International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 5, Issue 6, pp 872-877, June-2021

https://doi.org/10.47001/IRJIET/2021.506152

Forecasting Covid-19 Deaths in Oman

[1]Dr. Smartson. P. NYONI, [2]Mr. Thabani NYONI, [3]Mr. Tatenda. A. CHIHOHO

[1]ZICHIRe Project, University of Zimbabwe, Harare, Zimbabwe
[2]SAGIT Innovation Center, Harare, Zimbabwe
[3]Independent Health Economist, Harare, Zimbabwe

***Abstract* - In this study, the ANN approach was applied to analyze COVID-19 deaths in Oman. The employed data covers the period and the out-of-sample period ranges over the period. The residuals and forecast evaluation criteria (Error, MSE and MAE) of the applied model indicate that the model is quite stable. The results of the study indicate that daily COVID-19 deaths in Oman are likely to remain low over the out-of-sample period. Therefore is need for the government of Oman to ensure adherence to safety guidelines while continuing to create awareness about the COVID-19 pandemic and scale up COVID-19 vaccine rollout.**

Keywords: ANN, COVID-19, Forecasting.

I. INTRODUCTION

The COVID-19 outbreak began in Wuhan city in China in December 2019 (WHO, 2020, CDC, 2020; Wang et al, 2020). Several countries continue to report new infections and deaths, and the most worrisome trend is the emergence of variants which are more transmissible. The persistence of the health crisis has serious implications on the world economy at large as continuous or repeated lockdowns slow down economic activities resulting in fall in GDP growth. As of 19 June 2021 Oman had reported 242 723 confirmed cases, 2626 deaths and 213 880 recoveries (Worldometer, 2021). By the 15th of June 2021 a total of 535 578 people had received at least one dose of the COVID-19 vaccine (10.8% of the population) and a total of 185 621 people had been fully vaccinated representing 3.7 % of the total population (Our world in data, 2021). The Oman government responded to the COVID-19 outbreak by implementing mitigation measures which included quarantine/ isolation, hygiene practices, education, social distancing, disease surveillance and response (Ghafri et al, 2020). The aim of this paper is to forecast daily COVID-19 deaths in Oman using a machine learning algorithm. The results of the study will enlighten the authorities on the likely future trends of COVID-19 deaths in the country. This will assist in planning and decision making in order to mount an appropriate COVID-19 response.

II. METHODOLOGY

The Artificial Neural Network (ANN) approach, which is flexible and capable of nonlinear modeling; will be applied in this study. The ANN is a data processing system consisting of a large number of highly interconnected processing elements in architecture inspired by the way biological nervous systems of the brain appear like. Since no explicit guidelines exist for the determination of the ANN structure, the study applies the popular ANN (12, 12, 1) model based on the hyperbolic tangent activation function. This paper applies the Artificial Neural Network (ANN) approach in predicting COVID-19 deaths in Oman.

Data Issues

This study is based on daily COVID-19 deaths in Oman for the period 1 January 2020 – 20 April 2021.The out-of-sample forecast covers the period 21 April – 31 August 2021.All the data employed in this research paper was gathered from the Johns Hopkins University (USA).

III. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	OM
Observations	464 (After Adjusting Endpoints)
Neural Network Architecture:	

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 5, Issue 6, pp 872-877, June-2021

https://doi.org/10.47001/IRJIET/2021.506152

Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1
Activation Function	Hyperbolic Tangent Function
Back Propagation Learning:	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.120677
MSE	20.176874
MAE	2.863052

