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Original article

Univariate Time series Analysis of Road Traffic Accident in Ethiopia from1980 to 2021: Application of ARIMA Model

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Abstract

Road traffic accidents are considered major causes of death in the Ethiopia today and thus are major health problem all over the world. Accidents on Ethiopia roads are serious problems that need attention. Road traffic accidents would increase in number if tangible efforts are not made to tackle the problem. In this study to examine the pattern of road traffic accident in Ethiopia and to forecast the future behavior of road traffic accident. The aim of the study is to fit a statistical model that would describe the accident data in Ethiopia. Annual Road accident data for 42 years beginning from September 1980 to August 2021, collected from world health organization and Ethiopian statistical agency served as the data for the analysis. Box-Jenkin's (ARIMA) models were employed in the analysis and the statistical software was used E-views 9. The study revealed that there was no seasonality in the data. The result indicates the maximum number of road traffic accident in Ethiopia was found in year 2021(31564) compared with the other years and the minimum number of road traffic accident in Ethiopia in 1980(12065). The forecast for the 2023 to 2031 years from the selected ARIMA (1,1,1) model and it indicates the number of accidents will increase in the future. In general, the number of road traffic accident in Ethiopia is increasing from time to time and there will be increase therefore it is a series problem. The researcher's advice to the Ethiopia traffic police station to make a special focus on the flow of controlling traffic system on next the years. Further studies should be examined to determine while road accident still occur despite government efforts and researchers study focus on causes of the accidents in Ethiopia.

Keywords: ARIMA model; Autoregression; Autocorrelation; Ethiopia; Moving average; Road traffic accident.

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1. INTRODUCTION

Road traffic accident is an event that occurs during the movement, and with the participation, of a vehicle on a road, in which people are killed or injured, vehicles, equipment or goods are damaged, or any other material. Road traffic crashes result in the deaths of approximately 1.3 million people around the world each year and leave between 20 and 50 million people with non-fatal injuries. More than half of all road traffic deaths and injuries involve vulnerable road users, such as pedestrians, cyclists and motorcyclists and their passengers (Leitão, 2022).

Transport plays a significant role in the daily activities of man. Road transport was a critical mode of transportation in the development of a country particularly in Ethiopia, in which there were different impacts related to it. The effects were related to road traffic accidents that are considered to be a major critical problem all over the world. Each year an estimated 1.25 million peoples were killed in road traffic accident and up to 50 million people injured worldwide (WHO, 2018). Third world countries bear the brunt of the fatalities from road traffic accidents, accounting for more than 85% of the world's road fatalities. Thus, road traffic accident was the most dangerous health problem all over the world (Deme, 2019).

About 85% of annual road-traffic related deaths. Road traffic injuries are expecting to take third place in the rank order of disease burden by the year 2020 (Peden, 2004). Road traffic accident would be the world's third leading cause of premature death by 2020" (Peden, 2004). The world health organization believes that this figure will increase to 1.9 million if concrete action is not taking by the end of 2020, especially in developing country such as Ethiopia (WHO, 2020).

Africa has one of the highest road traffic death rates in the world, with little difference in rates between those countries categorized as low-income. Whereas the range of fatalities per 100,000 populations in countries of African region is not very wide, 70% of all the deaths occurred in ten countries that account for 70% of the regional population: Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Madagascar, Mozambique, Nigeria, South Africa, and Tanzania (WHO, 2020).

According to a World Health Organization report in 2015, Ethiopia is one of the 50 countries with the deadliest roads in the world (Inc, 2015). Principally, injured people have occupied 30 to 70 percent of orthopedic beds in developing countries hospitals World Health Organization (WHO, 2009).

Road traffic accident-related causalities are extremely high in Ethiopia. Male young adults and vulnerable road users are at increased risk of RTAs. There is urgent need for bringing road safety to the country's public health agenda. Pedestrian death in Ethiopia was common and high. Accordingly; about 74% of the fatal, serious and slight injury accidents happened when pedestrians tried to cross streets (Abegaz & Gebremedhin, 2018).

Transport has a direct impact on the day-to-day activities of the people in different reasons. Road traffic accidents are among the most damaging environmental impacts, which have resulted from transportation development. Road safety, therefore, is a worldwide problem. Each year more than a one a million people die in traffic accident and many more are injured, in this respect, more vehicles are usually involved. In developing countries, next to the death caused by natural factors is road traffic accident. And this has a great impact on the socio-economic activities.

