US Economics Analyst

2019 Outlook: The Home Stretch

GS MACRO OUTLOOK 2019

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

Alec Phillips
+1(202)637-3746 | alec.phillips@gs.com
Goldman Sachs & Co. LLC

David Mericle
+1(212)357-2619 | david.mericle@gs.com
Goldman Sachs & Co. LLC

Spencer Hill
+1(212)357-7621 | spencer.hill@gs.com
Goldman Sachs & Co. LLC

Daan Struyven
+1(212)357-4172 | daan.struyven@gs.com
Goldman Sachs & Co. LLC

Brian Chen
+1(212)357-8483 | brian.chen@gs.com
Goldman Sachs & Co. LLC

David Choi
+1(212)357-6224 | david.choi@gs.com
Goldman Sachs & Co. LLC

Blake Taylor
+1(202)637-3756 | blake.taylor@gs.com
Goldman Sachs & Co. LLC

Ronnie Walker
+1(917)343-4543 | ronnie.walker@gs.com
Goldman Sachs & Co. LLC

- Not for nothing has Fed Chairman Powell celebrated the "extraordinary times" the US economy enjoyed in 2018: growth is on pace to exceed 3%, the unemployment rate is at a 48-year low, and inflation is right on target. As we look ahead to 2019, the natural question is how long the good times can last.
- Growth is likely to slow significantly next year, from a recent pace of 3½%+ to roughly our 1¾% estimate of potential by end-2019. We expect tighter financial conditions and a fading fiscal stimulus to be the key drivers of the deceleration.
- Robust job creation should push the unemployment rate to 3% by early 2020, well below our 4½% estimate of full employment, the rate consistent with 2% inflation. Wage growth should reach 3¼-3½% in this environment, and firmer wage pressures coupled with additional tariff rounds should boost core PCE inflation to 2¼% by end-2019. While Fed officials would be comfortable with inflation at that level, we also see a risk of a more material inflation overshoot.
- The Fed is very likely to raise rates in December, and we expect 4 more hikes in 2019 to bring the terminal funds rate to 3¼-3½%, about two hikes above market forwards. With a large overshoot of its labor market target under way, the FOMC will likely be reluctant to stop until it is confident that the unemployment rate is no longer on a downward trajectory, a point we expect to reach only in early 2020. We still see the risks to our terminal rate forecast as tilted a little to the upside.
- History counsels that large labor market overshoots raise recession risk down the road. While we take this lesson seriously, we think it is being applied too mechanically in markets today. A flatter and more anchored Phillips curve should allow the Fed to unwind the overshoot more gradually, giving it a good chance of beating the historical odds. For now, neither overheating risks nor financial imbalances—the classic causes of US recessions—look worrisome. As a result, the expansion is on course to become the longest in US history next year, and even in subsequent years recession is not our base case.

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.

The Home Stretch

Not for nothing has Fed Chairman Powell celebrated the "extraordinary times" the US economy enjoyed in 2018. GDP growth is on pace to exceed 3%, boosted in part by fiscal stimulus. The unemployment rate has fallen to a 48-year low, and a wide range of labor market indicators paints a picture of one of the strongest job markets in memory. And after anxiety about "lowflation" last year, core PCE inflation has been remarkably on target, within 5bp of 2% for the last five months.

On the monetary policy front, the Fed appears very likely to deliver its fourth rate hike of 2018 in December, following four tightening actions in 2017 as well. But in contrast to 2017, in 2018 the Fed's policy actions were matched by a large tightening in broader financial conditions, as shown in Exhibit 1.

Exhibit 1: In 2018 the Fed's Rate Hikes Were Matched By a Large Tightening in Financial Conditions

Source: Goldman Sachs Global Investment Research

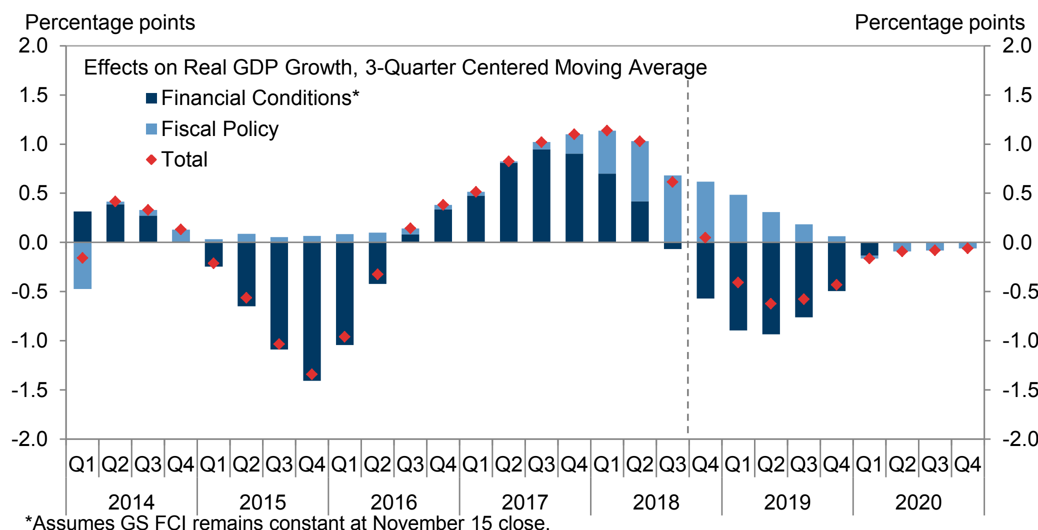
Tighter financial conditions and the fading of the fiscal boost should slow growth from its recent 3½%+ pace to roughly our 1¾% estimate of potential by end-2019. But before the economy stabilizes, we expect the unemployment rate to fall even further below target to a bottom of 3% in early 2020. This is well below our 4½% estimate of full employment, and we therefore expect to see faster wage growth and an increase in core inflation to 2¼% by the end of next year. The FOMC is likely to judge it prudent to keep its foot gently on the brake until it can be confident that the unemployment rate is no longer on a downward trajectory, and we therefore expect four more hikes in 2019 to a terminal rate of 3¼-3½%.

