CREDIT SUISSE

Supertrends. Driving forces.

The Future. Now
Investing for the long term.

For Professional Investors in Hong Kong and Accredited Investors in Singapore Only.
Not for redistribution.

The Future. Now
Investing for the long term.

Supertrends.
Driving forces.

Foreword

What do the Hollywood blockbuster film Crazy Rich Asians, the gilets jaunes protests in France, and the global climate school strikes have in common? They all are a testimony to the sweeping societal changes we picked up on two years ago when we launched our five Supertrends. Political shifts lead to change in economic policy focus, while demographic trends precipitate technological innovation, as well as evolving preferences and needs.

Investors can react to these changes or, better yet, try to stay apace with them. Our five Supertrends aim to do the latter. They cover a broad variety of timely topics: security; infrastructure; population aging; the influence of the next generation; the environment; and technology, among others. The Supertrends are focused on structural driving forces and are designed to transcend economic ups and downs. They aim to improve a portfolio's overall risk/return profile and outperform the broader market in the long run.

Our own conviction in these trends remains strong. We have added a couple of new angles like the seemingly unexciting but nevertheless significant rise of the pet industry as people increasingly adopt animals to alleviate loneliness, and we have sharpened our focus in existing themes like infrastructure and technology.

Michael Strobaek

Global Chief Investment Officer
Credit Suisse

Nannette Hechler-Fayd'herbe

Chief Investment Officer,
International Wealth Management
Global Head of Economics & Research
Credit Suisse

Table of contents

Supertrends

	Foreword	2–3
	Authors	6–7
	Supertrends. Driving forces.	8–13
1	**Angry societies – Multipolar world**	**14–23**
1.1	National champions and brands	16
1.2	Security and defense	17
1.3	Emerging market consumers	20
2	**Infrastructure – Closing the gap**	**24–33**
2.1	Transport	28
2.2	Energy and water	28
2.3	Affordable housing	31
2.4	Telecom infrastructure	32
3	**Technology at the service of humans**	**34–45**
3.1	Digitalization	36
3.2	Virtual reality/augmented reality	38
3.3	Artificial intelligence	40
3.4	Industry 4.0	41
3.5	Healthtech	43
4	**Silver economy – Investing for population aging**	**46–55**
4.1	Therapeutics & devices	48
4.2	Care & facilities	50
4.3	Health & life insurance	51
4.4	Senior consumer choices	52
5	**Millennials' values**	**56–67**
5.1	Sustainable business and investments	59
5.2	Clean energy and smart mobility	60
5.3	Digital natives	62
5.4	Fun, health and leisure	64
	Disclaimer	68–72
	Imprint	73

Authors

Daniel Rupli
Head of Single Security Research,
Equity & Credit

Daniel is a Swiss-Certified Banking Expert with a Federal Diploma and has 25 years of experience in the banking industry.

Reto Hess
Head of Single Security Research,
Equity & Industrials

Reto has 15 years of experience in the banking industry and is a CFA and CAIA charterholder.

Jens Zimmermann
Senior Equity Analyst, Energy & Utilities

Jens is a CFA charterholder and has over 15 years of equity research experience, working both as a sell-side and buy-side analyst.

Uwe Neumann
Senior Equity Analyst,
Technology & Telecom

Uwe is a CEFA charterholder and has over 30 years of experience in the securities and banking business.

Lorenzo Biasio
Senior Equity Analyst, Healthcare

Lorenzo holds a master's degree in Biology from ETH Zurich and was a management consultant to the pharmaceutical industry before joining Credit Suisse in 2014. He is a CFA charterholder.

Julie Saussier
Senior Equity Analyst, Consumer Goods

Julie has over 15 years of experience as a consumer analyst and is a CFA charterholder.

Supertrends. Driving forces.

Daniel Rupli

Head of Single Security Research, Equity & Credit
Credit Suisse

Supertrends staged an impressive recovery in the first four months of 2019, after 2018 put financial markets and our Supertrends to the test. In October 2018 equities fell across the board and continued to decline through the year-end, leading to negative absolute returns. Since their launch two years ago, however, all our five Supertrends have generated positive absolute returns, underscoring the Supertrends' long-term appeal.

Our Supertrend "Technology at the service of humans" benefited from a strong start into 2018 and robust growth in the healthtech industry, warranting our diversification effort away from pure IT stocks. In the first quarter of 2019, this Supertrend remained much stronger than global equity markets, making it the best performer among our themes since inception. Our "Silver economy" Supertrend, focused on population aging, displayed its defensive characteristics, delivering a positive outperformance of the market in 2018, while somewhat lagging in Q1 given its lower-risk approach.

The more cyclical, growth-oriented "Millennials' values" underperformed the market quite strongly in Q4, only to rebound even more sharply in Q1 2019. Meanwhile, "Angry societies – Multipolar world," which identifies potential in both developed and emerging market stocks from political and economic shifts, performed roughly in line with the global equity market, as emerging markets detracted from performance in 2018. That being said, the emerging market subtheme was the strongest performance contributor of that Supertrend in Q1 2019. As for our Supertrend "Infra-structure – Closing the gap," it continued to lag behind. This prompted us to subject it to a detailed review, which reinforced our conviction in the infrastructure theme's relevance.

Increasingly relevant

In the third edition of our publication, we again reiterate all five Supertrends, including our 20 subthemes. Numerous events in the last twelve months only served to underscore their relevance.

Take our politically oriented “Angry societies – Multipolar world” Supertrend: the last twelve months were characterized by continued populism, trade disputes and a focus on domestic economies, not only in the USA but around the globe. The political establishment continues to cede ground to political outsiders, as demonstrated by the most recent elections in Ukraine and Spain.

Over the last year, we also saw intense discussions among European Union (EU) countries about defense spending, a development we pointed to when we first launched our Supertrends. For now, EU countries have reiterated the 2024 target for their NATO defense spending increases, but they remain under pressure from the USA to eventually contribute more. We are also seeing a growing need for stricter cybersecurity as the volume of big data continues to surge. Last but not least, in its latest report on emerging market consumers, the Credit Suisse Research Institute confirmed that this topic remains in the focus of investors. We therefore believe that this Supertrend’s combined investment focus on national champions, security and EM consumers remains relevant.

Turning to our “Millennials’ values” Supertrend, we are pleased to have brought this topic to the fore two years ago as it has become much talked about. In recent years, the Millennials have become an increasingly important focus of companies, driving product trends and development. Corporate marketing narratives and operational focus have become strongly geared to sustainability and environmental, social and governance criteria, a cause of serious concern particularly for Generation Z. Digitalization, gamification, education and entertainment are just a few of the areas that we see as providing interesting investment opportunities.

Trends evolve with technology

Population aging, which our “Silver economy” Supertrend focuses on, has also attracted continued research and coverage, with the world’s senior population expected to grow to over two billion by 2050. China, for instance, aims to establish a comprehensive elderly care system by 2022. Furthermore, biopharmaceutical companies are allocating disproportionate research and development budgets to oncology, heart disease and other age-related diseases, while merger and acquisition activity in related segments of the healthcare market has risen to USD 481 billion or almost 2,000 deals since the inception of our Supertrends, demonstrating its attractiveness for companies and, by extension, investors.

Staying with healthcare, we are seeing the industry become more and more reliant on technology in order to improve efficiency, strengthen diagnostics and move toward greater automation. “Healthtech” (healthcare and technology) has become a buzzword in the last two years, making this area an ideal candidate for our “Technology at the service of humans” Supertrend, which goes beyond pure IT.

This Supertrend also extends to augmented and virtual reality, an area that is expected to reach the size of the current smartphone market and may well eventually extend to healthcare. 5G, which we cover in our “Digitalization” subtheme, is starting to be adopted around the world.

5G is also an important topic we consider in our “Telecom infrastructure” subtrend of “Infrastructure – Closing the gap.” In fact, we expect 5G to become a key driver of telecom infrastructure in the coming years. China and the USA have taken the lead in terms of spending for the build-out for the 5G radio access network (RAN) infrastructure. Another key topic is climate change, which is likely to put more public pressure on politicians to curb emissions, as climate activism has recently been on the rise. Thus, we believe that the energy transition from fossil fuels to renewables will make energy infrastructure investments a

key priority in the years to come. Affordable housing continues to be a priority that we examine in this Supertrend, as major cities like Berlin and London, faced with steep rent increases in recent years, adopt schemes to counter that development.

Something new

Even though we stand by our existing Supertrends, we constantly look for new trends and features to bring into our long-term thematic framework. With this update, we again introduce new angles that should help us achieve an even broader diversification and tap additional investment opportunities.

Within our "Silver economy" Supertrend, we have been reading more and more about the growing number of elderly living alone, but enjoying the company of pets. This has contributed to an overall increase in the adoption of pets and increasing demand for premium pet care products. After all, animals have their own dietary, veterinary care and other supply needs, making this an attractive segment of the consumer market. Given the significant potential the pet care market offers – Grand View Research expects it to grow to USD 202.6 billion globally by 2025 – we have added this angle to our senior consumer choices subtheme. In "Millennials' values," we have shifted our consumer angle under the subthemes "Digital natives" and "Fun, health and leisure" toward education technology. The Millennials, in particular Generation Z, have grown up with technology. Being online, streaming music and videos, participating in social gaming as well as using social media come naturally to them. Even so, education with a technological twist – education technology – is in the early stages of what we believe will be a major transformation. Separately, we capture the young generation's interest in gaming and entertainment. We argue that the Millennials will substantially impact the way the entertainment industry evolves over time, making it more technology-driven and most likely a disruptive force in various industries.

In our "Technology at the service of humans" Supertrend, we broaden the scope of our "Digitalization" subtheme further, focusing on 5G and how it impacts big data. After adding the blockchain technology last year, we are now also looking at financial technology, so-called fintech. Big data as well as blockchain technology are spreading into the financial service industry and driving innovation in areas such as payment services. These adjustments allow us to better diversify this Supertrend beyond the large IT corporations, providing investors with a wide range of investment opportunities.

Turn to the pages ahead for more details about investing in the Supertrends that are shaping our future.

1

Angry societies

Around the world, there is a shift away from the political establishment toward populist leaders and outsiders who pledge to prioritize national interests. Populist parties now form part of every third European government, according to Swedish think tank Timbro. In the USA, there are signs that society's polarization may further widen ahead of the 2020 presidential election. Relatedly, the shift towards a multipolar world is evident in the USA's trade tensions with China as well as with neighbors and allies. We believe that security firms, national champions and brands in developed markets, and consumer companies in emerging markets (EM) are best placed to adapt to this changing socio-economic backdrop.

1.1 National champions and brands

Buy domestic

While populism has been on the rise over the past decade, the world began to feel the economic repercussions last year as trade conflicts intensified. Indeed, the World Trade Organization (WTO) sees trade tensions as the biggest risk to its global trade growth forecasts for this year and next. Between mid-October 2017 and mid-October 2018, WTO members imposed 137 new trade-restrictive measures including tariffs, quantitative restrictions or export duties affecting USD 588.3 billion worth of trade – seven times more than in the prior-year period.

The World Economic Forum's Global Risks Report 2019 notes that "global risks are intensifying but the collective will to tackle them appears to be lacking. Instead, divisions are hardening." Indeed, economic confrontation/frictions between major powers as well as the erosion of multilateral trading rules and agreements were the top short-term risks cited by respondents in the WEF report.

In 2019, trade relations will likely remain high on the global agenda. The USA and China continue to pursue trade negotiations but have yet to hammer out an agreement. Europe also appears to be rethinking its approach to trade. Earlier this year, Germany's Economy Minister Peter Altmaier released the National Industry Strategy 2030, which calls for national and European champions to gain critical mass in order to thrive in the high-tech sector. This plan can be viewed as a response to other countries' recent efforts to boost their domestic economies and high-tech industries, including US President Donald Trump's America First doctrine and China's Made in China 2025 initiative.