Ethiopia as one of the developing countries has one of the world's worst road traffic accidents. There are many problems towards the researchers tried to study the trend analysis of road traffic accident in Ethiopia.

The effect of increasing road traffic accident not only causes physical injury (paralysis) or death but also psychological problems may occur. These issues may make those who have been in a crash afraid to drive again. In some cases, the psychological trauma may affect individuals' ability to work and take on family responsibilities.

Even if the level of motorization comparatively is low in the developing countries, the incidence of road traffic accident is increasing. By the year 2020, it is estimated that the road traffic accident will move up from the ninth to third place out of separately identified world diseases causing death and disability (Murray *et al*., 2002)

The major traffic accidents that occur on the main highway and streets can be grouped into two. These are motor and non-motor vehicle accidents. Motor vehicle accident is an accident that occurs, on highway and streets, which involve cars, that is one or more or with car, car-pedestrian and car-bicycle accidents. On the other hand, non-motor vehicle accident that involve collision between a pedestrian and bicycle on a sidewalk (Christie, 1995).

Road traffic accident occurs due to different causes. Most scholars grouped the different causes in three categories. Three are causes by road user's error, vehicle defects and road condition or environment. Among the most prominent factors, is the human factor of which drivers' errors takes

the majority of the blames. Driver's errors that are hazardous include driving too fast, failing to give way, improper over taking and following too close (Christie, 1995).

According to Petridou & Moustaki (2000), driver-related behavioral factors dominate the causation of a motor vehicle accident while they contribute to the occurrence of 95% of all accidents". The accident caused by vehicle defects, which are mainly related to of regular maintenance, defective tires and brakes have a significant Role in the road traffic accidents (Petridou & Moustaki, 2000). In addition to this, the third factor, is environmental or condition factor is related to design, lighting and surfacing of roads (Christie, 1995). Another study in Zanjan Province, Iran indicated there was a decreasing trend of the fatalities due to traffic accidents between 2016 and 2021 (Yousefzadeh & Razzaghi, 2022).

Ethiopia is one of the developing countries with a very low level of motorization, 2 vehicles per 1000 people in 2001 despite having a very low road network density, vehicle ownership level and has a relatively high accident record (Eke & Fresd, 2001; Christie, 1995). Ethiopia has a fatality rate of 1997 per 10,000 vehicles on the average in the years between 1990 to 1995 RTA (Tiruneh, 2012). Ethiopia road traffic accident problem has been indicated as the worst (Tiruneh, 2012). When we see the last three data on motor vehicle fatal accidents in Ethiopia in the years between 2001/02-2003/04 it is increase in with an average of 240 (WHO, 2020).

The knowledge of the causalities by road users helps in how and where to start to solve the problem of personal injuries (causalities), According to Brass (1998). Most of the road deaths in developing countries involve vulnerable road use Such as pedestrians and cyclists. In Ethiopia, pedestrian injuries account for 84% of all road traffic fatalities compared with 32% in Britain and 15% in the USA. The higher pedestrian causality has been attributed to lack of pedestrian care and attention (Tiruneh, 2012).

The aim of the study is to fit a statistical model that would describe the traffic accident data in Ethiopia from 1980 to 2021. In this study to examine the pattern of road traffic accident in Ethiopia and to forecast the future behavior of road traffic accident.

2. METHODOLOGY

2.1. Study Setting, Data Source, and Data Analysis

2.1.1. Study area

The study was conduct in the Ethiopia. Ethiopia is located in the eastern part of Africa continent. Ethiopia map also shows that the country is located on the Horn of Africa and it shares its

international boundaries with Eritrea in the north, Djibouti and Somalia in the east, Kenya in the south, and Sudan in the west.

Source of the Data

Data were retrieved from the world health organization official database website Estimated road traffic death rate (per 100 000 population) (who.int) and and Ethiopia traffic police control station, which was collected from January 1982 to December 2021 annually.

Study Variables

This study was attempts to focus on time series variable that relevant to identify trend of road traffic accident. The proposed variables under this study were time and number of accidents. The dependent variable is the number of accidents that are recorded in the station while the independent variables/explanatory variables are the lagged number of occurrences of accident in time.