For financial markets, this combination of less growth, more inflation, and more rate hikes than priced could be challenging. But a meaningful deceleration next year would help to reduce the risk of eventually overheating and could ultimately extend the life of the expansion.

The Economic Outlook for 2019: Less Growth, More Inflation

The tightening in financial conditions and the fading of the fiscal stimulus are the key drivers of the growth deceleration we expect next year. Our estimate of the sum of the growth impulses from these two factors declines from a ¾pp boost in 2018Q3 to a ½pp net drag by mid-2019, as shown in Exhibit 2.

Exhibit 2: Tighter Financial Conditions and a Fading Fiscal Boost Should Drive Growth Lower in 2019



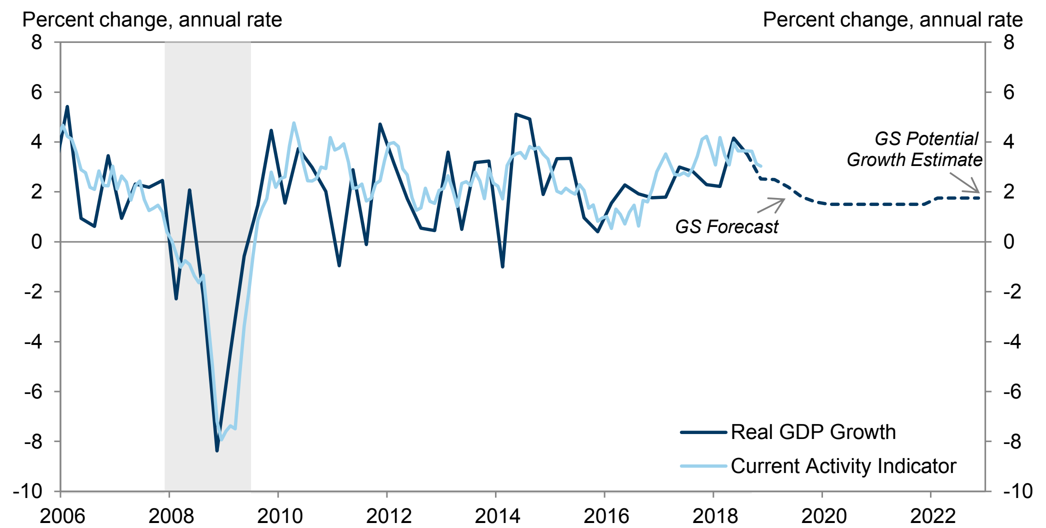
Source: Goldman Sachs Global Investment Research

The slowdown should come gradually, with growth remaining above trend in the first half of 2019 before slowing to its potential pace later in the year (Exhibit 3). The economy's recent performance has been stronger than the fiscal and financial impulses alone would suggest, and some of this additional self-sustaining momentum should persist next year.

We expect consumption growth of about 2½% in 2019, supported by solid income growth, a high saving rate, and high confidence. We project business investment growth of about 4%, supported by strong demand growth, fairly easy credit conditions, and healthy business confidence. Strength in these areas should be only partly offset by drags from net trade and continued weakness in the housing sector.

While further escalation of trade tensions with China appears likely, we have found minimal effects on the US economy so far and the next steps should have only a modest impact on growth unless they affect US business confidence and risk assets much more adversely than the trade war has to date.

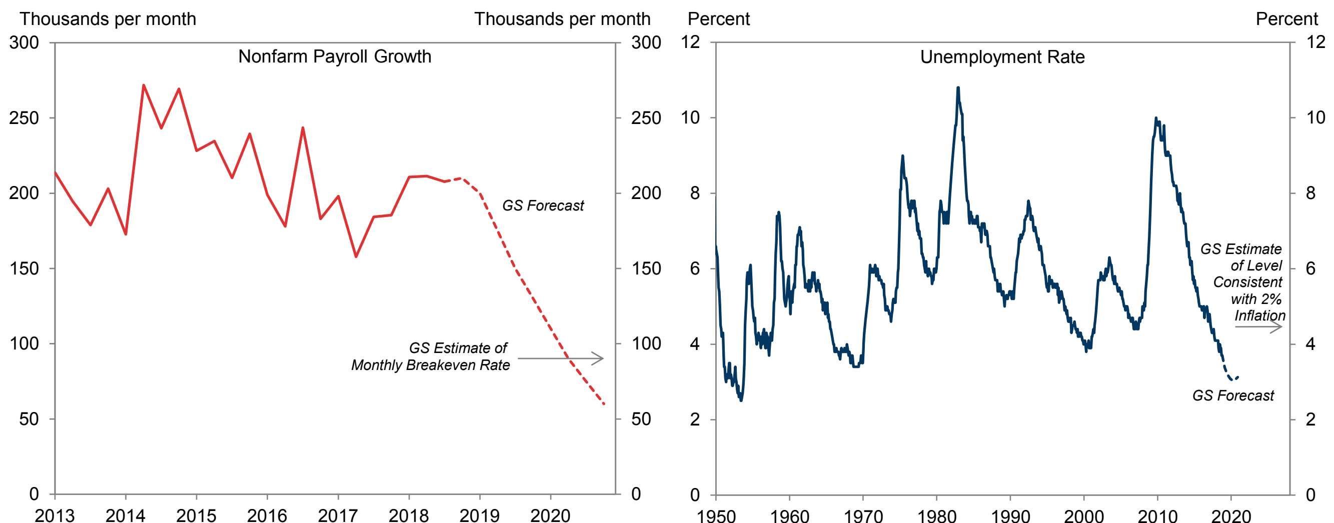
Exhibit 3: We Expect Growth to Slow from 3½%+ Recently to a Trend-Like Pace by Late 2019



