AMULETUM
INVESTMENT GROUP

**AM Report**

Vol. 4, Nr. 2
May 2025

The economic-financial analysis that enlightens your investments

# Fed funds futures predictions: evidence from quantiles

Author: Rafael B. De Rezende, Ph.D.

*Founder, Chairman, CEO and investment manager of Amuletum Investment Group LLC and Amuletum Invest AB*.

Fed funds futures are commonly regarded as the best predictors of the Fed funds rate in the very near-term forecast horizons (1- to 2-months ahead). I take advantage of this feature to generate forecasts for the conditional distribution of the Fed funds rate using quantile regression. Results suggest well balanced downside and upside risks for the Fed funds rate throughout June and July. Besides that, uncertainty around the Fed funds rate forecasts continues to lower, indicating that the Fed funds rate is likely to continue its declining process initiated in September 2024, as declining uncertainty has preceded interest rate cuts.

## 1. Introduction

Fed funds futures are commonly regarded as the best predictors of the Fed funds rate in the very near-term, i.e. 1- to 2-months ahead, and although distribution forecasts are also available from these future contracts, they only inform about the likelihood of the Fed funds rate falling into certain intervals.[1] Based on that, and as the debate around future interest rate cuts looms, a better understanding of the risks around these predictions becomes significantly important.

In this report, I take advantage of the high near-term accuracy of Fed funds futures as predictor of the Fed funds rate and generate forecasts of the conditional distribution of the Fed funds rate using quantile regressions. Besides being highly accurate in the near-term, these distributions also present the feature of providing a continuum of quantile forecasts, which are then used for estimating risk measures regarding the Fed funds rate, such as uncertainty, tail risks, upside/downside risks and median forecasts. It turns out that uncertainty has been preceding interest rate cuts.

Results suggest highly accurate distribution forecasts generated from the quantile regressions for horizons of 1- and 2-months ahead, meaning that they are able to capture the risks associated with the Fed funds rate in the future. An assessment of the risks around recent forecasts reveals well balanced downside and upside risks for the Fed funds rate throughout June and July. Besides that, uncertainty around the Fed funds rate forecasts continues to lower, indicating that the Fed funds rate is likely to continue its declining process initiated in September 2024, as declining uncertainty has preceded previous interest rate cuts.

The results described above reinforce the view that bond yields, at least in the 1- to 10-years segment, are expected to decline in the near- to mid-term.[2] In a scenario where the effects of tariffs on inflation are temporary given the current well anchored inflation expectations, and inflation cools down, the Fed shall continue cutting its policy rate. This shall lower short-rate expectations across the yield curve and, therefore, bond yields. Importantly, although a recessionary scenario may still affect bond risk premia positively, there is a large room for the Fed to cut interest rates and provide liquidity and stimulus to the US economy, which would lower uncertainty and fear in financial markets, reduce risk aversion and, consequently, bond risk premia and bond yields. This would imply less pressure on borrowing costs, which may help to diminish the upward pressure on ultra-long Treasury yields (20-years plus) seen lately.

This report is organized as follows. The following section describes the framework for generating forecasts of the conditional distribution of the Fed funds rate. The third section describes the data used. The fourth section describes the empirical results, and the final section concludes, also with a discussion on the future developments in the bond market.

## 1. Econometric framework

The econometric model is a generalization of the quantile model for density forecasting proposed by Gaglianone and Lima (2012). First, I assume that Fed funds futures interest rates are a measure of market participants' expectations on the Fed funds rate at any point in time. Based on that, I propose the following quantile model.

$$Q_{y_{t+h}}(\tau|\Omega_t) = \alpha_0(\tau) + \alpha_1(\tau) ff_{n,t} \qquad (1)$$

---

[1] See the AM Report of November 2023 "Fed funds rate predictions: what are the odds" by De Rezende, as well as Gürkaynak, Sack and Swanson (2007).

