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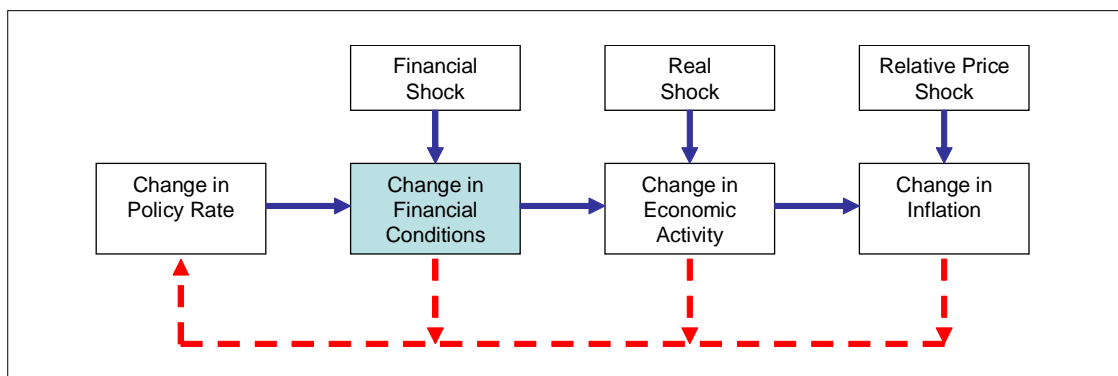
FINANCIAL CONDITIONS WATCH

GLOBAL FINANCIAL MARKET TRENDS & POLICY

MICHAEL R. ROSENBERG

Inside This Issue:

Fed Funds Rate Outlook — A Taylor Rule Perspective



"Monetary policy works in the first instance by affecting **financial conditions**, including the levels of interest rates and asset prices. Changes in **financial conditions** in turn influence a variety of decisions by households and firms, including choices about how much to consume, to produce, and to invest."

Federal Reserve Chairman Ben S. Bernanke, March 2, 2007

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Overview

Fed Funds Rate Outlook — A Taylor Rule Perspective

With U.S. real GDP growth moving back into positive territory in the second half of 2009 following four consecutive quarters of negative growth (see Figure 1), the economic forecasting community appears to be increasingly optimistic about the U.S. economy's growth prospects for 2010-11. According to Bloomberg's latest survey of 57 economists (as reported on {ECFC}), the U.S. economy is expected to grow by 2.7% in 2010 and 2.9% in 2011 (see Figure 2). These projections represent a significant rebound from the 2.5% decline expected for 2009.

It should be noted that U.S. economic recoveries are typically more robust than what is being predicted for 2010-11. The reason for the more muted projected recovery pattern is that the 2008-09 downturn was not your garden-variety recession. The historical record indicates that when a recession is triggered by a serious financial cri-

sis, both the supply and demand for credit tend to remain weak in the early stages of a recovery as financial institutions rebuild their depleted capital positions and as households and businesses unwind excessive amounts of leverage built up in the preceding boom period.

Research on the history of financial crises finds that in episodes where financial stress has been highly elevated, the decline in output has often exceeded 5% from peak to trough, and that it often takes several years before economic growth returns to pre-crisis norms. Indeed, a newly released report by the McKinsey Global Institute ("Debt and Deleveraging: The Global Credit Bubble and Its Economic Consequences") finds that real GDP growth tends to contract during the first 2-3 years of a typical post-crisis deleveraging process, with GDP growth not returning to pre-crisis norms until the fourth or fifth year of the deleveraging cycle (see Figure 3).

