Global Economics Analyst

Our New Current Inflation Indicators

- Today we introduce a new tracker of underlying inflationary pressure, the Current Inflation Indicator (CII), for four economies: the US, Euro area, Japan, and the UK. It follows our Current Activity Indicators—which help us escape the confines of GDP as a narrow measure of economic activity—and uses a range of inputs to provide a broad measure of the pace of price pressures that are not subject to erratic components or methodological considerations, in contrast to the consumer price indices. The CIIs are updated daily and are available on Bloomberg.
- The CIIs have picked up recently in all four economies, and this signal emerges from a range of different indicators. That said, the gap between underlying inflation and central banks' targets differs markedly across economies and points to inflation close to target in the US and the UK.
- The CII framework, in keeping with the CAIs, also generates a set of "CII innovations", which measures the economic news content of data releases relative to expectations. Looking at the recent picture, realized inflation expectations have differed the most from our forecasts, turning out weaker in the US, Euro area, and Japan but stronger in the UK.
- The signal from "domestically generated" sources of inflationary pressure (DGI)—which could be a more reliable indicator of medium-term pressures, less sensitive to transitory factors–supports our policy outlooks for all four economies. The steady pickup in US price pressures—especially when focusing on DGI—supports the current FOMC view that recent hard inflation weakness is transitory. Meanwhile, Euro area core inflation still falls short of target and does not look likely to catch up. Similar weakness in Japan underlines the need for continued policy accommodation. Stable—if below target—UK DGI has underpinned easy policy of late, but the large gap with broader inflation brings into sharp relief the MPC's judgment about whether to tolerate a possibly persistent overshoot of its inflation target.

Jan Hatzius
(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

Karen Reichgott
(212) 855-6006 | karen.reichgott@gs.com
Goldman Sachs & Co. LLC

In 2011 we developed our Current Activity Indicators to provide a measure of underlying growth momentum. These offered a more timely and comprehensive take on economic activity than GDP.[1] Today, we apply the principles of the CAI to a range of different price measures to develop a Current Inflation Indicator—capturing underlying price pressures from a broad set of indicators covering hard and soft price data, inflation expectations, and the labor market.

Of course, inflation data do not generally suffer from the same lack of timeliness as GDP. But CPI data can be affected by erratic factors that may be transitory and reflect little of the inflationary pressure linked to the economic cycle, which is of most relevance to policymakers.[2] And just as GDP ignores data from surveys and the labor market and includes volatile spending components like inventories, which hold little information about underlying growth momentum, the CPI only tracks a basket of most commonly bought goods, ignoring price pressure elsewhere (such as the labor market).

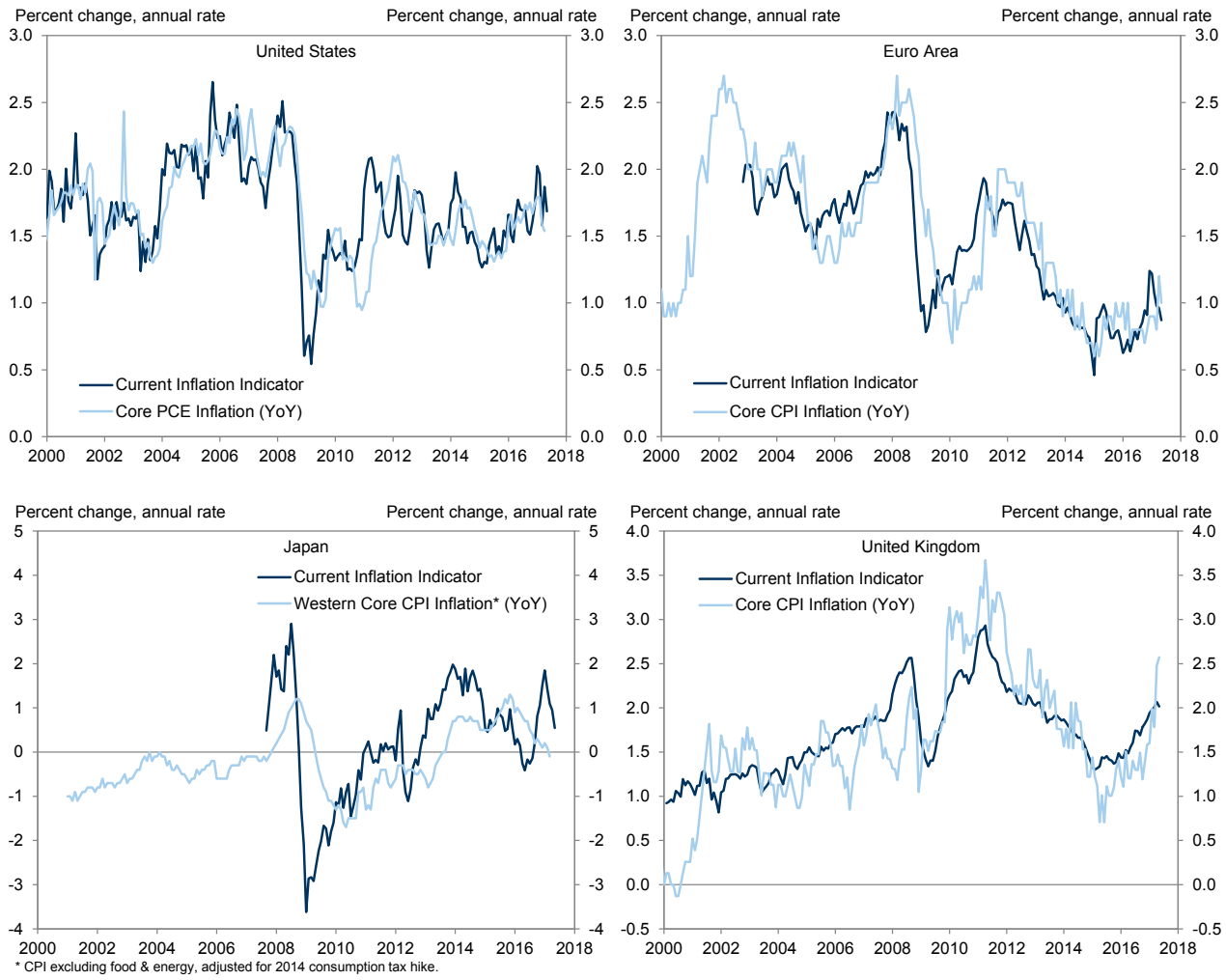
This suggests that there are benefits to looking at a broader measure of underlying price pressures, beyond just CPI data. Other practitioners–such as the New York Fed, with its Underlying Inflation Gauge—have come to the same conclusion and developed models that take in a wide range of indicators. Here, we use our CAI framework for the same purpose, given that it is ideally suited to compare underlying inflation, both across countries and within sectors, in a consistent way.