Source: Department of Commerce, Goldman Sachs Global Investment Research

With growth likely to remain above potential a while longer, the impressive recent momentum in job creation is likely to fade only gradually. Monthly payroll growth has averaged 215k over the last six months, and our statistical models suggest that it is unlikely to slow to our 90k estimate of the breakeven pace—the pace needed to stabilize the unemployment rate—until early 2020 (Exhibit 4, left). By then we expect the unemployment rate to have declined to 3%, well below our 4.5% estimate of the full employment rate consistent with the Fed's 2% inflation target (Exhibit 4, right).

Exhibit 4: Above-Trend Job Creation Is Likely to Push the Unemployment Rate to 3% by Early 2020



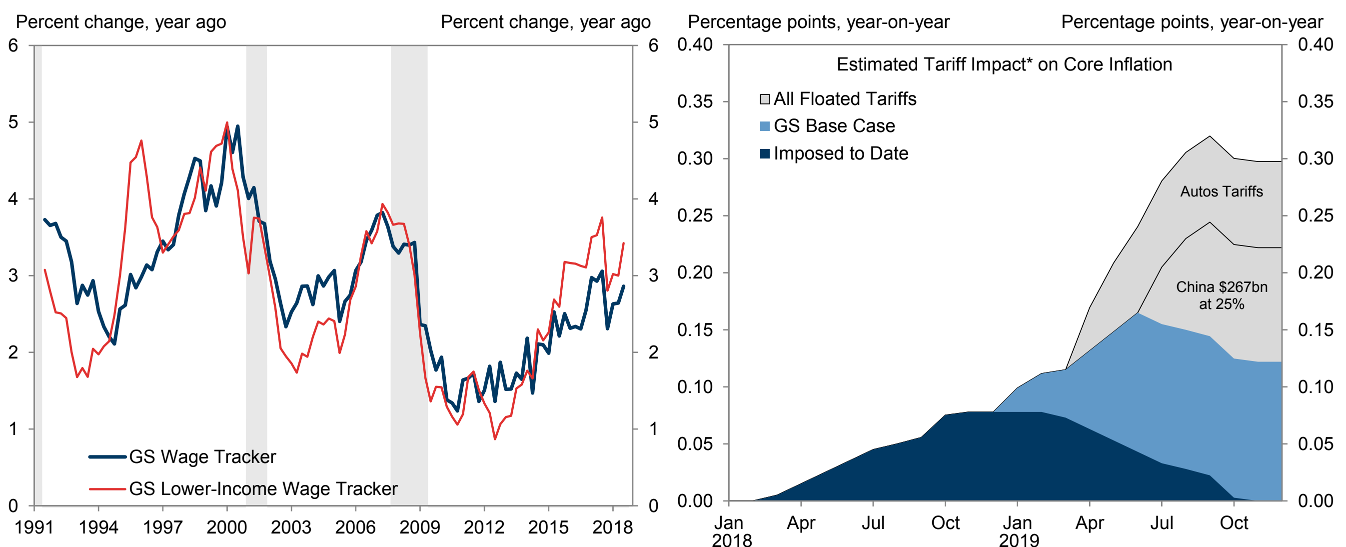
Source: Department of Labor, Goldman Sachs Global Investment Research

Other indicators support this picture of one of the strongest labor markets in memory. The number of job openings per unemployed worker, the quit rate, household reports of the ease of finding a job, and employer reports of the difficulty of finding workers all suggest that workers' bargaining power has increased. Based on these signals, recent

acceleration in the highest-quality wage indicators, the rise in our wage survey leading indicator, and the larger pick-up in wage growth in the more cyclically-sensitive lower half of the income distribution, we expect overall wage growth to reach 3.25-3.5% next year.

Core PCE inflation is likely to grind higher next year as well. While recent inflation readings have been soft, we expect to reach 2¼% by end-2019. Measures of the underlying inflation trend have risen, and in the year ahead pass-through from firmer wage growth, bottlenecks and capacity constraints in product markets, additional tariff rounds with a greater focus on consumer goods, and new state-level online sales taxes should all put upward pressure on core inflation.

Exhibit 5: Firmer Wage Pressures and Higher Tariffs Should Boost Core PCE Inflation to 2¼% by End-2019



*Tariffs already imposed include those on solar panels, washing machines, steel, aluminum, and $250bn of Chinese imports; our base case involves an increase in the tariff rate from 10% to 25% on $200bn of Chinese imports as well as a new 10% tariff on the remaining $267bn of Chinese imports. While not our base case, a 25% tariff rate on this $267bn and/or on the majority of the $340bn of global auto-sector imports are also possible from the administration (represented in the gray area above).

Note: Tariff chart shows estimated impact on core PCE inflation; however, we estimate an impact of a similar magnitude on the core CPI measure.