Figure 1

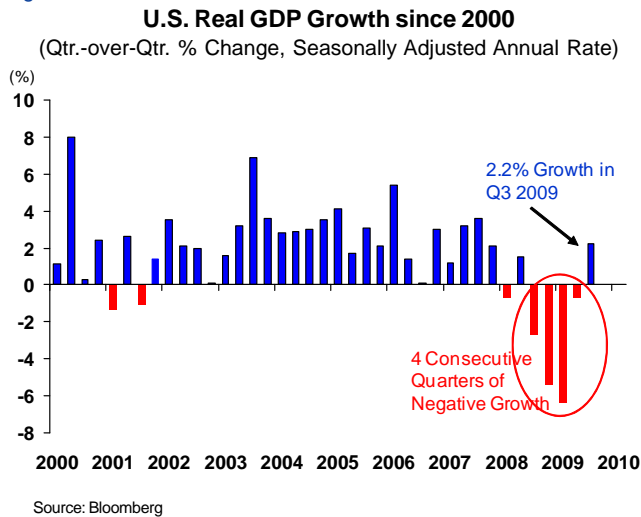


Figure 2

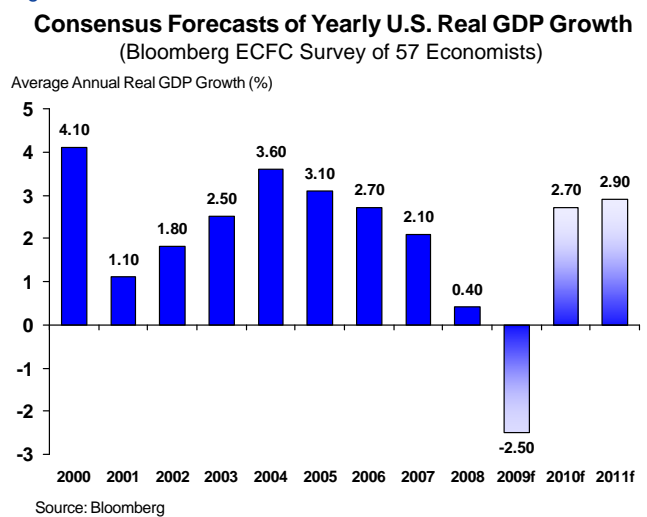
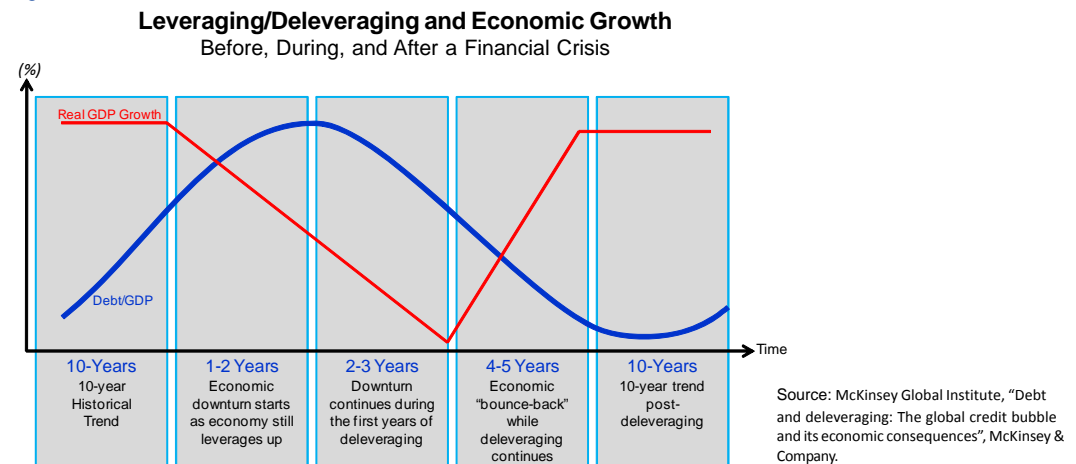


Figure 3



If the U.S. economy were to recover from the 2007-09 recession along the path outlined by the McKinsey study, a sustained rebound in real GDP growth back to pre-crisis norms would probably not occur until 2012 at the earliest. Yet, the consensus forecasts for the U.S. economy depicted in Figure 2 suggest a quicker return to pre-crisis norms.

