Some Empirical Evidence on the Effectiveness of Monetary Policy at the Zero Bound

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The effectiveness of monetary policy options at the zero bound is arguably the single most important question facing monetary policymakers today. We have very limited experience with such policies, and, even where we do have some experience, there is understandable uncertainty about the effects. There is, as a result, considerable question, inside and outside the FOMC, about the effectiveness of these policies. In this paper, we first discuss the paper by James Hamilton and Jing Wu on this important topic and then provide some the research findings at Macroeconomic Advisers on the effect of several monetary policy options at the zero bound. We focus on the effect of a resumption of large-scale asset purchases (LSAPs), both because that is the focus of the Hamilton-Wu paper and because it seems virtually certain to be the first easing action taken by the FOMC, and almost certainly at the next FOMC meeting. We also discuss research at Macroeconomic Advisers on the power of communication and the effect of money-financed fiscal stimulus, which are other options for the Committee, and offer some comments on another option, targeting the ten-year Treasury yield.

Hamilton's Methodology and Findings

I very much liked the Hamilton-Wu paper. They used a methodology that was completely different, and more explicitly theoretically grounded, than what we have done at Macroeconomic Advisers[1] and what Gagnon *et al* did.[2] The fact that Hamilton-Wu's results are so close to ours and their's gives us great comfort!

Hamilton-Wu posit a world with two types of investors: preferred habitat investors (buy securities of maturity *n*, with a demand function that is increasing in the *n*-year yield) and arbitragers (buy any asset based on a simple trade-off between risk and expected return).[3] Relative to our approach, Hamilton-Wu use a well-defined structural framework for analyzing the problem, especially one that takes into account arbitraging behavior of market participants. We had such a framework in the back of our minds when we designed our empirical analysis, but our results were ultimately based on reduced form regressions and event studies.

There are three points of agreement. First, the empirical results are, as noted above, very similar to ours. Hamilton-Wu find that $400 billion of purchases of Treasury notes would result in a 14-basis-point drop in the ten-year yield. Our estimate, scaled to a $400 billion

[1] See our *Fixed Income Focus* commentary, "Quantifying the Effects of Fed Asset Purchases on Treasury Yields," Macroeconomic Advisers, June 17, 2010.
[2] See Joseph Gagnon, Matthew Raskin, Julie Remache, and Brian Sack, "Large-Scale Asset Purchases by the Federal Reserve: Did They Work?" Federal Reserve Bank of New York Staff Report no. 441, March 2010.
[3] His approach has some similarities and differences from our approach in a recent commentary on the effect of the zero bound on the yield curve. See our *Fixed Income Focus* commentary, "Mind the Curve! Market Expectations and the Zero Bound," Macroeconomic Advisers, September 7, 2010. The similarities are (1) the focus on latent factors that would prevail if the zero bound were not binding; and (2) estimating the model by using a sample period before the recent episode (then short rates are at the zero bound). But his model is very different from ours: Our focus was on how the zero bound option premium was affecting the shape and level of the curve; his focus was on how the interactions between preferred-habitat investors and arbitragers might affect the shape and level of the curve.

purchase, is that the effect is about 13 basis points. That is remarkable. It must be the truth!

Second, we also believe that pushing additional reserves into the system would, in itself, be fruitless, though I am not sure if Hamilton-Wu reach that conclusion for the same reason we do. We distinguish *quantitative easing* and *credit easing*: Quantitative easing focuses exclusively on the level of reserves. In this case, it does not matter how the FOMC puts reserves into the system; it might as well buy Treasury bills to distort markets the least. The same operations can be, in our view, better understood as credit easing.[4] In this interpretation, what matters is what you buy and how much you buy. LSAPs, for example, stimulate aggregate demand by lowering long-term rates and risk spreads, working through the same transmission mechanism from monetary policy action to financial conditions, and eventually to aggregate demand. The difference today is that the FOMC cannot initiate this mechanism by lowering the funds rate; it has to begin it by operating directly on long-term rates or risk spreads.

Third, we also agree that, in principle, Treasury debt management is a perfect substitute for FOMC purchases of longer-term Treasuries. Treasury debt management has the advantage, importantly, of getting the job done without expanding the Fed's balance sheet. The FOMC has been reluctant to further expand its balance sheet because of the high costs the Committee assigns to doing so; but there is a threshold that has apparently already been met. With respect to the maturity structure of the debt held by the public, the Fed and Treasury operations effectively intersect: Treasury debt management policy and LSAPs by the FOMC. Which one should defer to the other? I think the answer is very clear, to a point. Any policy that is directed at affecting interest rates to stimulate aggregate demand is the province of the Fed, that is, monetary policy. But the concern about expanding the balance sheet could, interestingly, trump this if the Fed would otherwise need to buy up all government debt (or anything close to that.) So the story is, given the uncertainty about the outlook, never say never!

