

Increased spending, aided by recent record amounts of corporate cash, can likely support the current economic expansion.

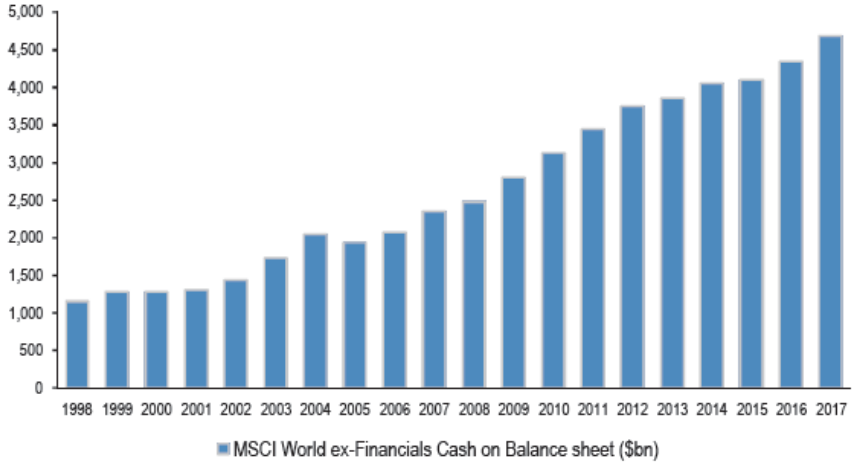

Exhibit 78. *Cash on MSCI World Index Corporate Balance Sheet, source JP Morgan.*

In the US, as recently as 2017, fixed investment spending as a percent of GDP was at the same level as third world nations such as Venezuela and Afghanistan.

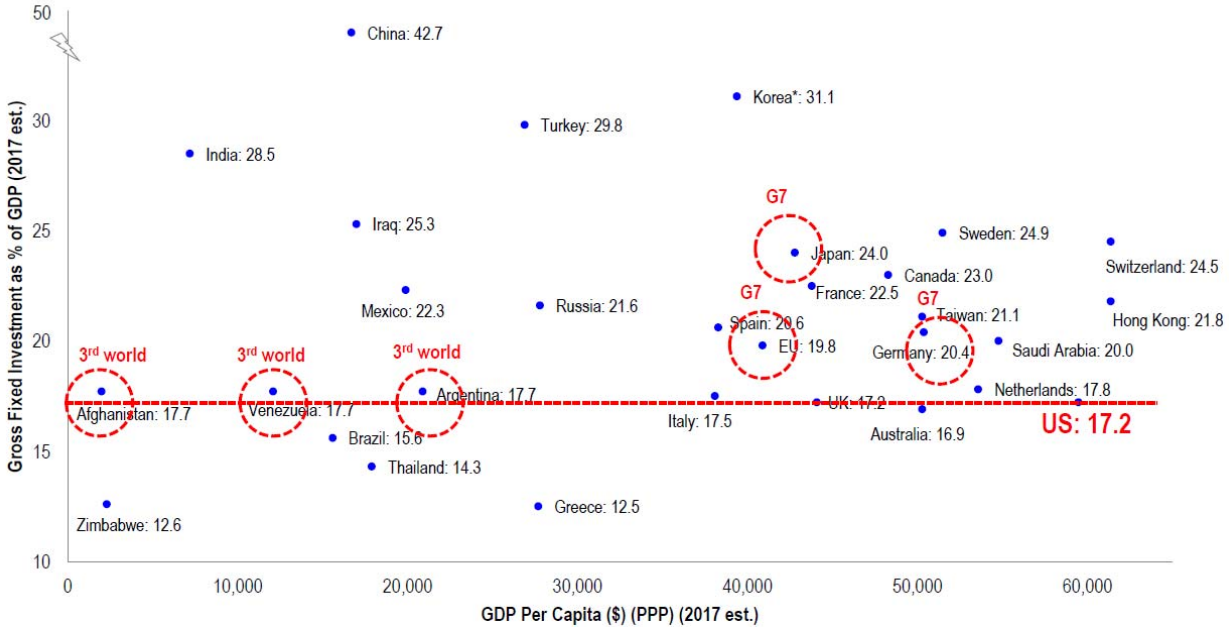

Exhibit 79. *Gross Fixed Investment as a percent of GDP, 2017 Estimates, source Fundstrat and CIA World Factbook.*

Moreover, the labor market remains robust, with jobless claims continuing to reach new lows, levels we have not seen since 1969.

Exhibit 80. *US Continuing Jobless Claims, source Bloomberg.*

This is quite remarkable, given that total employment has increased more than 100% since 1969 (shown below).

