Emad A. Zikry, President and Chief Executive Officer

The Ever Elusive Estimation of R-Star

The natural real rate of interest is a concept that originated with Knut Wicksell, a prominent Swedish economist who theorized the existence of a short-term interest rate that supports full employment and price stability (1898[1]). For this reason, the rate was often referred to as the "Wicksellian Rate of Interest". In certain respects, one can think of the natural rate as an analog to the "Non-Accelerating Inflation Rate of Unemployment" or NAIRU. That is, they are both theoretical constructs that correspond to an economy operating at its potential whilst holding prices stable. In modern academic and policy circles this concept has evolved into the ever elusive R-Star, often stylized as R* to distinguish it from the ordinary real interest rate often represented by the capital letter R in macroeconomic models. Being a theoretical variable, it is unobservable and its estimation has been the obsession of macro economists for several decades. While numerous estimates have been proposed, no single one has garnered the consensus of the profession. To better understand this never-ending search, let us first explore why the variable is so important for policy matters.

At its most basic level, individuals tend to think of monetary policy as either restrictive or accommodating depending on the level of nominal interest rates and more specifically short term interest rates (Fed Funds Rate). However, as we delve deeper into the notion of the stance of policy we come to the realization that real interest rates are also of import. The graph below shows the path of interest rates during the Great Depression. As is well understood, nominal interest rates were extraordinarily low, however, real rates were extremely high. Accordingly, do we conclude that policy was accommodative or tight during this period? The consensus is that policy was too tight during this period, however was this simply because real rates were too high? This is where the concept of R* becomes useful, as it allows us to determine the stance of policy by comparing actual rates versus the aforementioned theoretical natural one.

---

[1] Wicksell, Knut. 1898. "Interest and Prices".

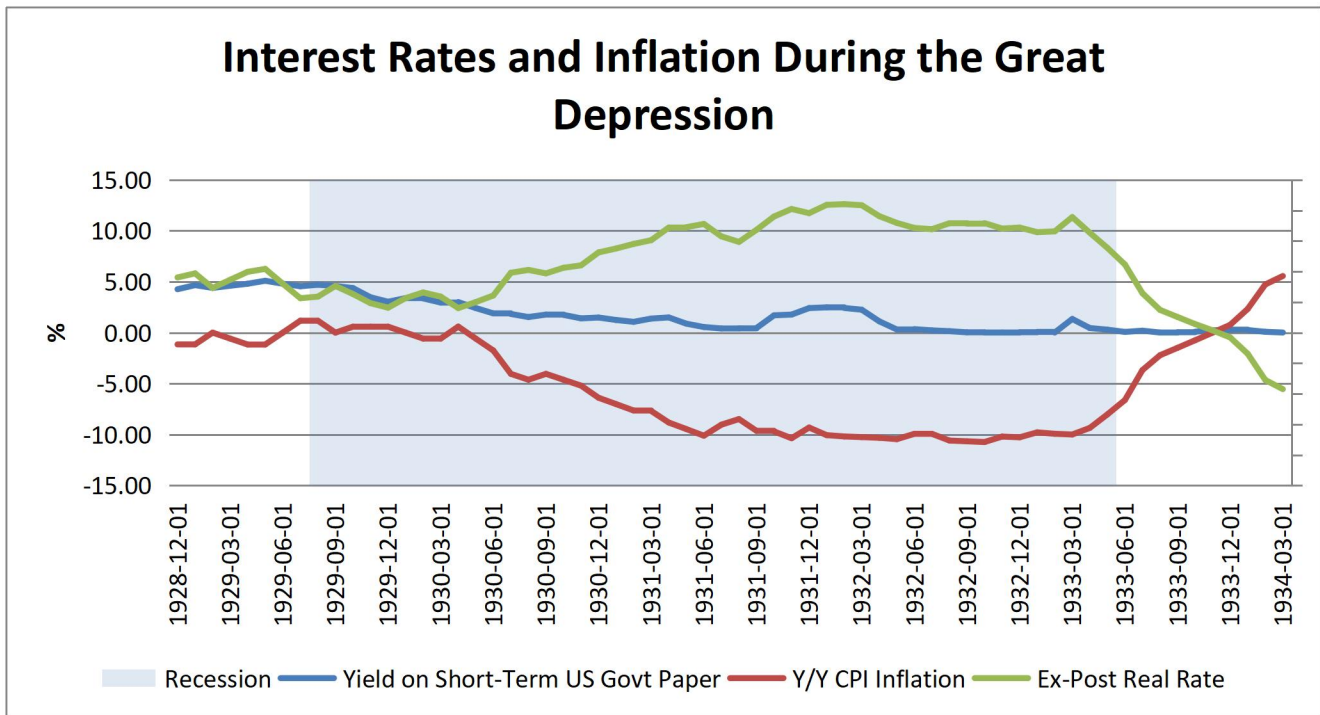**Interest Rates and Inflation During the Great Depression**

