PARAMETRIC MODELING OF SOME MEDICAL DATA USING FAV-JERRY DISTRIBUTION

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1 Introduction

The coronavirus disease 2019 (COVID-19) outbreak which was a global pandemic hit the world with surprise. Not only was it deadly, it was a novel disease that proved difficult to eradicate. It was first recorded to be discovered in the Asian county, China in December 2019, **pokhrel2021literature**. WHO declared the COVID-19 disease a pandemic in March 11, 2020. All head leaders were forced to disclose to their citizens to be at alert. Preventive measures had to be set in place as a strategy to avoid the disease, because as they say "prevention is better than cure". Cleaning of hands regularly, wearing face masks, physical distancing, avoiding gatherings, and mass function, lockdown (sit at home), all these and more were put into play through out the world, see **sintema2020effect**. A record from a https://data.who.int/dashboards/covid19/cases?m49=566n=ohttps://data.who.int/dashboards/covid19/cases shows a total case of the disease to be 776 million worldwide with USA having 103 million cases, Canada 4.8 million cases, China recorded a total of 99.4 million cases, UK and Northern Ireland 24.9 million, Nigeria having a total of 267 thousand recorded cases e.t.c. As the spread of the disease continued and no remedy found, the state government began closure of schools and colleges. This closure started off with a week break,then extended to two weeks until it became indefinite, see **omer2020covid**. **pranggono2021covid** stated that during this period there was an increase in cyber security issues such as scams, and phishing. Also of great not is the psycological impact of the pandemic across the world. Varying from maladaptive behaviours to emotional distress down to defensive responces like anxiety, fear, boredom and depression, see **talevi2020mental**. Talk about the increase in the unemployment rate, inflation **priya2021perspective** and a whole bunch. It definitely no news that the pandemic left a dent in the world, one which we are still trying to recover from.

The initial data set used for analysis in this work is on new cases of COVID 19 in some countries gotten from https://covid19.who.int/https://covid19.who.int/.

The data set is shown below

2	3	10	15	13	21	41	48	58	37
79	124	97	155	123	149	172	99	37	24

Table 1: Model fitness and adequacy measures for COVID-19 data set of Afghanistan within few selected days in the year 2020

Distr.	NLL	AIC	CAIC	BIC	HQIC	W^*	A^*	KS	p-value
FJ	103.6	209.190	209.412	210.186	209.384	0.034	0.266	0.123	0.9215
Gamma	103.57	270.499	271.205	272.491	270.888	0.034	0.261	0.346	0.0163
EIE	103.42	210.838	211.544	212.829	211.227	0.034	0.276	0.125	0.9127
Weibull	103.52	245.193	254.899	247.184	245.582	0.049	0.381	0.551	$1.059e^{-05}$
TI-HTE	103.24	210.481	211.187	212.473	210.870	0.370	2.27	0.125	0.9134
CJ	109.82	221.640	221.863	222.636	221.835	0.043	0.307	0.247	0.1732

Table 2: MLEs of the parameters of the fitted distributions for COVID-19 data set of Afghanistan within few selected days in the year 2020

Distr.	α	β	θ
FJ	0.015		
Gamma	4.325	0.015	
EIE	0.036		2.33.
Weibull	0.323	8.524	
TI-HTE	0.003	4.388	
CJ			0.043

Table 3: Estimating the parameter of Fav-Jerry distribution with different methods using the first data set

Methods	Estimate	Std. Error
MLE	0.0153	0.0034
MPS	0.0143	0.0032
LSE	0.0139	0.0082
WLSE	0.0142	0.0007
CVM	0.0141	0.0082
ADE	0.0143	0.0034
RTADE	0.0141	0.0043
Bayes	0.0131	0.0013

From the above estimations using the several method estimation approach, it is concluded that the best estimation method for estimating the parameter in Fav-Jerry distribution using the first data set is WLSE. The reson for this choie is because WLSE has the least standard error value.

The second data set is from the infant mortality rate in some randomly selected countries in 2021 obtained from https://data.worldbank.org/indicator/SH.DYN.MORThttps://data.worldbank.org/indicator/SH.

22	9	14	5	7	4	18	46	4	46	9
42	4	29	3	2	41	13	4	5	35	4	6

Table 4: Model fitness and adequacy measures for data on mortality rate in some randomly selected countries

Distri.	NLL	AIC	CAIC	BIC	HQIC	W^*	A^*	KS	p-value
FJ	87.02	176.036	176.226	177.171	176.321	0.162	1.042	0.138	0.7697
Gamma	86.77	179.183	179.783	181.454	179.754	0.163	1.047	0.225	0.1932
EIE	85.37	174.746	175.346	177.017	175.317	0.127	0.828	0.198	0.324
Weibull	86.9	186.101	186.701	188.372	186.672	0.167	1.068	0.275	0.0616
TI-HTE	85.04	174.070	174.670	176.341	174.641	0.121	0.790	0.190	0.3718
CJ	92.82	187.638	187.829	188.774	187.924	0.204	1.287	0.315	0.0204

Table 5: MLEs of the parameters of the fitted distributions for data on mortality rate in some randomly selected countries

Distr.	α	β	θ
FJ	0.061		
Gamma	1.6702	9.447	
EIE	0.333		4.693
Weibull	0.962	0.061	
TI-HTE	0.035	1.935	
CJ			0.172

Table 6: Estimating the parameter of Fav-Jerry distribution with different methods using the second data set

Methods	Estimate	Std. Error
MLE	0.0619	0.0129
MPS	0.0584	0.0122
LSE	0.0649	0.0402
WLSE	0.0596	0.0029
CVM	0.0652	0.0396
ADE	0.0610	0.0142
RTADE	0.0158	0.0179
Bayes	0.0630	0.0084

From the above estimations using the several method estimation approach, it is concluded that the best estimation method for estimating the parameter in Fav-Jerry distribution using the second data set is WLSE. The reson for this choie is because WLSE has the least standard error value.