

Forecasting and Comparison of Economic Indicators for The Universal Pension Scheme in Bangladesh

BY

Md. Warid Hasan
ID: 0242220005103009

This Report Presented in Partial Fulfillment of the Requirements for
The Degree of Masters of Science in Computer Science and Engineering

Supervised By

Dr. Fizar Ahmed
Associate Professor
Department of CSE
Daffodil International University



DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

JANUARY 2024

APPROVAL

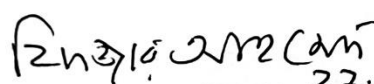
This Project/Thesis titled “**Forecasting and Comparison of Economic Indicators for The Universal Pension Scheme in Bangladesh,**” submitted by Md. Warid Hasan, ID No: 0242220005103009 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of **M.Sc. in Computer Science and Engineering** and approved as to its style and contents. The presentation has been held on 27-01-2024.

BOARD OF EXAMINERS

Chairman

Professor Dr. Sheak Rashed Haider Noori
Professor and Head
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner


27.01.2024

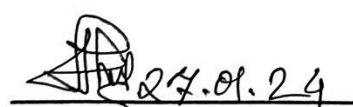
Dr. Fizar Ahmed, PhD
Associate Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner


27.01.2024

Dr. Arif Mahmud, PhD
Associate Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

External Examiner


27.01.24

Dr. Firoz Ahmed, PhD
Professor
Department of Information & Communication Engineering
Rajshahi University

DECLARATION

We hereby declare that, this thesis has been done by us under the supervision of **Dr. Fizar Ahmed**, Associate Professor, **Department of CSE** Daffodil International University. We also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

Supervised by:

24.01.2024

Dr. Fizar Ahmed
Associate Professor
Department of CSE
Daffodil International University

Submitted by:

27-01-2024

Md. Warid Hasan
ID: 0242220005103009
Department of CSE
Daffodil International University

ACKNOWLEDGEMENT

First, we express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final thesis successfully.

We really grateful and wish our profound our indebtedness to **Dr. Fizar Ahmed**, Associate Professor, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of “Data Mining” to carry out this thesis. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this thesis.

We would like to express our heartiest gratitude to **Dr. Sheak Rashed Haider Noori, Professor and Head, Department of CSE**, for his kind help to finish our thesis and also to other faculty members and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and passion of our parents.

ABSTRACT

Article 15 of the Bangladeshi constitution requires the state to guarantee "the right to social security." From birth to death, the Universal Pension Scheme aims to provide social security for all of its citizens and ensure that no one is left behind. This universal pension scheme is expected to provide sustainable and well-structured social security to the population of Bangladesh especially the growing elderly population due to the increase in average life expectancy. Bangladeshi citizens of all classes and professions can participate in this pension scheme between the ages of 18 to 50 years as per the national identity card or conditionally by making a minimum contribution of 10 years. The government is announcing a total of six pension schemes, but for now, four have been launched, namely **PROBASH**, **PROGOTI**, **SHUROKKHA** and **SAMATA**. Currently 62% of our total population is working. Although the current average life expectancy is 72.3 years, there is a possibility of further increase in the future, the increase in the average life expectancy and the increase in the number of single households will increase the dependency ratio in the future, so it is necessary to build a sustainable social security structure. As much as this pension scheme will benefit the people of the country, it can also harm them terribly if the government does not implement this system in a proper way. So, we will discuss a system that will most likely verify the feasibility of our pension system, as well as how much it will be acceptable to people and the possible transparency of the pension scheme. We can highlight some studies that can give us a better idea of the past and future of our economy. Among these, past data visualisation is a very significant method for reviewing the past. And I think data forecasting is the most appropriate decision for the future. We will do a good comparison of our own economic data with the data of other countries so that we can better understand the feasibility of introducing our pension system. And we will use the forecasting model so that we can see the possibility of the future of the data. In this way, we can get an idea of how the future development of the country's economy can affect our pension system. Our studies will surely help the financial sector of the government and also give a clear and proper understanding of this pension scheme among the people of the country.

LIST OF FIGURES

FIGURES	PAGE NO
Figure 4.1 LSTM Rolling Mean and Standard Deviation	17
Figure 4.2 LSTM Seasonal Decomposition	18
Figure 4.3 LSTM Training & Prediction Graph	18
Figure 4.4 Baseline And Predictions	19
Figure 4.4 Facebook Prophet Learnig and Forecust data	19
Figure 4.5 Yearly & Trend	20
Figure 4.6 Aging population	21
Figure 4.7 Bangladesh GDP 2003-2028	22
Figure 4.8 Ban, Ind Nether 1973-2022	22
Figure 4.9 Imports & Exports of goods and services (% of GDP)	22
Figure 4.10 Purchasing Power Parity 2018-2028	23
Figure 4.11 Unemployment and labor market statistics	23
Figure 4.12 Inflation & Deflator, consumer prices (annual %)	24
Figure 4.13 Inflation & Interest rate	24
Figure 5.1 Forecasting Performance Evaluation	27

TABLE

Table 1: RMSE and MSE Error

PAGE NO

26

TABLE OF CONTENTS

CHAPTER

CHAPTER 1: INTRODUCTION	3
1.1 Introduction	3
1.2 Motivation	4
1.3 Research Objective	4
1.4 Research Questions	5
1.5 Report Layout	5
CHAPTER 2: BACKGROUND	7
2.1 Introduction	7
2.2 Related Works	7
2.3 Scope of the problem	9
2.4 Challenges	9
CHAPTER 3: RESEARCH METHODOLOGY	11
3.1 Introduction	11
3.2 Research Subject and Instrumentation	11
3.3 Data Description	12
3.4 Statistical Analysis	12
3.5 Proposed Methodology	13
3.5.1 Proposed Forecasting Models Workflow	14
3.5.1.2 LSTM	14
3.5.1.3 PROPHET	14
3.5.1.4 ARIMA	14
3.6 Model Compiling	15
3.7 Implementation Requirements	15
CHAPTER 4: DATA FORECASTING AND VIZUALIZETIONS	17

4.1 DATA FORECASTING	17
4.1.1 LSTM	17
4.1.1.2 Seasonal Decomposition	18
4.1.2.3 Baseline And Predictions	18
4.1.2 PROPHET	19
4.2 DATA VISUALIZATION	20
4.2.1 Aging population	21
4.2.2 Bangladesh GDP	21
4.2.3 Purchasing Power Parity (PPP)	22
4.2.4 Unemployment and labor market statistics Bangladesh	23
4.2.5 Inflation	23
4.2.6 Inflation & Interest rate	24
CHAPTER 5: EXPERIMENTAL RESULTS AND DISCUSSION	26
5. Introduction	26
5.1.1 FORECASTING MODELS EVALUATION	26
5.1.1.2 RMSE and MSE Error	26
5.1.1.3 Forecasting Performance Evaluation	27
5.2.1 Economics of UPS	27
5.2.2 Accountability, Transparency & Good Governance	28
5.2.3 Experimental Results and Discussion	28
CHAPTER 6: CONCLUSION AND FUTURE WORK	30
6.1 Conclusions	30
6.2 Implication for further study	30
REFERENCE	31

CHAPTER 1

INTRODUCTION

1.1 Introduction

One of the goals of the government of every country is to ensure its social and financial security for all the people of that country. The Old Age Allowance Programme was introduced in the financial year 1997–98 to provide social security to the elderly poor and low-earning or unable-to-earn elderly people of our country and to increase their status in the family and society. In the current financial year 2023–24, 4205.96 crore rupees have been allocated for 58 lakh, 01 thousand elderly people [1]. The Centre for Policy Dialogue (CPD) said in its investigation that the wrongdoers were taking TK 1500 crore in widow and old age allowances [2]. Which is a matter of great concern and may increase further in the future. But these allowances are not sufficient for them, as the amount of these allowances is very low and lags far behind inflation. As the average life expectancy in our country is increasing, a challenge awaits our government in the near future with regard to the people in this sector, which is quite predictable. Thinking in that direction, it became necessary for them to introduce a sustainable and dignified system. For that purpose, for the first time, the Prime Minister of Bangladesh inaugurated the Universal Pension Scheme 2023 on August 17, through which people of all professions, except government bureaucrats, can be covered by this universal pension and make their lives financially prosperous after the age of 60. If someone contributes 10,000 TK for 42 years to the PROBASH pension scheme, then he will deposit a total of 504,000 taka for up to 60 years. And the total amount including pension until 75 years is 62037900 t, which is approximately 12.31 times their total contribution. If 1 lakh people subscribe to this PROBASH scheme, then 6 lakh crore takas will have to be returned to them [3], which is almost equal to the budget of Bangladesh for the financial year 2021-2022.

