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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 449-452, August-2021

https://doi.org/10.47001/IRJIET/2021.508101

Forecasting Total Fertility Rate in Thailand

[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 article, the ANN approach was applied to analyze TFR in Thailand. The employed annual 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 Thailand. The results of the study indicate that annual total fertility rates in Thailand are likely hover around 2 births per woman over the out-of-sample period. Therefore, the authorities in Thailand should address pertinent challenges being faced by adolescents and young adults in accessing family planning services and fund empowerment programs for women.**

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

I. INTRODUCTION

Child marriage is a violation of fundamental human rights that has a negative impact on the girls' sexual, mental, and physical and well-being (UNICEF, 2015; UNFP, 2012a). Approximately 45% of women aged 20-24 are married before they reach the legal age of majority (UNCEF, 2014b). It has been noted that child marriage and pregnancy are the major risk factors of maternal and child mortality in low and middle income countries (Wadlar, 2012). Despite the visibility of family planning programs in developing countries, many adolescent girls and women face many obstacles in accessing family planning services (STAG, 2017; Alkema et al, 2013). About 214 million women in developing countries in need of contraception do not use any contraceptive method (Guttmacher Institute, 2017).The global fertility rates have declined over the years due to use of modern methods of contraception, health education, and increased level academic education (Worldometer, 2020).This indicates significant progress made over the years in order to improve maternal and child health outcomes. The aim of this paper is to project TFR in Thailand using a machine learning algorithm. The findings of this paper are expected to reveal the likely future trends of fertility in the out of sample period. This will facilitate planning and the nation's response to the future health, education and employment requirements.

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 Thailand.

Data Issues

This study is based on annual total fertility rate (births per woman)in Thailand 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.

III. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	A
Observations	47 (After Adjusting Endpoints)
Neural Network Architecture:	

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 8, pp 449-452, August-2021
https://doi.org/10.47001/IRJIET/2021.508101

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	0.130768
MSE	0.084446
MAE	0.204606

Residual Analysis for the Applied Model

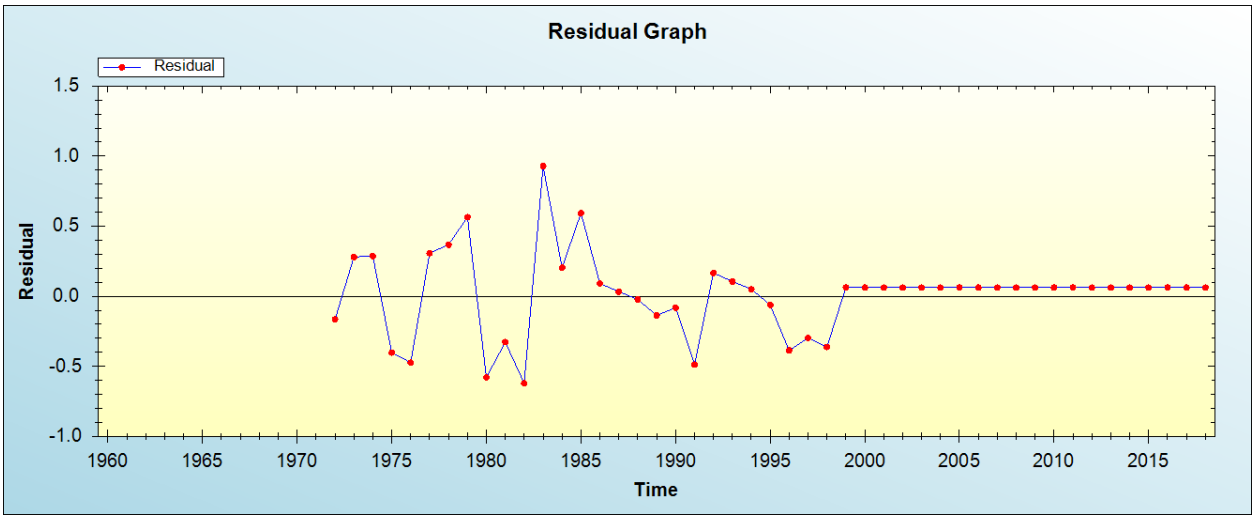

Figure 1: Residual analysis

In-sample Forecast for A

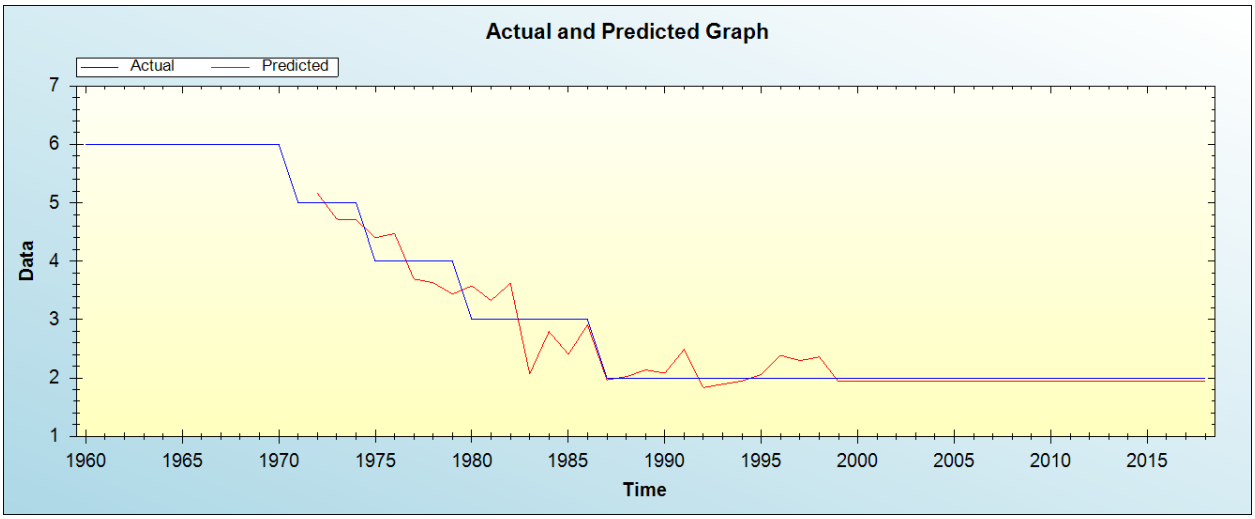

Figure 2: In-sample forecast for the A series

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 8, pp 449-452, August-2021
https://doi.org/10.47001/IRJIET/2021.508101

