Dirassat & Abhath
The Arabic Journal of Human and Social Sciences

مجلة دراسات وأبحاث
المجلة العربية في العلوم الإنسانية والاجتماعية

EISSN: 2253-0363
ISSN : 1112-9751

Todo-Yamamoto Causality Approach to Investigate the Relationship between Exchange Rate and its Determinants in Algeria

دراسة العلاقة السببية بين سعر الصرف و محدداته في الجزائر باستخدام منهجية Todo-Yamamoto

DAHMANI Meriem 1, BENBOUZIANE Mohamed 2

University of Tlemcen, meriem.dahmaniufc@gmail.com 1

،University of Tlemcen, mbenbouziane@yahoo.fr 2

Corresponding author: DAHMANI Meriem, meriem.dahmaniufc@gmail.com

تاريخ الاستلام : 2020-05-27 **تاريخ القبول :** 2020-09-12

Abstract:

The goal of this study is to investigate the causal relationship between Algerian Dinar exchange rate/US Dollar and its determinants, which are monetary mass (MM), balance of payments (BoP) and exchange reserve (EXR) through an empirical analysis using Todo-Yamamoto causality upon annual data for the period 1999-2018. Results show that the existence of a unidirectional causality from balance of payments and exchange reserve to Algerian Dinar exchange rate/US Dollar respectively. Whereas, there is no causal relationship between monetary mass and Algerian Dinar exchange rate/US Dollar.

Keywords: Todo-Yamamoto Causality; Exchange rate determinants; Algerian dinar exchange rate; US Dollar;

ملخص

تهدف هذه الدراسة الى تحديد طبيعة العلاقة السببية بين سعر صرف الدينار الجزائري مقابل الدولار و محدداته، و هي كالتالي الكتلة النقدية، ميزان المدفوعات و احتياطي الصرف من خلال دراسة قياسية باستخدام اختبار Todo-Yamamoto Causalityو الاعتماد على بيانات سنوية من 1999 الى 2018. اظهرت النتائج انه توجد علاقة سببية احادية الاتجاه من كل من ميزان المدفوعات و احتياطي الصرف الى سعر صرف الدينار مقابل الدولار في حين انعدام وجود علاقة سببية بين الكتلة النقدية و سعر صرف الدينار مقابل الدولار.

كلمات مفتاحية: اختبار السببية لTodo-Yamamoto ، محددات سعر الصرف، سعر صرف الدينار، الدولار الأمريكي

1. INTRODUCTION

Since the breakdown of the Bretton Woods Arrangements, there was a variety of exchange rate policies adopted by several countries. Accordingly, a massive interest has been emerged in identifying the relevant determinants of exchange rate as well as modeling of exchange rate behavior is one of the unsolved issues of research to be dealt with. Due to the crucial significance of the exchange rate in an economy.

The exchange rate is one of the economic and financial indicators that reflects the quality of a country's economic performance. Furthermore, the exchange rate is a very sensitive economic variable. This fact is a consequence of the internal and external influences to which it is

exposed, in particular due to the expansion of the cycle of foreign trade and the development of markets. The focus of economists and specialists in international finance through their numerous studies on exchange rate regimes and the factors that control their identification is on the rise. Thus, the theoretical and empirical literature continues to develop in order to address the volatility in distressed markets and an adequate accumulation of foreign exchange reserves to meet the international capital markets.

In Algeria, the management of exchange rate is the responsibility of the Bank of Algeria, and this has taken different dimension over the years. However, in 1994, Algeria put in place an adjustment programs in order to correct the previous real appreciation of the Algerian dinar, which led to several devaluation of the dinar with a view to achieving a realistic exchange rate. In 1995, Algeria adopted the management float regime and this is the case so far. Through past years, Algeria has experienced serious problems in its balance of payments and its macroeconomic equilibrium for many reasons, the most important of which is the decline in economic growth rates, high interest rates in international markets, fluctuating exchange rates in addition to low productivity and quantitative easing.

