Does r* predict policy rates?

By Alan M. Taylor, Lennart Brandt and Vitor Dotta[1]

Abstract

We evaluate the predictive power of nominal neutral rate estimates for future short-term rates in the United Kingdom and the United States. We use the fluctuation test of Giacomini and Rossi (2010) to estimate their forecast accuracy relative to the instantaneous forward yield on government bonds at the three-year point over the past forty years. We find that, when combined with a time-varying inflation trend, model-based measures of r^* have considerable predictive power, outperforming their benchmark over long periods in our sample.

1 Introduction

The Bank of England, like many other central banks, regularly produces forecasts that are conditional on a path of future short rates extracted from financial markets. These conditioning paths are themselves typically not unbiased predictions of actual future short rates. For example, in both the United Kingdom and the United States, instantaneous forward curves based on overnight indexed swaps did not anticipate the long period of near-zero short-term rates after the Global Financial Crisis (**Chart 1**) but instead expected a swift return to the previous regime.

In this note, we compare the predictive power of market-based forwards at a medium horizon of three years with the predictive power of model-based estimates of the nominal neutral rate. We choose this horizon since it is the length of the Bank of England's central forecast and one at which many short-lived shocks could be expected to have washed out.

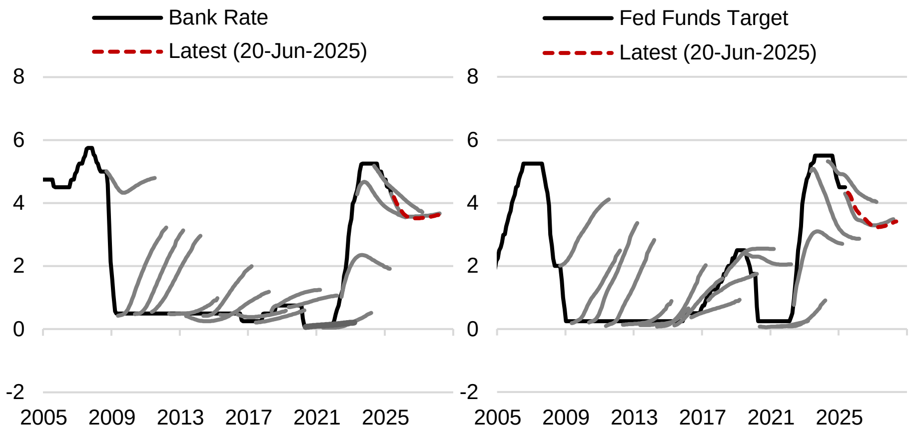
In a recursive forecasting exercise, we find that model-based estimates of the nominal neutral rate have considerable predictive power for future short rates in both countries in our sample.

[1] All Bank of England. This note was prepared to accompany remarks made by Alan Taylor at the ECB Forum on Central Banking in Sintra, Portugal on 2 July 2025.

Chart 1

Policy rates and forward curves in UK (lhs) and US (rhs)

(Percent)



Sources: Bloomberg Finance L.P. and Bank of England calculations.
Notes: Both charts show the respective central bank's policy rate as well as selected instantaneous forward curves (of April each year) based on overnight indexed swaps.
Latest observation: May 2025.

2 Data

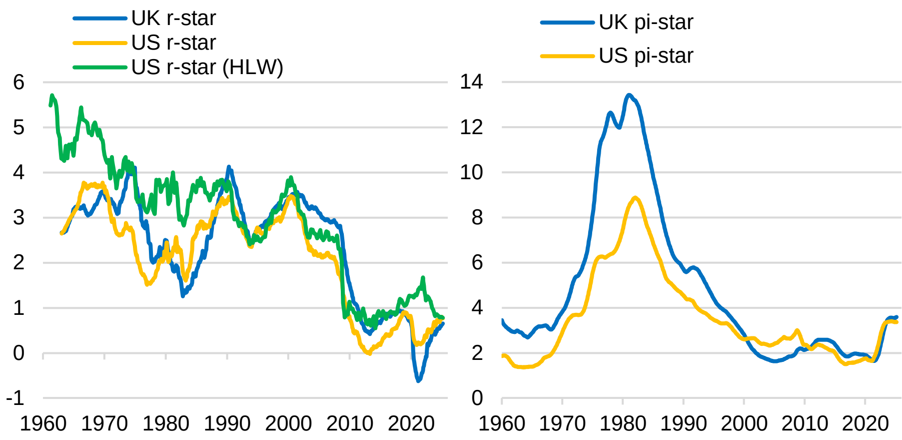
For the United Kingdom, we use Bank Rate as our measure of the short-term rate and instantaneous forward yields of the Bank of England's government liabilities curve as our market-based estimates of future short rates. For the United States, the short-term rate is the effective Fed Funds rate and market-based measures are the instantaneous forward yields of Gürkaynak et al. (2007). For both countries, we estimate a fully one-sided estimate of the neutral real rate of Davis et al. (2024) which we combine with a time-varying inflation trend (Cieslak and Povala, 2015) to construct a neutral nominal rate. Finally, we take the most recent vintage of Holston et al.'s (2017) measure of r^* to construct an alternative measure of nominal neutral for the US by adding the same inflation trend.