[4] Credit easing is a term almost always used by Chairman Bernanke to describe these operations. See, for example, "The Crisis and the Policy Response," Speech by Ben S. Bernanke, January 13, 2009.

The Effect of a Resumption of LSAPs

We take this opportunity to discuss our research on the effects of LSAPs on the ten-year Treasury yield. We also take the empirical analysis a step further by estimating the effect of the decline of the ten-year yield on the unemployment and inflation rates.

How much did the first round of LSAPs lower the ten-year yield? An Event Study
We start by estimating the effect of the first round of asset purchases.[5] We assume that the effect on the ten-year yield reflected the combined $1.75 trillion in purchases of agency MBS, agency debt, and longer-term Treasuries.[6] Then we do an event study of the impact of the announcement of those purchases, and complement that with an econometric study to separate the effect of the increase in purchases from any change in expectations about the future path of the funds rate, for example, reflecting incoming data on the strength of the expansion.

Table 1 shows our findings with respect to the first round of asset purchases.[7] The event study focuses on three announcements: (1) The FOMC's original announcement on November 25, 2008 that it would buy up to $600 billion in agency MBS and debentures; (2) a speech by Chairman Bernanke on December 1, 2008 where he mentioned the possibility of Fed purchases of longer-dated Treasuries; and (3) the FOMC statement on March 18, 2009 that it would buy up to $300 billion of Treasuries and significantly expand its agency securities purchase program, from up to $500 billion to up to $1.25 trillion for agency MBS and from up to $100 billion to up to $200 billion for agency debentures.

Table 1
One-Day Change in the Ten-Year Treasury Yield

Event Date	(bps)
March 18, 2009 (FOMC Announcement)	-51
November 25, 2008 (FOMC Announcement)	-24
December 1, 2008 (Bernanke Speech)	-21
Total	**-96**

Source: Federal Reserve.

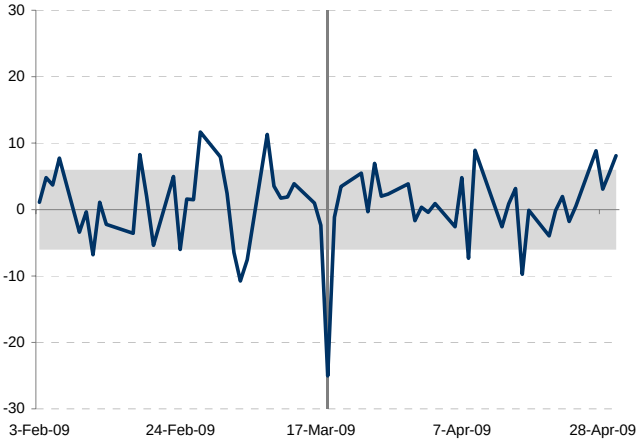
Table 2
Regression Results for the March 2009 Announcement

Dependent Variable: Daily Change in Ten-Year Treasury Yield		
	(1)	(2)
Change in two-year OIS rate	2.163	1.827
	(6.734)	(11.491)
Dummy variable		-29.077
		(-15.240)
R-squared	0.691	0.795

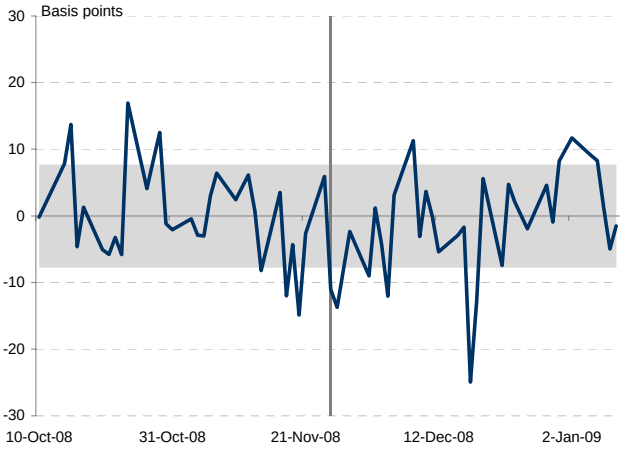
Note: Heteroskedasticity- and autocorrelation-consistent t-statistics in parentheses. The dummy variable is set to one on the day of the event, and zero elsewhere. Changes in the Treasury yield and the OIS rate are measured in basis points.