Figure 1: Source: Federal Reserve Economic Data

In discussing the stance of monetary policy, it is important to understand what we mean by stipulating that policy is accommodative, restrictive, or neutral. In central banker jargon, this usually means whether the policy rate is below, above, or at its long run natural rate. This comparator is often termed "R*" or "R-Star". The biggest issue, however, is that this rate is a theoretical construct and can't be observed empirically. It can be estimated using fundamental data on the economy such as productivity and labor force growth. It is important to note that both the level and the trend of the rate are relevant for determining the stance of policy. That is, the path of future interest rates matters for policy setting purposes. One major implication of evaluating policy using R*, or some variation of it, is that if the natural real interest rate is negative the efficacy of monetary policy becomes impaired. More succinctly, what appears to matter in determining the stance of policy is not just nominal rates or real rates, but rather the differential between the natural rate and the policy rate. This is part of the explanation for why monetary policy wasn't more stimulative in the aftermath of the great recession in the presence of very low nominal rates. Accordingly, policy was likely tighter than would be suggested by the level of nominal interest rates or even real interest rates alone. At this juncture, we turn our attention then to the estimation of R*.

Estimation Procedures

In the words of the late economist John H. Williams, "The natural rate is an abstraction; like faith, it is seen by its works" (1931[2]). Therefore, one can only ascertain if the policy rate is in line with R* if it succeeds in stabilizing prices and output. On the other hand, if the policy rate fails to achieve such goals, then it is not in line with the natural rate. Given that the long run interest rate, devoid of cyclical features, will be determined by fundamental factors of the underlying economy, it is sensible to assume that the long-run ex-post real rate will approximate the natural rate. For this reason, efforts at estimating R* rely primarily on two methods:

1. Structural estimation
   a. Involves specifying econometric models to estimate what the natural rate should be given certain macroeconomic variables. Typically, the models look at the behavior of trend GDP growth rates, labor force growth rate, and labor force productivity. Common models include:
      i. Laubach-Williams
      ii. James Bullard's R-Dagger (Regime switching model)
2. Trend extraction of short term interest rates to generate a time series of the realized value of the natural real rate of interest
   a. Detrend empirical data on ex-post real short term interest rates. Common methods include:
      i. Linear trend
      ii. Hodrick-Prescott filter
      iii. Assume the natural real rate is a constant

Estimates

Figure 2 below shows estimates for the natural real rate of interest by means of detrending ex-post short term interest rates since 1984. The clear downward trend in the data suggests that the natural rate has been falling and current levels appear to be relatively low. This is consistent with model estimates of the natural rate, which imply a low and falling value for R*.

