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Forecasting Total Fertility Rate (TFR) In Togo

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***Abstract* - In this research article, the ANN approach was applied to analyze TFR in Togo. 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 Togo. The results of the study indicate that annual total fertility rates in Togo are generally likely to remain around 4.5 births per woman over the out-of-sample period. Therefore, the government of Togo should focus on improving access to sexual and reproductive health (SRH), HIV testing and ART (antiretroviral therapy) services among adolescents and young adults by addressing challenges they face when seeking these health services as well as channeling more resources towards women empowerment program activities.**

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

I. INTRODUCTION

The international conference on Population and development which was held in Cairo, Egypt in 1994 paved way for the recognition of sexual and reproduction health (SRH) rights of every individual or couple all over the world. The signatories to the conference agreed to ensure universal access to health for all in their respective countries including ensuring universal access to SRH and rights especially for women who are being deprived of their SRH rights in many countries (Sundewall, 2019). Good SRH is a state of complete physical, mental, and social well-being in all matters relating to the sexual and reproductive health system (UNPF, 2019).

In 2015 Togo had approximately 11000 people living with HIV including 59 000 women aged 15 years and above and 9000 children aged 0-14 years (ONUSIDA Togo, 2015). HIV prevalence among women attending antenatal clinics was 2% in 2015 (PNLS-IST, 2015). Togo has a population size of about 8.1 million (World Bank, 2019) and a total fertility rate of 4.3 births per woman (World Bank, 2020). The unmet need for family planning in 2019 was 34.5%. Maternal mortality ratio remains high at 396 per 100 000 live births (World Bank, 2020). This means that the country has to invest more in maternal and child health services. There are limited studies in the region that have focused on examining fertility or predicted fertility trends. Based on a cross-sectional study, Yaya et al (2020), assessed the unmet need for limiting childbirth and its associated factors among women living with HIV in Togo. The study highlighted that even though the unmet need for births limitation was relatively low among WLHIV in Togo, interventions to improve more access to contraceptive methods, and targeting 35 to 49 years old women, those in couple or followed in the public healthcare facilities would contribute to the eradication of mother-to-child transmission of HIV. Yaya et al (2018) conducted a cross-sectional survey to assess the prevalence of modern contraceptive use and associated factors among HIV-infected women in Togo and the study revealed that about three-quarters of sexually active HIV-infected women in Togo were using contraceptive methods, and private health facilities favored this contraceptive use. Darré et al (2018)evaluated the practice of sexuality, contraception and the risk of sexually transmitted infections among students in the Faculty of Health Sciences, University of Lomé, Togo and the study revealed that Gonorrhea was reported in 30.4% of cases, candidiasis in 26.1% of cases.

The aim of this study is to forecast TFR in Togo using a machine learning approach. The results of the study are envisioned to reveal likely trends of TFR in the out of sample period to facilitate planning and resource mobilization for health, 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 Togo.

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Data Issues

This study is based on annual total fertility rate (births per woman)in Togo 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	T
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	0.079307
MSE	0.017471
MAE	0.111540