Therefore, considering the massive importance given to the role of exchange rate in the economic. There is a need to study exchange rate determinants and behavior in Algeria. In order to accomplish this study, we state the research question as follow:

What is the nature of the causal relationship between the exchange rate of Algerian dinar against U.S dollar and its determinants?

However to answer this question we set a number of hypothesis as follow:

- Mass Monetary causes the dinar's exchange rate;
- There is a causal relationship between balance of payments and dinar's exchange rate;
- Exchange reserve has an impact on dinar's exchange rate.

To achieve the aim of this study which is the investigation the nature of the causal relationship between dinar's exchange rate against U.S dollar and its determinants. First, we will present a literature review of the study then we will identify the empirical methodology and data used in this paper, after that, a discussion of the empirical results is made and the last section concludes the study.

2. Literature Review

- ***(Saeed et al, 2012)*** their study undertook an econometric analysis of determinants of exchange rate for US Dollar in terms of Pakistani Rupee within the framework of monetary approach. They used monthly data from January 1982 to April 2010 for Pakistan relative to USA to examine the long run and short run behavior of PKR/USD exchange rate and relationship of exchange rate behavior with relative monetary variables. Stock of money, foreign exchange reserves and total debt of Pakistan relative to United States along with Political instability in Pakistan as a dummy variable were taken as determinants of PKR/USD exchange rate during the managed floating regime in

Pakistan. They applied ARDL approach to co-integration and error correction model. According to the results, they confirmed that stock of money, debt and foreign exchange reserve balance all in relative terms are significant determinants of exchange rate between Pakistani Rupee and US Dollar. Moreover, Political instability has a significant negative effect on the value of domestic currency.**(1)**

- ***(Mirchandani,2013)*** investigated in her study various macroeconomic variables leading to acute variations in the exchange rate of a currency. She attempted to review the probable reasons for the depreciation of the Rupee and analyzed different macroeconomic determinants that have impact on the volatility of exchange rate and their extent of correlation with the same. The researcher found that Indian Rupee has shown high volatility and that because India was receiving capital inflows even amidst continued global uncertainty in 2009-11 as its domestic outlook was positive. With domestic outlook also turning negative, Rupee depreciation was a natural outcome. Apart from lower capital inflows, uncertainty over domestic economy has also made investors nervous over Indian economy, which has further exaggerated depreciation pressures. She expected the Rupee remained highly volatile**.(2)**
- ***(Daoudi & Ghettas, 2016)*** tried in their study to recognized which macroeconomic variables that affect the Algerian dinar in the short-run and the long-run. For this aim, they used an annual data of Algerian macroeconomic during the period from 1970 to 2011 to build a VAR model of Algerian dinar determinations. Their model was based on cointegration test, Error Correction Model (ECM) and Granger causality test. The results of their study showed that there was a positive impact but weak for each of government expenditures, oil prices and real gdp. Also, there was a negative impact but weak foe each of FDI and trades openness.**(3)**
- ***(Tabache & Chetbani, 2016)*** measured the exchange rate, and estimated the relationship between the Algerian Dinar exchange rate and a number of macroeconomic variables during the period 1993-2041. They adopted in their study the Multiple Leaner Regression model. The most important result indicated that the exchange rate affected by a set of economic variables. A 1% increase of GDP leads to decline exchange rate by 0.695% , 1% increase of money supply leads exchange rate to rise by 0.289% , 1% increase in trade opening leads to increase exchange rate by 0.301% , and 1% increase of trade exchange cause 0.256% increase of exchange rate.**(4)**
- ***(Mekhnane.O & Mekhnane.A,2017)*** determined and evaluated the economic variables that influence the exchange rate in Algeria during the period 1990 - 2014, by estimating the model to measure the impact of macro-economic variables on the exchange rate, and between the explanatory variables that were used in the study, we find exports, imports, interest rates, inflation rate and GDP. They used Multiple Leaner Regressive (MLR).**(5)**
- ***(Alioui, 2018)*** identified the main determinants of real exchange rate in Algeria from 1974 to 2013 by applying

El badawi's (1998) model which include (the real effective exchange rate, terms of trade , openness and foreign exchange reserves) to the Algerian dinar using a Vector autoregressive model 'VAR'. Her results showed that movement in terms of trade and openness were very important in explaining the real effective exchange rate in Algeria.**(6)**