[2] See the AM Report of February 2025 "Risk premia in bond markets: a macro perspective" by De Rezende.

where $y_{t+h}$ is the realized Fed funds rate at time t = 1, 2 months ahead, or 22, 44 days ahead, $ff_{n,t}$ is the Fed funds future rate for contracts expiring at n = 1, 2 months ahead, and $\alpha_0(\tau), \alpha_1(\tau)$ are coefficients to be estimated. Importantly, similar to Gaglianone and Lima (2012), I assume that there is a continuum of investors in the market classified as $\tau \in (0,1)$ with loss functions $L^\tau$. Under certain reasonable assumptions regarding $L^\tau$ and the data generation process driving the Fed funds rate $y_{t+h}$, it is possible to show that investor's $\tau$ optimal forecast is,

$$\hat{y}_{t+h}^{\tau} = \alpha_0(\tau) + \alpha_1(\tau) ff_{n,t} \qquad (2)$$

which implies that $\hat{y}_{t+h}^{\tau} = Q_{y_{t+h}}(\tau|\Omega_t)$, that is, the optimal forecast of investor $\tau$ is the quantile of the true conditional distribution of $y_{t+h}$, which turns out to be modeled as the linear quantile regression $\alpha_0(\tau) + \alpha_1(\tau) ff_{n,t}$.[3] This means that a set of quantile regressions as (1) estimated for $\tau \in (0,1)$ can be used for forecasting the conditional distribution of the Fed funds rate at any point in time.

Another key feature of the quantile framework above is the possibility of estimating risk measures regarding the Fed funds rate, such as uncertainty, tail risks and median forecasts. To do so, one has to just assign the relevant quantiles to be estimated and compute the required risk measures. To estimate the interquantile range as a measure of uncertainty, I use $\tau = 0.05, 0.95$, which are also used for estimating tail risks. Median forecasts are naturally estimated using $\tau = 0.5$.

## 2. Data

To estimate the quantile regressions (1) I use the Fed funds target rate and the Fed funds future rate for contracts expiring at 1 and 2 months ahead. The sample comprises the period from 2000-09-01 to 2025-05-21 with daily frequency. Therefore, I use two forecast horizons h = 22 and 44 days ahead. The out-of-sample forecast period ranges from 2010-01-04 to 2025-06-22, when h = 22 and the 1-month Fed funds future contract rate is used as predictor, and from 2010-01-04 to 2025-07-22, when h = 44 and the 2-months Fed funds future contract rate is used as predictor. Notice also that these forecasts can be rewritten at time *t* using $\alpha_0(\tau) + \alpha_1(\tau) ff_{n,t}$, which implies forecast periods ranging from 2009-12-03 to 2025-05-21, when h = 22 and the 1-month Fed funds future contract rate is used as predictor, and from 2009-11-03 to 2025-05-21, when h = 44 and the predictor is the 2-months Fed funds future contract rate.

## 3. Results and implications for investments

Results on the forecasting of the conditional distribution of the Fed funds rate are shown in Figure 1 (and Table 1 for the most recent period), with the top chart showing forecasts generated using the 1-month Fed funds future contract rate as predictor (ff1) and the bottom chart showing forecasts generated using the 2-month Fed funds future contract rate as predictor (ff2). As can be seen, an assessment of the forecasted distributions reveals well balanced downside and upside risks for the Fed funds rate throughout June and July 2025, following a period of increased upside risks and increased uncertainty.[4]

From the difference between the 95th and the 5th quantile forecasts I also estimate the interquantile range as a measure of uncertainty. Results are shown by Figure 2. As can be seen, during the lower bound period, uncertainty has dropped near zero, as the lower bound implies no

[3] As in Granger and Newbold (1986), Christoffersen and Diebold (1997), Patton and Timmermann (2007) and described in Gaglianone and Lima (2012), the loss function is a homogeneous function of the forecast error only, $e_{t+h}^{\tau} = y_{t+h} - \hat{y}_{t+h}^{\tau}$, with L(ae) = g(a)L(e) for some positive function g, whereas the data generating process for $y_{t+h}$ is $y_{t+h} = X'_{t+h}\alpha + (X'_{t+h}\gamma)\eta_{t+h}$ with $\eta_{t+h}|\Omega_{t+h} \sim iid\ F_{\eta,h}(0,1)$. The proof concerning the optimal forecast (2) is similar to the one shown in the Appendix of Gaglianone and Lima (2012).

