FUTURE VALUE OF THE TUNISIAN DINAR AGAINST THE EURO: ARIMA APPROACH

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Abstract

This study predicts the future values of the Tunisian dinar against the euro, the currency of our main trading partner, over the period 2000-2022 using an integrated moving average autoregressive model ARIMA. The study concludes that: the ARIMA model (3, 1, 2) constitutes the best model to forecast the Tunisian dinar against the euro during the study period.

We started by validating the model by performing the various diagnostic tests required. This leads us to show that the error term is white noise and the model specification is valid. The results found underline that the Tunisian dinar will lose its value against the euro where the Tunisian authorities have adopted a flexible exchange rate regime since 2012. In this context, the Central Bank of Tunisia has changed its mode of intervention on the change by replacing the mode based on the reference rate calculated on a basket of currencies by the fixing based on interbank rates. This was intended to encourage exports, reduce the current account deficit and increase foreign exchange holdings.

Keywords: Euro, Tunisian dinar, Forecast, ARIMA approach

JEL classification: C32, C53, F31

1. INTRODUCTION

In Tunisia, the exchange rate regime is a floating regime managed with discretionary intervention (Charfi, 2009). It is a management regime that allows the Central Bank of Tunisia (BCT) to stabilize the real effective exchange rate. This regime is based on an anchoring in the form of indexation according to a basket of currencies made up of the euro and the US dollar.

However, the Tunisian monetary authorities, after the 2011 revolution, allowed the value of the Tunisian dinar to be determined by the interplay of money supply and demand on the interbank market. This perspective has contributed to the depreciation of the Tunisian dinar against the European currency (Euro).

However, since March 2019 the Tunisian dinar has appreciated against the European and American currencies. Which leads us to ask the following question: will the Tunisian dinar continue to rise against the euro? The answer to this question prompts us to resort to econometric modelling based on forecasting models such as ARIMA (Auto-Regressive Integrated Moving Average).

The differential and logarithmic functions allow time series to be stationary (Gritli, 2018). Likewise, the auto-correlation functions and the partial auto-correlation functions allow the stochastic nature of the time series to be modelled. Thus, predictions of future values of the series, with a satisfactory degree of precision, can be easily obtained. Indeed, ARIMA models are relatively more robust and efficient than structural models which are more complex, with short-term forecasting horizons (Gritli, 2018).

This article will be organized as follows. In section 1 we will synthesize the various theoretical and empirical studies that focus on the modelling and prediction of the exchange rate. In section 2 we summarize the evolution of exchange rate policy in Tunisia. In section 3 we will present the data used. In section 4 we will develop the methodology adopted in modelling and forecasting time series. In section 4 we will present the results and econometric interpretations. The last section will be concluded.

2. LITERATURE REVIEW

There is an abundant literature on exchange rate modelling and forecasting. The many modelling approaches clearly highlight the difficulty of finding a representative model describing fluctuations in the foreign exchange market. And again, in the literature, there is no specific approach to shed light on changes in the EUR / USD exchange rate in a fruitful way. The problem of forecasting was illustrated by Meese and Rogoff in 1983 when the authors compared forecasts from structural models and time series.

Meese and Rogoff (1983) found that even if the models fit into the sample, none of them can make point forecasts more precise than a random walk, when the accuracy of the forecast has been compared by calculating the root mean square forecast error.

Yu (2011) examined the monthly exchange rate for three northern European countries using a VAR, a restricted VAR, a VECM and a Bayesian VAR with several macroeconomic variables such as money supply, production, rates of 'interest and price level, both internal and external. The conclusions adopted show that the ARIMA model has better short-term forecasting accuracy but that the random walk models have defended long-term forecasting.

Sellin (2007) assessed the predictive ability of the real and nominal effective exchange rate of the Swedish krona by estimating a VECM model. He included a cointegrating relationship between the real exchange rate, relative output, net foreign assets, and the trade balance, and he found the model to make accurate predictions once the model was increased by a differential. interest rate.