We build CIIs for the US, Euro area, Japan, and the UK, using hard data on consumer prices, firms' output prices and import prices, alongside information from surveys, inflation expectations and wages. These are updated as new data are published, and—in keeping with our CAIs—we publish the CIIs on Bloomberg. Exhibit 1 plots the four country CIIs, compared with standard measures of core inflation.

1. See, for example, "Trackin' All Over the World: Our New Global CAI", Global Economics Analyst, February 25, 2017.

2. Our US economics team has recently discussed methodological changes in the CPI, observing that such changes provide no new information about structural factors such as equilibrium unemployment; see Daan Struyven and Jan Hatzius, "The Return of the Missing Growth", US Economics Analyst, April 21, 2017 and Jan Hatzius, "Weaker Core Inflation, and What It Means for the Fed", US Daily, May 15, 2017.

Exhibit 1: Our New Current Inflation Indicators



Source: Goldman Sachs Global Investment Research

Constructing the Current Inflation Indicator

We build the CII in a similar manner to our Current Activity Indicator, in five steps.

1. Select the data. We harmonize the types of indicators we include across countries, with the aim of including similar measures of hard price data, surveys of current pricing intentions, longer-range inflation expectations, and wage indicators. Of the hard price data, we use a representative rate of core inflation (broken down into goods and services), producer price inflation and import prices. Productivity growth drives a wedge between price and wage inflation measures, so we adjust the wage indicators in our CIIs to account for this by subtracting productivity growth.

2. Transform the data. The CII components are expressed as month-over-month growth rates, except where only year-over-year data are available.[3] Some data—in

[3] For example, some inflation expectations series relate to price changes over 12 months. Separately,

particular hard price indicators—are volatile, so we use an exponentially smoothed transformation. This strikes a reasonable balance between removing uninformative noise and maintaining the timeliness of indicators when they reveal a change in the pace of underlying inflation.

3. Model missing data. Most indicators are released with a lag, although for price measures this is typically short. Before data are released, we form an expectation of their likely values, using information already in hand. For example, surveys of manufacturers' current pricing conditions may help predict the rate of producer price inflation before the data are published. We take advantage of this idea and construct forecast equations to create projections for the variables that have yet to be released. More concretely, we estimate four alternative models for each component of the CII and optimize for the information available before the release of the component (using stepwise regression analysis). We then combine the forecasts to improve robustness. Bringing the component forecasts together, we have a reliable measure of the CII for a given month, even before all the data for that month have been released.

4. Calculate the country CIIs. We follow our standard approach and apply principal components analysis to construct the CIIs. The first principal component is the linear combination of all the indicators that explains the greatest share of variance in the data. The CII is then the first principal component, translated into core inflation-equivalent terms through the regression:

$$Core\ Inflation = \alpha_t + \beta * First\ Principal\ Component$$

The fitted values from this regression, at a monthly frequency, become the CII. The time-varying constant in this regression enables us to account for longer-term trends in core inflation rates, while preserving the relationship between the CII indicators and core inflation.

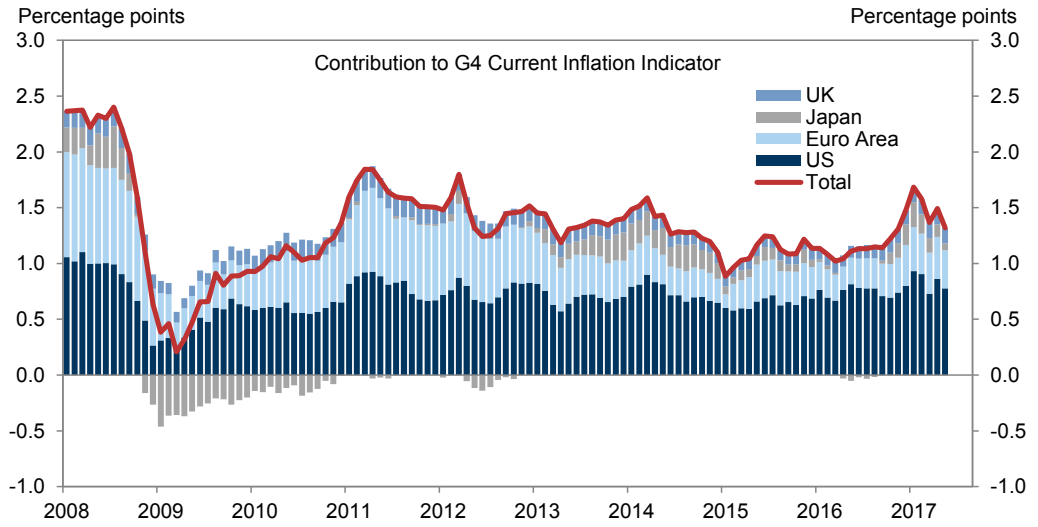
5. Build the aggregate CII. We construct an aggregate CII for the four economies, using PPP GDP weights.

where indicators are only available at a quarterly frequency, we interpolate into monthly observations.