[4] The GLLS (2011) test of forecast accuracy across quantiles are provided in the Table A.1. in the Appendix and shows quantile forecasts that statistically indistinguishable from the true quantiles.

variation in the Fed funds rate. On the other hand, uncertainty has risen during the liftoff periods of the US policy rate, while has started its declining period prior to interest rate cuts. In fact, the recent values indicate that uncertainty around the Fed funds rate forecasts continues to lower, suggesting that the Fed funds rate is likely to continue its declining process initiated in September 2024.

### *3.1. Implications for the bond market*

The results described above reinforce the view of the previous AM Report of February 2025 that bond yields, at least in the 1- to 10-years segment, are expected to decline in the near- to mid-term. In a scenario where the effects of tariffs on inflation are temporary given the current well anchored inflation expectations, and inflation cools down, the Fed shall continue reducing its policy rate. This shall lower short-rate expectations across the yield curve and, therefore, bond yields. Importantly, although a recessionary scenario may still affect bond risk premia positively, there is a large room for the Fed to cut interest rates and provide liquidity and stimulus to the US economy, which would lower uncertainty and fear in financial markets, reduce risk aversion and, consequently, bond risk premia and bond yields. This would imply less pressure on borrowing costs, which may help to diminish the upward pressure on ultra-long Treasury yields (20-years plus) seen lately.

## 4. Concluding remarks

In this report, I take advantage of the high near-term accuracy of Fed funds futures as predictor of the Fed funds rate to generate forecasts of the conditional distribution of the Fed funds rate using quantile regressions. These distributions are highly accurate in the near-term and allow estimating risk measures regarding the Fed funds rate, such as uncertainty, tail risks, upside/downside risks and median forecasts. Results suggest well balanced downside and upside risks for the Fed funds rate throughout June and July. Besides that, uncertainty around the Fed funds rate forecasts continues to lower, indicating that the Fed funds rate is likely to continue its declining process initiated in September 2024. These results reinforce the preview view (see AM Report of February 2025) that bond yields, at least in the 1- to 10-years segment, are likely to decline in the near- to mid-term. Ultra-long Treasury yields (20-years plus) may also face lower upward pressures, as lower borrowing costs by the US government may cool down the debt unsustainability issues that have been up for discussion lately (see AM Report of May 2022 "The difficult task for monetary policy and the call for a fiscal adjustment").

## References

Christoffersen, P.F. and Diebold, F.X. (1997). "Optimal prediction under asymmetric loss". Econometric Theory 13, p. 808-817.

De Rezende, R. B. (2022). "The difficult task for monetary policy and the call for a fiscal adjustment". AM Report, 1(1), p. 1-11.

De Rezende, R. B. (2023). "Fed funds rate predictions: what are the odds". AM Report, 2(6), p. 1-14.

De Rezende, R. B. (2025). "Risk premia in bond markets: a macro perspective". AM Report, 4(1), p. 1-13.

Gaglianone, W. P., Lima, L. R., Linton, O. and Smith, D. R. (2011). "Evaluating Value-at-Risk Models via Quantile Regression". Journal of Business & Economic Statistics, 29(1), p. 150-160.