Akincilar, Temiz, and Sahin (2011) fitted several models to daily data for the purpose of forecasting USD / TL, EURO / TL, and POUND / TL models and concluded that Integrated Moving Average Autoregressive Models (ARIMA) give accurate, comparable forecasts.

In addition, Mida (2013) compared 12 forecasts of the monthly USD / EUR exchange rate between a random walk and a VAR with inflation, interest rate, unemployment rate and industrial production index. Mida (2013) concluded that the VAR model precedes the short-term random walk, namely one to three months, but is strongly outperformed in the longer term, namely six, nine and twelve months.

Weisang and Awasu (2014) presented three ARIMA models for the USD / EUR exchange rate using data from monthly macroeconomic variables and they showed that the exchange rate is best modelled by a linear relationship between its last three values and the last three values of the log. price index gap levels.

In addition, Ayekple et al. (2015) considered an ARIMA model to forecast the dynamics of the Ghanaian cedi against the US dollar. They found small differences between predictions by the ARIMA model and the random walk. However, some work highlights the fact that fundamental macroeconomic variables may contain predictive power for long-term exchange rate movements.

Gritli (2018) jointly used a model without endogenous rupture and a model with endogenous rupture. It showed that the Tunisian dinar fell rapidly against the euro during the period from November 2017 to October 2018.

Other linear time series models have traditionally been used by incorporating multivariate systems, namely the vector autoregressive model (VAR) and the vector error correction model (VECM).

In this work, we aim to build a suitable model for forecasting the real EUR/TND exchange rate. Due to previous research, we first use past values to predict future values (our ARIMA model).

3. THE EXCHANGE RATE POLICY IN TUNISIA

Since its independence, Tunisia has adopted essentially two exchange rate policies since the collapse of the Bretton Woods system. From 1973 until 1986, Tunisia preferred a fixed exchange rate policy, in particular, it applied a conventional fixed parity regime. During this period, the exchange rate went through five phases (Safra and Ben Marzouka, 1987):

• **First phase from 1973 to 1978**: the Tunisian authorities chose the German deutsche mark as the reference currency following the significant instability of the French franc.

• **Second phase from 1978 to 1981**: Tunisia adopted, in 1978, the principle of anchoring to a basket of currencies in order to avoid suffering the fluctuations of a single currency. During this period, it fixed its currency at the French franc, the German deutsche mark and the US dollar. The monetary authorities also considered the availability of foreign currency.

• **Third phase from 1981 to 1984**: the fall in the price of oil and the export promotion policy prompted the Tunisian monetary authorities to extend the basket to other currencies depending on the structure of trade.

• **Fourth phase from 1984 to 1985**: following the real appreciation of the Tunisian dinar, Tunisia decided to once again expand its basket of currencies and the dinar exchange rate was now also linked to the currencies of competing countries. This policy aimed to promote exports and improve Tunisian competitiveness.

• **Fifth phase from 1985 to 1986:** the succession of the recession and the problems of the balance of payments pushed the Tunisian authorities to change the weightings of the currencies. These corrections were ineffective (balance of payments crisis) forcing the authorities to devalue the currency by 10% in 1986 (Hanna, 2001).

Since the devaluation of 1986, Tunisia has applied an intermediate exchange policy, it has set up a regime with mobile fluctuation bands. Indeed, the exchange rate was anchored to a basket of currencies with a fluctuation band; the central rate and the fluctuation band were determined according to the objectives and inflation.

• **From 1986 to 1989**, under the SAP, the BCT lowered the nominal effective exchange rate gradually until the real effective exchange rate reached its equilibrium level in order to gain in terms of competitiveness. (Domaç, Shabsigh, 1999).

• **During the 1990s**, the nominal effective exchange rate was determined in such a way as to keep the real effective exchange rate constant; the monetary authorities aimed to preserve competitiveness (Faniza and al, 2002). During this decade, an interbank spot exchange market was created in 1994 and forward in 1997. Resident and non-resident authorized intermediaries were authorized to act as counterparties in forward exchange transactions on behalf of their own. resident customers for import operations of goods and services and financial operations for a maximum period of 12 months and export operations for a maximum period of 9 months.

