Shadow Interest Rates and the Stance of U.S. Monetary Policy

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8 November 2012

Center for Finance and Accounting Research
Annual Corporate Finance Conference

Olin Business School

Washington University in St. Louis

Any opinions expressed here are my own and do not necessarily reflect those of others on the Federal Open Market Committee.

Is Current U.S. Monetary Policy "Too Easy"?

Main idea

- Some recent research suggests that current U.S. monetary policy may be considerably easier than commonly understood.
- In particular, the current U.S. policy stance may be substantially easier than the policy stance recommended by commonly-used monetary policy feedback rules.
- This research is based on ideas in mathematical finance.

A shadow rate

- The level of nominal short-term interest rates is conventionally taken to indicate the stance of policy.
  - Lower values are described as "easier" policy.
- The FOMC's policy rate has been effectively pegged near zero since December of 2008.
- How should the monetary policy stance be described given this development?
  - A math finance answer: Construct a "shadow rate."

Sources

- Main papers:
  - Leo Krippner. 2012a. "Measuring the stance of monetary policy in zero lower bound environments." Reserve Bank of New Zealand, Discussion Paper 2012/04, August.
  - Leo Krippner. 2012b. "Modifying Gaussian term structure models when interest rates are near the zero lower bound." Reserve Bank of New Zealand, Discussion Paper 2012/02, March.
- Less technical discussion:
  - Leo Krippner. 2012c. "A model for interest rates near the zero lower bound: An overview and discussion." Reserve Bank of New Zealand, Analytical Note 2012/05, September.

The value of the shadow rate

- Krippner (2012a,b,c) calculates a shadow short-term rate.
  - This rate can be understood as a metric for the stance of monetary policy in a zero lower bound environment.
  - The current value is about -5.0 percent.
  - This value is considerably more negative than values recommended by common monetary policy rules.

- Bottom line: The current policy stance looks very easy according to this analysis.

Background and Methodology

Fischer Black

- The late Fischer Black (1938-1995) was a leader in mathematical finance.
- Co-creator of Black-Scholes option pricing.
- One paper he worked on shortly before his death:
  - "Interest Rates as Options"
  - Published in late 1995 in the *Journal of Finance*.*

* *See:* F. Black, 1995, "Interest Rates as Options," *Journal of Finance*, 50(5), pp. 1371-6.

