Research

The Risk of Foreign Exchange Currency in a Public-Private Partnership (PPP) Projects and Djibouti Currency Forecast

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Abstract: Unpredicted Foreign exchange (FX) rate changes produce to a serious risk factor, particularly in public-private partnership (PPP) infrastructure projects in developing countries. The risk exists since PPP extends their offer commonly locally and generate incomes in local currency, while their expenditure costs and managing and maintenance cost designated by significant monetary forms. Multidisciplinary experience and building judgment are expected to control and forecast the exchange rates. In this paper, we are going to yearly models the exchange rate between USD/DJF (Djibouti Franc) and contrasts the actual information with forecasting one using time series analysis over the period from 2011 to 2018. The official yearly data of OANDA is used for the present study. Mainly, this paper is to apply the ARIMA model for forecasting the exchange rate between USD/DJF by using the Box-Jenkins approach. The precision of the forecast is compared with Root Mean Squared Error (RMSE).

Keywords: Exchange rate Forecasting, Public-Private Partnership, Infrastructure, ARIMA model

INTRODUCTION

In the past, numerous countries have attempted genuine efforts to enhance infrastructure development. Even though infrastructure will dependably be paid for by the government, the users or a mix of both, countries setting out on huge construction programs are probably not going to locate the required assets from their national spending plan. In such cases, the private sector can give to forward the vital capital. In a common Public-private partnership (PPP) infrastructure projects, the elements of construction, activity, support, and fund transmitted to a special-purpose company (SPC) that shaped for this reason for a time of, for example, 30 years.
The SPC works under the terms of an agreement with the aspects of a contract for work and administrations, with possession coming back to the public sector in general at the finish of the legally binding term. The concessionaire gets either a regular payment as availability fee or incomes dependent on users expenses consequently.

For example, if an organization contracts to give services (with dollar currency) but receives payment in a foreign currency, at that point, an 8% drop in the exchange rate would result in an 8% reduction in the value of the contract revenues. Correspondingly, the keeping balances of a foreign currency run the risk of value reductions as foreign exchange rates changes.

A movement of outside purchase and multinational firms enlargement into new markets recommends the significant development of this topic. However, it is really important to manage and forecast the currency change to avoid any sorts of future change.

In two recent papers, using dynamic error-correction models, (MacDonald & Taylor, 1993, 1994) have obtained more convincing results regarding US dollar versus pound and US dollar exchange rate forecasts. In these two studies, the specification of the short-term equation based on the statistical properties of the series, but long-term developments are compatible with currency exchange rate models (which incorporate overreaction variants (Dornbusch, 1976) and interest rate differential real (Frankel, 1979).

In a recent article, (Amano R., 1992) developed an error-correction model of the real exchange rate between the Canadian dollar and the American dollar. The latter is determined in the long term by terms of trade indices, and the deviations explain its short-term movements from the long-term equilibrium and a term of interest differential.

The (Meese, 1983a, 1983b) reviews marked a watershed in empirical exchange rate economies. Specifically, their strong finding that standard empirical exchange rate models couldn't beat a straightforward random the walk forecast seen as pulverizing.

Even with the advantage of 20 years of knowing the past, besides, the random walk remains the regular comparator for exchange rate forecasting and models which reliably and essentially beat a guileless random walk are as yet subtle (e.g., see (Mark, 1995). A parallel finding in the exchange rate literature, likewise dating from the mid-1980s, was that the forward rate isn't an ideal predictor of the future spot exchange rate (see, e.g., (Hansen & Hodrick, 1980); (Frankel, 1980); (Bilson, 1980), or, proportionately, that the forward premium isn't an ideal predictor of the rate of depreciation, as the effective market's
speculation, at least in its risk-neutral formulation, would propose (see (Frankel & Rose, 1995); (Taylor, 1995). Endeavors to find the source of this disappointment of the risk-neutral effective markets speculation either in the presence of stable, huge and conceivable risk premia or in some sense in the disappointment of discerning expectations when connected to foreign exchange market as an entire, have additionally met with blended and extremely constrained achievement (see (Lewis, 1995);(Taylor, 1995)). In this manner, from the mid-1980s ahead, exchange rate forecasting, in general, turned out to be progressively to be viewed as a dangerous occupation, and this remains to a great extent the case.

A beam of expectation in a generally cloudy condition was, in any case, given by (Clarida & Taylor, 1997), who contended that the disappointment of the forward rate ideally to foresee the future spot rate did not infer that forward rates did not contain important data for forecasting future spot exchange rates. Clarida and Taylor create what they term a "rationalist" system for connecting spot rate and forward rate developments without expecting anything by any stretch of the imagination particular about risk premia or desires arrangement with the exception of that takeoff from the risk-neutral efficient markets hypothesis (RNEMH) drove at most a stationary wedge among forwarding and expected future spot rates. This is adequate to build up the presence of a linear vector equilibrium correction model (VECM) for spot and forward exchange rates. Utilizing this system, Clarida and Taylor can remove adequate data from the term structure of forwarding premia to outflank the random walk forecast—and a range of alternative forecasts—for several exchange rates in out-of-sample forecasting. Undoubtedly, at the one-year forecasting horizon, their change over the gullible random walk is of the request of 40 percent as far as the root mean square errors.

The goal of this paper is to apply the ARIMA model for forecasting currency exchange rate of DJF against USD and this forecast of the exchange rate was led both with Crystal Ball software and excel. The paper is organized as pursues. Part 2 portrays the Autoregressive Integrated Moving Average (ARIMA), model. Part 3 portrays the forecasting exercise and discusses the results. Part 4 summarizes and concludes.

