Goldman Sachs | Economics Research

10 November 2017 | 6:53PM EST

For the exclusive use of ESZTER.MILTENYI@ECB.INT

Global Economics Analyst

Look Who's Talking—Evaluating Central Bank Communication

Jan Hatzius
+1(212)902-0394 | jan.hatzius@gs.com
Goldman Sachs & Co. LLC

Sven Jari Stehn
+44(20)7774-8061 | jari.stehn@gs.com
Goldman Sachs International

Nicholas Fawcett
+44(20)7051-8321 |
nicholas.fawcett@gs.com
Goldman Sachs International

Manav Chaudhary
+44(20)7051-3063 |
manav.chaudhary@gs.com
Goldman Sachs International

- When central bankers talk, do markets correctly interpret what they have to say or is the message lost in translation? This matters, as financial markets play an important role in transmitting policy changes to the rest of the economy. We consider how asset prices respond to G4 central bank communications and then use these responses to infer whether markets take a clear signal about the monetary policy outlook or other factors.
- One gauge of "success" in central bank communication is whether interventions trigger outsized moves in asset prices in a window around events. We explore this using our database of central bank events, together with intraday asset data, and find that all four central banks have significant impacts on a range of assets. Fed and ECB events trigger the largest moves, followed by the BOE and the BOJ.
- These shocks endure over time. Looking at their impact on broader financial conditions, we find that the Fed, ECB and BOE have significant effects, persisting over several days. Fed policy statements tend to be more powerful than press conferences, while the opposite is true of the ECB and the BOE.
- But while central banks may have an impact, is it the one that they intend or does the message somehow get lost in translation? We use the comovement in yields and equities to identify "growth" shocks—where both assets move in the same direction—and "policy" shocks—where they move in opposite directions. Presuming that policymakers generally aim to communicate policy news, it is encouraging that between 50% and 75% of shocks around central bank events are identified as "policy" shocks, well above the normal daily split. On this basis, we find that markets listen closely to central bankers and focus primarily on their guidance about monetary policy as opposed to the growth outlook.

Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to www.gs.com/research/hedge.html.

For the exclusive use of ESZTER.MILTENYI@ECB.INT

When central bankers talk, do financial markets correctly interpret what they have to say? Or is the message lost in translation? These questions matter, since financial markets play an important role in transmitting policy changes to the rest of the economy. Today we consider how asset prices respond to central bank communications in the US, Euro area, Japan and the UK, and then use these responses to infer whether markets take a clear signal about the monetary policy outlook or other factors.

The power of central bank decisions is illustrated in Exhibit 1, which traces out the path of the 10-year swap yield and equity prices around four dates, chosen from our database of central bank events:[1]

1. The introduction of the large scale asset purchase program by the FOMC in March 2009.
2. The March 2017 ECB policy meeting, which reaffirmed the sequencing of asset purchase tapering followed by rate rises.
3. The introduction of yield curve control by the BOJ in September 2016.
4. The cut in Bank Rate following the UK's EU referendum, in the August 2016 MPC meeting.

These vignettes introduce two aspects of our analysis:

- First, there can be substantial **movements in asset prices in a small window** around each event. Assuming the price reflects all available information, the change during this window should capture the market surprise in response to information released. This provides a "clean" read of the hawkish or dovish news, generally uncontaminated by other market-moving events such as data releases.
- Second, we may learn something about the **basic macro forces underlying movements in assets** by looking at the comovement between them. For example, an improvement in the market's assessment of the growth outlook—a "growth" shock—should push both yields and equities higher. But a perceived increase in inflation or a hawkish tilt of central banks—a "policy" shock—should push yields up and equities down. In these examples, two—the US and UK cases—stand out as "policy" shocks, as yields fell while equities increased. But the reaction to ECB and BOJ events was different, with yields and equities rising.