Our sample is January 1972 to May 2025 for both countries. We aggregate daily yields by taking the average over working days within the month. And we linearly interpolate the measure of Holston et al. assuming that the quarterly reading is the observation for the middle month in each quarter. **Chart 2** shows real and inflation components of the nominal neutral rate in the two countries since 1960.

Chart 2

Measures of real neutral rates in UK and US and estimated trend inflation rates

(Percent)



Sources: Davis et al. (2024), Holston et al. (2017), and Bank of England calculations.
Notes: The left-hand side chart shows measures of real neutral interest rates for UK and US following Davis et al. (2024) and from Holston et al. (2017) for the US only. The right-hand side chart shows Davis et al.'s measure of trend inflation for both countries. Latest observation: May 2025.

3 Results

We estimate univariate, linear regressions of the form:

$$i_{t+36} = \alpha + \beta i_t^* + u_{t+36} \quad (1)$$

Where the dependent variable i_{t+36} is a realisation of the nominal short rate 36 months ahead, i_t^* is a measure of the nominal neutral rate given information available at time t, and u_{t+36} is a serially correlated forecast error.

We estimate three different versions of each specification. First, we estimate the unrestricted parameters of equation 1 by simple OLS on the full sample (**Table 1**). We find that estimates of the slope parameter β are generally close to unity, especially for the model-based measures. This supports the premise that our i^* variables are indeed measures of the stochastic trend in interest rates. The parameters associated with market-based measures of nominal neutral, for which we take the instantaneous government bond yield 10 years forward, are less than one.

We find that the intercepts in these predictive regressions are strictly less than zero in the full sample. We interpret this as being driven by the presence of term premia which cause both model- and market-based measures of real neutral rates to be biased upwards relative to the pure expectation of future short rates. For a discussion of the role of term premia in estimating neutral rates using financial asset prices, see Davis et al. (2024).

Table 1

Full-sample estimates of unrestricted regressions

(Percentage points)

Parameter (Equation 1)	UK 10y0y	UK r* + pi*	US 10y0y	US r* + pi*	US HLW
Intercept	-0.396 (-1.647)	-0.996 (-4.740)	-0.964 (-2.840)	-1.475 (-5.329)	-2.018 (-7.886)
Slope	0.876 (31.259)	0.949 (38.934)	0.827 (17.987)	1.044 (24.383)	1.023 (28.649)
Observations	605	605	605	605	605
R2	0.618	0.715	0.349	0.496	0.576
RMSE	2.88	2.49	3.14	2.76	2.54

Notes: The sample for all regressions is January 1972 to May 2025. Numbers in parentheses are the t-statistic of the respective parameter.

Second, we estimate restricted regressions for each specification where we constrain the slope parameter to be exactly equal to one while leaving the intercept unconstrained. **Table 2** shows the full-sample estimates of these restricted regressions. We find that this restriction is not rejected for the model-based measures of i^* and that goodness-of-fit statistics are little changed in the full sample.

Table 2

Full-sample estimates of restricted regressions

(Percentage points)

Parameter (Equation 1)	UK 10y0y	UK r* + pi*	US 10y0y	US r* + pi*	US HLW
Intercept	-1.323 (-11.110)	-1.378 (-13.570)	-2.151 (-16.620)	-1.213 (-10.775)	-1.868 (-18.096)
Trend	1	1	1	1	1
Observations	605	605	605	605	605
R2	0.671	0.735	0.434	0.474	0.565
RMSE	2.93	2.50	3.18	2.77	2.54

Notes: The sample for all regressions is January 1972 to May 2025. Numbers in parentheses are the t-statistic of the respective parameter. This is not reported for the constrained parameter.