- ***(Boufellioun & Lanseur, 2018)*** identified the determinants of exchange rates in Algeria from 1968 to 2016. They applied an estimation model Vector Error Correction model (VECM). The chosen variables were the gross domestic product, the rate of inflation, the money supply; the interest rate; the trade balance and the foreign exchange reserve. They claimed in their results that the exchange rate is determined by, the money supply, the trade balance and the foreign exchange reserve.**(7)**
- ***(Medjnah, 2019)*** determined determinants that affect the exchange rate. He analyzed the effect of economic variables on the exchange rate (exports, imports, interest rate, inflation rate, GDP) during the period from 1990 to 2O15. He applied the Autoregressive Distributed Lag (ARDL).The study concluded that there was a long-term equilibrium relationship between the exchange rate and the other macroeconomic variables in the study.**(8)**

3. Data and Methodology

The study employed annual time series data from 1999 to 2018. The data of dinar's exchange rate against the US dollar (USD/DZD), monetary mass (MM), balance of payments (BoP) and exchange reserve (EXR). All data were retrieved from Bank of Algeria except for exchange reserve from World Bank database. Furthermore, to investigate the causal relationship between dinar's exchange rate against US dollar and the other variables, this study applied *Todo-Yamamoto causality* approach. The unit root test was conducted by Augmented Dickey-Fuller (ADF), and the optimal lag length was selected according to *Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC)* .

3.1. Stationarity test:

The first step in causality analysis is to check unit root problem in the data. The time series are one of the most important data used in empirical studies, especially those that rely on the construction of regression models to estimate the economic relationships. These studies assume that the time series used are stationary; this is because the nonstationary leads to econometric problems such as the spurious regression problem. In time series analysis a series is said to be stationary if both the mean and variance are constant and do not depend on time **(9)**, that is, it meets the following conditions **(10)** :

- The mean of xt must be constant $\mathrm{E}(x_t) = \mu, t \in Z$
- The variance of x_t must be constant over time $V(x_t) = \delta_x^2 = \gamma_0 < +\infty t \in Z$
- The autocovariance must not depend on time $\mathrm{cov}(x_{ti}, x_{t\pm h}) = \gamma_h, t \in Z, h \in Z$

In other words, time series are considered stationary if it does not have a component trend , seasonal component or any affection by a change of time origin.

There are many methods used to examine the stationarity of time series and we have relied in this study on ***Augmented***

Dickey-Fuller **(11)**, because the simple dickey-fuller test is valid only for autoregression model integrated in order one as well as neglecting error correlation possibility, therefore, Dicky &Fuller extended an developed this test to overcome these deficiencies. As this test is based on three models shown as follow:

$$\begin{cases} (4)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + \varepsilon_t \\ (5)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + c + \varepsilon_t \\ (6)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + c + bt + \varepsilon_t \end{cases}$$

After estimating these three models using ordinary least squares (OLS) method, the two hypotheses are tested:

$$\begin{cases} H_0 : \lambda = 0 \\ H_1 : \lambda \neq 0 \end{cases}$$

In order to accept or to reject the null hypothesis we compare the critical value in the statistical tables proposed by Dickie-Fuller with the statistical test results:

$$ADF_{\tau} = \frac{\hat{\lambda}}{SE(\hat{\lambda})}$$

If $ADF_{\tau} \geq ADF_{tab}$ in one of the three models, the null hypothesis is accepted $H_0 : \lambda = 0$ it means that the time series has a unit root and it is not stationary.

3.2. Optimal lag length:

Once, established the order of integration, the study process requires the estimation of the relationships among the variables included. However, before estimating this relationship need to identify the optimal lag length of the model. *Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC)* are adopted to determine the optimal lag length.