Interest rates as options

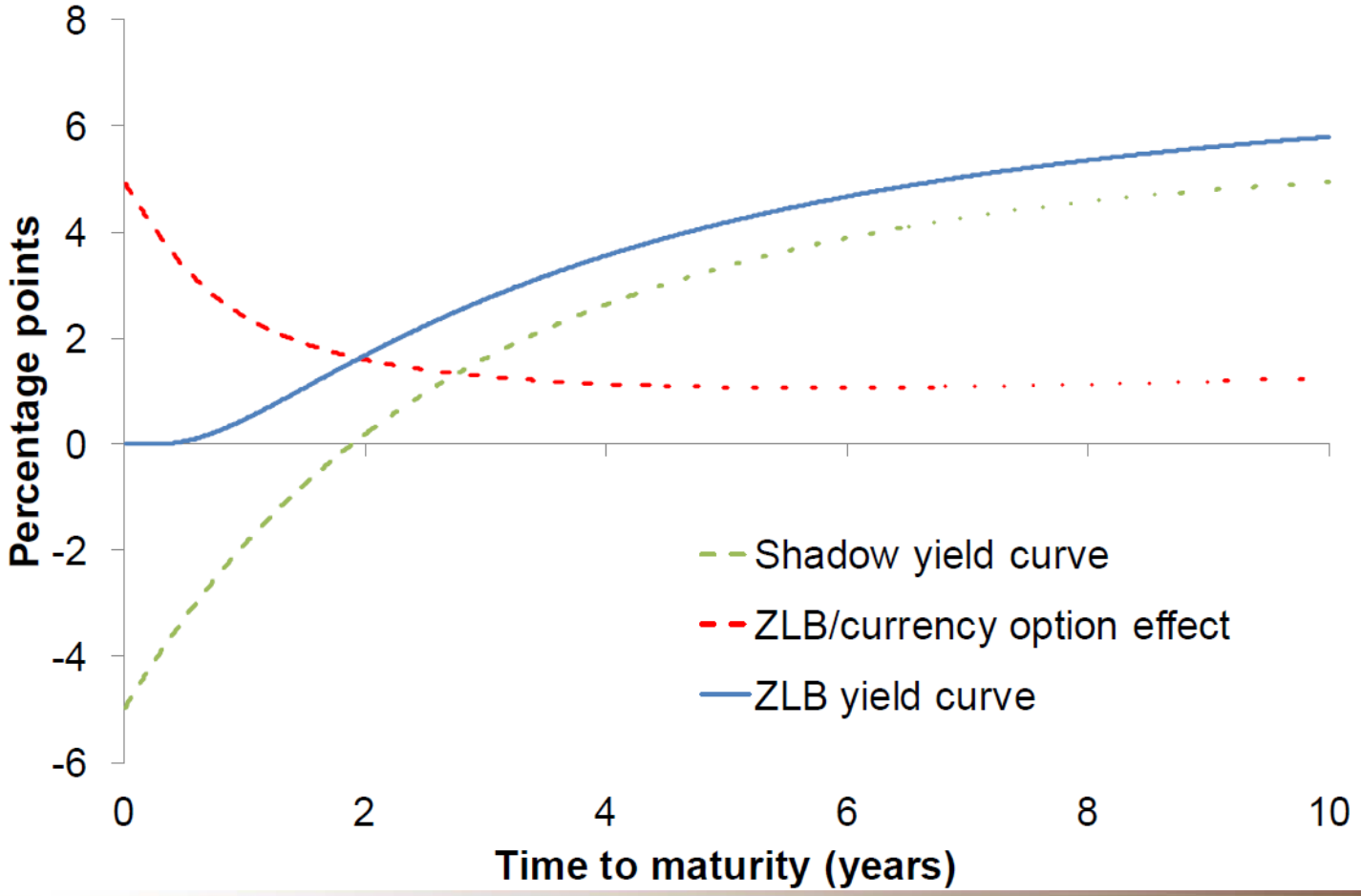
- Nominal interest rates cannot fall materially below zero.
  - This is because cash provides a risk-free investment at a zero nominal rate.
  - Holding cash will therefore be more attractive than accepting a negative nominal rate on a security.
- Black (1995) provided a way to calculate the value of the call option to hold cash at the zero lower bound.
  - The value of this option can then be subtracted from observed nominal yields.
  - This leaves a shadow nominal yield curve that would exist in the absence of the cash option.

Monetary policy applications

- Leo Krippner is a financial market economist working at the Reserve Bank of New Zealand.
- Krippner (2012a,b) suggested modifications to the Black (1995) approach to allow for closed-form solutions to the option pricing problem.
  - This allows for considerable simplification.
  - Krippner (2012a,b,c) also emphasized a monetary policy application: Using the implied shadow overnight rate as a metric for the actual stance of monetary policy.
- One earlier U.S. monetary policy application is Bomfim (2003).*

* *See:* A. Bomfim, 2003, "*Interest Rates as Options*: Assessing the Markets' View of the Liquidity Trap," Federal Reserve Board *Finance and Economics Discussion Series* paper 2003-45.

Example



Source: Krippner (2012c).

Implications for U.S. Monetary Policy

Recommended U.S. monetary policy

- It has become popular in recent years to describe the desired level of the policy rate by using versions of Taylor-type policy rules.
- These rules relate the current value of the policy rate to macroeconomic variables such as inflation and output or unemployment gaps.
- Most policy rules in this class currently recommend a negative policy rate.