As is the case for our CAIs, we will update the CIIs with each data release and post the series to Bloomberg.[4] Each country CII is released as soon as the first component indicator for the month has been published.

The CIIs broadly keep pace with core inflation (Exhibit 1). Underlying inflation fell sharply following the Global Financial Crisis, and although it subsequently recovered, the past few years have witnessed a progressive slide in inflationary pressure, most obviously in the Euro area and the UK. That said, across all four countries the picture has turned over the past year, with the CIIs rising by close to 0.5pp in aggregate (Exhibit 2), albeit with some volatility in the data.

Exhibit 2: A Modest Pickup in G4 Inflationary Pressure, But Still Below Pre-Crisis Average

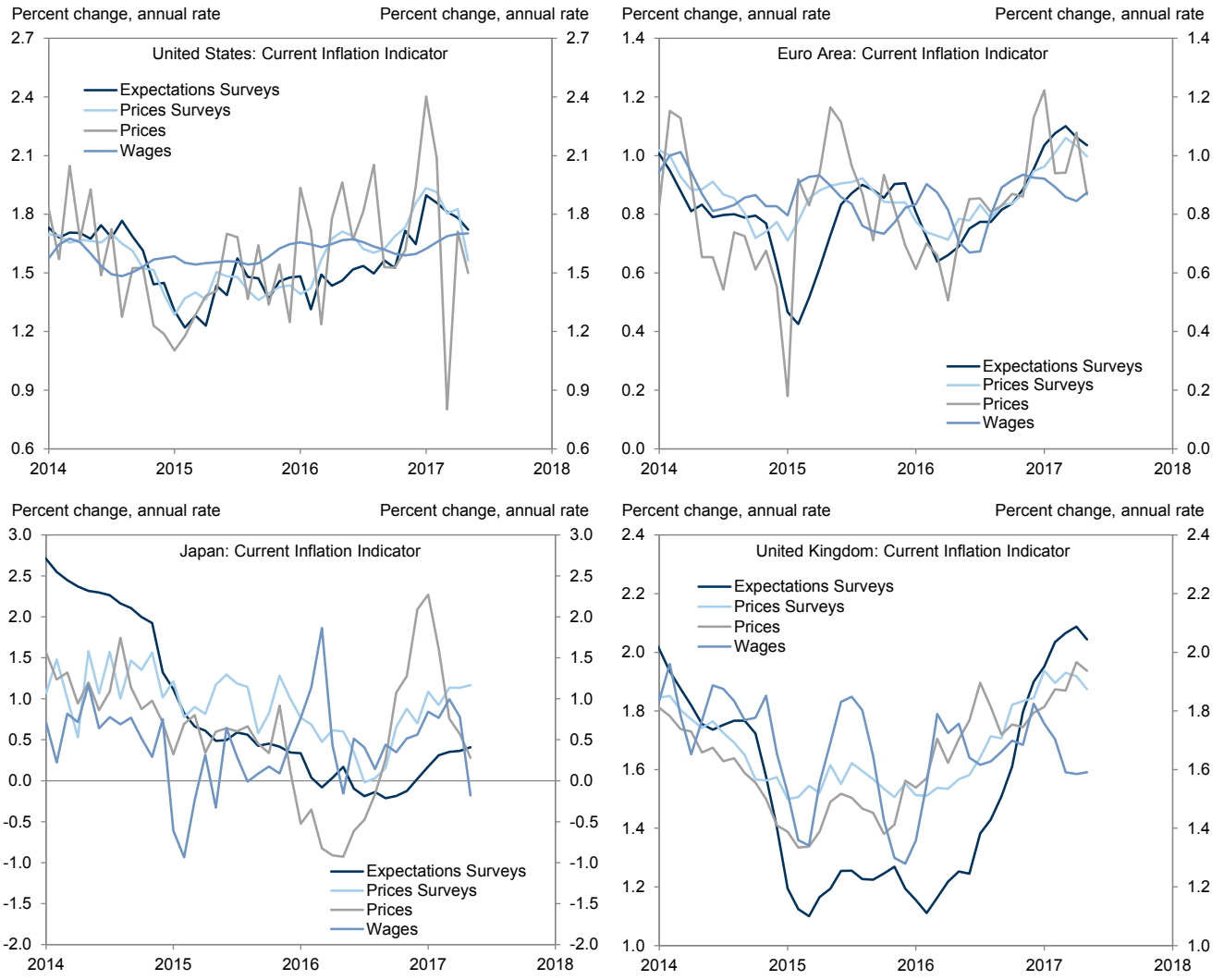


Source: Goldman Sachs Global Investment Research

Exhibit 3 shows the underlying pace of inflation when we look at the four different types of indicators in the CII. What emerges is that most recently there has been a synchronized pickup in underlying inflation as implied by both inflation expectations and soft data, in all four economies. The wages-based measure has risen in the Euro area and Japan but has remained flat in the US and the UK. Finally, although most of the hard price series measure core prices excluding direct energy prices, the sharp rise—and subsequent unwinding—in several countries at the turn of the year suggests that some energy-related effects (such as through airfares) hit all at once but have since subsided.