[5] This section is based on our *Fixed Income Focus* commentary, "Quantifying the Effect of Fed Asset Purchases on Treasury Yields," June 17, 2010.
[6] Treasuries and MBS are not perfect substitutes because MBS also have prepayment risk. Nevertheless, they are identical in their removing duration from the markets.
[7] In an earlier *Fixed Income Focus* commentary, "Were Treasury Purchases Effective? Don't Just Focus on Treasury Yields," November 30, 2009, we argued that the relatively quick backtracking in Treasury yields in the weeks following the Fed's announcement of its Treasury securities purchases is not itself evidence that the program did not achieve its goal of improving financial conditions. Specifically, there could have been other factors—such as an improving economic outlook, new issuance, and the return of investors' risk appetite that could have pushed yields higher over that period.

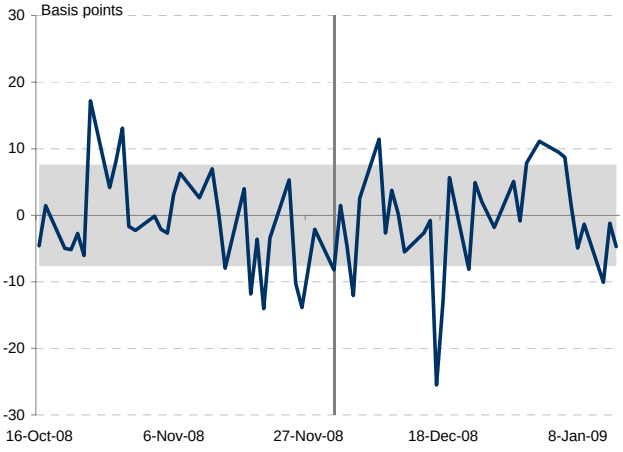
Figure 1
Regression Residuals
March 18, 2009: FOMC Announcement



November 25, 2008: FOMC Announcement



December 1, 2008: Bernanke Speech



Source: Federal Reserve, Bloomberg, and Macroeconomic Advisers.

Note: Vertical lines mark the day of each event. Shaded areas show the residuals' one standard-deviation bands.

The ten-year Treasury yield dropped noticeably on the days of each announcement. As shown in Table 1, the cumulative decline in the ten-year yield amounted to almost 100 basis points on the three days. However, we do not take this directly as an estimate of the effect of the purchase program. One needs to control for other factors that could potentially explain those movements in the ten-year yield, such as changes in market expectations about the future path of the funds rate. In addition, one needs to allow for the possibility that part of the initial declines was a knee-jerk reaction that was reversed in subsequent days. Below we address these considerations with the help of a regression analysis framework.

Regression analysis of the effect of LSAP on the ten-year yield

To illustrate the basic approach, we use the March 18, 2009 announcement. We started by focusing on the 61-day window centered on that announcement. We regress daily changes in the ten-year yield on daily changes in the two-year OIS rate, which we use as a proxy for market expectations of the future path of the funds rate. The results are summarized in column 1 of Table 2. They suggest that nearly 70% of the daily variation of the ten-year yield in the weeks that surrounded the March 2009 FOMC announcement was attributable

to changes in market participants' fed funds rate expectations. The result highlights the importance of controlling for policy expectations when attempting to measure the effect of purchase announcements on the ten-year term premium.[8]

The top panel of Figure 1 shows the regression residuals. The shaded area corresponds to a one standard-deviation band, and the vertical line in the middle of the panel marks the day of the announcement. The key result here is that, on the day of the announcement, the equation made a very large negative error that was well outside the one standard-deviation band. Indeed, the error was greater than four standard deviations that day. The top panel of Figure 1 also hints that, at least a large portion of the negative error was long-lasting, in that there is no string pattern of positive residuals in the days that followed that announcement.

A more formal approach for examining the effect of the announcement is to directly measure it by introducing a dummy variable in the regression equation. The dummy variable is set to one on the day of the announcement and zero elsewhere. Intuitively, the regression coefficient captures the lasting effect of the announcement, if any. As shown in column 2 of Table 2, we estimate that coefficient to be -29.1, suggesting that the March announcement lowered the ten-year premium by 29 basis points, and that such an effect was not reversed during the sample period.

We conducted the same analysis for the November 25, 2008 FOMC announcement and for the December 1, 2008 speech by Chairman Bernanke. The main findings are summarized in Table 3 and in the middle panels of Figure 1. The results provide evidence of announcement effects, though not as strong as for the March 2009 announcement. In particular, as shown in Figure 1, the residuals that correspond to the regression that did not include dummy variables—the results of which are shown in columns 1 and 3 of Table 3—were negative on both 2008 dates, but they fell not too far from their one-standard-deviation bands.