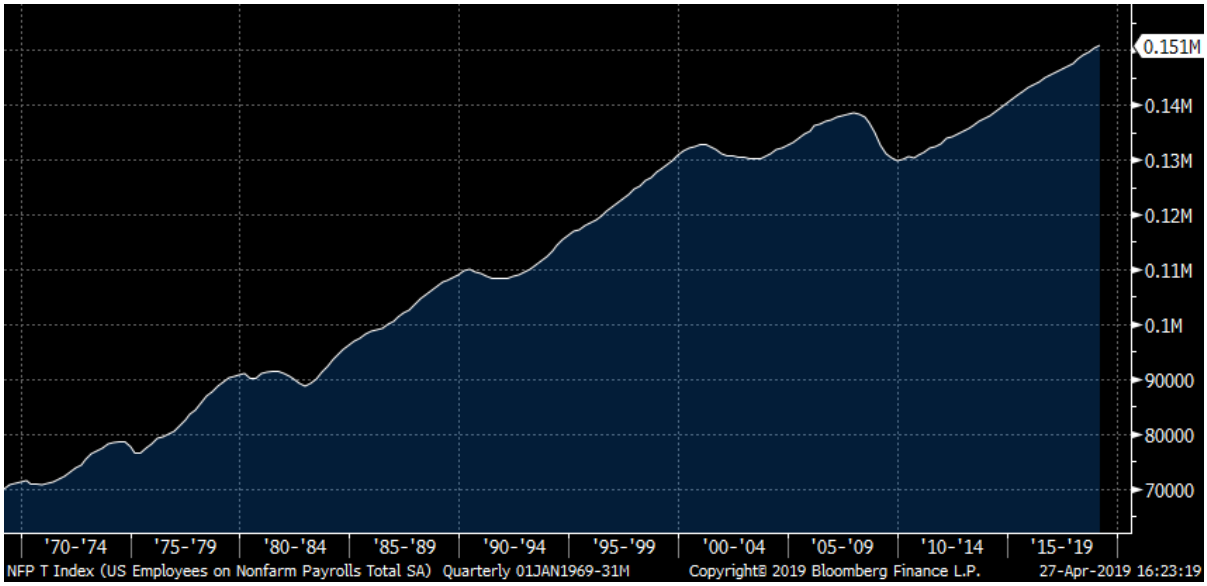

Exhibit 81. *US Nonfarm Payrolls, source Bloomberg.*

All this of course should not be good for bond investments. If inflation were to drive yields higher and, consequently, fixed-income prices lower, that could signal the end of almost two decades of strong fixed-income market inflows.

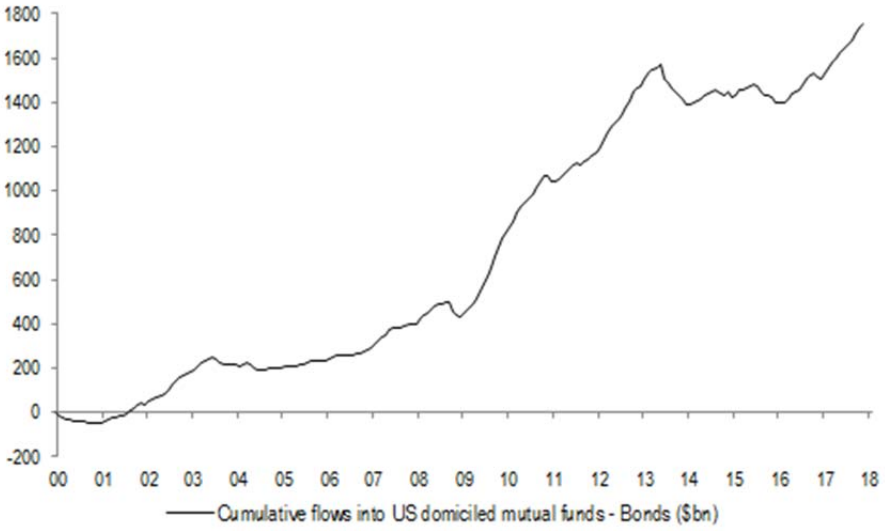

Exhibit 82. *Fund Flows into US Bond Mutual Funds, source JP Morgan.*

And that, in turn, may drive a strong reallocation wave to high quality growth stocks (both from fixed income and bond proxy equities), as capital needs to find another place to be invested. The case for major capital reallocations into stocks is made even more compelling by the recent positive earnings revisions for global equities, the strongest such revisions in decades.

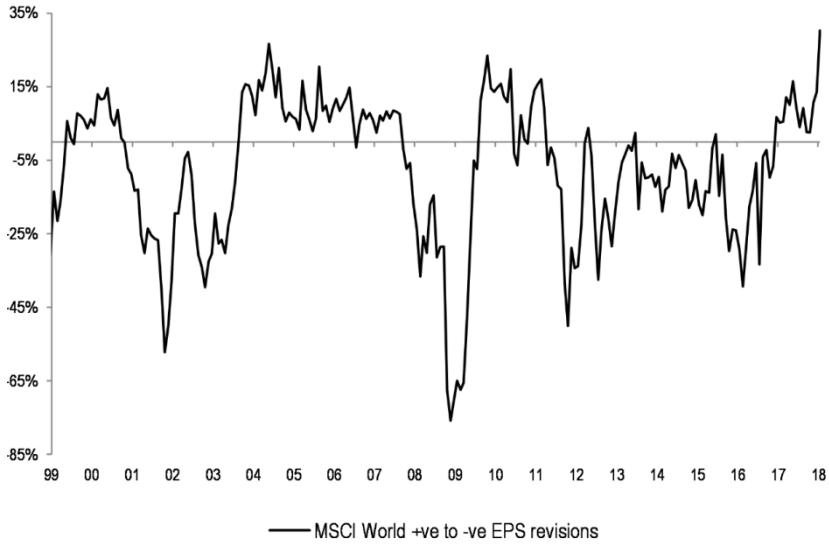

Exhibit 83. *MSCI World Index EPS Revisions through 2017, source JP Morgan.*

Second, the fundamental backdrop for consumers remains healthy. Consumer leverage has fallen as rates remain low and asset prices have risen, and, as noted above, consumers are also seeing increasing wages, a tight labor market and rising home prices and equity values, all leading to record high consumer confidence.

