Until when are we going to suffer with the Euribor? A forecasting exercise based on fractional integration

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Abstract

In this paper we analyse the evolution of the 12-month EURIBOR, with the aim of forecasting its trend in the forthcoming years. Using fractional integration, we find that the Euribor will return to a downward trend towards the end of 2023 and potentially reach negative numbers by 2025. This all assuming ceteris paribus.

Key words: EURIBOR, mortgages, forecast, European Union, finance

JEL Classification: C22, F15

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Luis A. Gil-Alana gratefully acknowledges financial support from the MINEIC-AEI-FEDER PID2020-113691RB-I00 project from 'Ministerio de Economía, Industria y Competitividad' (MINEIC), `Agencia Estatal de Investigación' (AEI) Spain and `Fondo Europeo de Desarrollo Regional' (FEDER). An internal Project from the Universidad Francisco de Vitoria is also acknowledged. Juan Carlos Cuestas acknowledged the support of the financial support from the Generalitat Valenciana project no. AICO/2021/005 and the Universitat Jaume I Project UJI-B2022-03

1. Introduction

In the aftermath of the COVID19 pandemic and the Russian invasion of Ukraine, inflation rates have surged, and with them, so have interest rates. The European Central Bank (ECB) has pursued an orthodox contractionary monetary policy aiming to reduce the inflation rate and bring it to the long-term target of 2%. This has had important implications for households and companies, since the Euribor rates have also increased drastically since mid-2022. This is because banks have been issuing mortgages with variable interest rates, linked to the 1-year or 6-month Euribor rates. All this has increased fears of a recession in the European Union (EU), as a consequence of constrained investment and an adjustment in private consumption towards paying more interest to banks through mortgage rates.

The aim of this article is to forecast the future of the 1-year Euribor rate by applying fractional integration techniques. Given the current state of economic affairs it is of key importance to analyse how the Euribor is likely to react after the recent shocks. To the best of our knowledge there has been no recent attempt to perform such an exercise, never mind using fractional integration techniques. The advantage of using fractional integration methods, along with autoregressive, integrated and moving average (ARIMA) models is that one can estimate at the same time the order of integration which may be a non-integer number. These models are called autoregressive, fractionally integrated, moving average (ARFIMA) models of order p, d, q, where p is the order of the autoregressive process (AR), d is the non-integer order of integration, and q is the order of the moving average component (MA), and they are more flexible than traditional ARIMA models where the order of differentiation is always an integer.

Interest rates have been shown to be possibly anti-persistent, with a negative order of integration (see, e.g., Canarella et al. 2022). This implies that the speed of mean reversion is relatively fast. Using monthly observations for the 1-year Euribor rate from January 1994 until February 2023, our results show that the elected model is an ARFIMA (3, -0.50, 3). Our forecast, using as a training set our full sample, is that the Euribor will stabilise towards the end of 2023, reaching negative values around 2025. This, of course, assumes no extra exogenous shocks.

The reminder of the paper is organised as follows. In the next section we summarise the method used; in Section 3 we present the data and the results, and the last section concludes the paper.

2. Econometric method

As mentioned earlier, we use fractional integration, and in particular, based on our forecasting purposes, a parametric modelling based on ARFIMA models. To allow for some degree of generality, we allow for a constant and a linear time trend,

$$y_t = \beta_0 + \beta_1 t + x_t, \qquad t = 1, 2, \ldots, \tag{1}$$

where y_t refers to the Euribor rate, and x_t is supposed to be integrated of order d, or I(d), of the form,

