A Shadow Short Rate series for New Zealand

Leo Krippner*

31 March 2020

"Measure what is measurable, and make measurable what is not so"
Galileo Galilei (1564–1642)

In this note, I introduce a Shadow Short Rate (SSR) series for New Zealand, which is plotted in figure 1. As explained more fully below, SSR estimates provide a quantitative indicator for the stance of monetary policy over both Conventional Monetary Policy (CMP) and Unconventional Monetary Policy (UMP) environments. Specifically, SSR estimates are similar to the Official Cash Rate (OCR) and closely related short-maturity interest rates during CMP periods, but can freely take on negative values during UMP periods to account for unconventional monetary policy measures employed in addition to the near-zero OCR.

New Zealand's SSR (week average to 27 March 2020) indicates a stance of monetary policy approximately equal to an OCR of –0.48%

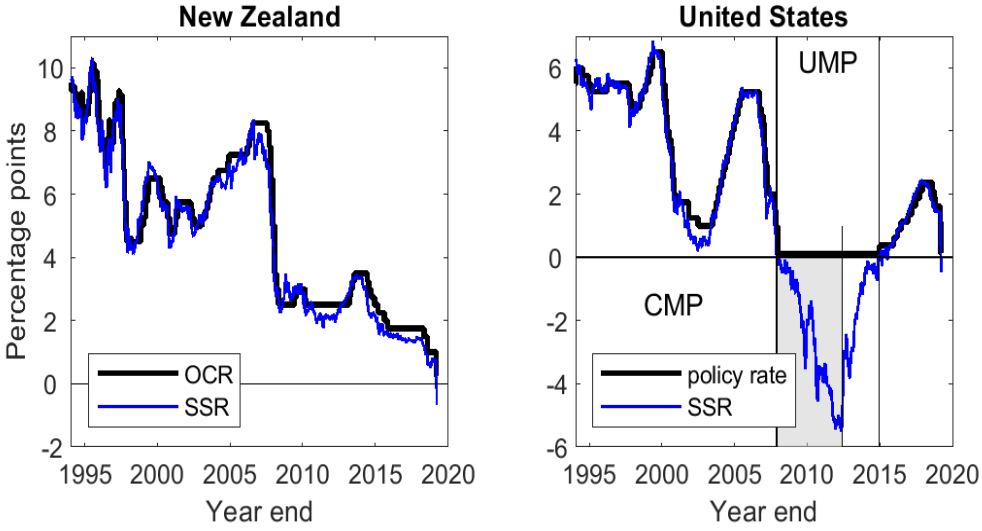

Figure 1: New Zealand's OCR (proxied by the 90-day rate prior to 17 March 1999) and my estimated SSR series. I have provided the policy rate and my estimated SSR series for the United States to illustrate an SSR series that includes a full UMP easing (shaded)/tightening cycle.

As background, the Reserve Bank of New Zealand (RBNZ) sets monetary policy to achieve inflation and employment objectives agreed with the Minister of Finance. The OCR has

*Email: leo.krippner@ljkmfa.com. Website: ljkmfa.com.

conventionally been the RBNZ's primary "tool" for operating monetary policy when it could be freely lowered (or raised). During such CMP times, short-maturity interest rates close to the OCR (e.g. the 90-day bank bill rate) are typically used as the "metric" for the stance of monetary policy. That is, a lower (or higher) level of the OCR and hence short rates is generally taken to indicate more stimulus (or damping) for inflation and economic activity.

The RBNZ has now followed the central banks of many economies into an UMP environment where, in addition to the 0.25% OCR, unconventional tools such as more-explicit forward guidance, credit easing, and quantitative easing (QE) have been employed.[1] In this environment, the OCR or short rates no longer provide an adequate metric for the stance of monetary policy, because the additional UMP tools employed result in a monetary policy stance that is more stimulatory than suggested by near-zero interest rates alone. A quantitative indication of "how much more?" is important because the RBNZ still needs to formulate and communicate, to the public and financial markets, the overall stance of monetary policy that it thinks will be required to meet its inflation and employment objectives.

One way of quantifying the overall stance of monetary policy in UMP times is the concept of an estimated Shadow Short Rate (SSR), which I first suggested in the papers Krippner (2012, 2013), and which has been used internationally.[2] There are two main principles underlying the SSR:

- Yield curve data, i.e. interest rates of different times to maturity, are influenced by the OCR and UMP tools (when the latter are in use).
- The yield curve may be considered as two components: (1) a "shadow yield curve" without a near-zero lower-bound constraint that can therefore freely take on negative values; and (2) a "physical currency option effect" that results in a lower-bound constraint on interest rates.[3]

Applying a "shadow/lower-bound" model to the yield curve allows the shadow yield curve and the option effect components to be separately estimated. The SSR is then the shortest-maturity interest rate on the shadow yield curve, just like the OCR is the shortest-maturity interest rate on the actual yield curve. These concepts are readily illustrated with the stylized examples in figure 2:

[1] Specifically, and respectively for each of the three categories, the RBNZ has already announced: (1) the OCR will be held at 0.25% until at least March 2021 (16 March 2020); (2) a term auction facility plus a range of other liquidity actions (20 and 30 March 2020); (3) a $30 billion Large Scale Asset Purchase programme for government bonds (23 March 2020). The RBNZ on 10 March 2020, see Orr (2020), also mentioned other potential UMP tools, i.e. receiving interest rate swaps, purchasing foreign currency assets, and setting the actual OCR at negative levels. (The latter would arguably be more akin to CMP, but is unconventional in the sense that it reverses the typical arrangement that borrowers make interest payments to lenders.)