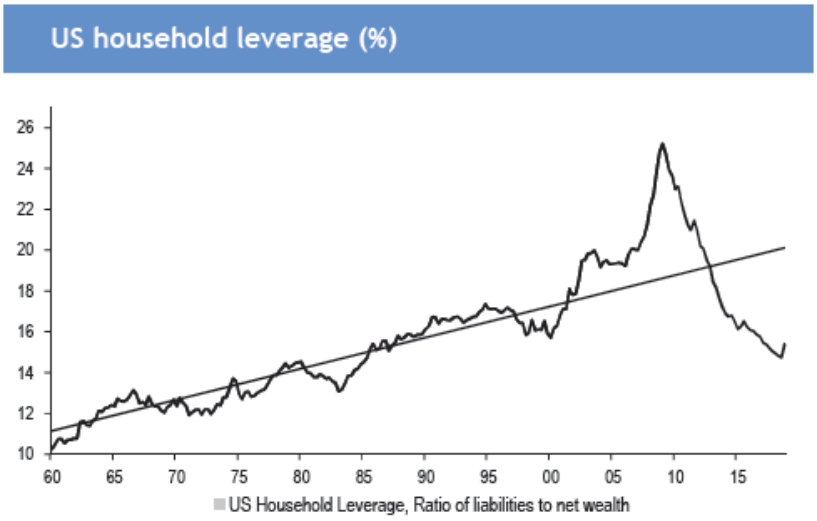

Exhibit 84. *US Household Leverage, Ratio of Liabilities to Net Wealth***,** *source JP Morgan.*

Furthermore, in our research we see a pattern of clear, unabated upward pressures for both employment gains and wage increases. This pattern of wage inflation is strongly supported by government data. For example, US nominal wages and salaries reached a new all-time high in March.

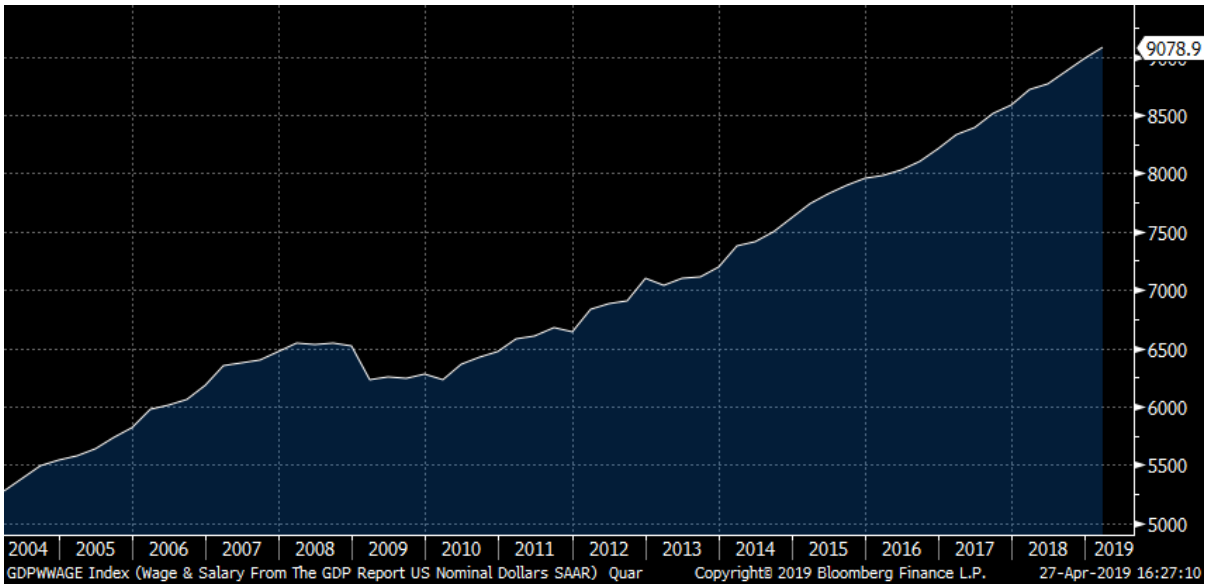

Exhibit 85. *Wages & Salaries, US Nominal Dollars (Billions), source Bloomberg.*

In fact, average hourly earnings accelerated higher, recently growing 3.4% year over year.

