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Monetary Policy at the Zero Bound

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The Federal Open Market Committee (FOMC) has been implementing monetary policy by setting a target for the federal funds rate since about 1990. Implementing monetary policy by setting a target for the funds rate enabled policymakers and monetary policy analysts to characterize changes in the stance of monetary policy by simply observing whether the target was increased or decreased. However, with the federal funds rate target currently between zero and 25 basis points, the FOMC can no longer ease policy by reducing the target rate given the zero lower bound on nominal interest rates.[1] Instead, the Federal Reserve has attempted to ease policy by engaging in quantitative easing (QE): the large-scale purchase of government and other securities with the primary intent of reducing longer-term interest rates.

Given the difficulty of characterizing monetary policy using QE, it is natural to want to equate a given quantity of assets purchased with a given reduction in the federal funds rate target in an environment when the FOMC could reduce the target. Indeed, in a Congressional hearing on February 9, 2011, Representative Tim Huelskamp questioned how the Fed "picked $600 billion" when the FOMC decided on a second round of QE (called QE2) at its November 2010 meeting. Fed Chairman Ben Bernanke responded, "We asked the hypothetical question, if we could lower the federal funds rate, how far—how much would we lower it?" He noted that "a powerful monetary policy action in normal times would be about a 75 basis point cut in the federal funds rate. We estimate that the impact on the whole structure of interest rates from $600 billion is roughly equivalent to a 75 basis point cut."[2] This synopsis focuses on an important reason to be skeptical of such equivalency estimates.

The average relationship between changes in the 10-year Treasury yield and changes in the funds rate over the 1987-2007 sample period is not indicative of the relationship between changes in the funds rate and changes in the 10-year Treasury yield that existed for more than a decade prior to the financial crisis.

Chung et al.'s article is used to illustrate how analysts estimate the funds rate target change equivalency of a given QE action. Chung et al. estimate that the FOMC's 2009 QE actions resulted in about a 50-basis-point reduction in the 10-year Treasury yield, which they then estimate is equivalent to about a 200-basis-point cut in the federal funds rate.[3] The latter estimate, which is similar to Chairman Bernanke's, is based on a regression of quarterly changes in the 10-year Treasury yield on quarterly changes in the funds rate over the 1987-2007 period. They note that their

Regression Estimates of the Change in the 10-Year Treasury Yield on the Change in the Federal Funds Rate

	1987:Q1–2007:Q4		1995:Q1–2007:Q4		2000:Q1–2007:Q4	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	–0.030	0.483	–0.067	0.187	–0.058	0.342
Slope	0.295	0.002	0.103	0.385	0.104	0.370
$\bar{R}^2$	0.105		0.000			0.000
Standard error	0.384		0.363			0.328

estimate of the coefficient on the funds rate of "about 0.25" implies "that a 100 basis point reduction in short-term rates is typically associated with a 25 basis point decline in long-term yields" and concluded that the "50 basis point drop in bond yields through conventional means rather than asset purchases should *ordinarily* require something like a 200 basis point cut in the federal funds rate"[4] (emphasis added).

However, these authors and others have failed to notice that the relationship between changes in 10-year Treasury yields and changes in the funds rate (on which their estimate rests) changed dramatically beginning in the late 1980s and essentially vanished by the mid-1990s. Consequently, the average relationship between changes in the 10-year Treasury yield and changes in the funds rate over the 1987-2007 sample period is not indicative of the relationship between changes in the funds rate and changes in the 10-year Treasury yield that existed for more than a decade prior to the financial crisis.

The table illustrates the marked change in the relationship. The table reports the estimates of the intercept on slope coefficients and corresponding significance levels (p-values), along with estimates of $\bar{R}^2$ and the standard error, from a simple regression of the change in the 10-year Treasury yield on the change in the funds rate using quarterly averages of daily figures over three sample periods: 1987:Q1–2007:Q4, 1995:Q1–2007:Q4, and 2000:Q1–2007:Q4. The estimates over the full sample period confirm the conclusion by Chung et al. that a 200-basis-point reduction in the federal funds rate target would correspond to about a 50-basis-point reduction in long-term yields. The estimate of the slope coefficient over the 1995:Q1–2007:Q4 and 2000:Q1–2007:Q4 periods is about a third of that over the entire sample. Moreover, the estimates are insignificantly different from zero, and the estimate of $\bar{R}^2$, which was only about 10 percent over the entire sample period, declines to zero over the latter sample periods. Hence, there has been no statistically significant relationship between quarterly changes in the funds rate and quarterly changes in the 10-year Treasury yield since the mid-1990s.[5] This suggests that, at best, it is misleading to use estimates of the relationship between these rates obtained with data before the mid-1990s to equate a given level of asset purchases by the Fed with a specific change in the FOMC's funds rate target. Such estimates are not valid for translating QE actions into funds rate target changes. Consequently, they provide no guidance for the appropriate amount of QE actions the FOMC should undertake. ■

[1] To better understand the zero lower bound, see Daniel L. Thornton. "Nominal Interest Rates: Less Than Zero?" Federal Reserve Bank of St. Louis, *Monetary Trends*, January 1999; http://research.stlouisfed.org/publications/mt/19990101/cover.pdf.

[2] See Dow Jones. "Rep. Paul D. Ryan Holds a Hearing on the U.S. Economic Outlook." House Committee on the Budget, p. 38; http://findarticles.com/p/news-articles/political-transcript-wire/mi_8167/is_20110209/rep-paul-ryan-holds-hearing/ai_n56848469/pg_28/?tag=content;col1.

[3] Chung, Hess; Laforte, Jean-Philippe; Reifschneider, David and Williams, John C. "Have We Underestimated the Likelihood and Severity of Zero Lower Bound Events?" Working Paper No. 2011-01, Federal Reserve Bank of San Francisco, January 2011, p. 24; www.frbsf.org/publications/economics/papers/2011/wp11-01bk.pdf.

[4] From Chung et al., p. 28. See footnote 3.

[5] For the results using monthly average data, see Daniel L. Thornton. "The Unusual Behavior of the Federal Funds Rate and Treasury Yields: A Conundrum or an Instance of Goodhart's Law?" Working Paper No. 2007-039D, Federal Reserve Bank of St. Louis, September 2007, revised August 2010; http://research.stlouisfed.org/wp/2007/2007-039.pdf.

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Views expressed do not necessarily reflect official positions of the Federal Reserve System.