One recommended policy

- One possible policy rule is often called the Taylor (1999) rule:*

$$R_t = 2 + \pi_t + 0.5\,(\pi_t - 2) + 1.0\,Y_t$$

  - π_t : headline PCE inflation (year-over-year)
  - $Y_t = 2.3\,(5.6 - U_t)$: output gap
  - U_t: unemployment rate

- Vice Chair Janet Yellen used this specification of the Taylor (1999) rule in her June 6, 2012, speech *Perspectives on Monetary Policy* given at the Boston Economic Club Dinner.

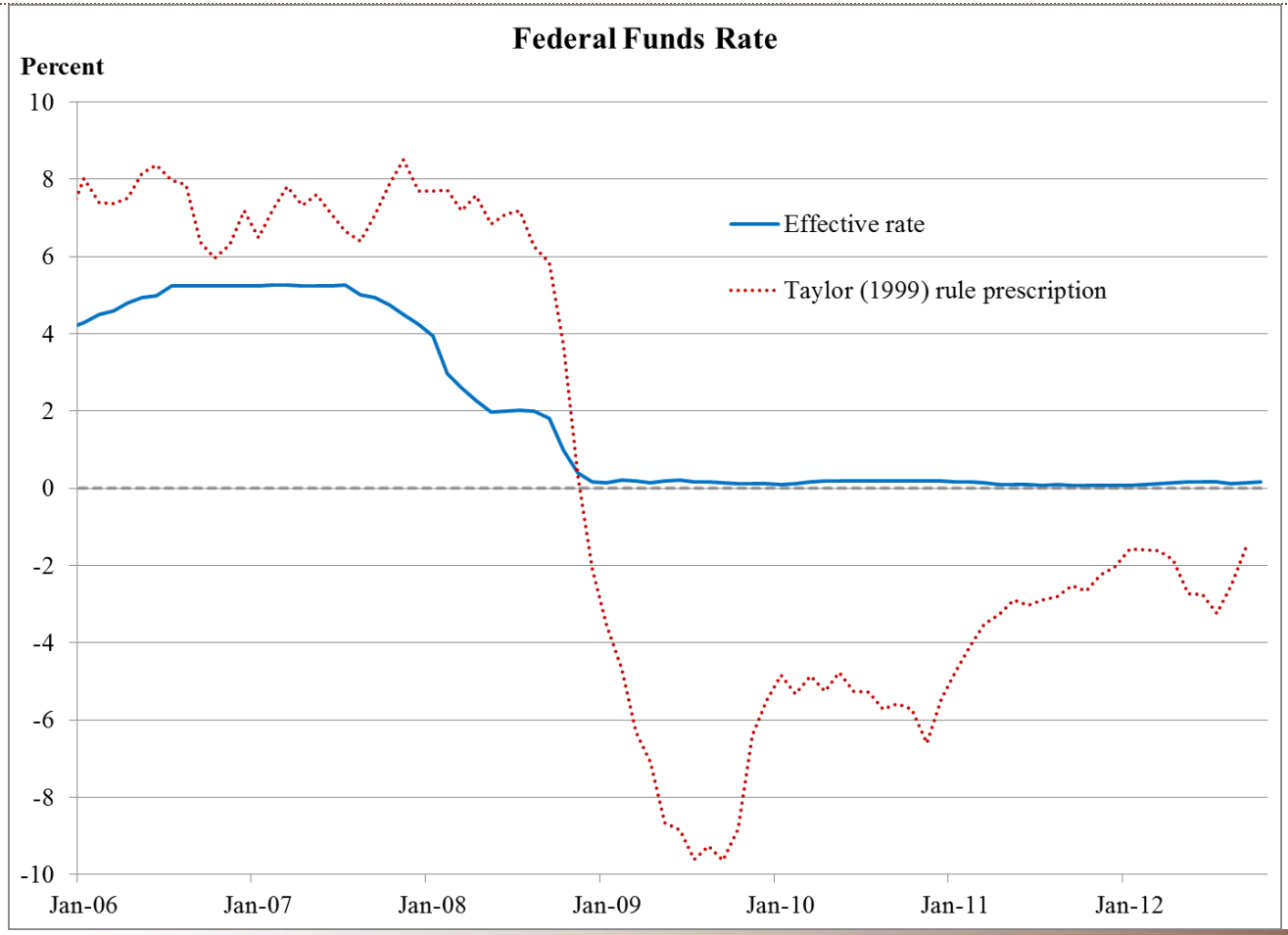
* *See* J.B. Taylor, 1999, "A Historical Analysis of Monetary Policy Rules," in J.B. Taylor, ed., *Monetary Policy Rules*, Chicago: University of Chicago Press.

