

# US Economics Analyst

Issue No: 11/41  
October 14, 2011

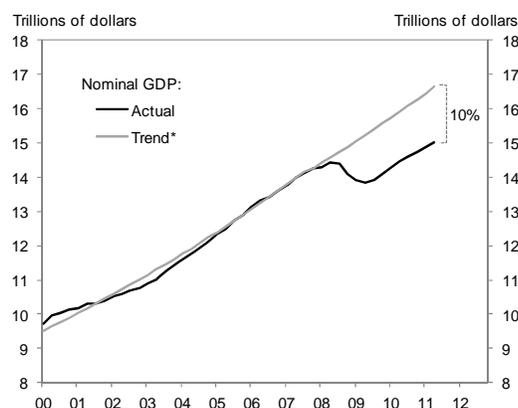
FOR THOSE PERMISSIONED:

Goldman Sachs Global ECS Research  
at <https://360.gs.com>

## The Case for a Nominal GDP Level Target

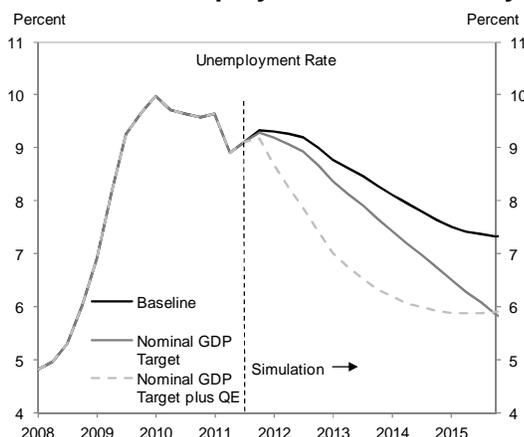
- With short-term interest rates near zero and the economy still weak, we believe that the best way for Fed officials to ease policy significantly further would be to target a nominal GDP path such as the one shown in the chart on the right, indicating that they will use additional asset purchases to help bring actual nominal GDP back to trend over time. The case would strengthen further if deflation risks reappeared clearly on the radar screen.
- While a shift to a nominal GDP level target would be a big decision, it would be consistent with the Fed's dual employment and price mandate. It differs from the standard Taylor rule interpretation of the dual mandate in two ways. First, it depends on the price level, not the inflation rate. Second, it puts more weight on the output/employment part of the mandate.
- Simulations using a highly simplified model suggest that a nominal GDP target could improve economic performance substantially compared with a standard Taylor rule. In the model, the economy receives a significant boost through lower real long-term interest rates, via a delay of the first funds rate hike and temporarily higher expected inflation.
- The improvement in economic performance in our model, however, depends critically on the credibility of the Fed's commitment. We believe a nominal GDP level target is less likely to dislodge long-run inflation expectations than other proposals to ease monetary policy significantly further. First, it is not very sensitive to errors in estimating potential output. Second, it is simple, which promotes accountability. Third, there is a natural exit strategy.
- Pairing a nominal GDP target with additional asset purchases would enhance the credibility of the shift in the short term. And the shift in the target would raise the likelihood that the asset purchases will be effective—making the whole greater than the sum of the parts.

### Nominal GDP Languishes Far Below the Pre-2007 Trend



\* Estimated as level of nom. GDP in 2007Q4 extrapolated backward at historical trend rate of 5.3% and extrapolated forward at assumed 4.5%. Source: Department of Commerce. GS Global ECS Research.

### Lower Unemployment Substantially



Source: GS Global ECS Research.

Jan Hatzius  
jan.hatzius@gs.com  
212 902 0394

Zach Pandl  
zach.pandl@gs.com  
212 902 3393

Alec Phillips  
alec.phillips@gs.com  
202 637 3746

Sven Jari Stehn  
jari.stehn@gs.com  
212 357 6224

Andrew Tilton  
andrew.tilton@gs.com  
212 357 2619

Shuyan Wu  
shuyan.wu@gs.com  
212 902 3053

Maria Acosta-Cruz  
maria.acosta-cruz@gs.com  
212 902 6709

Goldman Sachs

Important disclosures appear at the back of this document.