• **Since 2001**, Tunisia has widened the fluctuation band of the nominal exchange rate. This policy was put in place with the aim of applying the IMF recommendations aimed at relaxing the exchange rate policy (Faniza and al, 2002) in order to improve competitiveness.

• **Since 2012**, more flexible management of the exchange rate policy has been introduced by the BCT in 2012. It consists in determining its reference exchange rate based on the average exchange rate on the interbank market and not on the basis of a fixed basket of currencies. It intervenes on the foreign exchange market through bilateral transactions when market quotations undergo substantial deviations from the daily fixing.

4. PRESENTATION OF THE DATA

The Tunisian revolution of 2011 generated a significant drop in tourism revenues and a slowdown in export activities after numerous shutdowns and closures of several production units of mines, phosphates and derivatives. Popular demonstrations, social movements, strikes and the climate of expectation and insecurity in the country have contributed to deteriorating the external balances of the Tunisian economy.

The graph below shows the evolution of the nominal exchange rate of the euro and the US dollar against the Tunisian dinar with a trend that can be deterministic or stochastic. Indeed, after a sharp depreciation of the Tunisian dinar since December 2010, the latter began to appreciate from April 2019 against the dollar and from March 2019 against the euro. Our series is monthly, has peaks and valleys, and may contain seasonal effects. The appearance of the graph shows a process with a strongly increasing linear trend.

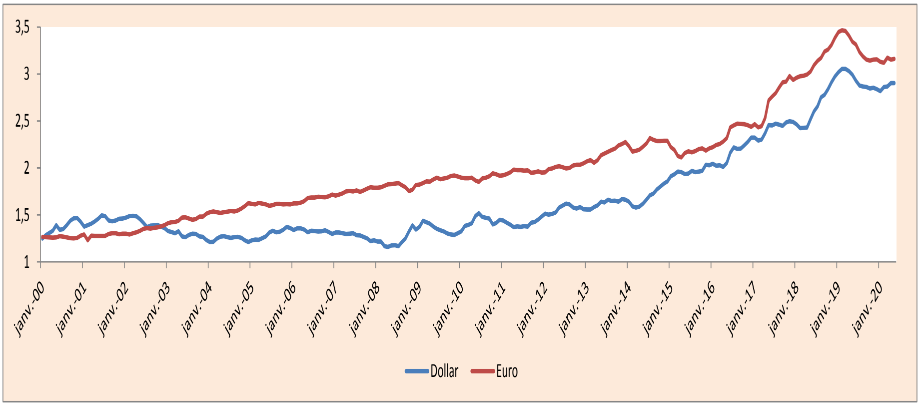

Figure 1. *Monthly evolution of the EUR/TND and USD/TND rate*

It is clear from the above chart that there is an overall upward trend that is accelerating for both currencies against the Tunisian dinar.

5. ARIMA MODEL

The ARIMA model, a method of time series forecasting, was proposed by Box and Jenkins in the 1970s.

The model includes AR, I and MA. AR represents the autoregressive model, I represent the order of integration, and MA represents the moving average model. The unit root test makes it possible to judge the stationarity of the series. As for a no stationary series, it must be converted into a stationary series with a difference operation. The number of corresponding differences is called the order of integration. The ARIMA model (p, d, q) is essentially a combination of the differential function and the ARMA model (p, q). A no stationary process I (d) is a process which can be made stationary by taking d differences. This process is often referred to as the difference-stationary process or the unit root process.