Residual Analysis for the Applied Model

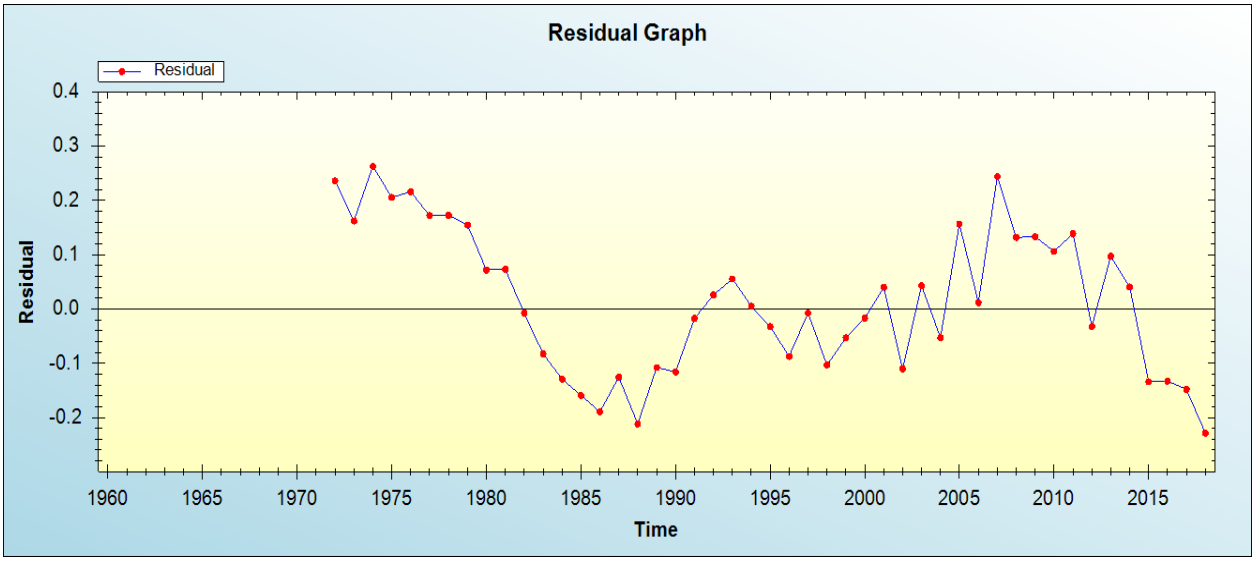

Figure 1: Residual analysis

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In-sample Forecast for T

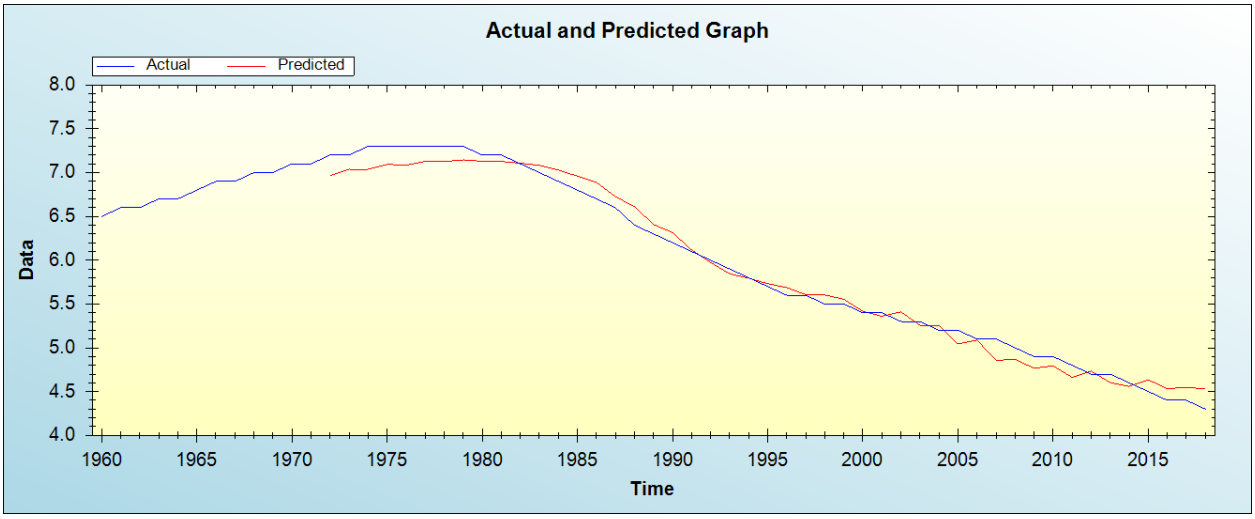

Figure 2: In-sample forecast for the T series

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

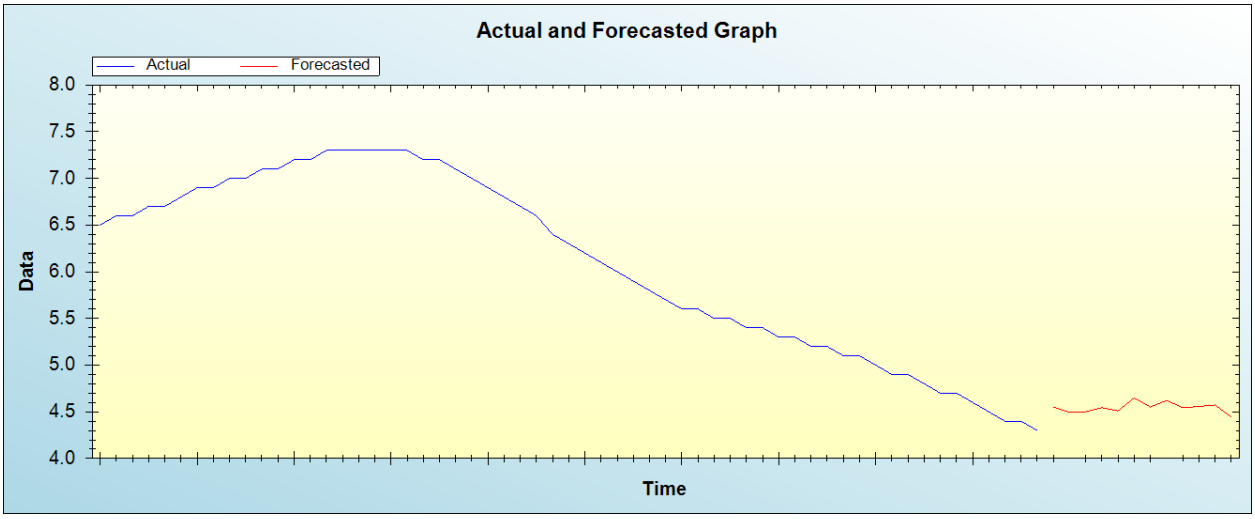

Figure 3: Out-of-sample forecast for T: actual and forecasted graph

Out-of-Sample Forecast for T: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Year	Forecast
2019	4.5502
2020	4.4943
2021	4.5016
2022	4.5436
2023	4.5106
2024	4.6486
2025	4.5512
2026	4.6213
2027	4.5441
2028	4.5565
2029	4.5725
2030	4.4459

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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 Togo are generally likely to remain around 4.5 births per woman over the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Togo continues to report high maternal mortality ratio and high fertility rates. High teenage pregnancies, new HIV infections, STIs and unsafe abortions are common among adolescents and young women. In this study, we proposed an artificial neural network approach to predict total fertility rates in Togo. The ANN (12, 12, 1) model projections revealed that annual total fertility rates in Togo are generally likely to remain around 4.5 births per woman over the out-of-sample period. Therefore, the government of Togo is encouraged to focus on improving access to sexual and reproductive (SRH), HIV testing services (HTS) and antiretroviral therapy (ART) services among adolescents and young adults by addressing challenges they face when seeking these health services as well as channeling more resources towards women empowerment program activities.

REFERENCES

[1] Sundewall, Jesper (2019). UHC as a means to advance sexual and reproductive health and rights: Lessons from health benefits packages and prioritization processes in six countries in sub-Saharan Africa.
[2] United Nations Population Fund (2019). State of World Population 2019: Unfinished Business the Pursuit of Rights and Choices for All. New York
[3] Programme National de Lutte contre le Sida et le IST au Togo PNLS-IST. Rapport annuel d'activités. PNLS - Togo: Lomé, 2015.
[4] World Bank, population (2019). Population, total - Togo | Data (worldbank.org).
[5] Fertility rate, total (births per woman). Fertility rate, total (births per woman) - Senegal, Benin, Ghana, Togo | Data (worldbank.org).
[6] World Bank. Maternal Mortality Ratio. https://databank.worldbank.org/reports.aspx?-source=2&series=SH.STA.MMRT&country=
[7] Worldometer (2020). Togo demographics. https://www.worldometers.info

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