# I. The Case for a Nominal GDP Level Target

We believe that the best way for the Federal Open Market Committee (FOMC) to deliver significant additional easing would be to target a nominal GDP path such as the one shown in Exhibit 1, indicating that it will use additional asset purchases—and all other available policy instruments—to ensure that actual nominal GDP reverts to trend over the medium term. The target path would remain in place until nominal GDP has converged to it, and would thus constitute a temporary change to the Fed’s monetary policy framework.<sup>1</sup> The instruments for pushing nominal GDP back to the target path could include a commitment to keep the federal funds rate low for as long as needed to put the economy well on its way back to the target path, as well as additional large-scale asset purchases.

The specific path in Exhibit 1 is calculated as the level of nominal GDP in 2007 extrapolated forward at a rate of 4½% per year. We can think of this number as the sum of real potential GDP growth of 2½% and inflation as measured by the GDP deflator of about 2%. The specific numbers matter less than the Fed’s willingness to a target path that is anchored at a point like 2007, when the economy was near full employment, and that they indicate that they will pursue this target aggressively.

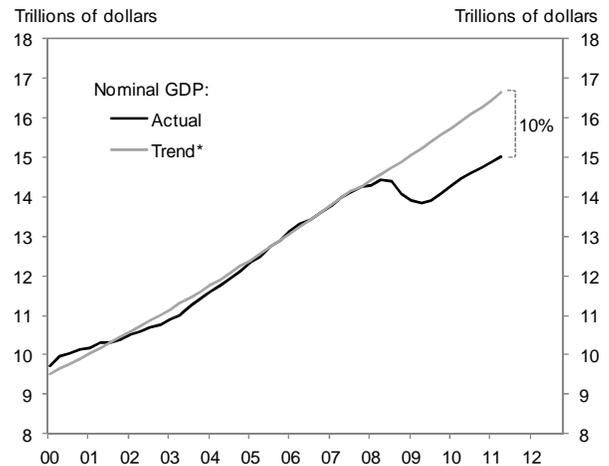
It would also be advisable not to commit to a particular time period over which the target must be reached. While Fed officials have a lot of leeway to enact policies that push nominal GDP higher over the medium term, they do not have enough control to achieve any particular time path for nominal GDP. Committing to a target path that cannot be achieved with sufficient precision would hurt credibility.

The idea of targeting the level of nominal GDP is not new. In a 1994 study, Robert Hall and Gregory Mankiw investigated the potential performance of different nominal income rules.<sup>2</sup> They concluded that “...although nominal income targeting is not a panacea, it is a reasonably good rule for the conduct of monetary policy.” They also found that a rule targeting the *level* of nominal income is likely to work better than a rule targeting the *rate of change*. More recently, bloggers such as Scott Sumner and David Beckworth as well as Financial Times columnist Clive Crook have made the case that Fed officials should target the level of nominal GDP, and at least Sumner

<sup>1</sup> For a discussion whether to adopt nominal GDP targeting on a permanent basis see, for example, Robert Hall and Gregory Mankiw, “Nominal Income Targeting,” in Mankiw, ed., *Monetary Policy*, 1994.

<sup>2</sup> See footnote 1.

**Exhibit 1: Nominal GDP Languishes Far Below the Pre-2007 Trend**



\* Estimated as level of nom. GDP in 2007Q4 extrapolated backward at historical trend rate of 5.3% and extrapolated forward at assumed 4.5%. Source: Department of Commerce. GS Global ECS Research.

goes so far as to argue that failure to do so was responsible for the depth of the 2008 downturn.

## A Different Interpretation of the Dual Mandate

While a shift to a nominal GDP level target would clearly be a big decision for the Fed, it would be quite consistent with the dual mandate to pursue maximum employment and low inflation. After all, nominal GDP is equal to the price level multiplied by real GDP, and real GDP in turn is very closely related to employment via “Okun’s law.” So there is a lot of common ground between a nominal GDP level target and a standard Taylor rule in which the desired stance of monetary policy depends on the deviations of inflation and unemployment from their target rates.