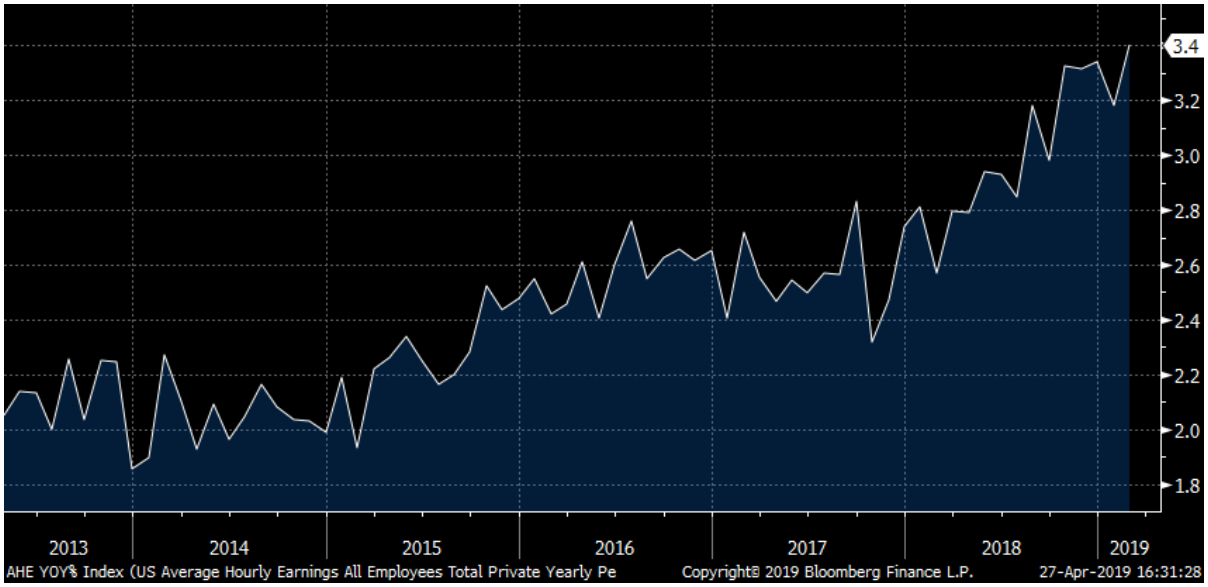

Exhibit 86. *US Average Hourly Earnings yoy%, source Bloomberg.*

Moreover, as job openings rose to record levels last year, we saw for the first time more job openings than people who are unemployed.

Exhibit 87. *Job Openings and Unemployed Persons, source Deutsche Bank Research.*

Additionally, leading indicators of employment growth look robust, with some, such as the NFIB Small Business Job Openings Index, hitting new highs. This of course bodes well for future wage gains, and, of course, inflation gains.

Exhibit 88. *NFIB Small Business Job Openings Index, source Bloomberg.*

Not only is this tightening in labor markets inflationary for wages, but also, and as noted previously, it stands to benefit the technology sector, which has historically experienced increased spending during labor shortages.

Finally, consumer comfort is at a multi-year high, as consumer net-worth reached new record high levels, far surpassing the prior 2007 cyclical peak and approaching $110 trillion in March. We believe the resulting impact on spending can be stimulative, creating yet another upward long-term inflationary force.

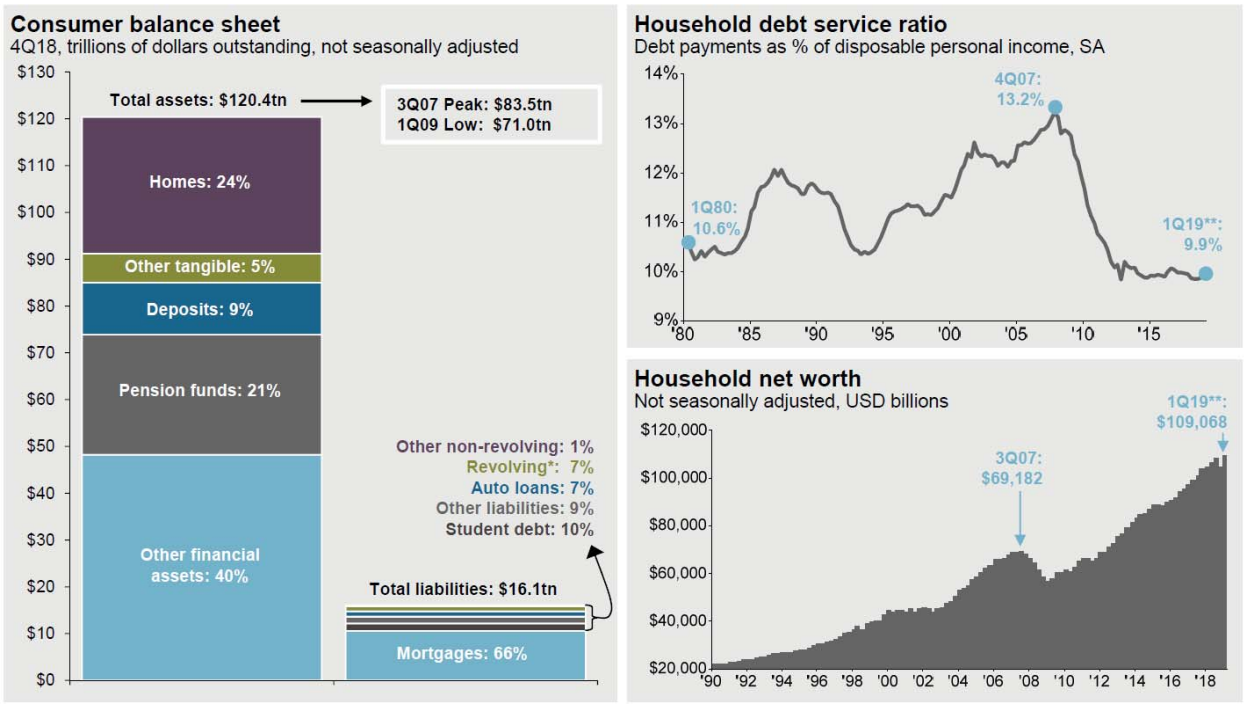

Exhibit 89. *Consumer Net Worth Overview, source FactSet, US Federal Reserve Bank, J.P. Morgan Asset Management and US Bureau of Economic Analysis.*

Third, this accelerated pace of upward inflationary pressures is seen precisely at a time when central banks are ending accommodative policies, reversing a multi-year course to lower benchmark rates and finally admitting the limitations of endless permutations of QE and in particular negative interest rates mechanisms, both of which had a taxing effect on banks in Europe in the first half of 2016 (see chart below) and Japan – and as a result, on those regions' underlying economies.