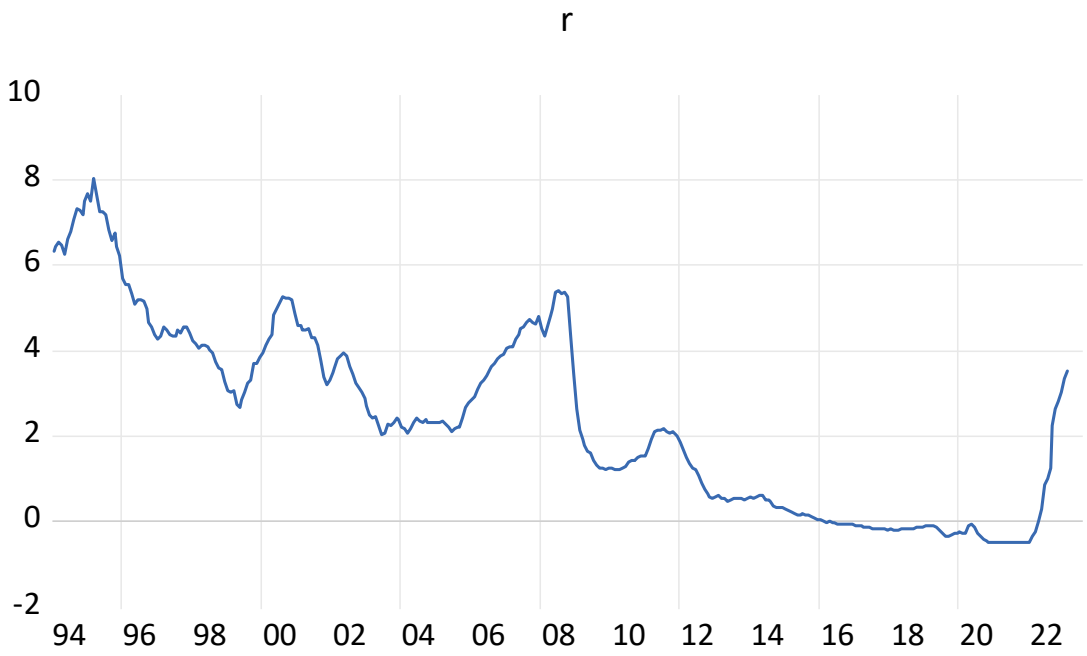
$$(1-B)^d x_t = u_t, \qquad t = 1, 2, \ldots, \tag{2}$$

(see Granger and Joyeux, 1980; Hosking, 1981), where B is the backshift operator, and u_t is I(0) and that follows a standard autorregressive moving average (ARMA) process of orders p and q respectively for the AR and MA components. The estimation is conducted via maximum likelihood in the time domain (Sowell, 1992).

3. Results

As mentioned above, we have used monthly observations for the 1-year Euribor rate between January 1994 and February 2023 which have been downloaded from the *Statistical Data Warehouse* of the ECB. The observations are monthly averages. The data are plotted in Figure 1.

Figure 1: 1-year EURIBOR



As we can see from Figure 1, the Euribor entered a quite brisk downward trend following the start of the global financial crisis in 2008, reaching a minimum around the end of 2022. Since then, the surge of the inflation rate, pushed by the fast recovery form the pandemic along with the Russian invasion of Ukraine and a set of contractionary monetary policy decisions by the ECB, have exacerbated the upward trend in the Euribor.

We have used as a training set the full sample, for which we have estimated an ARFIMA(p,d,q) model with a maximum of 4 lags for both p and q. The selection

of the model has been made according to the minimum of the Akaike Information Criterion (AIC). Hence, the AIC minimises its value for an ARFIMA (4, -0.50, 2). Similar results were obtained with alternative Bayesian and Hannan-Quinn information criteria. The estimated model is reported in Table 1.