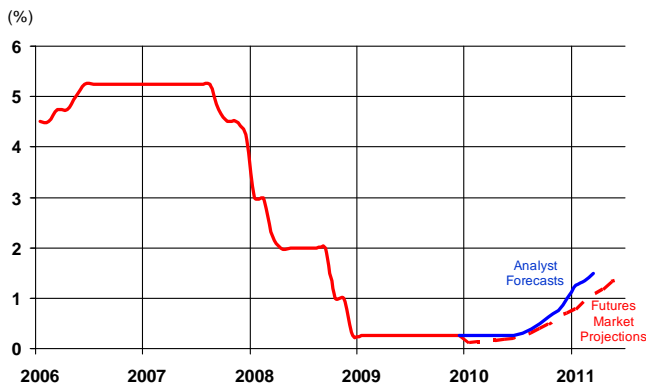
What probably distinguishes the current recovery process from a typical post-crisis recovery path has been the magnitude and timing of the policy response. In previous crises, the magnitude of the policy response has often not been of sufficient size, or the stimulus was not delivered in a timely fashion. This time around, the amount of monetary and fiscal policy stimulus has been extraordinary in terms of both size and timing. This has raised hopes that the pace of the U.S. economic recovery will prove to be far more ebullient than a typical post-crisis recovery pattern.

Indeed, judging by expectations of the future course of U.S. short-term interest rates, the market appears to believe that the U.S. recovery will prove to be stronger than

a typical post-crisis recovery. Expectations for higher short-term interest rates are reflected both in the Fed Funds futures market and in the consensus interest-rate projections of leading economists (as reported in Bloomberg's latest {BYFC} survey). As shown in Figure 4, the futures market is pricing in Fed rate hikes that will take the Funds rate to around 0.75% by year-end 2010 and to around 1.00% by February 2011. The forecasting community believes the Fed will be even more aggressive as they expect the Fed to hike the Fed Funds rate to 1.75% by mid-2011.

While it is certainly the case that the Fed will eventually have to push its policy rate higher, there is reason to believe that the policy-rate path predicted in Figure 4 might be overly aggressive. Indeed, as we demonstrate below, the market's projection for Fed rate hikes is not consistent with the path forecasted by conventional Taylor Rule models. If we input the Federal Reserve's forecasts for core inflation and unemployment into a variety of Taylor Rule-type models, we actually end up with a zero or negative Fed Funds rate projected for all of 2010 and, in a number of cases, for 2011 as well.

Figure 4
Futures Market and Analyst Forecasts
of the U.S. Fed Funds Rate
 (Fed Funds Futures Market and BYFC Analyst Forecasts)



Source: Bloomberg

The Taylor Rule

The Taylor Rule, which was devised by Professor John B. Taylor of Stanford University, is a simple mathematical formula that describes the fundamental criteria that a central bank should consider when setting its policy rate. As described in Equation 1, the Taylor Rule breaks down the Federal Reserve's decision-making process into two parts: (1) a neutral setting for the Fed Funds rate, and (2) the recommended deviation from that neutral setting.

$$i_{Taylor} = (r_N + \pi^*) + [\alpha (\pi - \pi^*) + \beta (y - y^*)] \quad (1)$$

	$(r_N + \pi^*)$	+	$[\alpha (\pi - \pi^*) + \beta (y - y^*)]$	
Taylor Rule Prescribed Policy Rate	Neutral Policy Rate	+	Taylor Rule Recommended Deviation from the Neutral Rate Setting	

The neutral rate setting for the Fed Funds rate consists of two components: (1) a neutral real rate (r_N), generally assumed to be around 2%, and (2) the Fed's implicit target for inflation (π^*), as measured by the core personal consumption expenditure rate (core PCE), which we assume to be around 1.5%. Hence, the neutral nominal Fed Funds rate setting would be on the order of 3.5%.