---

[2] Williams, John H. 1931. "The Monetary Doctrines of J.M. Keynes." Quarterly Journal of Economics 45(4), 547-87.
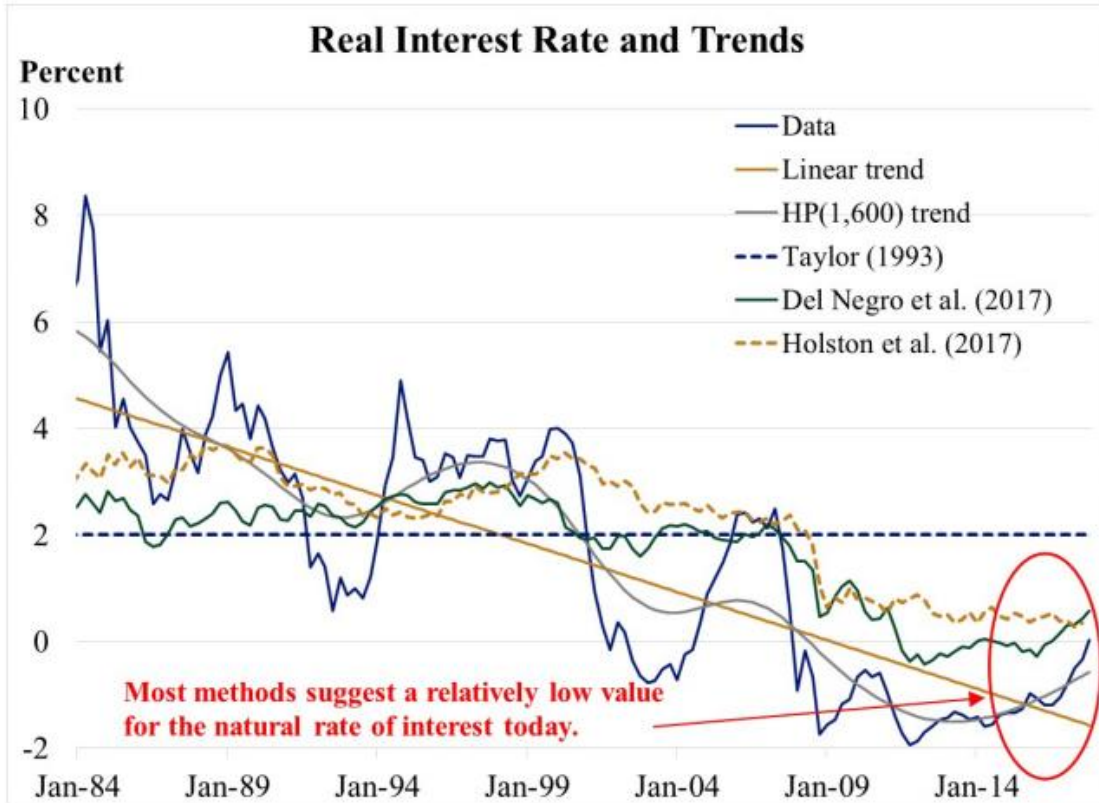
Real Interest Rate and Trends

Percent

- Data
- Linear trend
- HP(1,600) trend
- Taylor (1993)
- Del Negro et al. (2017)
- Holston et al. (2017)

Most methods suggest a relatively low value for the natural rate of interest today.

Figure 3 shows the estimates for the natural rate from a structural model developed by current New York Fed President John C. Williams and his co-author Thomas Laubach. Their estimates highlight the declining character of the natural rate and the acceleration in the downward trend since the great financial crisis. Their estimates from 2015 pinned the rate at about -0.2%. Given a Fed Funds target between zero and a quarter of a percent during the period and a CPI inflation rate of about 0.66% for the year, the stance of policy could be interpreted as being moderately accommodating at the time.