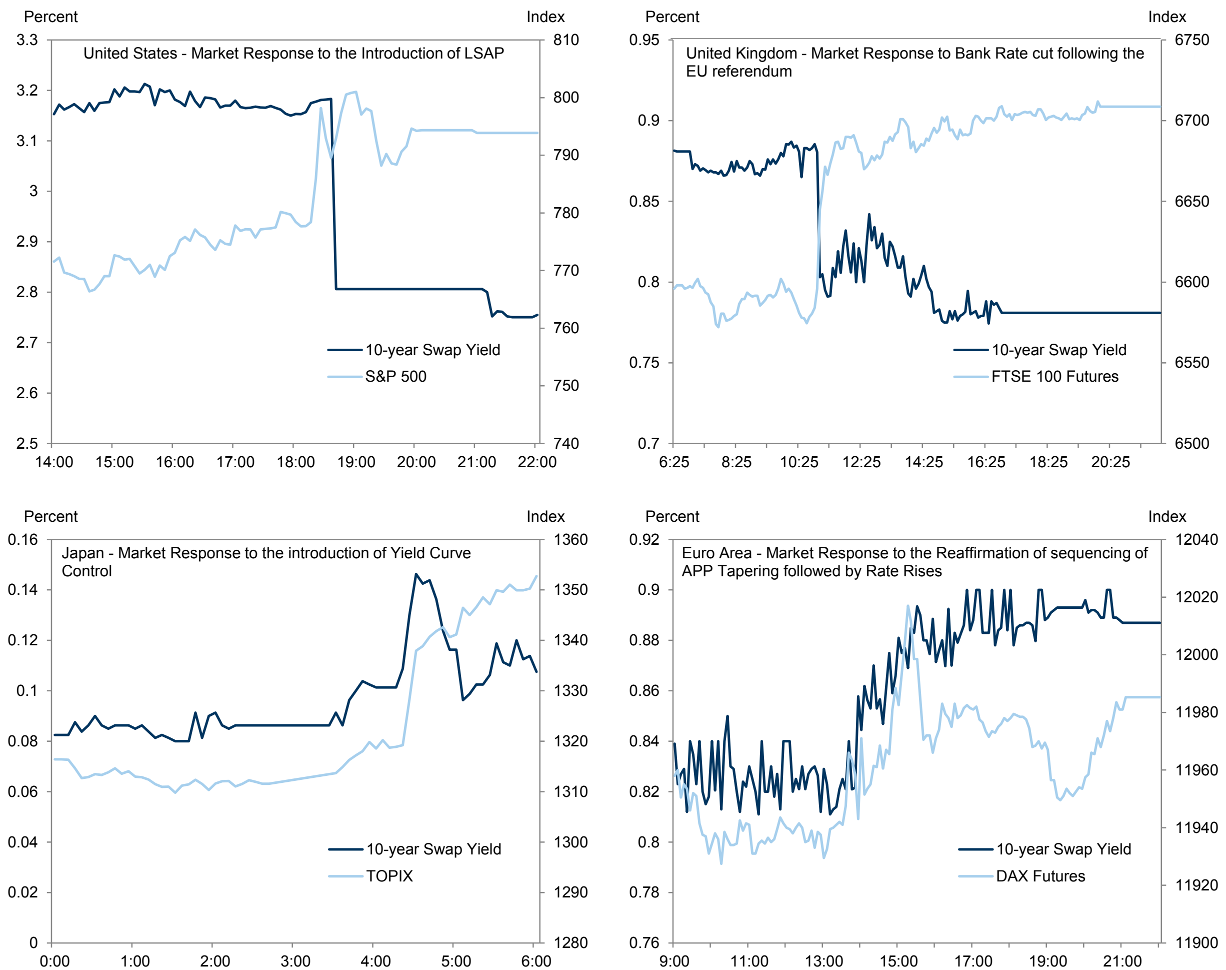
How should central banks measure the "success" of communications on both these yardsticks? On the former, one gauge of the power of central bank interventions is whether they lead to significantly larger moves in asset prices over a window than we would normally expect. And the persistence of such moves over the days that follow events should indicate whether the message "sticks". On the latter, it is more likely that central banks have material private information about the outlook for policy, rather than

[1] This database covers most major central bank events for the FOMC, ECB, BOJ and BOE—including policy decisions, press conferences and minutes—since 2001. Since it includes details of the date and time of each event, we can examine how different assets react in the minutes and hours that follow. For more details, see Nicholas Fawcett and Karen Reichgott, "It's Good to Talk: Asset Reactions to Central Bank Events", *Global Economics Analyst*, June 9, 2017, and Nicholas Fawcett, "The Cross-Border Impact of Central Bank Events", *Global Economics Analyst*, July 12, 2017.

growth, and so we would expect interventions to be judged this way in general. That said, the vignettes illustrate that the market reaction can sometimes go towards a "growth" story rather than "policy".