But a nominal GDP level target differs from a standard Taylor rule in two key respects:

### 1. Targeting the price level, not the rate of change.

In a nominal GDP level target, prices enter as a level, while in the standard Taylor rule they enter as a rate of change. There is a long literature on the relative merits and drawbacks of price level vs. inflation targeting, but many studies find that a level target is preferable.<sup>3</sup> The key advantage of a price level target is that it reduces uncertainty about the future price level because the central bank commits to making up for past inflation under- and overshoots. This implies that households and businesses should rationally

<sup>3</sup> See, for example, Lars Svensson, “Inflation Targeting vs. Price Level Targeting: A Free Lunch?” *Journal of Money, Credit and Banking*, 31(3), 1999.

expect higher inflation following a period of economic weakness and sub-trend inflation. This should push down real interest rates and boost economic activity during times of weak growth.<sup>4</sup>

## 2. A bigger weight on output/employment.

A nominal GDP level target increases the relative importance of output or employment. Under the standard Taylor rule, a decline in real GDP by 3% percentage points would call for the same monetary policy adjustment as a decline in inflation by 1 percentage point. But under a nominal GDP level target, a decline in real GDP by 3% would call for the same monetary policy adjustment as a decline in the price level (relative to trend) by as much as 3%. This is likely to mean greater responsiveness to output or employment relative to prices while the nominal GDP level target is in place.<sup>5</sup>

Is such a shift desirable? At least currently, we believe the answer is yes because continued weakness in output and employment would increase the risk that part of the increase in unemployment will eventually turn structural. Fed Chairman Bernanke essentially made this case in his remarks at the 2011 Jackson Hole Symposium: *“Normally, monetary or fiscal policies aimed primarily at promoting a faster pace of economic recovery in the near term would not be expected to significantly affect the longer-term performance of the economy. However, current circumstances may be an exception to that standard view.”* If growth is faster in the near term, this will not only have a near-term but also a longer-term benefit by reducing the risk that unemployed workers become unemployable. This justifies putting more weight on the output and employment part of the dual mandate than under normal circumstances.

## A Powerful Tool

To get a sense of what these two differences between the Taylor-rule setup and a nominal GDP level target might mean in practice, we now use a “toy model” of the economy to simulate its effects. The model consists of a relationship that determines real GDP as a function of the real interest rate and fiscal policy, an Okun’s law equation that translates GDP growth into changes in the unemployment rate, a Phillips curve that determines inflation as a function of the unemployment gap, a Taylor rule that determines the

federal funds rate as a function of inflation and the unemployment gap, and a quantitative easing equation that uses our estimates to “translate” changes in the size of the Fed’s balance sheet into the federal funds rate. A key aspect of the model is the inclusion of endogenous expectations: anticipation of future policy changes are allowed to affect the economy today. The model is described in the box on the next page.

We consider three scenarios that make different assumptions about monetary policy. The first is the baseline assumption that Fed officials follow a standard version of the Taylor rule, without any additional asset purchases relative to current holdings. The second is that Fed officials start targeting the level of nominal GDP beginning next quarter, but again do not opt for any additional asset purchases. The third is that Fed officials start targeting the nominal GDP level and buy as many additional Treasury securities as needed to mimic the effects of a negative funds rate.

Before we discuss the simulation results, we stress two key assumptions. First, and most importantly, we assume that Fed officials can credibly commit to implementing the nominal GDP level target.<sup>6</sup> We will return to this important issue below. Second, our third scenario which allows for asset purchases is an extreme one because it ignores the perceived costs of QE—potential Fed losses and difficulty in exiting from the now-huge portfolio—and because it assumes that QE remains effective even if it is scaled up dramatically further. In practice, we believe that a more realistic case lies somewhere in between the last two scenarios.

The results for unemployment, inflation, the federal funds rate, the size of the Fed’s balance sheet, and the gap between actual nominal GDP and its target are shown in Exhibits 2 to 6. In the baseline scenario, the unemployment rate falls only very gradually, inflation falls to very low levels, and Fed officials start to raise the funds rate in late 2014. Under the nominal GDP target without QE, Fed officials delay the first hike until 2016, which leads to a faster decline in the unemployment rate and a smaller decline in inflation. Finally, under the nominal GDP target with QE, Fed officials expand the balance sheet to about \$5trn, which pushes down the unemployment rate a lot more quickly and slightly raises inflation, and this in turn

<sup>4</sup> See Sven Jari Stehn, “The Fed’s ‘Unconventional’ Unconventional Options,” *US Economics Analyst*, 11/38, September 23, 2011.