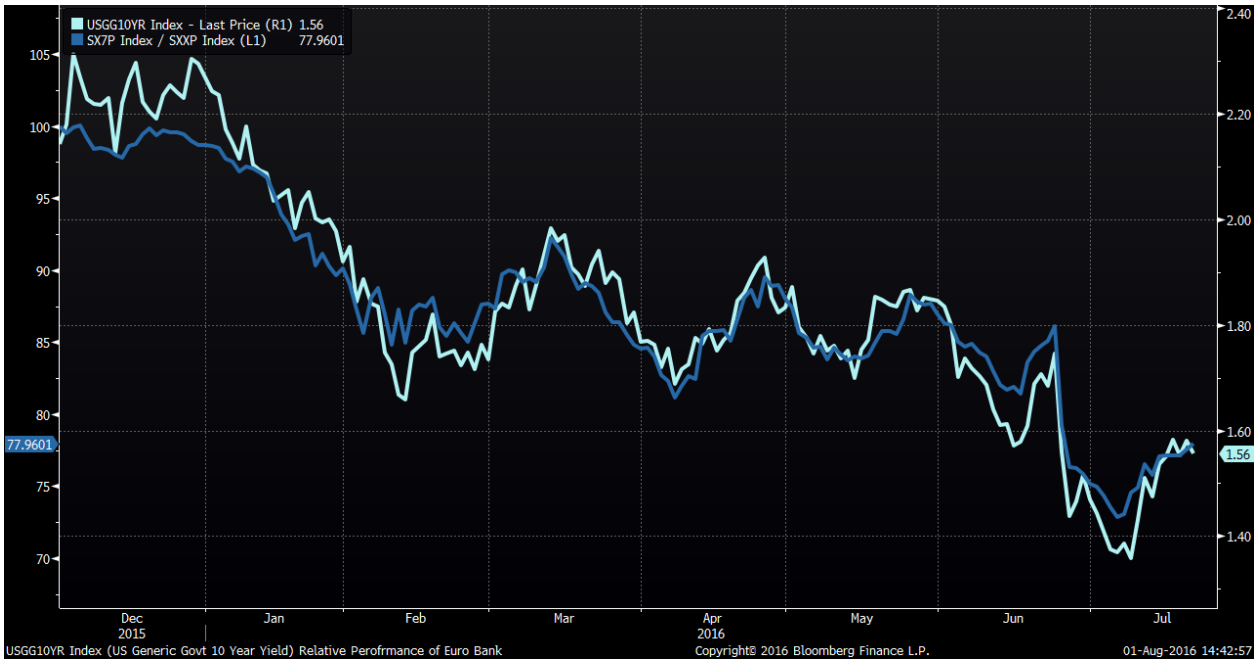

Exhibit 90. *Relative Performance of European Banks vs. Euro Stoxx Index, plotted against 10-Year US Treasury Yield, source Goldman Sachs.*

The combination of these three factors not only signals acceleration in economic activity but also carries significant implications for stock picking. For example, from a short-selling standpoint, an environment of rising inflation and rising interest rates can be emphatically negative to the performance of low quality, balance-sheet burdened stocks for several reasons. One, as rates elevate, these companies can no longer use financial engineering activities to mask deteriorating fundamentals. Two, low-quality companies with a lot of debt are forced to refinance at higher levels, which drives earnings and cash flows down. And three, as a result of one and two, a low-quality company's earnings growth rate declines (or becomes negative), which in turn compresses the company's multiple (and thus shrinks the stock price).

We believe current economic conditions create a most attractive backdrop for stock picking, underlying the need to remain highly selective. Our plan is to use our long-short approach to target valuation distortions in equity securities and be ready to extend the size of related short investments when interest rates rise significantly.

Inflation and Stocks

As we have explained in recent communications, rising growth expectations and rising inflation are both generally positive for equities overall. In particular, as long as the 10-year Treasury yield is below 5%, there is generally a positive correlation between increasing yields and increasing US stock prices. Above the 5% level, the relationship then inverts and becomes negative.[28] For example, when the Fed tightened rates in the 1990s, the S&P 500 went up almost threefold between the end of 1992 and the end of 2000.

Exhibit 91. *Federal Funds Effective Rate US, source Bloomberg.*

To remind the reader again, there is a strong theoretical rationale supporting the empirical evidence that stock prices move upward as interest rates rise – up to the 5% level. The theory is as follows. The discount rate which is typically used to estimate the net present value of future earnings –in the equity price equation– has two components: the "risk-free" rate and an equity premium. Therefore, mathematically equities are sensitive and inversely correlated to both interest rates and risk premiums, and as a result, it matters why interest rates go up when the net effect on equity values is being assessed. Specifically, at the beginning stages of an economic recovery when interest rates go up slowly because of increased confidence in sustained economic growth, risk premiums do fall in general –i.e., stocks are perceived as less risky by investors– often fast enough to overwhelm the interest-rate effect. The combined result is a reduction in the discount rate and a net positive for stocks.