One recommended policy

- We can plot the recommended policy rate according to the Taylor (1999) rule.

- In some ways this plot does not make sense, since the recommended short-term rate is negative, which cannot occur.
  - One interpretation is that other, unconventional policies have been needed to try to achieve the recommended policy rate.
  - But, how do we know if those unconventional policies are working?

Plot of the Taylor (1999) policy recommendation



Source: Federal Reserve Board, Bureau of Economic Analysis, Bureau of Labor Statistics and author's calculations.
Last observation: October, 2012.

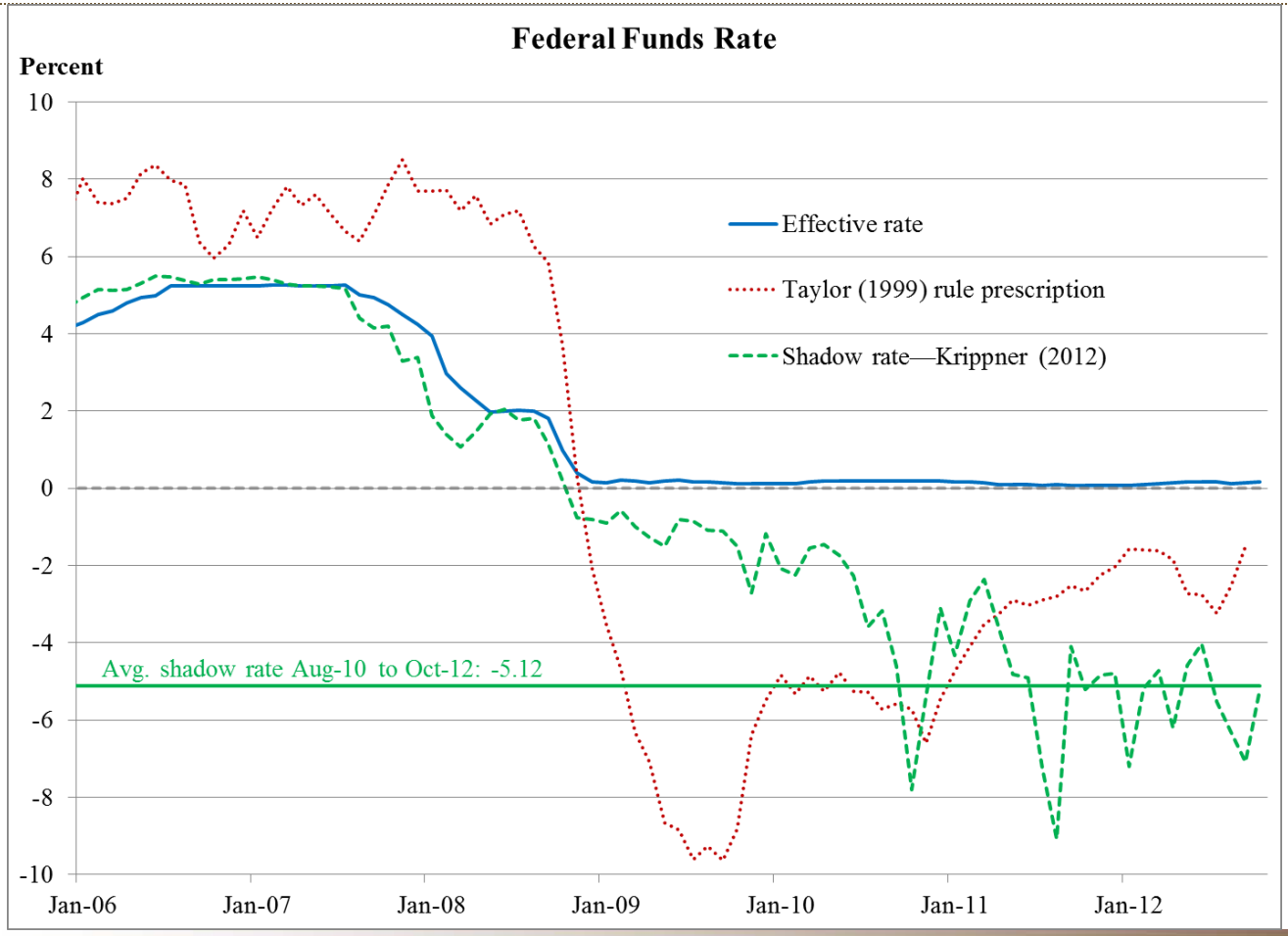
Application of Krippner

- The Krippner calculation of a shadow short-term nominal interest rate allows us to compare a measure of actual policy against the recommended policy from a standard policy rule.

- The Krippner approach is dubbed ZLB-GATSM.
  - "Zero lower bound Gaussian affine term structure model."

- Krippner uses an estimated two-factor GATSM from his earlier work.
  - More extensive empirical work is desirable, and further research on this topic is something I encourage.

Recommended policy versus actual policy



Source: Federal Reserve Board, Bureau of Economic Analysis, Bureau of Labor Statistics and author's calculations; the estimated shadow rate was kindly provided by Leo Krippner. Last observation: October, 2012.

Current policy may be easier than often perceived

- According to these estimates, the shadow policy rate is currently more than 300 basis points lower than the rate recommended by the Taylor (1999) rule.