A series that can be modelled as a stationary ARMA process (p, q) after being d-fold differentiated is referred to as ARIMA (p, d, q). The form of the ARIMA model (p, d, q) is as follows:

$$\Delta dy_t = c + \emptyset_1 \Delta dy_{t-1} + \cdots + \emptyset_p \Delta dy_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q} \quad (1)$$

Where Δdy_t denotes a differentiated edema series, and εt is the uncorrelated random error with zero mean. In shift operator notation, $L_i y_t = y_{t-i}$. The ARIMA model (p, d, q) can be written as follows:

$$\emptyset * (L) y_t = \emptyset(L)(1-L) dy_{it} = c + \emptyset(L)\varepsilon_t \quad (2)$$

Where $\phi^*(L)$ is an unstable AR polynomial operator with roots exactly d. We can consider this polynomial as $\phi(L)*(1 - L)*d$, or $\phi^*(L) = (1 - \phi_1 L- \ldots\ldots -\phi_p L_p)$ is a stable shift operator polynomial AR of degree p. Likewise, $\theta(L) = (1 + \theta_1 L + \ldots + \theta_q L_q)$ is an invertible polynomial MA of degree q.

When two of the three ARIMA model parameters (p, d, q) are zeros, the model can be referenced, based on the non-zero parameter, by removing "AR", "I" or "MA" from the abbreviation describing the model. For example, ARIMA (1, 0, 0) is AR (1), ARIMA (0, 1, 0) is I (1) and ARIMA (0, 0, 1) is MA (1).

The ARIMA model is a commonly used time series model for short-term forecasting with high accuracy. The basic idea of the model is that a time series is a set of time-dependent random variables, but changes to the entire time series have certain rules, which can be approximated by the corresponding mathematical model. Through the analysis of the mathematical model, it can understand more fundamentally the structure and characteristics of time series and achieve the optimal forecast in the sense of minimum variance.

6. ARIMA FORECASTING PROCEDURE

- **Analysis of stationarity and seasonality**

The first step is to identify the stationarity of the time series. The stationarity of the series is judged based on a line graph, a scatter plot, an autocorrelation function and a partial autocorrelation function of the time series. The unit root of Augmented Dickey-Fuller (ADF) is typically used to test for variance, trend, and seasonal variations, as well as to study stationarity. As underlined in the table below, the results show that the variable “Euro” is stationary in first difference at a significance level of 1%.

Table 1. *ADF test results*

ADF test			
Level variables	Constant	Constant and trend	Neither constant nor trend
Euro	0.701738	-1.427066	2.838584
In first difference	Constant	Constant and trend	Neither constant nor trend
Euro	-7.635121***	-7.720708***	-7.108661***

, ** and * represent the significance threshold of 10%, 5% and 1% respectively*
Source: *author (our estimates on Eviews 11)*

The series used has either constant or increasing trends (see previous graph) which are not proportional to the oscillations of the series. Thus, the series can be decomposed according to the additive model. Seasonal adjustment will consist of subtracting the seasonal effect from the observed values of the series after having estimated it. This will allow us to obtain seasonally adjusted series. Since the series is monthly, then the centred moving average used to seasonally adjust them is the 12th order moving average.

The seasonal coefficients were determined by the method of deseasonalization by centred moving averages. The seasonally adjusted series is obtained by subtracting these coefficients from the initial series, because the model adopted is additive. The results will be presented in the form of a summary table in the forecasting phase.

Table 2. *Kruskal-Wallis test of the initial series*

Test for Equality of Medians of EURO					
Categorized by values of EURO					
Sample: 2000M01 2019M08					
Included observations: 236					
Method			**df**	**Value**	**Probability**
Med. Chi-square			4	149.6863	0.0000
Adj. Med. Chi-square			4	141.0897	0.0000
Kruskal-Wallis			4	210.5739	0.0000
Kruskal-Wallis (tie-adj.)			4	210.5740	0.0000
van der Waerden			4	209.3666	0.0000
Category Statistics					
			> Overall		
EURO	**Count**	**Median**	**Median**	**Mean Rank**	**Mean Score**
[1, 1.5)	47	1.299400	0	24.00000	-1.379467
[1.5, 2)	102	1.791205	31	98.50000	-0.225347
[2, 2.5)	58	2.207000	58	178.5000	0.703050
[2.5, 3)	13	2.917400	13	214.0000	1.304179
[3, 3.5)	16	3.282850	16	228.5000	1.880581
All	236	1.888050	118	118.5000	7.98E-07

Source: author (our estimates on Eviews 11)

The probability values are significant and therefore the presence of seasonal effects which must be eliminated.