Finally, we estimate the restricted regression recursively on expanding windows. This is to mimic the situation of a forecaster who is tasked with predicting future short rates given a measure of nominal neutral at any point in time. Given an initial holdout sample of 10 years plus one month, the first observation in each chart is January 1982. Since we use an expanding window to prevent overfitting in short samples and to more closely mimic the forecaster's situation, the estimate converges to the full-sample estimate shown in **Table 2**.

Using the parameters of the recursive regressions, we then predict short rates three years ahead. Note that equation 1 can be re-written as a regression of the current short rate on the 36th lag of i^*. We therefore take the parameters from this regression and apply them to the current month estimate of i^* (which is themselves not part of the regressors but is known at the time of the forecast).

Table 3 shows the root mean squared forecast error from this out-of-sample exercise. We find that model-based measures have lower RMSFEs than the market-based measure on a like-for-like comparison. Further, we find that RMFSEs are generally lower than the respective in-sample RMSEs from the non-recursive regressions. It seems that, with our data, knowledge of future interest rates dominates any potential over-fitting in sub-samples.

Table 3
Out-of-sample RMSFE of recursively estimated restricted regressions

(Percentage points)

Parameter (Equation 1)	UK 10y0y	UK r* + pi*	US 10y0y	US r* + pi*	US HLW
RMSFE	2.89	2.51	2.90	2.54	2.19
Observations	450	450	450	450	450

Notes: The sample for all recursive regressions is January 1972 to May 2025 with a hold-out sample of 10 years. The recursive forecasts are then compared with outturns three years ahead, which leaves 605-120-36+1=450 forecast errors.

Finally, we evaluate the predictive power of our measures of nominal neutral over time by computing the fluctuation test statistic of Giacomini and Rossi (2010) relative to a naïve market-based benchmark. Since we are predicting short-term rates three years ahead, we use the instantaneous yield three years forward as our benchmark for both countries.

Charts 3 and **4** show the time-varying test statistics for UK and US measures versus the null hypothesis of equal forecast accuracy. A positive value indicates that the respective measure out-performs the benchmark and vice versa. In black, we plot the critical values for a two-sided test at the 5% level.

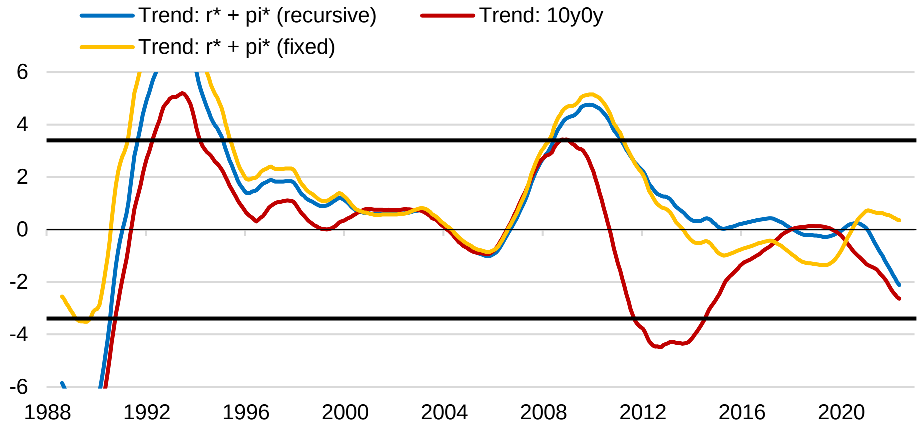
We also add a rule-of-thumb prediction based on our measure of i^* where we fix the intercept to be equal to -1 for the UK and -1.5 for the US which is close to the full-sample estimate. We find that model-based measures tend to be no worse than the market-based benchmark while, at times, outperforming significantly. They fare especially well at the start of the 1990s and around the Global Financial Crisis.

Both of those periods saw large movements in the drivers of the nominal neutral rate. Expected inflation on our measure was falling sharply in the late 1980s and early 1990s, while r^* was, in fact, rising (see **Chart 2**). Then, during the Global Financial Crisis, real neutral rates dropped sharply as slack opened up and stayed low for an extended period of time with trend inflation low and stable. In contrast, after short-term rates had fallen to close to their effective lower bound, yield curves were historically steep (see **Chart 1**). Thus, model-based measures turned out to be better predictors of low-for-long interest rates than the market forwards which implied a swift return to the pre-crisis regime.