4. The Appendix provides details of the tickers.

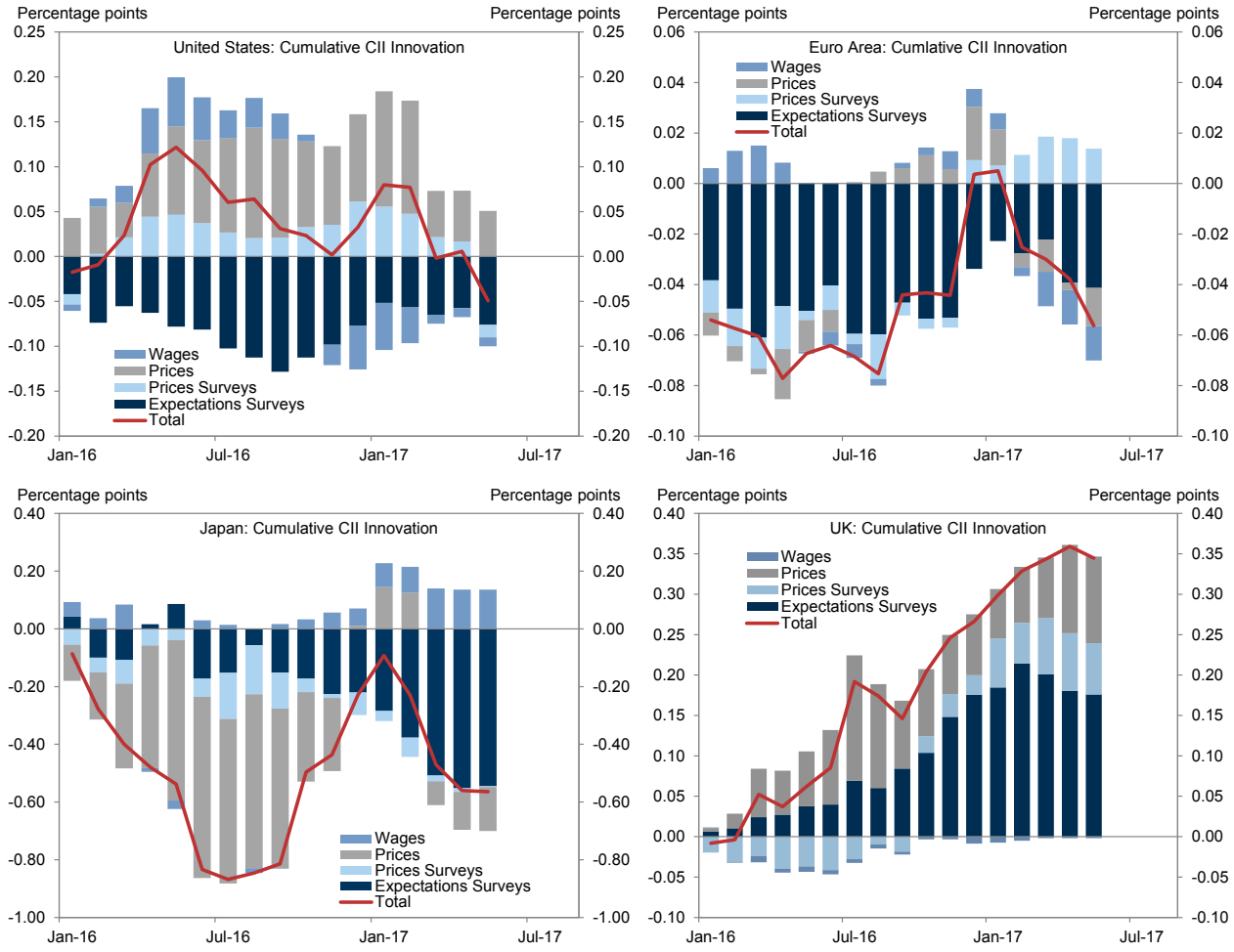
Exhibit 3: The Recent CII Moves Are Broadly Based



Source: Goldman Sachs Global Investment Research

In keeping with our CAIs, we are able to track whether new data exceed or fall short of the projections we obtain from our forecasting system. The gap between forecasts and reality—the CII Innovations—provides a sense of changes in the momentum of data. Exhibit 4 compares the cumulative innovations for all four since the start of 2016. Most obvious from these charts is the gap between actual and anticipated inflation expectations: while they were weaker than forecast in the US, Euro area, and—most recently—Japan, they were stronger than projected in the UK. Hard price data account for much of the movement in the remaining cumulative innovations.

Exhibit 4: Inflation Expectations Have Surprised the Most

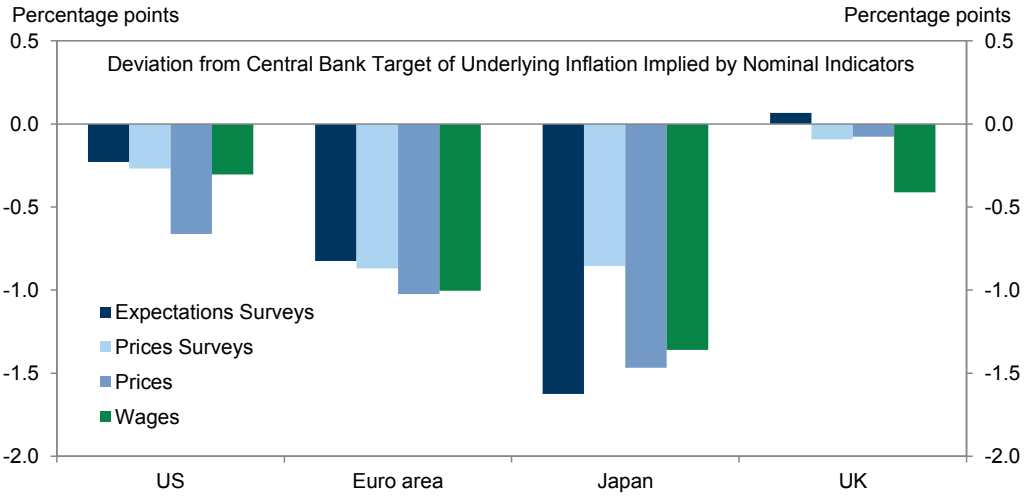


Source: Goldman Sachs Global Investment Research

Feeding through into policy

What bearing do the CIIs have on current policy? We can use them to explore how far away each economy is from its inflation target, where we compare the read from the four subsets of indicators (hard price data, soft price data, expectations, and wages; Exhibit 5). Echoing current measures of core inflation, there is a wide range of variation in CIIs across the G4 economies. Japan has the largest gap to close, regardless of which subgroup we look at; the UK is closest on several measures, except those drawn from the labor market. And the current weakness in US inflation shows up markedly on the hard price data, but less so on the other metrics.