Based on the regressions that included the dummy variables, the estimated effects of these two 2008 announcements were statistically significant, but not as large as the March 2009 announcement. In particular, the results indicate that the November announcement lowered the ten-year premium by 12 basis points—Table 3, column 2—

Table 3
Regression Results for the November 2008 FOMC Announcement and the December 2008 Bernanke Speech

Dependent Variable: Daily Change in Ten-Year Treasury Yield

	November 25, 2008 FOMC Announcement		December 1, 2008 Bernanke Speech	
	(1)	(2)	(3)	(4)
Change in two-year OIS rate	0.937	0.891	0.998	0.960
	(6.136)	(6.037)	(6.220)	(5.694)
Dummy variable (Nov. 25, 2008)		-11.706		
		(-5.748)		
Dummy variable (Dec. 1, 2008)				-8.714
				(-4.038)
R-squared	0.430	0.451	0.410	0.422

Note: Heteroskedasticity- and autocorrelation-consistent t-statistics in parentheses. Each dummy variable is set to one on the day of the event, and zero elsewhere. Changes in the Treasury yield and the OIS rate are measured in basis points.

[8] It is possible that the purchase announcement also affected market expectations of the funds rate, if market participants inferred that the FOMC's plans to buy longer-dated assets also meant it would keep the funds rate unchanged for a longer period.

suggesting that only one half of the decline of the ten-year yield on that day was attributable to a lasting effect of the announcement. Our estimate of the effect of the Chairman's December 1 speech was even more modest: nine basis points, as shown in Table 3, column 4.

Taken together, our regression-based results suggest that only about one half of the cumulative decline in the ten-year yield on the three days examined—Table 1—could be directly attributable to a lasting effect of asset purchase communications.

We also obtained results based on a single regression, encompassing all three events and a much longer sample from October 1, 2008 through April 30, 2010. Our main results remained largely intact, though the combined effect of the three events was a bit larger, close to 60 basis points.

In Table 4 we compare the estimates of the effect on the ten-year yield of $400 billion of purchases of Treasuries by the FOMC, based on Hamilton-Wu, Gagnon *et al*, and Macroeconomic Advisers, reinforcing the similarity of the results.

Table 4

Effect on the Ten-Year Yield of $400 Billion of Purchases of Treasuries by the FOMC

Study	Estimated Effect (bps)
Macroeconomic Advisers*	13
Gagnon *et al**	13
Hamilton-Wu	14

*We computed these estimates from the midpoints of ranges cited by the authors.

Would the effect of a second round of purchases be smaller?

We use the above results as a point of departure to examine the potential effect of LSAPs in stimulating aggregate demand. Before doing so, we ask whether the effect of a second round of LSAPs on the ten-year yield will be the same or smaller.

There are some reasons to think it will be smaller, though this conclusion is not definitive. First, markets were less liquid then and the lower liquidity amplified the effect of purchases. Second, the ten-year yield is much lower today, and it seems plausible that the lower the initial rate, the smaller the effect of a given size of purchases on rates. As a result, our estimate of the impact of a resumption of LSAPs on the ten-year yield may be an upper-end estimate.