This sets up our analysis below: first we look at the systematic effect on asset prices of central bank events, and consider whether the message stays in place. Then, we break down the moves into "growth" and "policy" shocks.

Exhibit 1: The Power to Shock



Source: Goldman Sachs Global Investment Research, Thomson Reuters

Words Can Speak as Loudly as Actions

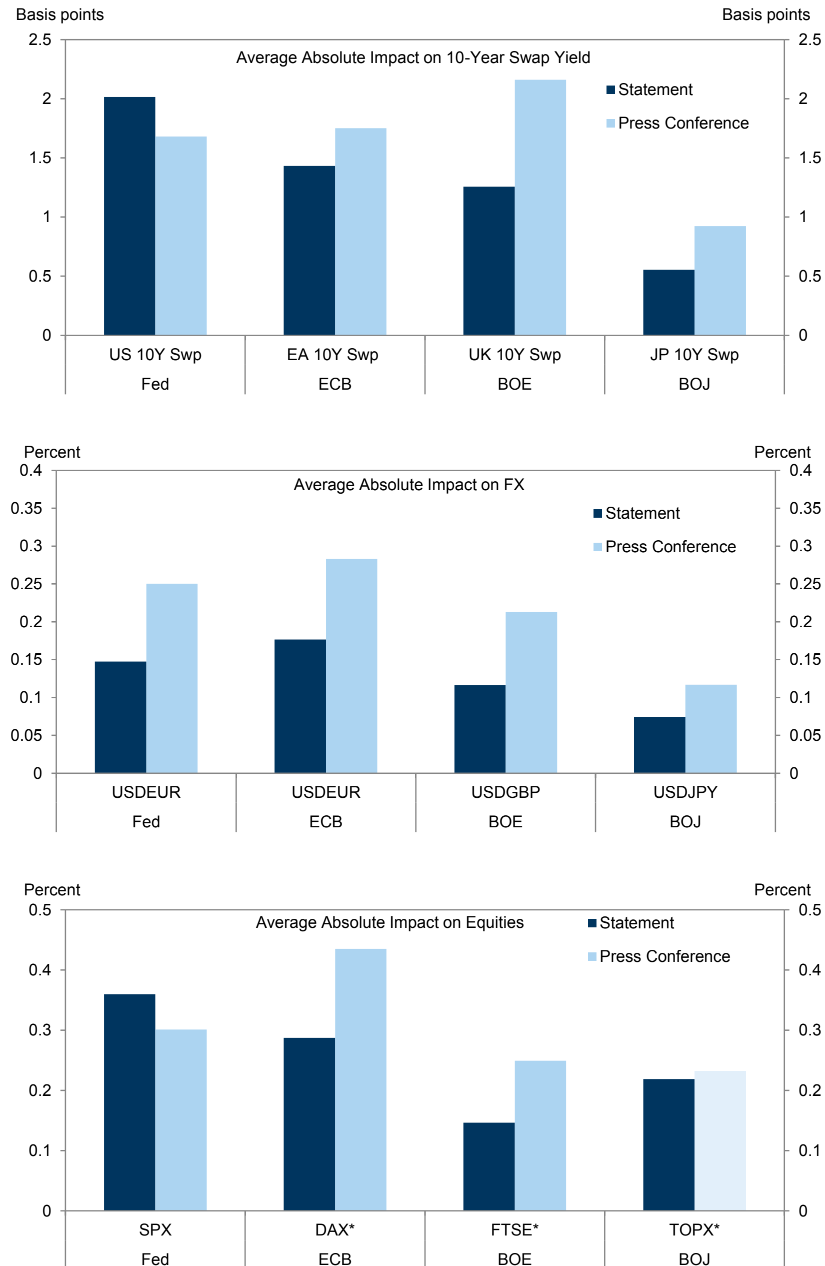
Of the extensive history in our central bank database, we sharpen our analysis by focusing on two types: monetary policy decisions (including rate decisions and unconventional policies), and press conferences associated with monetary policy meetings. With these events in hand, we use intraday data on asset prices, to trace the movement in asset returns over a selected time window around each event.[2]

[2] For rate decisions, we use a window of 15 minutes before and after the announcement; and for press conferences, we open 15 minutes before the start time and close one hour after. We restrict the sample to events where we know time of event in reality, as opposed to the time expected beforehand.