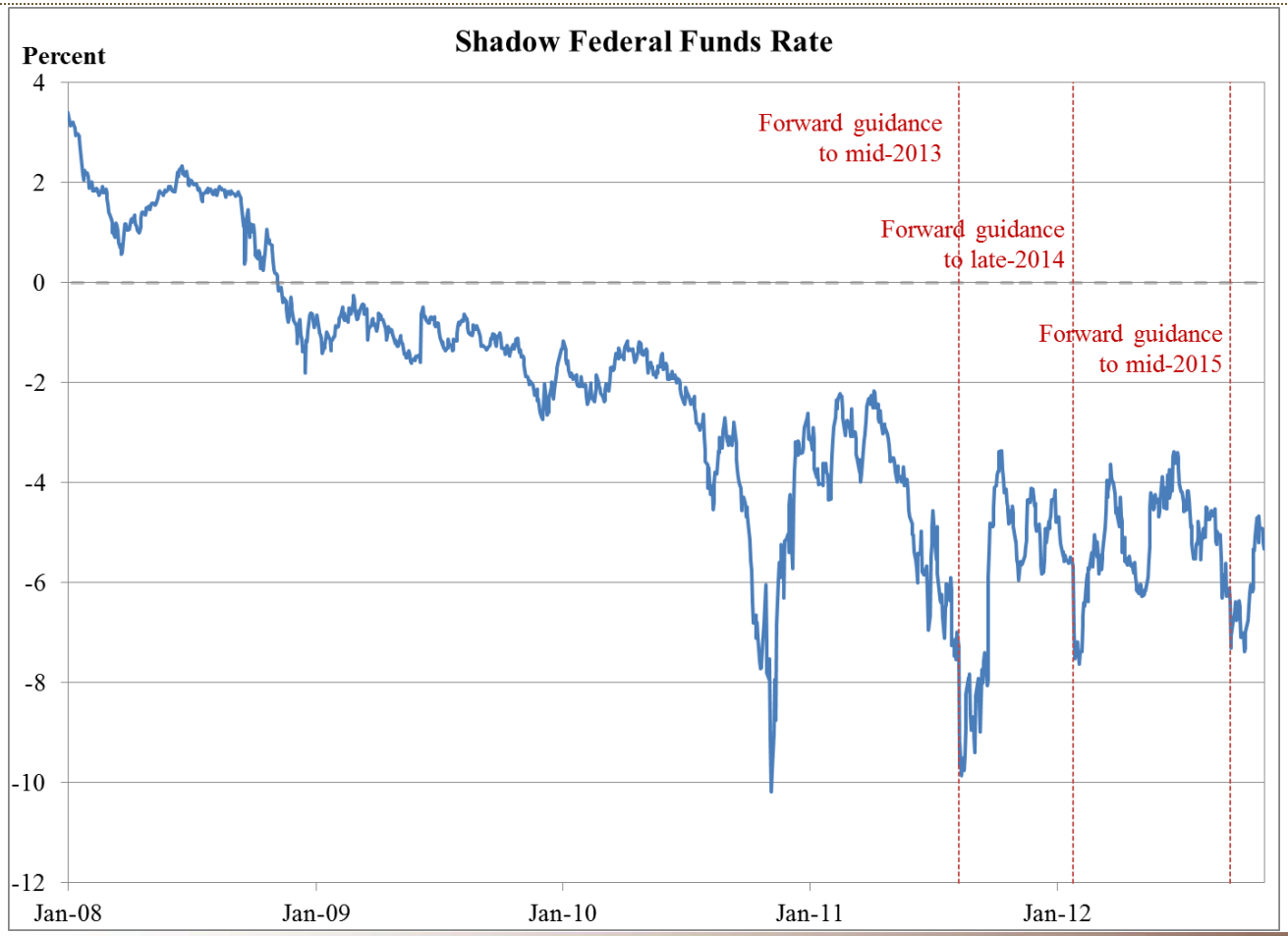
- This suggests that actual U.S. monetary policy may currently be easier than the recommendations from that particular rule.

More implications

- In 2009, policy may have been too tight relative to the recommended Taylor (1999) rate.
  - The FOMC at that point had not taken many of the unconventional policy actions and did not expect to do so.