Data Processing and Analysis

The statistical model used in this study was univariate time series. Univariate time series is broadly defined as any series of measurements taken sequentially at regular times**.**

Data management and statistical analysis

A secondary data which comprises 42 years of yearly RTA cases for the period 1980 to 2021 were collected from the world health organization and Ethiopian central Agency. There were 42 data points. In analyzing the data, E-view 9 was used. The model building process followed the Box-Jenkin's method.

Test of stationarity

Before fitting a specific time series model for time series data, the series must be changed stationary. Stationarity occurs in a time series when there is no systematic change in mean (no trend) and if there is no change in the variance of the series (Shumway, 2010).

In this study to test the stationarity of the time series data graphical methods (time series plot, autocorrelation function, and partial autocorrelation function) and hypothesis testing methods like unit root test (Augmented Dickey Fuller (ADF) and Phillips - Perron (PP) stationary test) were used (Box and Jenkins, 1976).

The unit root test was subsequently used to test the stationarity of the series. The time series data are not stationary or the data needs to be differenced to make it stationary or the series has a unit root. The time series data are stationary or the data is stationary and does not need to be differenced (Ruppert, 2011).

Augmented Dickey–Fuller test (AD)

Augmented Dickey–Fuller test (AD) is a test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit roots at some level of confidence (Dickey & Fuller, 1981).

The hypotheses of unit root test are given as

Ho: time series is not stationary

H1: time series is stationary

Once test statistics is computed it can be compared to the relevant critical value for the Dickey–Fuller Test. If the test statistic is less (this test is non-symmetrical so we do not consider an absolute value) than the (larger negative) critical value, then the null hypothesis is rejected and no unit root is present (Dickey & Fuller, 1981).

Phillips–Perron test (pp)

The Phillips–Perron test is a unit root test. That is, it is used in time series analysis to test the null hypothesis that a time series is integrated of orders one. It builds on the Dickey–Fuller test of the null hypothesis $\delta = 0$ in $\nabla Y_t = \delta Y_{t-1} + \varepsilon_t$, where ∇ is the first difference operator. Like the augmented Dickey–Fuller test, the Phillips–Perron test addresses the issue that the process generating data for Y_t might have a higher order of autocorrelation than is admitted in the test equation - making y_{t-1} endogenous and thus invalidating the Dickey–Fuller t-test. Whilst the augmented Dickey–Fuller test addresses this issue by introducing lags of $\Delta\ y_t$ as regressors in the test equation, the Phillips–Perron test makes a non-parametric correction to the t-test statistic (Leybourne & Newbold, 1999).

Time Series Model: Box Jenkins modeling method

The Box-Jenkins have endowed modeling developed serves not only explain the underlying process generating the series but as a basis for forecasting.

Therefore, the Box-Jenkins approach is one of the most widely used methodologies for the analysis of time series data that involves identifying an approximate ARIMA process, fitting it to the data and then using the fitted model for forecasting for future events (Makridakis & Hibon, 1997).

Model selection

Given a set of models for the data, the preferred model is the one with the minimum AIC and BIC. Hence AIC and BIC not only rewards goodness of fit, but also includes a penalty that is an increasing function of the number of estimated parameters (Pankratz, 2009).

Autoregressive Integrated Moving Average (ARIMA): It is a general model capable of representing a wide range of non-stationary time series. Such a model (or process) represents a non-stationary series that can be reduced to a stationary series with a degree of differencing and having p autoregressive and q moving average term.

A non-seasonal ARIMA model is classified as an ARIMA (p, d, q) model where:

p is the number of autoregressive terms,

d is the number of non-seasonal differencing passes, and

q is the number of moving average terms (lagged errors in the equation).

According to the prescription of Box & Jenkins a few steps have to be taken when building an ARIMA model. To identify a perfect ARIMA model for a particular time series data, Box and Jenkins methodology that consists of four phases: Model identification and selection, Parameter estimation, Diagnostic checking for the identified model and the last part is application of the model (i.e., forecasting) (Pankratz, 2009).

Autoregressive Moving Average (ARMA) processes are processes that are formed as combination of autoregressive and moving average processes. ARMA process of order (p,q), ARMA(p,q) has the form: $Y_t = \mu + \phi_1 Y_{t-1} + \phi_2 y_{t-2} + \ldots + \phi_p Y_{t-p} - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - \ldots - \theta_q \varepsilon_{t-q} + \varepsilon_t$.

Correlogram is the graph is useful both in determining whether or not a series is stationary and in identifying a tentative ARIMA model (Naylor & Wichern, 1972).