<sup>5</sup> Since the Taylor rule depends on the inflation rate while a nominal GDP level target depends on the price level, this statement is a static one and only correct if there is not too much persistence in the inflation process.

<sup>6</sup> For simplicity, we assume that the nominal GDP target is adopted on a permanent basis for the purposes of the simulation. However, assuming a return to a Taylor rule after nominal GDP has reached the target path would not significantly alter the conclusions.

## Our “Toy Economy”

Following previous studies, our “toy economy” consists of the following equations.<sup>7</sup> For simplicity we assume that there are no shocks in the model such that future expected values are equal to actual future values.

**1. An “IS curve.”** The output gap today ( $x_t$ ) depends on the output gap next quarter ( $x_{t+1}$ ) and last quarter ( $x_{t-1}$ ), last quarter’s real federal funds rate—which, in turn, consists of the nominal funds rate ( $i_{t-1}$ ), inflation expectations ( $\pi_{t+1}$ ) and the funds-rate equivalent effect of existing asset purchases ( $q_{t-1}$ )—and the impact of fiscal policy and any private sector balance sheet adjustments that push the output gap away from its normal level ( $f_t$ ):

$$x_t = \frac{1}{3}x_{t+1} + \frac{2}{3}x_{t-1} - 0.09(i_{t-1} - \pi_{t+3} + q_{t-1}) + f_t$$

**2. Okun’s Law.** We then use “Okun’s law” to translate the output gap into the unemployment rate, where  $u_t^*$  is the structural rate of unemployment (currently at around 6%):

$$u_t = u_t^* - \frac{1}{2}x_t$$

**3. A Phillips curve.** In this equation GDP price inflation ( $\pi_t$ ) depends on future inflation ( $\pi_{t+1}$ ) and lagged inflation ( $\pi_{t-1}$ ) and last quarter’s slack in the labor market ( $u_{t-1} - u_{t-1}^*$ ):

$$\pi_t = \frac{1}{3}\pi_{t+1} + \frac{2}{3}\pi_{t-1} - 0.04(u_{t-1} - u_{t-1}^*)$$

**4. A Taylor-type rule.** In the baseline we use our “backward-looking” Taylor rule, which describes how the “warranted” funds rate ( $i_t^*$ ) evolves as a function of inflation and the unemployment gap:

$$i_t^* = 4 + 1.5(\pi_t - 2) - 1.8(u_t - u_t^*)$$

Under the nominal GDP target we assume that the “warranted” funds rate evolves with the deviation from the nominal GDP gap:

$$i_t^* = 0.6(y_t - y_t^*)$$

Given the zero bound of nominal interest rates, we make sure throughout the analysis that the actual funds rate ( $i_t$ ) is not allowed to fall below zero.

**5. Asset Purchases.** In the final scenario we allow for asset purchases to close the gap between the actual and “warranted” funds rate ( $i_t - i_t^*$ ). Our estimates of the effectiveness of QE suggest that around \$1 trillion of purchases is needed to close 100 basis points of this gap.<sup>8</sup>

pulls forward the time of the first rate hike. The behavior of the balance sheet in this scenario is quite extreme: the balance sheet is first quickly expanded through asset purchases and, as the economy rebounds, then quickly returned to the level prior to the regime shift through asset sales. Again, we believe that a more realistic outcome—in which a nominal GDP target is paired with some asset purchases—lies somewhere in between the second and third scenario.

The key mechanism through which the shift from the baseline scenario to the nominal GDP target with QE boosts the economy is a reduction in the real long-term interest rate. This occurs via three channels:

**1. Lower nominal long-term interest rates via a delay in the onset of rate hikes.** As monetary policy needs to stay on hold for longer to reach the nominal GDP target, the first funds rate hike is pushed out to 2016, lowering the long-term interest rate. This, in turn, boosts growth and pushes down the unemployment rate.

**2. Higher inflation expectations and thereby lower real rates.** The reduction in the unemployment rate pushes up inflation and expectations of future inflation, which lowers the real long-term interest rate further.