Source: Goldman Sachs Global Investment Research

While Fed officials would be comfortable with inflation at that level, we also see some risk of a larger overshoot to 2.5% or higher in the years ahead, a level that would likely change the monetary policy conversation. Part of the reason is simply that inflation risk is always higher than it seems. While this statistical uncertainty is a two-sided risk, we also see upside risks from trade war escalation beyond our baseline, such as the imposition of auto tariffs, and from the possibility suggested by our analysis of city-level data that extremely tight labor markets can and often do push inflation notably, not just slightly, higher.

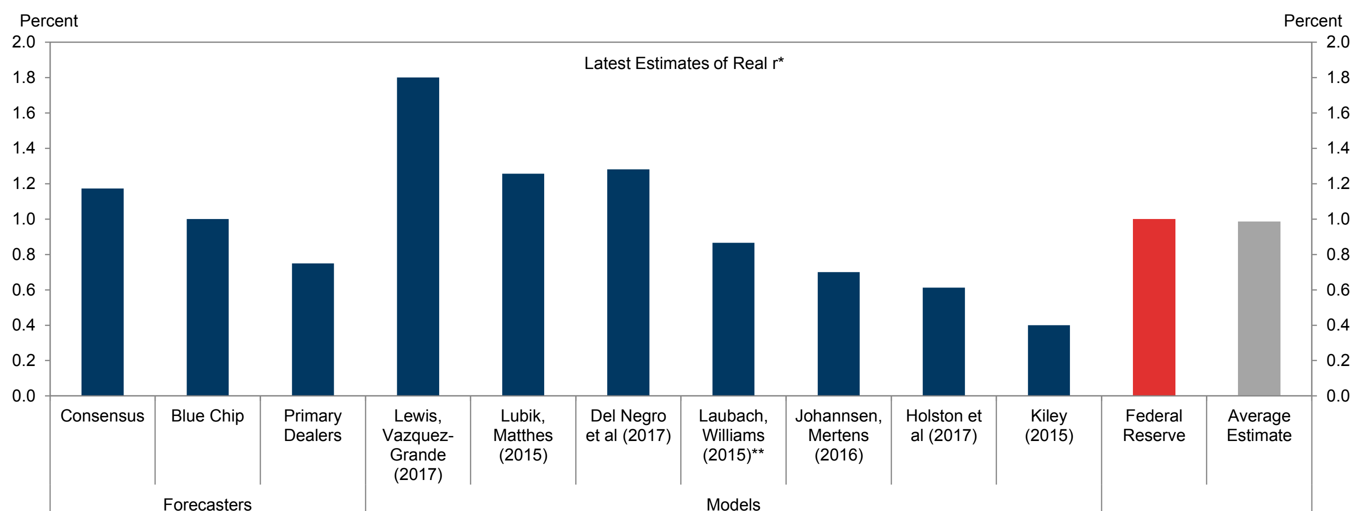
The Fed in 2019: The Home Stretch of the Hiking Cycle

We expect the Fed to deliver a rate hike in December followed by four hikes in 2019, about two more than priced. This would bring the terminal funds rate to 3¼-3½% and mark the third straight year in which the Fed surprised markets in a hawkish direction.

In 2017 investor skepticism about rate hikes centered on the lowflation narrative, the weight the FOMC was likely to put on low inflation versus a tight labor market, and the level of the neutral rate. In 2018 investor skepticism centered on the idea of the neutral rate as a barrier, an assumed fear of yield curve inversion, and concern about foreign and especially EM vulnerability to Fed hikes. As we enter the home stretch of the hiking cycle in 2019, investor skepticism has so far centered on whether four hikes are really necessary for an economy already on a trajectory to decelerate substantially.

The next three hikes up to the Fed's 3% estimate of the neutral rate (Exhibit 6) appear likely to be fairly uncontroversial, barring a significant shock. Recent commentary by Fed officials indicates that most think that an accommodative stance is inappropriate at a time when the economy is past their labor market target. The controversy is likely to begin beyond 3%.

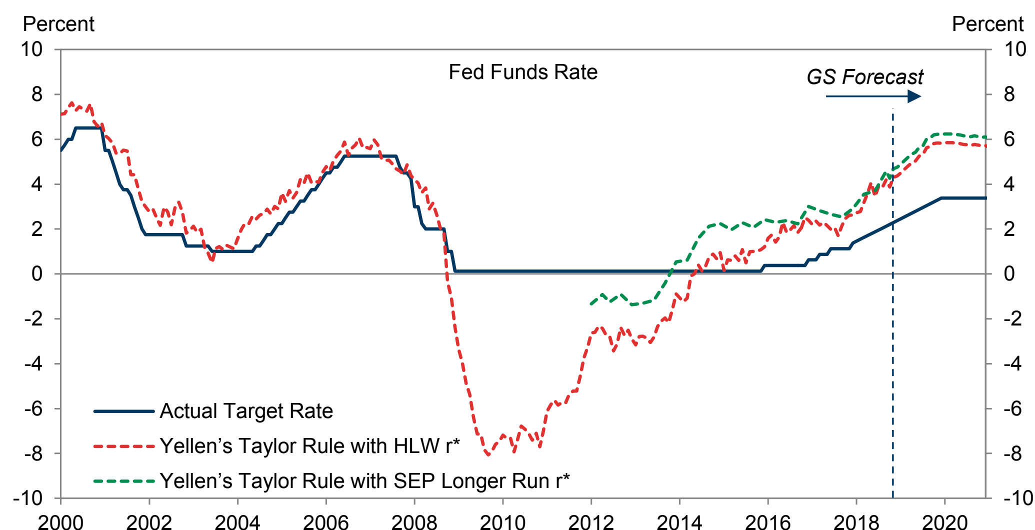
Exhibit 6: Most FOMC Participants Now Agree that an Accommodative Policy Stance Is Inappropriate



Source: Consensus Economics, Blue Chip, Federal Reserve Bank of New York, Federal Reserve Board, Goldman Sachs Global Investment Research

Many investors find it instinctively implausible that the Fed would take the policy rate beyond neutral. But since last December FOMC participants have overwhelmingly projected that a terminal rate modestly above neutral will be an appropriate response to the labor market overshoot. And compared to standard benchmarks such as the "balanced approach" Taylor rule included in the Fed's Monetary Policy Report, taking the funds rate a hike or two above neutral actually looks very restrained (Exhibit 7).