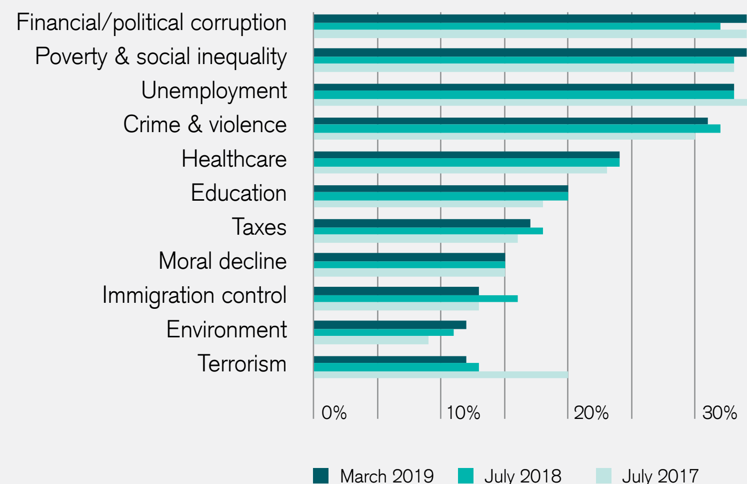
We believe national champions (major domestic companies with a large workforce in their home country and strong regional demand) as well as national brands (national champions with well-respected brands and a loyal global customer base) remain well placed to benefit amid the evolving international trade environment. When trade tensions heated up and equity markets came under pressure in 2018, the national champions outperformed global equities. They have also posted attractive absolute returns during the current market rally, providing an attractive risk/reward profile, in our view.

1.2 Security and defense

Threats at home

Safety and security remain a key concern for many people. Crime and violence were among the top worries in a monthly survey of adults in 28 countries conducted by Ipsos Public Affairs. In contrast, concerns about terrorism have abated in some developed countries including France, Germany and the USA since we launched our Supertrends in the spring of 2017, according to Ipsos survey data.

What worries the world



Source
Ipsos Public Affairs, What worries the world, March 2019 (interviews conducted between 22 Feb and 8 March 2019, international sample of 20,019 adults, Ipsos Online Panel system), July 2018, July 2017; Credit Suisse

But the threat of terrorism is still on people's minds, particularly given this year's tragic terrorist attacks in New Zealand and Sri Lanka. Hence, we would expect continued demand for security guards and surveillance technologies, such as smart cameras, drones and access control.

Defense technology race

Within the defense space, the focus remains on new technologies. According to the US Department of Defense, technological advancements in fields such as advanced computing, big data analytics, artificial intelligence (AI), robotics, directed energy, biotechnology and hypersonics are key to "win wars of the future." The USA remains by far the biggest spender on defense: US President Donald Trump has proposed a 2020 budget of USD 718.3 billion for the Department of Defense to fund efforts against China and Russia. The US defense budget includes the largest research and development request in seven decades, covering investment in new technologies and cyber security. We expect this global technology race – and investment – to continue for the foreseeable future. However, the long-term outlook for defense spending is more uncertain given the growing budget deficit in the USA.

Urgent need for data protection

We see data protection solutions as the most promising area for investors within security and defense. Social media applications continue to expand rapidly, with Statista forecasting some 2.8 billion users in 2019. At the same time, the number of connected devices such as smart phones, smart homes or intelligent speakers is increasing rapidly. Indeed, Gartner forecasts that more than 12.9 billion consumer Internet of Things (IoT) devices such as smart TVs will be in use by 2020, compared to 4 billion in 2016.

As a result, the amount of personal data available is increasing tremendously. According to the European Commission, the potential value of the personal data of European citizens could reach almost EUR 1 trillion annually by 2020. However, a steady stream of **data breaches** and the misuse of personal data have provoked outrage from consumers and politicians alike. Indeed, the scale of data breaches in the first half of 2018 already surpassed the number of breaches for all of 2017, according to Experian's Data Breach Industry Forecast 2019. Experian's top data breach predictions for 2019 include a cloud breach, saying "it's a matter of when, not if, a top cloud vendor breach will occur." Attackers could also go after vulnerabilities in touch ID sensors or facial recognition, according to Experian.

In response to these ongoing breaches and misuses, regulation has been strengthened over the last year. In particular, the European Union's **General Data Protection Regulation (GDPR)**, which came into force in May 2018, has set a global standard for data protection and privacy. Among the GDPR rules, personal data may not be processed unless the user has given their consent. Companies that violate the GDPR rules on record-keeping, security, breach notification or privacy could face penalties of up to EUR 20 million or 4% of their global turnover. California has also made inroads with regard to data protection. The California Consumer Privacy Act was signed into law in 2018 and takes effect in 2020. Due to the size of the California economy, the new law will likely have a large impact on businesses. In terms of US-wide data legislation, the probability appears fairly high given bipartisan support.

Interestingly, given the rising regulatory pressure and corresponding financial consequences, only 52% of companies surveyed said they had a highly effective data breach response plan in place in 2018, up from 49% in 2017, according to Ponemon Institute's Sixth Annual Study "Is Your Company Ready for a Big Data Breach?". Further, the survey showed that only 20% said they are fully prepared for an IoT attack, a low number given the proliferation of IoT devices. These trends confirm our view that companies will need to continue investing in processes and technology such as cyber security to protect personal data.

Keywords see end of chapter.

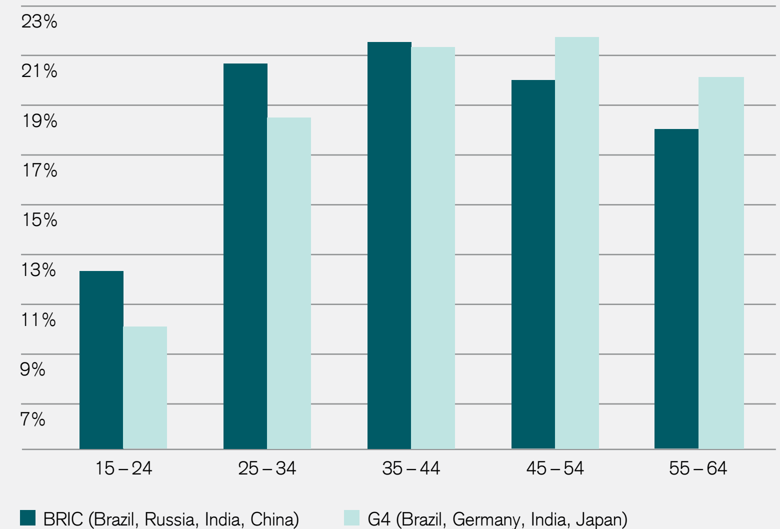
1.3 Emerging market consumers

Travel a growth spot
In an increasingly multipolar world, the growth of emerging markets – and EM consumers – remains an important subtheme. September 2018 was a tipping point for the world, according to a Brookings Institution report. For the first time in history, just over half of the world's population lived in households considered **middle class** or rich. And the middle class should continue to increase at a rapid rate: from 3.6 billion people currently to 4 billion by the end of 2020 and 5.3 billion by 2030, according to the Brookings report. Asia is the source of much of this growth: almost 9 in 10 of the next billion middle class consumers will come from this region, underscoring its huge potential.

Despite the promising outlook, the performance of EM consumer stocks in 2018 proved rather disappointing. This was due to overall weakness in EM equities, increased uncertainty stemming from trade disputes, fiscal tightening as well as country-specific reasons such as elections (e.g. in Brazil). However, considering the positive longer-term fundamentals, we see phases of weakness as possible buying opportunities for EM consumer stocks, for example the Q4 correction and subsequent rebound in Q1 2019. Indeed, the mood in EM has improved of late. The Credit Suisse Research Institute's Emerging Consumer Survey 2019 confirmed that the average readings for survey sentiment indicators (personal finances and income expectations) increased in 2018. While India remains the most attractive country in terms of sentiment, Russia and Turkey had the weakest survey readings.

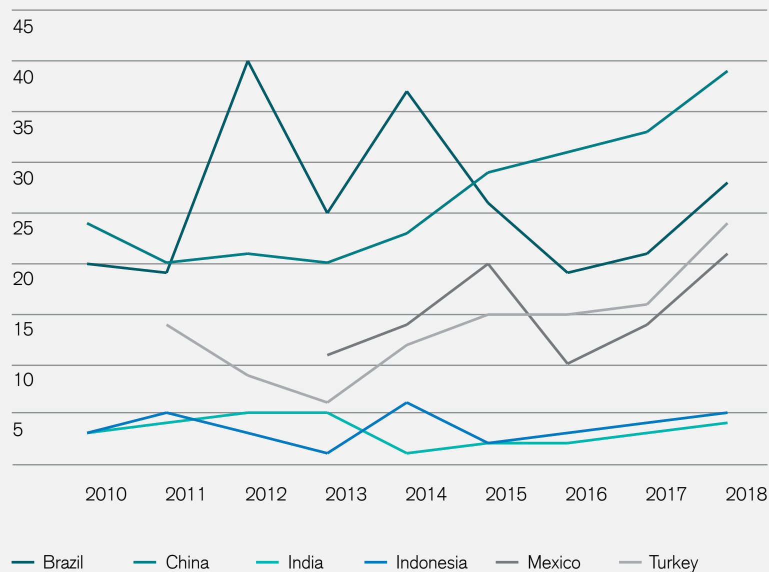
With higher disposable income, discretionary spending among EM consumers should increase, starting with cheaper goods like cosmetics, then expanding to large ticket items such as cars and travel. In recent years, car ownership has increased in many EMs. But EM Millennials, an important target group as they earn above-average wages, could prove to be a spoiler. Fewer consumers aged 18-29 in the survey in Brazil, China, India and Mexico said they intended to buy a car.

Distribution of average income by age group, 2018



Source
Credit Suisse Emerging Consumer Survey 2019, Credit Suisse Research Institute

Going on vacation remains attractive for EM consumers. While the survey showed that the share of EM consumers who plan to take at least one vacation declined in five countries, levels are still high. Accordingly, air traffic remains a bright spot – the number of consumers flying to their holiday destination is steadily increasing.



Source
Credit Suisse Emerging Consumer Survey 2019, Credit Suisse Research Institute

The International Air Transport Association (IATA) expects the number of air travelers will soar to 8.2 billion in 2037, a compound annual growth rate of 3.5% during the next two decades. The biggest growth driver will be the Asia-Pacific region, accounting for more than half of new passengers, IATA says. The organization expects that China will surpass the USA as the largest aviation market in the mid-2020s. India will take third place, leapfrogging the UK, around 2024. And Indonesia will jump to fourth place by 2030, according to IATA. We believe that airlines, airports, duty free operators, hotels, as well as tour operators all stand to benefit from the rapid growth in EM air traffic and tourism.

Investor takeaways

The key beneficiaries of this first Supertrend are, in our view:

- National champions, which should be better protected from trade tensions and protectionist government measures. National brands – national champions with strong brands – should be even better insulated against trade worries.
- Companies that provide physical and cyber security should benefit from higher spending. Companies offering solutions to effectively protect personal data should benefit from an increasing focus on personal data protection.
- EM consumer companies, especially those with a strong online offering, that are set to benefit from the growing middle class.
- EM travel agencies, hotel or restaurant chains or airports and airlines that benefit from increasing EM travel, especially domestically.

Data breach (data leak, data spill): A data breach is an intended or unintended release of private or confidential data such as medical records, financial records or credit card details – either in electronic or paper format.

GDPR: The General Data Protection Regulation (GDPR) is designed to harmonize data privacy laws across Europe and to protect and empower all EU citizens data privacy.

Middle class: Households with spending of USD 11-110 per day per person in 2011 purchasing power parity (Brookings Institution).

2

Infrastructure

Infrastructure investments have been on the back burner over the past year as simmering global trade tensions and rising interest rates weighed on the sector. Underlying fundamentals remain strong, however, and this theme should again attract attention this year as headwinds weaken and new catalysts emerge. Among these, China's Belt and Road Initiative is pushing into Europe and will likely spur more infrastructure investment in the region. Furthermore, efforts by the G20 to better enable the private sector to invest in public infrastructure should help boost investment in this sector.

Infrastructure renaissance

The collapse of Italy's Morandi bridge in the summer of 2018 was a tragic reminder of the struggle that many developed countries face in dealing with outdated infrastructure. Developing countries face their own challenges as they seek to build new infrastructure for clean water, energy and transport. Indeed, the G20's Global Infrastructure Hub initiative forecasts that the global **infrastructure gap** will widen to USD 15 trillion by 2040.

Several catalysts should bring the infrastructure theme back into focus for investors. At the end of 2018, G20 leaders endorsed the promotion of infrastructure as an asset class to help address the above-mentioned funding gap. The G20's roadmap aims to improve the standardization of documents for procurement and financing, among other measures, making it easier for private capital to invest in public infrastructure projects worldwide.