Parameter estimation:

Once a tentative model has been identified, the estimates for the constant and the coefficients of the equation must be obtained. It is a way that finding the values of the model coefficient (like, $\phi_1, \phi_2, \phi_3, \ldots, \phi_p, \theta_1, \theta_2, \theta_3, .., \theta_q$).

There are several different methods for estimating the parameters. All of them should produce very similar estimates, but may be more or less efficient for any given model. In general, during the parameter estimation phase a function minimization algorithm is used (the so-called *quasi-Newton* method; refer to the description of the Nonlinear Estimation method) to maximize the likelihood (probability) of the observed series, given the parameter values. In practice, this requires the

calculation of the (conditional) sums of squares (SS) of the residuals, given the respective parameters (Ding & Duan, 2013).

Model checking/Diagnostics:

Before forecasting with the final equation, it is necessary to perform various diagnostic tests in order to validate the goodness of fit of the model. If the model is not a good fit, the tests can also point the way to a better model (Naylor & Wichern, 1972).

A good way to check the adequacy of an overall box-Jenkins model is to analyze the residuals ($Y_t - \hat{Y}_t$). If the residuals are truly random, the autocorrelations and partial autocorrelations calculated using the residuals should be statistically equal to zero.

If they are not, this is an indication that we have not fitted the correct model to the data. When this is the case, the residual ACF and PACF will contain information about which alternate models to consider (Hipel & Lennox, 1977). If the model is appropriate, then the residual sample autocorrelation function should have no structure to identify. The Ljung-Box Q statistic can be employed to check the independence of the residual instead of visual inspection of the sample autocorrelations (Clement, 2014).

Forecasting

The end step of the ARIMA modeling process is forecasting. In forecasting, the goal is to predict future values of a time series variables.

Forecasts are usually needed over a period known as the lead time, which varies with each problem. For example, in a sales forecasting problem, sales Y_t, in the current month t and the sales $Y_{t-1,}$ $Y_{t-2,}$ Y_{t-3}, … in previous years might be used to forecast sales for lead times k=1, 2, 3, …, 12 years ahead.

Once forecasts are made, some measurements of the accuracy of forecasts are the AIC, root mean square error (RMSE), mean absolute error (MAE), mean absolute percentage error (Gebretensae & Asmelash, 2021).

3. RESULTS AND DISCUSSION

The current study applied univariate time series analysis to model the patterns of the total number of road traffic accidents and to forecast the future behavior of road traffic accident in Ethiopia the future years.

The minimum and maximum number of road traffic accidents were recorded during the year 1980 (12065) and 2021 (31643) respectively (Table 1).

Table 1: Descriptive Statistics for number of traffic accident data from 1980 to 2021

	Years	Minimum	Maximum	mean	Std. Deviation
Year 1980-2021	42	1980	2021		
Number of accidents	42	12065	31643	18852	5870.902

Over the last 42 years, on average 18852 accidents have been reported in a single year. It implies road traffic accidents were a series problem in Ethiopia, in line with literature of Tiruneh (2012) and, this finding is consistent with (WHO, 2020).