The government launched the SAMATA pension scheme for marginalized people, but it is also a concern whether these marginalized people will be able to pay their monthly contribution after meeting their living expenses. This is the biggest challenge for our government. When people come under this pension and start contributing, the government will accumulate a lot of money, but while returning, they will have to pay back the original money as well as the extra money, which seems to be very difficult for the government. So, the government should have a clear direction from the very beginning and sustain the pension system by using this money properly. Will the pension scheme launched by the government bring benefits for us or not?

Again, an outline of the pension system should be set up among the common people, which makes the operation of this system transparent in front of everyone. It will take 42 years to complete a full term of public pension; therefore, at first, it is very difficult to verify its feasibility. But we can make an estimate with the economic index of our country from 1973 to 2022, including the trend of all the country's infrastructure indicators, that this universal pension scheme can perform properly in our country's economy.

We will discuss everything about our country in this study and also compare it with other countries. Because some countries have introduced this universal pension system before our country, so their footsteps will help guide us in the right direction. I think it is possible to estimate a possibility by comparing their economic indicators and infrastructure indicators. But there are some aspects in which the situation in our country will not match the situation in other countries, so we have to discuss those aspects separately. Political instability, corruption, and a lack of accountability are among them. But we will work only on economic and infrastructure indicators in our study and will also include the pillars of success in pension schemes.

1.2 Motivation

As a human being, discussing and studying the current affairs of our country is a different aspect of me. From that point of view, the first universal pension scheme in Bangladesh was launched on August 17, 2023, which is new for all of us. Although it is a part of the economy of a country, I think there are many opportunities here too that can be created in a relationship with data science. And for that purpose, I will present our economy in a different way and try to establish a relationship with the universal pension scheme. Because this research of mine is directly related to the economy of our country, I assume that we will all benefit from it here. On the other hand, this pension scheme is a very big system, so I hope it needs to be researched with the utmost importance, because if this system fails, Bangladesh will be in the midst of an economic disaster.

1.3 Research Objective

If we talk about the first purpose of the research, will this universal pension bring welfare to the common people? Verify that. Because this system is first for all common people, including the government, so we want to do a comparative analysis with the real indicators of our country's economy and infrastructure through data science, who will be able to verify this pension system. This pension scheme has four categories: **PROBASH**, **SOMOTA**,

PROGOTI, and **SUROKKHA**. So, we will complete our research in two ways, because it is such a big research project that it is not possible to cover everything if we discuss it in one direction. So, we will compare our old data and use that old data to forecast the data so that we can get an idea of the future and the past. Then we can make some guesses about how much our people of all classes are able to financially participate in the categories mentioned, and the financial transparency of the government is also an important part of this resource.

1.4 Research Questions

In every resource, there are problems along the way, and these problems have to be solved or avoided to move forward. Also, many questions arise some of which are useful for resources and others are not relevant. But we have many questions about this universal pension scheme which will sustain our research a lot.

- What kind of dataset is being analyzed in this research?
- What models are used for data forecasting?
- Which economic indicators are used for forecasting models?
- Economic comparison with which country?
- Which machine learning model will be used for data forecasting?
- Which indicators will be discussed in our Research?

1.5 Report Layout

The report has total 5 Chapters which will be followed given by instructions:

In Chapter 1, We have outlined the full concept of our resources in the introduction to this chapter. Also, some motivational talks and some questions shed light on rationale and necessity.

In Chapter 2, We have organized this section of ours to discuss the similarities and differences between our work and that of those who have worked on IPS in the past. Also, some problems and challenges are discussed cautiously.

In Chapter 3, The most important functions of our resource are implemented in this section, including data processing, data analysis, forecasting GDP, data visualization and detailed discussion.

In Chapter 4, In this chapter we discuss our forecasting model and data training and prediction. Here the most important parts of our resource are implemented. Machine learning models and techniques are also discussed here.

In Chapter 5, This chapter of our resource discusses and highlights the realities of economic transformation, accountability, transparency, good governance, Forecasting GDP indicators, and results through UPS.

In Chapter 6, A final discussion of our research and working methodology is given in this section. As well as the evaluation of our work, the scope of future work, and aspects of how to take this research forward are highlighted in this section.

CHAPTER 2

BACKGROUND

2.1 Introduction

A person will save his hard-earned money with the government for a long time just to get financial security in old age. Similarly, millions of people will also be included in this scheme. Creating a sustainable pension scheme, considering the economic condition of our country along with the infrastructure and environmental conditions, is quite a challenge. Therefore, almost all the economists of the country, including the responsible people of the government, are continuing their research because it is a first for the people, including the government. In this short period of time, the government is getting a good response from many aspects regarding this pension scheme, and at the same time, economists in the country and outside the country are also presenting a lot of information in newspapers, including many thesis papers on this pension system. As well as giving a complete direction on how the government should work.

2.2 Related Works

We have come up with a new approach that will help us better evaluate this public pension system and also help us in our work with a lot of information and guidance. Because it is not possible for us alone to present all the issues correctly, in that case we have to resort to other journals and articles. With that in mind, here is a summary of important information and guidelines from some journals and articles that are very relevant to our thesis.

Innumerable journals have been published with many thesis papers on pension, some of which are highlighted:

Mustafizur Rahman published a journal on Estimation of Implementation Costs and Financial Options in which he worked on some frameworks of pension schemes and also discussed various pillars of public pension. They also showed statistics on many indicators of the economy, which made their work very reliable. And suggested some changes with a rough outline of the future [4].

LUIGI RAGNO has published many practical articles on social security and poverty alleviation, as well as extensive discussions on grounded theory and research in the economics of Bangladesh. In addition to these, the issues of economic risk have been presented beautifully through some frameworks. But in this journal, only low-income people are presented, but in

reality, the participation of all types of people in the universal pension scheme is ensured, and our dataset is also made with all of them [5].

Explains how pension scheme administrators can easily do their job and the government's tax collection issues with possible costs. But the future of these resources is very unclear, as they do not discuss any complicated issues, including customer refunds. From that point of view, almost all the topics are presented in our thesis using real data [6].

LARRY WILLMORE has not only worked on universal pension schemes in developing countries, we also have Bangladesh on this list. He nicely points out that a lot is possible and this is because all kinds of people are coming into this system which can ensure a sustainable future. It also sets separate age limits for women and men even though it may vary from country to country. Because many countries are included in this resource, there is less focus on a single country as there is for Bangladesh [7].

A comprehensive comparative journal with coverage, performance, reliability and cost calculations has been published. There are Denmark, Netherlands, United Kingdom, Canada and Malaysia which are all developed countries. Therefore, with the help of this journal, we think that we can take some directions besides validating our thesis. Because we are a developing country, our economic infrastructure is quite weak compared to others, so we can compare the economic indicators of our country with their indicators [8].

