Comments on Kiley and Roberts

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This paper is very useful for evaluating alternative policies in a low-interest rate world.

I will illustrate this usefulness with three exercises that extend and complement the analysis in the paper:

1) A simple calculation regarding the risk of hitting the ELB.

2) The optimal inflation target when the equilibrium level of output is below the optimal level.

3) Commitment strategies: how much would output and inflation overshoot their long-run levels?

(All three exercises strengthen the case for raising the inflation target.)

(1) The Risk of Hitting the ELB

Under current policy, how deep a downturn is needed to push interest rates to zero?

Following K-R, assume a Taylor-Yellen policy rule:

$$i = r^* + \pi^* + (1.5)(\pi - \pi^*) + y$$

Also following K-R, assume $\pi^* = 2$ and $r^* = 1 \Rightarrow$

$$i = (1.5)\pi + y$$

Assume a simple Phillips curve with anchored expectations (in spirit of FRB/US?):

$$\pi = 2 + (0.25)y$$

Substitute the Phillips curve into the policy rule $\Rightarrow$

$$i \;=\; 3 + (1.375)y$$

The interest rate hits zero if

$$y \;=\; -3/(1.375) = -2.2$$

So, the ELB will bind if output falls 2.2 percent below potential.

By Okun's Law, this means unemployment rises 1.1 pts above its natural rate.

Therefore, a Great Recession is not needed for the ELB to constrain policy. That will happen in moderate and even mild recessions. (The unemployment rate exceeded the CBO natural rate by more than 1.1 points in 7 of the last 8 recessions, including the mild recession of 2001.)

This analysis supports K-R's conclusion that, under current policy, the ELB will often bind, reducing the average level of output significantly.

(2) The Optimal Inflation Target

K-R calculate welfare in their models for alternative inflation targets (assuming "risk adjustment" to hit the target on average). See Figure 9.

Consider the results for the FRB/US model, assuming r* = 1 and a loss function of

$$E[(\pi - \pi^o)^2 + (y - y^o)^2]$$

where π^o and y^o are the optimal levels of inflation and the output gap. (Middle graph in Figure 9A.)

The output gap, y, is the difference between actual and potential output. Potential is average output in the absence of the ELB.

K-R assume that y^o, the optimal level of y, is zero. This means that potential output is the socially optimal level of output. However...

As K-R note (p. 34), potential output may be less than optimal output because of microeconomic distortions (e.g., imperfect competition, taxes, asymmetric information in the labor market). Note this is a key assumption in the Kydland-Prescott (1979) theory of dynamic inconsistency in monetary policy.

This point is important because, with the ELB, a low inflation target reduces average output below potential. That implies a second-order welfare loss if potential is optimal, but a first-order loss if potential is below optimal.

A decomposition of the loss function:

$$E[(\pi - \pi^o)^2 + (y - y^o)^2]$$

$$= \mathrm{Var}(\pi) + (E[\pi] - \pi^o)^2 + \mathrm{Var}(y) + (E[y] - y^o)^2$$

Note: $d(\text{loss})/dE[y] = 2(E[y] - y^o)$

$$= -2y^o \text{ at } E[y]=0$$

Calibration

Following K-R, I assume $\pi^o = 2$.

To calibrate y^o, I use Okun's Law:

$$y^o = -2(u^o - u^n)$$

where u^o is the optimal level of unemployment and u^n is the natural rate.

I assume $u^n = 5$ and $u^o = 3$, which implies $y^o = 4$.

(In January 2017, the unemployment rate was 2.9% in Colorado and 3.2% in Massachusetts.)

Loss components for alternative inflation targets

	$\pi^* = 2$	$\pi^* = 3$	$\pi^* = 4$
$Var(\pi)$	2.0	1.8	1.6
$(E[\pi] - 2)^2$	0.0	1.0	4.0
$Var(y)$	8.5	6.9	5.9
$(E[y] - 0)^2$	0.5	0.1	0.0
$(E[y] - 4)^2$	22.1	18.5	16.0
TOTAL LOSS:			
if $y^o = 0$	11.0	9.8	11.5
if $y^o = 4$	32.6	28.2	27.5

Conclusion:

If we assume $y^o > 0$, the optimal inflation target rises significantly.

