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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 179-182, August-2021

https://doi.org/10.47001/IRJIET/2021.508036

Total Fertility Rate (TFR) Forecasting in Burkina Faso

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

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

***Abstract* - In this research paper, the ANN approach was applied to analyze TFR in Burkina Faso. 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 Burkina Faso. The results of the study indicate that the annual total fertility in Burkina Faso is likely to be around 5.3 births per woman throughout the out of sample period. Therefore, the government is encouraged to (1) create more demand for family planning services and improve access to sexual and reproductive health (SRH) services among adolescents and young adults, and (2) focus on empowering women through education, equal employment opportunities and upholding their rights.**

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

I. INTRODUCTION

Burkina Faso has a serious challenge of unwanted adolescent pregnancies in schools (AFP, 2016). The country has a low modern contraceptive prevalence rate of 22.8 % and a high unmet need for family planning of 24.2 % (AFP, 2011). The country has one of the highest adolescent birth rates in Sub-Saharan Africa which is approximately 122 births per 10 (201500 girls aged 15-19 years old (Burkina Faso National institute of Statistics and Demography, 2016). It has been noted that some of the unwanted pregnancies lead to unsafe abortions, stigmatization and school drop outs (UNICEF, 2013).

Burkina Faso has recorded a decline in fertility rates over the years from 7.2 births per woman in 1985 to 5.2 births per woman in 2020 (Worldometer, 2020). Infant mortality rate declined from 228.11 infant deaths per 1000 live births in 1950 to 45.09 infant deaths per 1000 live births in 2020 (Worldometer, 2020) indicating that authorities need to put more resources in the health sector to further reduce infant and under five mortality. There are few previous studies in the region that have examined fertility trends in the region to inform policy. Based on a qualitative study, Bado et al (2020) explored the perspectives of men and women on barriers to contraceptive use and to identify the strategies to increase male involvement in family planning. The results show that men's attitudes are still a significant barrier to women's use of modern contraceptives. Drabo (2020) provided detailed information on the ethnographic findings that show the complexity of family planning within the social context of women's lives and care-seeking trajectories. It drew on participant observation in Ouagadougou, Burkina Faso's capital, and interviews with women with a wide range of reproductive experiences and providers of family planning services. The author concluded that women's use of contraceptive methods and abortion is embedded in the wider social dilemmas relating to marriage, sexuality, and gendered relationships. Casey et al (2015) explored the availability and quality of, and access barriers to RH services in three humanitarian settings in Burkina Faso, Democratic Republic of the Congo (DRC), and South Sudan. In total, 63 purposively selected health facilities were assessed: 28 in Burkina Faso, 25 in DRC, and nine in South Sudan, and 42 providers completed a questionnaire to assess RH knowledge and attitudes. Thirty-four focus group discussions were conducted with 29 members of the host communities and 273 displaced married and unmarried women and men to understand access barriers. The study revealed that although RH services are being provided, the availability of good quality RH services was inconsistent across settings.

The aim of this study is to forecast TFR in Burkina Faso using a machine learning algorithm. The results of the study are envisioned to reveal likely fertility trends in the out of sample period to facilitate policy formulation, planning and resource mobilization to fund health sector, education and employment creation.

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 Burkina Faso.

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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 179-182, August-2021

https://doi.org/10.47001/IRJIET/2021.508036

Data Issues

This study is based on annual total fertility rate (births per woman)in Burkina Faso 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	B
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	0.082438
MSE	0.008390
MAE	0.070293