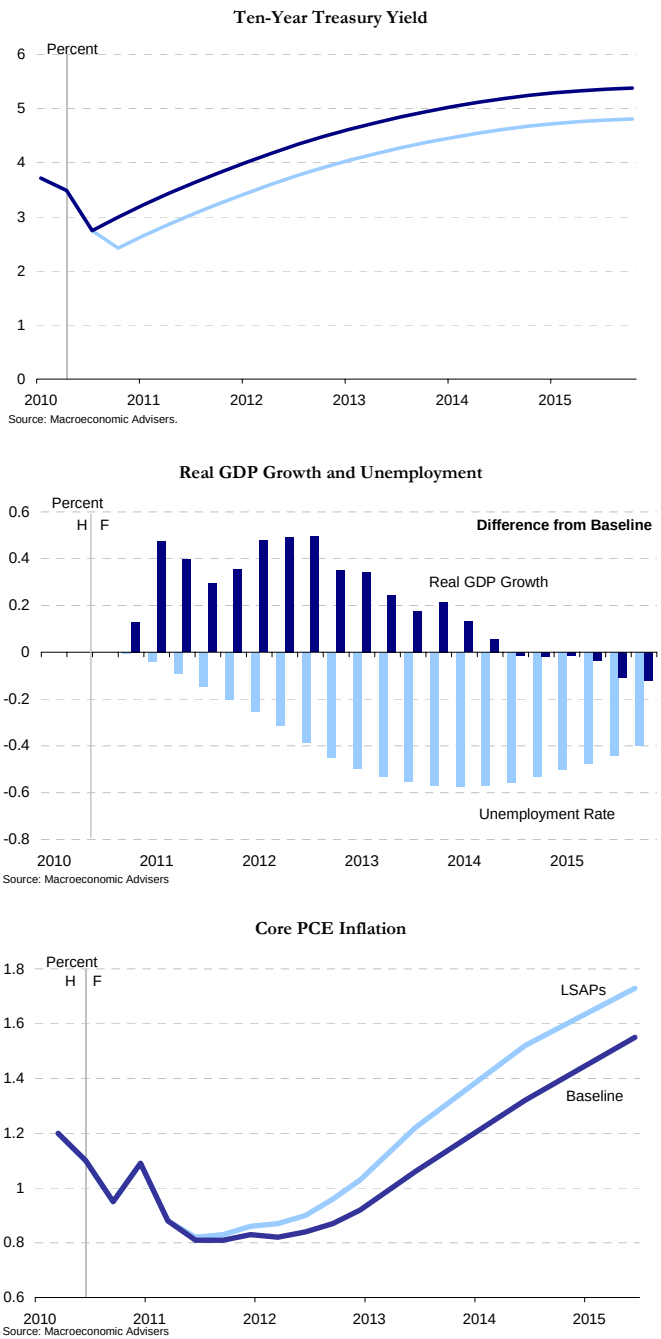
Estimating the macro effects of LSAPs

The final step is to estimate the effect of the decline in the ten-year yield on aggregate demand, and hence on the unemployment rate and inflation. We do so by simulating the effect of a 50-basis-point decline in the ten-year yield, using our large scale structural macro-econometric model.

MA's model has properties that are neo-Keynesian in the short run and neo-classical in the long run. It is theoretically grounded, empirically calibrated and, in some cases, forward looking. It is widely used for forecasting and policy analysis by the U.S. government, by central banks around the world, by our model-using clients, and, of course, by us.

We find that a 50-basis-point decline in the ten-year Treasury rate, as a result of $2 trillion additional Treasury purchases, would, of course, lower the unemployment rate and raise inflation over the intermediate term. In that sense, LSAPs work. But, in the scale we assume, LSAPs is not a game changer. We estimate that it would lower the unemployment rate by only ½ percentage point by the end of 2012 and only marginally raise the inflation rate. Of course, if the effects are linear, we can always estimate, in principle, the size of asset purchases that would produce whatever macro effects the FOMC wants. But we also have to remember the limited tolerance of the FOMC to further expand its balance sheet. Today, the amount of Treasuries held outside the government is about $8½ trillion; presumably the Fed will be reluctant to hold too large a proportion of that debt on its balance sheet. A cumulative increase of $2 trillion to a balance sheet of $4 trillion may already exhaust, if not exceed, that tolerance.

Figure 2
Effect of LSAPs



The Power of Communication

We now turn to three other options at the zero bound: using FOMC communication, setting an explicit target for the ten-year Treasury yield, and engineering a money-financed fiscal stimulus.

We start with the use of FOMC communication to affect longer term rates, an option that has been discussed around the FOMC table. The statement after the September FOMC meeting is an example of FOMC communication getting the job done, in this case, moving forward expectations of the resumption of LSAPs.[9]

Much of the discussion about communication options, however, has been centered on the rate guidance in the FOMC's statement: Today that guidance is: "The Committee …continues to anticipate that economic conditions…are likely to warrant exceptionally low levels for the federal funds rate for an extended period." The intent of this language is obviously to push back expectations of the timing of the first increase in the policy rate relative to what was then built into markets. It is well appreciated that the effectiveness of monetary policy is based on, not only the current setting of the policy rate, but also market expectations of the future path of that rate. Conveying expectations about the future path of the policy rate is always important and increases the effectiveness of policy. But at the zero bound, it is especially important, given the absence of the ability to lower the funds rate further.[10]
Rate guidance is, first of all, a signal about future policy. But, like a change in the funds rate itself, communication can affect expectations about the future path of the policy rate, and, therefore, affect longer-term interest rates and broad measures of financial conditions. Of course, a signal has to be validated by action later or the effect will disappear sooner or later.

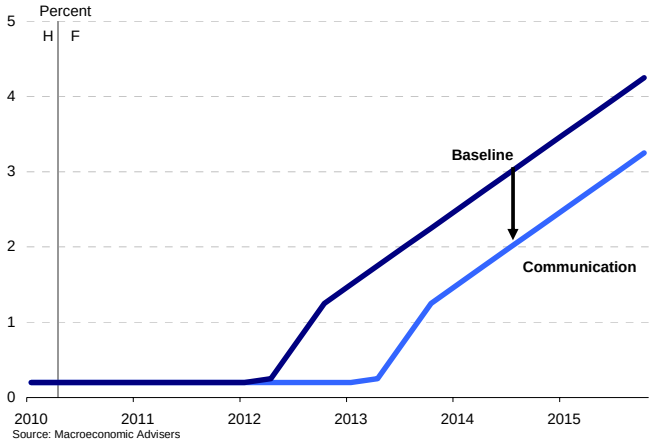
We present here a simple analysis of the effect of a change in the policy guidance that pushes back market expectations of the timing of exit. We start from expectations built into the markets today that the first increase in the funds rate will be in mid-2012. We then assume that the FOMC is effective in pushing back market expectations by one year.