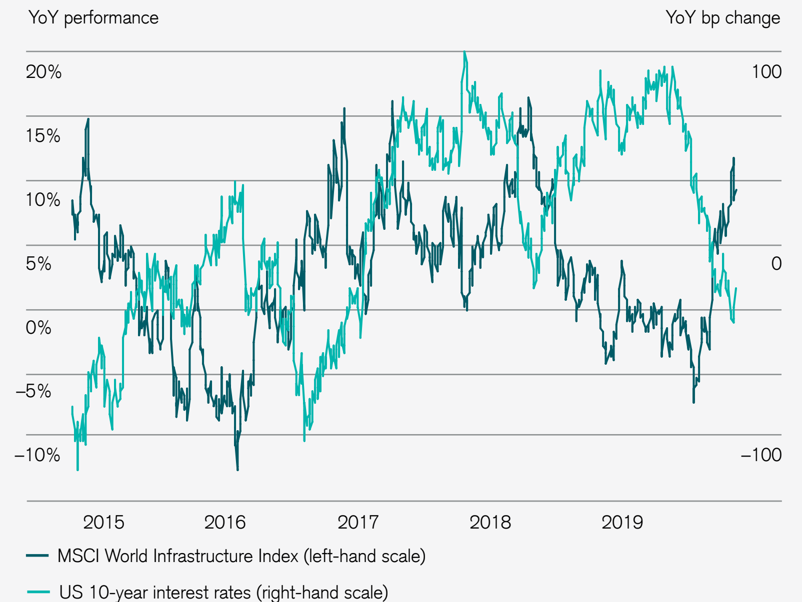
In addition, China's Belt and Road Initiative – a driving force for global infrastructure development – is now on Europe's doorstep. China signed a memorandum of understanding with Portugal in December 2018 and Italy in March 2019 covering Chinese infrastructure investments in their respective countries.

Furthermore, governments are facing greater pressure to adopt renewable energy targets as the global climate movement gains momentum. Such policies will require major infrastructure investments to ensure a smooth transition from fossil fuel-generated electricity to renewable energy.

Finally, the monetary policy of major central banks including the US Federal Reserve has turned more accommodative of late, transforming a headwind for infrastructure investment into a positive catalyst in 2019. The MSCI World Infrastructure Index's recent rally appears to support this view.

Keywords see end of chapter.

Dovish Fed: Solid base for infrastructure spending



Source
Bloomberg, Credit Suisse

2.1 Transport

Moving faster
Within our transport subtheme, we have increased our exposure to infrastructure operators (airports, toll roads and railways) and reduced our exposure to suppliers of materials and construction services for transport projects.

While rising interest rates acted as a headwind for infrastructure investments in 2018, the upside is that higher rates are linked to increasing inflation expectations. If inflation picks up in the USA and Europe, infrastructure operators with regulated business models and inflation-protected cost-plus pricing formulas could benefit as they can raise prices to pass on the cost of inflation to their customers.

The transport subtheme provides an additional benefit in that it tends to be less exposed to economic cycles. For example, transport infrastructure operators are quasi-monopolies as they manage or own assets that are almost impossible to replicate. These companies typically generate stable revenue streams from large infrastructure assets over several decades and are thus less affected by ups and downs in the overall economy.

They also offer robust growth profiles. Airports of Thailand Pcl, for instance, has benefited from strong organic growth in passenger numbers and traffic. And Spanish toll road operator Ferrovial SA has recorded robust growth from the highways it manages in Canada and the USA.

2.2 Energy and water

Mind the climate gap
Our "closing the gap" slogan also applies to the shortfall in meeting greenhouse gas emission targets. The reduction of energy-related carbon dioxide (CO_2) emissions is at the heart of the debate concerning the transition to renewable energy sources. Current government targets continue to fall short of the emission cuts that will be necessary to limit global warming to 1.5 °C above pre-industrial levels in coming decades, a target established in the 2015 Paris climate accord. The Intergovernmental Panel on Climate Change (IPCC) describes different policy pathways to **net zero carbon emissions** by 2050 to avoid breaching the critical 1.5 °C ceiling. One key component requires significant growth in renewable energy.

The public pressure on politicians to take action will only intensify as climate activism gains momentum. Government policy is therefore expected to become more ambitious when it comes to setting short and medium-term renewable energy targets.

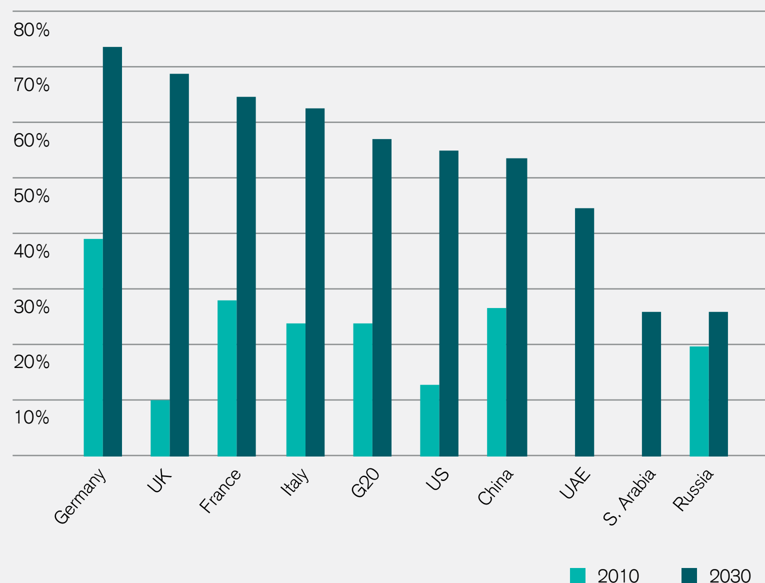
Renewable energy projects will thus need to be built faster than previously planned to close the emission reduction gap. Accordingly, the International Renewable Energy Agency (IRENA) projects a strong increase in renewable energy sources (wind, solar, hydro) as a share of total electricity generation worldwide by 2030.

In the transition toward renewable energy, nuclear energy (in addition to natural gas) continues to be an important bridge fuel. However, it still suffers from a negative public image following the Fukushima nuclear disaster in 2011. In coming years, there are likely to be more nuclear plant closures than new projects: IRENA projects that the global share of nuclear energy as a fuel for power generation will decline from 10% in 2015 to about 4% by 2050.

These policy changes will have a profound impact on utility companies. Many of the large electricity generators are adding wind and solar energy to their generation mix. In our energy and water subtheme, we prefer electricity companies that have already started to adapt their business models to become leading global renewable energy operators.

Time to shift

Renewable energy as share of total power generation capacity



Source

IRENA, Credit Suisse

Another infrastructure gap is the acute water supply shortage in the Middle East and North Africa (MENA) region, where 6% of the world's population lives with just 1% of the world's freshwater resources, according to the World Bank. As a result, 13 MENA countries suffer from an absolute water scarcity. To close this water gap, MENA has become the largest desalination market in the world and now accounts for nearly half the world's desalination capacity, according to World Bank calculations.

However, desalination in the Middle East has a high carbon footprint as the region is reliant on energy-intensive thermal desalination plants. To reduce carbon emissions, the region is experimenting with less energy-intensive processes including solar-powered and reverse osmosis desalination.

Besides desalination, the region also uses wastewater treatment, groundwater recharge and the capture of rain and storm water to recharge aquifers as less energy-intensive ways to increase water supply.

The World Bank estimates that the insufficient water supply and sanitation costs MENA about USD 21 billion per year in economic losses. If the region cannot close or at least narrow its water gap, the World Bank estimates that climate-related water scarcity will cost the region 6% – 14% of its GDP by 2050.

2.3 Affordable housing

Rocketing rents

Finding affordable housing remains a concern that affects households in both developed and in emerging market cities. Germany provides a good example, where rental costs for an 80-square-meter apartment in large cities have soared over the past decade: Berlin has seen rents surge by 80%, Munich by 65%, Stuttgart by 60% and Frankfurt by 50%, according to the Spring Real Estate Industry Report 2019 from the ZIA German Property Federation.

In response, activists in Berlin have started collecting signatures for a referendum proposal that would require landlords that own more than 3,000 apartments to sell them to the city – a move that the Berlin Senate reckons could cost as much as EUR 36 billion. Another explanation for the explosion in rents, according to The German Institute for Economic Research, is rising construction costs due to more stringent building regulations as well as renewable energy standards.

In London, mayor Sadiq Khan plans to address the current housing crisis by exempting private housebuilders from revealing their project's profitability when at least 35% of the development is earmarked for affordable housing, a move aimed at making the planning process go faster. The goal is to reverse the trend of declining share of affordable housing in London's newly built housing stock.

With these developments in mind, we seek to invest in rental housing companies, as well as in homebuilders that construct lower-income housing in developing markets and entry-level homes in developed markets.

2.4 Telecom infrastructure

Building on the promise of 5G
Our telecom infrastructure subtheme is focused on infrastructure equipment that is required for the rollout of the new fifth-generation telecom technology. 5G will be the next major investment cycle for the mobile industry. As a result, mobile data traffic is expected to expand almost five-fold by 2024 to 24 gigabytes (GB) per user per month, according to the GSM Association (GSMA).

Mobile carriers in the USA and South Korea launched 5G services in 2018, making them the first in the world to do so. The next major wave of commercial 5G services launches are expected to take place in Japan, China and Europe. Strategy Analytics predicts that China will be the 5G market share leader with a 46% global market share in 2019 (compared with 16% for the USA). Globally, the market for 5G radio access network (RAN) infrastructure is projected to grow at a 67% compound average growth rate between 2018 and 2022, reaching a size of more than USD 7 billion.

The company selection in our telecom infrastructure subtheme is focused on 5G-related infrastructure providers such as data centers, telephone tower companies and equipment manufacturers. Telephone tower companies should generate strong growth from the upcoming 5G implementation as demand for wider bandwidth increases and the transmission distance between telecom towers must decrease to enable seamless 5G coverage. As a result, more towers will be required or mobile providers will share towers by merging them into new entities to increase their respective coverage. The recent announcement from Telecom Italia and Vodafone Italia to enter a 5G network sharing agreement and potentially combine their telecom towers in Italy into a single entity seems to confirm this view.

Investor takeaways

The key beneficiaries of this second Supertrend are, in our view:

- Operators of transport infrastructure such as airports, toll roads and railways with regulated business models and inflation-protected cost-plus-pricing formulas, which allow them to raise prices in order to pass rising inflation on to customers.
- Utility companies with a growing share of renewables in their generation mix. This energy transition requires smarter transmission lines (smart grids) and energy storage technology to keep electricity supply reliable as more power comes from renewables.
- Rental housing companies as well as homebuilders that construct lower-income housing in developing markets and entry-level homes in developed markets.
- Companies that provide infrastructure equipment for the rollout of the new 5G telecom technology (data centers, telephone tower companies, equipment providers).

Infrastructure gap: The shortfall between needed infrastructure investments and the projects actually built.

Net zero carbon emissions: All greenhouse gas emissions would be eliminated or offset by negative emissions, which will be necessary to limit global warming to 1.5 °C above pre-industrial levels by 2050. To reach this goal, renewable energy generation capacity in the electricity sector will need to grow significantly.

3 Technology

Technology investments have had a strong start to 2019, providing a positive backdrop for our Supertrend "Technology at the service of humans." Structural growth trends such as increasing data usage and the need for greater efficiency should continue to support this Supertrend. The race between the USA and China for global leadership in artificial intelligence (AI) and automation provides an important long-term catalyst in the deployment of 5G, the adoption of AI applications and digital automation. Both areas – AI and automation – are also expected to become increasingly important in the digital health, fintech and education markets, which are expected to grow strongly in the years ahead.

3.1 Digitalization

Ones to watch: 5G and fintech
The adoption of **5th generation** mobile networks (5G) has been much talked about in recent months. Discussions at the 2019 Mobile World Congress (MWC), for instance, showed that 5G is expected to provide myriad new use cases for virtual and augmented reality: artificial intelligence; automation, namely the Internet of Things (IoT); and healthtech.