**3. A lower term premium.** In the third scenario, the asset purchases further reduce long-term interest rates by lowering the term premium. In our scenario the purchase of \$2½ trillion of additional assets lowers the long-term interest rate by about 60bp.

## Comparison with Other Policy Proposals

Two other changes in the Fed’s policy framework have recently been proposed:

**1. Evans proposal.** Chicago Fed President Evans has suggested that the Fed could pledge not to hike interest rates until the unemployment rate declines to 7%-7.5% unless (core) inflation exceeds 3%.<sup>10</sup> The motivation for this proposal is similar to ours, but it is clearly a less aggressive approach for two reasons.

First, the ability of the Evans proposal to lower real rates via higher inflation expectations is weakened by its focus on the rate of change rather than the level of

<sup>7</sup> See, for example, Marc Giannoni and Michael Woodford, “Optimal Inflation-Targeting Rules,” in *The Inflation Targeting Debate*, NBER, 2005.

<sup>8</sup> See “QE2: How Much is Needed?” *US Economics Analyst*, October 22, 2010.

<sup>10</sup> See Charles Evans, “The Fed’s Dual Mandate Responsibilities and Challenges Facing U.S. Monetary Policy,” [www.chicagofed.org](http://www.chicagofed.org).

prices. Suppose that a shock lowers the rate of inflation in the first year after the adoption of the Evans proposal. Unlike a nominal GDP level target, the Evans proposal would not make up for this decline in inflation in subsequent years. This means that the boost to inflation expectations and the decline in real interest rates would be smaller.<sup>11</sup> Second, Evans does not explicitly call for additional asset purchases but relies only on a commitment to hike the funds rate later. This would probably help at the margin, but a more aggressive approach would be more powerful.

**2. Price level target.** Another proposal is to adopt a price level target. While this has some desirable features, we believe that a nominal GDP target is preferable for three reasons. First, it avoids the complicated issues surrounding the choice of which price level to target; these include the choice of the price index—the CPI, the PCE deflator or the GDP deflator—and whether to focus on headline or core measures. Second, a nominal GDP target would likely call for more stimulus in the current environment than a price level target, as nominal GDP is much further away from its pre-crisis trend than most price indexes. Third, a price level target would be much less palatable politically. Higher inflation is not popular, and it would be an uphill struggle to convince the public that targeting a higher price level will help the economy.

**But Credibility is Key**

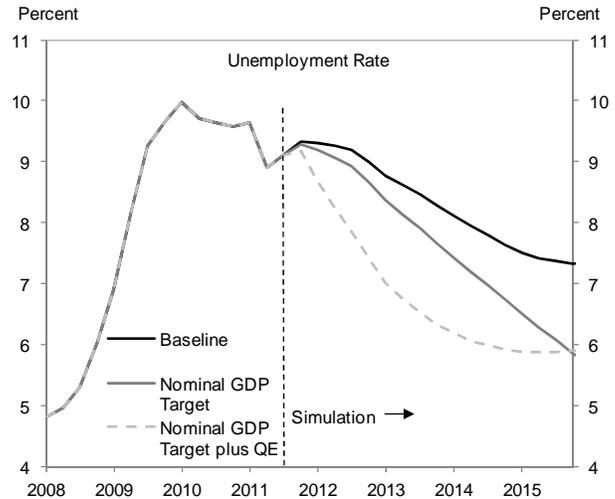
The sharp improvement in economic performance shown in Exhibits 2 to 6 depends critically on the assumption that the announcement of a nominal GDP level target is viewed as credible by the markets and the public.<sup>12</sup> In particular, the public must believe that nominal GDP growth will pick up in the short term, but that it will again slow to the long-term target rate of 4½% after the initial gap has been unwound. If this credibility is lacking, then the policy will be much less successful. On the one hand, if the public doesn't believe that nominal GDP growth will rise in the short term, then output expectations will remain depressed. On the other hand, if the public doesn't believe that nominal GDP growth will come back down after the target has been reached, long-term interest rates may rise sharply, which would weigh on the economy.

Two aspects of the nominal GDP level target would help its credible implementation:

<sup>11</sup> For a formal treatment of this point see Gauti Eggertsson and Michael Woodford, "The Zero Bound on Interest Rates and Optimal Monetary Policy," *Brookings Papers on Economic Activity*, 34, 2003.