[9] Such communication also limits the surprise about the policy announcement at the November meeting. Avoiding discrete market surprises also appears to be a goal of the FOMC.
[10] This option is always likely to be the first to be implemented, today especially, because it does not require an expansion of the Fed's balance sheet and can be understood in terms of the old regime where policy affects the economy through the policy rate setting and expectations of the future path of the policy rate.

The result depend, of course, on the effect on longer-term rates of expectations about the future path of the funds rate (the well-known "expectations theory" of the term structure of rates). We assume, in line with this framework, that the ten-year yield depends on expectations (the expected path of the funds rate over ten-years) and the term premium (the excess return for the risk of holding term assets). We assume that the change in expectations in this case drives the impact of communication on the ten-year yield. We take expectations over the first two years from market pricing, and then assume that market expectations converge to ours. There is, of course, a terminal point, our estimate of the nominal equilibrium funds rate (the equilibrium real rate plus the FOMC's inflation objective). Next we assume that FOMC communication is successful in extending the "extended period." Figure 3 depicts the results.

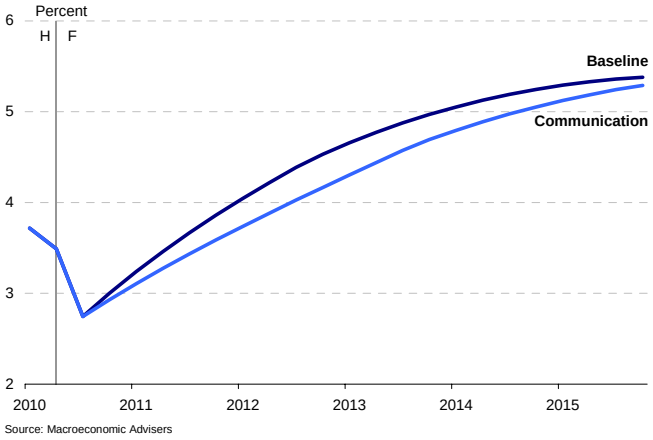
Figure 3

Federal Funds Rate: Market Expectations



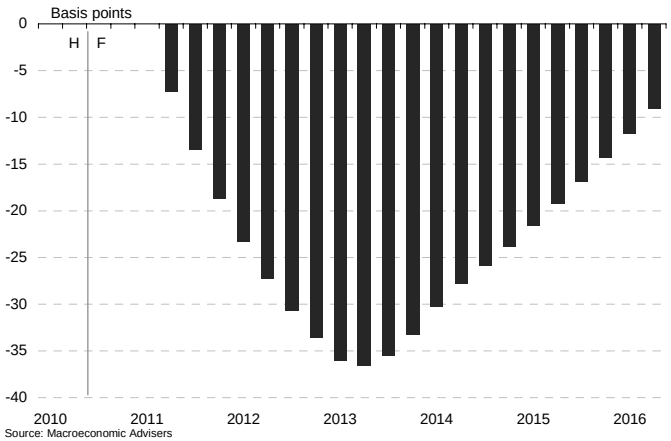
Source: Macroeconomic Advisers

Ten-Year Treasury Yield



Source: Macroeconomic Advisers

Change in Ten-Year Treasury Yield



Source: Macroeconomic Advisers

Communication matters. But pushing back market expectations by one year at this time has only a temporary peak affect of 35 basis points after about six quarters, and then fades to zero. The further out expectations are changed, the smaller the effect of pushing those expectations back by another year.

Today, we would argue that the use of communication intended to shift back expectations about the timing of exit, especially alone, would be puzzling to the markets, even if effective as discussed above. The time for focusing on exit is over. Today, the question is whether, when, and how the FOMC will ease. That is what we want to hear about. That is what the FOMC should communicate about.

Targeting the Ten-Year Yield: Powerful if Feasible

If LSAPs do not have a large enough effect, the next option on the table might be to target the ten-year yield. That is, the FOMC could set an explicit target for the ten-year yield and buy Treasuries as needed to hit the target. This is another option offered by Bernanke in his 2002 speech.