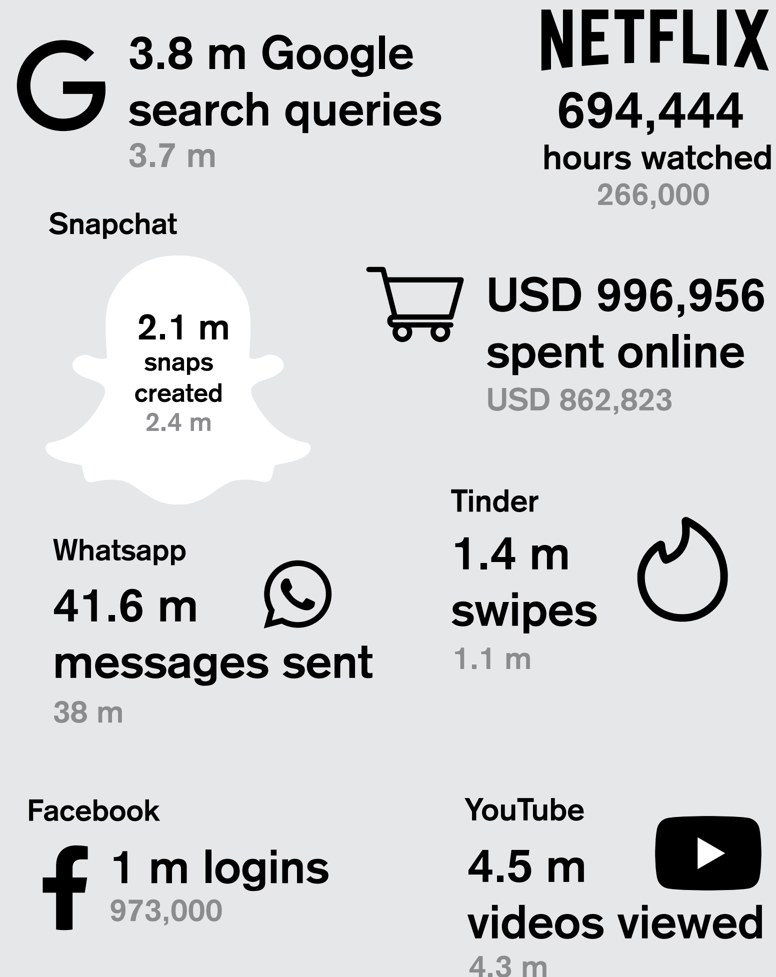
In "The Mobile Economy 2019" report, the GSM Association says it expects the number of connected devices to triple to 25 billion between 2018 and 2025 and global IoT revenue to quadruple to USD 1.1 trillion, supporting our conviction that 5G is driving the next phase of digitalization. By 2024, 5G networks are expected to carry 25% of mobile data traffic, a nearly eight-fold increase from 2018, according to the Ericsson Mobility Report of November 2018, while global monthly data traffic per subscriber is expected to increase at a compound annual growth rate of around 30% to 24 GB by 2024. On the back of 5G deployment, we expect investments in telecom infrastructure to increase over the next 3–5 years.

As digitalization progresses, one of the areas we believe will become increasingly important is financial technology (fintech). Innovation in this area has been driven by changing customer needs, technological progress, rising adoption rates and regulatory changes – drivers we expect to further accelerate. And this innovation will likely lead to disruption: firms like Revolut, which offers low-cost credit cards, are putting pressure on established revenue streams.

At the same time, an active fintech environment forces larger incumbents to continuously innovate. JPMorgan, for example, spends over USD 11 billion annually on technology (almost 20% of its cost base), underscoring the importance of its digital offering to clients. In recent months, investor

Keywords see end of chapter.

What happens in an internet minute



Source
Visualcapitalist.com (https://www.visualcapitalist.com/what-happens-in-an-internet-minute-in-2019/); Credit Suisse

interest has focused on payment services, where volumes and growth rates are high and technological capabilities are quickly evolving. A prominent example is the Apple credit card, a virtual card built into the Apple Wallet app. From an investment point of view, we favor focusing on credible, technology-enabled niche fintech providers, as well as larger providers with financial firepower.

3.2 Virtual reality/augmented reality

Opening up to a new world

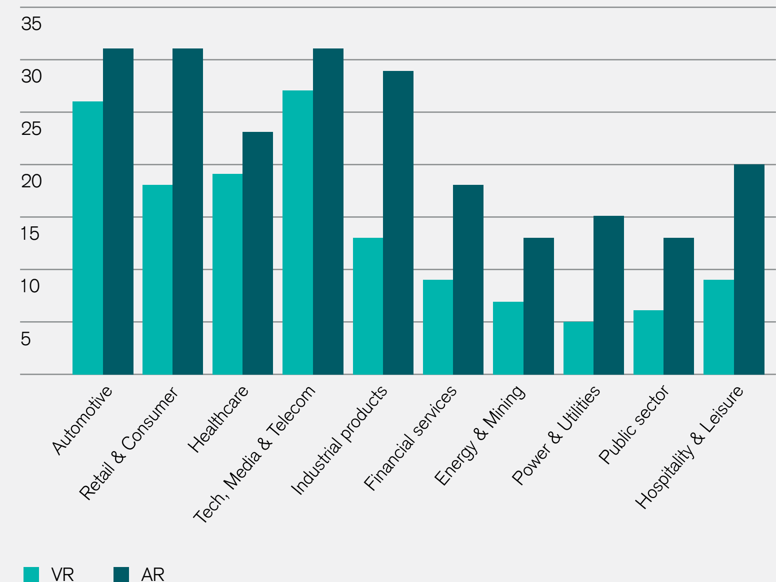
Over the last two years, discussions regarding virtual and augmented reality (VR/AR) have focused mainly on the applicability of VR/AR technology. Even so, only a few applications have emerged. Given high costs, adoption rates have been rather slow so far. However, we expect VR/AR to gain greater prominence in 2019, as expectations for the technology are lowered and better, cost-efficient solutions emerge. In our opinion, mobile AR will be a key driver of the VR/AR market going forward, as the development of AR applications is expected to accelerate.

In 2018, enterprises in different industries explored the AR technology extensively, recognizing its value. As enterprises increase their focus on the commercial use of VR and AR, new investment opportunities should emerge. According to VR analytics group Digi-Capital, venture capital investments in VR/AR amounted to USD 7.2 billion between Q4 2017 and Q3 2018, USD 4 billion of which were invested in computer vision/AR technology. In addition, the number of AR-compatible smartphone users is growing, reports ARtillery Intelligence, reaching 762 million as of July 2018. The gaming sector, in turn, is seeing a transition into streaming, with recent initiatives by Apple, Google and Snap to launch game streaming platforms or services a case in point. In our view, these initiatives should promote the global adoption of mobile gaming or streaming, offering significant new growth potential for publishers and content providers.

Revenue estimates for the consumer VR market for 2019/2020 (USD 6.2 billion/9.6 billion) are still higher than for AR/mixed reality (MR) (USD 4.4 billion/USD 7.2 billion), according to game research firm SuperData. However, a 2018 study by application software firm PTC reveals that industrial enterprises have started piloting AR projects, enhancing their understanding of AR's potential in improving efficiency, productivity, safety and customer experience. Most of these companies expect to launch AR-based solutions over the next 12 months, indicating a high pace of adoption. These developments strengthen our view that 2019/2020 will witness significant AR integration into enterprises, both in terms of customer applications and internal operations.

Bye-bye real world

VR/AR investment by industry in three years starting 2017 (% of firms)



Source

Adapted and reprinted with permission from "https://www.pwc.com.au/pdf/essential-8-emerging-technologies-augmented-and-virtual-reality.pdf" © 2017 PwC. All rights reserved. PwC refers to the PwC network and/or one or more of its member firms, each of which is a separate legal entity. Please see http://www.pwc.com/structure for further details; Credit Suisse

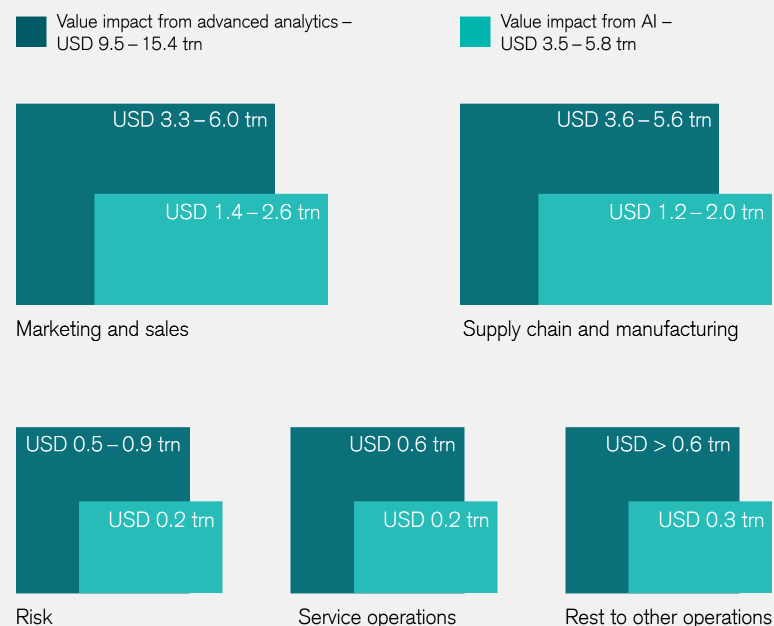
3.3 Artificial intelligence

The race for global leadership
The future of AI remains promising, opening attractive new avenues for companies. We expect AI to help companies increase revenues by identifying customer needs, reducing costs and enabling efficiency gains. Furthermore, AI applications are continuously improving and increasing in range, providing opportunities for industries and investors.

In 2018, several large technology companies accelerated their efforts to develop AI applications. Alphabet-owned DeepMind, for example, further improved its computer program AlphaZero, which masters games like chess, and continued to actively develop AI technologies related to healthcare. Separately, AI programs from both Microsoft and Alibaba beat humans in a Stanford reading comprehension test and accurately translated news stories from Chinese to English.

On a larger scale, AI growth could also be significant for global economies. The McKinsey Global Institute estimates that AI could potentially boost global economic activity by around USD 13 trillion by 2030, which could mean an additional 1.2% GDP growth per year. In an effort to capture the potential that AI offers, recent years have brought to the fore an intensifying race for global AI leadership between the USA and China. In 2017, China published its Next Generation Artificial Intelligence Development Plan, establishing how it intends to become the world leader in AI by 2030 with a domestic industry worth nearly USD 150 billion. Meanwhile, the US administration's summit on AI in May 2018 highlighted the USA's goal to maintain American leadership in AI. To that end, US President Trump signed the American AI Initiative in February 2019, directing federal agencies to invest more in AI research and development. Efforts to boost research investments are also underway in Europe, with the EU signing the Declaration of Cooperation on AI in April 2018. These examples underscore how economies are recognizing that lagging behind in this area may become a long-term disadvantage.

Real money to be made in artificial world



Source
McKinsey Global Institute (Notes from the AI frontier: Applications and value of deep learning, 2018); Credit Suisse

3.4 Industry 4.0

Robots for hire
2018 was a subdued year for automation, as a majority of automation companies experienced decelerating revenue growth. Many of these companies are cyclical and therefore felt the slowing global economy. In Japan, for instance, robot shipments declined. In the USA, demand from the auto industry weakened, but the non-automotive segment remained strong. Nevertheless, the adoption of robots is continuing, with Amazon a case in point: in 2018 the company further increased the number of autonomous warehouse robots while reducing the number of temporary workers.

Despite cyclical headwinds, we believe that the outlook for automation remains attractive. We expect automation will not only be driven by the continued rise in factory applications, but will become increasingly important beyond the industrial sector. For instance, machines that sequence DNA have become materially cheaper in the last 20 years, which makes the work on DNA synthesis, a large bio automation market, much more viable. We identify numerous other compelling non-industrial areas of growth, for instance smart home automation, retail automation, workflow automation and transport automation, to name but a few.

Employee of the week
Increasing use of robots in retail and distribution

Source
Amazon, Credit Suisse

3.5 Healthtech

New avenues of treatment
Healthtech, where information technology meets healthcare applications, has shown considerable growth in recent years, attracting investor interest. Four distinct areas stand out: diagnostics, therapeutics, care delivery and support functions.

In diagnostics, the most exciting health technology applications are modern imaging and genetic analysis techniques that are less invasive than previous standards of care and have scope to further reduce invasiveness. Using such techniques, physicians are able to obtain highly detailed information of a patient's body without large doses of radiation. Similarly, using genetic analyses, physicians can gain clear-cut patient information without having to resort to other measures that often leave room for interpretation.

In therapeutic health technology, the innovative frontier currently encompasses robotic surgery and some newer genome-directed biotechnological approaches. The latter notably include areas like gene therapy – which in the past 12 months saw a flurry of merger and acquisition activity – and **RNA (ribonucleic acid) technology**. The initial public offering (IPO) of Moderna in 2018 highlighted to what degree investors appreciate this technology – it became the biggest biotechnology IPO to date.

The care delivery aspect of healthtech currently revolves around telehealth offerings, which enable care delivery at a distance, be it kilometers or continents. One particular provider, Teladoc Health, by now administers millions of virtual physician visits (via mobile/tablet/PC) per year and continues to grow strongly. Not only does such technology reduce system-wide healthcare costs due to greater efficiency, but it also makes it possible to extend care to regions that lack a sufficient number of physical healthcare locations.