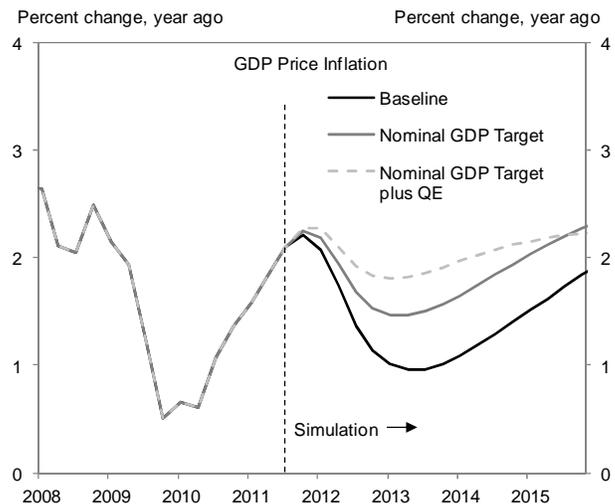
<sup>12</sup> We discussed these credibility issues in more detail in Sven Jari Stehn, "The Fed's 'Unconventional' Unconventional Options," *US Economics Analyst*, 11/38, September 23, 2011.

**Exhibit 2: A Nominal GDP Level Target Could Lower Unemployment Substantially**



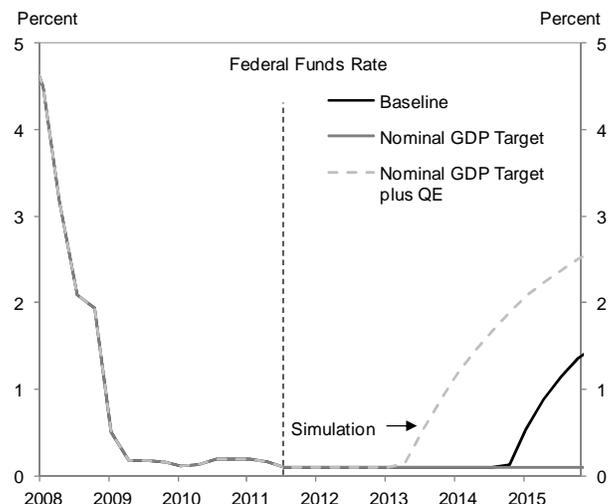
Source: GS Global ECS Research.

**Exhibit 3: Nominal GDP Target Keeps Inflation Stable**



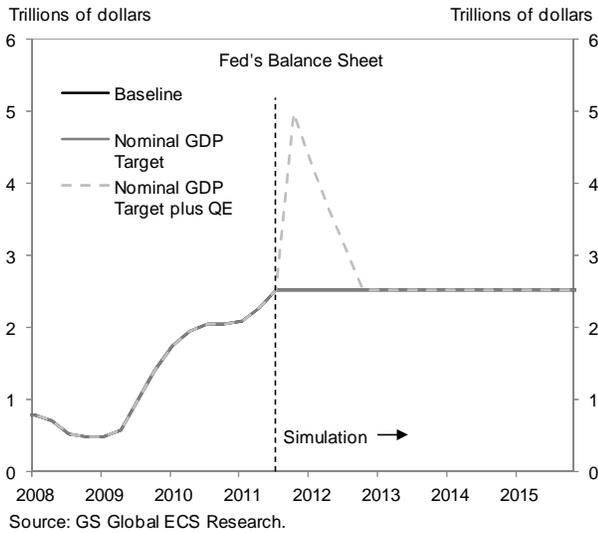
Source: GS Global ECS Research.

