US Equity Strategy

If History Were A Perfect Guide …
Stocks Would Be In A World Of Trouble Here

Equity Strategy

Americas

Francois Trahan
Strategist
francois.trahan@ubs.com
+1-212-713 8450

Samuel Blackman
Strategist
samuel.blackman@ubs.com
+1-212-713 3186

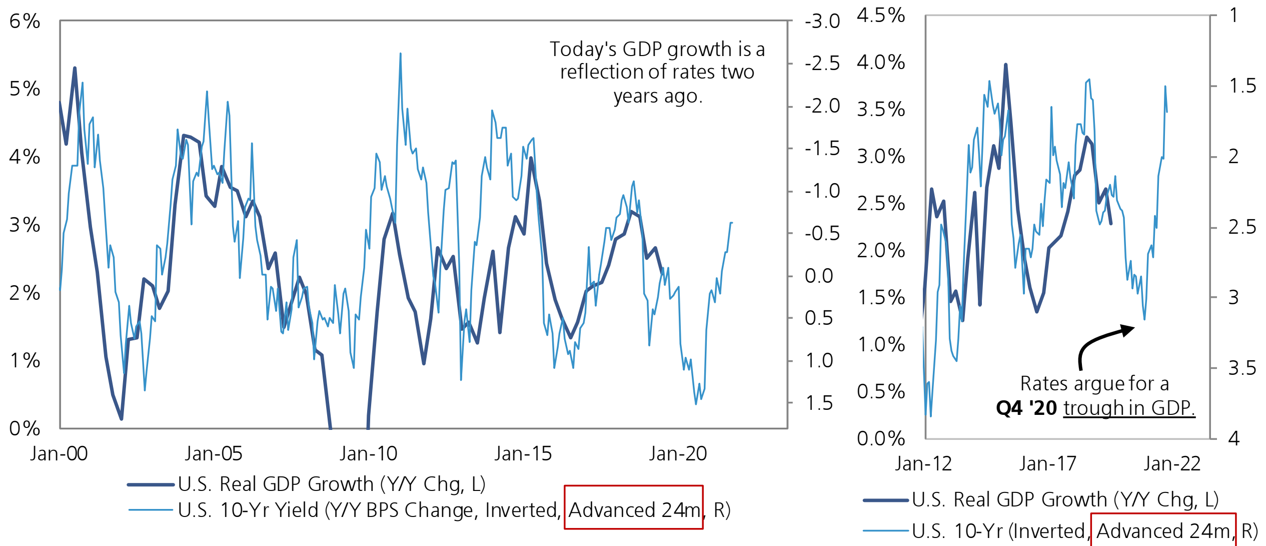
Magdalena Ocampo
Associate Analyst
magdalena.ocampo@ubs.com
+1-212-713 2406

In Today's Report:

A contraction in forward EPS is still the biggest threat for U.S. equities ahead: Every bear market of the past 50 years has witnessed an actual decline in S&P 500 forward earnings. Moreover, earnings expectations for the S&P 500 have fallen in the wake of 7 of the past 8 Fed tightening cycles.

The earnings landscape has already deteriorated and will likely get worse: The consensus year-over-year growth rate in S&P 500 forward earnings is down to a mere 1% from a peak of 23% in September of 2018. Forward earnings are already contracting in the Midcap and Smallcap indices.

The Q4 2018 Cycle Peak In Rates Argues That U.S. GDP Will Bottom In Q4 2020



Source: FactSet, UBS

Rates argue that real GDP growth will continue to slow through Q4 of 2020: It takes about two years historically for a change in interest rates to be fully reflected in the U.S. economy. The November 2018 peak in the 10-year bond yield argues for a trough in U.S. real GDP sometime in late 2020.

The S&P 500 has historically been able to discount a low in GDP with a lead time of 3-7 months: The S&P 500 has begun to discount an economic recovery sometime between 3 and 7 months before the low point in U.S. GDP in the economic slowdowns of the past 50 years.

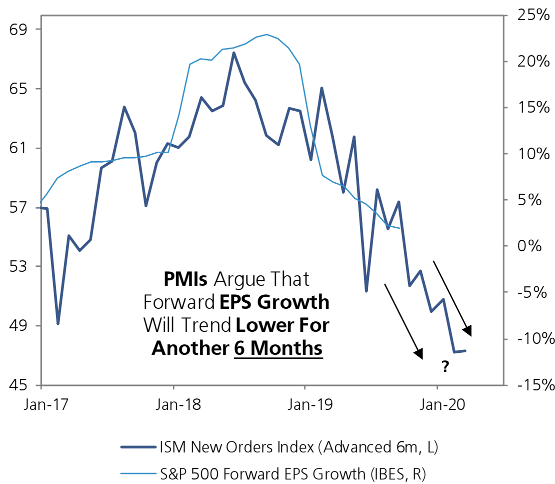
If history were a perfect guide, the S&P 500 would trough in Q2 of 2020 and rebound thereafter: Should the economy bottom in Q4 of 2020, as interest rates suggest, then history argues the S&P 500 would begin to price in a sustainable recovery sometime between April and August of 2020.

This report has been prepared by UBS Securities LLC. The recommendations in this report are based on UBS's proprietary quantitative models. These recommendations are made independently of the recommendations of UBS's fundamental equity research analysts. **ANALYST CERTIFICATION AND REQUIRED DISCLOSURES BEGIN ON PAGE 11.** UBS does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

The Greatest Risk To U.S. Equities In 2019 … Negative Earnings Expectations

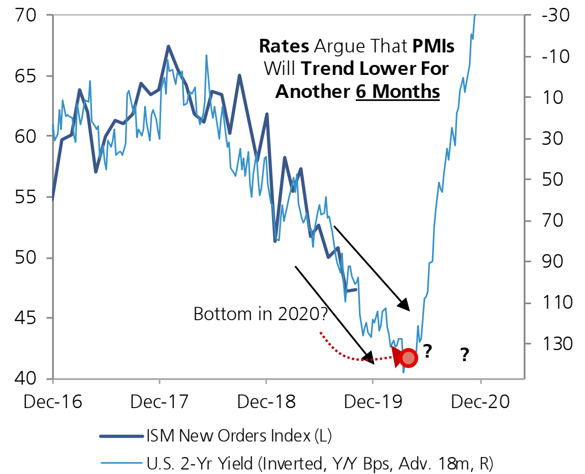
The S&P 500 has remained rather resilient in the last few weeks after a rocky start to the month of October. Some market participants are pointing to the Fed's past and potentially-future rate cuts as the reason for the market's buoyant response in the face of slowing economic prospects. This seems implausible to us since rates and equities are currently **positively** correlated. This means that lower rates would mean lower equities, which has indeed been the reaction after the last two rate cuts. We continue to see earnings as THE catalyst most likely to alter the equity landscape from here. Forward EPS growth for the S&P 500 is down to a mere 1% and leading economic indicators (LEIs) argue that the deceleration is set to continue. Moreover, the lagged effects of last year's Fed rate hikes point to further weakness in LEIs in the coming months. All and all, this adds up to S&P 500 EPS slowing well into H2'20.

LEIs Like The ISM Argue For Slower Earnings …



Source: FactSet, UBS

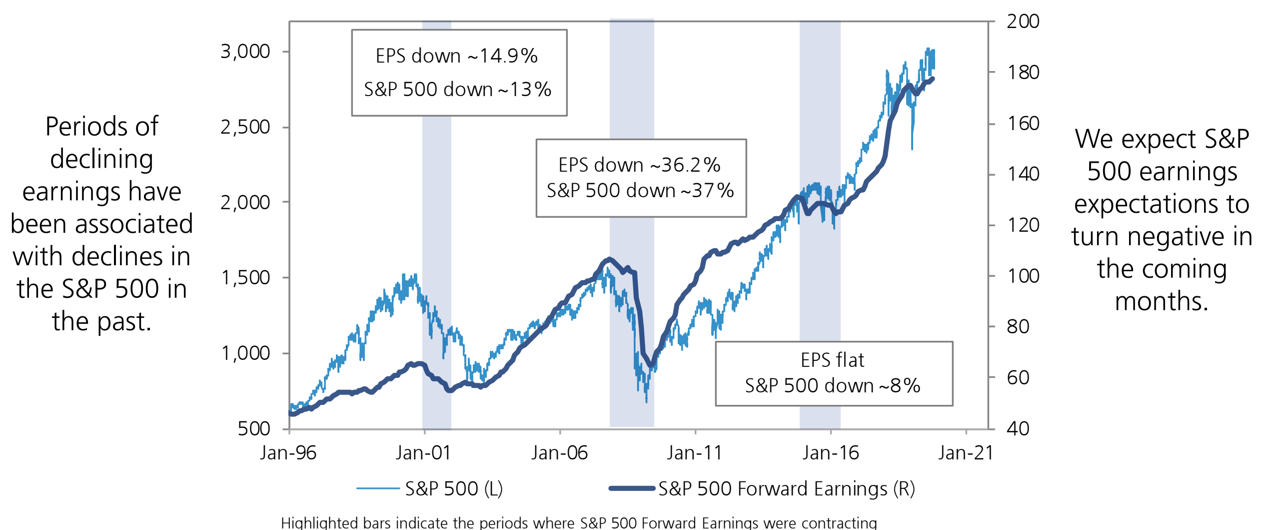
… And Past Rates Argue For Even Weaker LEIs



