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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 264-267, August-2021

https://doi.org/10.47001/IRJIET/2021.508057

Projection of Total Fertility Rate in Malaysia

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

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

***Abstract* - In this research paper, the ANN approach was applied to analyze TFR in Malaysia. The employed data covers the period 1960-2018 and the out-of-sample period ranges over the period 2019-2030. The residuals and forecast evaluation criteria (Error, MSE and MAE) of the applied model indicate that the model is stable in forecasting TFR in Malaysia. The model projections suggest that annual total fertility rates in Malaysia are likely to be around 2.1 births throughout the out-of-sample period. Therefore, the Malaysian government is encouraged to continue with their 2017 strategic action plan to keep TFR between 1.9 and 2.1 until 2030.**

Keywords: ANN, Forecasting, Total fertility rate (TFR).

I. INTRODUCTION

Socio-economic progress in Malaysia is has led to sustained low fertility levels which are below replacement level fertility (Peng, 2020).The country's total fertility rate declined from 6.3 births per woman in 1958 to 5.6 births per woman in 1965. As a result of the national family programme total fertility rate has dropped to below replacement level fertility of 1.8 births per woman in 2018 (Worldometer, 2020; DOSM, 2017). The Malaysian government in 2017 adopted a strategic action plan for sustainable development towards 2030. The plan aims to create a conduce environment for family formation. The plan of action is envisioned to maintain TFR between 1.9 and 2.1 until 2030 by diversifying childcare options appropriate for various communities and assist couples struggling with subfertility, lower the cost of child raising, provide pro-fertility incentives. In this article we shall state few studies that have been carried out in order to understand fertility rates in the region and beyond. Babiarz et al (2017) investigated the contribution of family planning programs to fertility decline in Malaysia by studying the staggered introduction of family planning across Malaysia during the 1960s and 1970s. The study found out that Malaysia's total fertility rate declined by about one quarter birth under family planning, explaining only about 10 percent of the national fertility decline between 1960 and 1988. Examination of the feasibility of developing fertility forecasts based on age structure in Malaysia was done by Hanafiah and Jemain (2013). Lee Carter model (1992) was applied and singular value decomposition approach was incorporated with an ARIMA model to estimate age specific fertility rates in Peninsular Malaysia over the period 1958-2007. The results indicated that the proposed model provides a relatively reasonably accurate data fitting.

The aim of this paper is to project total fertility in Malaysia using an artificial intelligence technique. The results of the study will enlighten the Malaysian government on the likely future trends of fertility in the country and trigger an appropriate response to the future health, educational and employment needs of the Malaysian population.

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 annual total fertility rates in Malaysia.

Data Issues

This study is based on annual total fertility rate (births per woman) in Malaysia for the period 1960 – 2018. The out-of-sample forecast covers the period 2019 – 2030. All the data employed in this research paper was gathered from the World Bank online database.

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 8, pp 264-267, August-2021
https://doi.org/10.47001/IRJIET/2021.508057

III. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	M
Observations	47 (After Adjusting Endpoints)
Neural Network Architecture:	
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	0.033887
MSE	0.008718
MAE	0.074865