**Exhibit 4: Nominal GDP Target Implies an Earlier Onset of Fed Rate Hikes**

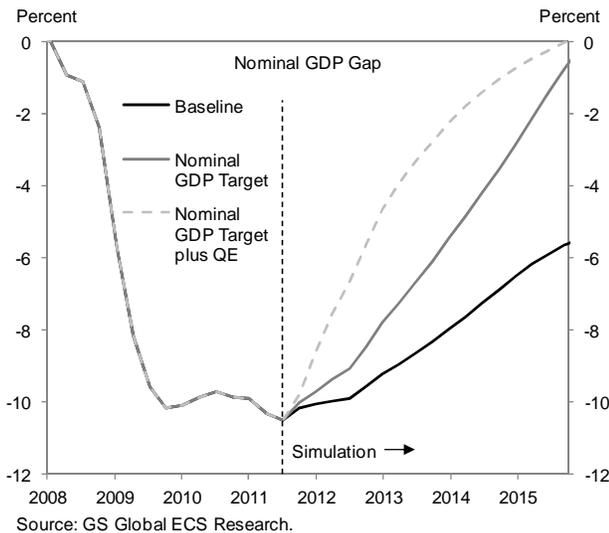


Source: GS Global ECS Research.

**Exhibit 5: A Sharp but Temporary Expansion in the Fed's Balance Sheet**



**Exhibit 6: Unwinding the Nominal GDP Gap**



**1. Simplicity and transparency.** The simplicity of a nominal GDP level target should increase the Fed's ability to steer the public's expectations. In the short run, a nominal GDP level target would give a clear indication as to how much stimulus is needed. In particular, it would be much more transparent than the current regime where the policy targets and the trade-offs between them are not quantified, leaving considerable ambiguity about the extent to which the FOMC is committed to undoing a deviation of output or employment from potential. Publishing a nominal GDP target path—and thus a clear exit point for the expansionary policy—should be helpful in containing upward pressures on long-term inflation expectations that are likely to occur following a period of stronger nominal GDP growth.

**2. No reliance on measures of the output gap.** We believe that most of the weakness in real GDP since 2007 represents a cyclical output gap, which underpins our view that more monetary easing would be appropriate. But some economists believe that most of the recent weakness in the economy is structural. In their view, a very expansionary policy that attempts to close the—in their view largely imaginary—output gap would run the risk of generating higher and higher inflation. It would be a potential rerun of the 1970s, when Fed officials kept policy too loose for too long because they had an overoptimistic view of the economy's supply potential.<sup>13</sup>

But a nominal GDP level target is more robust to errors in estimating potential output—and thus to concerns about runaway inflation. If potential real GDP growth is slower or the gap is smaller than anticipated, this would result in a bit more inflation, but it would not result in ever-increasing inflation.

To see this for the case of errors in estimating potential GDP growth, suppose that Fed officials chose a 4½% trend nominal GDP growth rate in the belief that potential real GDP growth is 2½% and a 2% inflation target. But suppose also that they found out at some point in the future that true potential GDP growth is only 1½% (a very pessimistic assumption). This implies that a 4½% nominal GDP growth rate would translate into a 3% inflation rate in the long term, a rate that is unlikely to make a major difference to economic performance.

Similarly, errors in estimating the starting level of the output gap would also have only a limited impact on inflation. The nominal GDP gap in Exhibit 1 was 10% for the second quarter of 2011. We believe that the output gap—that is, the difference between actual and potential *real* GDP—accounts for about 6 percentage points of the nominal GDP gap. So a full elimination of the nominal GDP gap over a 4-year period would imply inflation of 1 percentage point per year above the target, or about 3%. In contrast, if the true output gap is not 6% but only 2%—again a very pessimistic assumption—then a full elimination of the nominal GDP gap over a 4-year period would imply inflation of 2 percentage points per year above the target, or about 4%.

If we assume that potential growth is slower *and* the output gap is smaller, then inflation could rise to 5% in the transition period. While this is high by recent standards, even a 5% inflation rate would still be far

<sup>13</sup> The standard reference in this context is Athanasios Orphanides, "Monetary Policy Rules Based on Real-Time Data," *American Economic Review*, 91(4), September 2001, pp. 964-985.

below the peak rates seen in the 1970s. More importantly, as long as Fed officials make it clear that they will strongly resist continuation of the temporarily faster nominal GDP growth after the return to trend, it is unlikely that temporarily higher inflation would undermine the Fed's credibility in the same way as the accelerating inflation of the 1970s.

### **Not a Panacea, But Probably the Best Option**

Under our forecast of high (and gradually rising) unemployment coupled with renewed disinflation, further monetary policy easing would be appropriate. We believe that a nominal GDP level target paired with additional large-scale asset purchases would be a good framework to deliver such easing. Asset purchases enhance the credibility of the shift in the target, and the shift in the target raises the likelihood that the asset purchases will be effective. The whole is greater than the sum of the parts. The case for such a policy would strengthen further if inflation fell sharply and the risk of deflation reappeared clearly on the radar screen.