Recommended deviations from this neutral setting are assumed to be driven by two key fundamental criteria: (1) the inflation gap, which is defined as the deviation of the actual core PCE inflation rate from the Fed's inflation target ($\pi - \pi^*$) multiplied by the policy-response coefficient, alpha (α) which is often assumed to equal to 1.5; and (2) the output gap, which is defined as the deviation of the actual level of output from the economy's potential level of output ($y - y^*$) multiplied by the policy-response coefficient, beta (β), which is often assumed to equal 0.5.

Substituting the values of those parameters into Equation 1 gives you :

$$i_{Taylor} = (2.0 + 1.5) + [1.5 (\pi - 1.5) + 0.5 (y - y^*)]$$

to which you can substitute the current rates of inflation and output to derive the Taylor Rule prescribed level of the Fed Funds Rate.

The Taylor Rule prescribes the specific amount by which the nominal Fed Funds Rate should rise relative to the neutral rate setting if actual inflation exceeds the Fed's implicit target. That is, if $(\pi - \pi^*) > 0$, the nominal Fed Funds rate should rise by 1.5 times the inflation gap, assuming the policy response coefficient $\alpha = 1.5$. For example, if actual inflation rate exceeds the Fed's implicit inflation target by 1%, then the Fed Funds rate should rise by 1.5 percentage points. This will insure that if inflation rises above target, then the "real" Fed Funds rate will rise to slow domestic demand enough to gradually bring the inflation rate back to its targeted level.

Similarly, everything else being equal and assuming an output policy-response coefficient $\beta = 0.5$, if the actual level of output exceeds the economy's potential level of output by 1%, the Taylor Rule prescribes that the nominal Fed Funds rate (and thus the real Fed Funds rate) should rise by 0.5 percentage points. Such a move will insure that domestic demand will slow over time to bring the actual level of output in line with the economy's long-run potential.

The Taylor Rule can be rewritten by substituting the unemployment gap for the output gap. Historically, there has been an inverse relationship between the level of the output gap and the unemployment gap (defined as the difference between the natural rate of unemployment, NAIRU, and the actual unemployment rate). That is, when output falls below potential, the unemployment rate tends to rise relative to the natural rate of unemployment and vice versa. The inverse relationship has been referred to as Okun's Law, which is depicted in Equation 2.

$$(y - y^*) = Okun * (U_N - U) \quad (2)$$

$(y - y^*)$	=	Okun	*	$(U_N - U)$
Output Gap	=	Okun Factor	*	Unemployment Gap

According to Equation 2 and assuming an Okun coefficient of 2.0 (which is broadly in line with historical estimates) and a natural rate of unemployment of 5% (which is in line with the Congressional Budget Office's estimate), if the actual unemployment rate stands at 5.5%, that would translate to an output gap of -1.0% (i.e., $-1.0 = 2.0[5.0 - 5.5]$).

Substituting Equation 2 into Equation 1 yields a modified version of the Taylor Rule in Equation 3, which indicates that deviations from a neutral Fed Funds rate setting will be driven by the deviation of inflation from the Fed's implicit inflation target and the deviation of the unemployment rate from its natural level. It is this version of the Taylor Rule that appears on the {TAYL} function on the Bloomberg terminal.

$$i_{Taylor} = (r_N + \pi^*) + [\alpha (\pi - \pi^*) + \beta(Okun)(U_N - U)] \quad (3)$$

	$(r_N + \pi^*)$	+	$[\alpha (\pi - \pi^*) + \beta(Okun)(U_N - U)]$	
Taylor Rule Prescribed Policy Rate	Neutral Policy Rate	+	Taylor Rule Recommended Deviation from the Neutral Rate Setting	

We consider four different iterations of a modified Taylor Rule to come up with a range of estimates for the appropriate Fed Funds rate setting in 2010 and 2011, using the Federal Reserve's own forecasts for the core PCE inflation rate and the unemployment rate.

further to 8.4% by end 2011. On the inflation front, the Fed is optimistic that core-PCE inflation will remain tame at around 1.25%-1.30% in 2010-11, which would mean that inflation for the next two years will lie somewhat below the Fed's implicit inflation target.