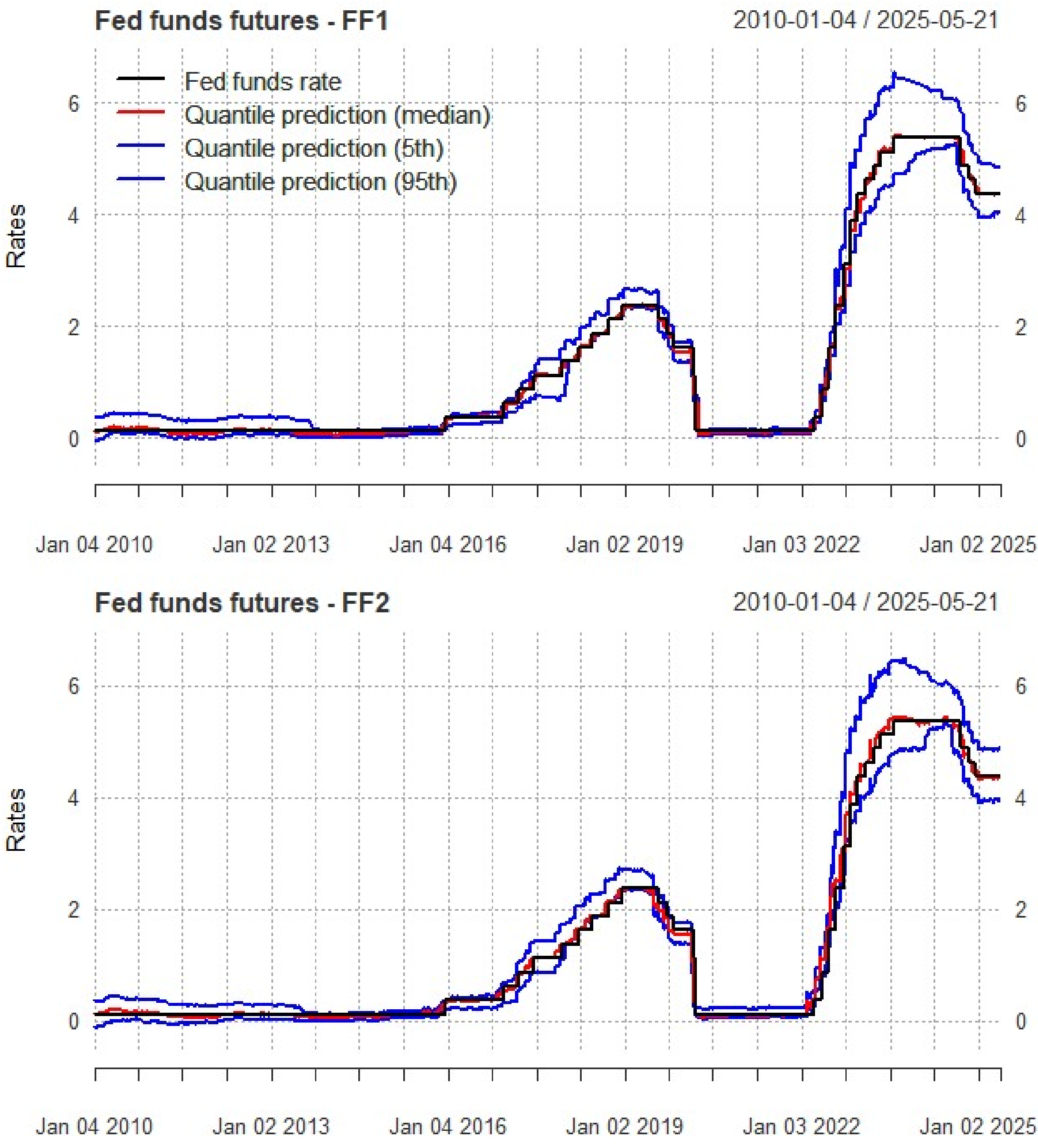
Gaglianone, W. P. and Lima, L. R. (2012). "Constructing Density Forecasts from Quantile Regressions". Journal of Money, Credit and Banking, 44(8), p. 1589-1607.

Granger, C.W.J. and Newbold, P. (1986). "Forecasting time series". 2nd Edition. Academic Press.

Gürkaynak, R, Sack, B. and Swanson, E. (2007). "Market-based measures of monetary policy expectations". Journal of Business and Economic Statistics, 25(2), p. 201-212.