Exhibit 7: A Modest Overshoot of Neutral Would Actually Be Quite Tame Relative to Standard Benchmarks

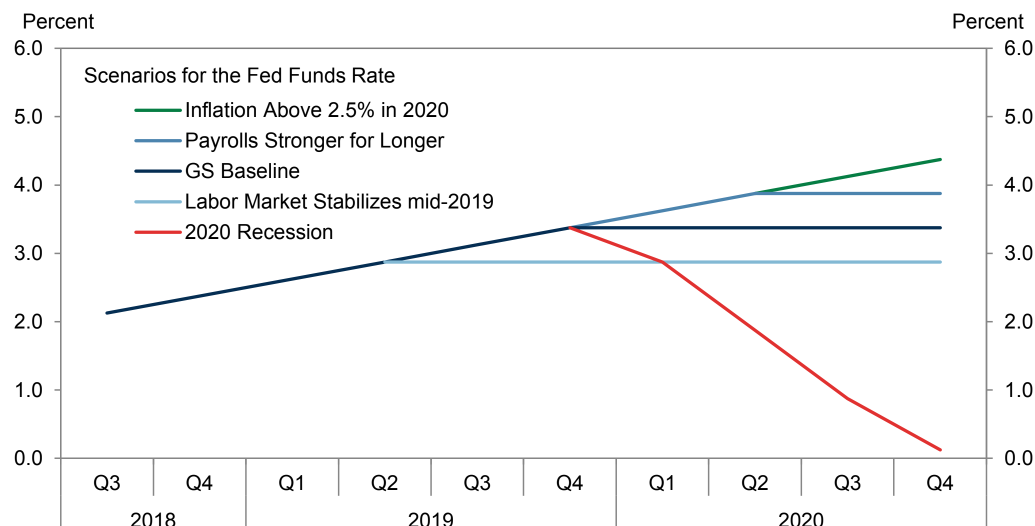


Source: Goldman Sachs Global Investment Research

We think the question of when the hiking cycle ends largely comes down to when Fed officials can be confident that the overshoot of full employment already under way is at least not growing further, the same principle that determined the endpoint in the last few hiking cycles. The recent sharp tightening in financial conditions has made it more plausible that this point could be reached earlier than the end of next year, but we think it is more likely that job growth will not slow sufficiently until early 2020. If so, the FOMC is likely to judge it prudent to continue tightening gradually, for fear of having to tighten more abruptly down the road. This has been the Committee's guiding principle for the last couple of years.

Exhibit 8 illustrates a few possible alternative scenarios around our baseline. If GDP growth and job creation slow earlier than we expect, the Fed could stop after two hikes next year at 2.75-3%, say. Conversely, if job growth remains stronger for longer than we expect or inflation rises to 2.5% or higher, the path of least resistance would likely be to continue hiking once per quarter into 2020. While many scenarios are possible, we see the risks to our baseline terminal rate as still tilted a little to the upside.

Exhibit 8: We See the Risks Around Our Baseline Terminal Rate As Two-Sided but Tilted to the Upside



Source: Goldman Sachs Global Investment Research

Beyond the number of rate hikes, three other monetary policy issues will be important in 2019.

First, the end of balance sheet normalization will come into sharper focus. Our best guess remains that runoff will end with bank reserves at roughly $1tn and a total balance sheet of about $3.6tn in early 2020, though a wide range of outcomes is possible. While we sympathize with arguments that the benefits of keeping the balance sheet somewhat larger than its minimum possible size exceed the costs, the Fed's standing guidance, reiterated in Congressional testimony by Chairman Powell in July, is that the "balance sheet will return to a size that's no larger than it needs to be for us to affect monetary policy in our chosen framework," and that point looks a bit further off.

Second, the FOMC will likely have to make further IOER realignments. With the effective fed funds rate now just 5bp below the top of the target range for the funds rate, we expect the FOMC to raise IOER by only 20bp at its December meeting and to make one or two additional IOER realignments in 2019.

Third, a press release from the Fed issued yesterday announced that the debate on alternative monetary policy frameworks has resumed. We expect the next milestone to be a summary of a staff presentation in the minutes to one of the upcoming FOMC meetings. The key event in 2019 will then be a conference on June 4-5 that will invite discussion from both within and outside of the Federal Reserve.