As shown in Figure 5, the Fed is projecting that the U.S. unemployment rate will decline gradually from its present reading of 10% to 9.5% by end-2010 and then decline

We input these projections into the {TAYL} function on Bloomberg (see Figure 6) to derive a projected path for the Fed's policy rate (see Figure 7).

Figure 5

Federal Reserve and Consensus Forecasts of 2010-11 Inflation and Unemployment
{ECFC <go>}

<HELP> for explanation. Index ECFC
<MENU> to return SCHEMA MODE

Economic Projections of the Federal Reserve
Actual / Forecasts

Indicator	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Economic Activity										
1) Real GDP (yoy %)	1.80	2.50	3.60	3.10	2.70	2.10	0.40	-0.21	3.00	3.95
2) Composite								-2.50	2.70	2.90
3) CPI (yoy %)	1.58	2.28	2.68	3.38	3.23	2.87	3.85	-0.35	1.45	1.45
4) Composite									2.10	2.05
5) Core PCE (yoy %)	1.73	1.53	2.09	2.26	2.29	2.36	2.40	1.45	1.25	1.30
6) Composite								1.50	1.20	1.50
7) Unemployment (%)	5.80	6.00	5.50	5.10	4.60	4.60	5.80	9.30	9.50	8.40
8) Composite									10.00	9.00

Figures shown are mid-points of the ranges on the central tendencies table on the Federal Reserve published economic projections.

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000 Japan 81 3 3201 6500 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2010 Bloomberg Finance L.P. SN 229941 6357-556-0 25-Jan-2010 10:39:56

Source: Bloomberg

Figure 6

Bloomberg's Taylor Rule Model
{TAYL <go>}



Source: Bloomberg

Because there is some debate on whether the appropriate level for the unemployment-gap response coefficient (β) should be 0.5, as in Professor Taylor's original formulation, or 1.0 as suggested in Taylor's later writings, or whether the natural rate of unemployment (NAIRU) is still 5% or has increased to 6% during the recent downturn, we consider four alternative versions of the Taylor Rule that allow for these different assumptions of β and NAIRU.

As we show in Figure 8, in Rule 1 we set NAIRU equal to its commonly assumed value of 5% and set beta equal to 0.5, the value used in Taylor's original formulation. In Rule 2, we assume that policymakers respond to changes in unemployment more forcefully by setting beta equal to 1.0. In Rule 3 we assume that the natural rate of unemployment is now 6% because of the enormous amount of dislocations caused by the recent crisis and set beta equal to 0.5. In Rule 4, we set NAIRU at 6% and assume a more forceful response by policymakers to changes in unemployment by setting beta equal to 1.0.

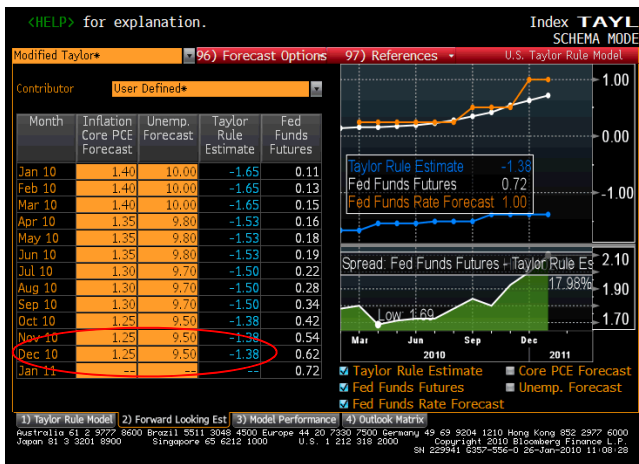
Inputting the Federal Reserve's own forecasts for core PCE inflation and unemployment into Rules 1-4, none of these versions of the Taylor Rule would prescribe a policy rate above zero in 2010. In fact, only Rule 3 would pre-

scribe a Fed Funds rate above zero in 2011, while the other three rules would prescribe a negative Fed Funds rate in 2011. Overall, the simulated policy rate paths suggest that Fed Fund rate hikes are not warranted in 2010, and a case could be made that no rate hikes should be forthcoming through at least the first half of 2011 as well.