Source: FactSet, UBS

Across history, earnings expectations (forward earnings) crossing into negative territory have been a key catalyst for investors. In fact, most bear markets in the S&P 500 have been periods in which earnings were declining. There have been a few instances where the S&P 500 managed to rise when earnings were falling, barring the beginning of an economic recovery when LEIs were beginning to turn up, fueling P/Es higher. Ultimately, the most vulnerable macro backdrop for equities occurs when forward earnings growth turns negative as LEIs are trending downward (pushing P/Es lower). This is typically a combination seen in the latter stages of a slowdown, as the chart below highlights.

A Contraction In Earnings Is THE Catalyst To A Bear Market Across History



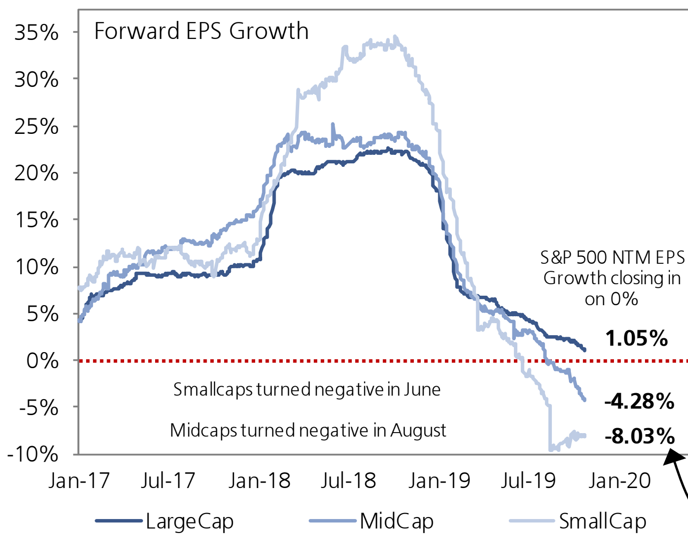
Highlighted bars indicate the periods where S&P 500 Forward Earnings were contracting

Source: FactSet, UBS

The Landscape For U.S. Earnings Has Already Deteriorated Tremendously

Long gone are the days when S&P 500 forward earnings growth was in double-digit territory. Indeed, it's hard to believe that just 13 months ago earnings expectations were up 23% (September 2018). The deceleration has been abrupt given the roll-off effect from last year's corporate tax cuts. Forward earnings growth now sits at a paltry 1.05% while expectations are already negative in the midcap and smallcap S&P indices. At this pace, we would expect to see a negative print on S&P 500 forward earnings growth sometime in the coming months.

Earnings Expectations For The S&P 500 Closing In On Negative Territory



#of Companies With Negative EPS Growth

	Start of 2019	Today
S&P 500	68	160
S&P 400	81	176
S&P 600	172	304

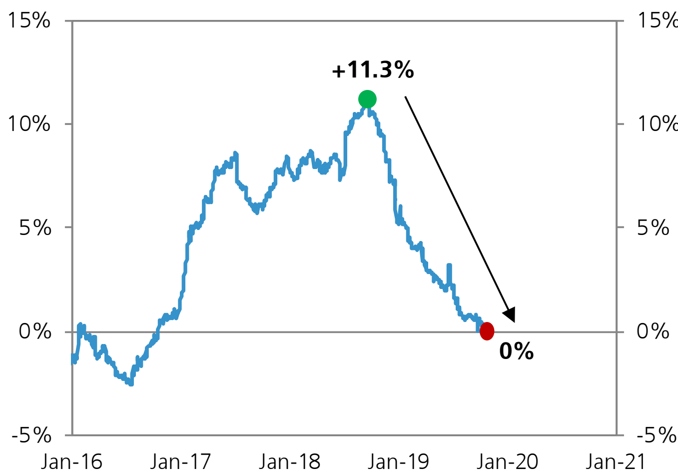
There are more companies now with negative earnings growth.

	Date Forward EPS Growth Went Negative
S&P 500	? (Current pace argues for Nov. '19)
S&P 400	August '19 (2 consecutive months)
S&P 600	June '19 (4 consecutive months)

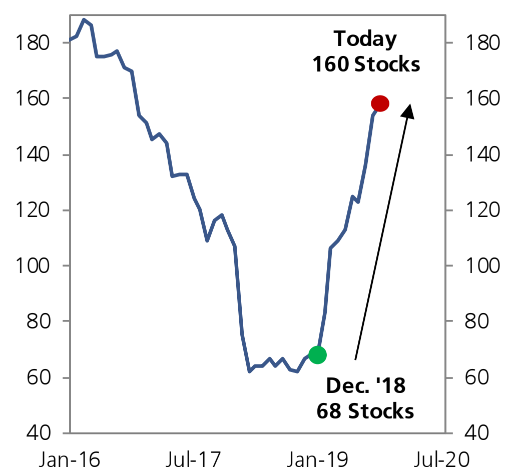
Source: FactSet, UBS

There are many ways to assess the health of S&P 500 earnings, but at this stage no matter how you slice it, the trend is slowing. One measure of underlying earnings (Forward EBIT) that we like to monitor is already down to zero growth. This is likely due to the fact that EBIT was less impacted than overall EPS by the tax cuts of 2018. Meanwhile, breadth in S&P earnings expectations also looks paltry. Indeed, there are now 160 companies in the S&P 500 with negative earnings expectations from just 68 at the beginning of the year. Note that over half of the S&P 600 Small Index constituents have negative expectations and the S&P 400 is also faced with limiting breadth. While the S&P 500 has fared better than other indices historically, that is not enough to keep the index up once earnings turn negative.

S&P 500 Forward EBIT Growth Already At 0%



Number of Companies With EPS Growth < 0

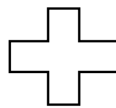


Source: FactSet, UBS

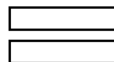
Interest Rates Argue For Another 12 Months Of Slower Earnings From Here

Historically there has been about a six-month lead time between leading indicators (i.e., ISM New Orders Index) and S&P 500 forward earnings growth, as illustrated below. Furthermore, the lagged effects of the Fed's tightening cycle are still in the pipeline and argue for a low in the ISM New Orders Index some time next Spring. All and all, this suggests that **S&P 500 forward earnings growth could slow into the Fall of 2020.**

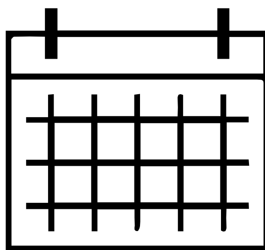
The past decline in the ISM New Orders Index suggests there are at least **6 more months of downside for earnings expectations ahead**



The ISM New Orders Index still has about 6 more months of past monetary tightening to digest and is set to decline further