Lastly, the support function of healthtech in our view provides some lower-visibility, but highly essential services. In the global healthcare system, where the records market remains highly fragmented, the most important near-term opportunity is transforming electronic healthcare records into a more relevant, useful and transferrable tool while maintaining the confidentiality and security of records. Such tools may even integrate an ever-increasing wealth of data sources (e.g. wearable devices such as watches). It is our understanding that apart from healthcare-centric software vendors, traditional technology companies have also ventured into this field, albeit silently so far. It is a market that deserves watching.

Investor takeaways

The key beneficiaries of this third Supertrend are, in our view:

- Telecom equipment, semiconductor firms with strong exposure to the rollout of 5G networks; tower companies and construction firms that maintain and implement 5G networks.
- Software, IT services and semiconductor companies that are enablers for AI, VR & AR and industry automation processes.
- Internet platform providers benefitting from the disruption of traditional businesses, for instance in agriculture, healthcare and media.
- Companies in the healthcare sector that use technology to improve execution in the areas of diagnostics, sequencing, therapeutics and care delivery.

Fifth generation (5G): Set to greatly enhance the speed coverage and responsiveness of wireless networks. 5G is expected to be up to 100x faster than a typical cellular connection.

RNA technology: Ribonucleic acid (RNA) technology includes RNA interference approaches to silence specific genes or messenger RNA technology to mimic the presence of certain genes.

4

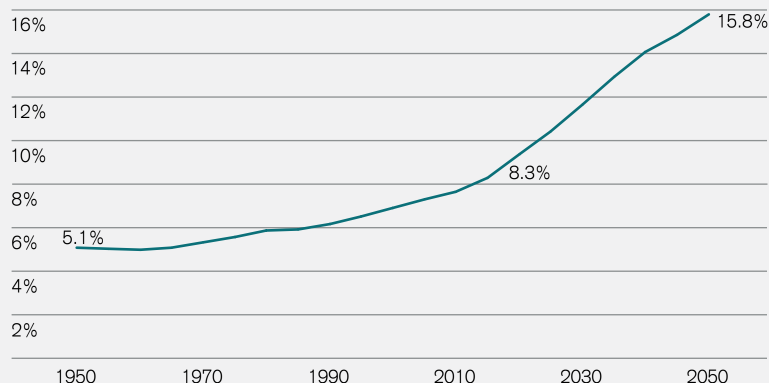
Silver economy

At the heart of the “Silver economy” Supertrend lies the expectation that the world’s senior population will double from just short of a billion senior citizens at present to over two billion by 2050. On a global scale, this demographic shift has accelerated in recent years and is continuing with strong momentum. What is appealing about this Supertrend is that, regardless of the state of the world economy, politics and other more medium-term drivers, the population will continue to age, creating new needs in areas such as healthcare, insurance and funding solutions, consumer and property markets.

4.1 Therapeutics & devices

Reining in healthcare costs
We continue to believe that healthcare is the sector most affected by an aging population. The incidence of many chronic diseases increases with age, which is why a larger elderly population is tied to a disproportionate rise in healthcare expenditure. Healthcare costs are expected to continue to rise at a rate significantly above the growth of countries' gross domestic products. This raises an important debate around healthcare costs and calls for solutions to contain them despite demographic developments. Technology can and will play a critical role in providing such solutions. In this context, we refer to our "Technology at the service of humans" Supertrend, which includes healthtech and which we believe can be considered in conjunction with "Silver economy" investments.

Proportion of global population over 65



Source
2017 Revision of World Population Prospects, by Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, ©2017 United Nations. Reprinted with the permission of the United Nations; Credit Suisse

Medical progress, too, is looking to provide more effective and affordable cures for the diseases or disorders that come with age. Heart disease, for example, is a leading cause of death among the elderly and leads to global costs of USD 500 billion, according to the American Heart Association. Yet heart disease can be managed or in some instances even avoided if risk factors are addressed. We see a tangible investment case in the area of cardiovascular medical devices, where **minimally invasive heart valve replacements**, for instance, are associated with a lower interventional burden and better therapeutic outcomes.

Cancer is also in large parts related to aging and already today carries a cumulative healthcare burden in excess of USD 1.1 trillion. Significant efforts to contain that burden are currently underway: biopharmaceutical companies are allocating a disproportionate share of their research and development budgets to oncology, and we are witnessing strong merger and acquisition activity in the segment.

Regardless of medical indication, therapeutic area or nature of intervention (drugs, disease or other forms of therapy), we believe that focusing on value-creating innovation is paramount, as it alone ensures negotiating leverage for pharmaceutical, biotech and medical technology companies in a world facing increasing healthcare costs. We thus focus on companies that have demonstrated strength in innovating.

Keywords see end of chapter.

4.2 Care & facilities

Changing needs
An aging population – in conjunction with age-related conditions and diseases – calls for dedicated care options and settings as well as facilities equipped to provide them. Today's senior cohorts often live a healthier and more active life than earlier generations, which enables them to live independently for longer, a lifestyle they often seek to maintain for as long as possible. Intuitively, the one-size-fits-all retirement home option is therefore no longer going to satisfy the diverse demands of the elderly. Therefore, builders and operators of dedicated senior housing concepts spanning the full spectrum of the care continuum – from **assisted living** to intensive care – will play a crucial role in satisfying these requirements. Anecdotally, in Germany alone, real estate advisor CBRE estimates that EUR 55 billion in investments will be needed by 2030 to cope with future demand for senior housing, with data points across other developed as well as emerging markets trending in the same direction.

When it comes to care provisioning, managed care organizations will also play an important role. They combine their deep understanding of risk factors, the healthcare environment and a wealth of data assets on historic care episodes and claims in order to guide patients to the most effective care setting, ideally before catastrophic (and, importantly, costly) consequences and complications arise. For example, **dialysis** candidates can be identified early and transitioned into appropriate care, rather than crash into dialysis through a costly medical emergency.

4.3 Health & life insurance

The price of a longer life
Along with the growing senior population comes the need for funding solutions, both for living expenses as well as healthcare expenditures, which can be substantial despite efforts to rein them in. The need for health and life insurance is most substantial in regions that cannot rely on a social security safety net built over the course of decades and that are underpenetrated with respect to insurance products. That being said, we increasingly find data points suggesting that substantial focus on funding solutions is also warranted in developed markets. The Federal Reserve Bank of St. Louis, for example, pointed out that 35% of US households do not participate in a retirement plan and warned that "for many American households, the total balances of their retirement accounts may not be sufficient to ensure a solid life in retirement." Similarly, Vanguard reported that the median 401 (k) account (a tax-deferred pension account in the USA) for investors aged 65 and older amounted to just under USD 60,000, while the non-profit Pension Rights Center reports that the median annual income from private pensions and annuities came in just marginally above USD 9,000 in 2016.

At the same time, traditional pension plans are under pressure due to low bond market yields and rising longevity. As a result, we are seeing a growing market for specialized insurance companies to take on the pension plan assets and management of large corporations in developed markets. In such an environment, private savings should be a further pillar for retirement, which is why we see an attractive opportunity for asset managers and providers of advisory services. Given similar considerations regarding health insurance – notably the underpenetration in emerging markets and the need to cover unexpected out-of-pocket healthcare costs in developed markets – we would expect a similar trajectory for health insurance solutions.

4.4 Senior consumer choices

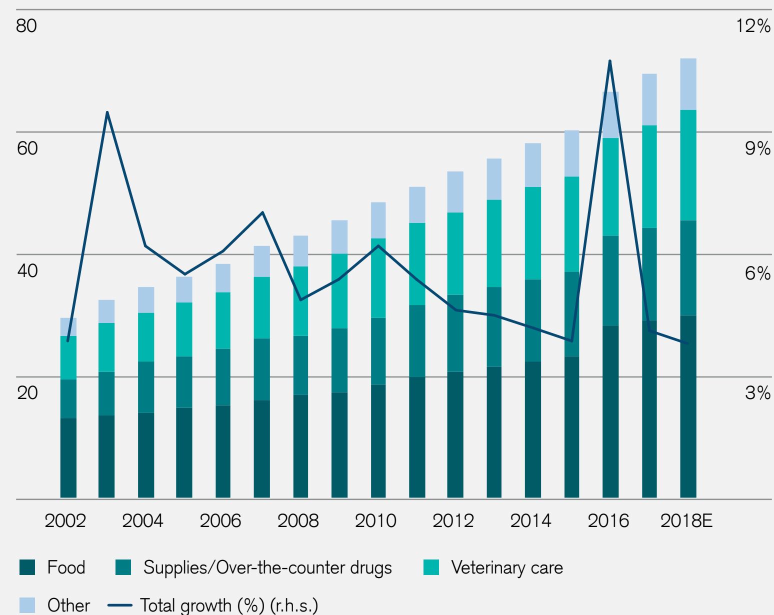
Pets: The new grandkids

On aggregate, and despite the above-mentioned concerns, seniors today are a powerful consumer group. Euromonitor projects private spending by seniors to reach USD 15 trillion by 2020, making it the fastest-growing age group on that metric in many regions of the world. This significant spending power, combined with seniors' considerable free time, has proven to benefit the leisure and tourism sector, congruent, for example, with the increase in cruise line bookings in recent years. Further industries expected to benefit include personal care and beauty products or home automation manufacturers. In addition, some medical equipment and devices, such as prescription glasses or hearing aids in many countries only receive patchy insurance coverage and thus usually feature high on a patient's out-of-pocket expenditures. This makes the decision to acquire them essentially a consumer choice.

A further interesting angle is in the area of pet ownership. Baby boomers in the USA make up a disproportionate percentage of pet owners (32%) compared to their share of the overall population (23%), and there are now more pet-owning households than households with kids. This finding is a likely contributor to the high percentage of people living with a pet, which is estimated at close to 60% in a study conducted by GfK in 22 countries. Pets come with their own dietary, veterinary care and other supply needs, resulting in an attractive segment of the consumer market. Typical annual expenditures for a dog, for example, amount to about USD 1500 and just shy of two thirds that amount for a cat.

A senior's best friend

Size of US pet industry in USD bn



Source

American Pet Products Association, Credit Suisse

Euromonitor even went as far as to term the great care some of these pets receive as “pet parenting,” pointing to the steep rise in premium dog and cat food market share in a market that – according to estimates of the American Pet Products Association and its European counterpart – already today exceeds USD 50 billion in these regions. Given the historic trajectory of this consumer market segment, combined with rapid innovation in, for instance, smart feeders, self-cleaning litter boxes and pet health insurance, we see an attractive investor proposition in another market segment in part fueled by senior consumers.

Investor takeaways

The key beneficiaries of this fourth Supertrend are, in our view:

- Biopharmaceutical, medical technology and life sciences companies that address conditions affecting the elderly through innovative products.
- Providers and operators of senior housing, dialysis clinics and other care facilities, as well as managed care organizations that can direct patients to the most efficient care setting.
- Health and life insurance companies, private wealth advisors and asset managers with strong pricing capabilities.
- Consumer companies focusing on the basic needs as well as the more discretionary wants of senior consumers, such as tourism companies, beauty product manufacturers or prescription glass and hearing aid manufacturers.

Minimally invasive heart valve replacements: Procedures like transcatheter aortic valve replacement that avoid open-heart surgery.

Dialysis: Procedure used to remove toxins, water and other agents from the blood of patients with worsening or loss of kidney function.

Assisted living: Setting for elderly people that facilitates daily life through the use of low-acuity and unobtrusive technologies and services that integrate seamlessly into daily life.

5 Millennials

The Millennials have become a force to be reckoned with – politically and economically. Today corporations not only cater to the 20 – 35-year-olds, known as Generation Y, but increasingly also to Generation Z, the under 20-year-olds, which we jointly refer to as Millennials. Generation Z is at the forefront of a global climate change movement, driving a heightened focus among companies on environmental responsibility and sustainability. Their influence also extends to education, with technology becoming more and more important as a new way to deliver education and develop skills. As for leisure, they are driving the popularity of social gaming and eSports.

Millennials (Generations Y, Z)

Source
Credit Suisse

5.1 Sustainable business and investments

Push for real change

Generation Z's key priorities include environmental conservation and pollution reduction. After all, it is this cohort that stands to bear the brunt of the impact from climate change. They are pushing governments and companies to cut greenhouse gas emissions, as well as reduce plastic waste. About 50% of global packaging materials today are made of plastic, but only 14%–18% of plastics are recycled at the global level, according to a 2018 paper by the Organisation for Economic Co-operation and Development (OECD).