Table 1: Estimated ARFIMA model

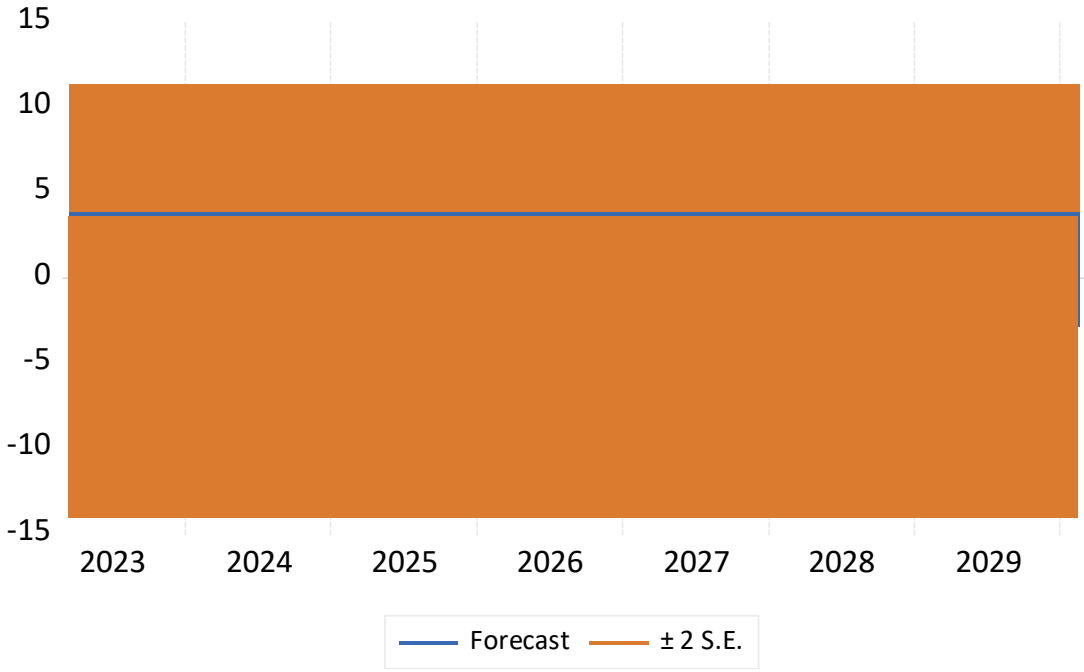
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.378	0.351	15.316	0.000
@TREND	-0.017	0.002	-8.838	0.000
D	-0.502	0.063	-7.930	0.000
AR(1)	0.850	0.055	15.539	0.000
AR(2)	0.254	0.082	3.079	0.002
AR(3)	0.742	0.067	11.083	0.000
AR(4)	-0.861	0.039	-21.858	0.000
MA(1)	1.164	0.061	19.183	0.000
MA(2)	0.891	0.047	18.777	0.000
SIGMASQ	0.018	0.001	21.135	0.000
R-squared	0.996	Mean dependent var		2.404
Ad. R-squared	0.996	S.D. dependent var		2.193
S.E. of regression	0.136	Akaike info criterion		-1.107
Sum squared resid	6.280	Schwarz criterion		-0.996
Log likelihood	203.643	Hannan-Quinn crit.		-1.063
F-statistic	10058.847	Durbin-Watson stat		2.026
Prob(F-statistic)	0.000			
Inverted AR Roots	.97+.06i	.97-.06i	-.54+.79i	-.54-.79i
Inverted MA Roots	-.58+.74i	-.58-.74i		

From Table 1, we can see that all the coefficients are statistically significant and that the order of integration is -0.502, implying a fast reversion towards the equilibrium.

Next, we perform the forecast from March 2023 onwards until 2030. We plot the results in Figure 2. As we can see in the figure, the Euribor is likely to reach a maximum during 2023 and start a negative trend from the end of 2023 onwards. According to our forecast, it will hit the zero value around mid 2025, converging to

negative values. As mentioned above, this is of course under the assumption of no future exogenous shocks. However, this analysis shows that Euribor rates tend to push downwards after a shock in relatively short periods of time to return to values below zero in the long-term.

Figure 2: Forecasted EURIBOR 2023M03 – 2030M02



4. Conclusion

In this paper we have aimed to contribute to forecasting the evolution of the Euribor rate in the forthcoming periods using an alternative ARFIMA modelling approach, which is more general and flexible than the classical ARMA-ARIMA models. Our results indicate a degree of anti-persistence in the Euribor rate that will produce a decline in the rate by the end of 2023, reaching negative values towards 2025. This proves the tendency of the Euribor to be below zero, which may set up a new reality for mortgages and loans linked to the Euribor.

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