Laubach- Williams model estimates of the natural rate of interest

One-sided estimates

Percent

Current estimates

Real-time estimates

1980 1983 1986 1989 1992 1995 1998 2001 2004 2007 2010 2013
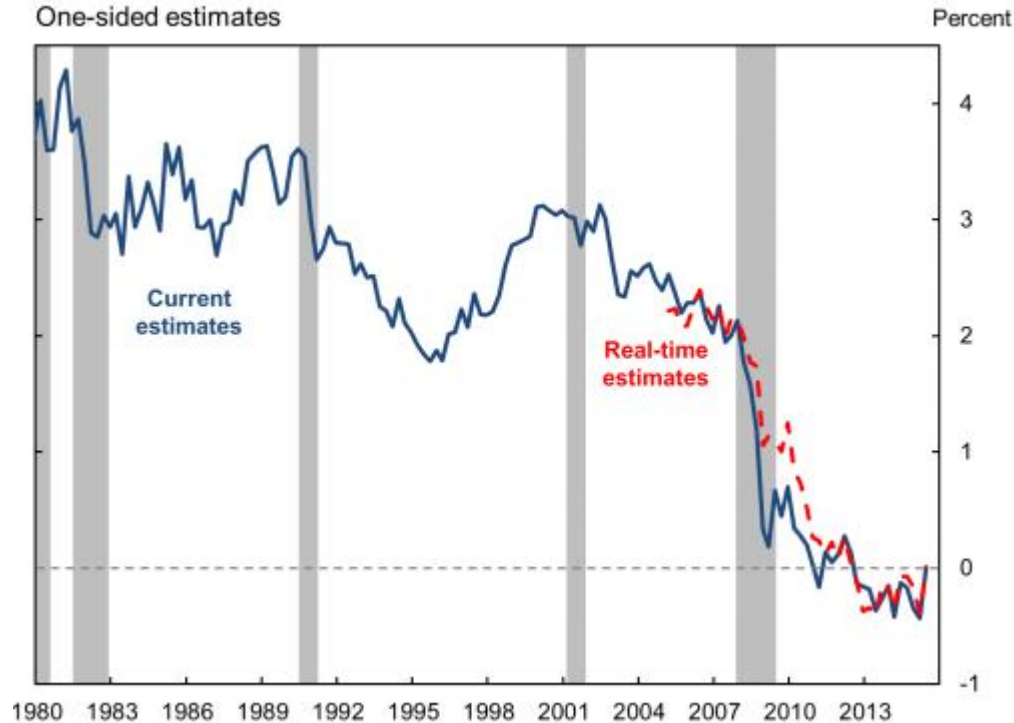
Figure 3: Source: Laubach, Thomas & John C. Williams. 2015. "Measuring the Natural Rate of Interest Redux". Federal Reserve Bank of San Francisco Working Paper.

Conclusion

As demonstrated above, understanding R* is incredibly useful for evaluating the projected efficacy of monetary policy. That is, in order to determine the stance of policy it is important to compare the prevailing policy rate to the natural rate. Unfortunately, the unobservable nature of this variable (R*) makes its quantification difficult to pin down. Nonetheless, several estimates of R* can be found in academic and policy circles. In general, the time-varying characteristics of R* imply that the natural rate can change as economic fundamentals change. These factors have been on the decline, corresponding with an overall fall in the natural rate. Declining demographic and productivity trends have been asserting a downward force on R* and this has manifested itself in a declining natural rate over time. Moreover, a growing demand for safe assets has also impacted the rate by lowering its level. According to John C. Williams, incoming president of the Federal Reserve Bank of New York, the current value of R* is around 0.5%[3]. By this measure, policy can be said to be neutral or modestly accommodative. Given that the Fed Funds effective rate stands at 1.9% and inflation at

---

[3] Williams, John C. FRBSF Economic Letter. May 21, 2018. "The Future Fortunes of R-Star: Are They Really Rising?". https://www.frbsf.org/economic-research/publications/economic-letter/2018/may/are-future-fortunes-of-r-star-really-rising/.