Residual Analysis for the Applied Model

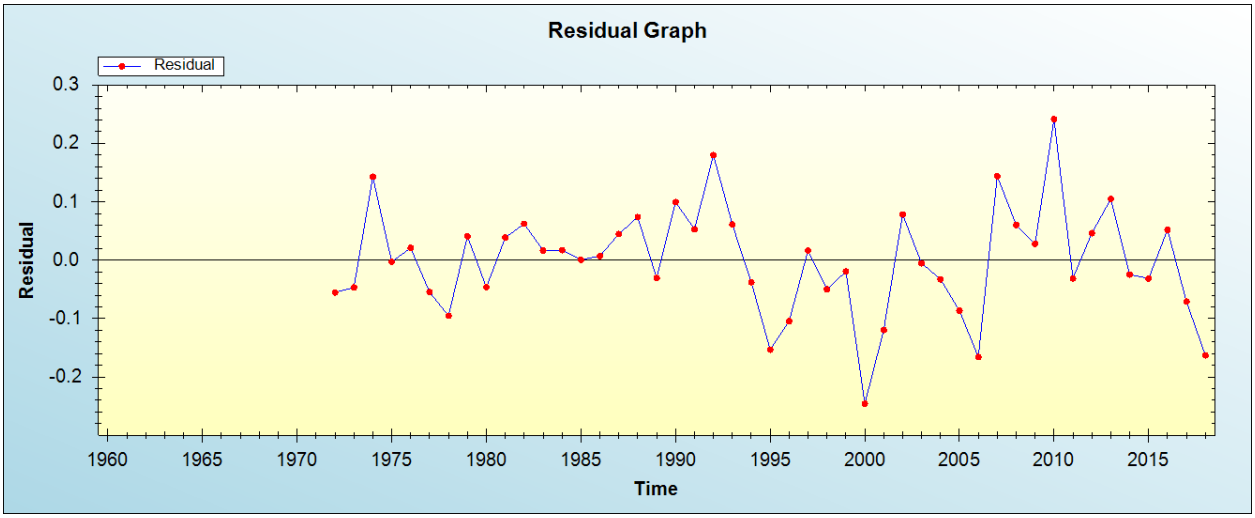

Figure 1: Residual analysis

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 5, Issue 8, pp 179-182, August-2021
https://doi.org/10.47001/IRJIET/2021.508036