[2] Notable examples are Bullard (2012) in the context of United States monetary policy, and a reference in Draghi (2019) for the European context, although most uses are for research by analysts, central banks, and academics. My shadow/lower-bound yield curve model was first developed in the paper Krippner (2011), but a more definitive treatment is the book Krippner (2015). Wu and Xia (2016) produces SSR estimates from a model analogous to mine, and those estimates are also used for research. An alternative indicator is the Effective Monetary Stimulus developed in Halberstadt and Krippner (2016).

[3] Physical currency essentially offers an interest rate of zero percent. Hence, in the absence of changes to the physical currency framework, there is a limit to how negative the OCR could be set; below a so-called "effective lower bound", people and/or institutions would begin to consider the cost/benefit of the option to hold physical currency instead of account balances with a negative interest rate.

- In the UMP example, which is akin to the United States in 2011, the near-zero OCR plus UMP tools have pushed much of the yield curve data to the near-zero lower bound constraint. Hence the option effect is high and the shadow yield curve has many very negative values. The resulting SSR estimate is –5%.

- In the CMP example, the positive OCR without UMP tools means the yield curve data is essentially unconstrained. Hence the option effect is negligible and the shadow yield curve almost coincides with the actual yield curve. The result is a positive estimated SSR that pretty much equals the OCR of 1% in this example.

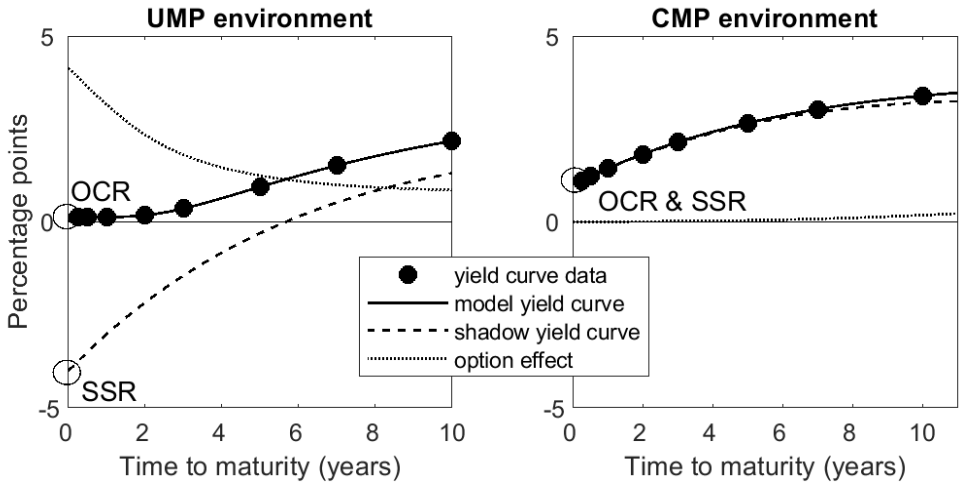

Figure 2: Stylized examples of yield curve data in UMP and CMP environments, and the SSR estimates obtained by applying my shadow/lower-bound model.

Because the shadow/lower-bound model is estimated across UMP and CMP periods, the resulting SSR series provides a consistent and comparable metric for the stance of monetary policy over both periods. Therefore, the levels and changes of the SSR in the UMP period may be broadly interpreted in a similar manner to the levels and changes of the short rate (or SSR) in the CMP period. However, there are several reasons why SSR should not be treated as literally as the OCR or short rates:

- The SSR is an estimated value rather than a setting like the OCR or an observed market short rate. Hence, any SSR series will (unavoidably) vary with the model specification and data used for its estimation. The choices I have made for the SSR series in this note have produced more favorable properties than alternatives for the United States,[4] but the magnitudes of negative SSR estimations can easily vary by fractions of a percentage point on re-estimations, and sometimes more for UMP periods if the lower-bound setting in the model needs revisiting in light of central bank communications and/or actions. My model for New Zealand currently uses a lower-bound setting of 0.25%, consistent with the RBNZ's 16 March 2020 forward guidance.