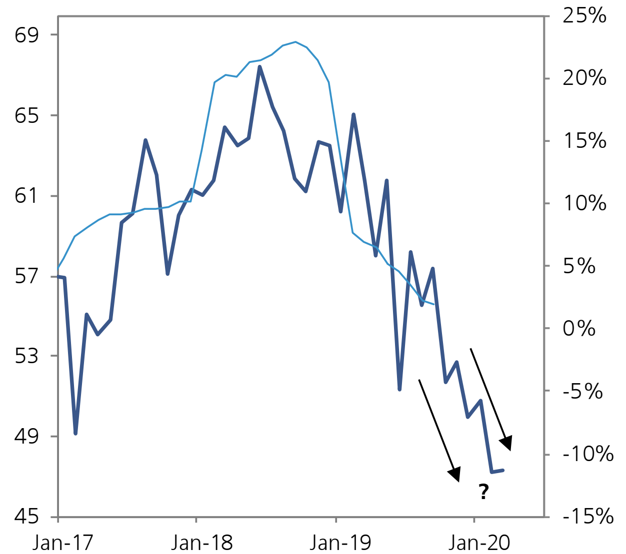


~12 months until trough in Forward EPS growth



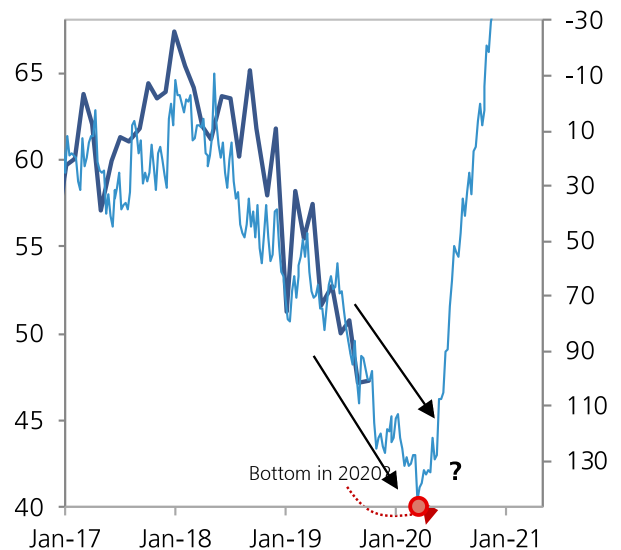
Earnings Bottom in Sept. 2020?

PMIs Argue That Forward **EPS Growth** Will Trend **Lower For Another 6 Months**



ISM New Orders Index (Advanced 6m, L)
S&P 500 Forward EPS Growth (IBES, R)

Rates Argue That **PMIs** Will **Trend Lower For Another 6 Months**



ISM New Orders Index (L)
U.S. 2-Yr Yield (Inverted, Y/Y Bps, Adv. 18m, R)

Source: FactSet, UBS

S&P 500 Returns Historically Abysmal When **EPS And P/E Are Both Contracting**

Leading indicators have been steadily falling since the end of 2017 and earnings have lost steam. This slowing dynamic has pushed the equity market into what we like to call the "Risk-Off" phase of the business cycle. Risk-Off is characterized by P/Es trending lower as a result of slowing LEIs, while earnings growth remains positive, albeit slowing ... all of this typically adds up to subpar returns for the equity market. This backdrop sometimes turns worse if LEIs continue to slow (pushing P/Es lower still) while earnings growth turns negative. This combination usually turns investors very pessimistic and is what we call the "Risk-Aversion" phase of the cycle. **The S&P 500 has been down double digits 7 out of the past 8 times we have seen Risk-Aversion in the wake of Fed rate hikes.**

Analysis Of S&P 500 Returns Across Eight Fed-Driven Business Cycles ~50 Years

PMI Phase	1974	1980	1981	1984	1991	1995	2001	2008	Average
Risk-On	10.8%	23.1%	27.2%	66.9%	20.4%	-3.2%	47.9%	16.3%	**28.4%**
Risk-Off	-16.4%	4.0%	-3.6%	-1.0%	0.4%	13.7%	2.5%	-4.3%	**1.7%**
Risk-Aversion	-33.0%	-11.7%	-16.8%	-12.7%	-19.9%	26.0%	-24.2%	-53.9%	**-16.2%**

The historical exception covered in Annex on page 9.

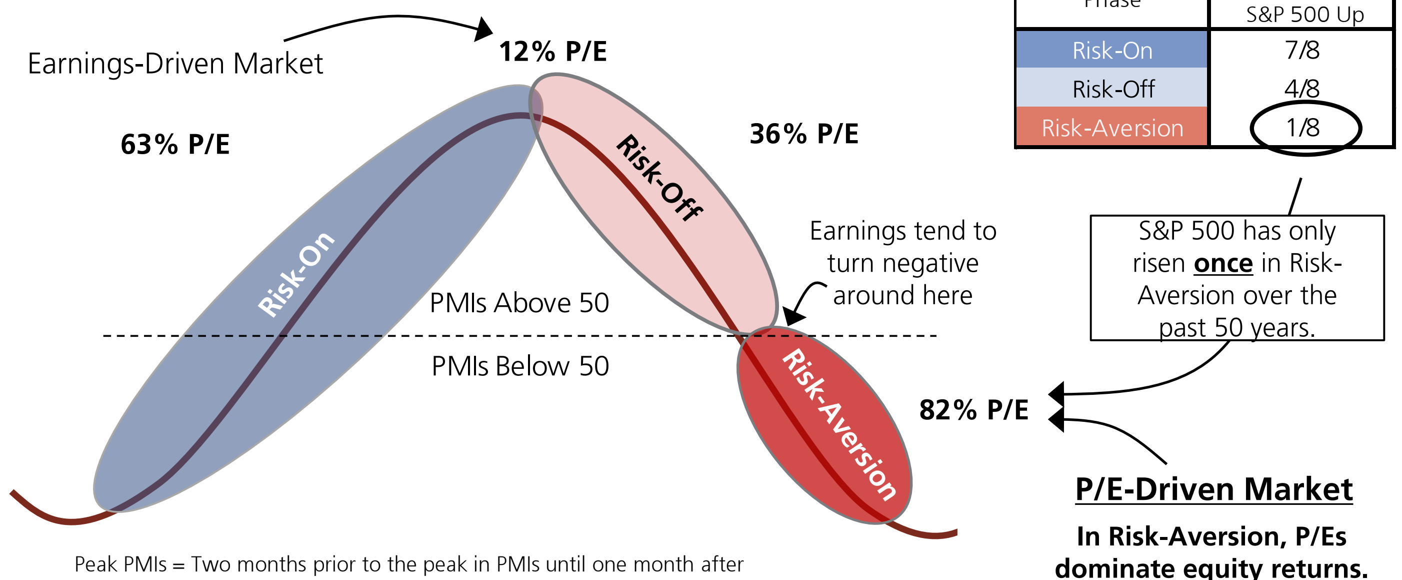
PMI Phase	Description	Historical Odds
Risk-On	PMIs Rising	7/8
Risk-Off	PMIs Falling > 50	4/8
Risk-Aversion	PMIs falling < 50	1/8

The S&P 500 is almost always up in the Risk-On phase of the business cycle.

The S&P 500 has been up only **once** in the last eight Risk-Aversion cycles of the past 45 years.

Source: FactSet, UBS

ISM < 50 Usually Spells Problems As Earnings Turn Negative Leading P/E To Compress Further



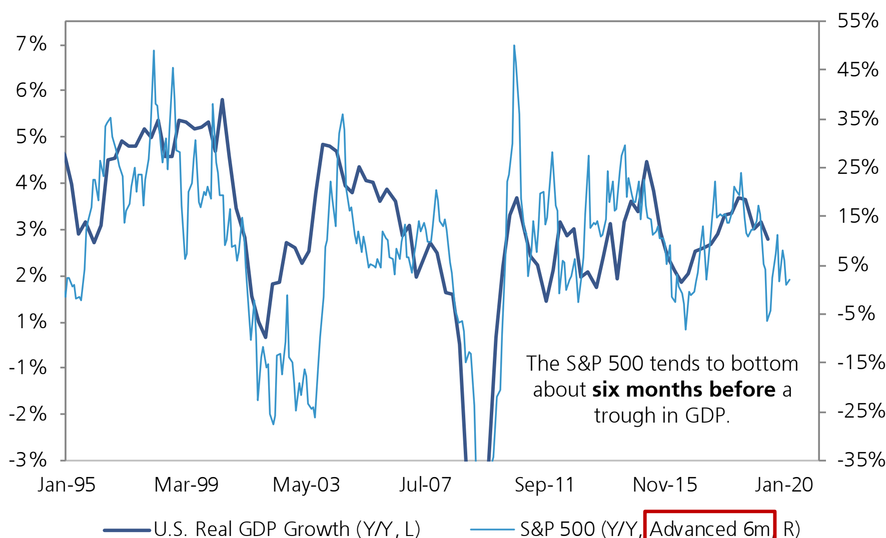
Source: FactSet, UBS

The significance of P/Es as a contributor to equity returns fluctuates around the business cycle, as the relative importance of sentiment and earnings change. On average, P/Es hit their peak influence during the Risk-Aversion phase where they are responsible for 82% of the S&P 500's return. This is not good news at a time when downward pressure on the multiple is intensifying via increasing risks, declining earnings growth, and deteriorating sentiment. This is the period in which we typically see the worst performance from equities, and it is why today our biggest concern for the S&P 500 is forward earnings turning negative.