Remarkably, and reinforcing the argument above, a similar relationship exists between stock valuations and interest rates, reflecting an underlying multiple-expanding trend for stocks –generally up to the 5% level– as 10-year Treasury yields rise.

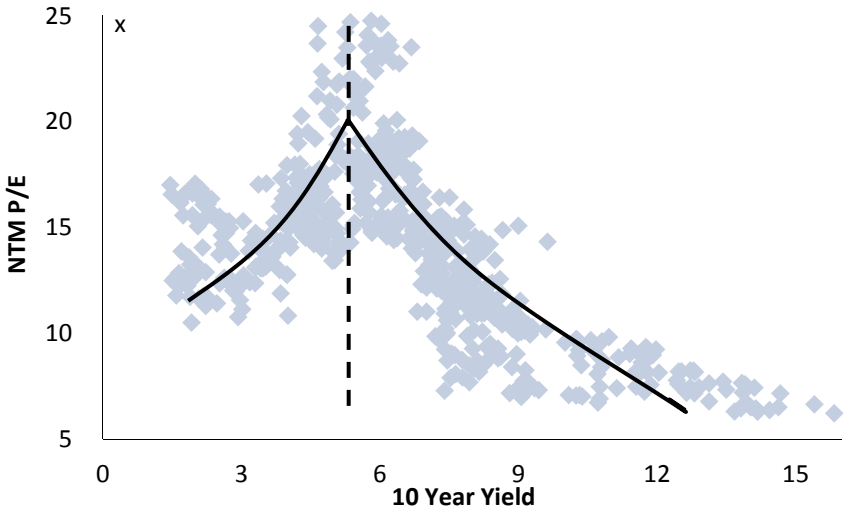

Exhibit 92. *S&P 500 Index Forward P/E vs. 10-Year Yield through July 2016, source RBC.*

However, from a stock selection standpoint, it is important to be reminded that a rising interest-rate environment, albeit broadly favorable for equities, can create a highly unfavorable and asymmetric risk/reward ratio that can be highly unfavorable to certain interest-rate sensitive equity groups. For example, the valuation premium of utilities against the S&P 500 tends to shrink considerably and then reverse to a discount as Treasury yields rise towards or above 3%.

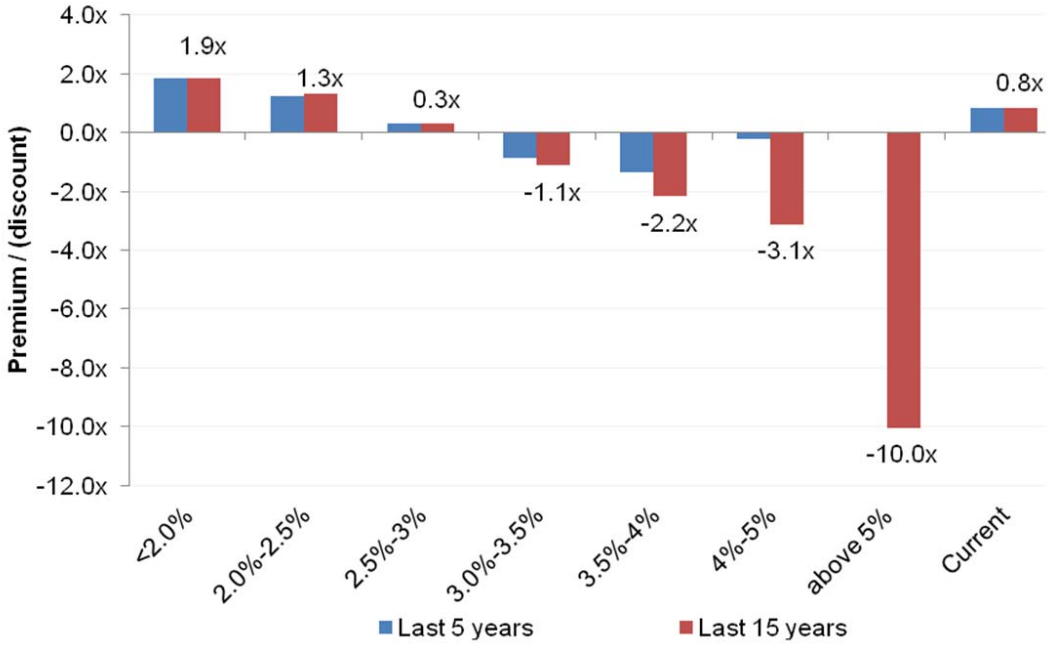

Exhibit 93. *Utility ETF (XLU) P/E Premium (Discount) vs. S&P 500 Index in Different Treasury Yield (10-Year) Environments, August 2014, source Goldman Sachs.*

To highlight how vulnerable these interest-rate sensitive "bond-proxy" stocks remain, one only needs to look back at an example of a recent Fed "taper tantrum" period. Specifically, between May and December 2013, as rates moved up from 1.67% (10-year) to 3.03%, utilities and real estate stocks –as represented by their respective industry groups in the S&P 500– underperformed the broader market by approximately 25% and 29%, respectively.