It is important to appreciate that LSAPs and long rate targeting (LRT) are cousins. After all, with LSAPs, the FOMC sets a quantity and the markets determine the price. With LRT, the FOMC sets a price and the markets determine the quantity. LSAPs have the advantage of leaving the FOMC in control of its balance sheet, but at the expense of leaving the effect on the ten-year yield uncertain. The obvious disadvantage of LRT is that the Committee gives up control of the size of its balance sheet. Given the limited tolerance for a further expansion of its balance sheet, the hurdle for implementing LRT is very high, much higher than for LSAPs. But what if LSAPs have a disappointing macro effect and at the same time the outlook continues to deteriorate and the economy is sliding toward recession and deflation? Certainly then, if not before, LRT presumably would be on the table, reflecting an increased tolerance of the Committee for further aggressive expansion in its balance sheet, a tolerance that presumably increases as the outlook deteriorates.

While LSAPs and LRT may be cousins, as noted above, even so, one is bigger than the other. LSAPs, in our modeling, result in a one-time effect on the ten-year yield, sustained as long as the assets remain on the Fed's balance sheet. In contrast, the macro effect of LRT builds over time, as long as the target ten-year yield remains unchanged, but so does the need to buy assets, because the stimulus provided by LTR is proportional to the difference between the target rate and what the ten-year yield would have been in the absence of imposing the target. As the economy improves over time, the ten-year yield would increase in the absence of a target for that rate. To maintain the ten-year target in this case, the Fed would have to buy more and more Treasuries. The further expansion of the balance sheet in this case would be a measure of the degree of additional stimulus from maintaining an unchanged ten-year yield target.

There is, however, a real question (including among market participants) if LRT is even a feasible option. For example, at the target ten-year yield, would *everyone* want to sell their Treasuries to the Fed? In addition, we noted above that there is a limit to how many Treasuries that the FOMC can buy (the outstanding debt) and is willing to buy. As noted above there is about $8.4 trillion of government debt held by the public. Of this, $5.1 trillion is outstanding in the five- to ten-year maturity range where the FOMC would likely prefer to operate. If the FOMC buys too much, it would effectively make the Treasury market irrelevant for pricing any other security. The Treasury market would become detached from the state of the economy.[11] This is not an acceptable outcome.[12]

[11] However, that might mean that those who wanted duration would have to buy it elsewhere, thus driving up prices in other bond markets.

[12] Of course, this is not a binding constraint, because the FOMC could also resume buying agency MBS and debentures, as it certainly would in this case. The outstanding volume of agency MBS is around $10 trillion, so more than the outstanding Treasuries. So we also have to ask if there is a limit to the FOMC's willingness to hold these

There might, however, be a fortuitous outcome. First, the ten-year yield might instantly go to the target when the FOMC announces it; no Treasury purchases are necessary at this point. This is the case, after all, when the FOMC announced a change in its federal funds rate target. Second, perhaps, and I only say perhaps, the FOMC might have to purchase fewer Treasuries if, at this point, market participants didn't want to "fight the Fed." Maybe! But, this might be wishful thinking.

An obvious problem with LRT is the challenge of exit. We expect that uncertainty about the ability to smoothly exit from LRT weighs heavily on whether or not the Committee even wants to put this option seriously on the table. Certainly a decision to exit abruptly would lead to a discrete and unacceptably large increase in the ten-year yield. Equally important, as the markets perceive that the target was close to being removed, the FOMC would have to purchase more and more and more Treasuries to sustain the target.

We believe that, there might, and we emphasize might, at least in principle, be a workable exit strategy for LRT. When the FOMC wants to withdraw the stimulus from the ten-year yield target, and avoid a discreet jump in rates, perhaps it can exit by gradually but steadily raising the ten-year yield target toward the (implicit but unknown) "market rate."

In any case, we will be simulating the effect of a ten-year Treasury rate target (assuming that this option is feasible and the "solution" to the exit problem is as set out above).

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assets. Clearly, they would today prefer to buy only Treasuries. But we should not rule out purchases of agency MBS and debentures if the Committee judges that still more stimulus is called for and they have reached the limit of how much of outstanding Treasuries it wants to have in its portfolio. And, of course, there is always the option of asking the Treasury to help via a change in its debt management policy.

The Most Powerful Macro Policy at the Zero Bound: Money-Financed Fiscal Stimulus

The Chairman in his 2002 and 2003 speeches singled out fiscal stimulus accommodated by monetary policy as the most powerful macro policy at the zero bound.[13] The FOMC, in this case, accommodates the new fiscal stimulus by preventing the increase in aggregate demand (or in Treasury issuance) to raise interest rates relative to what they otherwise would have been.[14] That is, they combine fiscal stimulus with LSAPs.