For the exclusive use of ESZTER.MILTENYI@ECB.INT

We look at three asset types: the headline national stock index, the 10-year swap rate, and three foreign exchange crosses (the US Dollar with regard to the euro, yen, and sterling). Exhibit 2 summarizes the domestic reactions to all four central banks' events, reporting the average absolute change in each asset price (either in basis points for yields or percent for equities and FX).

Exhibit 2: Central Banks Move Markets



Source: Goldman Sachs Global Investment Research

Three observations stand out:

For the exclusive use of ESZTER.MILTENYI@ECB.INT

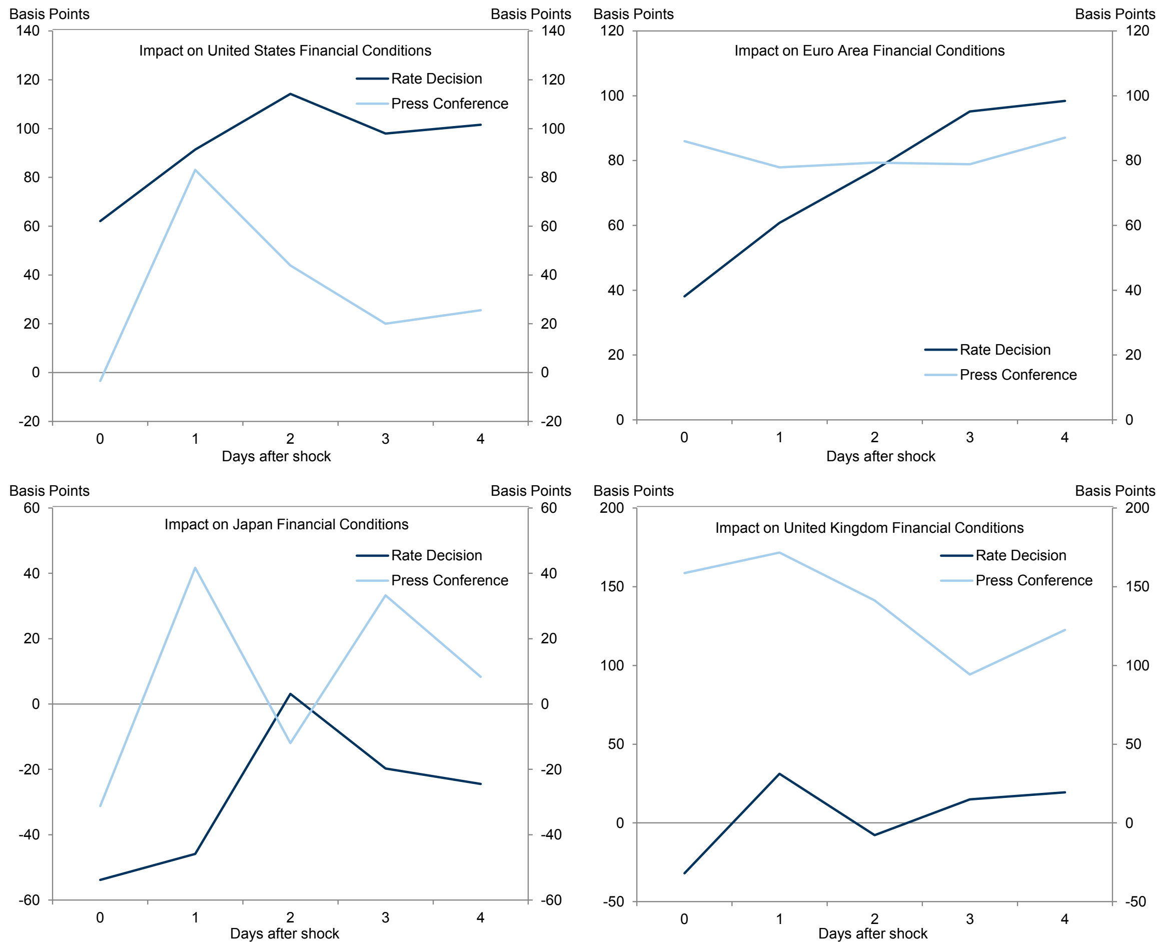
1. First, comparing central banks, the typical responses to FOMC and ECB events dominate the others. This finding holds even when we adjust for the typical "background" variation observed in each asset during windows where no central bank event takes place; these are indicated by the darker shaded bars, which report significantly larger increases in absolute changes. By contrast, reactions to BOJ events are both smaller than others, though they are generally significantly larger than normal.
2. Second, within each country, policy decisions and press conferences both tend to matter. Other events, such as minutes or speeches by officials, tend to have a smaller and generally insignificant impact, and so we do not include them in the exhibit.
3. Third, looking across asset types, we find that 10-year yields and exchange rates respond more systematically than equities. This echoes our earlier work that found the relationship between equity prices and central bank moves to be more complex than fixed income assets, depending on whether the moves yielded positive or negative "growth" shocks.[3] We return to this theme below.