Exhibit 94. *S&P 500 Index vs. S&P 500 Utility Index and S&P 500 REIT Index, May through December 2013, source Bloomberg.*

Asset Allocation Implications

From an asset allocation standpoint investors are faced with an incredible scarcity of attractive asset choices. Several years ago, we came across a landmark research report by Deutsche Bank, intriguingly entitled "A Journey into the Unknown," which highlighted how historic the fixed-income bull market had been in nature – see the long-dated chart on the 10-year Treasury below.

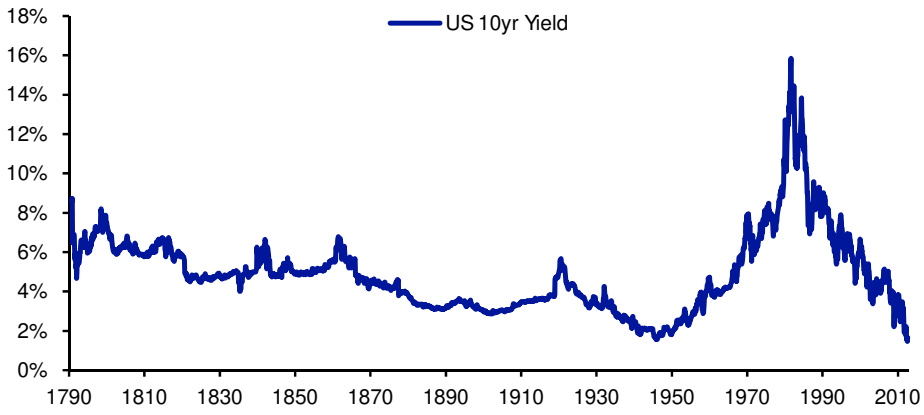

Exhibit 95. *US Treasury 10-Year Yield, source Deutsche Bank.*

As bonds mature, investors are faced with a fundamental question: should they re-invest all of this cash back into record-low yielding fixed-income investments or invest in other asset alternatives? If the answer is invest in other asset alternatives, will stocks gradually become the "new bonds"?

After all, the free cash flow yield on the S&P 500 currently stands at 5.1% vs. an approximately 2.5% yield for the US ten-year treasury. And real policy rates are near zero! Incidentally, and as one would expect, in the past eight cycles the US never entered a recession with negative or zero real policy rates. In fact, six months before the start of a recession real policy rates were at least 1.9%, much higher than current levels.

Real interest rates before recession starts

Recession Start	Real Interest Rate (Fed Funds - Core CPI, %yoy) Latest reading before start	6m Avg before start
1960	1.9%	1.9%
1970	2.8%	3.0%
1973	5.5%	6.3%
1980	1.8%	2.2%
1981	7.9%	7.1%
1990	3.2%	3.4%
2001	2.6%	3.4%
2007	1.8%	2.6%
Average	3.4%	3.7%
Median	2.7%	3.2%
Current	0.3%	0.0%

Exhibit 96. *Real interest rates (Fed Funds - Core CPI) before recession starts, source JPM.*

There is certainly no shortage of dry powder for a major reallocation to equities. Just in the last few months, money market fund assets surged to a new multi-year high.

Exhibit 97. *Investment Company Institute Money Market Fund Assets, source Bloomberg.*

In our view, in this environment of a severe lack of attractive asset allocation choices, the value of high quality, high-free-cash-flow-yielding, growth businesses stands out in stark contrast to a plethora of lower-quality and lower-yielding investment instruments. We believe that publicly-traded businesses that fit this mold represent the "New Real Assets", and, grouped together, form a rare oasis of safety and relative value in the desert of unattractive asset allocation choices that investors continue to find themselves wandering through.

It is precisely this scarcity of compelling asset allocation choices that elevates the attractiveness of high quality, pristine balance sheet, high-free-cash-flow-yielding equity investments, many of which offer not only superb relative value, but also a safer alternative to a broad array of unattractive and increasingly vulnerable investment options within both the fixed-income and correlated low-volatility equity bubble formations.

We also believe this environment presents compelling opportunities on the short side. This is an important part of our strategy, and is embedded in the DNA of our firm, as we always deploy a significant amount of capital on the short side. Our committed long-short approach, along with the convexity embedded in our option positions, has allowed us to outperform the market and our peers –represented by the HFRX Equity Hedge Index– in all negative markets since the 2008 crisis.[29] Our strategy has also sizably outperformed both the market and our peers since its inception.

Period	MSCI World	HFRX Equity Hedge	AGP
2018	-10.44%	-9.42%	-4.65%
2015	-2.74%	-2.33%	6.36%
2011	-7.62%	-19.08%	0.40%
2008	-42.08%	-25.45%	-16.68%
Since Inception (annualized)	3.89%	4.74%	(AGS) 13.63%

Exhibit 98. *Negative Market Performance from 2008 Financial Crisis through Q1 2019, source Alkeon and Bloomberg.*[30]

In this connection, it is important to note that the strategy's use of options and short sales can also serve to protect principal, in addition to generating alpha. While the strategy may not avoid temporary volatility, the strategy's use of options for catastrophe insurance can be an inherent risk reduction mechanism, protecting principal more and more as markets correct. For example, during the market correction in Q4 of last year, the portfolio's net exposure bottomed out at around 20% (which also highlights how our hedged strategy differs materially from long-only equity investments).