A simulation of the public pension system of some African countries has been carried out, the results of which have been presented by Just & Maria in their journal. There are some indicators used like cost, refund, earning power of people and population. But this journal does not highlight the inflation rate and economic condition of the country. However, this simulation is considered to have yielded much better results [9].

In this resource, ARIMA and LSTM have been compared through the forecasting of economic indicators. Everything has been discussed extensively in this resource, and the mathematical conditions have also been shown in addition to showing everything through graphs [15].

This resource covers the learning methods of LSTM. Here's how ANN works in LSTM models, and how to increase the learning rate. Besides ANN, KNN, SVR, GRNN are also discussed in comparison [16].

The research of supermarket sales forecast through Facebook Prophet has been presented in this study. Here the workflow of the model is shown as well as some specific conditions that help increase forecasting accuracy. Also compared with AREMA model and outlier detection is also worked on [17].

In this resource, a model has been created by combining Facebook Prophet and LSTM. This super model is used in this resource. Weekly, yearly scenarios, learning rates and prediction intervals are extensively discussed in this model [18].

2.3 Scope of the problem

A universal pension system is a social security system that provides basic income to all citizens, aiming to reduce poverty and inequality. However, it faces challenges such as fiscal sustainability, pension adequacy, and equity. It must ensure benefits meet beneficiaries' needs and preferences, and address potential disparities among different groups. It also requires clear and transparent design that reflects society's objectives and values. Different countries have different approaches to pension systems, such as France's points-based system, India's multiple-tiered scheme, and China's mandatory savings scheme. Each system has its own advantages and disadvantages.

As our research is directly based on the people and economic factors of the country, in some cases, our research model may not be valid. It will take 42 years to complete a full cycle of the universal pension scheme, which is a long time, and the results of our assumed thesis may not fully match the future reality. One of the biggest challenges in data forecasting is training our data to match the forecasting model, because no economic forecasting model is yet operational, so we need to do some extra work to preprocess the data. Again, our data is of annual frequency, but forecasting models show good performance with date time. For this, we may need to modify our data a little, which is a big challenge. Consideration of those aspects may require more careful and more reasonable economic indicators in terms of inputs. We have taken a very cautious stance as to the exact reasoning behind whatever the outcome of our thesis may be. We strongly believe that our resource model will be equally acceptable for the present and the future.

2.4 Challenges

We are working with very large datasets, which will be a big challenge for us in many ways. This dataset consists of 49 years of real economic indicators for our country and people from all walks of life. In that context, the dataset may have some inconsistencies, missing values, or outliers. Therefore, before working with this data, we have to spend a lot of time preprocessing it. So, I think it is a big challenge for us to make a dataset of the highest quality. Because if there are any data inaccuracies or inconsistencies in the dataset, it will be more likely to affect

the thesis in one direction or another. Apart from the dataset, we also have to focus on the working framework or the working method. Then I assume that many challenges will be faced in presenting the correct information along with the comparative verification of our economy with other countries. We will forecast the data in our resources by various forecasting methods, as well as visualize and analyze the economic indicators of some countries. So many challenges await us at all levels of our resources.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Although Bangladesh is a developing country now, it can become a middle-income country by 2026. Because the economic indicators of our country are increasing satisfactorily. As a result of this, the earning power of the people has increased, and the lifestyle of the people is also getting better and more secure. But it is also true that 20% of the total population of Bangladesh still lives below the poverty line [10]. Although there has been a lot of improvement in all aspects of the country, this 20% poverty level has not decreased.

The government has launched a universal pension scheme to ensure that all people, including the poor, can live a secure life in old age. This pension system is expected to reduce poverty in the country and also benefit the government. One of the reasons for taking this bold step is the improving economy of the country and the strong inflow of remittances. So how much this pension system can adapt to our economy is one of our main discussion points. We will show our data through Visualize and we will try to forecast the data through different models, so that we can get an accurate idea about the future and present about our economic status. We will try to compare the past and future of our country's economy with the economies of different countries to see how sustainable this universal pension scheme will be and how much it will benefit the common people.

3.2 Research Subject and Instrumentation

The main ideas of our resources are to use the economic indicators of our country to compare them through visualization, and to forecast the indicators through forecasting methods so that our pension system will actually survive or not? It is convenient to verify a clear possibility.

Forecasting methods help set realistic goals, identify opportunities and risks, evaluate strategies, and communicate plans to stakeholders like customers, employees, suppliers, and investors, ensuring effective communication and strategic adjustment. There are different types of forecasting methods, such as straight-line, moving average, simple linear regression, and multiple linear regression. Each method has its own advantages and disadvantages depending on the data available, the complexity of the problem, and the level of accuracy required.

Data visualization is a powerful tool that simplifies complex data by breaking it down into manageable pieces. It can reveal hidden patterns and trends, aid in decision-making, and make data more appealing and memorable. It also increases accessibility by making data more understandable and shareable for different audiences. Data visualization is the process of using graphical elements to represent and communicate data. It can help you understand, analyze, and present data in a more effective and engaging way. And we will make extensive use of data visualization in our resources because it can present our work in a clear and understandable way.

3.3 Data Description

We have collected our data from "World Development Indicators (WDI)" which has real data from 1970–2022, for almost all countries in the world. To get this data, everyone has to purchase it through registration, although all kinds of people can use this data to continue their research. There are 1,600 indicators in numerical terms, including the economy, agriculture, poverty, age, remittances, and more. The explanation of each indicator is given so that all types of people can have a clear idea about this data. We will discuss and compare indicators from our dataset in Bangladesh, the Netherlands, India, China, Bolivia, Finland, and Switzerland. Since this dataset is very large, its preprocessing is very complex, and sometimes these data are transformed in many ways. But an interesting thing is that there is no self-made dummy dataset; it is completely real-life data. This dataset has 448 indicator columns and 50 rows that indicate 50 years. And the total memory taken is 175.1 KB.

3.4 Statistical Analysis

We will highlight some aspects of our statistical analysis that will make our research more acceptable. Our dataset contains many economic indicators, none of which will be relevant to my resources. The forecasting method we use will also have a policy effect on the performance of the model if we work with all the indicators. Again, in the field of data visualisation, we cannot present our work properly. So, we will work with some economic indicators that can make our research more practical and acceptable.

For example, we will use only Bangladesh GDP for data forecasting, and these forecasting techniques will be discussed extensively. And in the second step, we will use the data to visualise the ageing population, poverty, DGP, unemployment, inflation, and interest rates of different countries, including Bangladesh.

We think that if we do a lot of work with these indicators, it is possible to show everything within our resources.

3.5 Proposed Methodology

Economic forecasting techniques are methods that use historical data and current trends to make predictions about the future of the economy. They are important tools for businesses, governments, and investors to make informed decisions and plan ahead.

Forecasting methods are techniques that use historical data and trends to make predictions about the future. They are useful for businesses and investors because they help them plan ahead, allocate resources, and anticipate changes in the market. There are different types of forecasting methods, such as straight-line, moving average, simple linear regression, and multiple linear regression. Each method has its own advantages and disadvantages depending on the data available, the complexity of the problem, and the level of accuracy required. By using these techniques, they can anticipate future trends and make plans to succeed in the long term.

There are various techniques and methods that can be used in forecasting, such as time series analysis, regression analysis, and machine learning algorithms, among others. These methods rely on statistical models and historical data to make predictions about future events. The accuracy of forecasting depends on several factors, including the quality and quantity of data used, the methods and techniques employed, and the expertise of the individuals making the predictions.