The credibility of the policy could be strengthened further via a broadening of the assets to be purchased and/or renewed fiscal expansion. But these policies would probably require the explicit cooperation of Congress, which seems unlikely for the foreseeable future. Thus, we believe that the Fed's most promising option for delivering significant further policy easing would be a shift to a nominal GDP level target coupled with large-scale asset purchases.

**Jan Hatzius**

**Sven Jari Stehn**

# US Calendar

## Focus for the Week Ahead

- The major price indexes likely increased again in September. We forecast that the Produce Price Index (PPI) increased by 0.5% after an unchanged reading in August (October 18). We expect that the Consumer Price Index (CPI) rose by 0.28%, or 0.18% excluding food and energy (October 19). The deceleration in the core (from +0.24% in August) reflects an expected cooling in rent and apparel inflation.
- We expect mixed news on the housing-related data released next week, with starts rising by 3.0% (October 19) but existing home sales falling by 4.0% (October 20).
- The Philadelphia Fed index will be closely watched for clues on the near-term cyclical outlook. We project another improvement to -7.0 from -17.5 previously (October 20).

Date	Time (EST)	Indicator	Estimate		
			GS	Consensus	Last Report
Mon	Oct 17	8:30 Empire Manufacturing Survey (Oct)	n.a.	-4.0	-8.8
		9:15 Industrial Production (Sep)	+0.3%	+0.2%	+0.2%
		9:15 Capacity Utilization (Sep)	77.4%	77.5%	77.4%
Tue	Oct 18	8:30 Producer Price Index (Sep) Ex Food & Energy	+0.5%	+0.2%	Flat
			+0.2%	+0.1%	+0.1%
		9:00 Net Long-Term TIC Data (Aug)	n.a.	n.a.	+\$9.5bn
		10:00 Homebuilders' Survey (Oct)	n.a.	15	14
Wed	Oct 19	12:30 Bernanke spks at Boston Fed Conference			
		8:30 Consumer Price Index (Sep) Ex Food and Energy	+0.3%	+0.3%	+0.4%
			+0.2%	+0.2%	+0.2%
		Consumer Price Index NSA	226.910	226.931	226.545
		8:30 Housing Starts (Sep)	+3.0%	+3.6%	-5.0%
Thu	Oct 20	14:00 Fed's Beige Book			
		8:30 Initial Jobless Claims	n.a.	400,000	404,000
		8:30 Continuing Claims	n.a.	3,680,000	3,670,000
		10:00 Existing Home Sales (Sep)	-4.0%	-2.6%	+7.7%
		10:00 Philadelphia Fed Survey (Oct)	-7.0	-9.0	-17.5
	10:00 Leading Indicators (Sep)	n.a.	+0.2%	+0.3%	

We, Jan Hatzius, Zach Pandl, Alec Phillips, Sven Jari Stehn and Andrew Tilton hereby certify that all of the views expressed in this report accurately reflect personal views, which have not been influenced by considerations of the firm's business or client relationships.

### Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs, and pursuant to certain contractual arrangements, 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 & Partners Australia Pty Ltd (ABN 21 006 797 897) on behalf of Goldman Sachs; in Brazil by Goldman Sachs do Brasil Banco Múltiplo S.A.; in Canada by Goldman Sachs & Co. regarding Canadian equities and by Goldman Sachs & Co. (all other research); 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 & Partners New Zealand Limited on behalf of Goldman Sachs; 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. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

**European Union:** Goldman Sachs International, authorized and regulated by the Financial Services Authority, has approved this research in connection with its distribution in the European Union and United Kingdom; Goldman Sachs AG, 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. 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. SIPC: Goldman, Sachs & Co., 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 our proprietary trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, our proprietary trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

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.

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/publications/risks/riskchap1.jsp>. Transactions cost may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

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 all research available on a particular stock, please contact your sales representative or go to [www.360.gs.com](http://www.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.

**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.**

© Copyright 2011, The Goldman Sachs Group, Inc. All Rights Reserved.