Exhibit 5: Euro area and Japan Are Furthest—and Most Consistently—Away From Target



Note: We show the 3m average CII as of May 2017 less the central bank inflation target.

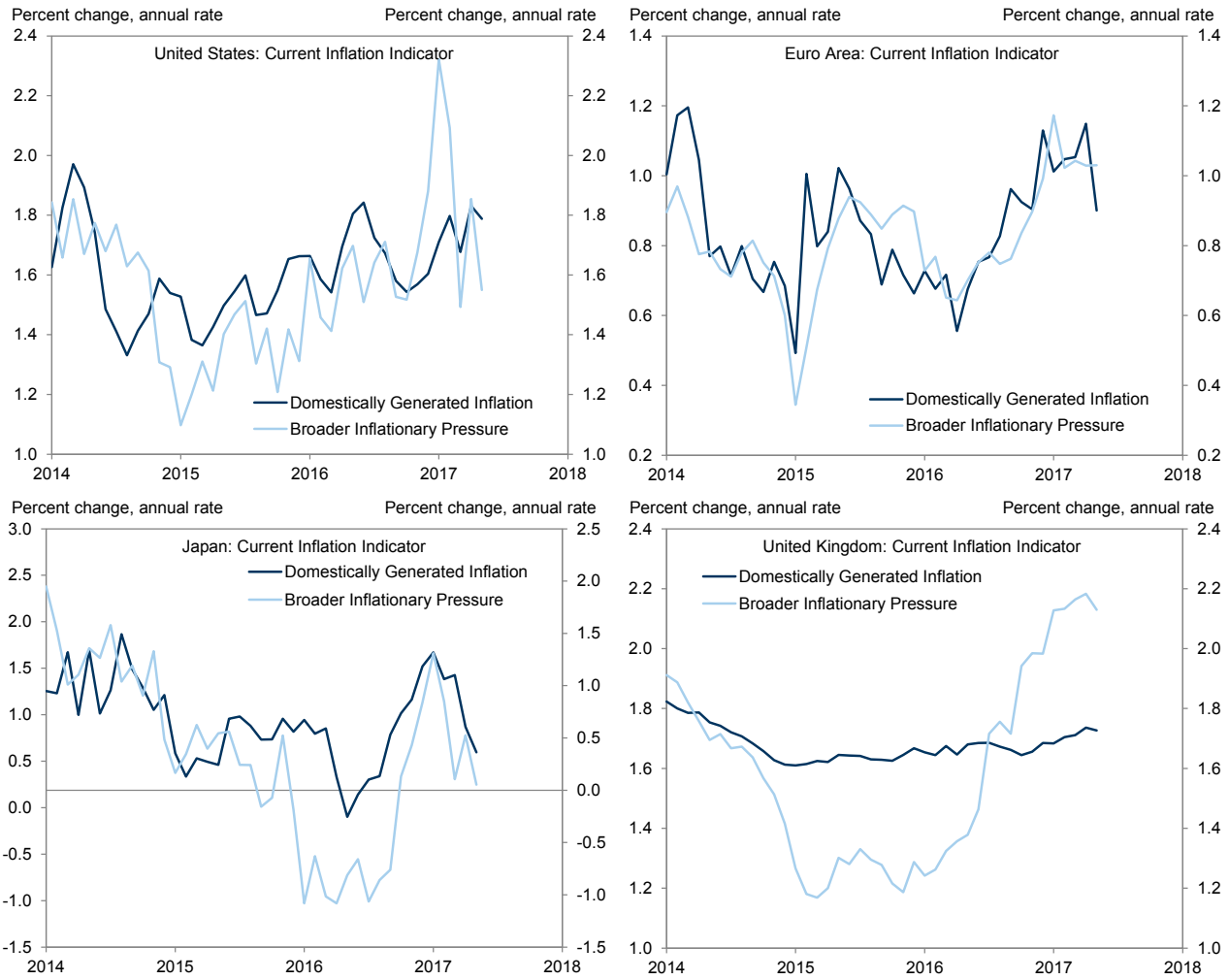
Source: Goldman Sachs Global Investment Research

We can also look at "domestic" sources of inflation as a measure of medium-run underlying price pressures, as some central banks have recently emphasized, with a focus on a range of indicators from the labor market and price measures with a small import component, such as services inflation.[5] Our CII framework lends itself naturally to this kind of analysis, as we can compare the read we get from components that we—albeit subjectively—classify as domestic vs broader components. Exhibit 6 shows the recent trends in both for all four economies. Although there is some volatility in these sub-groups (most notably the US), we find no evidence of a progressive downward trend in domestically generated inflation. The US has witnessed a steady buildup in domestic pressure over the past three years, which does not look to have abated materially in 2017; meanwhile the Euro area has seen a sharp rise in DGI over the past nine months. In Japan, DGI now sits close to the post-crisis average. Finally, our summary measure of DGI in the UK has been remarkably stable—but running consistently below the inflation target.

Drawing these signals together, the underlying inflation measures support our policy outlooks for all four economies. The steady pickup in US price pressures—especially when focusing on domestically generated inflation—supports the current FOMC view that recent hard inflation weakness is transitory.

5. See, for example, the Bank of England *Inflation Report*, May 2017; Kristin Forbes, "When, why and what's next for low inflation?: No magic slippers needed", speech, June 17, 2015; and European Central Bank *Economic Bulletin*, issue 4, 2017.

Exhibit 6: Domestically Generated Inflation Has Been More Stable Than General Measures



Source: Goldman Sachs Global Investment Research

Meanwhile, the pickup in Euro area core inflation is notable, but the current pace still falls short of the 2% target and does not look likely to catch up, for reasons discussed elsewhere.[6] Similar weakness in Japan underlines the need for continued easy policy. In the UK, the comparative flatness of domestically generated inflationary pressure has provided the backdrop to accommodative policy over the recent past, although it has started to creep up of late, and the gap between domestic and broader price pressures is the largest of the four economies. This brings into sharp relief the MPC's judgment about whether to tolerate a possibly persistent overshoot of its inflation target.