Chart 3

Fluctuation test statistics for UK out-of-sample forecast errors

(Normalised relative loss)

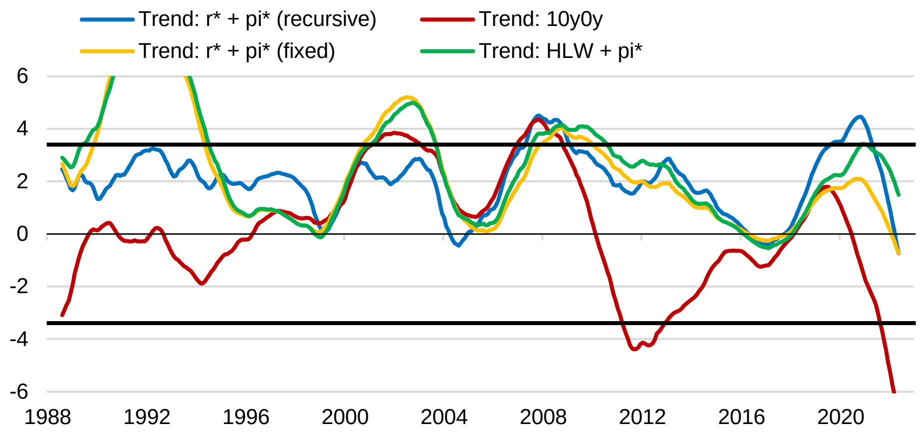


Notes: This chart shows the fluctuation test statistic of Giacomini and Rossi (2010) for each predictive regression versus the instantaneous forward at the three-year horizon. Positive numbers indicate out-performance of the predictive regression. Dark lines indicate the critical value of the two-sided test for significance at the 5% level with a narrow window of μ=0.1.

Chart 4

Fluctuation test statistics for US out-of-sample forecast errors

(Normalised relative loss)



Notes: This chart shows the fluctuation test statistic of Giacomini and Rossi (2010) for each predictive regression versus the instantaneous forward at the three-year horizon. Positive numbers indicate out-performance of the predictive regression. Dark lines indicate the critical value of the two-sided test for significance at the 5% level with a narrow window of μ=0.1.

The predictive power of our model-based measures, however, drops sharply at the onset of the global inflation surge of 2021 and 2022 when policy rates were raised rapidly off the zero lower bound in order to combat inflation. This meant a large and persistent shock to short term rates which is not captured by the drivers of nominal neutral rates three years prior.

4 Conclusion

In this note, we have evaluated the predictive power of model-based estimates of nominal neutral rates compared to a naïve market-based benchmark. We find that they are competitive predictors of future short rates at the three-year horizon, even outperforming their benchmark over long periods in the past half-century.

This is notable in the context of uncertainty about the stance of monetary policy after the Covid pandemic and the inflation surge of 2022 and 2023. The confluence of these events has caused great uncertainty about the neutral level of interest rates and the degree of restrictiveness of monetary policy in advanced economies. To the extent that financial markets are pricing higher medium-term interest rates than would be implied by models of the long-run neutral rate, this may lead to a tighter stance of monetary policy than intended.

References

Cieslak, A. and Povala, P. (2015), “Expected returns in Treasury bonds”, *Review of Financial Studies*, Vol. 28(10), pp. 2859-2901.

Davis, J., Fuenzalida, C., Huetsch, L., Mills, B., and Taylor, A. M. (2024), “Global natural rates in the long run: Postwar macro trends and the market-implied r* in 10 advanced economies”, *Journal of International Economics*, Vol. 149, 103919.

Giacomini, R. and Rossi, B. (2010), “Forecast comparison in unstable environments”, *Journal of Applied Econometrics*, Vol. 25(4), pp. 595-620.

Gürkaynak, R. S., Sack, B., and Wright, J. H. (2007), “The U.S. Treasury yield curve: 1961 to the present”, *Journal of Monetary Economics*, Vol. 54(8), pp. 2291-2304.

Holston, K., Laubach, T., and Williams, J. C. (2017), “Measuring the natural rate of interest: International trends and determinants”, *Journal of International Economics*, Vol. 108, Supplement 1, pp. S59-S75.