Table 3. *Kruskal-Wallis test after correction for seasonal effects*

Test for Equality of Medians of EURO					
Categorized by values of EUROSA					
Sample: 2000M01 2019M08					
Included observations: 236					
Method		**df**	**Value**	**Probability**	
Med. Chi-square		11	0.610526	1.0000	
Adj. Med. Chi-square		11	0.400000	1.0000	
Kruskal-Wallis		11	0.235945	1.0000	
Kruskal-Wallis (tie-adj.)		11	0.235945	1.0000	
van der Waerden		11	0.300830	1.0000	
Category Statistics					
			> Overall		
EUROSA	**Count**	**Median**	**Median**	**Mean Rank**	**Mean Score**
-0.020718	20	1.872185	10	116.4000	-0.013038
-0.015546	20	1.874712	10	117.8000	-0.011464
-0.009230	20	1.864150	10	114.4000	-0.073196
0.000811	20	1.857319	10	115.6250	-0.019961
0.001153	20	1.871423	9	118.9000	0.006587
0.004056	19	1.912400	10	118.5789	-0.022917
0.004169	19	1.919100	10	119.3158	-0.000223
0.005601	19	1.907400	10	121.0789	0.056415
0.005836	19	1.895900	10	117.6842	-0.030066
0.005975	20	1.890700	10	121.7000	0.044841
0.008306	20	1.873043	10	119.9000	0.028312
0.009587	20	1.883700	9	120.7500	0.034880
All	236	1.888050	118	118.5000	7.98E-07

Source: author (our estimates on Eviews 11)

For the results of the study to be accurate, it is necessary to remove the seasonal effects. We find that the values of the probability are not significant and thus the absence of the seasonal effects.

• **Choice of orders p and q of the models**

After having determined the degree of integration and the elimination of seasonal effects, we will determine the rank of the autoregressive model (AR) and the rank of the moving average model (MA) using the software (Eviews 11) which makes it possible to determine the rank automatically without resorting to the auto-correlation function (AC) and the partial auto-correlation function (PCA).

First, the determination of the rank AR (p) and MA (q) are made by the value method AIC.

Automatic ARIMA Forecasting
Selected dependent variable: D(EURO)
Date: 11/15/19 Time: 09:33
Sample: 2000M01 2019M08
Included observations: 235

Forecast length: 36
Number of estimated ARMA models: 25
Number of non-converged estimations: 0
Selected ARMA model: (3,2)(0,0)
AIC value: -4.54034716075

Source: author (our estimates on Eviews 11)

According to the previous table, the best model which allows to minimize the AIC values for the variable "euro" is the ARIMA model (3.1.2) where the autoregressive degree is: AR (3), the moving averages: MA (2) and the degree of integration that we identified previously: I (1).