Residual Analysis for the Applied Model

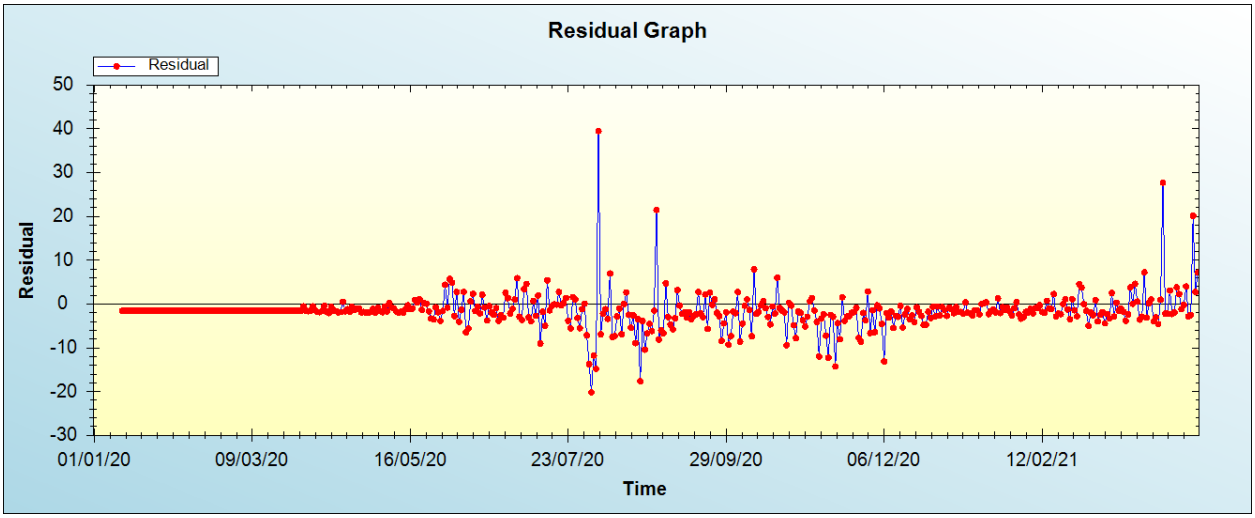

Figure 1: Residual analysis

In-sample Forecast for OM

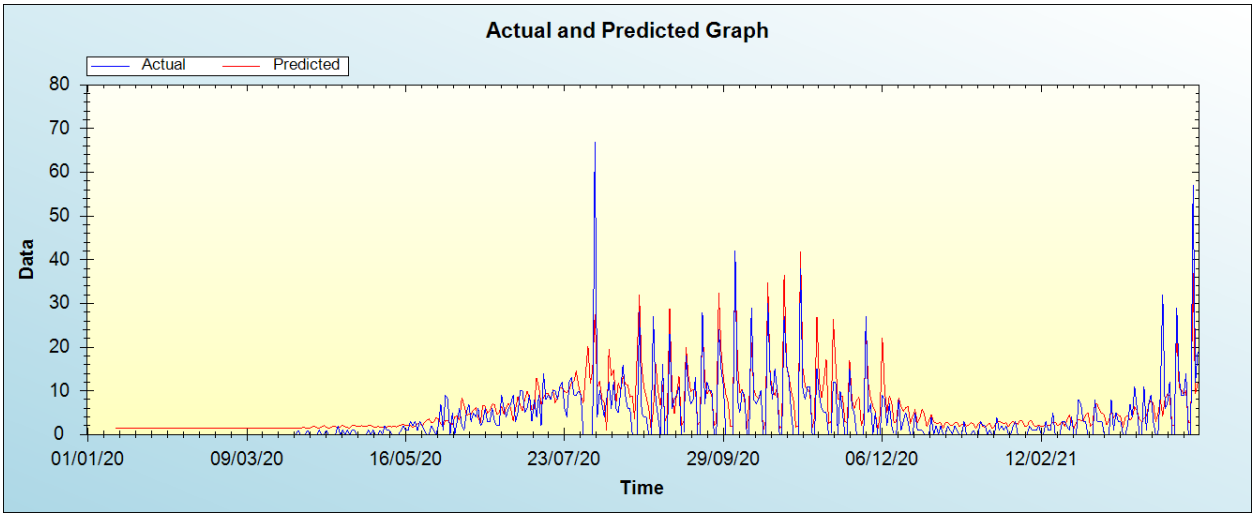

Figure 2: In-sample forecast for the OM series

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 6, pp 872-877, June-2021
https://doi.org/10.47001/IRJIET/2021.506152