U.S. Equities Are A Discounting Mechanism For Future Economic Activity (i.e., GDP)

The S&P 500 is a leading indicator of the economy. In fact, it is such a reliable discounting mechanism for future economic activity that the Conference Board includes it in its official Leading Economic Indicator index. As the chart below illustrates, the year-over-year change in the S&P 500 (sometimes called the S&P 500's return) leads GDP across history by about six months. In the current cycle, the S&P 500's return topped out in late 2017, about six months before the Q2 '18 peak in U.S. GDP growth. Going forward, we would expect stocks to bottom about six months before the trough in U.S. GDP.

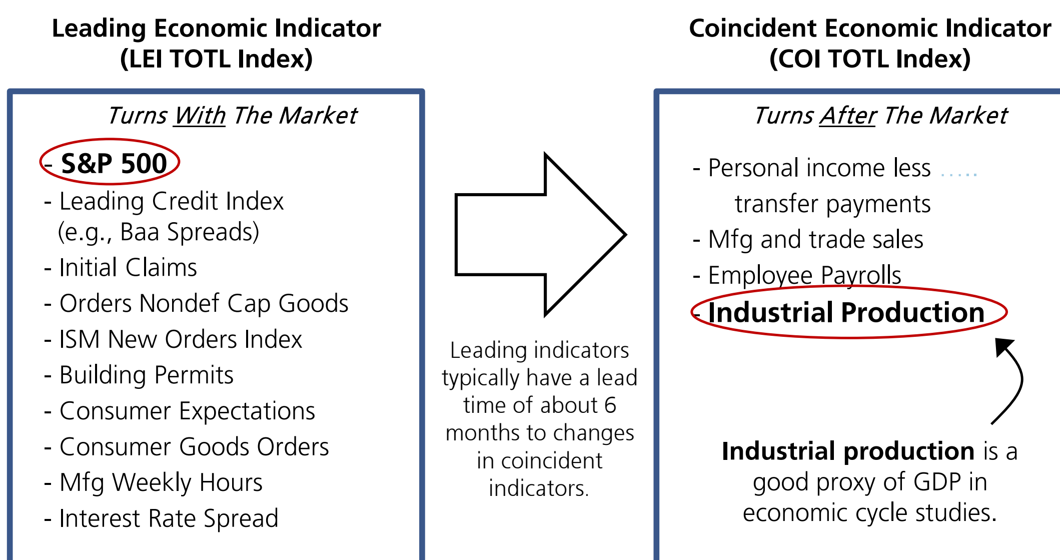
Stocks Usually Begin To Price Changes In U.S. Economy About Six Months Ahead Of Time



Source: FactSet, UBS

Truth be told, the S&P 500 is not the only reliable gauge of future activity across time. Indeed, most LEIs end up changing course about six months before the economy does. Similarly, stocks are not only a gauge of future GDP. Indeed, it is easy to show that the S&P 500's return leads other coincident indicators of the economy, like monthly Payrolls or Industrial Production. In fact, when doing historical analyses on the S&P 500's discounting mechanism, we often use Industrial Production instead of GDP, given its monthly periodicity.

The S&P 500 Is Officially An LEI And Often Leads GDP And Other Coincident Data By About Six Months



Source: The Conference Board, UBS

S&P 500 Discounting Mechanism: Stocks Historically Have A **~6 Month Visibility**

A review of past Fed-induced slowdowns shows 7 major episodes over the last 50 years. There is also 1995 but as we cover in the Annex on page 9, the economy barely slowed in that particular episode and S&P 500 earnings did not turn negative. So that is not a great period to use when studying the discounting mechanism of the S&P 500. Looking at the other episodes, however, shows that the S&P 500 typically bottoms 5 to 7 months before GDP does. There are two exceptions: the recession of 1980 and the financial crisis of 2008, in which equities troughed 4 and 3 months before GDP, respectively. As we see it, it looks like the more severe the slowdown, the shorter the window of visibility.

The S&P 500 Has Had A Consistent Track Record Of Having About A 6-Month Discounting Window

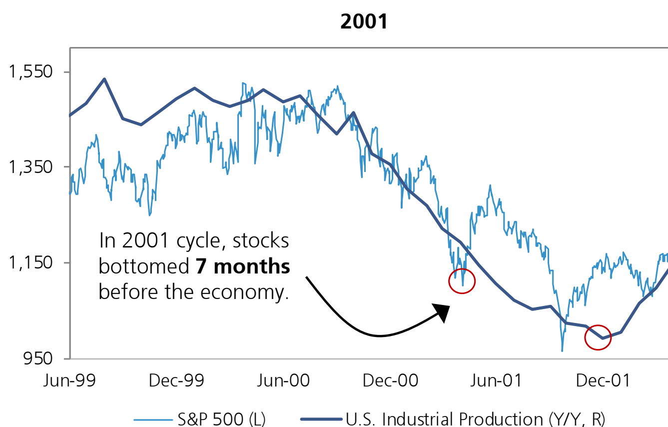
Seven Fed-induced business cycles where **monetary tightening led to a trough in GDP about 24 months after that last rate hike.**

Historical Cycles	Trough In Economy (GDP)	Lead Time of Stocks to Economy (months)
1974	Q1 '75	5
1980	Q3 '80	4
1981	Q3 '82	5
1984	Q2 '85	7
1991	Q1 '91	5
2001	Q4 '01	7
2008	Q2 '09	3

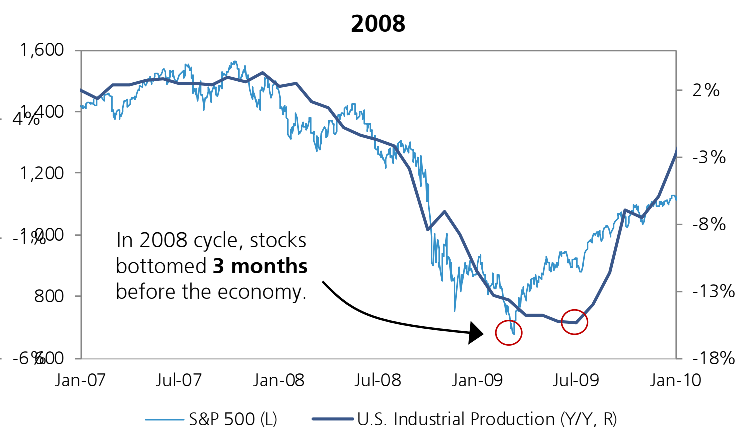
The S&P 500's ability to discount a trough in the U.S. economy has been somewhere in the range of **3 – 7 months** in past Fed-induced business cycles.

*1995 cycle not included in analysis (see pg 9)