Model Selection Criteria Table				
Dependent Variable: DEURO				
Date: 11/18/19 Time: 09:50				
Sample: 2000M01 2019M08				
Included observations: 235				
Model	LogL	AIC*	BIC	HQ
(3,2)(0,0)	540.490791	-4.540347	-4.437296	-4.498802
(2,3)(0,0)	539.691991	-4.533549	-4.430497	-4.492003
(4,2)(0,0)	540.580812	-4.532603	-4.414830	-4.485122
(3,3)(0,0)	540.564649	-4.532465	-4.414692	-4.484984
(2,4)(0,0)	540.539640	-4.532252	-4.414479	-4.484772
(4,3)(0,0)	540.490941	-4.523327	-4.390832	-4.469911
(3,4)(0,0)	540.428313	-4.522794	-4.390299	-4.469378
(1,0)(0,0)	533.724479	-4.516804	-4.472639	-4.498999
(4,4)(0,0)	540.719404	-4.516761	-4.369544	-4.457410
(1,1)(0,0)	533.962688	-4.510321	-4.451434	-4.486580
(2,0)(0,0)	533.907141	-4.509848	-4.450961	-4.486108
(3,0)(0,0)	534.214752	-4.503955	-4.430347	-4.474280
(1,2)(0,0)	534.082084	-4.502826	-4.429218	-4.473151
(2,1)(0,0)	534.019965	-4.502298	-4.428689	-4.472622
(0,4)(0,0)	534.804786	-4.500466	-4.412136	-4.464856
(0,2)(0,0)	532.530426	-4.498131	-4.439245	-4.474391
(0,3)(0,0)	533.337293	-4.496488	-4.422879	-4.466812
(1,3)(0,0)	534.248459	-4.495732	-4.407402	-4.460121
(4,0)(0,0)	534.218325	-4.495475	-4.407145	-4.459865
(3,1)(0,0)	534.215552	-4.495452	-4.407122	-4.459841
(2,2)(0,0)	534.118453	-4.494625	-4.406295	-4.459015
(1,4)(0,0)	534.951228	-4.493202	-4.390150	-4.451656
(4,1)(0,0)	534.638449	-4.490540	-4.387489	-4.448994
(0,1)(0,0)	530.073530	-4.485732	-4.441567	-4.467927
(0,0)(0,0)	511.801885	-4.338739	-4.309296	-4.326869

Source: author (our estimates on Eviews 11)

Note that the lowest AIC value is 4.540347 at the approved level of (3.1.2) and that the diagram below shows the AIC values by class.

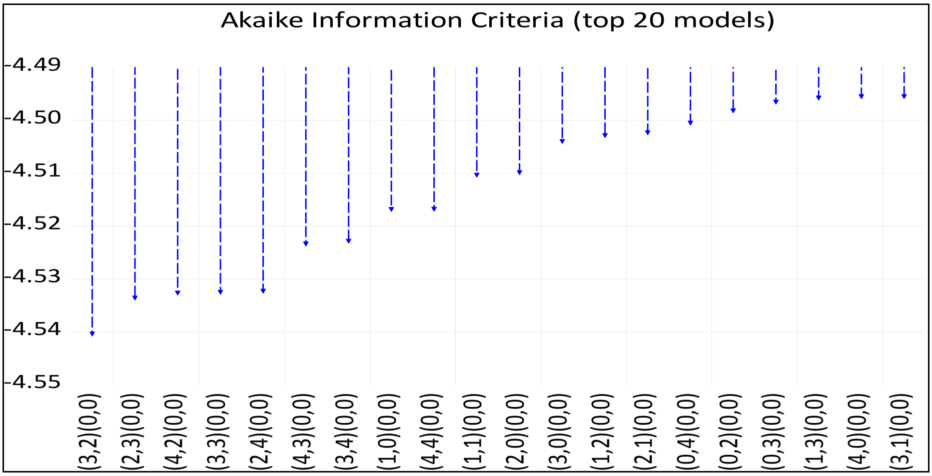

Table 4. *Study Model*

Dependent Variable: DEURO				
Method: ARMA Maximum Likelihood (OPG - BHHH)				
Date: 11/18/19 Time: 09:56				
Sample: 2000M02 2019M08				
Included observations: 235				
Convergence not achieved after 500 iterations				
Coefficient covariance computed using outer product of gradients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.007991	0.003154	2.533812	0.0120
AR(1)	-0.259212	0.067140	-3.860759	0.0001
AR(2)	-0.705508	0.038752	-18.20577	0.0000
AR(3)	0.423943	0.050651	8.369890	0.0000
MA(1)	0.690581	0.061473	11.23380	0.0000
MA(2)	0.986604	0.058617	16.83136	0.0000
SIGMASQ	0.000606	4.58E-05	13.25032	0.0000
R-squared	0.192973	Mean dependent var		0.008186
Adjusted R-squared	0.171735	S.D. dependent var		0.027469
S.E. of regression	0.025000	Akaike info criterion		-4.503385
Sum squared resid	0.142495	Schwarz criterion		-4.400333
Log likelihood	536.1477	Hannan-Quinn criter.		-4.461839
F-statistic	9.086382	Durbin-Watson stat		2.044241
Prob(F-statistic)	0.000000			
Inverted AR Roots	.43	-.34-.94i	-.34+.94i	
Inverted MA Roots	-.35+.93i	-.35-.93i		