- **Akaike Criterion**: this is the most used criterion, which aims to minimize the variance. When there are several competing models, it is defined by the model and by the maximum likelihood estimates of the parameters which give the minimum of AIC which is defined by (*Akaik, 1974*)**(12)**:

$$AIC = \hat{\sigma}^2 \exp\left[2\left(\frac{p+q}{N}\right)\right]$$

Where : p,q number of estimates parameters in the model

- **Schwarz criterion *:*** this criterion is suggested by (*Schwarz, 1978*)**(13)** and it is assumed that the trade-off among models is made according to its lowest value and it is defined by the following formula:

$$SC = Ln\left(\hat{\sigma}^2\right)\left(\frac{p+q}{N}\right)Ln(N)$$

3.3. Causality test (Todo-Yamamoto causality) :

Traditionally (Granger, 1969) **(14)** causality is employed to test for the causal relationship between variables. This test states that, if past values of a variable ***y*** significantly contribute to forecast the future value of another variable ***x*** then ***y*** is said to Granger cause ***x*** and that if:

$$E\left(Y_t / Y_{t-1}, X_{t-1}\right) \neq E\left(Y_t / Y_{t-1}\right)$$

Time series must be stationary and integrated in the same level that is the most important condition to apply *Granger causality*. To avoid this problem *Todo & Yamamoto (1995)***(15)** suggested a new

developed method based on *Granger* equation but augmented with extra lags. Moreover, *Todo-Yamamoto causality* could be use regardless whether a series is I(0), I(1) or even I(2). The testing procedure is built on the following steps:

- Determine the maximal order of integration in the process d_{max}. ;
- Determine the optimal lag length k using *AIC, SC, HQ;*
- Estimate $VAR(k+d_{max})$ model which is a developed approach for *Wald* test .

One of the preconditions to apply *Todo-Yamamoto Causality* is that the order of integration of the process d_{max} does not exceed the true lag length k of the model. In order to clarify the principle, let us consider the simple example of a bivariate model (h_t, m_t) , and, in order to study *Todo-Yamamoto Causality*, we have to estimate $VAR\ (k+ d_{max})$ model as follow:

$$\begin{cases} h_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} h_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \alpha_{2j} h_{t-j} + \sum_{i=1}^{k} \alpha_{1i} m_{t-i} + \\ m_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} m_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \beta_{2j} m_{t-j} + \sum_{i=1}^{k} \beta_{1i} h_{t-i} \end{cases}$$

The test is based on *Wald* statistic has an asymptotic chi-square x^2 distribution, which test the following hypotheses:

$H_0 : \alpha_{1i} = 0 \left(\chi_c^2 < \chi_t^2 ; p - value \ \chi^2 > 5\% \right)$: m_t *does*
$H_0 : \beta_{1i} = 0 \left(\chi_c^2 < \chi_t^2 ; p - value \ \chi^2 > 5\% \right)$: h_t *does*

4. RESULTS AND DISCUSSION

4.1. Stationary test :

In our study we will apply ADF test to examine the stationarity of study variables *dinar exchange rate against the dollar (USD/DZD), monetary mass (MM), exchange reserve (EXR), balance of payment balance (BoP)).* the following table summarizes the results of ADF test obtained from EVIEWS:

Table 1: stationarity test result

Time series	Decision	Augmented Dickey-Fuller		
		level	1st difference	2nd difference
USD/DZD	I(1)	0.082967	**-3.679536**	/
Mm	I(1)	6.010109	**-3.093077**	/
Exr	I(2)	-1.257029	-1.096699	**-3.395121**
Bop	I(1)	-0.171051	**-3.727442**	/
Critical Values	*1%*	-2.692358	-2.699769	-2.708094
	5%	-1.960171	-1.961409	-1.962813
	10%	-1.607051	-1.606610	-1.606129

Source: based on Eviews 9 output

By comparing the ADF statistic in the table (1) with the critical value of ADF from (*Mackinon*) table for a significance level of 1%, 5% and 10%. This comparison shows that the null hypothesis of nonstationarity is accepted for all variables in level, in other words, all variables are non-stationary in level. Therefore, we run the test in 1st difference.

While the null hypothesis is rejected for ***USD/DZD*** (dinar exchange against dollar), ***Mm*** (monetary mass) and ***Bop*** (balance of payment) in 1st differences. Where, the statistic values are greater than critical values from *Mackinon* table for a significance level of 1%, 5% and 10%. Hence, the series are integrated of order 1 I(1).