Do these shocks endure over time? In Exhibit 3, we examine the persistence of each central bank's events on overall financial conditions—aggregating moves in rates, equities and the exchange rate—in the days that follow. More concretely, we use changes in the domestic 10-year yield during the event window to try to explain daily moves in our financial conditions indices, starting with the day of the event itself, and then stretching out up to four days after the event. In general, the Fed, ECB and BOE are effective in influencing financial conditions, and these effects persist over several days. There is some variation across events: Fed policy statements tend to be more powerful than press conferences, while the opposite is true of the ECB and the BOE; the impact of BOJ shocks on financial conditions in Japan is insignificant.

For the exclusive use of ESZTER.MILTENYI@ECB.INT

[3] See Jan Hatzius, Sven Jari Stehn and Matteo Leombroni, "Looking After Number One", *Global Economics Analyst*, June 10, 2016.

Exhibit 3: Central Banks Have Persistent Effects on Financial Conditions



Note: Line show the impact on financial conditions of a central bank surprise measured with the domestic 10-year yield, equivalent to 100bp

Source: Goldman Sachs Global Investment Research

For the exclusive use of ESZTER.MILTENYI@ECB.INT

Loud and Clear, or Lost in Translation?

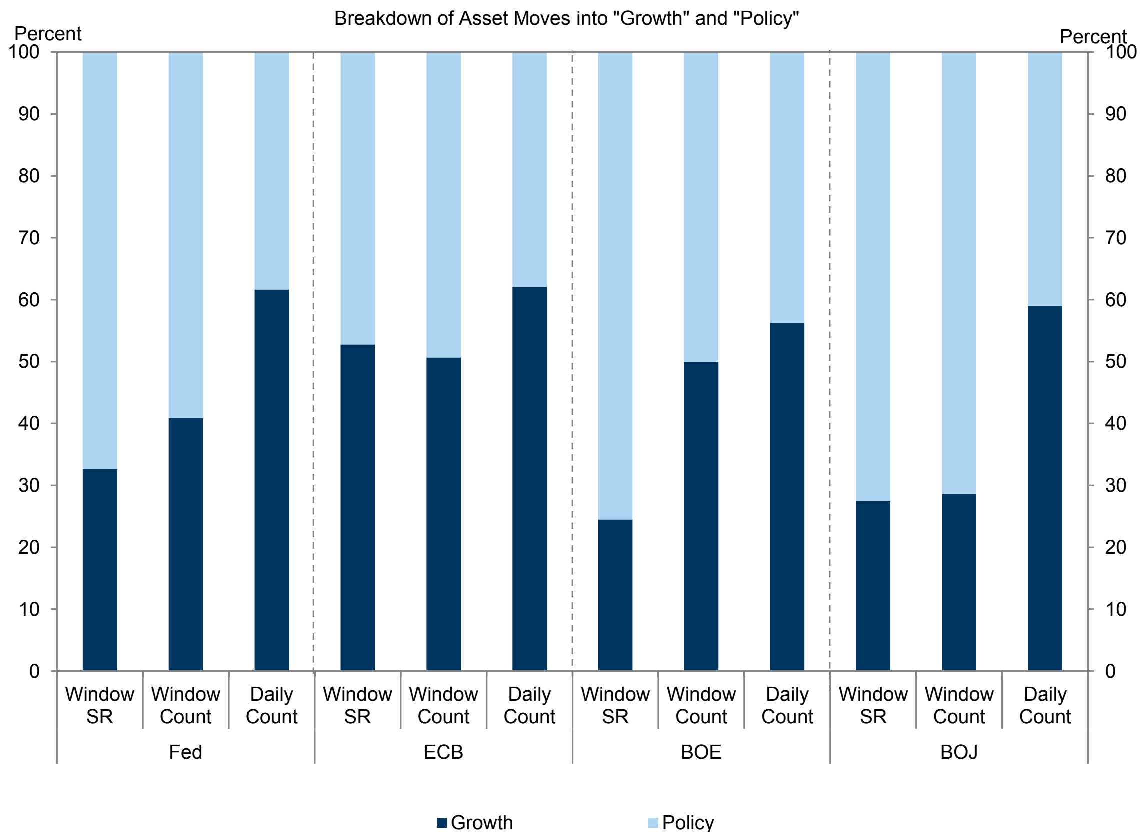
These results suggest that some central banks' communications—especially the Fed, ECB and BOE—can have systematic and significant effects on financial markets. But while there may be an impact, is it the one that they intend, or does the message somehow get lost in translation? We can try to answer this by exploiting the comovement in yields and equities in the event windows.