Source: author (our estimates on Eviews 11)

It appears from the t statistic of the model coefficients and its p-value that the parametric estimates of all the explanatory variables of the model are significant at the significance level of 0.01 and therefore the prediction will be made on the basis of these significant values. As we know before making the prediction, it is necessary to check the validity of the model by performing a white noise test on the residue after fitting the ARIMA model (3, 1, 2). The graph of the autocorrelation and partial autocorrelation functions of the residual series is shown in the following figure.

We can see that the residue is white noise, indicating that the model is valid.

Date: 11/18/19 Time: 10:08						
Sample: 2000M01 2019M08						
Included observations: 235						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	-0.023	-0.023	0.1212	0.728
.|. |	.|. |	2	0.043	0.043	0.5652	0.754
.|. |	.|. |	3	0.020	0.022	0.6653	0.881
.|. |	.|. |	4	0.047	0.046	1.2034	0.878
.|. |	.|. |	5	-0.014	-0.014	1.2526	0.940
.|. |	.|. |	6	-0.032	-0.037	1.4959	0.960
*|. |	*|. |	7	-0.079	-0.082	3.0081	0.884
.|. |	.|. |	8	-0.062	-0.065	3.9447	0.862
.|. |	.|. |	9	-0.054	-0.049	4.6650	0.862
.|. |	.|. |	10	0.035	0.045	4.9743	0.893
.|* |	.|* |	11	0.077	0.096	6.4326	0.843
.|. |	.|. |	12	0.042	0.053	6.8822	0.865

Most of the correlation coefficients between the error terms fall within the 95% confidence interval, which means that the correlation between the error terms is not significant.

In order to guarantee the suitability of the model, the p-values obtained in the white noise test are greater than 5%, which means that the null hypothesis of the randomness of the residuals must be accepted and therefore the residual is a white noise and the model is valid and optimal for prediction.

• **Forecast of the Tunisian dinar against the euro**

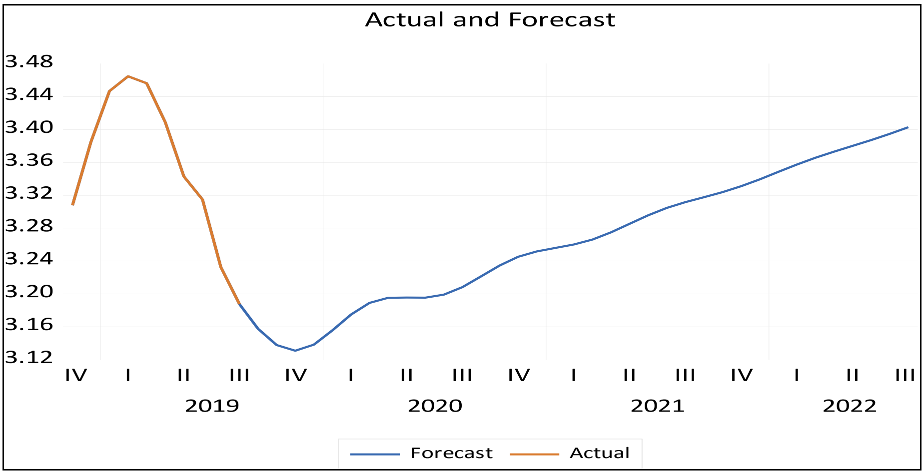

***Figure 3**. Current and predicted EURO / TND values*
Source: author (our estimates on Eviews 11)

The results of the forecast made as part of this study are grouped together in the table below which gave us the predictable values of the nominal exchange rate of the Tunisian dinar against the euro over the next three years (September 2019 - August 2022):