Unless drastic change is brought about, there will be more plastic than fish in the ocean by 2050, states a report by the Ellen MacArthur Foundation. Companies in the food, beverage and cosmetics industries as well as restaurant or supermarket chains are already pledging to reduce the use of plastic and have announced targets for recyclable packaging. Producers of plastic substitutes should benefit from this development. But the plastics industry itself is not standing idle, adopting more environmentally conscious strategies, developing lightweight products or improving recycling systems.

Sustainable industrialization, in other words running factories at zero waste, reduced emissions and water pollution, is increasingly moving into the focus of companies. In response, industrial companies are launching innovative clean-tech solutions such as energy management and automation – so-called smart technologies – that can be used in energy efficient buildings, for example. Cloud computing is also seen as a solution to reduce consumers' environmental footprint.

5.2 Clean energy and smart mobility

Not your parents' car

According to the 2018 Global Energy & CO_2 Status Report from the International Energy Agency (IEA), global CO_2 emissions rose by 1.7% to reach a historic high of 33.1 gigatons in 2018. The 1.7% increase was the highest annual emissions growth rate since 2013 and 70% higher than the average increase since 2010. However, the IEA also showed that without any emission savings from policy measures, such as switching from coal to gas, the use of more renewable energy sources and improvements in energy efficiency, CO_2 emissions would have increased by an even stronger 3.8% in 2018.

Cars remain responsible for a large part of carbon emissions today. In a world where the majority of cars sit idle 95% of the time and, if they are used, it is mostly by one occupant, cars are likely to become increasingly autonomous and car sharing offerings more popular. To cater to tech-savvy generations like the Millennials, cars are also becoming more and more connected. Over the next decade, we are therefore likely to move from an auto-centric world to a mobility-centric world.

As concerns about the environment increase, the development of electric cars continues to move ahead, with the timeline for the adoption of electric vehicles accelerating. In 2019, numerous electric vehicles are expected to be launched, offering improved driving ranges and new features. Original equipment manufacturers (OEM) target an average electrification of powertrains of 25% by 2025. Battery costs are rapidly falling, making vehicle prices more affordable for consumers. The entire battery supply chain for electric vehicles is set to benefit from these developments, hence a rapid expansion of capacity should not be a concern. Neither should falling prices for commodities used in batteries, as expected battery demand outstrips projected supply.

The road to autonomous vehicles will develop in stages from partial automation to full automation. Increasing safety standards are going to require technology hardware such as Lidar, a type of sensor that combines light and radar, and HD map-based systems to be included in vehicles. Moreover, technological disruptors are going to create software utilizing significant advances in artificial intelligence. Credit Suisse expects 20% of cars to include level-3 and above autonomous functions, in other words conditional, high or full automation, by 2030. Premium OEMs are set to launch cars with level-3 features as early as 2020. Despite serious incidents involving autonomous vehicles in test runs last year, we expect “robotaxis” to be introduced in a limited number of areas in 2019 and further launches to accelerate in the years to come.

Ride-hailing or ride-sharing companies are expected to be early adopters of autonomous driving, as owning and managing a fleet of autonomous vehicles appears to be an attractive business model. Such fleets will require financial services for asset ownership, cleaning and charging, maintenance and repair, as well as an app provider. Monetizing time spent in autonomous vehicles by selling ads or services represents another significant opportunity. In this context, we expect current ride-on-demand platforms, hardware/software integrators and potentially social media businesses to partner up.

5.3 Digital natives

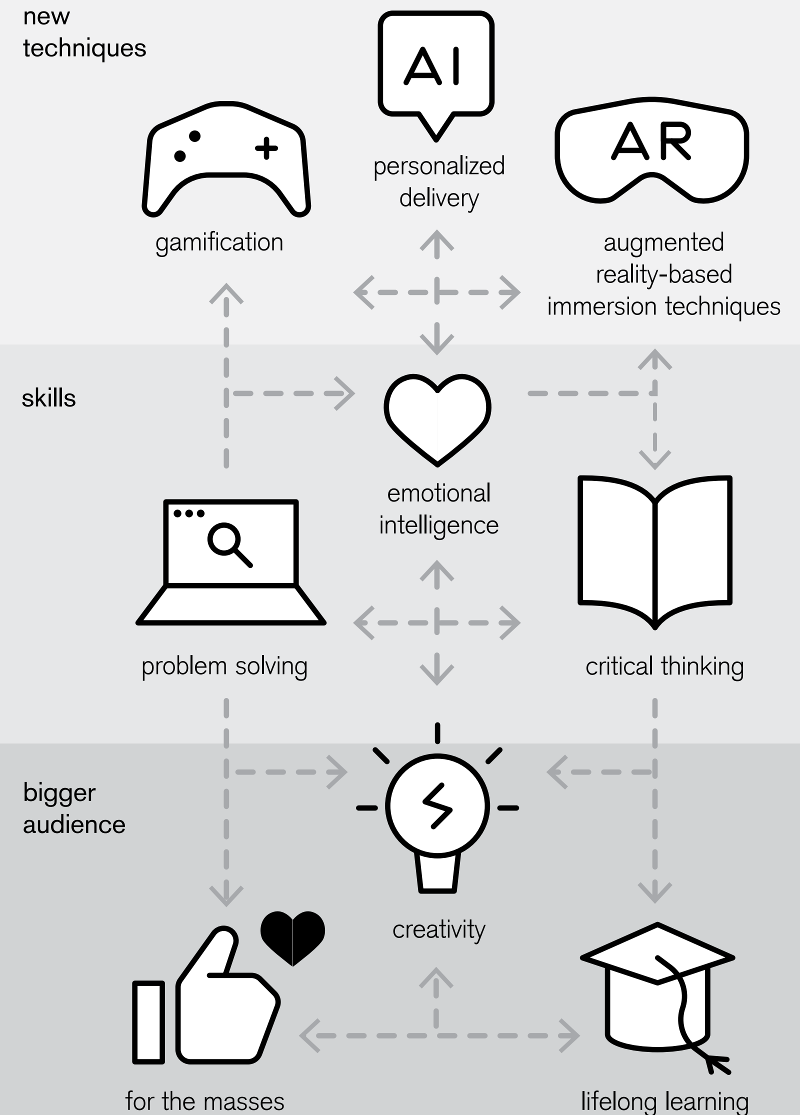
Technology as a teacher
In our era of digitalization, artificial intelligence and automation, Generation Z is demanding new forms of education delivery. We call it an **education technology** revolution in the making.

Technology-savvy individuals who know their way around **social gaming**, this young generation is used to simulated experiences and stimulation. Education technology caters to these preferences with an innovative game-like approach that facilitates the learning process. For instance, animated curricula provide scope for customization or augmented reality books seek to improve engagement. Automation and artificial intelligence are already leading to changes in job profiles, and the best way to respond is by developing skills that cannot be automated, such as critical thinking, problem solving, emotional intelligence and creativity. Education technology seeks to address these increasingly vital skills.

Given the rise of smart phone addiction and its impact on health, education technology may also encourage the use of technology in a beneficial way. It may also make education less expensive and accessible to more students, promoting lifelong learning. HolonIQ, a global education market intelligence platform, expects education technology expenditure to grow strongly, reaching USD 340 billion by 2025. Venture capitalists are already investing in start-up projects in the USA and Asia, and are forecast to have invested close to USD 8 billion in 2018, double the amount invested in 2017, according to HolonIQ. There have already been initial public offerings in this space, or large internet companies are looking to acquire start-up businesses.

Keywords see end of chapter.

Education technology revolution



Source
Credit Suisse

5.4 Fun, health and leisure

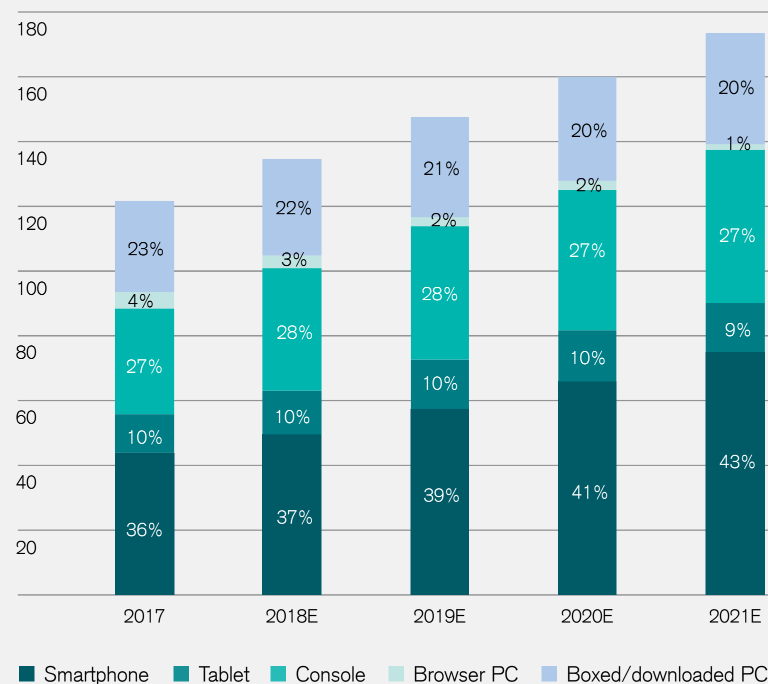
Gaming goes social

Sociable and fun-loving, the younger generations have also fueled the popularity of social gaming. The free-to-play video game Fortnite Battle Royale is a case in point: Launched by Epic Games, which is 48%-owned by China's Tencent, in autumn 2017 for PCs and in March 2018 for mobile devices, the game attracted 125 million users in record time and is currently the largest game in terms of user base. Or consider League of Legends from Riot Games, also majority-owned by Tencent. It is the most popular game in eSports, where professional gamers compete in tournaments. The League of Legends World Championship finals attracted almost 100 million unique viewers, which compares to just over 98 million viewers for the 2018 Super Bowl and an average 14.3 million viewers over the five games of the 2018 World Series (Baseball).

The growing popularity of eSports is testament to the fact that the gaming industry is rapidly shifting from traditional consoles and paid games to mobile and social gaming, thanks in particular to the influence of Generation Z. The mobile market targets a larger user base by distributing free games via large internet platforms. The way these games are monetized is through in-game micro transactions, advertising and the sale of licensing rights to eSports broadcasters. Furthermore, integrating social aspects in the gaming experience is becoming increasingly important. We believe that the gaming market and eSports continue to offer attractive development potential.

Gaming on the go

Video gaming market set to grow further driven by mobile (in USD bn)



Source
October 2018 Quarterly Update, Global Games Market Report, Newzoo; Credit Suisse

Despite its growing popularity, social gaming does come with the downside of addiction and its adverse impact on health. In this context, we expect gaming companies to be increasingly scrutinized for their efforts to mitigate addiction-related risks. We are already seeing the rise of time-keeping tools, but technology companies will also face pressure to embrace ethical design, in other words limit the use of psychological persuasion technology for apps used by children.

Investor takeaways

The key beneficiaries of this fifth Supertrend are, in our view:

- Companies that score high in terms of environmental, social and governance (ESG) criteria and embrace sustainability as part of their strategy.
- Companies exposed to clean energy and **smart mobility** (renewable energy and electric vehicle supply chain), digital natives brands (social media sites, e-commerce leaders, technology brands, education platforms) and companies exposed to fun, health and leisure (video gaming, eSports, Millennials consumer brands).

Education technology: This is a new approach to delivering education using digitalization and enabling personalization, gamification and simulation to develop skills that cannot be automated.

Social gaming refers to online games that allow social interaction among players.

Smart mobility: Smart mobility refers to modes of transportation that are clean and autonomous, encompassing hardware/software providers and integrators, fleet managers and ride hailing/sharing platforms.

Risk warning
Every investment involves risk, especially with regard to fluctuations in value and return. If an investment is denominated in a currency other than your base currency, changes in the rate of exchange may have an adverse effect on value, price or income.

For a discussion of the risks of investing in the securities mentioned in this report, please refer to the following Internet link: https://research.credit-suisse.com/riskdisclosure

This report may include information on investments that involve special risks. You should seek the advice of your independent financial advisor prior to taking any investment decisions based on this report or for any necessary explanation of its contents. Further information is also available in the information brochure "Special Risks in Securities Trading" available from the Swiss Bankers Association.

The price, value of and income from any of the securities or financial instruments mentioned in this report can fall as well as rise. The value of securities and financial instruments is affected by changes in spot or forward interest and exchange rates, economic indicators, the financial standing of any issuer or reference issuer, etc., that may have a positive or adverse effect on the income from or price of such securities or financial instruments. By purchasing securities or financial instruments, you may incur a loss or a loss in excess of the principal as a result of fluctuations in market prices or other financial indices, etc. Investors in securities such as ADRs, the values of which are influenced by currency volatility, effectively assume this risk.