Residual Analysis for the Applied Model

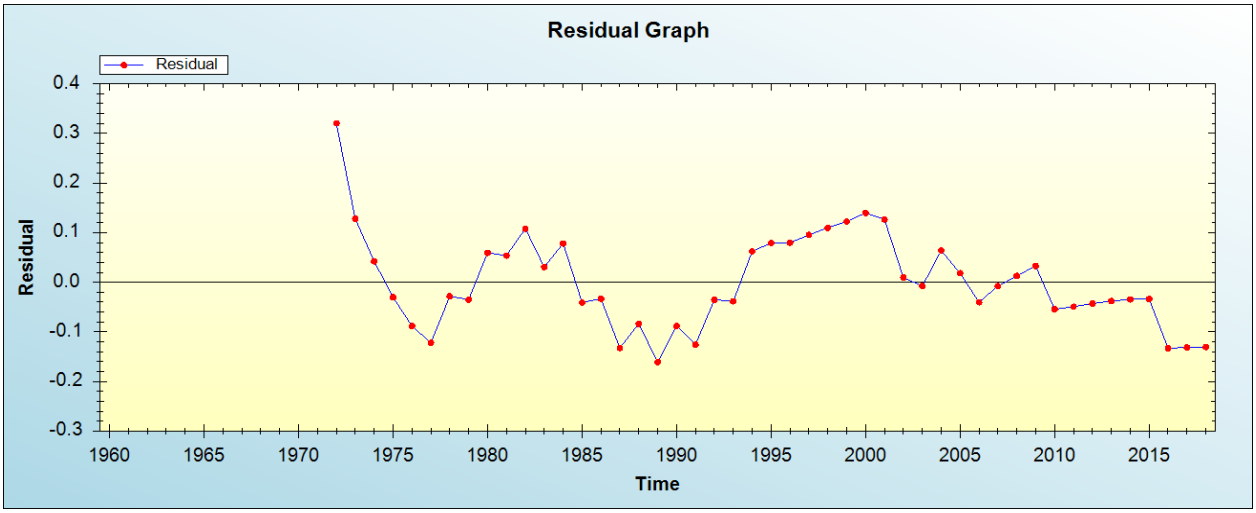

Figure 1: Residual analysis

In-sample Forecast for M

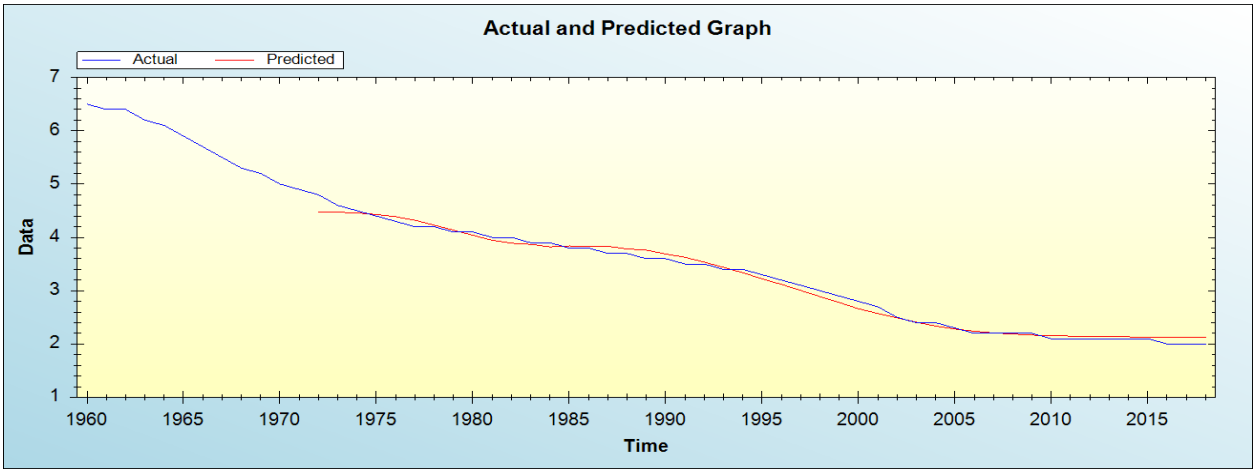

Figure 2: In-sample forecast for the M series

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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 264-267, August-2021

https://doi.org/10.47001/IRJIET/2021.508057

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

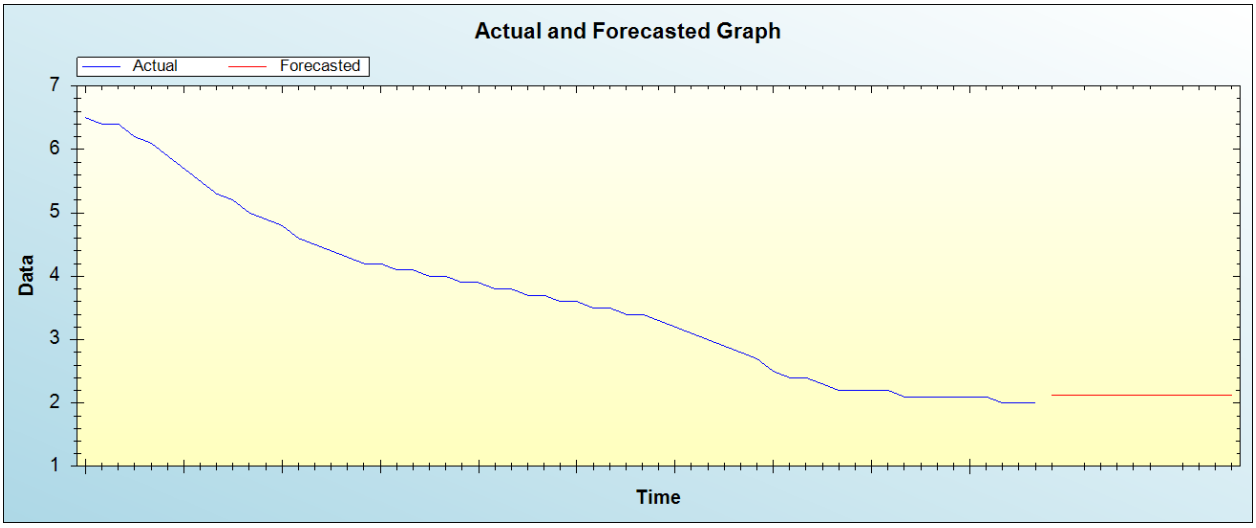

Figure 3: Out-of-sample forecast for M: actual and forecasted graph

Out-of-Sample Forecast for M: Forecasts only

Table 2: Tabulated out-of-sample forecast

Year	Forecasted TFR values
2019	2.1303
2020	2.1297
2021	2.1297
2022	2.1295
2023	2.1295
2024	2.1292
2025	2.1291
2026	2.1294
2027	2.1294
2028	2.1292
2029	2.1295
2030	2.1300

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 annual total fertility rates in Malaysia are likely to be around 2.1 births throughout the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Malaysia's total fertility rates have declined over the past years to levels below replacement level fertility. The country's 2017 strategic action plan is meant to maintain TFR between 1.9 and 2.1 births per woman until 2030. In this study we proposed an artificial neural network approach to predict TFR in Malaysia and the ANN model projections revealed that annual total fertility rates in Malaysia are likely to be around 2.1 births throughout the out-of-sample period. Therefore, we encourage the Malaysian authorities to continue with their 2017 strategic action plan to keep TFR between 1.9 and 2.1 until 2030.

REFERENCES

[1] Tey Nai Peng (2020). Bracing for Low Fertility in Malaysia, ISEAS, pp 1-11.
[2] DOSM. (2017). Malaysian Economics Statistics - Population - Time Series 2016.
[3] Worldometer (2020). Guinea demographics. https://www.worldometers.info

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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 264-267, August-2021

https://doi.org/10.47001/IRJIET/2021.508057

Citation of this Article:

Dr. Smartson. P. NYONI, Tatenda. A. CHIHOHO, Thabani NYONI, "Projection of Total Fertility Rate in Malaysia" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 8, pp 264-267, August 2021. Article DOI https://doi.org/10.47001/IRJIET/2021.508057

****