Out-of-Sample Forecast for OM: Actual and Forecasted Graph

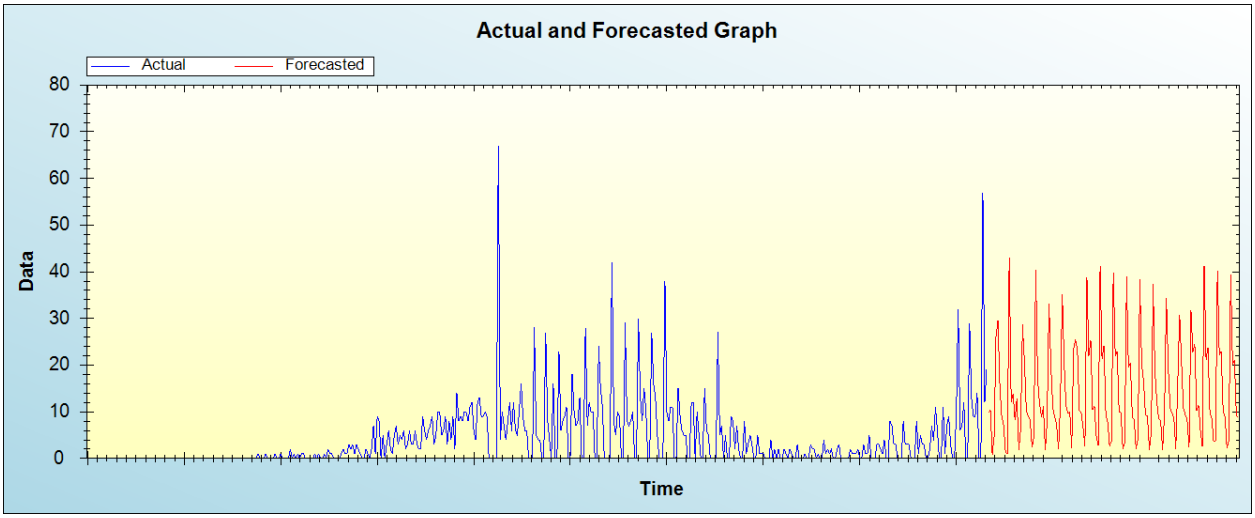

Figure 3: Out-of-sample forecast for OM: actual and forecasted graph

Out-of-Sample Forecast for OM: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Date	Forecasts
21/04/21	9.7998
22/04/21	10.3762
23/04/21	0.8825
24/04/21	4.6597
25/04/21	26.1460
26/04/21	29.5842
27/04/21	15.3628
28/04/21	9.0250
29/04/21	7.1221
30/04/21	1.2497
01/05/21	0.9648
02/05/21	42.9456
03/05/21	12.0823
04/05/21	13.9104
05/05/21	8.3525
06/05/21	12.7674
07/05/21	1.8768
08/05/21	6.2687
09/05/21	28.6239
10/05/21	21.0987
11/05/21	10.2729
12/05/21	8.9829
13/05/21	8.2007
14/05/21	2.4210
15/05/21	4.5929
16/05/21	40.4127
17/05/21	16.8896
18/05/21	11.7587
19/05/21	8.8336
20/05/21	11.0500
21/05/21	1.8560
22/05/21	8.3354
23/05/21	33.1325
24/05/21	19.3980
25/05/21	10.9285
26/05/21	8.9049

ISSN (online): 2581-3048
Volume 5, Issue 6, pp 872-877, June-2021
https://doi.org/10.47001/IRJIET/2021.506152

27/05/21	7.3161
28/05/21	2.0201
29/05/21	11.9126
30/05/21	35.2312
31/05/21	20.1715
01/06/21	11.2661
02/06/21	9.7720
03/06/21	9.9268
04/06/21	2.1543
05/06/21	23.4817
06/06/21	25.4896
07/06/21	23.1873
08/06/21	10.3320
09/06/21	9.9271
10/06/21	6.7997
11/06/21	2.6854
12/06/21	38.8194
13/06/21	22.0017
14/06/21	25.2412
15/06/21	10.4148
16/06/21	11.2651
17/06/21	4.8175
18/06/21	2.7937
19/06/21	41.1317
20/06/21	21.3894
21/06/21	24.1191
22/06/21	9.4132
23/06/21	7.7356
24/06/21	2.6979
25/06/21	3.6593
26/06/21	39.8705
27/06/21	21.9109
28/06/21	22.9280
29/06/21	10.0504
30/06/21	9.8117
01/07/21	2.0404
02/07/21	3.3933
03/07/21	38.8641
04/07/21	19.6129
05/07/21	20.4839
06/07/21	8.8505
07/07/21	8.2518
08/07/21	1.9737
09/07/21	4.2493
10/07/21	38.2655
11/07/21	20.3478
12/07/21	16.2749
13/07/21	9.2694
14/07/21	9.0692
15/07/21	1.9038
16/07/21	5.4719
17/07/21	37.2559
18/07/21	18.4605
19/07/21	12.0415
20/07/21	8.4393
21/07/21	8.1019
22/07/21	1.8526
23/07/21	9.4221
24/07/21	34.3213
25/07/21	19.5799
26/07/21	10.8725
27/07/21	9.7157
28/07/21	8.5818
29/07/21	2.0379