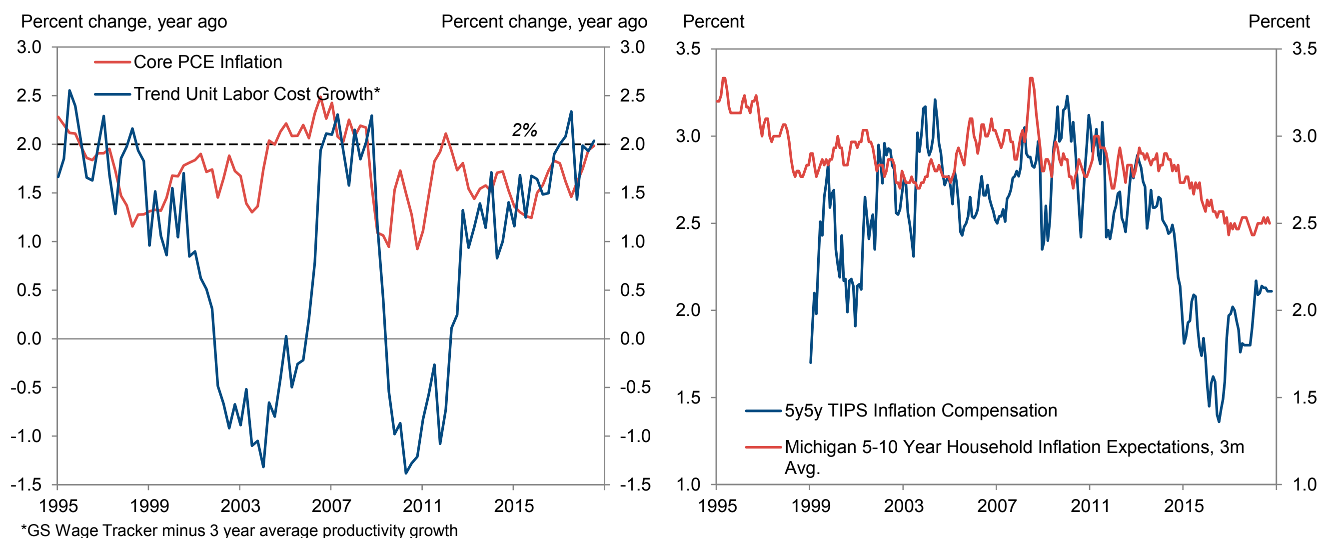
Beating the Historical Odds: Recession Risk in 2019 and Beyond

We have long highlighted the risks that have historically been associated with large overshoots of full employment. We have noted that the Fed has never engineered a soft landing from beyond full employment, that few other advanced economy central banks have either, and that countries that have achieved very long expansions often used countercyclical policy to prevent a large overshoot in the first place. In practice it hasn't been easy to nudge up the unemployment rate just so.

While we take this lesson seriously, we think it is being applied too mechanically by market participants today. The key difference with the past is that the Phillips curve is flatter and better anchored on the Fed's target today. As a result, where labor market overshoots once led to high and accelerating inflation and consequently had to be unwound urgently with a forceful policy response, today an overshoot will more likely mean inflation persistently but only moderately above target. The Fed could probably live with this for a while, permitting it to tighten gradually and unwind the overshoot slowly. This gives the Fed a good chance of beating the historical odds.

How worried should we be about recession risk today? The history of US recessions points to two classic causes of US recessions, overheating and financial imbalances. While overheating risks could emerge down the road, they look quite limited for now: core inflation is at 2%, trend unit labor cost growth is at 2%, and both household inflation expectations and market-implied inflation compensation are below average (Exhibit 9).

Exhibit 9: Overheating Risks Look Limited for Now



Source: Department of Commerce, Federal Reserve Board, University of Michigan, Goldman Sachs Global Investment Research

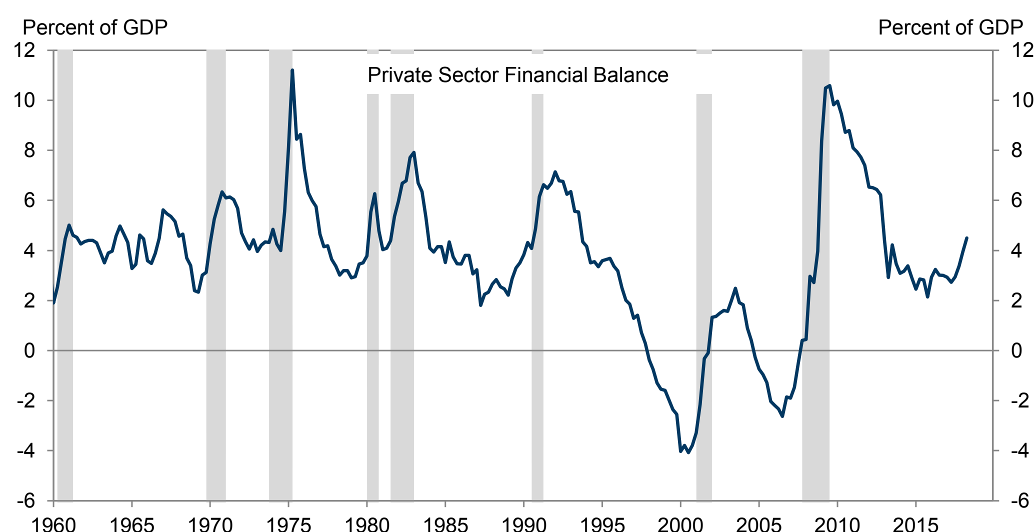
We also see little risk from financial imbalances at the moment. At a high level, the private sector financial balance—a very good predictor of recession risk—looks quite healthy (Exhibit 10).

Digging deeper, our financial excess monitor looks for elevated valuations and stretched risk appetite across major asset classes, and for financial imbalances and vulnerabilities

in the household, business, banking, and government sectors. Overall, the message is mostly reassuring. On the valuations side, while commercial real estate prices look somewhat frothy, lending terms and standards have tightened in recent years. On the sectoral imbalances side, fiscal sustainability remains a long-run concern, but we see this less as a recession trigger than as something that could prolong a downturn if policymakers perceive a lack fiscal space to respond.