In-sample Forecast for B

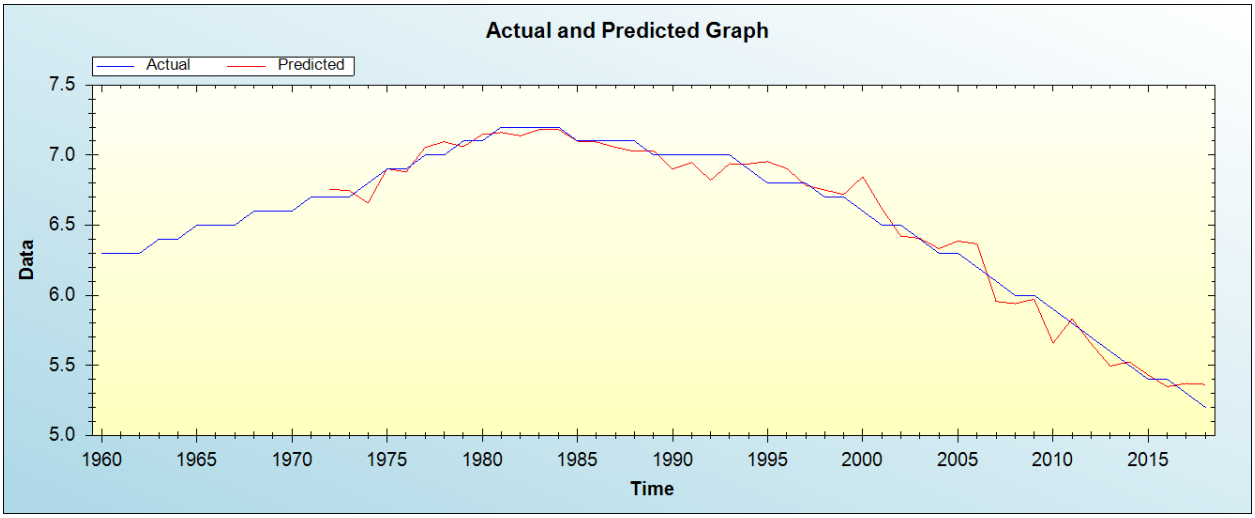

Figure 2: In-sample forecast for the B series

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

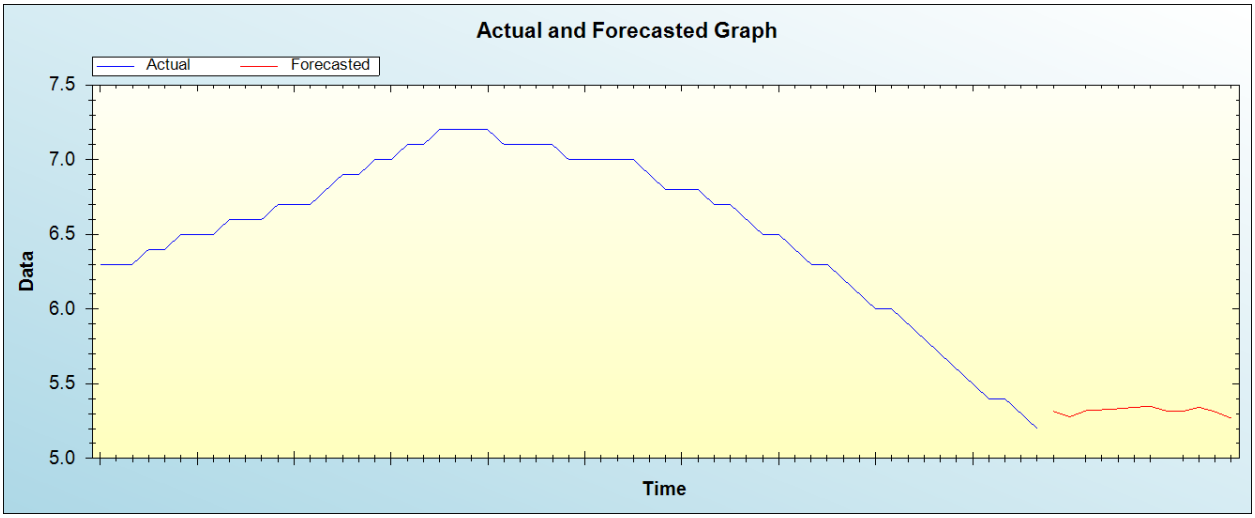

Figure 3: Out-of-sample forecast for B: actual and forecasted graph

Out-of-Sample Forecast for B: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Year	Forecasts
2019	5.3145
2020	5.2780
2021	5.3202
2022	5.3266
2023	5.3332
2024	5.3424
2025	5.3484
2026	5.3181
2027	5.3162
2028	5.3427
2029	5.3132
2030	5.2705

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

ISSN (online): 2581-3048

Volume 5, Issue 8, pp 179-182, August-2021

https://doi.org/10.47001/IRJIET/2021.508036

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 rate in Burkina Faso is likely to around 5.3 births per woman throughout the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Burkina Faso has a serious challenge of teenage pregnancies coupled with low contraceptive prevalence and a high unmet need for family planning. The country's high fertility rates are a cause for concern. In this study we employed the artificial neural network approach to predict total fertility rates in Burkina Faso. The findings indicate that annual total fertility rate in Burkina Faso is likely to around 5.3 births per woman throughout the out-of-sample period. Therefore the government of Burkina Faso should create more demand for family planning services and improve access to sexual and reproductive health (SRH) services among adolescents and young adults. The government must also focus on empowering women through education, equal job opportunities and upholding their rights.

REFERENCES

[1] Worldometer (2020). Burkina Faso demographics. https://www.worldometers.info
[2] Burkina Faso AFP (2016). High-level Leaders Commit to Integrating Sexual and Reproductive Health Education in Burkina Faso November 2016 CASE STUDY, pp 1-4
[3] Burkina Faso Institut national de la statistique et de la démographie (National Institute of Statistics and Demography), The Bill & Melinda Gates Institute for Population and Reproductive Health at The Johns Hopkins Bloomberg School of Public Health, Performance Monitoring and Accountability 2020 (PMA2020) Survey round 3, PMA2016/Burkina Faso-R3. 2016. Ouagadougou, Burkina Faso and Baltimore, Maryland, USA
[4] UNICEF (2013). "UNICEF Annual Report 2013 – Burkina Faso." Page 10

Citation of this Article:

Dr. Smartson. P. NYONI, Tatenda. A. CHIHOHO, Thabani NYONI, "Total Fertility Rate (TFR) Forecasting in Burkina Faso" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 8, pp 179-182, August 2021. Article DOI https://doi.org/10.47001/IRJIET/2021.508036

****