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 6, pp 872-877, June-2021
https://doi.org/10.47001/IRJIET/2021.506152

30/07/21	15.9927
31/07/21	30.7444
01/08/21	20.6607
02/08/21	10.7909
03/08/21	9.4046
04/08/21	8.2783
05/08/21	2.4094
06/08/21	31.6775
07/08/21	22.7783
08/08/21	24.4366
09/08/21	10.3122
10/08/21	11.4098
11/08/21	6.2277
12/08/21	2.6405
13/08/21	41.2044
14/08/21	21.1891
15/08/21	23.7360
16/08/21	9.7436
17/08/21	8.6441
18/08/21	3.6214
19/08/21	3.8447
20/08/21	40.1939
21/08/21	22.1261
22/08/21	22.8893
23/08/21	9.9380
24/08/21	8.9734
25/08/21	2.2041
26/08/21	3.8799
27/08/21	39.3178
28/08/21	20.0875
29/08/21	21.0697
30/08/21	9.1532
31/08/21	8.8269

The main results of the study are shown in table 1. It is clear that the model is stable as confirmed by evaluation criterion as well as the residual plot of the model shown in figure 1. It is projected that daily COVID-19 deaths in Oman are likely to remain low over the out-of-sample period.

IV. CONCLUSION AND POLICY RECOMMENDATIONS

The health crisis of the moment is COVID-19 and many researchers all over the world are still seeking answers as to why the pandemic is still in our midst and how to tackle the issue of the ever emerging new strains of the virus which are even more contagious there by posing a serious health threat to the world. Prediction of future trends of infections and mortality is critical so that governments can prepare enough resources to mitigate the spread of the SARS-COV2 virus and identify areas which need prioritization to effectively control the pandemic. In this paper we applied a machine learning technique to forecast daily COVID-19 deaths in Oman and the results indicate that daily COVID-19 deaths in Oman are likely to remain low over the out-of-sample period. Therefore the Oman authorities are strongly encouraged to speed up COVID-19 vaccination amongst other WHO recommended guidelines.

REFERENCES

[1] Worldometer (2021). Austria COVID-19 update. https://www.worldometers.info.
[2] Our world in data (2021). Austria COVID-19 update. https://ourworld.in data.org.Austria
[3] Thamra Al Ghafri., Fatma Al Ajmi., Lamya Al Balushi., Padma Mohan Kurup., Aysha Al Ghamari., Zainab Al Balushi., Fatma Al Fahdi., Huda Al Lawati., Salwa Al Hashmi., Asim Al Manji and Abdallah Al Sharji (2020). Responses to the Pandemic COVID-19 in Primary Health Care in Oman: Muscat Experience, Oman Medical Journal, Vol. 36, No. 1: e216
[4] Wang D et al (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. JAMA 323, 1061–1069.

ISSN (online): 2581-3048
Volume 5, Issue 6, pp 872-877, June-2021
https://doi.org/10.47001/IRJIET/2021.506152

[5] Wang H et al (2020). Phase-adjusted estimation of the number of coronavirus disease 2019 cases in Wuhan, China. Cell Discovery 6, 76.

[6] Wang. W et al (2020). Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. J. Med. Virology 92, 441–447

[7] CDC (2020). The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. China CDC Weekly 2, 113–122.

Citation of this Article:

Dr. Smartson. P. NYONI, Mr. Thabani NYONI, Mr. Tatenda. A. CHIHOHO, "Forecasting Covid-19 Deaths in Oman" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 6, pp 872-877, June 2021. Article DOI https://doi.org/10.47001/IRJIET/2021.506152

****