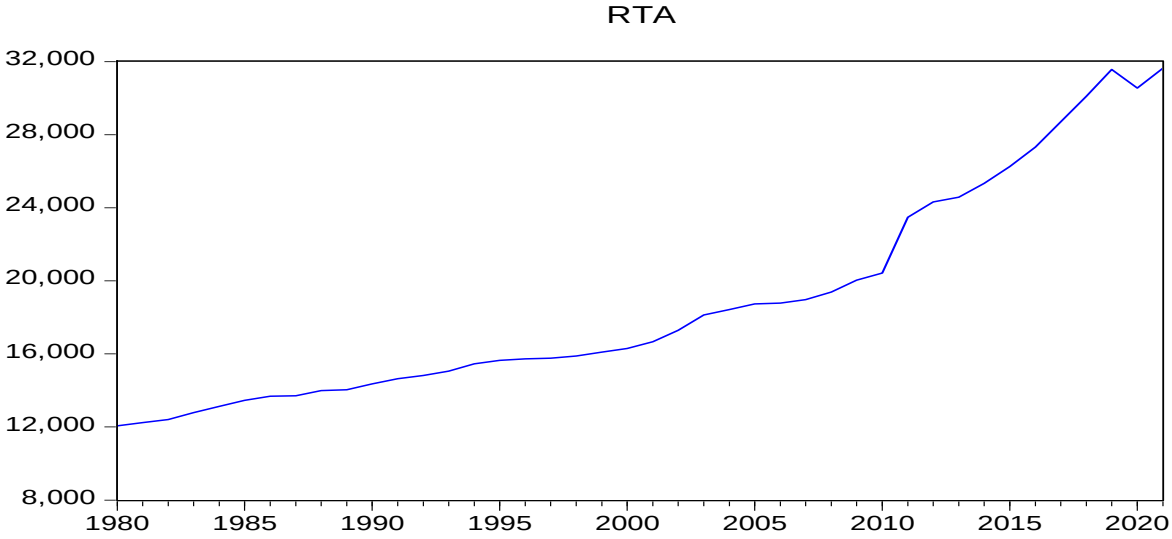


Figure 1. Time series plot data of road accidents from 1980 and 2021

Figure 1 shows that the time plot of the original series RTA before it was differenced means at level. The plot shows an overall increasing trend. This is one of indication about a non-stationary data. Generally, the above graph indicates that the number of traffic strictly increasing year to year. But in inconsistent with other study in Zanjan Province, Iran indicated there was a decreasing trend of the fatalities due to traffic accidents between 2016 and 2021 (Yousefzadeh, 2022).

The plot of autocorrelation function and partial autocorrelation function against time lag is given in the figure shown with 95% confidence interval in Ethiopia (Figure 2). The autocorrelation function decreases rather slowly to zero, but partial autocorrelation nearly closes to zero.

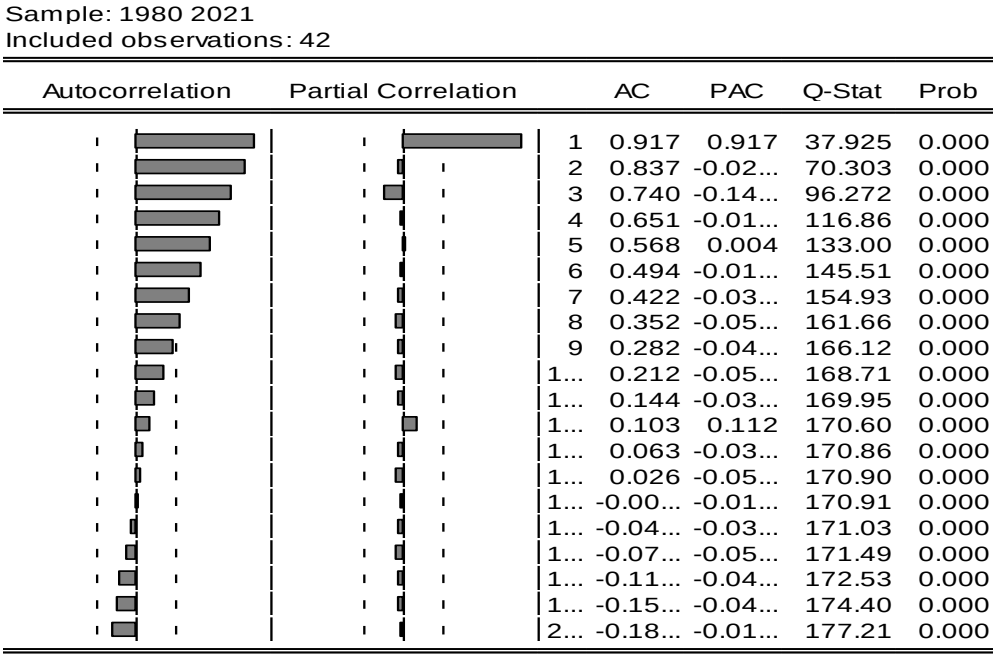


Figure 2. Correlogram of road traffic accident at level

Stationary Test

The pattern of the time series plot in Figure 1 shows a highly trending upward change in the mean. This indicates that the series is non-stationary from the autocorrelation function plot in Figure 2 the series is not stationary & the behavior of the series is clear. Therefore, differencing is needed to make it stationary.

Table 2 Stationarity test in level (unit root test results (at level))

Series	level with intercept and trend			
	Test statistics		p-value	
	ADF	PP	ADF	PP
RTA	-0.331257	-0.34658	0.7423	0.8660
Series	level with intercept and trend			
	Test statistics		p-value	
	ADF	PP	ADF	PP
RTA	-6.119414	-6.12125	0.0000	0.00001

Test results presented in Table 2 indicate that the null hypothesis that the series in levels contain unit root could not be rejected for RTA As we see from output the original data needs differencing because the p-value is 0.7423 which is greater than 0.05 at the 95% level of significance so we don’t reject the null hypothesis and concluded that the data is not stationary.