Some of the common terms and concepts that are used in forecasting techniques are:

Time horizon: The length of time in the future for which a forecast is made. The time horizon affects the choice of method and the level of detail required in the forecast.

Data pattern: The shape and behavior of the data over time. The data pattern affects the type of model and the complexity of the analysis required in the forecast.

Accuracy: The degree to which the forecast matches the actual outcome. The accuracy of the forecast depends on the quality of the data, the validity of the model, and the uncertainty of the future.

Cost: The amount of resources and effort required to produce and maintain the forecast. The cost of the forecast depends on the availability of the data, the sophistication of the method, and the frequency of the updates.

Reliability: The consistency and trustworthiness of the forecast. The reliability of the forecast depends on the stability of the data, the robustness of the model, and the feedback from the users.

3.5.1 Proposed Forecasting Models Workflow

The proposed methodology for forecasting models involves a systematic, logical approach to estimate future values or outcomes based on historical data and trends, using various methods with varying advantages and disadvantages[18].

The best forecasting model for time series analysis depends on the specific use case and the characteristics of the data. There are several models available for time series forecasting, including **ARIMA**, **Prophet**, and **LSTM**.

3.5.1.2 LSTM

LSTM stands for Long Short-Term Memory. LSTM is a recurrent neural network (RNN) that can learn and predict long sequences, especially for time series data with strong temporal dependencies. It consists of memory cells with input, output, and forget gates, and is trained using backpropagation through time (BPTT) to minimize the difference between predicted and actual output. LSTM networks can be used for univariate and multivariate time series forecasting, with the former predicting the next value in a single time series and the latter in multiple time series.

3.5.1.3 PROPHET

Facebook's Prophet is an open-source library for time series forecasting, designed to handle data with seasonality patterns, outliers, and missing values. It uses a decomposable model with three main components: trend, seasonality, and holidays[22]. The library is easy to use and automatically finds suitable hyperparameters for forecasting data with trends and seasonal structure. It is ideal for internal company use, such as sales and capacity forecasting. The library uses Bayesian inference to estimate parameters and incorporate prior knowledge.

3.5.1.4 ARIMA

ARIMA is a statistical model used for time series forecasting, consisting of three parts: Auto-Regressive (AR), Integrated (I), and Moving Average (MA). AR uses past series values to

predict future values, I make the series stationary, and MA uses past errors to predict future values. ARIMA models are useful for non-stationary time series data, as their statistical properties change over time. They can forecast future values and model the underlying process generating the data.

3.6 Model Compiling

Adam Optimizer is used, and it is a popular optimization algorithm for deep learning models, particularly recurrent neural networks (RNNs) like LSTM models. It combines the advantages of AdaGrad and RMSProp, adjusting the learning rate for each parameter based on gradient history.

The fit function is used here because it will do most of the work itself. The fit function in machine learning models trains the model on data, adjusting parameters to minimize error. It takes input features and output labels as arguments and returns the trained model, with different options like epochs, batch size, learning rate, and validation data.

We use seasonal decomposition very heavily because it represents our data in different ways. Seasonal decomposition is a technique that can help you analyse and forecast time series data that has cyclic or periodic patterns. Separate time series into trend, seasonality, and residual components. Focus on the underlying trend, choose an appropriate forecasting method, and evaluate the residual component's quality and validity.

RMSE and MSE errors are metrics used to measure the performance of a forecasting model, which predicts future values based on historical data and trends. They are calculated by comparing predicted values with actual values in a dataset. RMSE is more interpretable and less sensitive to outliers than MSE, but MSE is more useful for penalizing large errors. Lower RMSE and MSE errors indicate better model fit, but they depend on data scale and variability. Other metrics to evaluate the model include residual plots, R-squared, and cross-validation, which help estimate model performance on new data and avoid overfitting or underfitting. Since we have used three models for data forecasting and many other libraries have been used along with it.

3.7 Implementation Requirements

There are some requirements to implemented this project.

Hardware or Software Requirements

- Windows 7 or above operating system

- Portable or in-built Hard Disk above 300 GB
- Minimum 2 GB RAM
- Google Chrome or Mozilla Firefox

Developing Tools

- Google Colab
- Python with Tensor flow
- Jupiter
- Notepad++

CHAPTER 4

DATA FORECASTING AND DATA VIZUALIZETIONS

We have used two processes in our resources; one of them is forecasting the data through machine learning and visualising the data properly. So, we are presenting these two processes separately.

4.1 DATA FORECASTING

We'll build three different model with Python and inspect their results. Models we will use are ARIMA (Autoregressive Integrated Moving Average), LSTM (Long Short-Term Memory Neural Network) and Facebook Prophet.

4.1.1 LSTM

The LSTM model is a recurrent neural network suitable for time series forecasting complex patterns and trends. Its structure includes memory cells, input gates, forget gates, and output gates for efficient storage and retrieval.

Rolling mean and standard deviation are statistical measures used to analyze time series properties, smoothing out noise and fluctuations. They are useful in LSTM forecasting models for data preprocessing, transforming data into a stationary series with constant mean, variance, and autocorrelation, making the model easier to train and more accurate. The LSTM model's performance and validity can be evaluated using rolling mean and standard deviation, comparing predicted and actual values to assess trend and seasonality, and plotting results for visualization.

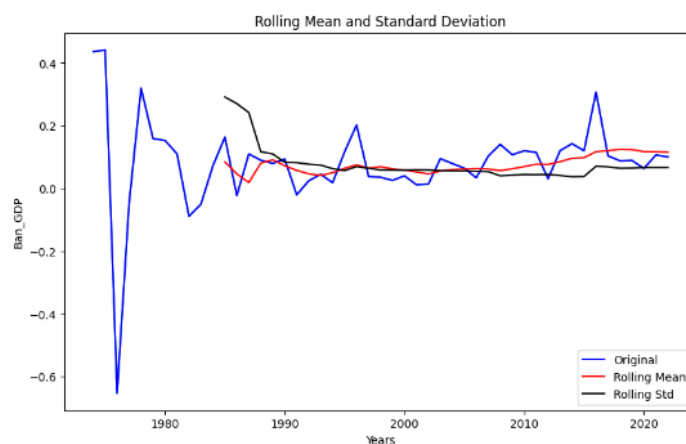


Figure 4.1 LSTM Rolling Mean and Standard Deviation

4.1.1.2 Seasonal Decomposition

Seasonal decomposition is a technique that can help us to analyze and forecast time series data that have cyclic or periodic patterns. Separate time series into trend, seasonality, and residual components. Focus on underlying trend, choose appropriate forecasting method, and evaluate residual component quality and validity.

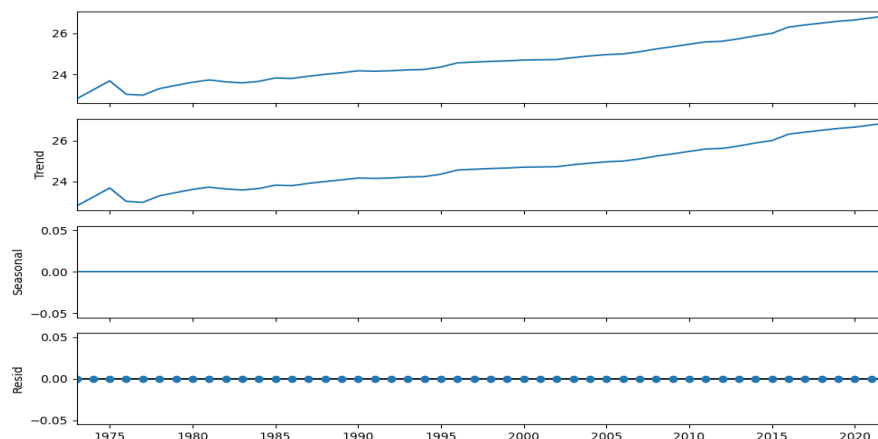


Figure 4.2 LSTM Seasonal Decomposition

We separate our data as a time series into its trend, seasonality, and residual components. And we can see that the frequency of our dataset is very good, and we can assume that the LSTM model can also perform well for our dataset.