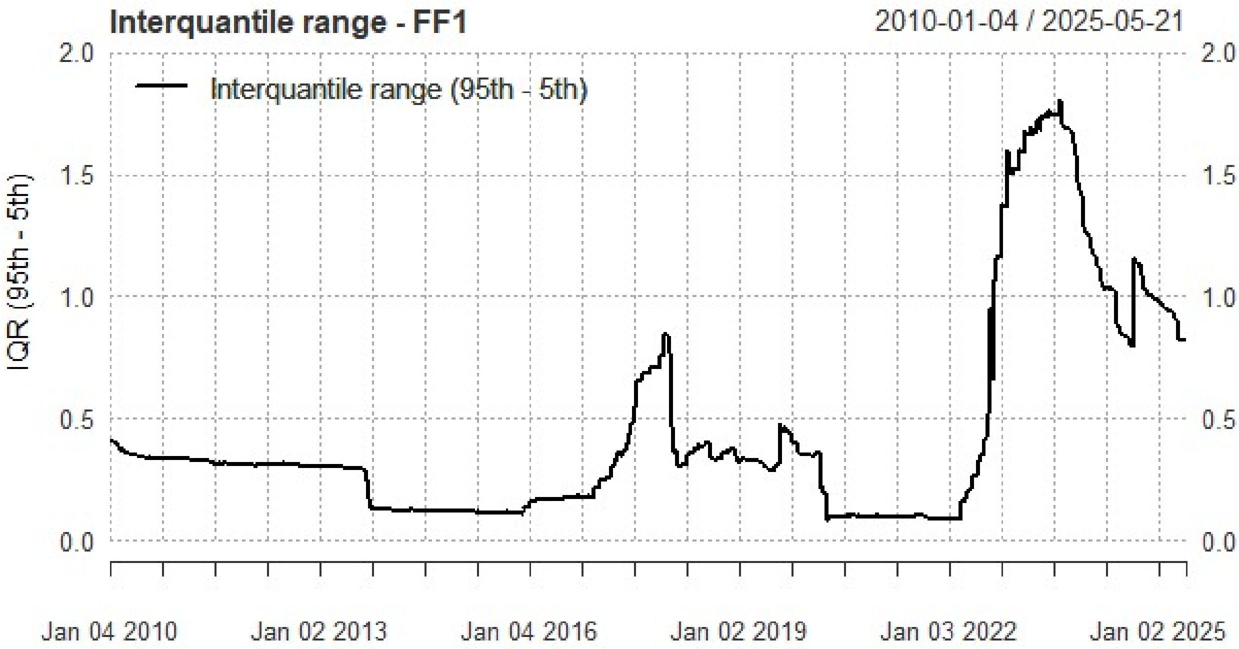
Patton, A.J. and Timmermann, A. (2007). "Testing Forecast Optimality under Unknown Loss". Journal of the American Statistical Association, 102(480), p. 1172-1184.

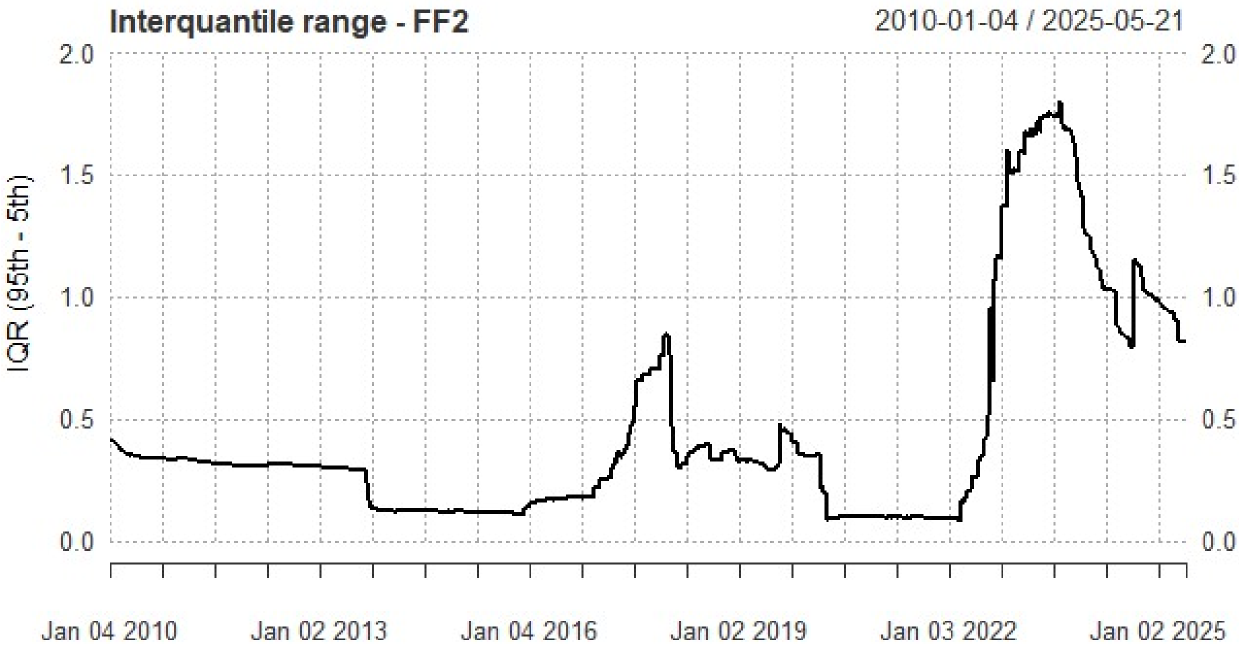
**Figure 1: Fed funds futures predictions**




Notes: This figure shows the predictions for the Fed funds rate generated from the quantile regression model with federal funds futures rates (FF1 and FF2) as predictors. It is shown predictions for the median (in red) and for the 5th and the 95th quantiles (in blue). Realized values for the fed funds rate are shown in black.