METHODOLOGY
The exchange rate series USD/DJF for the period from October 01, 2011 to September 30, 2018 [4] is exhibited in Figure 1. The historical currency exchange rates from October 2011 to September 2018 provided by the OANDA were used.
The data utilized for this study subsists of quarterly yearly data on USD/DJF exchange rate spot, for the time of 2011 to 2018 extracted from the official site of OANDA. In this examination, we use the ARIMA model to forecast one-period ahead of the series by applying the Box-Jenkins approach. An ARIMA demonstrate is a conjecture of an ARMA model.

The model is, for the most part, alluded to as ARIMA (a, b, c) model where a, b, and c are integers greater than or equal to zero and allude to the request of the autoregressive, coordinated and moving average aspects. The Box-ARMA model is a mix of the AR(Autoregressive) and MA(Moving Average) models (Olajide, Ayansola, Odusina, & Oyenuga, 2012) as pursues:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \cdots + \beta_p y_{t-p} - \alpha_1 \mu_{t-1} - \alpha_2 \mu_{t-2} - \cdots - \alpha_q \mu_{t-q} + \mu_t$$  \hspace{0.5cm} (1)

The Box-Jenkins philosophy (Box, Jenkins, Reinsel, & Ljung, 2015) is a five-step process for establishing, choosing, and evaluating conditional mean models (for discrete, univariate time series data). The means are recorded as follow:

1. Establish the stationarity of your time series. If your series is not stationary, progressively
change your series to achieve stationarity. The example autocorrelation function (ACF) and fractional autocorrelation function (PACF) of stationary series rot exponentially (or cut off totally after a couple of slacks).

2. Recognize a (stationary) conditional mean model for your data. The example ACF and PACF functions can help with this choice. For an autoregressive (AR) process, the example ACF rots slowly, yet the example PACF cuts off after a couple of slacks. On the other hand, for a moving average (MA) process, the example ACF cuts off after a couple of slacks. However, the example PACF rots step by step. If both the ACF and PACF rot step by step, consider an ARMA model.

3. Determine the model, and evaluate the model parameters. When fitting non-stationary Models in Econometrics Toolbox, it isn't important to physically contrast your data and fit a stationary model. Rather, utilize your data on the first scale, and make an arima model question with the coveted level of non-seasonal and seasonal differencing. Fitting an ARIMA model straightforwardly is profitable for forecasting: forecasts returned on the first scale (not differenced).

4. Lead integrity of-fit checks to guarantee the model portrays your data sufficiently. Residuals ought to be uncorrelated, homoscedastic, and typically circulated with consistent mean and variance. If the residuals are not regularly conveyed, you can change your development dissemination. In the wake of picking a model and checking its fit and forecasting capacity, you can utilize the model to forecasts or produce Crystal ball predictor over a future time skyline.

RESULTS AND DISCUSSION
The ARIMA model is implemented for forecasting of exchange rates for USD/DJF. The period was taken from October 01, 2011 to September 30, 2018. The root means squared mistake (RMSE) is chosen to be forecasting accuracy measures.
Figures 2 demonstrate that the time series data was not stationary. It represents the actual and forecast values of the USD/DJF exchange rates. Considering this, the forecast model shows a similar trend as the actual exchange rates.

**Figure 2.** Actual and forecast of the USD/DJF exchange rate.

In doing the test for ARIMA process, ARMA (2, 0, 1) was inferred and an *Akaike Information Criteria* (AIC) estimation of -21.02. After all, since the series are unified the conditional models that were distinguished for the global time series data are AR(1), MA(1) and AR(2). The tentative models (as shown in table 3) revealed that the best model is ARIMA (2, 0, 1) from the crystal ball prediction.

**Table 1.** ARIMA model coefficients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR(1)</td>
<td>1.82</td>
<td>0.0966</td>
</tr>
<tr>
<td>AR(2)</td>
<td>-0.8894</td>
<td>0.0954</td>
</tr>
<tr>
<td>MA(1)</td>
<td>1.03</td>
<td>0.0196</td>
</tr>
<tr>
<td>Constant</td>
<td>4.0671E-04</td>
<td></td>
</tr>
</tbody>
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**Table 2.** Forecast accuracy

<table>
<thead>
<tr>
<th>Method</th>
<th>Rank</th>
<th>RMSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIMA(2,0,1)</td>
<td>Best</td>
<td>0.00</td>
</tr>
<tr>
<td>Single Moving Average</td>
<td>2nd</td>
<td>0.00</td>
</tr>
<tr>
<td>Single Exponential</td>
<td>3rd</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Theil's U</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIMA(2,0,1)</td>
<td>0.8254</td>
<td>2.25</td>
</tr>
<tr>
<td>Single Moving Average</td>
<td>1.00</td>
<td>1.96</td>
</tr>
<tr>
<td>Single Exponential</td>
<td>1.00</td>
<td>*</td>
</tr>
</tbody>
</table>

*Note: *Durbin-Watson test.*
The prediction of the USD/DJF exchange rate for the next three years is made by using a statistical package, the residual value for the data was also obtained and used to predict the exchange rate up to 2021 using ARIMA (2,0,1).

CONCLUSION
This study anticipated at predicting the exchange rate between USD/DJF using ARIMA model. The time series data isn't stationary at level. We at that point connected the Box-Jenkins method on the stationary information arrangement, and we recognize the relating ARIMA (a,b and c) process. The series correlogram has enabled us to pick proper a and b and c for the data series. Thus, the units root test was directed, and the null of the series integrated of order one was not rejected. We finally, constructed an ARIMA (2,0,1) model. The root mean square error (RMSE) which decide the effectiveness of the model was evaluated at 0.00, this shows the model fabricated is adequate using an ARIMA (2,0,1) model of quarterly yearly value series of exchange rate until 2021 shown in the previous figure 5.

References


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