However, ***Exr*** (exchange reserve) is getting rid of unit root at 2nd difference. Hence, it is integrated of order 2 I(2).

4.2. Optimal lag length:

The lag length selection results are provided in the Table:

Table 2: optimal lag length results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-717.6700	NA	8.77e+31	84.90235	85.09840	84.92184
1	-629.8381	123.9979	2.01e+28	76.45154	77.43179	76.54898
2	-613.5730	15.30829	2.93e+28	76.42036	78.18481	76.59575
3	-534.1710	37.36567*	7.29e+25*	68.96129*	71.50995*	69.21463*

Source: based on Eviwes 9 output

The results shown in the table (2) indicates that the lowest value of AIC is (68.96129) which corresponds to the third lag (*k=3*). Therefore, this lag length will be relied upon to test causality using (*Toda-Yamamoto Causality*).

4.3. Causality test (Todo-Yamamoto Causality):

The choice of the optimal lag length was made by *SC,AIC* criteria and the results in the table (2) indicate that the lowest value of *AIC* is 68.96129 which corresponds to third

lag *k=3.* After the determination of the number of lagged terms and level of cointegration d_{max}=2, we construct *VAR(2+3)* model then we apply *Todo-Yamamoto Causality* test in order to study the relationship among the variables. The results were as follow:

Table 3: results of Todo-Yamamoto Causality test

DZD/Dependent variable: USD			
Excluded	Chi-sq	df	Prob.
MM	0.527755	2	0.7681
EXR	139.9560	2	0.0000
BOP	8.051798	2	0.0178
All	316.1836	6	0.0000
Dependent variable: MM			
Excluded	Chi-sq	df	Prob.
DZD/USD	1.207551	2	0.5467
EXR	5.830522	2	0.0542
BOP	0.260330	2	0.8780
All	12.85727	6	0.0454
Dependent variable: EXR			
Excluded	Chi-sq	df	Prob.
DZD/USD	2.623261	2	0.2694
MM	5.818066	2	0.0545
BOP	3.998731	2	0.1354
All	49.64826	6	0.0000
Dependent variable: BOP			
Excluded	Chi-sq	df	Prob.

DZD/USD	0.136617	2	0.9340
MM	1.829281	2	0.4007
EXR	13.79680	2	0.0010
All	19.48477	6	0.0034

Source: based on Eviews 9 output

The table (3) above shows the causal relationship between the variables of the study and the Dinar exchange against Dollar in significant level 5%. The results will be analyzed and discussed hereunder:

- **Causal relationship between *USD/DZD* and *MM:*** the table above gives no evidence of causality existence between these two variables at 5% significant because the p-value of *Wald* statistic is greater than 0.05. Therefore, changes in monetary mass *MM* does affect or cause changes in *USD/DZD* dinar exchange rate against dollar and vices-versa. This result disagrees with the economic theory and that due not only to economic factors but also to political and social factors. This disagreement is because of inefficiency of banking system also the preference of using parallel market rather than the formal because of variations in exchange rate between the two markets. Furthermore, a big mass monetary of foreign currency is in parallel market where the banks are not able to absorb them into current accounts or convert them into Algerian dinar that is why Algerian-banking system could not control this massive monetary mass in parallel market, which is continuing to expand;
- **Causality relationship between *USD/DZD* and *BOP*:** the findings show the existence of a unidirectional causality from balance of payments *BOP* to dinar exchange rate against dollar *USD/DZD* at 5% significant with a p-value lower than 0.05. Thus, changes in *BOP* cause changes in *USD/DZD*, in contrary changes in *USD/DZD* do not cause changes in *BOP*. According to the economic theory, the impact of balance of payments on exchange rate is indirect; the effect is through supply and demand of the domestic currency. Moreover, the exchange rate is a tool of *BOP* disequilibrium correction whether this disequilibrium is temporary or structural (in term of IMF) so, in order to fix this disequilibrium the state should devaluate its exchange rate .In other words, deficit in *BOP* causes an exchange rate devaluation. This causal relationship is on way relation since Algeria has an undeveloped tourism sector and almost 96% of its imports are hydrocarbon. By mean, that Algeria does not have any advantages to motivate domestic currency supply;
- **Causality relationship between *USD/DZD* and *EXR*:** as observed in the table above there is a unidirectional causality from exchange reserve *EXR* to dinar exchange rate against dollar *USD/DZD* at 5% significant whereas p-value of *Wald* statistic is lower than 0.05. Hence, changes in *EXR* affect and