**Figure 2: Uncertainty on Fed funds rate**




Notes: This figure shows estimates for the interquantile range (95th minus 5th quantile) as a measure of uncertainty on the Fed funds rate. The estimates are generated from quantile regressions with federal funds futures rates (FF1 and FF2) as predictors.

## Table 1: Quantile predictions for the Fed funds rate, from 2025-05-22

| *Horizons* | *FF1* ($\tau = 0.05$) | *FF1* ($\tau = 0.5$) | *FF1* ($\tau = 0.95$) | *FF2* ($\tau = 0.05$) | *FF2* ($\tau = 0.5$) | *FF2* ($\tau = 0.95$) |
|---|---|---|---|---|---|---|
| $h = 1$ | 4.034 | 4.374 | 4.852 | - | - | - |
| $h = 5$ | 4.034 | 4.374 | 4.852 | - | - | - |
| $h = 10$ | 4.032 | 4.371 | 4.849 | - | - | - |
| $h = 15$ | 4.032 | 4.371 | 4.849 | - | - | - |
| $h = 20$ | 4.034 | 4.374 | 4.852 | - | - | - |
| $h = 25$ | - | - | - | 3.960 | 4.366 | 4.873 |
| $h = 30$ | - | - | - | 3.942 | 4.346 | 4.854 |
| $h = 35$ | - | - | - | 3.955 | 4.361 | 4.868 |
| $h = 40$ | - | - | - | 3.969 | 4.376 | 4.882 |

Notes: This table shows the quantile predictions starting from 2025-05-22 using the 1-month fed funds future contract (ff1) and the 2-month fed funds future contract (ff2) as predictors. The quantiles are 5th, 50th and 95th.

## Table A.1: GLLS (2011) test of forecast accuracy across quantiles (p-values)

| *Percentiles* | *FF1 (h=22)* | *FF2 (h=44)* |
|---|---|---|
| $\tau = 0.05$ | 1.00 | 1.00 |
| $\tau = 0.10$ | 1.00 | 1.00 |
| $\tau = 0.15$ | 1.00 | 1.00 |
| $\tau = 0.20$ | 1.00 | 1.00 |
| $\tau = 0.25$ | 1.00 | 1.00 |
| $\tau = 0.30$ | 1.00 | 1.00 |
| $\tau = 0.35$ | 1.00 | 1.00 |
| $\tau = 0.40$ | 1.00 | 1.00 |
| $\tau = 0.45$ | 1.00 | 1.00 |
| $\tau = 0.50$ | 1.00 | 1.00 |
| $\tau = 0.55$ | 1.00 | 1.00 |
| $\tau = 0.60$ | 1.00 | 1.00 |
| $\tau = 0.65$ | 1.00 | 1.00 |
| $\tau = 0.70$ | 1.00 | 1.00 |
| $\tau = 0.75$ | 1.00 | 1.00 |
| $\tau = 0.80$ | 1.00 | 1.00 |
| $\tau = 0.85$ | 1.00 | 1.00 |
| $\tau = 0.90$ | 1.00 | 1.00 |
| $\tau = 0.95$ | 1.00 | 0.99 |

Notes: This table shows the p-values of the Gaglianone, Lima, Linton and Smith (2011), or GLSS, test of forecast accuracy across quantiles. P-values equal to one indicate that the forecasted quantiles are statistically indistinguishable of each quantile of the true conditional distribution of the Fed funds rate.

AMULETUM
INVESTMENT GROUP

AM Report leverages Amuletum Investment Group's expertise to provide insights on the global economy, financial markets, investments, and asset allocation – all to help its clients to navigate through financial markets. AM Report offers strategic and tactical market views and publications that are underpinned.