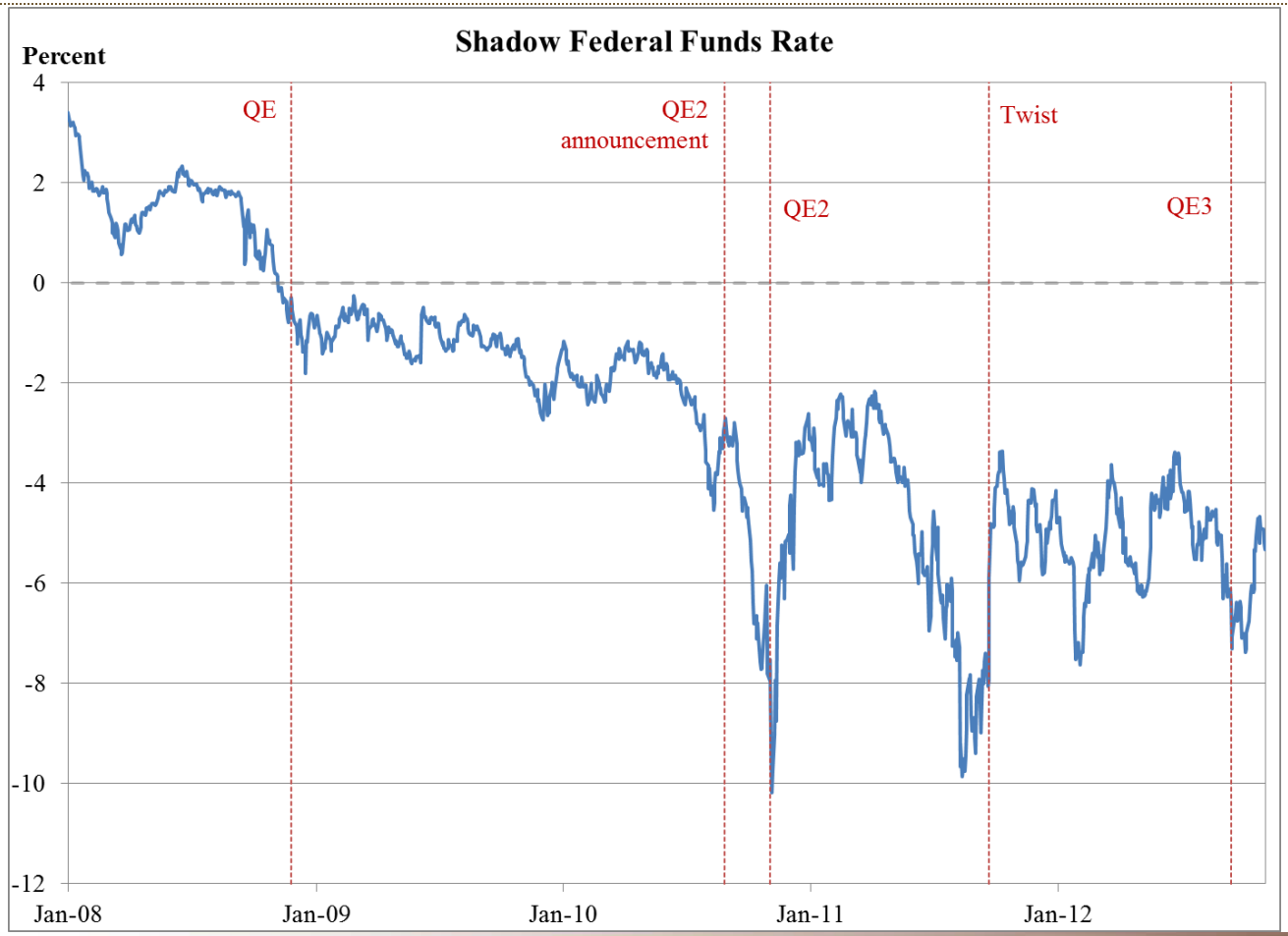
- The actual policy stance as measured by the shadow rate has recently been more volatile than during the pre-2008 era.
  - This may be because monetary policy has been harder to interpret during the period of the zero lower bound.

A closer look: Forward guidance



Source: the estimated shadow rate was kindly provided by Leo Krippner. Last observation: October, 2012.

A closer look: QE



Source: the estimated shadow rate was kindly provided by Leo Krippner. Last observation: October, 2012.

The value of unconventional policy

- The Krippner study gives us one way to evaluate recent unconventional policy actions by the FOMC.
  - Significant unconventional policy actions at times seem to conform well with movements in the shadow policy rate.
  - Times of less conformity may indicate an ineffective policy action.

The value of unconventional policy

- The accumulation of policy actions since 2008 has generally been associated with a continuing decline in the level of the shadow rate—that is, an easier and easier policy stance.

- Krippner argues that these estimates are consistent with Williams (2011),* which are based on wholly different methods.

* *See* J. Williams, 2011, "Unconventional monetary policy: Lessons from the past three years," Federal Reserve Bank of San Francisco *Economic Letter* 2011-31.

Conclusions

Summary

- Recent research by Leo Krippner builds on earlier work following Fischer Black and others in thinking about the call option value of cash in a zero nominal interest rate environment.
- Krippner's findings suggest current U.S. monetary policy is easier than the policy recommended by commonly-used Taylor-type policy rules.
- These findings are interesting and I encourage further and more detailed analysis in this area.

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