In a simple scheme to identify different drivers, we can label "growth" shocks as those where equities and yields move in the same direction, and "policy" shocks as those where they move in opposite directions, as we noted above. This is, of course, a simplification—for example, ignoring the possibility that a change in market views about inflation might also cause yields and equities to move inversely—but it provides an intuitive way to break down moves.

This approach enables each central bank event shock to be "scored" as "growth" or "policy", based on the comovement. Exhibit 4 shows the result of scoring moves within each event window, in the bars marked "Window Count". Interpreted this way, "policy"

shocks account for between 50%—75% of overall shocks, and "growth" the remainder. Is this materially different from normal? By comparison, the same interpretation of *daily* movements in 10-year yields and equities since 2000 ("Daily Count") points to "growth" shocks typically accounting for 60% of days.[4] Shocks during central bank event windows therefore seem to be substantially more common than in days in general, especially for the Fed, BOE and BOJ.

Exhibit 4: Making Sense of Asset Moves



Source: Goldman Sachs Global Investment Research

A more sophisticated refinement to this approach uses a tool we recently introduced to estimate the market's views of economic growth.[5] It labels "growth" and "policy" shocks with the same scheme as the simple "scoring" method, but by incorporating it into a small statistical model, we can break down movements in rates and equities separately into the contribution of each shock, and the distinction is less blunt: for each movement within an event window, we can allocate *part* of the change to "policy"

[4] This reflects the positive correlation between movements in yields and equity prices; in the absence of any correlation, we would expect the share of shocks to be 1:1.

[5] See Sven Jari Stehn, "The Market's View of Economic Growth", *Global Economics Analyst*, February 9, 2017.

For the exclusive use of ESZTER.MILTENYI@ECB.INT

shocks, and the remainder to "growth".[6] Exhibit 4 shows the breakdown from this model (labeled "Window SR"). Specifically, it shows the share of the variance in changes to the 10-year yield attributed to "growth" and "policy" shocks. In general, the results from the "scoring" method carry over, though the interpretation of BOE shocks is more "policy"-oriented.[7]

Message Understood

Drawing these results together, in general it seems that the G4 central banks are quite successful in communicating their policy messages. The Fed, ECB and BOE decisions and press conferences tend to lead to outsized moves in key asset prices during a window around each event, and the effect this has on financial conditions tends to persist in the days that follow. Although specific episodes of unintended communication are not hard to identify, we find that markets listen closely to central bankers and focus primarily on their guidance about monetary policy as opposed to the growth outlook.

Nicholas Fawcett

For the exclusive use of ESZTER.MILTENYI@ECB.INT

[6] We estimate a bivariate VAR comprising daily changes in the 10-year yield and equity prices, and use a sign restriction model to split the moves in both assets into "growth" and "policy" drivers, based on the comovement of the two assets.

[7] There is no obvious structural reason for this difference, but it holds whether we look at the whole sample from 2001-2017, or consider subsamples; and it is robust to different specifications of the statistical model.