These two classic recession risks are complementary—overheating and the associated risk of a more abrupt shift in monetary policy is more threatening when financial imbalances are elevated and less threatening when they are limited. With neither risk looking worrisome at the moment, we do not think it makes sense to characterize the economy as "late cycle" at this point.

Exhibit 10: The Private Sector Financial Balance Looks Healthy, a Key Contrast with the Last Two Cycles

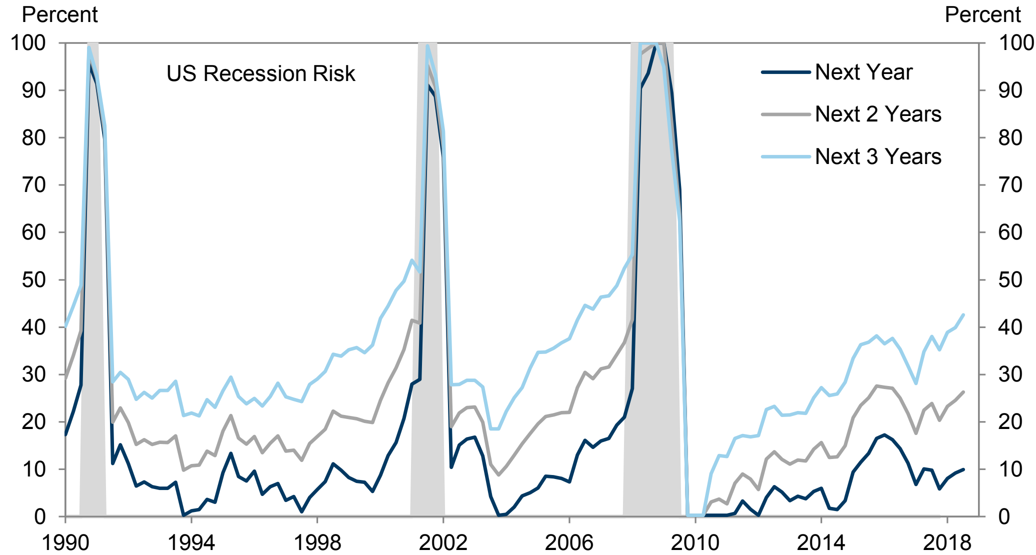


Source: Federal Reserve, Department of Commerce, Goldman Sachs Global Investment Research

The most obvious recession risk beyond 2019 is a mundane and technical one. With a low potential growth rate and a possible need to operate the economy a touch below potential to gradually unwind the overshoot—we forecast 1.5% growth in 2020 and 2021—the likelihood that normal fluctuations will tip growth negative is mechanically somewhat higher. We would interpret this as simply highlighting the arbitrariness of defining recessions as negative growth, rather than as a material rise in the unemployment rate. Of course, even a less severe recession could see a large sell-off in risk assets.

Accounting for these and other considerations, our recession risk model indicates that recession risk is still quite low (Exhibit 11). The expansion is therefore on course to become the longest in US history next year, and even in subsequent years recession is not our base case.

Exhibit 11: With No Obvious Trigger on the Horizon, Recession Risk Still Looks Low



Source: Goldman Sachs Global Investment Research

David Mericle

Jan Hatzius

The US Economic and Financial Outlook

(% change on previous period, annualized, except where noted)