2001 Example:
The S&P 500 Began To Discount The Coming Recovery About **7 Months Before The Trough**



2008 Example:
The S&P 500 Began To Discount The Coming Recovery About **3 Months Before The Trough**



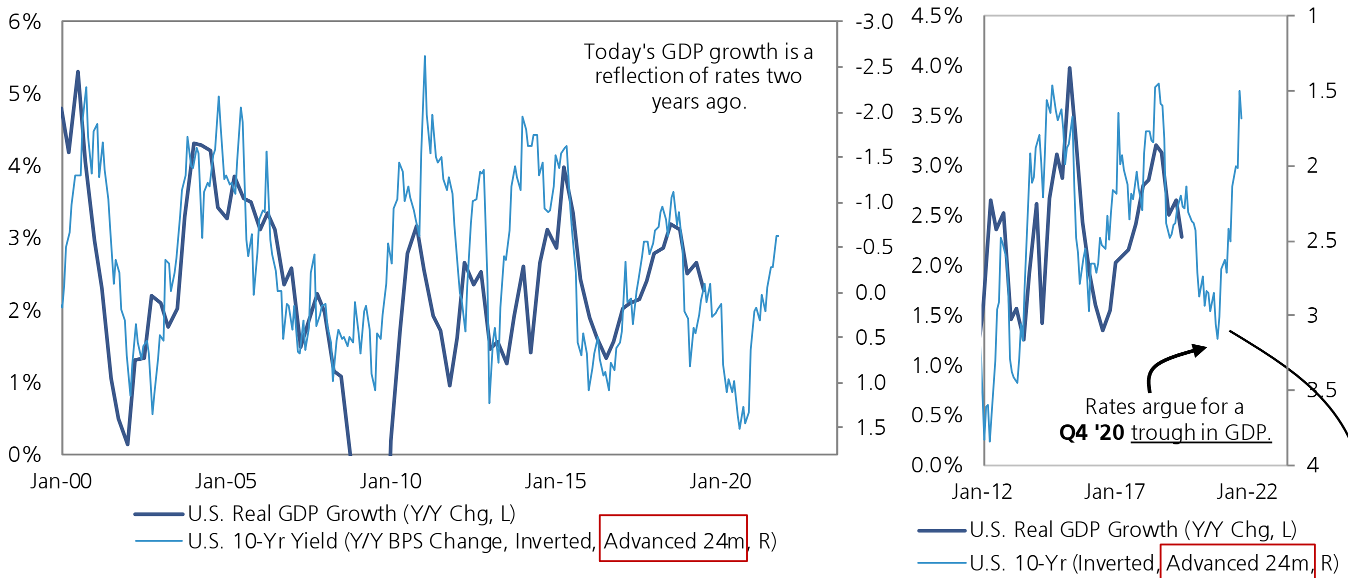
Source: FactSet, UBS

The longest discounting window we have seen between the stock market and the economy over the past 50 years is a seven-month lead time. This occurred twice, once in 1984 and then again in 2001. At the other end of the spectrum is the financial crisis of 2008 where equities only managed to trough in March of 2009, or about three months before the economy put in a low for the cycle. Looking at these patterns one does wonder whether the severity of a downturn impacts the stock market's ability to discount economic activity. Regardless, what is clear is that equities tend to bottom about six months before the economy does, and there has not been an episode with a longer lead time than 7 months, at least not in the past 50 years.

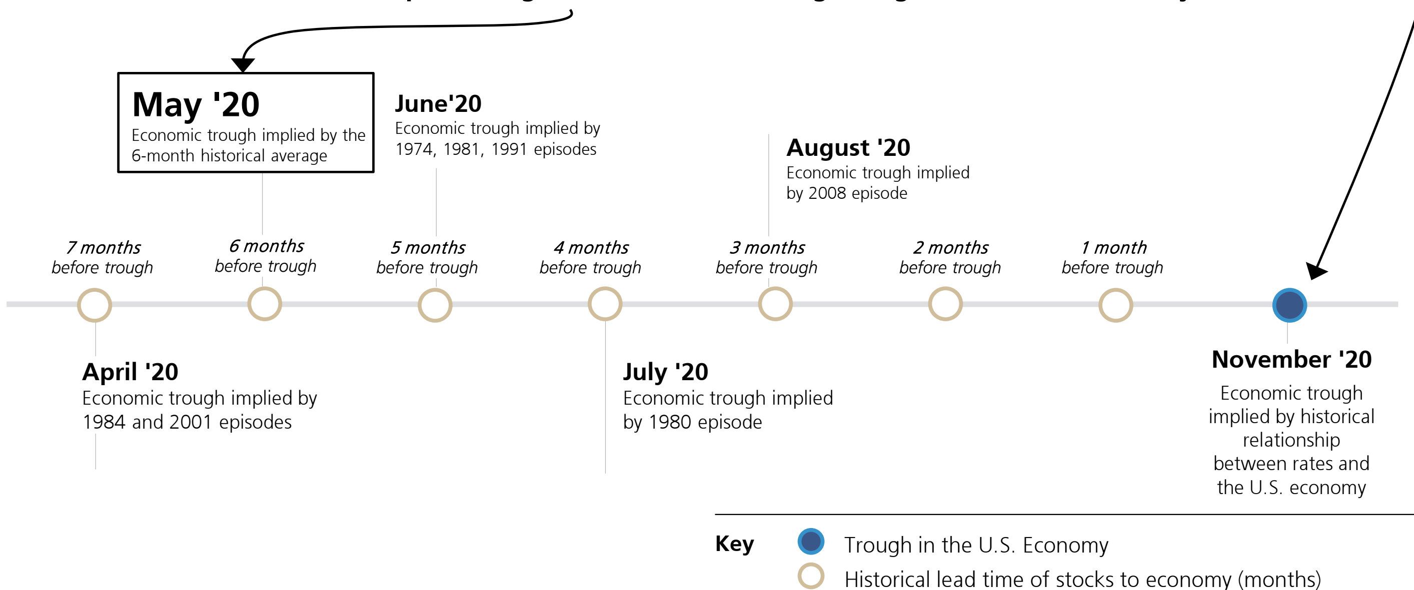
If History Were A Perfect Guide Then Stocks Would Bottom In Q2 Of 2020

Another relationship that has been very stable across time is that of interest rates and their impact on future growth. Indeed, across the decades, it takes about 24 months for a change in interest rates to be fully reflected in economic activity. This is why most GDP forecasting models are able to predict the future path of the economy by about two years. As the chart below illustrates, taking the 10-year bond yield and inversing it has in itself been a great forecasting tool of future growth in real U.S. GDP. In the current cycle where the 10-year bond yield peaked in November of 2018, this relationship would argue for a bottom in the economy in November of 2020, or essentially in Q4 of next year.

The Q4 2018 Cycle Peak In Rates Argues That The U.S. Slowdown Will Continue Through Q4 2020



When Will Equities Begin To Discount The Beginning Of The Next Recovery?



Source: FactSet, UBS

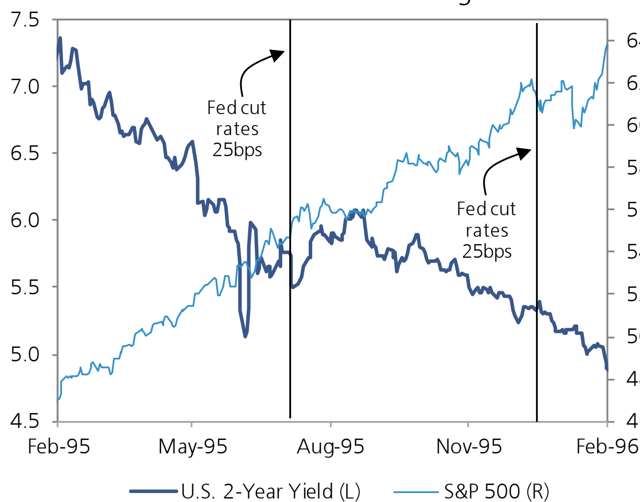
There is a lot of "IF" in the following, but if history were to be a perfect guide then the economy would bottom exactly as interest rates suggest in November of 2020. Now adding another "IF" to this and using the historical lead times seen across history would leave stocks at their lows sometime between 3 and 7 months before the November low point in the economy. This would mean that the stock market could finally begin to discount a recovery sometime between April and August of next year. Anything earlier than April would be making history.

Annex: No, It's Not The 90s: Why Rate Cuts Likely Won't Save Equities This Time

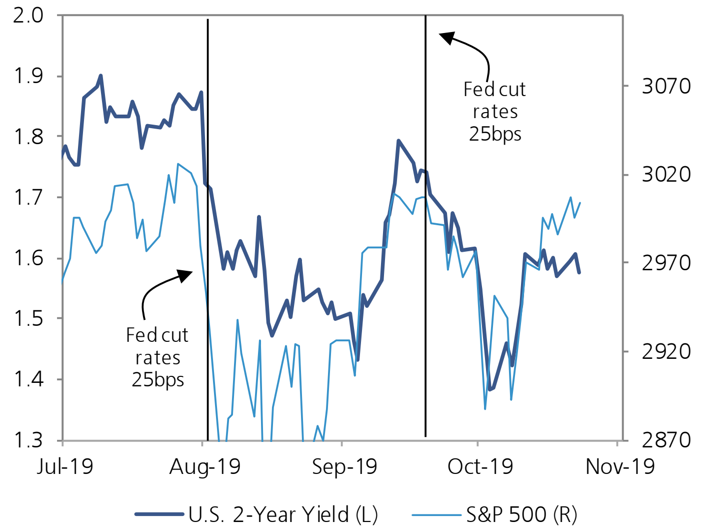
Investors anchored on a 1990s style "rate cut rally" are likely to be disappointed by the impact of any additional Fed rate cuts this year. The S&P 500 and interest rates moved in opposite directions earlier this year. This led many to conclude that the equity markets were behaving like they did in the mid-90s when the S&P 500 was able to rise in the face of deteriorating data (see chart on the left). This did not last, however, as equities and rates are now back in sync (see chart on the right), arguing that rate cuts likely won't help stocks this time around.