The results in Table 4 below indicate that the null hypothesis of unit root is rejected for the first differences of the three indices with intercept and trend using PP test. Similar results were also obtained from ADF test. Therefore, the ADF and PP test shows that all series are non-stationary in levels and stationary in the first differences.

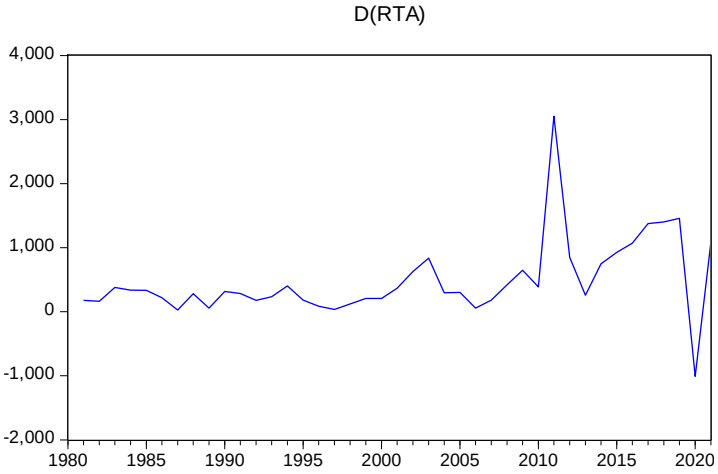


Figure 3. Time series plot at stationary level at first difference(d=1): (X-axis -years and Y-axis- RTA)

As we see from the time series plot the series does fluctuates about the mean (Figure 3). This means that it does trend away or drift away from the mean and the time plots appears at first difference level (D=1) points. Because of this reason the time series of RTA is stationary (Figure 4)**.**

Sample: 1980 2021
Included observations: 41

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.166	0.166	1.2187	0.270
		2	0.153	0.129	2.2771	0.320
		3	0.139	0.099	3.1695	0.366
		4	0.105	0.055	3.6917	0.449
		5	0.093	0.044	4.1179	0.533
		6	0.194	0.153	6.0085	0.422
		7	0.253	0.196	9.3396	0.229
		8	0.248	0.165	12.619	0.126
		9	-0.15...	-0.31...	13.953	0.124
		1...	0.126	0.083	14.855	0.137
		1...	-0.06...	-0.14...	15.120	0.177
		1...	-0.04...	-0.06...	15.243	0.228
		1...	-0.03...	-0.10...	15.309	0.288
		1...	-0.01...	-0.09...	15.332	0.356
		1...	-0.03...	-0.01...	15.410	0.422
		1...	-0.02...	0.066	15.438	0.493
		1...	-0.07...	0.053	15.811	0.537
		1...	-0.08...	-0.13...	16.373	0.567
		1...	-0.10...	0.096	17.258	0.572
		2...	-0.09...	-0.07...	18.003	0.587

Figure 4. Correlogram of D(RTA) at first difference d=1

Table 3. Different (possible) ARIMA models with different values of p and q with d=1 on RTA in Ethiopia

ARIMA Models	AIC	Log likelihood

ARIMA (1,1,1)	15.75549	-318.9875
ARIMA (1,1,2)	15.79123	-319.7203
ARIMA (1,1,3)	15.79227	-319.7416
ARIMA (1,1,7)	15.76905	-319.6506
ARIMA (1,1,8)	15.87994	-318.1117

Table 3 gives the ACF and PACF plot of the first difference series at various time lags. The table gives the Q-statistics of the series as well. Correlogram of D(RTA) at first difference which indicates the possible ARIMA models. From the ACF and PACF graph, the best model to fit the data of number of traffic accidents leads to ARIMA model.