- Related to estimation, in the present global UMP environment compared to previous years (e.g. for the United States easing/tightening cycle) yield curves may no longer

[4]The perspectives are essentially the relative robustness of profile and magnitude, consistent behaviour across CMP and UMP periods, and maintaining better relationships with macroeconomic data; see Claus, Claus, and Krippner (2018), Francis, Jackson, and Owyang (2020), and Krippner (2020) for further details.

capture sufficient information to quantify the stance of monetary policy. The reason is that yield curves in New Zealand and around the world are now very "flat" (i.e. longer-maturity rates are close to shorter-maturity rates). Only time (and updated analysis) will tell on this aspect, and model refinements may be needed.

- The SSR is not a market rate at which borrowers and lenders can transact, particularly in UMP times when the OCR and short rates will remain close to zero while the SSR may become increasingly negative. Hence, SSR declines in UMP times will not result in the same cashflow effects from interest payments and receipts as OCR cuts in CMP times, so the SSR transmission to the economy may differ from at least that perspective.

Notwithstanding the caveats above, the point remains that an SSR series in UMP periods accounts for UMP actions, and so it provides a better metric for the overall stance of monetary policy than the near-zero OCR or short rate. The SSR series also retains the familiar basis of a single interest rate, as opposed to considering the transmission effects of the OCR and each UMP tools separately. A particularly useful corollary in that regard is that existing models with short-maturity interest rates as an input (such as currency or macroeconomic forecasting models) can still be used, but with the SSR series substituted for the short-maturity interest rate series (or the SSR series could be used just for the UMP period, given the OCR and SSR are similar during CMP periods).

An estimated SSR series could potentially be used to formulate and communicate monetary policy in UMP periods, as already mentioned by the RBNZ.[5] Given the caveats above, it would be unlikely for an SSR series to be used as an operational target, like the OCR, but rather as a broad indicator of effective interest rate stimulus like shorter-maturity interest rates in CMP times. And, as in CMP times, the RBNZ would assess its desired effective interest rates stimulus in conjunction with other influences on wider monetary/financial conditions that also influence the econonmy, such as the exchange rate, asset prices, and credit market developments.

If the RBNZ creates and publishes its own SSR series,[6] then the alignment of that series with the RBNZ's monetary policy process would make it the natural choice for the public and financial markets to follow. In any case, I will continue to make updates of my New Zealand SSR estimates available close to month-end on my web site ljkmfa.com, within the wider suite of SSR estimates that includes the G4 economies, Canada and Australia. Hopefully others will find these useful metrics for their purposes.

References

Bullard, J. (2012). Shadow Interest Rates and the Stance of U.S. Monetary Policy. *Speech at the Annual Conference, Olin Business School, Washington University in St. Louis, 8 November 2012*. URL: http://www.stlouisfed.org/newsroom/displayNews.cfm?article=1574.

[5] See Orr (2020) page 16: "We need a meaningful 'shadow' OCR concept for ease of discussion." and also table 4 "Forward guidance: This would differ from our current approach of publishing our OCR forecast. It may involve publishing a forecast of the shadow short rate, which shows the combined stimulus from the OCR and other monetary policy tools through interest rates.".

[6] A public version of the shadow/lower-bound model and related documentation is available here: https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/matlab-code-for-krippner-2015-shadow-zlb-term-structure-model.

Claus, E., I. Claus, and L. Krippner (2018). Asset market responses to conventional and unconventional monetary policy shocks in the United States. *Journal of Banking and Finance 97*, 270–282.

Draghi, M. (2019). Twenty years of the ECBs monetary policy. *Speech at the ECB Forum on Central Banking, 18 June 2019*. https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp190618 ec4cd2443b.en.html.

Francis, N., L. Jackson, and M. Owyang (2020). How has empirical monetary policy analysis changed after the financial crisis? *Economic Modelling 84*, 309–321.

Halberstadt, A. and L. Krippner (2016). The effect of conventional and unconventional euro area monetary policy on macroeconomic variables. *Discussion Paper, Deutsche Bundesbank 49/2016*.

Krippner, L. (2011). Modifying Gaussian term structure models when interest rates are near the zero lower bound. *Discussion paper, Centre for Applied Macroeconomic Analysis 36/2011*.

Krippner, L. (2012). A model for interest rates near the zero lower bound: An overview and discussion. *Analytical Note, Reserve Bank of New Zealand AN 2012/05*.

Krippner, L. (2013). Measuring the stance of monetary policy in zero lower bound environments. *Economics Letters 118(1)*, 135–138.

Krippner, L. (2015). *Zero Lower Bound Term Structure Modeling: A Practitioner's Guide*. Palgrave-Macmillan.

Krippner, L. (2020). A note of caution on shadow rate estimates. *Journal of Money, Credit and Banking (forthcoming)*. URL: https://onlinelibrary.wiley.com/doi/full/10.1111/jmcb.12613.

Orr, A. (2020). Navigating at Low Altitude: Monetary Policy with Very Low Interest Rates. *Speech at the RBNZ Museum and Education Centre on 10 March 2020*. URL: https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Speeches/2020/speech2020-03-10.pdf.

Wu, J. and F. Xia (2016). Measuring the macroeconomic impact of monetary policy at the zero lower bound. *Journal of Money, Credit and Banking 48(2-3)*, 253–291.