4.1.2.3 Baseline And Predictions

We have done some extras for LSTM model like invert prediction, calculate root mean square. In the data training part of our model, we can see that the data train has been done very well, and it has also given good performance in the prediction part. We used 100 epochs to properly train this LSTM model. So, we can expect this LSTM forecasting model to predict our dataset well.

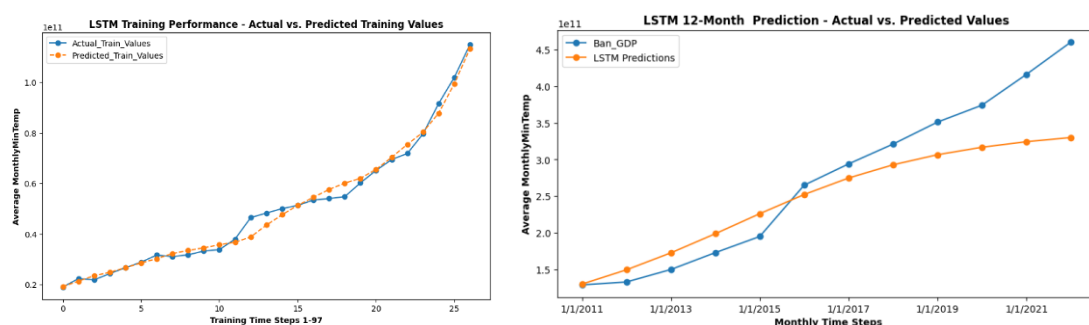


Figure 4.3 LSTM Training & Prediction Graph

As can be seen in the above image, our model is trained very well, and its accuracy is 88%. And in the next figure, we can see the prediction certainty, which is 85%. So, we can say that our LSTM model is working well for data forecasting. And it seems to be able to give a very good forecast prediction on future data as well.

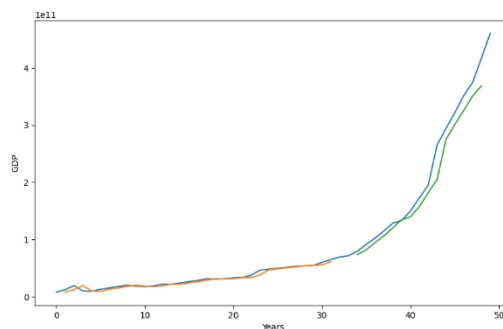


Figure 4.4 Baseline And Predictions

In this figure, we show the training graph, testing graph, and base line simultaneously. LSTM can handle variable-length sequences and missing values, which are common in real-world data. Since the model is well trained, it can stand as an ideal model for future forecasting for our dataset.

4.1.2 PROPHET

Prophet is a time series data prediction technique that adapts an additive model to non-linear trends with seasonality that happen on a daily, monthly, annual, or holiday basis. Prophet is generally good at handling anomalies and resilient to missing data and trend fluctuations. Seasonality parameters can be automatically managed by the Prophet library[21].

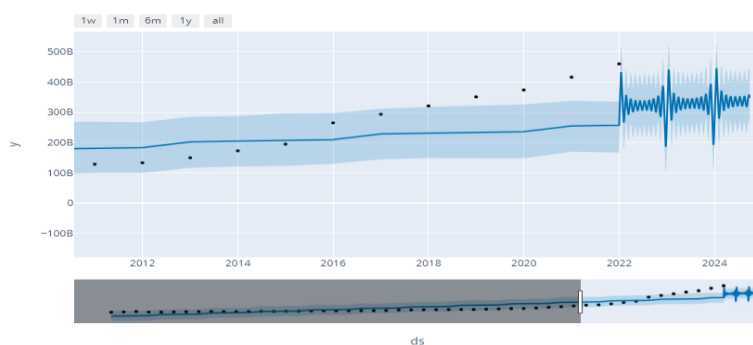


Figure 4.4 Facebook Prophet Learning and Forecast data

After training the PROPHET forecasting model on our dataset, it gives a very good future prediction based on our dataset. Which is considered to be one of the most successful parts of our resources. Here we can see that our original dataset is up to 2022, but we've done the forecasting visualisation up to 2026. And the forecasting output looks very smooth and realistic, which makes this model more reliable.

We can see everything by looking at this forecasting graph, as well as evaluate the model. You can also compare the predicted value with the actual value. The model can also keep pace with the variation in our data.

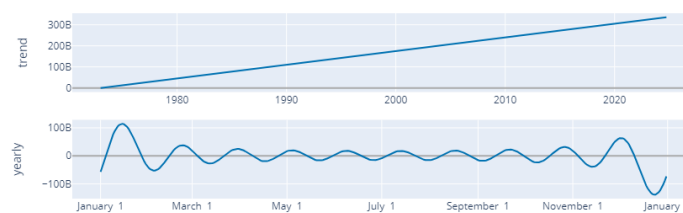


Figure 4.5 Yearly & Trend

Prophet is the only forecasting model that can handle time series data with trends, seasonality, and holidays. It uses an additive model that decomposes the data into four components: trend, seasonality, holiday, and error. The trend component represents the long-term pattern or direction of the data, while the seasonality component captures the repeating patterns within a specific time period. The holiday component accounts for the effects of predictable events that occur on specific dates, such as Christmas or the New Year. The error component is the random variation that remains after removing the other components from the data. This model is user-friendly, efficient, and adaptable to data trends, seasonality, and external events, making it quick and user-friendly. We can see a complete picture of annual data, and also see a trend of total data, which is one of the advantages of this model.

4.2 DATA VISUALIZATION

4.2.1 Aging population

Population ageing is a shift in the distribution of a country's population towards older ages and is usually reflected in an increase in the population's mean and median ages, a decline in the proportion of the population composed of children, and a rise in the proportion of the population composed of the elderly [11].

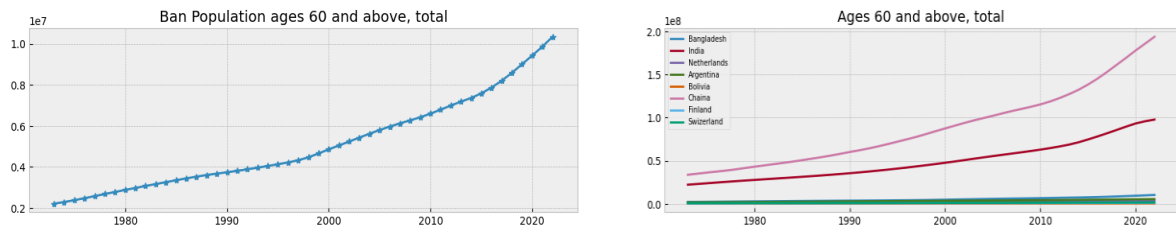


Figure 4.6 Aging population

As our average life expectancy has increased, the number of elderly people in the country has also increased. Our research shows that in 2021, the number of elderly people in the country was 7.47%, but in 2022, this number has increased to 9.29%. But the serious thing is that this number will increase to 32.56% in 2100, according to the study [12]. The number of people above the age of 60 is increasing very fast; even in countries where the number of people is high, such as India and China, their total is much higher. From that point of view, our position is after India and China. But the size of their economy is much larger than ours, and in some respects, our country is currently in a better position than India. Considering those aspects, the pension scheme for the elderly in our country will be a good opportunity if properly managed. And now is the time to do something sustainable with older people that makes their post-60 years financially sound and dignified.