Another note:

The optimal target rises further if welfare depends more on the variance of inflation and less on its average level. With risk adjustment, a lower target implies a larger variance of inflation (see first line of last table).

(3) Shadow-rate Commitment Strategies

K-R find that a commitment strategy based on a "shadow interest rate" can eliminate the ELB problem, even with $\pi^* = 2$ and $r^* = 1$.

The big question: credibility. Under the policy, the central bank says it will let output and inflation overshoot their long run levels before it raises i above zero. Will the central bank keep this commitment? Will people believe that the central bank will keep the commitment?

The answer probably depends on the magnitudes of the overshoots. For example, people may believe the Fed will let inflation rise temporarily to 2.5%, but not to 10%. How large are the overshoots implied by the shadow-rate policy?

Let x be the sum of the current deviations of y and π from their long-run levels:

$$x = y + (\pi - 2)$$

Let Σx be the cumulation of x over some period.

During a period when $x<0$ and $i=0$, Σx becomes increasingly negative over time.

Under the shadow-rate policy, after x returns to zero, the central bank must allow a period of $x>0$ that brings Σx back to zero. Policymakers must maintain $i=0$ during that period.

After a Great Recession, the central bank must allow a Great Overheating of equal magnitude before it raises i.

Over 2009-2016, output gaps y cumulated to -39 percent of annual output (based on $y = -2(u - 5)$). Deviations of core PCE inflation from 2% cumulated to -4 percentage points. Adding these numbers, $\Sigma x = -43$ for 2009-2016.

Assume $y = 0$ and $\pi = 2$ in 2017. Then $x=0$ in 2017 and Σx remains at -43.

If these outcomes occurred with a shadow-rate strategy, then starting in 2018, the Fed would need to set $i=0$ until Σx rises from -43 to 0. A huge overshoot.

On the other hand, if the shadow-rate strategy were in place in 2009, it would have dampened the Great Recession, according to K-R's models.

K-R might use their models to quantify this dampening of the recession. In the meantime, suppose the output losses and inflation shortfalls over 2009-2016 were cut in half by the shadow-rate policy. Then Σx in 2017 would be -21.5. We would still need a large overshoot to bring Σx back to zero.

What paths for output and inflation would lead Σx back to zero? Again, answers could be derived in K-R's models. In the meantime, suppose that output and inflation are determined by simple Phillips and IS curves:

Phillips curve: $\pi_t = 2 + (0.25)y_t$

IS curve: $y_t = -(0.4)(i_{t-1} - \pi_{t-1} - 1.0) + (0.8)y_{t-1}$

where a time period is a year.

(The IS curve is roughly equivalent to quarterly equations in previous work, such as Rudebusch and Svensson (1999) and Ball et al. (2016)).

With i=0, these equations determine the evolution of y, π, and Σx:

	y	π	x	Σx
2017	0	2	0	-21.5
2018	1.2	2.3	1.5	-20.0
2019	2.3	2.6	2.9	-17.1
2020	3.5	2.9	4.4	-12.7
2021	4.4	3.1	5.5	-7.2
2022	5.1	3.3	6.4	-0.8
2023	5.8	3.5	7.3	6.5

So, the Fed would raise i above zero in 2023, when y = 5.8.

If we assume Okun's Law and $u^n = 5$, then y = 5.8 implies

$$u = 5 - (5.8)/2 = 2.1$$

(These calculations strain the linearity of the equations.)

Is it credible that the Fed would allow such a large overheating before raising rates?

I don't think so.

So, the shadow-rate strategy is not a realistic solution to the ELB problem. We need a higher inflation target.