cause changes in *USD/DZD* but in the opposite changes in *USD/DZD* don't have an impact on *EXR.* These assets are used to fulfill financial obligations such as debt and to meet the needs finance the balance of payments or interfering with the exchange markets to influence the exchange rate. Since Algeria adopt the managed float regime, which is based on the accumulation of foreign reserves, the authorities adjust their exchange rates frequently based on their foreign currency reserves and gold.

5. CONCLUSION

The paper empirically investigates the causal relationship between Algerian dinar exchange rate against US dollar and its determinants, which are monetary mass, balance of payments and exchange reserve for the period 1999- 2018. The Toda and Yamamoto test is used for identify the direction of causality. The findings reveal that USD/DZD, MM and BoP are integrated in order 1 i.e. I(1) while EXR is integrated in order 2 i.e. I(2), also, the optimal lag length selected by the criteria is 3. Moreover, the Todo-Yamamoto causality test affirms that there is no causal relationship between dinar's exchange rate against the US dollar and monetary mass. Whereas, there is a unidirectional causality running from balance of payments to dinar's exchange rate against the US dollar as well as unidirectional causality running from exchange reserve to dinar's exchange rate against the US dollar.

To sum up the analysis, it can be concluded that exchange rate behavior significantly depends upon the macro or monetary fundamentals of the respective countries. There is no relationship between monetary mass and dinar's exchange rate and that contradicts the economic theory, which assumes the inverse relationship between them. Additionally, the unidirectional causal relationship between balance of payments and dinar's exchange rate contradicts the economic theory, which assumes that exchange rate affects balance of payments; because if a country intends to motivate and increase its imports it depreciates its currency value and that reflects on trade balance and so balance of payments. Nevertheless, in Algeria the low productivity and the dependence just on hydrocarbon as imports lead to this unidirectional causality relationship. Accordingly, to this analysis we say that factors affecting exchange rate can be economic, political, and psychological whether short run or long run.

6. Bibliography List :

6.1. Books

- C.Mills, T., 2015. Time Series Econometrics- A Consise Introduction. England : Palgrave Macmillan.

6.2. Journal article :

- Alioui, F. Z., (2018), The Algerian Exchange Rate Determinants. ECONOMIE & MANAGEMENT, 17(1), pp. 111-126 ;
- Akaike. H, (1974), A New Look at the Statistical Model Identification, IEEE Transactions on Automatic Control, Vol AC-19, n°06, PP 716-723;
- Daoudi, M. & Ghettas, A., (2016), Determinants of the Algerian dinar exchange rate: an analytical and econometric study for period (1970-2011). Journal of Quantitative Economic Studies, Issue 2, pp. 31-41;