Commission rates for brokerage transactions will be as per the rates agreed between CS and the investor. For transactions conducted on a principal-to-principal basis between CS and the investor, the purchase or sale price will be the total consideration. Transactions conducted on a principal-to-principal basis, including over-the-counter derivative transactions, will be quoted as a purchase/bid price or sell/offer price, in which case a difference or spread may exist. Charges in relation to transactions will be agreed upon prior to transactions, in line with relevant laws and regulations. Please read the pre-contract documentation, etc., carefully for an explanation of risks and commissions, etc., of the relevant securities or financial instruments prior to purchase

Structured securities are complex instruments, typically involve a high degree of risk and are intended for sale only to sophisticated investors who are capable of understanding and assuming the risks involved. The market value of any structured security may be affected by changes in economic, financial and political factors (including, but not limited to, spot and forward interest and exchange rates), time to maturity, market conditions and volatility, and the credit quality of any issuer or reference issuer. Any investor interested in purchasing a structured product should conduct their own investigation and analysis of the product and consult with their own professional advisers as to the risks involved in making such a purchase.

Some investments discussed in this report have a high level of volatility. High volatility investments may experience sudden and large falls in their value causing losses when that investment is realized. Those losses may equal your original investment. Indeed, in the case of some investments the potential losses may exceed the amount of initial investment, in such circumstances you may be required to pay more money to support those losses. Income yields from investments may fluctuate and, in consequence, initial capital paid to make the investment may be used as part of that income yield. Some investments may not be readily realizable and it may be difficult to sell or realize those investments, similarly it may prove difficult for you to obtain reliable information about the value, or risks, to which such an investment is exposed. Please contact your Relationship Manager if you have any questions.

Past performance is not an indicator of future performance. Performance can be affected by commissions, fees or other charges as well as exchange rate fluctuations.

Sensitivities
Sensitivity analysis is understood as the change in the market value (e.g. price) of a financial instrument for a given change in a risk factor and/or model assumption. Specifically, the market value of any financial instrument may be affected by changes in economic, financial and political factors (including, but not limited to, spot and forward interest and exchange rates), time to maturity, market conditions and volatility, and the credit quality of any issuer or reference issuer.

Financial market risks
Historical returns and financial market scenarios are no guarantee of future performance. The price and value of investments mentioned and any income that might accrue could fall or rise or fluctuate. Past performance is not a guide to future performance. If an investment is denominated in a currency other than your base currency, changes in the rate of exchange may have an adverse effect on value, price or income. You should consult with such advisor(s) as you consider necessary to assist you in making these determinations.

Investments may have no public market or only a restricted secondary market. Where a secondary market exists, it is not possible to predict the price at which investments will trade in the market or whether such market will be liquid or illiquid.

Emerging markets
Where this report relates to emerging markets, you should be aware that there are uncertainties and risks associated with investments and transactions in various types of investments of, or related or linked to, issuers and obligors incorporated, based or principally engaged in business in emerging markets countries. Investments related to emerging markets countries may be considered speculative, and their prices will be much more volatile than those in the more developed countries of the world. Investments in emerging markets investments should be made only by sophisticated investors or experienced professionals who have independent knowledge of the relevant markets, are able to consider and weigh the various risks presented by such investments, and have the financial resources necessary to bear the substantial risk of loss of investment in such investments. It is your responsibility to manage the risks which arise as a result of investing in emerging markets investments and the allocation of assets in your portfolio. You should seek advice from your own advisers with regard to the various risks and factors to be considered when investing in an emerging markets investment.

Alternative investments
Hedge funds are not subject to the numerous investor protection regulations that apply to regulated authorized collective investments and hedge fund managers are largely unregulated. Hedge funds are not limited to any particular investment discipline or trading strategy, and seek to profit in all kinds of markets by using leverage, derivatives, and complex speculative investment strategies that may increase the risk of investment loss.

Commodity transactions carry a high degree of risk and may not be suitable for many private investors. The extent of loss due to market movements can be substantial or even result in a total loss.
Investors in real estate are exposed to liquidity, foreign currency and other risks, including cyclical risk, rental and local market risk as well as environmental risk, and changes to the legal situation.

Interest rate and credit risks
The retention of value of a bond is dependent on the creditworthiness of the Issuer and/or Guarantor (as applicable), which may change over the term of the bond. In the event of default by the Issuer and/or Guarantor of the bond, the bond or any income derived from it is not guaranteed and you may get back none of, or less than, what was originally invested.

Disclosures
The information and opinions expressed in this report (other than article contributions by Investment Strategists) were produced by the Research department of the International Wealth Management division of CS as of the date of writing and are subject to change without notice.

This material may refer to previously published research recommendations and rating changes (sometimes collated in the form of lists). All Research articles and reports detailing the recommendations and rating changes for companies and/or individual financial instruments are available on the following internet link: https://investment.credit-suisse.com

For further information, including disclosures with respect to any other issuers, please refer to the Credit Suisse Research Disclosure site at: https://www.credit-suisse.com/disclosure

Article contributions by Investment Strategists are not research reports. Investment Strategists are not part of the CS Research department. CS has policies in place designed to ensure the independence of CS Research Department including policies relating to restrictions on trading of relevant securities prior to distribution of research reports. These policies do not apply to Investment Strategists.

CS accepts no liability for loss arising from the use of the material presented in this report, except that this exclusion of liability does not apply to the extent that liability arises under specific statutes or regulations applicable to CS. This report is not to be relied upon in substitution for the exercise of independent judgment. CS may have issued, and may in the future issue, a trading idea regarding this security. Trading ideas are short term trading opportunities based on market events and catalysts, while company recommendations reflect investment recommendations based on expected total return over a 6 to 12-month period as defined in the disclosure section. Because trading ideas and company recommendations reflect different assumptions and analytical methods, trading ideas may differ from the company recommendations. In addition, CS may have issued, and may in the future issue, other reports that are inconsistent with, and reach different conclusions from, the information presented in this report. Those reports reflect the different assumptions, views and analytical methods of the analysts who prepared them and CS is under no obligation to ensure that such other reports are brought to the attention of any recipient of this report.

Analyst certification
The analysts identified in this report hereby certify that views about the companies and their securities discussed in this report accurately reflect their personal views about all of the subject companies and securities. The analysts also certify that no part of their compensation was, is, or will be directly or indirectly related to the specific recommendation(s) or view(s) in this report.

Knowledge Process Outsourcing (KPO) Analysts mentioned in this report are employed by Credit Suisse Business Analytics (India) Private Limited.

Global Disclaimer / Important Information
This report is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject CS to any registration or licensing requirement within such jurisdiction.

References in this report to CS include Credit Suisse AG, the Swiss bank, its subsidiaries and affiliates. For more information on our structure, please use the following link: http://www.credit-suisse.com

NO DISTRIBUTION, SOLICITATION, OR ADVICE: This report is provided for information and illustrative purposes and is intended for your use only. It is not a solicitation, offer or recommendation to buy or sell any security or other financial instrument. Any information including facts, opinions or quotations, may be condensed or summarized and is

expressed as of the date of writing. The information contained in this report has been provided as a general market commentary only and does not constitute any form of regulated financial advice, legal, tax or other regulated service. It does not take into account the financial objectives, situation or needs of any persons, which are necessary considerations before making any investment decision. You should seek the advice of your independent financial advisor prior to taking any investment decisions based on this report or for any necessary explanation of its contents. This report is intended only to provide observations and views of CS at the date of writing, regardless of the date on which you receive or access the information. Observations and views contained in this report may be different from those expressed by other Departments at CS and may change at any time without notice and with no obligation to update. CS is under no obligation to ensure that such updates are brought to your attention. FORECASTS & ESTIMATES: Past performance should not be taken as an indication or guarantee of future performance, and no representation or warranty, express or implied, is made regarding future performance. To the extent that this report contains statements about future performance, such statements are forward looking and subject to a number of risks and uncertainties. Unless indicated to the contrary, all figures are unaudited. All valuations mentioned herein are subject to CS valuation policies and procedures. CONFLICTS: CS reserves the right to remedy any errors that may be present in this report. Credit Suisse, its affiliates and/or their employees may have a position or holding, or other material interest or effect transactions in any securities mentioned or options thereon, or other investments related thereto and from time to time may add to or dispose of such investments. CS may be providing, or have provided within the previous 12 months, significant advice in relation to the investments listed in this report or a related investment to any company or issuer mentioned. Some investments referred to in this report will be offered by a single entity or an associate of CS or CS may be the only market maker in such investments. CS is involved in many businesses that relate to companies mentioned in this report. These businesses include specialized trading, risk arbitrage, market making, and other proprietary trading. CS is party to an agreement with the issuer relating to provision of services of investment firms. TAX: Nothing in this report constitutes investment, legal, accounting or tax advice. CS does not advise on the tax consequences of investments and you are advised to contact an independent tax advisor. The levels and basis of taxation are dependent on individual circumstances and are subject to change. SOURCES: Information and opinions presented in this report have been obtained or derived from sources which in the opinion of CS are reliable, but CS makes no representation as to their accuracy or completeness. CS accepts no liability for a loss arising from the use of this report. WEBSITES: This report may provide the addresses of, or contain hyperlinks to, websites. Except to the extent to which the report refers to website material of CS, CS has not reviewed the linked site and takes no responsibility for the content contained therein. Such address or hyperlink (including addresses or hyperlinks to CS's own website material) is provided solely for your convenience and information and the content of the linked site does not in any way form part of this report. Accessing such website or following such link through this report or CS's website shall be at your own risk. DATA PRIVACY: Your personal data will be processed in accordance with the CS Principles of Client Data Processing accessible at your domicile through the official CS website at www.credit-suisse.com/ch/en/legal.html.