Table 4. The ARIMA (1,1,1) Model

Dependent Variable: D(RTA)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Sample: 1981 2021
Included observations: 41
Convergence achieved after 28 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	483.4376	461.5064	1.047521	0.3017
AR(1)	0.903415	0.387127	2.333643	0.0252
MA(1)	-0.781789	0.544938	-1.434638	0.1598
SIGMASQ	333668.3	71630.03	4.658217	0.0000

R-squared	0.077388	Mean dependent var	477.5122
Adjusted R-squared	0.002582	S.D. dependent var	608.8493
S.E. of regression	608.0629	Akaike info criterion	15.75549
Sum squared resid	13680398	Schwarz criterion	15.92267
Log likelihood	-318.9875	Hannan-Quinn criter.	15.81637
F-statistic	1.034511	Durbin-Watson stat	2.001466
Prob(F-statistic)	0.388586		

Inverted AR Roots	.90
Inverted MA Roots	.78

From Table 4 were possibles models that indicates AIC were used to compare selected models fit best to the yearly traffic accident series. The model with the smaller information criteria is said to fit the data better.

Therefore ARIMA (1,1,1) is the best model to fit RTA data, all of the p values have significant and lower AIC compared to the other model.

Model Diagnostics

Normal probability (top left corner), residual vs fitted value (top right corner), histogram of residuals (lower-left corner), and residual vs order (lower right corner) plots of residual of RTA in Ethiopia between 1980 to 2021 in Ethiopia (Figure 5).

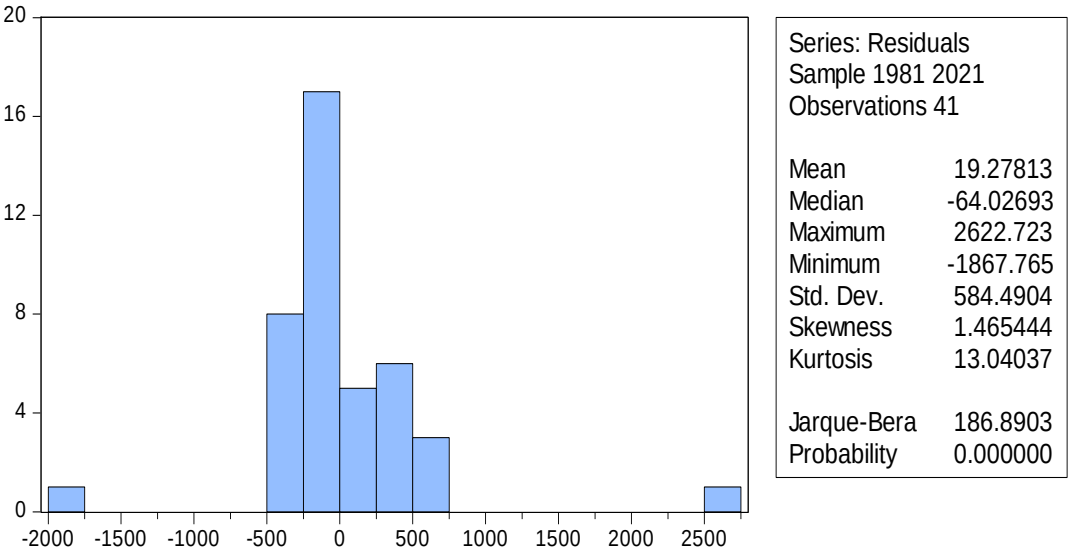


Figure 5. Normal probability of residuals (X- axis- residuals and Y axis -fitted values)

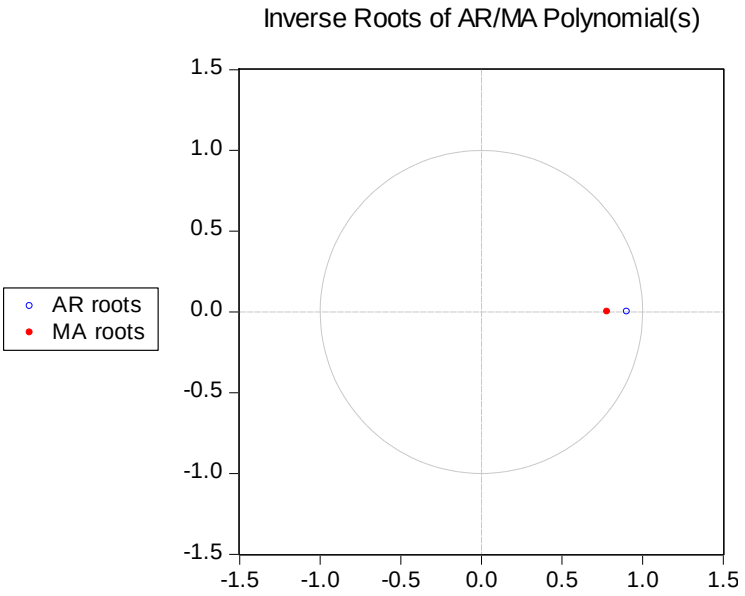


Figure 6. Test the residuals are white noise

Ho: residuals are white noise

H1: not residuals are white noise

The p values are greater than 0.05: the decision does not reject Ho; therefore, the residuals are white noise (Figure 6). ARIMA process is stationary and the AR roots should lie inside the unit circle and all MA roots lies are inside the unit circle. As the result The ARIMA possess are in