P/Es and Rates Were Inversely Correlated In The 1990s … But NOT In The 2000s

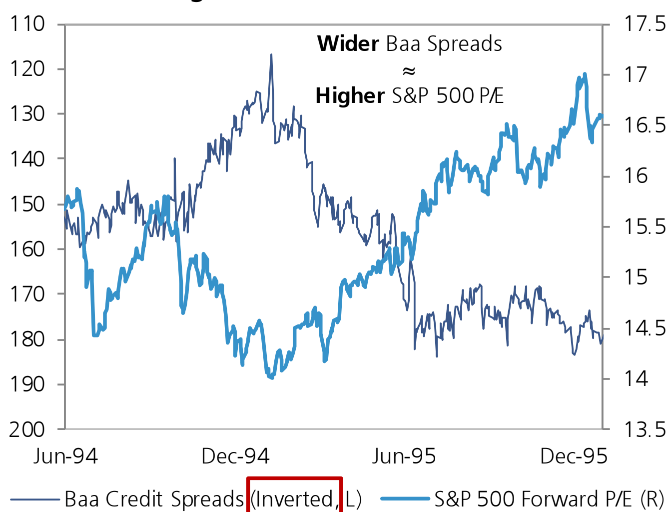
1995
Rates And Equities Negatively Correlated
Lower Rates = S&P 500 Rising



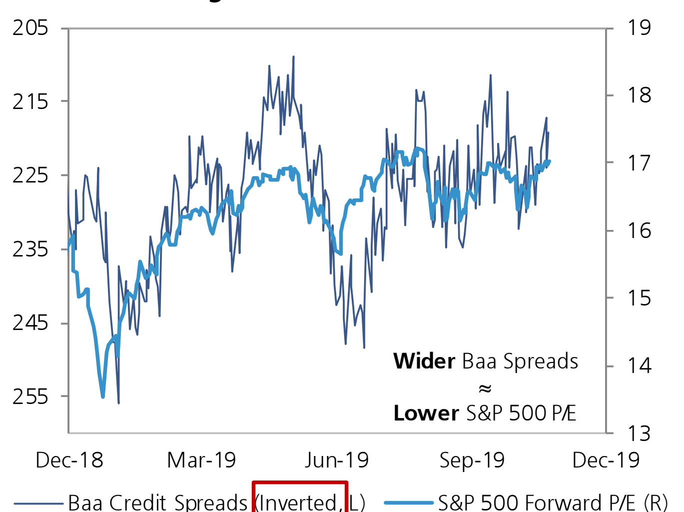
Present
Rates And Equities Positively Correlated
Lower Rates = S&P 500 Falling



1995
Baa Spreads and P/Es Positively Correlated
Higher Risks = Lower P/Es



Present
Baa Spreads and P/Es Inversely Correlated
Higher Risks = Lower P/Es



Source: FactSet, Bloomberg, UBS

The two charts directly above focus in on the comparison between today's cycle and the one from 1995. Twenty-five years ago, P/Es and credit spreads moved in the same direction, where wider spreads (i.e., higher risks) were synonymous with P/E expansion. Admittedly, in that world the S&P 500 still gained ground even as the PMI fell into contraction territory below 50. Contrast this with the chart on the right, which shows the relationship between P/Es and credit spreads today inversely correlated. In this backdrop, higher risks are synonymous with P/E contraction. We do not foresee a scenario where Fed rate cuts can sustainably boost equities as the PMIs continue to trend lower through the Spring of 2020, and in turn, market multiples likely contract until leading indicators bottom.

Valuation Method and Risk Statement

Equity market returns are influenced by corporate earnings, interest rates, risk premia, as well as other variables influenced by the business cycle. The outlook for any and all of these variables is subject to change.

Required Disclosures

This report has been prepared by UBS Securities LLC, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures. The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities Co. Limited is licensed to conduct securities investment consultancy businesses by the China Securities Regulatory Commission. UBS acts or may act as principal in the debt securities (or in related derivatives) that may be the subject of this report. This recommendation was finalized on: 25 October 2019 08:38 PM GMT. UBS has designated certain Research department members as Derivatives Research Analysts where those department members publish research principally on the analysis of the price or market for a derivative, and provide information reasonably sufficient upon which to base a decision to enter into a derivatives transaction. Where Derivatives Research Analysts co-author research reports with Equity Research Analysts or Economists, the Derivatives Research Analyst is responsible for the derivatives investment views, forecasts, and/or recommendations.

Analyst Certification: Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

UBS Investment Research: Global Equity Rating Definitions

12-Month Rating	Definition	Coverage[1]	IB Services[2]
Buy	FSR is > 6% above the MRA.	45%	29%
Neutral	FSR is between -6% and 6% of the MRA.	40%	29%
Sell	FSR is > 6% below the MRA.	15%	21%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 September 2019.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

KEY DEFINITIONS:Forecast Stock Return (FSR) is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months. In some cases, this yield may be based on accrued dividends. **Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium). **Under Review (UR)** Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. **Short-Term Ratings** reflect the expected near-term (up to three months) performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets** have an investment horizon of 12 months.

EXCEPTIONS AND SPECIAL CASES:UK and European Investment Fund ratings and definitions are: Buy: Positive on factors such as structure, management, performance record, discount; **Neutral:** Neutral on factors such as structure, management, performance record, discount; **Sell:** Negative on factors such as structure, management, performance record, discount. **Core Banding Exceptions (CBE):** Exceptions to the standard +/-6% bands may be granted by the Investment Review Committee (IRC). Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to the rating. When such exceptions apply, they will be identified in the Company Disclosures table in the relevant research piece.

Research analysts contributing to this report who are employed by any non-US affiliate of UBS Securities LLC are not registered/qualified as research analysts with FINRA. Such analysts may not be associated persons of UBS Securities LLC and therefore are not subject to the FINRA restrictions on communications with a subject company, public appearances, and trading securities held by a research analyst account. The name of each affiliate and analyst employed by that affiliate contributing to this report, if any, follows.

UBS Securities LLC: Francois Trahan; Samuel Blackman; Magdalena Ocampo.

Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report. For a complete set of disclosure statements associated with the companies discussed in this report, including information on valuation and risk, please contact UBS Securities LLC, 1285 Avenue of Americas, New York, NY 10019, USA, Attention: Investment Research.

Global Disclaimer

This document has been prepared by UBS Securities LLC, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

This Document is provided solely to recipients who are expressly authorized by UBS to receive it. If you are not so authorized you must immediately destroy the Document.

Global Research is provided to our clients through UBS Neo, and in certain instances, UBS.com and any other system or distribution method specifically identified in one or more communications distributed through UBS Neo or UBS.com (each a system) as an approved means for distributing Global Research. It may also be made available through third party vendors and distributed by UBS and/or third parties via e-mail or alternative electronic means. The level and types of services provided by Global Research to a client may vary depending upon various factors such as a client's individual preferences as to the frequency and manner of receiving communications, a client's risk profile and investment focus and perspective (e.g., market wide, sector specific, long-term, short-term, etc.), the size and scope of the overall client relationship with UBS and legal and regulatory constraints.

All Global Research is available on UBS Neo. Please contact your UBS sales representative if you wish to discuss your access to UBS Neo.

When you receive Global Research through a System, your access and/or use of such Global Research is subject to this Global Research Disclaimer and to the UBS Neo Platform Use Agreement (the "Neo Terms") together with any other relevant terms of use governing the applicable System.

When you receive Global Research via a third party vendor, e-mail or other electronic means, you agree that use shall be subject to this Global Research Disclaimer, the Neo Terms and where applicable the UBS Investment Bank terms of business (https://www.ubs.com/global/en/investment-bank/regulatory.html) and to UBS's Terms of Use/Disclaimer (http://www.ubs.com/global/en/legalinfo2/disclaimer.html). In addition, you consent to UBS processing your personal data and using cookies in accordance with our Privacy Statement (http://www.ubs.com/global/en/legalinfo2/privacy.html) and cookie notice (http://www.ubs.com/global/en/homepage/cookies/cookie-management.html).