Table 5. *EURO/TND yields and forecast prices*

Data	Forecast returns	Euro/TND prices
sept-19	-0,0298	3,1576
oct-19	-0,0199	3,1377
nov-19	-0,0068	3,1309
dec-19	0,0075	3,1383
jan-20	0,0174	3,1557
febr-20	0,0193	3,1750
mar-20	0,0141	3,1891
apr-20	0,0062	3,1952
mai-20	0,0004	3,1957
jun-20	-0,0002	3,1954
july-20	0,0037	3,1991
aug-20	0,0092	3,2083
sept-20	0,0130	3,2213
oct-20	0,0133	3,2346
nov-20	0,0105	3,2451
dec-20	0,0067	3,2517
jan-21	0,0042	3,2559
febr-21	0,0041	3,2601
mar-21	0,0062	3,2662
apr-21	0,0087	3,2750
mai-21	0,0104	3,2853
june-21	0,0103	3,2957
july-21	0,0089	3,3045
aug-21	0,0071	3,3116
sept-21	0,0060	3,3177
oct-21	0,0062	3,3238
nov-21	0,0072	3,3310
dec-21	0,0084	3,3394
jan-22	0,0091	3,3485
febr-22	0,0089	3,3574
mar-22	0,0082	3,3656
apr-22	0,0074	3,3730
mai-22	0,0070	3,3800
june-22	0,0071	3,3871
july-22	0,0076	3,3947
aug-22	0,0081	3,4028

Source: author (our estimates on Eviews 11)

This suggests that if the Tunisian monetary authorities do not intervene in the foreign exchange market to protect the dinar, the latter its value falls for three years 2020, 2021 and 2022. This is synchronized with the general pace of the evolution. of the Tunisian dinar against the European currency[1] throughout the last thirty years (1986-2018). Indeed, the Tunisian dinar depreciated by 50% during the period of structural adjustment (1986-1990), which corresponds to an average annual change of 8.5%, of 70% between 1991 and 2010, which corresponds to a shift in its value of 2.7% and a 56% transition period between 2011 and the first four months of 2018 (the transition period), i.e. an average annual change of 5.7%. However, it should be noted that the farther away the forecasts, the less precise they are. This is reflected by the confidence intervals generated by the model, which widen with time.

The appreciation of the Tunisian dinar is justified by the decision to increase the key rate by 100 basis points by the Central Bank of Tunisia in February 2019. The loan contracted in foreign currencies from the World Bank by STEG, tourism receipts, cash inflows following the sale of Zitouna Bank and Zitouna Takaful as well as the restrictive monetary policy since it had a positive effect on the Tunisian dinar, all these factors reduced the tension on currencies.

The appreciation of the Tunisian dinar against the euro, returns, according to the BCT, to the evolution of the euro / dollar parity on the international market, to the situation of liquidity in foreign currencies on the local foreign exchange market as well as the expectations of economic operators.

7. CONCLUSION

In this study we were interested in predicting the future values of the Tunisian dinar against the euro during the period from September 2019 to December 2022. To achieve this objective, we used an ARIMA type model (3, 1, 2), based on the AIC selection criteria.

We started by validating the model by performing the various diagnostic tests required. This leads us to show that the error term is white noise and the model specification is valid. The results found underline that the Tunisian dinar will lose its value against the euro, going from 3.15 euro in September 2019 to 3.40 euro in August 2022.

In this context, the BCT changed its mode of intervention on the foreign exchange market by replacing the mode based on the reference rate calculated on a basket of currencies by the fixing based on interbank rates. This was intended to encourage exports, reduce the current account deficit and increase foreign exchange holdings.

The ARIMA forecasting model is a relatively advanced method of forecasting time series under certain conditions. It can realistically describe the rules of dynamic change. In particular, the model is suitable for short-term forecasting and large deviations occur when the forecast timescale is long. It

[1] The ecu for the period 1986 to 1999 and the euro for the period 1999 to 2018, financial statistics bulletins, CBT.

should be noted that since this is a specific time series subject to many factors, model predictions based only on current values and historical data sometimes show some degree of deviation from the actual situation.

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