4.2.2 Bangladesh GDP

According to the data for 2022, the GPD of Bangladesh is 460.2 billion dollars, of which 12.92% comes from the agricultural sector and 29.54% comes from the industrial sector. Of these, about 22 million people are engaged in agriculture, and 5 million people are employed in small-scale jobs, which is much less than in other countries.

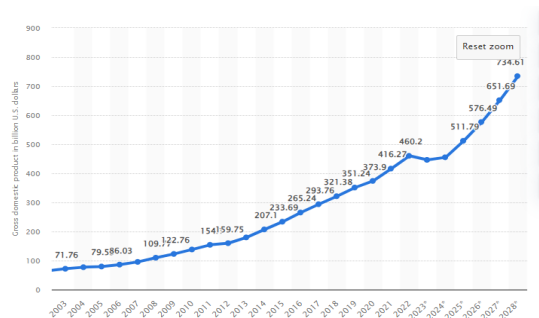


Figure 4.7 Bangladesh GDP 2003-2028

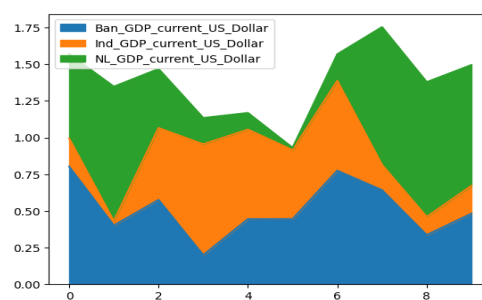


Figure 4.8 Ban, Ind Nether 1973-2022

Also, the hope for us is that our GDP size is steadily increasing. And this GDP is bringing welfare to all the people of our country; at the same time, people's purchasing power is increasing, as is the tendency of everyone to save some money, which is supposed to be a positive aspect of the government's pension scheme.



Figure 4.9 Imports & Exports of goods and services (% of GDP)

If we come as export imports, we will see that the export volume is increasing slowly, but the import volume has increased a lot, which is not a good sign for a developing country like us. Neighboring country India shows that the import graph is low, but the export volume is growing regularly at a high pace, which is very good for any country.

4.2.3 Purchasing Power Parity (PPP)

Bangladesh still lags behind India in per capita GDP in terms of purchasing power parity (PPP) [13]. One thing that can be easily understood is that if people's purchasing power does not increase, the economy of the country will have a big impact because it will not create entrepreneurs in the country, and the unemployment rate will increase a lot.

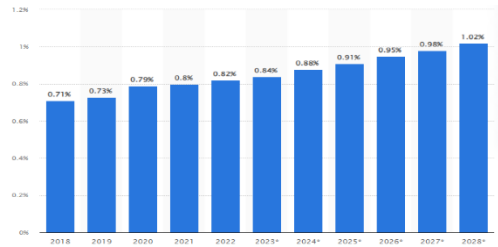


Figure 4.10 Purchasing Power Parity 2018-2028

Looking at India, their purchasing power has increased, and their GDP size is much higher than ours. We currently have a slightly lower purchasing power index due to political unrest. According to World Bank estimates, the per capita GDP for Bangladesh was \$1,961.64 compared to only \$1,927.7 for India in 2020.

4.2.4 Unemployment and labor market statistics Bangladesh

In the economic sector of Bangladesh in 2021, 37.09% of labour was associated with the agriculture sector, 21.71% was in the industrial sector, and 41.2% was in the service sector. But the unemployment rate in the country is 5.02% in 2020 and 4.7% in 2022, which is still not decreasing significantly. This is a matter of concern because, to grow the economy, unemployment must be brought to a minimum.

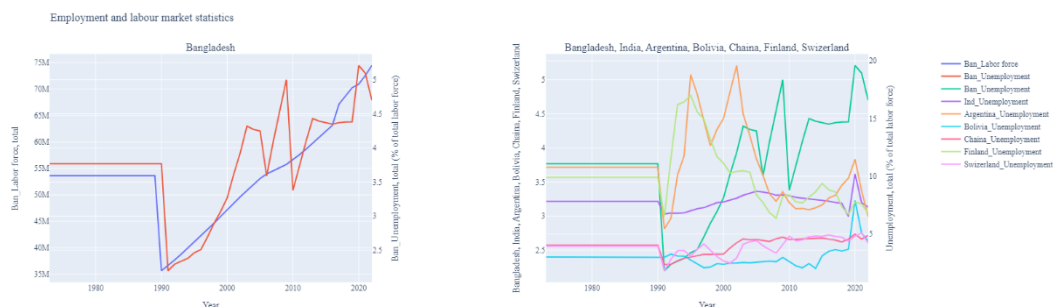


Figure 4.11 Unemployment and labor market statistics

Looking at other countries in the above graph, it can be seen that the unemployment rate in our country is very high. Therefore, unless the unemployment rate is brought down, there is a strong possibility that our public pension scheme will fail.

4.2.5 Inflation

In 2022, inflation rate (GDP deflator) for Bangladesh was 5 %. Though Bangladesh inflation rate (GDP deflator) fluctuated substantially in recent years, it tended to decrease through 1973 - 2022 period ending at 5 % in 2022. And Consumer price inflation in Bangladesh averaged 6.2% in the ten years to 2022, above the Asia-Pacific regional average of 2.1%. The 2022 average figure for Bangladesh was 7.7%.

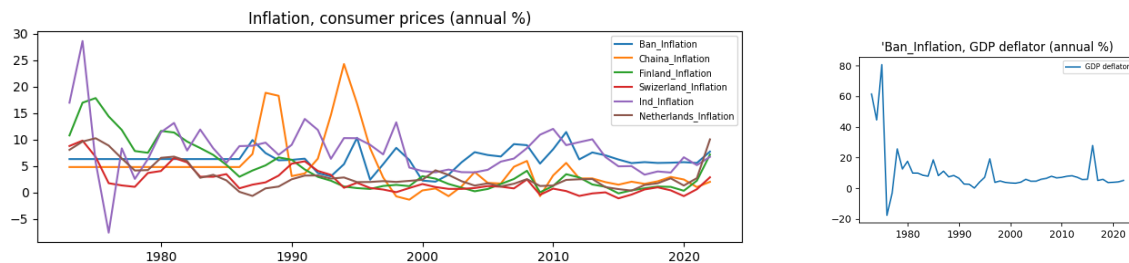


Figure 4.12 Inflation & Deflator, consumer prices (annual %)

Although these two economic indicators of Bangladesh are not at a good level now, there is nothing to worry about. Experts believe that these indicators will go back to a good level if the country's political instability subsides.

4.2.6 Inflation & Interest rate

The rate of interest did not increase as inflation has happened in Bangladesh; that is to say, the government kept the interest rate down, which is uncomfortable for the common people. However, the government has left interest rates above the market in 2023, which is the best measure to curb inflation. But when the people of the country put money in the pension scheme, when they get the money back, will it come as inflation or not? A big question remains about that. Because if the interest rate does not increase and the inflation rate increases, then the money deposited will lose its real value, which will have a big impact on everyone's life. So, the government should be hyper-cautionary about this inflation and interest rate in advance.

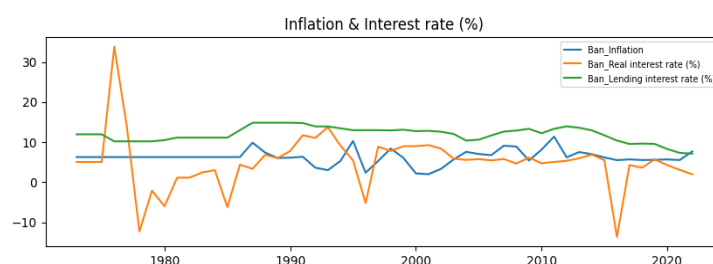


Figure 4.13 Inflation & Interest rate

It takes 42 years for a pension scheme to complete a full cycle, so the pensioner will face a lot of losses if his money is not kept up to date with interest and inflation.