- Dickey. D, Fuller. W, (1981), The likelihood Ratio Statistics for Autoregressive Time Series With a unit Root, Econometrica, n° 49, N-Y, PP 1057-1072;
- Gourieroux. C Monfort. A, (1990), Séries Temporelles et Modèles Dynamiques. Economica, p. 152 ;
- Granger, C. (1969), Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica, 37(3), 424-438;
- Harvey, J. T., (2015), A Post Keynesian View of Exchange rate determination. Post Keynesian Economics, pp. 61-71;
- Medjenah , F., (2019), Econometric modelling of the impact of some determinants of the exchange rate - dollar - on the economic growth in Algeria during the period (1980 – 2017). aggregates of knowledge magazine, 5(2), pp. 7-23;
- Mekhnane, O. & Mekhnane, A., (2017), Measurement and evaluation of the determinants of the exchange rate of the Algerian dinar against the US dollar for the period (1990-2014), an econometric study. Advanced Economic Studies Review , 2(2), pp. 271-307;
- Mirchandani, A., (2013), Analysis of Macroeconomic Determinants of Exchange Rate Volatility in India. International Journal of Economics and Financial Issues, 3(1), pp. 172-179;
- Saeed, A., Awan, R. U., Sial, M. H. & Falak, S., March (2012.),AN ECONOMETRIC ANALYSIS OF DETERMINANTS OF EXCHANGE RATE IN Pakistan. International Journal of Business and Social Science, 3(6), pp. 184-196;
- Schwarz. G, (1978), Estimating the Dimension of a Model, Annals of Statistics, Vol 06, PP 461-464;
- Tebache, D. & Chetbani, S., (2016), Algerian Dinar Exchnage Rate Determinants and its role in achieving economic stability. Strategy and Development Review, 6(11), pp. 309-336;
- Toda, H., & Yamamoto, T. (1995), Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. Journal of Econometrics, 66, 225-250;

6.3. Thesis & Dissertations :

- Boufellioun.R & Lanseur.T, (2017/2018), Les déterminants du taux de change du Dinar Algérien : une approche économétrie (1968-2016), Faculté des sciences Economiques, Université Abderrahmane Mira Bejaia ;

7. Citations:

(1) Saeed, A., Awan, R. U., Sial, M. H. & Falak, S., March (2012), AN ECONOMETRIC ANALYSIS OF DETERMINANTS OF EXCHANGE RATE IN Pakistan. International Journal of Business and Social Science, 3(6), pp. 184-196;

(2) Mirchandani, A., (2013), Analysis of Macroeconomic Determinants of Exchange Rate Volatility in India. International Journal of Economics and Financial Issues, 3(1), pp. 172-179;

(3) Daoudi, M. & Ghettas, A., (2016), Determinants of the Algerian dinar exchange rate: an analytical and econometric study for period (1970-2011). Journal of Quantitative Economic Studies, Issue 2, pp. 31-41;

(4) Tebache, D. & Chetbani, S., (2016), Algerian Dinar Exchnage Rate Determinants and its role in achieving economic stability. Strategy and Development Review, 6(11), pp. 309-336;

(5) Mekhnane, O. & Mekhnane, A., (2017), Measurement and evaluation of the determinants of the exchange rate of the Algerian dinar against the US dollar for the period (1990-2014), an econometric study. Advanced Economic Studies Review , 2(2), pp. 271-307;
(6) Alioui, F. Z., (2018), The Algerian Exchange Rate Determinants. ECONOMIE & MANAGEMENT, 17(1), pp. 111-126;
(7) Boufellioun.R & Lanseur.T, (2017/2018), Les déterminants du taux de change du Dinar Algérien : une approche économétrie (1968-2016), Faculté des sciences Economiques, Université Abderrahmane Mira Bejaia ;
(8) Medjenah , F., (2019), Econometric modelling of the impact of some determinants of the exchange rate - dollar - on the economic growth in Algeria during the period (1980 – 2017). Aggregates of Knowledge Magazine, 5(2), pp. 7-23;
(9) C.Mills, T., (2015), Time Series Econometrics- A Consise Introduction. England : Palgrave Macmillan;
(10) Gourieroux. C Monfort. A, (1990), Séries Temporelles et Modèles Dynamiques. Economica, p. 152 ;
(11) Dickey. D, Fuller. W, (1981), The likelihood Ratio Statistics for Autoregressive Time Series With a unit Root, Econometrica, n° 49, N-Y, PP 1057-1072;
(12) Akaike. H, (1974), A New Look at the Statistical Model Identification, IEEE Transactions on Automatic Control, Vol AC-19, n°06, PP 716-723;
(13) Schwarz. G, (1978), Estimating the Dimension of a Model, Annals of Statistics, Vol 06, PP 461-464;
(14) Granger, C. (1969), Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica, 37(3), 424-438;
(15) Toda, H., & Yamamoto, T. (1995), Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. Journal of Econometrics, 66, 225-250;