Global Economic Forecasts

Real GDP Growth (YoY)	2016	2017	2018	2019
World	3.2	3.8	0.0	0.0
Advanced Economies	1.7	2.2	2.1	1.8
Emerging Markets	4.7	5.2	0.0	0.0
G3				
United States	1.5	2.2	2.4	1.7
Euro area	1.7	2.2	1.8	1.6
Germany	1.9	2.3	1.9	1.6
France	1.1	1.7	1.8	1.6
Italy	1.0	1.4	0.9	0.9
Spain	3.2	3.1	2.5	2.3
Japan	1.0	1.6	1.2	1.3
Advanced Economies				
Australia	2.5	2.5	3.0	2.9
Canada	1.5	2.7	2.3	1.8
New Zealand	3.1	2.6	3.2	2.6
Norway	1.0	2.1	2.4	2.3
Sweden	3.1	3.0	3.0	2.6
Switzerland	1.4	0.6	1.6	1.8
United Kingdom	1.8	1.5	1.2	1.7
Asia				
China	6.7	6.8	6.5	6.1
India	7.9	6.3	7.4	8.0
CEEMEA				
Russia	-0.2	2.5	3.3	2.9
Turkey	2.9	5.0	3.5	3.5
Latin America				
Brazil	-3.6	0.9	2.1	2.7
Mexico	2.9	2.1	2.5	3.5

Core CPI Inflation (YoY)	2016	2017	2018	2019
G3				
United States (core PCE)	1.8	1.5	1.8	2.1
Euro area	0.9	1.0	1.0	1.4
Germany	1.1	1.3	1.3	1.5
France	0.6	0.6	0.9	1.1
Italy	0.5	0.8	0.6	1.2
Spain	0.7	1.4	1.3	1.6
Japan (ex food & energy)	-0.3	0.5	0.6	1.0
Advanced Economies				
Norway	3.1	1.5	2.2	2.2
United Kingdom	1.3	2.4	2.2	2.0

Policy Rate (%)	2016	2017	2018	2019
G3				
United States	0.5	1.4	2.4	3.4
Euro area	0.0	0.0	0.0	0.0
Japan	-0.1	-0.1	-0.1	-0.1
Advanced Economies				
Australia	1.5	1.5	2.0	2.5
Canada	0.5	1.0	1.8	2.8
New Zealand	1.8	1.8	2.0	2.8
Norway	0.5	0.5	1.0	1.8
Sweden	-0.5	-0.5	0.3	0.8
Switzerland	-0.8	-0.8	-0.8	-0.5
United Kingdom	0.3	0.5	0.8	1.0
Asia				
China	2.6	3.0	3.0	2.5
India	6.3	6.0	6.8	6.8
CEEMEA				
Russia	10.0	8.3	7.3	6.5
Turkey	8.5	12.3	12.3	12.3
Latin America				
Brazil	13.8	7.0	7.5	7.8
Mexico	5.8	7.0	7.0	6.0

Source: Goldman Sachs Global Investment Research

For the exclusive use of ESZTER.MILTENYI@ECB.INT

Disclosure Appendix

Reg AC

We, Jan Hatzius, Sven Jari Stehn, Nicholas Fawcett and Manav Chaudhary, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

Disclosures

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce equity research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Ombudsman Goldman Sachs Brazil: 0800 727 5764 and / or ouvidoriagoldmansachs@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Ouvidoria Goldman Sachs Brasil: 0800 727 5764 e/ou ouvidoriagoldmansachs@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

European Union: Goldman Sachs International authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority, has approved this research in connection with its distribution in the European Union and United Kingdom; Goldman Sachs AG and Goldman Sachs International Zweigniederlassung Frankfurt, regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht, may also distribute research in Germany.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (http://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage group as described herein.

We and our affiliates, officers, directors, and employees, excluding equity and credit analysts, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options disclosure documents which are available from Goldman Sachs sales representatives or at http://www.theocc.com/about/publications/character-risks.jsp. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by the Global Investment Research division of GS may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

For the exclusive use of ESZTER.MILTENYI@ECB.INT

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to http://360.gs.com.

Disclosure information is also available at http://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.

© 2017 Goldman Sachs.

No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.

For the exclusive use of ESZTER.MILTENYI@ECB.INT