If the Fed Funds rate were not to remain at zero in the coming months, but instead moved in line with the path predicted by the Fed Funds futures market or the path predicted by analysts in {BYFC}, then according to policy-rate prescriptions outlined in rules 1-4, monetary policy would be inordinately tight in 2010-11, which could seemingly choke off any potential recovery. Depending on which of the rules depicted in Figure 8 is used, the gap between the Taylor Rule-prescribed rates and the market's implied forecast of the policy rate could turn out to be quite wide—from as low as 1.1% to as high as 6.6% (see Figure 9).

In our view, it would be difficult for the Fed to justify rate hikes in line with market expectations if those rates deviated so far from Taylor Rule policy prescriptions. Remember, the Fed has been criticized rather harshly for keeping the Fed Funds rate too low for too long (relative to

Figure 7
Taylor Rule Prescriptions for the Fed Funds Rate Using Fed Projections for Inflation and Unemployment



Source: Bloomberg

Figure 8

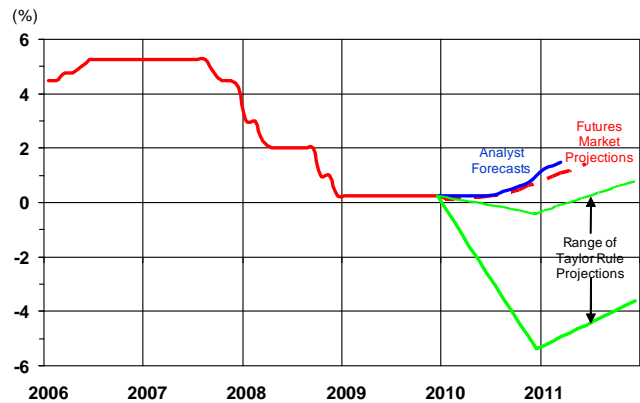
Modified Taylor Rule Policy-Rate Prescriptions

Using Federal Reserve Forecasts of Inflation and Unemployment and Selected Parameters

Taylor-Type Rule	Response Coefficients			Assumptions			FOMC Inflation Rate Forecasts		FOMC Unemployment Rate Forecasts		Year-End Projected Fed Funds Rate	
	Inflation α	Output β	Okun Factor	Neutral Real Rate r^N	Inflation Target r	Neutral Unemployment Rate (NAIRU) U^N	2010	2011	2010	2011	2010	2011
1 NAIRU = 5%, b = 0.5	1.5	0.5	2.0	2.0%	1.5%	5.0%	1.25%	1.30%	9.5%	8.4%	-1.4%	-0.2%
2 NAIRU = 5%, b = 1.0	1.5	1.0	2.0	2.0%	1.5%	5.0%	1.25%	1.30%	9.5%	8.4%	-5.9%	-3.6%
3 NAIRU = 6%, b = 0.5	1.5	0.5	2.0	2.0%	1.5%	6.0%	1.25%	1.30%	9.5%	8.4%	-0.4%	0.8%
4 NAIRU = 6%, b = 1.0	1.5	1.0	2.0	2.0%	1.5%	6.0%	1.25%	1.30%	9.5%	8.4%	-3.9%	-1.6%

Source: Bloomberg; Federal Reserve

Figure 9
Taylor Rule and Market Projections of the U.S. Fed Funds Rate



Source: Bloomberg

Taylor Rule prescriptions) during the 2002-05 period, and ultra-low rates may have played a contributing role in the housing bubble and the financial crisis that followed. This time around, the Fed could open itself up to further criticism if monetary policy became too tight too soon.