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

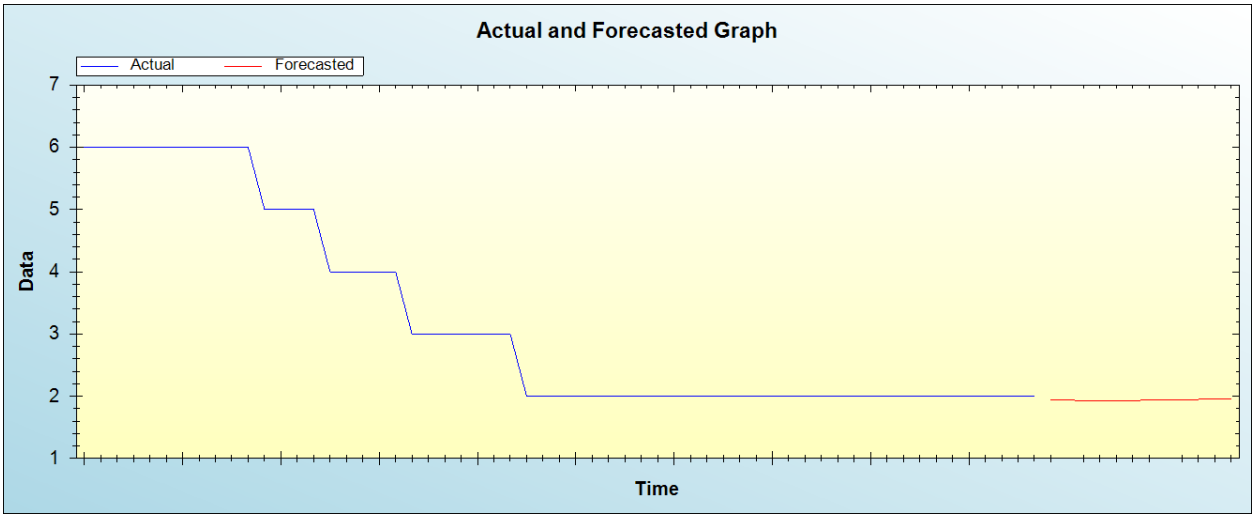

Figure 3: Out-of-sample forecast for A: actual and forecasted graph

Out-of-Sample Forecast for A: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Year	Forecasts
2019	1.9383
2020	1.9373
2021	1.9307
2022	1.9339
2023	1.9304
2024	1.9310
2025	1.9368
2026	1.9394
2027	1.9436
2028	1.9487
2029	1.9497
2030	1.9533

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 Thailand are likely to slightly decline and hover around 2 births per woman over the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Child marriages in developing nations are still occurring and are a violation of children's rights. Lack of comprehensive SRH knowledge among adolescents and young women needs to be addressed in order to prevent adverse maternal and child health outcomes. In this paper we apply a machine learning technique to predict total fertility rates in Thailand. The results of the study showed that annual total fertility rates in Thailand are likely to remain around 2 births per woman over the out-of-sample period. Therefore, the authorities in Thailand should address pertinent challenges being faced by adolescents and young adults in accessing family planning services and fund empowerment programs for women.

REFERENCES

[1] UNFPA. (2012a). Marrying too Young: End Child Marriage. New York, NY: UNFPA.
[2] UNICEF (2014b). The State of the World's Children 2015: Reimagine the Future: Innovation for Every Child, New York
[3] UNICEF (2014b). Ending Child Marriage: Progress and prospects, New York
[4] Walker, J. A. (2012). Early marriage in Africa – Trends, harmful effects, and interventions. African Journal of Reproductive Health 16(2): 231-240.
[5] UNICEF (2015). Child marriage, Adolescent pregnancy and Family formation in West and Central Africa, pp1-86.

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 449-452, August-2021

https://doi.org/10.47001/IRJIET/2021.508101

[6] Alkema L., Kantorova V., Menozzi C., Biddlecom A (2013). National, regional, and global rates and trends in contraceptive prevalence and unmet need for family planning between 1990 and 2015: a systematic and comprehensive analysis. Lancet, 381(9878):1642–52.

[7] Scientific and Technical Advisory Group (STAG), The Gender and Rights Advisory Panel (GRAP). Statement on the promotion, protection and fulfilment of sexual and reproductive health and rights (2017). Geneva: UNDP/ UNFPA/UNICEF/WHO/WORLD BANK Special Programe of Research, Development and Research Training in Human Reproduction.

[8] Guttmacher Institute (2017). Adding It Up: Investing in Contraception and Maternal and Newborn Health. New York.

Citation of this Article:

Dr. Smartson. P. NYONI, Tatenda. A. CHIHOHO, Thabani NYONI, "Forecasting Total Fertility Rate in Thailand" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 8, pp 449-452, August 2021. Article DOI https://doi.org/10.47001/IRJIET/2021.508101

****