Nicholas Fawcett

Karen Reichgott

We thank Andrew Benito, David Mericle, Lasse Holboell Nielsen, Tomohiro Ota, Yuriko Tanaka, and Pierre Vernet for their help in assembling the CIIs.

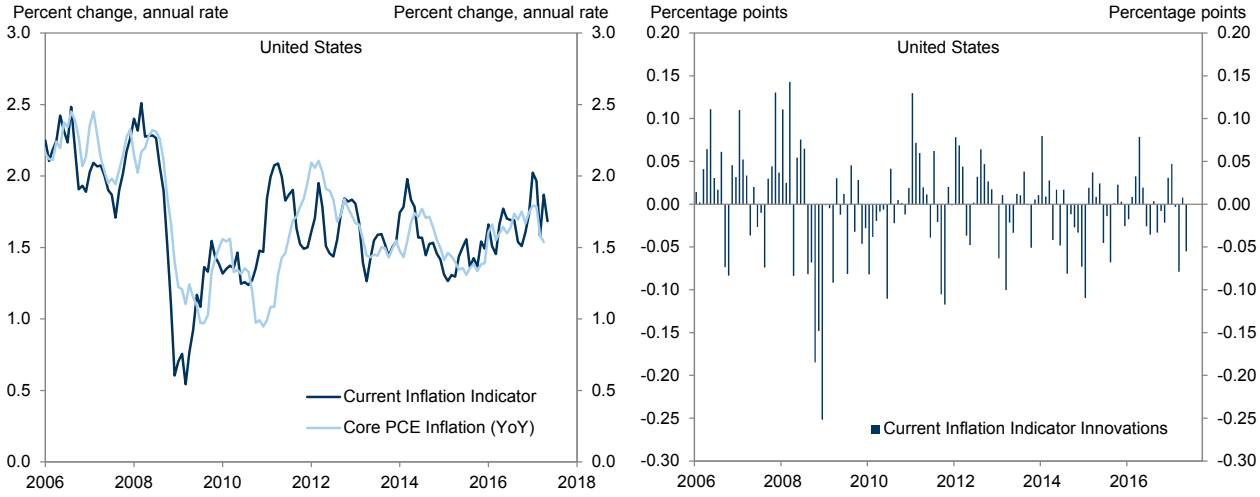
6. See in particular, Pierre Vernet, "The ECB and the 'German inflation cap'", European Economics Analyst, April 28, 2017.

Appendix

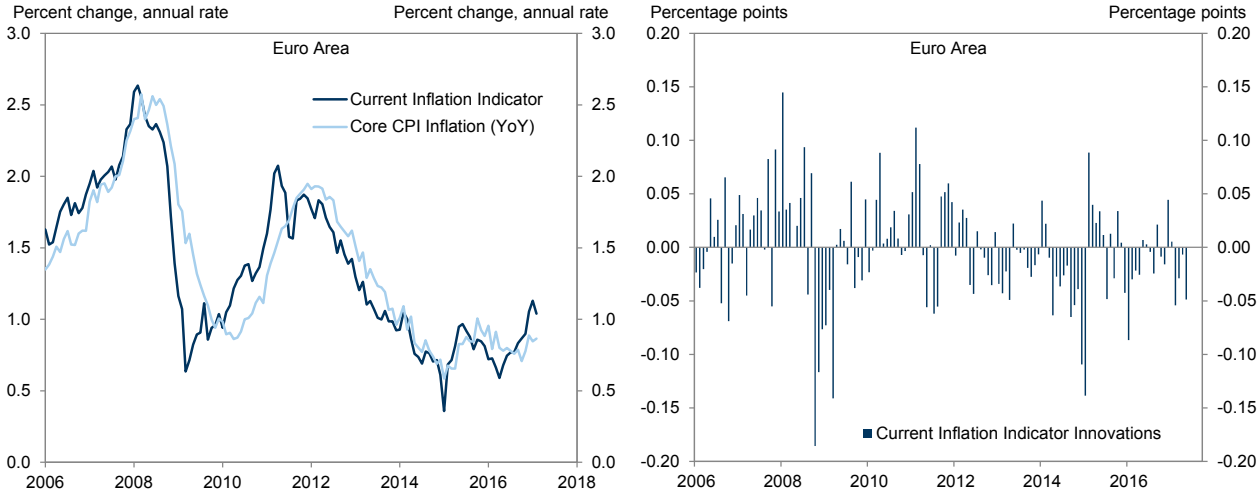
Current Inflation Indicator Bloomberg codes

Country	CII	CII Innovations
United States	GSUSCII Index	GSUSCIII Index
Euro area	GSEACII Index	GSEACIII Index
Japan	GSJPCII Index	GSJPCIII Index
United Kingdom	GSGBCII Index	GSGBCIII Index

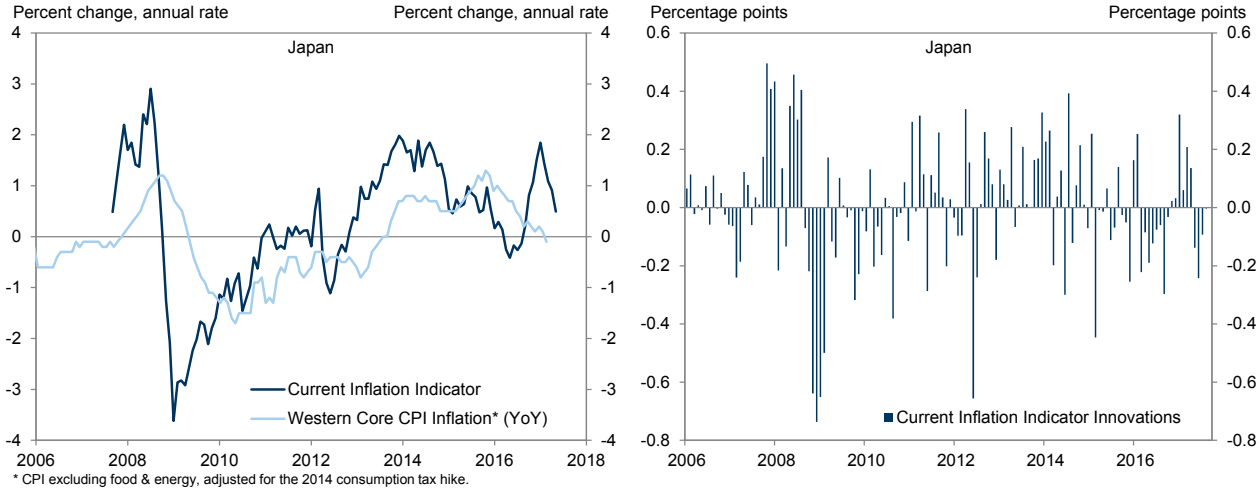
Source: Goldman Sachs Global Investment Research