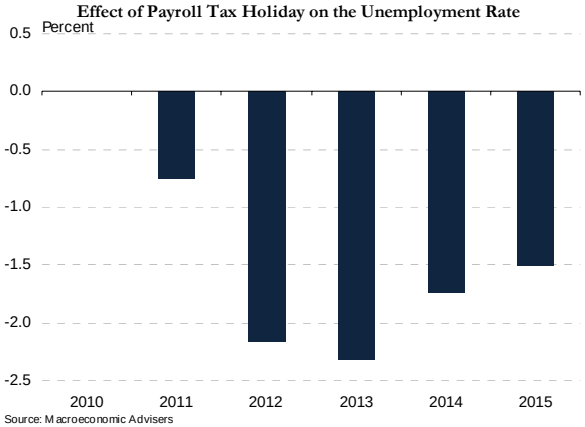
The stimulus afforded by this policy combination will, of course, only be as powerful as the size of the fiscal stimulus. But monetary accommodation will make sure that the macro effect of any fiscal stimulus is the largest possible.

We simulate the effect of this by assuming a fiscal stimulus comprised of a payroll tax holiday for two years.[15] Here we do so under the assumption that the funds rate remains at the zero bound and that the FOMC engages in LSAPs to limit any increase in longer term rates. However, if this policy option is very powerful, it is possible that monetary policy may have to tighten sooner than otherwise.

A two-year payroll holiday would directly lower taxes by about $1 trillion dollars in 2011 and 2012, a larger stimulus than in the first Obama package, and more front-loaded as well.[16]

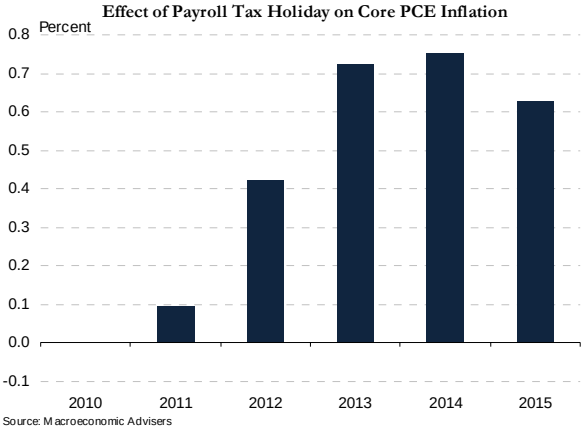
Figures 4 and 5 show the effect on the unemployment and inflation rates. The

Figure 4
Effect of Payroll Tax Holiday on the Unemployment Rate



Source: Macroeconomic Advisers

Figure 5
Effect of Payroll Tax Holiday on Core PCE Inflation



Source: Macroeconomic Advisers

[13] See, for example, "Deflation: Making Sure 'It' Doesn't Happen Here," Speech by Ben. S. Bernanke, November 21, 2002, and "Some Thoughts on Monetary Policy in Japan," Speech by Ben S. Bernanke, May 31, 2003.

[14] This is equivalent to the FOMC following a policy that results in a flat LM curve which ensures that the fiscal stimulus will have the largest effect (have the largest multiplier) possible.

[15] The effect of the first stimulus signed by President Obama is very controversial, though the political rhetoric about the failure of this program, is just, well, political rhetoric. But there is a deeper uncertainty reflected in different views even among economists. Our estimates of the effect of the first package are found in several MA *Macro Focus* commentaries. See, for example, "Fiscal Stimulus One Year On," Macroeconomic Advisers, February 19, 2010. We believe that the stimulus did have a significant effect, and, therefore, than a second one would also, indeed a more powerful and front-loaded effect that the last one if structured, for example, as a payroll tax holiday.

[16] We selected this form of fiscal stimulus because we thought it might have the best opportunity for bi-partisan support. Republicans always love tax cuts! And Republicans (as well as Democrats) would applaud the incentive this provides for firms to hire workers. And Democrats simply want stimulus.

unemployment rate falls by two percentage points by 2012 and 2013, and the inflation rate increases by more than half of a percentage point by 2013. There would of course be a pay-back effect at the end of the two years, again presenting a challenge to sustain above-trend growth when the stimulus abruptly ends. But hopefully, by this time, credit markets will have substantially healed and de-leveraging may be completed.

The Bottom Line

The FOMC appears ready to implement its first option, LSAPs, for providing additional monetary stimulus to lower the unemployment rate and increase inflation towards its dual mandate. It is important, therefore, to look at estimates of the effect of LSAPs using different methodologies. If they give us very similar results, as we found here with the Hamilton-Wu paper and research at Macroeconomic Advisers and in Gagnon *et al*, we will have more confidence in the results.

LSAPs, while the first easing option, may not be the last. We therefore explore the effectiveness of other options, specifically FOMC communication, targeting the ten-year yield, and money-financed fiscal stimulus. The latter two could be very powerful, though with much higher threshold for action than LSAPs. But, given the uncertainty about the outlook, and the very significant downside risks starting from such a high unemployment rate and low inflation rate, we sum up the threshold for the latter two options as: Never say never!