	2016	2017	2018	2019	2020	2021	2022	2018				2019			
			(f)	(f)	(f)	(f)	(f)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
OUTPUT AND SPENDING															
Real GDP	**1.6**	**2.2**	2.9	2.5	1.6	1.5	1.7	**2.2**	**4.2**	**3.5**	2.5	2.5	2.2	1.8	1.6
Real GDP (Q4/Q4)	**1.9**	**2.5**	3.1	2.0	1.5	1.5	1.7	--	--	--	--	--	--	--	--
Consumer Expenditure	**2.7**	**2.5**	2.7	2.7	2.0	1.7	1.9	**0.5**	**3.8**	**4.0**	2.3	2.8	2.5	2.3	2.0
Residential Fixed Investment	**6.5**	**3.3**	0.0	-1.3	0.2	1.9	2.3	**-3.4**	**-1.4**	**-4.0**	0.4	-1.5	-1.5	-1.0	-0.5
Business Fixed Investment	**0.5**	**5.3**	6.7	4.2	3.0	2.7	3.0	**11.5**	**8.7**	**0.8**	5.0	5.1	4.3	3.1	2.9
Structures	**-5.0**	**4.6**	4.9	2.1	2.0	2.0	2.0	**13.9**	**14.5**	**-7.9**	3.9	3.0	2.5	2.0	2.0
Equipment	**-1.5**	**6.1**	6.8	3.1	2.7	2.5	2.8	**8.5**	**4.6**	**0.4**	2.6	4.0	4.0	3.0	2.5
Intellectual Property Products	**7.5**	**4.6**	7.7	7.2	4.0	3.5	3.8	**14.1**	**10.5**	**7.9**	9.0	8.0	6.0	4.0	4.0
Federal Government	**0.4**	**0.7**	2.8	3.8	0.9	0.0	0.0	**2.6**	**3.6**	**3.3**	5.0	5.0	2.5	2.5	2.5
State & Local Government	**2.0**	**-0.5**	1.2	1.8	0.4	0.0	0.0	**0.9**	**1.8**	**3.2**	2.2	1.5	1.5	1.0	1.0
Net Exports ($bn, ’09)	**-786**	**-859**	-903	-967	-1,021	-1,060	-1,100	**-902**	**-841**	**-939**	-929	-943	-957	-975	-993
Inventory Investment ($bn, ’09)	**23**	**23**	31	30	25	25	25	**30**	**-37**	**76**	56	40	30	25	25
Industrial Production, Mfg.	**-0.8**	**1.2**	2.2	1.6	0.9	0.7	0.8	**2.0**	**2.3**	**2.7**	1.3	1.6	1.5	1.2	1.0
HOUSING MARKET															
Housing Starts (units, thous)	**1,177**	**1,208**	1,278	1,314	1,353	1,390	--	**1,317**	**1,261**	**1,218**	1,316	1,290	1,312	1,330	1,323
New Home Sales (units, thous)	**560**	**616**	637	688	707	728	--	**656**	**633**	**580**	677	680	685	694	695
Existing Home Sales (units, thous)	**5,441**	**5,536**	5,370	5,316	5,367	5,419	--	**5,507**	**5,413**	**5,273**	5,286	5,298	5,310	5,323	5,335
Case-Shiller Home Prices (%yoy)*	**4.9**	**5.7**	6.1	3.7	2.8	1.9	--	**6.5**	**6.9**	**6.1**	5.0	4.2	3.7	3.6	3.4
INFLATION (% ch, yr/yr)															
Consumer Price Index (CPI)	**1.3**	**2.1**	2.5	2.1	2.3	2.2	2.3	**2.3**	**2.6**	**2.6**	2.4	1.9	2.1	2.1	2.1
Core CPI	**2.2**	**1.8**	2.2	2.5	2.5	2.5	2.4	**1.9**	**2.2**	**2.2**	2.3	2.2	2.5	2.6	2.6
Core PCE**	**1.7**	**1.6**	1.9	2.1	2.2	2.2	2.2	**1.7**	**1.9**	**2.0**	1.9	2.0	2.0	2.2	2.3
LABOR MARKET															
Unemployment Rate (%)	**4.9**	**4.4**	3.8	3.2	3.1	3.2	3.3	**4.1**	**3.9**	**3.8**	3.6	3.4	3.3	3.2	3.1
U6 Underemployment Rate (%)	**9.6**	**8.5**	7.7	6.6	6.3	6.6	6.7	**8.1**	**7.8**	**7.4**	7.3	7.0	6.7	6.5	6.3
Payrolls (thous, monthly rate)	**201**	**181**	210	164	84	64	85	**211**	**211**	**206**	210	200	175	150	130
GOVERNMENT FINANCE															
Federal Budget (FY, $bn)	**-590**	**-666**	**-779**	-1,000	-1,125	-1,250	-1,325	--	--	--	--	--	--	--	--
FINANCIAL INDICATORS															
FF Target Range (Bottom-Top, %)^	**0.5-0.75**	**1.25-1.5**	2.25-2.5	3.25-3.5	3.25-3.5	3.25-3.5	3.25-3.5	**1.5-1.75**	**1.75-2**	**2.0-2.25**	2.25-2.5	2.5-2.75	2.75-3.0	3.0-3.25	3.25-3.5
10-Year Treasury Note^	**2.45**	**2.40**	3.20	3.50	3.30	3.10	3.10	**2.74**	**2.85**	**3.05**	3.20	3.30	3.40	3.50	3.50
Euro (€/$)^	**1.06**	**1.20**	1.13	1.20	1.25	1.30	1.35	**1.23**	**1.17**	**1.16**	1.13	1.14	1.18	1.19	1.20
Yen ($/¥)^	**117**	**113**	113	108	105	100	97	**106**	**111**	**113**	113	111	110	109	108

* Weighted average of metro-level HPIs for 381 metro cities where the weights are dollar values of housing stock reported in the American Community Survey.
** PCE = Personal consumption expenditures. ^ Denotes end of period.
Note: Published figures in bold.

Source: Goldman Sachs Global Investment Research

Economic Releases and Other Events

Date		Time (EDT)	Indicator	Estimate GS	Estimate Consensus	Last Report
Mon	**Nov 19**	10:00	Homebuilders' Survey (Nov)	n.a.	68	68
Tue	**Nov 20**	**8:30**	**Housing Starts (Oct)**	**+2.7%**	**+2.4%**	**-5.3%**
Wed	**Nov 21**	**8:30**	**Durable Goods Orders (Oct)**	**-3.5%**	**-2.2%**	**+0.7%**
		8:30	**Durable Goods Orders Ex-Transport (Oct)**	**+0.1%**	**+0.4%**	**Flat**
		8:30	**Core Capital Goods Orders (Oct)**	**+0.1%**	**+0.2%**	**-0.1%**
		8:30	**Core Capital Goods Shipments (Oct)**	**+0.4%**	**+0.2%**	**-0.1%**
		8:30	**Initial Jobless Claims**	**215,000**	**215,000**	**216,000**
		8:30	Continuing Claims	n.a.	1,650,000	1,676,000
		10:00	Leading Indicators Index (Oct)	n.a.	+0.1%	+0.5%
		10:00	**Existing Home Sales (Oct)**	**-0.3%**	**+1.0%**	**-3.4%**
Fri	**Nov 23**	**10:00**	**UMich Consumer Sentiment—Final (Nov)**	**97.9**	**98.3**	**98.3**

Source: Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Jan Hatzius, Alec Phillips, David Mericle, Spencer Hill, Daan Struyven, Brian Chen, David Choi, Blake Taylor and Ronnie Walker, 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.

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.

© 2018 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.