Distribution of research reports

Except as otherwise specified herein, this report is prepared and issued by Credit Suisse AG, a Swiss bank, authorized and regulated by the Swiss Financial Market Supervisory Authority. Australia: This report is distributed in Australia by Credit Suisse AG, Sydney Branch (CSSB) (ABN 17 061 700 712 AFSL 226896) only to "Wholesale" clients as defined by s761G of the Corporations Act 2001. CSSB does not guarantee the performance of, nor make any assurances with respect to the performance of any financial product referred herein. Austria: This report is distributed by CREDIT SUISSE (LUXEMBOURG) S.A. Zweigniederlassung Österreich (the "Austria branch") which is a branch of CREDIT SUISSE (LUXEMBOURG) S.A., a duly authorized credit institution in the Grand Duchy of Luxembourg with registered address 5, rue Jean Monnet, L-2180 Luxembourg. The Austria branch is subject to the prudential supervision of the Luxembourg supervisory authority, the Commission de Surveillance du Secteur Financier (CSSF), 283, route d'Arlon, L-2991 Luxembourg, Grand Duchy of Luxembourg, as well as of the Austrian supervisory authority, the Financial Market Authority (FMA), Otto-Wagner Platz 5, A-1090 Vienna, Austria. Bahrain: This report is distributed by Credit Suisse AG, Bahrain Branch, authorized and regulated by the Central Bank of Bahrain (CBB) as an Investment Business Firm Category 2. Related financial services or products are only made available to professional clients and Accredited Investors, as defined by the CBB, and are not intended for any other persons. Credit Suisse AG, Bahrain Branch is located at Level 21-22, East Tower, Bahrain World Trade Centre, Manama, Kingdom of Bahrain. DIFC: This information is being distributed by Credit Suisse AG (DIFC Branch). Credit Suisse AG (DIFC Branch) is licensed and regulated by the Dubai Financial Services Authority ("DFSA"). Related financial services or products are only made available to Professional Clients or Market Counterparties, as defined by the DFSA, and are not intended for any other persons. Credit Suisse AG (DIFC Branch) is located on Level 9 East, The Gate Building, DIFC, Dubai, United Arab Emirates. France: This report is distributed by Credit Suisse (Luxembourg) S.A. Succursale en France (the "France branch") which is a branch of Credit Suisse (Luxembourg) S.A., a duly authorized credit institution in the Grand Duchy of Luxembourg with registered address 5, rue Jean Monnet, L-2180 Luxembourg. The France branch is subject to the prudential supervision of the Luxembourg supervisory authority, the Commission de Surveillance du Secteur Financier (CSSF), and of the French supervisory authority, the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and of the Autorité des Marchés Financiers. Germany: This report is distributed by Credit Suisse (Deutschland) Aktiengesellschaft regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht („BaFin"). Guernsey: This report is distributed by Credit Suisse AG Guernsey Branch, a branch of Credit Suisse AG (incorporated in the Canton of Zurich), with its place of business at Helvetia Court, Les Echelons, South Esplanade, St Peter Port, Guernsey. Credit Suisse AG Guernsey Branch is wholly owned by Credit Suisse AG and is regulated by the Guernsey Financial Services Commission. Copies of the latest audited accounts are available on request. Hong Kong: This report is distributed in Hong Kong by Credit Suisse AG, Hong Kong Branch, an Authorized Institution regulated by the Hong Kong Monetary Authority and a Registered Institution regulated by the Securities and Futures Commission, and was prepared in compliance with section 16 of the "Code of Conduct for Persons Licensed by or Registered with the Securities and Futures Commission. The contents of this material have not been reviewed by any regulatory authority in Hong Kong. You are advised to exercise caution in relation to any offer. If you are in any doubt about any of the contents of this material, you should obtain independent professional advice. No one may have issued or had in its possession for the purposes of issue, or issue or have in its possession for the purposes of issue, whether in Hong Kong or elsewhere, any advertisement, invitation or material relating to this product, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than where this product is or is intended to be disposed of only to persons outside Hong Kong or only to "professional investors" as defined in the Securities and Futures Ordinance (Cap. 571) of Hong Kong and any rules made thereunder. India: This report is distributed by Credit Suisse Securities (India) Private Limited (CIN no. U67120MH1996PTC104392) regulated by the Securities and Exchange Board of India as Research Analyst (registration no. INH 000001030), as Portfolio Manager (registration no. INP000002478) and as Stock Broker (registration no. INB230970637; INF230970637; INB010970631; INF010970631), having registered address at 9th Floor, Ceejay House, Dr.A.B. Road, Worli, Mumbai - 18, India, T- +91-22 6777 3777. Italy: This report is distributed in Italy by Credit Suisse (Italy) S.p.A., a bank incorporated and registered under Italian law subject to the supervision and control of Banca d'Italia and CONSOB. Japan: This report is solely distributed in Japan by Credit Suisse Securities (Japan) Limited, Financial Instruments Dealer, Director-General of Kanto Local Finance Bureau (Kinsho) No. 66, a member of the Japan Securities Dealers Association, Financial Futures Association of Japan, Japan Investment Advisers Association, and Type II Financial Instruments Firms Association. Credit Suisse Securities (Japan) Limited will not distribute or forward this report outside Japan. Lebanon: This report is distributed by Credit Suisse (Lebanon) Finance SAL ("CSLF"), a financial institution incorporated in Lebanon and regulated by the Central Bank of Lebanon ("CBL") with a financial institution license number 42. Credit Suisse (Lebanon) Finance SAL is subject to the CBL's laws and regulations as well as the laws and decisions of the Capital Markets Authority of Lebanon ("CMA"). CSLF is a subsidiary of Credit Suisse AG and part of the Credit Suisse Group (CS). The CMA does not accept any responsibility for the content of the information included in this report, including the accuracy or completeness of such information. The liability for the content of this report lies with the issuer, its directors and other persons, such as experts, whose opinions are included in the report with their consent. The CMA has also not assessed the suitability of the investment for any particular investor or type of investor. Investments in financial markets may involve a high degree of complexity and risk and may not be suitable to all investors. The suitability assessment performed by CSLF with respect to this investment will be undertaken based on information that the investor would have provided to CSLF and in accordance with Credit Suisse internal policies and processes. It is understood that the English language will be used in all communication and documentation provided by CS and/or CSLF. By accepting to invest in the product, the investor confirms that he has no objection to the use of the English language. Luxembourg: This report is distributed by Credit Suisse (Luxembourg) S.A., a duly authorized credit institution in the Grand Duchy of Luxembourg with registered address 5, rue Jean Monnet, L-2180 Luxembourg. Credit Suisse (Luxembourg) S.A. is subject to the prudential supervision of the Luxembourg supervisory authority, the Commission de Surveillance du Secteur Financier (CSSF).

Mexico: Banco Credit Suisse (México), S.A., Institución de Banca Múltiple, Grupo Financiero Credit Suisse (México) and C. Suisse Asesoría México, S.A. de C.V. ("Credit Suisse Mexico"). This document is elaborated for information purposes only and does not constitute a recommendation, advice or an invitation to execute any operation and does not replace direct communication with your relationship manager at Credit Suisse Mexico before the execution of any investment. The people who elaborated this document do not receive payment or compensation from any entity of the Credit Suisse Group other than the one employing them. The prospectuses, offering documentation, term sheets, investment regimes, annual reports and periodical financial information contained useful information for investors. Such documents can be obtained without any cost, directly from the issuer of securities and investment fund managers or at the securities and stock market web page, as well as from your relationship manager at Credit Suisse Mexico. The information herein does not substitutes the Account Statements, the INFORME DE OPERACIONES or/ and confirmations you receive from Credit Suisse Mexico pursuant to the General Rules applicable to financial institutions and other persons that provide investment services. C. Suisse Asesoría México, S.A. de C.V., is an investment advisor duly incorporated under the Securities Market Law ("LMV") and is registered before the National Banking and Securities Commission ("CNBV") under folio number 30070 and therefore is not a bank, is not authorized to receive deposits nor to custody any securities, is not part of Grupo Financiero Credit Suisse (México), S.A. de C.V.. Under the provisions of the LMV, C. Suisse Asesoría México, S.A. de C.V. is not an independent investment advisor pursuant to its relationship with Credit Suisse AG, a foreign financial institution, and its indirect relationship with Grupo Financiero Credit Suisse (Mexico), S.A. de C.V. The people who produced this document do not receive payment or compensation from any entity of the Credit Suisse Group other than the one employing them. Netherlands: This report is distributed by Credit Suisse (Luxembourg) S.A., Netherlands Branch (the "Netherlands branch") which is a branch of Credit Suisse (Luxembourg) S.A., a duly authorized credit institution in the Grand Duchy of Luxembourg with registered address 5, rue Jean Monnet, L-2180 Luxembourg. The Netherlands branch is subject to the prudential supervision of the Luxembourg supervisory authority, the Commission de Surveillance du Secteur Financier (CSSF), and of the Dutch supervisory authority, De Nederlansche Bank (DNB), and of the Dutch market supervisor, the Autoriteit Financiële Markten (AFM). Portugal: This report is distributed by Credit Suisse (Luxembourg) S.A., Sucursal em Portugal (the "Portugal branch") which is a branch of Credit Suisse (Luxembourg) S.A., a duly authorized credit institution in the Grand Duchy of Luxembourg with registered address 5, rue Jean Monnet, L-2180 Luxembourg. The Portugal branch is subject to the prudential supervision of the Luxembourg supervisory authority, the Commission de Surveillance du Secteur Financier (CSSF), and of the Portuguese supervisory authority, the Comissão do Mercado dos Valores Mobiliários (CMVM). Qatar: This information has been distributed by Credit Suisse (Qatar) L.L.C., which is duly authorized and regulated by the Qatar Financial Centre Regulatory Authority (QFCRA) under QFC License No. 00005. All related financial products or services will only be available to Business Customers or Market Counterparties (as defined by the QFCRA), including individuals, who have opted to be classified as a Business Customer, with net assets in excess of QR 4 million, and who have sufficient financial knowledge, experience and understanding to participate in such products and/or services. Therefore this information must not be delivered to, or relied on by, any other type of individual. The QFCRA has no responsibility for reviewing or verifying any Prospectus or other documents in connection with this product/service due to the fact that this product/service is not registered in the

QFC or regulated by the QFCRA. Accordingly, the QFCRA has not reviewed or approved this information or any other associated documents nor taken any steps to verify the information set out in this document, and has no responsibility for it. Investors in this product/service may not have the same access to information about the product/service that they would have to information about a product/service registered in the QFC. The product/service to which this information relates may be illiquid and/or subject to restrictions on their resale. Recourse against the product/service, and those involved with it, may be limited or difficult and may have to be pursued in a jurisdiction outside the QFC. Prospective purchasers of the product/service offered should conduct their own due diligence on the product/service. If you do not understand the contents of this brochure you should consult an authorized financial advisor. Saudi Arabia: This information is being distributed by Credit Suisse Saudi Arabia (CR Number 1010228645), duly licensed and regulated by the Saudi Arabian Capital Market Authority pursuant to License Number 08104-37 dated 23/03/1429H corresponding to 21/03/2008AD. Credit Suisse Saudi Arabia's principal place of business is at King Fahad Road, Hay Al Mhamadiya, 12361-6858 Riyadh, Saudi Arabia. Website: https://www.credit-suisse.com/sa. Singapore: This report has been prepared and issued for distribution in Singapore to institutional investors, accredited investors and expert investors (each as defined under the Financial Advisers Regulations) only, and is also distributed by Credit Suisse AG, Singapore Branch to overseas investors (as defined under the Financial Advisers Regulations. Credit Suisse AG, Singapore Branch may distribute reports produced by its foreign entities or affiliates pursuant to an arrangement under Regulation 32C of the Financial Advisers Regulations. Singapore recipients should contact Credit Suisse AG, Singapore Branch at +65-6212-2000 for matters arising from, or in connection with, this report. By virtue of your status as an institutional investor, accredited investor, expert investor or overseas investor, Credit Suisse AG, Singapore Branch is exempted from complying with certain compliance requirements under the Financial Advisers Act, Chapter 110 of Singapore (the "FAA"), the Financial Advisers Regulations and the relevant Notices and Guidelines issued thereunder, in respect of any financial advisory service which Credit Suisse AG, Singapore branch may provide to you. Spain: This report is distributed in Spain by Credit Suisse AG, Sucursal en España, legal entity registered at Comisión Nacional del Mercado de Valores. Turkey: The investment information, comments and recommendations contained herein are not within the scope of investment advisory activity. The investment advisory services are provided by the authorized institutions to the persons in a customized manner taking into account the risk and return preferences of the persons. Whereas, the comments and advices included herein are of general nature. Therefore recommendations may not be suitable for your financial status or risk and yield preferences. For this reason, making an investment decision only by relying on the information given herein may not give rise to results that fit your expectations. This report is distributed by Credit Suisse Istanbul Menkul Degerler Anonim Sirketi, regulated by the Capital Markets Board of Turkey, with its registered address at Yildirim Oguz Goker Caddesi, Maya Plaza 10th Floor Akatlar, Besiktas/Istanbul-Turkey.

United Kingdom: This material is issued by Credit Suisse (UK) Limited. Credit Suisse (UK) Limited, is authorized by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. The protections made available by the Financial Conduct Authority and/or the Prudential Regulation Authority for retail clients do not apply to investments or services provided by a person outside the UK, nor will the Financial Services Compensation Scheme be available if the issuer of the investment fails to meet its obligations. To the extent communicated in the United Kingdom ("UK") or capable of having an effect in the UK, this document constitutes a financial promotion which has been approved by Credit Suisse (UK) Limited which is authorized by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority for the conduct of investment business in the UK. The registered address of Credit Suisse (UK) Limited is Five Cabot Square, London, E14 4QR. Please note that the rules under the UK's Financial Services and Markets Act 2000 relating to the protection of retail clients will not be applicable to you and that any potential compensation made available to "eligible claimants" under the UK's Financial Services Compensation Scheme will also not be available to you. Tax treatment depends on the individual circumstances of each client and may be subject to changes in future.

UNITED STATES: NEITHER THIS REPORT NOR ANY COPY THEREOF MAY BE SENT, TAKEN INTO OR DISTRIBUTED IN THE UNITED STATES OR TO ANY US PERSON (WITHIN THE MEANING OF REGULATION S UNDER THE US SECURITIES ACT OF 1933, AS AMENDED).

This report may not be reproduced either in whole or in part, without the written permission of Credit Suisse. Copyright © 2019 Credit Suisse Group AG and/or its affiliates. All rights reserved.

19C035A_R

Imprint

Editor-in-chief
Dr. Nannette Hechler-Fayd'herbe

Authors
Daniel Rupli
Reto Hess
Jens Zimmermann
Uwe Neumann
Lorenzo Biasio
Julie Saussier

Editorial support
Christa Jenni
Catherine McLean Trachsler
Christine Mumenthaler
Flurina Krähenbühl

Product management
Camilla Damm Leuzinger
Claudia Biri

Design concept
© LINE Communications AG

Editorial deadline
24 May 2019

More information
credit-suisse.com/supertrends

credit-suisse.com

2532494 WJCC1 06.2019