CHAPTER 5

EXPERIMENTAL RESULTS AND DISCUSSION

5. Introduction

We think that we have got a very good result by analyzing the data obtained through our dataset and depending on the current state and political situation of the country. Just as it is a difficult task for the government to launch this pension scheme for the first time, it is not an easy task to hope to bring people into this system. Therefore, in our research using forecasting model, we have tried to present the future picture of the country's GDP. we have tried to show the correct picture of the economy and human capacity of the country with the advantages and disadvantages of the pension system.

5.1.1 FORECASTING MODELS EVALUATION

5.1.1.2 RMSE and MSE Error

RMSE and MSE are two metrics that measure the performance of a forecasting model. They are calculated by comparing the predicted values and the actual values in a dataset[19]. The main difference between them is that RMSE is the square root of MSE, which means that RMSE is measured in the same units as the target variable, while MSE is measured in squared units of the target variable[20]. RMSE is more interpretable and less sensitive to outliers than MSE, but MSE is more useful for penalizing large errors.

Table 1: RMSE and MSE Error

Models	RMSE Errors	MSE Errors
ARIMA	2.58E+11	2.48E+22
LSTM	1.09E+12	1.52E+24
Prophet	2.55E+10	2.78E+21

The three forecasting models I have built have performed well against the data set, and the best way to understand this is RMSE error and MSE error. From the data in the above table, it is understood that the error rate of the LSTM model is lower than all other models. Here, the error of the PROPHET model is slightly higher, but its variation is much better, and it performs well in predicting future data. And although the error of the ARIMA model is low, it cannot show good performance in terms of predicting future data.

5.1.1.3 Forecasting Performance Evaluation

Performance evaluation of forecasting methods is the process of measuring and comparing the accuracy and reliability of different methods that can predict future values based on historical data and trends. We can measure performance in many ways, such as with error measures, accuracy measures, statistical tests, and visual methods. But here, we measure accuracy with RMSE error and MSE error and also represent the predicted values with visualisation.

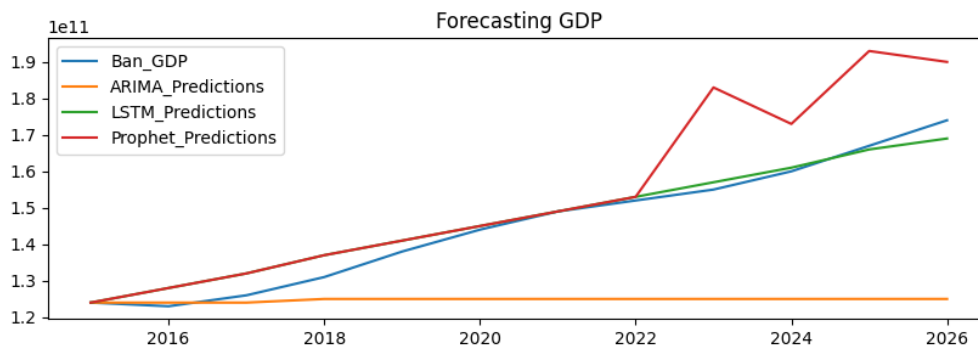


Figure 5.1 Forecasting Performance Evaluation

We show the three model testing predictions and future data predictions in this graph. The LSTM model is performing best, followed by the PROPHET model, and the ARIMA model is not performing well in future prediction. Also, the prediction frequency noise of the PROPHET model was slightly higher. After that, we found that the performance accuracy of all three models was better.

The dataset we used contains many economic indicators, but it is not possible to work with all good indicators for forecasting model use, because forecasting methods can show good performance when working with limited columns. So, we have worked only with the GDP of Bangladesh. And the forecasting result of Bangladesh's GDP has been as expected. We can conclude from our results that our GDP is expected to have a good position, and that even the worst prediction of the model can be considered quite good and realistic.

5.2.1 Economics of UPS

The public pension scheme is not dependent on government funding; it is entirely contributory. In other words, administrative costs and pension payments do not come directly from the government but through returns generated by funds in the market. For this reason, even if the government is in financial trouble, it will not create any risk with the management of this money.

In terms of economics, the entire pension money will flow into the market. And since the public pension scheme is a profitable institution, the government will definitely invest in the markets, which will increase the productive activities of the country.

Additionally, most Bangladeshis do not have adequate sustainable investment options which expose them to risky, wishy washy pyramid schemes. Through UPS, Bangladeshis will be able to invest in their future to better protect themselves from any future risks at their most vulnerable period of life [14].

5.2.2 Accountability, Transparency & Good Governance

The UPS participants have serious concerns about instances of poor governance, misappropriation of resources, and lack of accountability in Bangladesh. The social safety net programs suffered from mistargeting of beneficiaries and rent-seeking behavior prior to the introduction of the G2P payment system.

The National Pension Authority should provide oversight for monitoring corruption and waste. Accurate information about pension funds, where and how, and duration should be published regularly. Providing every customer with their transaction details and certificates, along with their legal privileges, will make them feel more motivated and assured. UPS must keep all information in strictest confidence and automate the system so that they don't face hassles in getting refunds or deposits.

While Bangladesh lacks low-risk investment options, many financial instruments, industries, and projects are showing great potential. A recent HSBC report shows that Bangladeshi stocks have potential like those in India, China, Finland, and Vietnam. According to the report, revenue could grow by 25% over the next three years. Pension funds should be channeled into profitable projects and financial instruments that will make the pension scheme a sustainable enterprise, and anything else will not bring benefits.

5.2.3 Experimental Results and Discussion

We verify almost all the information using real data in our resource and compare the data with that of many countries graphically to make it easy for everyone to understand. There are many indicators discussed in this resource, some of which are in favour and some are against. Our forecasting methods have shown significant performance, which is a form of success for our resources. Our models produce minimal errors, and with good training, a very powerful model is created, which makes data forecasting more credible and realistic. The learning rate of our model is good, and the certainty of future predictions is very high. The results of our three models are very relevant to our dataset, as we trained our model accordingly.

We did a study on older people, and the amount increased significantly with age. Therefore, the government has introduced a universal pension system to provide a sustainable lifestyle to this large number of people. But the focus of our research was on our position in implementing this UPS. But we looked at our economic indicators and realized that if there is a combination of inflation and interest rates, then the common man will benefit fairly from the implementation of UPS. Then the country has to bring control over the unemployment rate, corruption, purchasing power of people, and many more. All these have been extensively discussed in the above sections. UPA will have to do most of the work as they will be in charge of everything. They have to regularly disclose all accounting information, including data controls. UPS money must be invested in the right places, and it must be a profitable enterprise. If UPS is managed in this way, it will become a place of trust for the people of the country, so that everyone after the age of 60 can live a dignified life with financial security.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Conclusions

The biggest obstacles to UPS implementation are unemployment, inflation, affordability, and a lack of proper management. Almost all of the economic indicators we have discussed at length are similar to the unique developed country indicators. Therefore, it is important for the government to implement UPS as planned without thinking about these indicators. We have done our research in two categories, one of which is to get an idea of future GDP using forecasting methods, and the other is to compare economic indicators with some countries. We have discussed almost everything in our study in proper detail, which can help the government, the people of the country, and the economy of the country to some extent.