If you receive Global Research, whether through a System or by any other means, you agree that you shall not copy, revise, amend, create a derivative work, provide to any third party, or in any way commercially exploit any UBS research provided via Global Research or otherwise, and that you shall not extract data from any research or estimates provided to you via Global Research or otherwise, without the prior written consent of UBS.

This document is for distribution only as may be permitted by law. It 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 would subject UBS to any registration or licensing requirement within such jurisdiction.

This document is a general communication and is educational in nature; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. By providing this document, none of UBS or its representatives has any responsibility or authority to provide or have provided investment advice in a fiduciary capacity or otherwise. Investments involve risks, and investors should exercise prudence and their own judgment in making their investment decisions. None of UBS or its representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. By receiving this document, the recipient acknowledges and agrees with the intended purpose described above and further disclaims any expectation or belief that the information constitutes investment advice to the recipient or otherwise purports to meet the investment objectives of the recipient. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors.

Options, structured derivative products and futures (including OTC derivatives) are not suitable for all investors. Trading in these instruments is considered risky and may be appropriate only for sophisticated investors. Prior to buying or selling an option, and for the complete risks relating to options, you must receive a copy of "The Characteristics and Risks of Standardized Options." You may read the document at http://www.theocc.com/publications/risks/riskchap1.jsp or ask your salesperson for a copy. Various theoretical explanations of the risks associated with these instruments have been published. Supporting documentation for any claims, comparisons, recommendations, statistics or other technical data will be supplied upon request. Past performance is not necessarily indicative of future results. Transaction costs may be significant in option strategies calling for multiple purchases and sales of options, such as spreads and straddles. Because of the importance of tax considerations to many options transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full (or any) amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the Information.

Prior to making any investment or financial decisions, any recipient of this document or the information should take steps to understand the risk and return of the investment and seek individualized advice from his or her personal financial, legal, tax and other professional advisors that takes into account all the particular facts and circumstances of his or her investment objectives.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

No representation or warranty, either expressed or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in any materials to which this document relates (the "Information"), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups, personnel or other representative of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party. In no circumstances may this document or any of the Information (including any forecast, value, index or other calculated amount ("Values")) be used for any of the following purposes:

(i) valuation or accounting purposes;

(ii) to determine the amounts due or payable, the price or the value of any financial instrument or financial contract; or

(iii) to measure the performance of any financial instrument including, without limitation, for the purpose of tracking the return or performance of any Value or of defining the asset allocation of portfolio or of computing performance fees.

By receiving this document and the Information you will be deemed to represent and warrant to UBS that you will not use this document or any of the Information for any of the above purposes or otherwise rely upon this document or any of the Information.

UBS has policies and procedures, which include, without limitation, independence policies and permanent information barriers, that are intended, and upon which UBS relies, to manage potential conflicts of interest and control the flow of information within divisions of UBS and among its subsidiaries, branches and affiliates. For further information on the ways in which UBS manages conflicts and maintains independence of its research products, historical performance information and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

Research will initiate, update and cease coverage solely at the discretion of UBS Research Management, which will also have sole discretion on the timing and frequency of any published research product. The analysis contained in this document is based on numerous assumptions. All material information in relation to published research reports, such as valuation methodology, risk statements, underlying assumptions (including sensitivity analysis of those assumptions), ratings history etc. as required by the Market Abuse Regulation, can be found on UBS Neo. Different assumptions could result in materially different results.

The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other

areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however, compensation may relate to the revenues of UBS and/or its divisions as a whole, of which investment banking, sales and trading are a part, and UBS's subsidiaries, branches and affiliates as a whole.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms under English law or, if not carried out by UBS in the UK the law of the relevant jurisdiction in which UBS determines it carries out the activity) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

Within the past 12 months UBS AG, its affiliates or subsidiaries may have received or provided investment services and activities or ancillary services as per MiFID II which may have given rise to a payment or promise of a payment in relation to these services from or to this company.

Where Global Research refers to "UBS Evidence Lab Inside" or has made use of data provided by UBS Evidence Lab you understand that UBS Evidence Lab is a separate department to Global Research and that UBS Evidence Lab does not provide research, investment recommendations or advice.