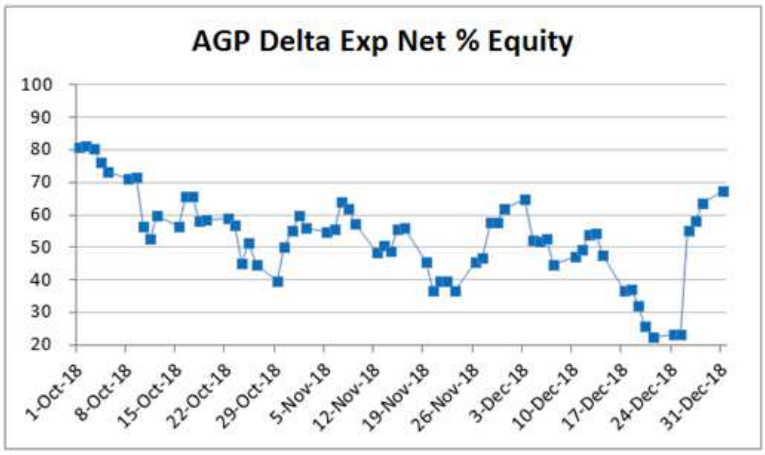

Exhibit 99. *Alkeon's Portfolio Automatically Reducing Exposure through Q4 2018 Market Correction.*[31]

IV. Conclusion

In summary, we currently see a great environment for fundamental stock-picking, and consider the present investment opportunity set to be equally attractive for both long and short investments globally. In particular, we believe there are significant investment opportunities in overseas markets, where equity performance has lagged sizably in recent years.

We have also continued to invest in our business and at an accelerated pace recently. Over the past twelve months we have grown our team, opened an office in Silicon Valley with three principal partners, and added to our Healthcare and Asia investing capabilities.

We remain strongly committed to our fundamental, quality-biased, private-ownership approach to investing in the public domain and continue to always stay active on the short side. Given sector-wide valuation and risk/reward

distortions we see in the market currently, namely, discrepancies between free cash flow valuations and growth rates, we believe this is one of the most exciting environments for long-short fundamental investors that we have seen in a long time.

Sincerely,

Alkeon Capital Management

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[1] Performance data is from another investment vehicle which runs pari-passu to Alkeon Growth Partners, LP (AGP) and follows substantially the same investment strategy (the "Alkeon Growth Strategy" or "AGS") as AGP. The other investment vehicle's performance represents the longest track record available for the Alkeon Growth Strategy with an inception date of January 5, 1998 (MSCI data is as of January 1, 1998) and reflects the deduction of the vehicle's actual fees and expenses during the period shown, including the deduction of a 1% management fee charged to investors prior to March 1, 2004, a 1.5% management fee charged to investors beginning March 1, 2004 and a 1.75% management fee charged to investors beginning July 1, 2011. AGP commenced operations in January 2003 and has been subject to different fees and expenses than the other investment vehicle. AGS performance shown above may have been lower during certain periods had it charged similar fees to AGP. Unless otherwise indicated, index returns are presented on a price return basis only - dividends and reinvestments are excluded. Please see Important Notes at the end of this letter, including "Comparisons to Indices". Past performance is no guarantee of future results.

[2] Fundstrat, August 2017.

[3] Fundstrat, January 2018.

[4] Fundstrat, January 2018.

[5] Merrill Lynch, Thematic Research, March 2019.

[6] 13D Global Strategy and Research, February 2019.

[7] Klaus Schwab, Founder and Executive Chairman, World Economic Forum, 2016.

[8] Jen-Hsun Huang, Keynote Speech, GTC 2017.

[9] https://www.chess.com/news/view/google-s-alphazero-destroys-stockfish-in-100-game-match.

[10] https://arxiv.org/pdf/1712.01815.pdf.

[11] 13D Global Strategy and Research, September 20, 2018.

[12] https://futurism.com/artificial-intelligence-remember-agi.

[13] Nvidia GTC, Munich, October 2017.

[14] Morgan Stanley, May 2018.

[15] Morgan Stanley, May 2018.

[16] Graphcore AI Call, March 31, 2017.

[17] Macquarie Research, August 2016.

[18] Huang, Keynote Speech, GTC 2017.

[19] B Riley & Co., March 22, 2017.

[20] Bernstein, AI Part VII, June 2017.

[21] https://www.graphcore.ai/blog/what-does-machine-learning-look-like.

[22] https://www.wsj.com/articles/elon-musk-launches-neuralink-to-connect-brains-with-computers-1490642652.

[23] https://techcrunch.com/2017/04/19/facebook-brain-interface/.

[24] Bernstein, April 25, 2017.

[25] Morgan Stanley, July 8, 2018.

[26] JP Morgan Equity Strategy, July 2018.

[27] JP Morgan Equity Strategy, July 2018.

[28] JP Morgan Asset Management, September 30, 2016.

[29] The HFRX Equity Hedge Index is comprised of approximately 225 constituents with typically a minimum $50 million AUM, 24-month track record and 50% invested in equities, long and short.

[30] Negative market performance as determined by the MSCI World Index. HFRX Equity Hedge Index is shown for reference purposes only. Past performance is no guarantee of future results. See endnote 1 for further information on AGS performance.

[31] Past performance is no guarantee of future results.

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