6.2 Implication for further study

We have worked with a dataset that will be of great use to any economic resource in the country. Because it is the real dataset of our country and it reveals our past and present situation, some future ideas can be obtained. But in the future, we can work on some economic frameworks that are being emulated in different decades of pension systems. Again, we have the data of many countries, with the help of which it is possible to go deeper into the resources. If we come to the model then we have to say that, the forecasting methods we've used generally work well on date-time, but if these methods worked on a yearly and quarterly basis, we would get a better idea of the future of these economic data. The models we usually use for forecasting are not perfect models or economic indicators because economic bias and economic weather cannot capture these tasks very well, so we should only make specific models for economic forecasting. Many of our other economic and geographical indicators have not yet been worked on, so their implementation is a huge task. Then many upgrades can be made to the data presentation as well. All in all, there is a lot of work left in the future that is almost too difficult to cover in a few research papers. But we have to limit the progress of this research paper here. I hope to come up with a new research paper soon for further discussion.

REFERENCE

- [1] “সমাজসেবা অধিদফতর,” *Dss.gov.bd*. <https://dss.gov.bd/site/page/7314930b-3f4b-4f90-9605-886c36ff423a/> (accessed Jan. 23, 2024).
- [2] রিপোর্টস্টার অনলাইন, “অনুপযুক্তরা বছরে ১৫০০ কোটি টাকা বিধবা ও বয়স্ক ভাতা নিচ্ছে: সিপিডি,” *The Daily Star Bangla*, Apr. 30, 2023. <https://bangla.thedailystar.net/news/bangladesh/news-474396> (accessed Jan. 23, 2024).
- [3] “Universal Pension: Deposit Tk50 lakh over 42 years, get up to Tk6cr back,” *The Business Standard*, Aug. 09, 2023. <https://www.tbsnews.net/bangladesh/universal-pension-deposit-tk50-lakh-over-42-years-get-tk6cr-back-679902> (accessed Jan. 23, 2024).
- [4] M. Rahman, T. I. Khan, and M. A. Sabbih, “An Estimation of the Implementation Costs and Financing Options for Introducing a Universal Pension Scheme in Bangladesh,” *South Asia Economic Journal*, vol. 22, no. 1, pp. 110–131, Mar. 2021, doi: <https://doi.org/10.1177/13915614211008102>.
- [5] “LINKING PROTECTION AND PROMOTION IN POOR HOUSEHOLDS: SOCIAL PENSION SCHEME AND POVERTY REDUCTION IN URBAN BANGLADESH Do cash-based social assistance measures promote more investments towards poverty exit?” Accessed: Jan. 23, 2024. [Online]. Available: https://pure.manchester.ac.uk/ws/portalfiles/portal/54558246/FULL_TEXT.PDF
- [6] A. Sanyal, “charansingh@iimb.ernet.in Year of Publication,” 2013. Accessed: Jan. 23, 2024. [Online]. Available: https://repository.iimb.ac.in/bitstream/123456789/7910/1/WP_IIMB_420.pdf
- [7] L. Willmore, “Universal Pensions for Developing Countries,” *World Development*, vol. 35, no. 1, pp. 24–51, Jan. 2007, doi: <https://doi.org/10.1016/j.worlddev.2006.09.008>.
- [8] M. Joust and P. Rattenhuber, “A role for universal pension? Simulating universal pensions in Ecuador, Ghana, Tanzania, and South Africa,” *www.econstor.eu*, 2018. <https://www.econstor.eu/handle/10419/190072> (accessed Jan. 23, 2024).
- [9] ralph, “Bangladesh: Poverty,” *www.adb.org*, May 12, 2022. <https://www.adb.org/where-we-work/bangladesh/poverty> (accessed Jan. 23, 2024).
- [10] “Population ageing,” *Wikipedia*, Jan. 21, 2024. https://en.wikipedia.org/wiki/Population_ageing#:~:text=Population%20ageing%20is%20a%20shift (accessed Jan. 23, 2024).

- [11] P. Alvarez, "Charted: The World's Aging Population from 1950 to 2100," *Visual Capitalist*, May 29, 2023. <https://www.visualcapitalist.com/cp/charted-the-worlds-aging-population-1950-to-2100> (accessed Jan. 23, 2024).
- [12] "In terms of purchasing power parity, Bangladesh still has a long way to go," *The Business Standard*, Apr. 08, 2022. <https://www.tbsnews.net/features/panorama/terms-purchasing-power-parity-bangladesh-still-has-long-way-go-399502> (accessed Jan. 23, 2024).
- [13] S. A. Uzzaman, "Bangladesh's Universal Pension Scheme : What We Know So Far," *The Confluence*, Aug. 20, 2023. <https://theconfluence.blog/bangladesh-universal-pension-scheme> (accessed Jan. 23, 2024).
- [14] S. Siami-Namini, N. Tavakoli, and A. Siami Namin, "A Comparison of ARIMA and LSTM in Forecasting Time Series," *2018 17th IEEE International Conference on Machine Learning and Applications (ICMLA)*, Dec. 2018, doi: <https://doi.org/10.1109/icmla.2018.00227>.
- [15] H. Sangrody, N. Zhou, S. Tutun, B. Khorramdel, M. Motaleb, and M. Sarailoo, "Long term forecasting using machine learning methods," *IEEE Xplore*, Feb. 01, 2018. <https://ieeexplore.ieee.org/abstract/document/8334980/> (accessed Jan. 23, 2024).
- [16] W.-X. Fang, P.-C. Lan, W.-R. Lin, H.-C. Chang, H.-Y. Chang, and Y.-H. Wang, "Combine Facebook Prophet and LSTM with BPNN Forecasting financial markets: the Morgan Taiwan Index," *2019 International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS)*, Dec. 2019, doi: <https://doi.org/10.1109/ispacs48206.2019.8986377>.
- [17] "How to Choose the Best Model for Time Series Forecasting: ARIMA, Prophet, or mSSa," www.ikigailabs.io. <https://www.ikigailabs.io/blog/how-to-choose-the-best-model-for-time-series-forecasting-arima-prophet-or-mssa> (accessed Jan. 23, 2024).
- [18] "10 Incredibly Useful Time Series Forecasting Algorithms," *Advancing Analytics*. <https://www.advancinganalytics.co.uk/blog/2021/06/22/10-incredibly-useful-time-series-forecasting-algorithms> (accessed Jan. 23, 2024).
- [19] D. Andrés, "Error Metrics for Time Series Forecasting - ML Pills," Jun. 22, 2023. <https://mlpills.dev/time-series/error-metrics-for-time-series-forecasting/> (accessed Jan. 23, 2024).
- [20] S. Glen, "RMSE: Root Mean Square Error," *Statistics How To*, 2022. <https://www.statisticshowto.com/probability-and-statistics/regression-analysis/rmse-root-mean-square-error/> (accessed Jan. 23, 2024).

[21] Facebook, “Prophet,” *Prophet*, 2019. <https://facebook.github.io/prophet/> (accessed Jan. 23, 2024).

[22] “Prophet: forecasting at scale - Meta Research,” *Meta Research*. <https://research.facebook.com/blog/2017/2/prophet-forecasting-at-scale/> (accessed Jan. 23, 2024).

Forecasting and Comparison of Economic Indicators for The Universal Pension Scheme in Bangladesh

ORIGINALITY REPORT

17%	16%	2%	10%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	dspace.daffodilvarsity.edu.bd:8080 Internet Source	5%
2	Submitted to Daffodil International University Student Paper	3%
3	theconfluence.blog Internet Source	1%
4	origin.geeksforgeeks.org Internet Source	1%
5	subashpalvel.medium.com Internet Source	1%
6	Submitted to Liverpool John Moores University Student Paper	1%
7	qcostarica.com Internet Source	1%
8	www.tbsnews.net Internet Source	<1%

aichatgpt.co.za