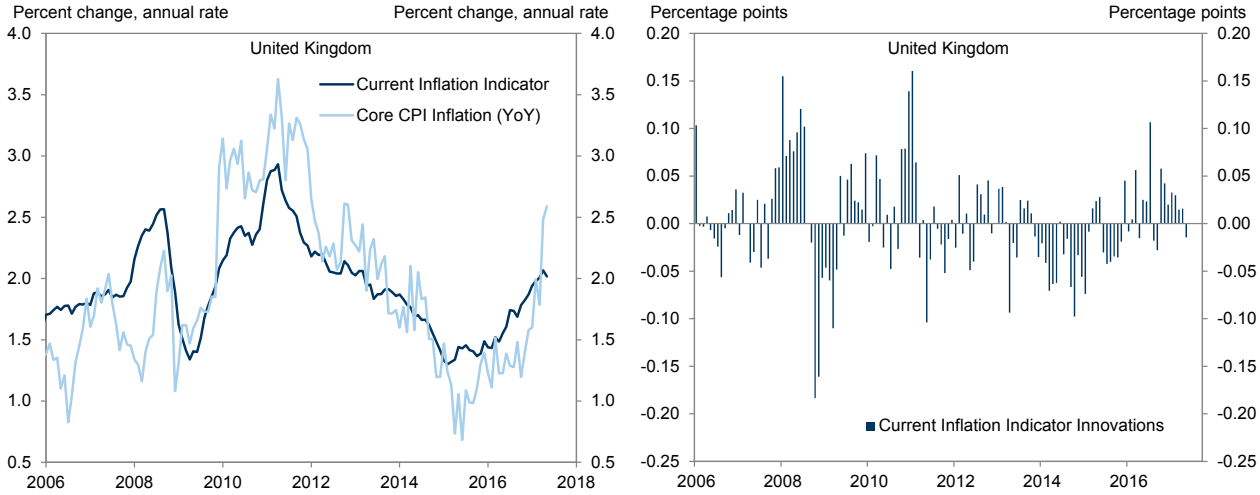
Source: Haver Analytics, Goldman Sachs Global Investment Research



Source: Haver Analytics, Goldman Sachs Global Investment Research



Source: Haver Analytics, Goldman Sachs Global Investment Research



Source: Haver Analytics, Goldman Sachs Global Investment Research

United States: Weights	Sector	Type	CII	Innovations
SPF 10-Year Expectations	Expectations	Soft	4.8%	0.5%
Consensus Economics Inflation Expectations One Year Ahead	Expectations	Soft	9.2%	14.8%
Michigan 5-Year Expectations	Expectations	Soft	6.2%	5.3%
TIPS-Implied 5-Year Inflation	Expectations	Soft	6.5%	6.8%
ISM Manufacturing Prices Index	Prices Survey	Soft	9.1%	11.8%
Average Hourly Earnings (Production & Nonsupervisory)	Wages	Hard	3.2%	3.6%
ISM Nonmanufacturing Prices Index	Prices Survey	Soft	10.0%	7.8%
CPI Category: Goods Ex-Food and Energy	Prices	Hard	1.1%	3.6%
CPI Category: Services Ex-Energy	Prices	Hard	4.4%	5.8%
Import Prices Ex-Petroleum	Prices	Hard	6.9%	5.8%
Core PPI	Prices	Hard	2.5%	1.7%
Atlanta Fed Wage Tracker	Wages	Hard	4.5%	4.3%
Core CPI	Prices	Hard	4.4%	4.3%
Core PCE	Prices	Hard	5.5%	4.2%
Employment Cost Index	Wages	Hard	4.5%	3.6%
Unit Labor Costs	Wages	Hard	3.8%	3.7%
Compensation Per Hour	Wages	Hard	3.8%	5.7%
Gross Domestic Purchases: Implicit Price Deflator	Prices	Hard	9.8%	6.7%

Source: Goldman Sachs Global Investment Research

Euro Area: Weights	Sector	Type	CII	Innovations
Consensus Economics Euro Area Inflation Expectations One Year Ahead	Expectations	Soft	10.7%	14.7%
EC Consumer Survey: Price Trends Bext 12 Months	Expectations	Soft	9.3%	12.8%
PMI: Manufacturing Output Prices (latest estimate including flash)	Prices Surveys	Soft	10.0%	16.6%
PMI: Services Prices Charged (latest estimate including flash)	Prices Surveys	Soft	9.7%	9.8%
*EA11-19: HICP: Nonenergy Industrial Goods	Prices	Hard	4.5%	3.9%
*EA11-19: HICP: Services	Prices	Hard	7.3%	7.5%
Euro Area Domestic PPI: Manufacturing	Prices	Hard	5.5%	7.1%
Wages and Salaries: Industry Ex Construction	Wages	Hard	7.2%	7.1%
Euro Area Labor Costs: Business Economy	Wages	Hard	6.1%	7.1%
Euro Area Indicator of Negotiated Wages	Wages	Hard	3.2%	2.7%
Euro Area Domestic Demand Deflator	Prices	Hard	10.4%	-4.0%
Euro Area Compensation Per Employee	Wages	Hard	7.5%	7.0%
*Euro Area Import Price: Total	Prices	Hard	8.5%	7.8%

* Indicates series has been exponentially smoothed.

