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

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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. 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:

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*.

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).*

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:

\[ R_t = 2 + \pi_t + 0.5 (\pi_t - 2) + 1.0 Y_t \]

- \( \pi_t \): 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.

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

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.

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.