If the Fed were to start lifting the Fed Funds rate higher beginning in the second half of 2010 and if that tightening were accompanied by an early exit from the Federal Reserve's Large Scale Asset Purchase (LSAP) program, the combination of the two policy steps could have a pronounced negative effect on the long end of the U.S. bond market. Since the Fed Funds rate was effectively pushed to the zero bound in December 2008, the Federal Reserve has been shifting its policy emphasis away from directly influencing the level of short-term interest rates to directly and indirectly influencing the level of long-term interest rates. This new policy focus is depicted in the flow diagram in Figure 10.

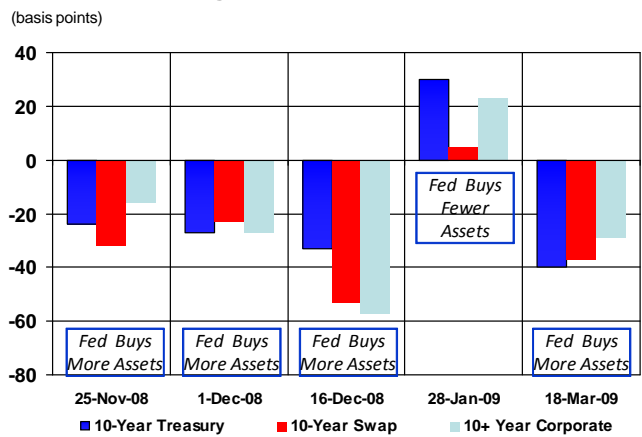
As shown in Figure 10, the Fed has been able to influence the long end of the yield curve through a variety of channels. Because long-term interest rates are a weighted average of the current and expected future level of short-term interest rates, the setting of a low policy rate by the Fed, coupled with a commitment to maintain the policy rate at a low level for an "extended period", has helped exert downward pressure on long-term Treasury yields.

In addition, the Federal Reserve's LSAP program has also contributed to lower long-term interest rates, not only in the Treasury market, but in the mortgage and corporate bond market as well. The size of the LSAP program has been unprecedented—involving the Fed's purchase of \$300 billion in Treasuries and \$1.25 trillion in agency debt and agency mortgage-backed securities.

As Figure 10 indicates, the Fed's asset purchases have helped to lower the term premium on U.S. Treasuries and at the same time have directly helped to narrow the spread between mortgages and Treasuries, while indirectly narrowing the spread between corporate and Treasury bonds. The Fed estimates that the LSAP program has had substantial effects on long-term interest rates. As Figure 11 reports, the cumulative impact of the LSAP announcements on longer-term yields is estimated to have been on the order of 50-100 basis points.