Source: Goldman Sachs Global Investment Research

Japan: Weights	Sector	Type	CII	Innovations
Consensus Economics Inflation Expectations One Year Ahead	Expectations	Soft	11.1%	15.6%
PMI: Mfg Output Prices [Latest Estimates incl Flash]	Prices Surveys	Soft	11.6%	9.0%
PMI: Services Prices Charged	Prices Surveys	Soft	11.5%	11.1%
Opinion Survey: Avg Change in Prices Over Next 5 Years: Median	Expectations	Soft	4.0%	13.5%
PPI ex Consumption Tax; Manufacturing Industry Products	Prices	Hard	6.7%	9.6%
*Import Prices Yen Basis: Gen Purpose, Prod&Bus Oriented Mach	Prices	Hard	6.9%	6.5%
*Price Indexes: Services Producer Price Index; All Items	Prices	Hard	12.3%	9.6%
Consumer Price Index Goods Excluding Fresh Food	Prices	Hard	7.9%	5.6%
Consumer Price Index Services Excluding Fresh Food	Prices	Hard	4.5%	2.9%
*Scheduled Earnings/Employee [30 or More Empl]: All Surveyed Ind	Wages	Hard	8.8%	6.7%
*Scheduled Earns/PT Employee[30 or More Empl]: All Surveyed Inds	Wages	Hard	2.7%	1.9%
GDP Deflator: Domestic Demand	Prices	Hard	12.0%	8.2%

* Indicates series has been exponentially smoothed.

Source: Goldman Sachs Global Investment Research

United Kingdom: Weights	Sector	Type	CII	Innovations
Consensus Economics Inflation Expectations One Year Ahead	Expectations	Soft	10.1%	10.7%
CPI Breakeven Inflation Implied by 5Y5Y Swap	Expectations	Soft	3.5%	3.7%
PMI: Manufacturing Output Prices	Prices Surveys	Soft	11.5%	10.7%
PMI: Services Output Prices	Prices Surveys	Soft	9.2%	8.7%
BoE/TNS Inflation Survey: Inflation Next 12 Mos: Median Response	Expectations	Soft	9.3%	14.5%
*CPIH: Nonenergy Industrial Goods	Prices	Hard	0.1%	2.1%
*CPIH: All Services	Prices	Hard	9.0%	8.4%
*RPI: All Items Excluding Seasonal Food	Prices	Hard	10.8%	9.6%
*PPI: Net Sector Output: Manufacturing Prods Ex Fd/Bev/Tobacco/Petrol	Prices	Hard	10.8%	12.1%
*Import Price Index: Goods Excluding Oil	Prices	Hard	7.0%	5.3%
Gross Domestic Expenditure Deflator	Prices	Hard	6.3%	4.6%
Services PPI: Gross Sector Total	Prices	Hard	7.8%	5.9%
AWE, Regular Pay: Private Sector	Wages	Hard	2.6%	2.1%
Labour Costs Index	Wages	Hard	2.0%	1.5%

Source: Goldman Sachs Global Investment Research

Global Economic Forecasts

Real GDP Growth (YoY)	2016	2017	2018	2019
World	3.2	3.7	3.8	3.8
Advanced Economies	1.7	2.0	1.9	1.7
Emerging Markets	4.6	5.2	5.4	5.5
G3				
United States	1.6	2.1	2.2	1.7
Euro area	1.7	1.9	1.4	1.4
Germany	1.8	1.8	1.5	1.4
France	1.1	1.2	1.4	1.5
Italy	1.0	1.0	0.8	0.9
Spain	3.2	2.9	2.4	2.3
Japan	1.0	1.2	1.1	1.3
Advanced Economies				
Australia	2.5	2.4	2.8	2.9
Canada	1.4	1.8	2.0	1.8
New Zealand	3.1	3.4	3.1	2.5
Norway	1.0	1.7	2.2	2.3
Sweden	2.9	2.7	2.9	2.6
Switzerland	1.5	1.3	1.5	1.7
United Kingdom	1.8	1.7	1.2	2.0
Asia				
China	6.7	6.8	6.3	6.1
India	7.9	7.3	7.8	8.0
CEEMEA				
Russia	-0.2	1.9	3.3	2.9
Turkey	2.9	4.0	3.6	3.8
Latin America				
Brazil	-3.6	0.7	2.1	2.7
Mexico	2.3	2.0	2.6	3.5

Core CPI Inflation (YoY)	2016	2017	2018	2019
G3				
United States (core PCE)	1.7	1.6	1.9	2.1
Euro area	0.8	1.0	1.1	1.3
Germany	1.1	1.3	1.3	1.6
France	0.5	0.6	0.8	1.0
Italy	0.5	0.9	1.2	1.3
Spain	0.7	1.2	1.3	1.4
Japan (ex food & energy)	-0.3	0.3	0.5	1.0
Advanced Economies				
Norway	3.1	1.7	2.2	2.2
United Kingdom	1.3	2.2	2.0	1.9

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	1.7	1.5	2.0	2.3
Canada	0.5	0.8	1.0	1.3
New Zealand	1.8	2.0	2.5	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	0.3	0.5	0.8
Asia				
China	2.6	3.0	3.0	2.5
India	6.3	6.3	7.0	7.0
CEEMEA				
Russia	10.0	7.5	6.5	6.5
Turkey	8.5	12.8	10.0	10.0
Latin America				
Brazil	13.8	8.8	8.8	8.8
Mexico	5.8	7.3	7.0	6.0

Source: Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Jan Hatzius, Sven Jari Stehn, Nicholas Fawcett and Karen Reichgott, 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.

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