2.0% (May PCE Core Y/Y), the real short term interest rate is currently about -0.1%. This value is lower than the estimated natural rate, suggesting an accommodative policy stance. Accordingly, if one is to trust the estimates of the natural rate (and assuming it doesn't change significantly) then the Fed's tightening cycle hasn't necessarily tilted policy towards restrictive territory yet. This implies that at least two more hikes would be needed to bring the policy rate in line with the natural rate and therefore establish a neutral stance. A more involved evaluation would take into consideration a Taylor rule type framework.

Fed president Bullard has developed an approach to the natural rate within a Taylor-type rule. In his paper, "R-Star Wars: The Phantom Menace", he determines that given a range of estimates for the inflation and output gap, as well as R*, the current stance of policy lies within the interval prescribed by the Taylor rule[4]. This further suggests that policy is moderately accommodative or neutral. As a reminder, the Taylor rule sets a prescription for the nominal short term rate given the distance between actual values and target values for the Fed's objectives. In other words, given the deviation of actual inflation from its target and the difference between actual GDP and potential, the Taylor rule indicates what the nominal policy rate should be. In Bullard's interpretation, the natural rate serves as the intercept to the Taylor rule equation. Hence, the formula is set up as follows[5]:

$$i_t = rt \quad *+ \ \pi_t^e + \phi_\pi \pi_t^{GAP} + \phi_y Y_t^{GAP}$$

Using this formulation, we can estimate the Taylor prescription by inputting Williams's estimate of 0.5% for R* and the following values for the GAP estimates:

1) $\phi_\pi = 1.5, \phi_y = 1$
2) $\pi_t^e = inflation\ target\ of\ 2\%$
3) $\pi_t^{GAP} = -0.39\%$
4) $Y_t^{GAP} = 0.53\%$

Under these assumptions, the Taylor rule yields a value of 2.45%. Given a current Fed Funds target range of between 1.75% and 2%, with an effective rate at 1.9%, the current stance of policy appears to be accommodative. In other words, assuming our formulation of the Taylor rule above is correctly specified with consistent parameter estimates, the FOMC would conclude that monetary policy remains supportive to the macro-economy.

Elias Scheker
Portfolio Manager

---

[4] Bullard. James. 2018. "R-Star Wars: The Phantom Menace". Business Economics. 2018. vol. 53, issue 2. 60-65

[5] Bullard, James. 2018. "R-Star Wars: The Phantom Menace". 34th Annual NABE conference (Estimates are averages for the intervals provided for the values in the presentation).

Emad A. Zikry

Chief Executive Officer
Vanderbilt Avenue Asset Management

Emad is the Managing Partner and Chief Executive Officer of Vanderbilt Avenue Asset Management LLC. Vanderbilt's client base includes Multi-national Corporations, Public Funds, Foundations/Endowments, and Taft Hartley accounts.

Previously, Emad was Chairman of Institutional Business at Pioneer Investments. Pioneer investments has more than $300 Billion in assets under management. The parent of Pioneer, UniCredit S.p.A., is the largest bank in Italy and the second largest bank in Europe. Pioneer had purchased Vanderbilt Capital Advisors, of which Emad was the founder and Chief Executive Officer.

Emad has had numerous articles published in professional and academic journals such as The Journal of Forecasting, The American Economist and The Journal of Fixed Income. He is a Board member of The National Investment Company. Emad was a member of the Board of Advisors of the Pacific Institute, The Advisory Committee of Fulcrum Global Partners, The Chief Executive Officers Club and formerly a board member of The Foreign Policy Association. He also served on the Board of Directors of the University of Albany Foundation, NextGen Healthcare Inc., The Park Avenue Bank, AA Bank and The New Providence Fund and Associates LP.

Emad is an FINRA Arbitrator. He is also a member of the National Association for Business Economists and The Economic Club of New York. Emad served as an adjunct professor at the University of Kansas and St. John's University.

Emad holds a Bachelor of Science from the University of Albany, and a M.A. and Ph.D. in Economics from the University of Kansas.