veritable. The conditions are satisfied ARIMA (1,1,1) model was used for forecast the future RTA in Ethiopia.

Forecasting the future RTA in Ethiopia

After identification and estimation of the parameters, the next step is forecasting with the appropriate model for the next coming years of road traffic accident at the country of Ethiopia. The appropriate model for this data is ARIMA (1, 1, 1) for forecasting (Figure 7).

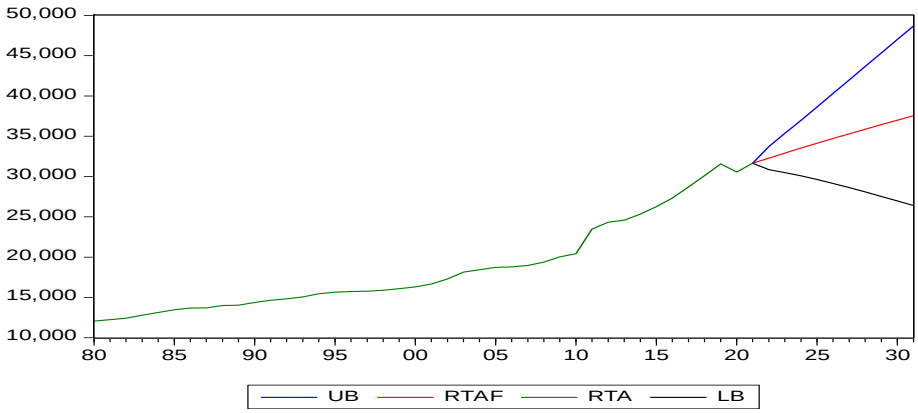


Figure 7 Forecasting graph for RTA in Ethiopia for the next 10 years

Using the ARIMA (1, 1, 1) model forecast was made for the coming 10 years. As shown in Figure **7** the number of traffic accident will be forecasted in Ethiopia. The 95 % forecasting values for the next 10 years shows there will be high increment in road traffic accident accidents. The overall findings of this study indicate that 10 years of forecasts were provided for total accidents would continue in a non-decreasing trend. The evidences from other studies also showed similar findings with Tohe (2020).

4. CONCLUSIONS

Road traffic accident is considered one of the leading causes of death in our country Ethiopia today and is thus a major health problem. This study shows there is increasing pattern in traffic accident with respect to time. A greater number of accidents were reported in the year 2021. We found that ARIMA (1,1,1) was the best fitted model for road traffic accident of Ethiopia. The model is also adequate to describe the RTA data.

Forecasting with ARIMA (1,1,1) model is recommend for the RTA cases in Ethiopia. The result revealed that the number of road traffic accident in Ethiopia is increasing from time to time and

there will be increase also in the future. The study did not consider the causes of the accident, type of vehicle involved and etc. This study can be used for forecasting the in future road traffic accidents on Ethiopia.

Based on the above conclusions we recommend that trend analysis of number of traffic accident in Ethiopia on the result of the study. From the result of this study the number of traffic accident occurrence is increasing from year to year. The concerned body should take the following remedial actions; to take remedial action that decreases number of road traffic accidents.

We should advice to the Ethiopia traffic police station to make a special focus on the flow of controlling traffic system on the years. Government by itself drawing a short- and long-term plan and creating a great commitment on the people for the reduction of number of traffic accident on these special years.

Lastly the Ethiopian government should carry out continuous re-evaluation of the measures aimed at reducing road traffic accidents so as to make them more effective. Officials should be trained that would help government enforce relevant laws to prevent road accidents. Further researchers may be important to in order to study cause of the traffic accidents.

Availability of data and materials

The data used in this study are available from world health organization official database website Estimated road traffic death rate (per 100 000 population) (who.int) and Ethiopia traffic police control station report.

Competing interests

The authors declared that there is no competing interest.

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