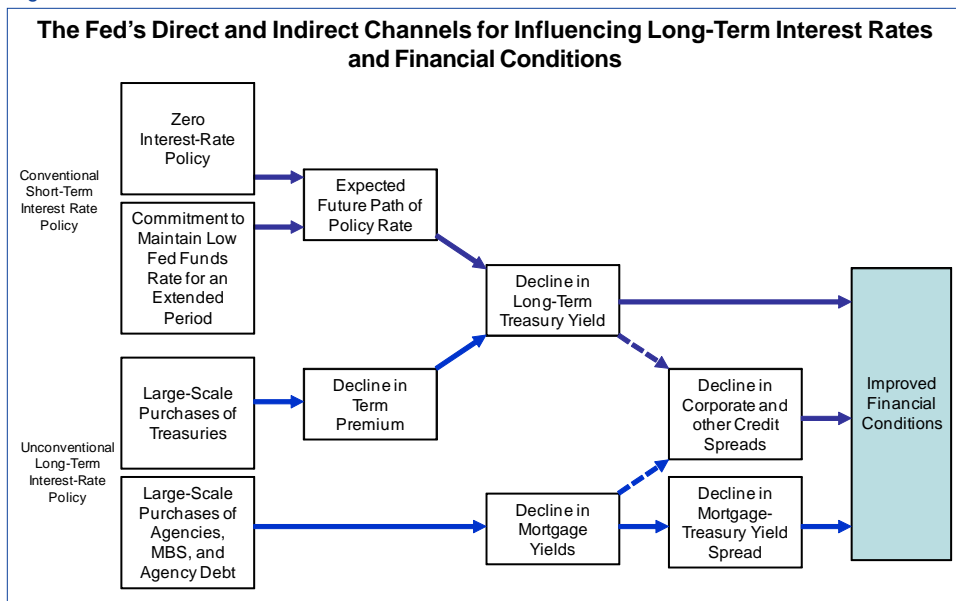
The flow diagram in Figure 10 highlights the risks to the longer end of the bond market if the Fed were to (1) start raising the Fed Funds rate, (2) end its commitment to keep rates low for an extended period, and (3) begin to gradually unwind its LSAP program. Not only could long-term Treasury yields rise significantly, but credit spreads could widen significantly as well. Higher long-term yields and wider yield spreads, in turn, might then exert a nega-

Figure 11
U.S. Bond Market Reaction to Fed Announcements of Long-Term Asset Purchases



Source: Joseph Gagnon, EconBrowser, November 20, 2009

Figure 10



Source: Bloomberg

tive impact on the U.S. equity market. The end result of all this could be a generalized downturn in financial conditions, which might then exert a negative drag on the U.S. economy.

The overall trend in U.S. financial conditions has been undergoing a broad-based improvement since the third quarter of 2008, as indicated by the trend in Bloomberg's Financial Conditions Index, {BFCIUS Index}, which monitors the level of stress in the U.S. financial markets by gauging how far trends in U.S. money-market spreads, bond-market spreads, and key equity-market indicators are deviating from historical norms. The index actually moved back into positive territory in January 2010 for the first time since July 2007 (see Figure 12) and a large part of the improvement in financial conditions can be attrib-

uted to the Fed's aggressive easing initiatives and its LSAP program.

A premature exit from the Fed's easing initiatives could drive the BFCIUS Index back into negative territory, signaling a deterioration in financial conditions that could hinder the budding U.S. economic recovery. Indeed, because the trend in the BFCIUS Index tends to lead changes in GDP growth (see Figure 13), it is highly unlikely that the Fed will want to deviate from its current, cautious approach to monetary-policy management. It would therefore seem likely that the forecasts of aggressive rate hikes presently being projected by market participants and economists will eventually need to be revised downward.

Michael R. Rosenberg
mrosenberg10@bloomberg.net

(212) 617-3984

Figure 12

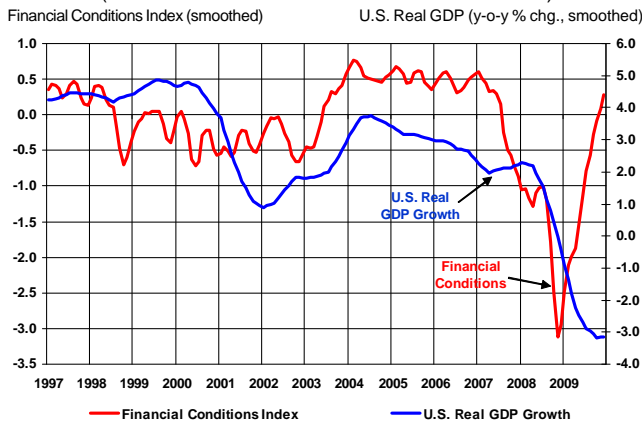
Bloomberg's Financial Conditions Index
 {BFCIUS Index}



Source: Bloomberg

Figure 13

Financial Conditions and U.S. Real GDP Growth
 (2008-09 Actual and 2010-11 BYFC Forecasts)



Source: Bloomberg