United Kingdom: This material is distributed by UBS AG, London Branch to persons who are eligible counterparties or professional clients. UBS AG, London Branch is authorised by the Prudential Regulation Authority and subject to regulation by the Financial Conduct Authority and limited regulation by the Prudential Regulation Authority. **Europe:** Except as otherwise specified herein, these materials are distributed by UBS Europe SE, a subsidiary of UBS AG, to persons who are eligible counterparties or professional clients (as detailed in the Bundesanstalt fur Finanzdienstleistungsaufsicht (BaFin)Rules and according to MIFID) and are only available to such persons. The information does not apply to, and should not be relied upon by, retail clients. UBS Europe SE is authorised by the [European Central Bank (ECB)] and regulated by the BaFin and the ECB. **France:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Securities France S.A. UBS Securities France S.A. is regulated by the ACPR (Autorité de Contrôle Prudentiel et de Résolution) and the Autorité des Marchés Financiers (AMF). Where an analyst of UBS Securities France S.A. has contributed to this document, the document is also deemed to have been prepared by UBS Securities France S.A. **Germany, Luxembourg, the Netherlands, Belgium and Ireland:** Prepared by UBS AG, London Branch and distributed by UBS AG, London Branch and UBS Europe SE. **Spain:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Securities España SV, SA. UBS Securities España SV, SA is regulated by the Comisión Nacional del Mercado de Valores (CNMV). **Turkey:** Distributed by UBS AG, London Branch. No information in this document is provided for the purpose of offering, marketing and sale by any means of any capital market instruments and services in the Republic of Turkey. Therefore, this document may not be considered as an offer made or to be made to residents of the Republic of Turkey. UBS AG, London Branch is not licensed by the Turkish Capital Market Board under the provisions of the Capital Market Law (Law No. 6362). Accordingly, neither this document nor any other offering material related to the instruments/services may be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the Capital Market Board. However, according to article 15 (d) (ii) of the Decree No. 32, there is no restriction on the purchase or sale of the securities abroad by residents of the Republic of Turkey. **Poland:** Distributed by UBS Europe SE (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce regulated by the Polish Financial Supervision Authority. Where an analyst of UBS Europe SE (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce. **Russia:** Prepared and distributed by UBS Bank (OOO). **Switzerland:** Distributed by UBS AG to persons who are institutional investors only. UBS AG is regulated by the Swiss Financial Market Supervisory Authority (FINMA). **Italy:** Prepared by UBS Europe SE and distributed by UBS Europe SE and UBS Europe SE, Italy Branch. Where an analyst of UBS Europe SE, Italy Branch has contributed to this document, the document is also deemed to have been prepared by UBS Europe SE, Italy Branch.**South Africa:** Distributed by UBS South Africa (Pty) Limited (Registration No. 1995/011140/07), an authorised user of the JSE and an authorised Financial Services Provider (FSP 7328). **Israel:** This material is distributed by UBS AG, London Branch. UBS Securities Israel Ltd is a licensed Investment Marketer that is supervised by the Israel Securities Authority (ISA). UBS AG, London Branch and its affiliates incorporated outside Israel are not licensed under the Israeli Advisory Law. UBS AG, London Branch is not covered by insurance as required from a licensee under the Israeli Advisory Law. UBS may engage among others in issuance of Financial Assets or in distribution of Financial Assets of other issuers for fees or other benefits. UBS AG, London Branch and its affiliates may prefer various Financial Assets to which they have or may have Affiliation (as such term is defined under the Israeli Advisory Law). Nothing in this Material should be considered as investment advice under the Israeli Advisory Law. This Material is being issued only to and/or is directed only at persons who are Eligible Clients within the meaning of the Israeli Advisory Law, and this material must not be relied on or acted upon by any other persons. **Saudi Arabia:** This document has been issued by UBS AG (and/or any of its subsidiaries, branches or affiliates), a public company limited by shares, incorporated in Switzerland with its registered offices at Aeschenvorstadt 1, CH-4051 Basel and Bahnhofstrasse 45, CH-8001 Zurich. This publication has been approved by UBS Saudi Arabia (a subsidiary of UBS AG), a Saudi closed joint stock company incorporated in the Kingdom of Saudi Arabia under commercial register number 1010257812 having its registered office at Tatweer Towers, P.O. Box 75724, Riyadh 11588, Kingdom of Saudi Arabia. UBS Saudi Arabia is authorized and regulated by the Capital Market Authority to conduct securities business under license number 08113-37. **UAE / Dubai:** The information distributed by UBS AG Dubai Branch is only intended for Professional Clients and/or Market Counterparties, as classified under the DFSA rulebook. No other person should act upon this material/communication. The information is not for further distribution within the United Arab Emirates. UBS AG Dubai Branch is regulated by the DFSA in the DIFC. UBS is not licensed to provide banking services in the UAE by the Central Bank of the UAE, nor is it licensed by the UAE Securities and Commodities Authority. **United States:** Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a **'non-US affiliate'**) to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a document prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this document must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. UBS Securities LLC is not acting as a municipal advisor to any municipal entity or obligated person within the meaning of Section 15B of the Securities Exchange Act (the "Municipal Advisor Rule"), and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of the Municipal Advisor Rule. **Canada:** Distributed by UBS Securities Canada Inc., a registered investment dealer in Canada and a Member-Canadian Investor Protection Fund, or by another affiliate of UBS AG that is registered to conduct business in Canada or is otherwise exempt from registration. **Mexico:** This report has been distributed and prepared by UBS Casa de Bolsa, S.A. de C.V., UBS Grupo Financiero, an entity that is part of UBS Grupo Financiero, S.A. de C.V. and is a subsidiary of UBS AG. This document is intended for distribution to institutional or sophisticated investors only. Research reports only reflect the views of the analysts responsible for the reports. Analysts do not receive any compensation from persons or entities different from UBS Casa de Bolsa, S.A. de C.V., UBS Grupo Financiero, or different from entities belonging to the same financial group or business group of such. For Spanish translations of applicable disclosures, please go to www.ubs.com/disclosures. **Brazil:** Except as otherwise specified herein, this material is prepared by UBS Brasil CCTVM S.A. to persons who are eligible investors residing in Brazil, which are considered to be Investidores Profissionais, as designated by the applicable regulation, mainly the CVM Instruction No. 539 from the 13th of November 2013 (determines the duty to verify the suitability of products, services and transactions with regards to the client´s profile). **Hong Kong:** Distributed by UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch, which is incorporated in Switzerland with limited liability. Please contact local licensed/registered representatives of UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch in respect of any matters arising from, or in connection with, the analysis or document. **Singapore:** Distributed by UBS Securities Pte. Ltd. [MCI (P) 009/09/2018 and Co. Reg. No.: 198500648C] or UBS AG, Singapore Branch. Please contact UBS Securities Pte. Ltd., an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110); or UBS AG, Singapore Branch, an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110) and a wholesale bank licensed under the Singapore Banking Act (Cap. 19) regulated by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with, the analysis or document. The recipients of this document represent and warrant that they are accredited and institutional investors as defined in the Securities and Futures Act (Cap. 289). **Japan:** Distributed by UBS Securities Japan Co., Ltd. to professional investors (except as otherwise permitted). Where this document has been prepared by UBS Securities Japan Co., Ltd., UBS Securities Japan Co., Ltd. is the author, publisher and distributor of the document. Distributed by UBS AG, Tokyo Branch to Professional Investors (except as otherwise permitted) in relation to foreign exchange and other banking businesses when relevant. **Australia:** Clients of UBS AG: Distributed by UBS AG (ABN 47 088 129 613 and holder of Australian Financial Services License No. 231087). Clients of UBS Securities Australia Ltd: Distributed by UBS Securities Australia Ltd (ABN 62 008 586 481 and holder of Australian Financial Services License No. 231098). This Document contains general information and/or general advice only and does not constitute personal financial product advice. As such, the Information in this document has been prepared without taking into account any investor's objectives, financial situation or needs, and investors should, before acting on the Information, consider the appropriateness of the Information, having regard to their objectives, financial situation and needs. If the Information contained in this document relates to the acquisition, or potential acquisition of a particular financial product by a 'Retail' client as defined by section 761G of the Corporations Act 2001 where a Product Disclosure Statement would be required, the retail client should obtain and consider the Product Disclosure Statement relating to the product before making any decision about whether to acquire the product. The UBS Securities Australia Limited Financial Services Guide is available at: www.ubs.com/ecs-research-fsg. **New Zealand:** Distributed by UBS New Zealand Ltd. UBS New Zealand Ltd is not a registered bank in New Zealand. You are being provided with this UBS publication or material because you have indicated to UBS that you are a "wholesale client" within the meaning of section 5C of the Financial Advisers Act 2008 of New Zealand (Permitted Client). This publication or material is not intended for clients who are not Permitted Clients (non-permitted Clients). If you are a non-permitted Client you

must not rely on this publication or material. If despite this warning you nevertheless rely on this publication or material, you hereby (i) acknowledge that you may not rely on the content of this publication or material and that any recommendations or opinions in such this publication or material are not made or provided to you, and (ii) to the maximum extent permitted by law (a) indemnify UBS and its associates or related entities (and their respective Directors, officers, agents and Advisors) (each a 'Relevant Person') for any loss, damage, liability or claim any of them may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material and (b) waive any rights or remedies you may have against any Relevant Person for (or in respect of) any loss, damage, liability or claim you may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material. **Korea:** Distributed in Korea by UBS Securities Pte. Ltd., Seoul Branch. This document may have been edited or contributed to from time to time by affiliates of UBS Securities Pte. Ltd., Seoul Branch. This material is intended for professional/institutional clients only and not for distribution to any retail clients. **Malaysia:** This material is authorized to be distributed in Malaysia by UBS Securities Malaysia Sdn. Bhd (Capital Markets Services License No.: CMSL/A0063/2007). This material is intended for professional/institutional clients only and not for distribution to any retail clients. **India:** Distributed by UBS Securities India Private Ltd. (Corporate Identity Number U67120MH1996PTC097299) 2/F, 2 North Avenue, Maker Maxity, Bandra Kurla Complex, Bandra (East), Mumbai (India) 400051. Phone: +912261556000. It provides brokerage services bearing SEBI Registration Number: INZ000259830; merchant banking services bearing SEBI Registration Number: INM000010809 and Research Analyst services bearing SEBI Registration Number: INH000001204. UBS AG, its affiliates or subsidiaries may have debt holdings or positions in the subject Indian company/companies. Within the past 12 months, UBS AG, its affiliates or subsidiaries may have received compensation for non-investment banking securities-related services and/or non-securities services from the subject Indian company/companies. The subject company/companies may have been a client/clients of UBS AG, its affiliates or subsidiaries during the 12 months preceding the date of distribution of the research report with respect to investment banking and/or non-investment banking securities-related services and/or non-securities services. With regard to information on associates, please refer to the Annual Report at: http://www.ubs.com/global/en/about_ubs/investor_relations/annualreporting.html**Taiwan:** Distributed by UBS Securities Pte. Ltd., Taipei Branch which is regulated by the Taiwan Securities and Futures Bureau. This documents contains general information and/or general advice only and does NOT constitute any "Recommendation" to clients for the covered companies or any companies mentioned in this document. **Indonesia:** This report is being distributed by PT UBS Sekuritas Indonesia and is delivered by its licensed employee(s), including marketing/sales person, to its client. PT UBS Sekuritas Indonesia, having its registered office at Wisma GKBI, 22nd floor, JL. Jend. Sudirman, kav.28, Jakarta 10210, Indonesia, is a subsidiary company of UBS AG and licensed under Capital Market Law no. 8 year 1995, a holder of broker-dealer and underwriter licenses issued by the Capital Market and Financial Institution Supervisory Agency (now Otoritas Jasa Keuangan/OJK). PT UBS Sekuritas Indonesia is also a member of Indonesia Stock Exchange and supervised by Otoritas Jasa Keuangan (OJK). Neither this report nor any copy hereof may be distributed in Indonesia or to any Indonesian citizens except in compliance with applicable Indonesian capital market laws and regulations. This report is not an offer of securities in Indonesia and may not be distributed within the territory of the Republic of Indonesia or to Indonesian citizens in circumstance which constitutes an offering within the meaning of Indonesian capital market laws and regulations.

The disclosures contained in research documents produced by UBS AG, London Branch or UBS Europe SE shall be governed by and construed in accordance with English law.

UBS specifically prohibits the redistribution of this document in whole or in part without the written permission of UBS and in any event UBS accepts no liability whatsoever for any redistribution of this document or its contents or the actions of third parties in this respect. Images may depict objects or elements that are protected by third party copyright, trademarks and other intellectual property rights. © UBS 2019. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.