An Analytical Approaches and Techniques for Price Prediction

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Abstract: ---- Agriculture is the prominent occupation of India. Agriculture in combination with Information and Communication Technology has greatly advanced in the field of predictive analytics for price prediction. ICT allows varieties of techniques and tools to be used for prediction of prices and its analysis. Predictive Analytics helps everyone to know the future of crops for a better production and may help to overcome the difficulties. It also helps the farmers to get the right price for their crops. Price Prediction is one of the problems that have to be sorted out based on the historical data. This paper makes an attempt to survey the different techniques that are available for agricultural price prediction.

Keywords: Price prediction, Predictive analytics, Statistical method

I. INTRODUCTION

There is a rise and fall in the prices of the agricultural commodities in recent days due to various changes that are occurring in the atmosphere. The changes may be in the climatic conditions like temperature, humidity, rainfall, soil fertility and many other factors that affect the growth of crops [1]. The price prediction for agricultural commodities can help the farmers, government and industries that help in agriculture. The government of India provides various varieties of data for agricultural commodities on daily basis, year-wise, state-wise etc. Price prediction is done using certain approaches like econometric, time-series analysis. There is a need for predictive analytics in the current scenario to overcome the occurring loss in future. Predictive analytics makes use of certain qualitative and quantitative methodologies to make proper prediction. Prediction is a precise term for forecasting which makes an estimation of the variable that is being used. The general approaches for forecasting the prices are: survey methods and statistical methods. The survey method include types like: expert opinion poll, market experiment method, Delphi method and the statistical method make price prediction based on past data and cross-sectional data. There is also different type of data that is available like: time-series data. The time series data varies with respect to time whereas cross-sectional data varies with respect to space and it is defined by performing surveys with people, region-wise and population. Price prediction of agricultural commodity can help the farmers as well as the government to make effective and efficient decisions for purchasing [2]. The increased volatility in agricultural commodity prices may increase the difficulty of forecasting accurately making the simple methods less reliable and even the more complex forecast methods may not be robust in this new market environment.

II. SURVEY OF METHODOLOGIES

Agricultural data usually falls under the category of time-series data since the data being collected is dependent on time. Let's have a look at the general ways for forecasting the prices:

1.   Survey method.
2.   Statistical method

2.1 Survey Methods: Survey method is a common approach that is used for forecasting. It is done on the basis of surveys conducted by the organizations to know the current customer interests for a particular product of their company and then predict the future of that product and provide services.

In a similar way, this approach can also be used to know the crop prices in the market. This method has its own subtypes for predicting the values. The types are as follows:

1.   Experts opinion
2.   Market experiment
3.   Delphi

2.1.1 Experts Opinion: This is one of the simplest methods practiced but not that reliable. In this, the experts who understand the market well are called and requested to give opinion about the price prediction of the agricultural commodity.

2.1.2 Market Experiment: This approach involves collecting necessary information regarding the current and future market price of the product to be sold. The market for a particular agricultural commodity is identified in this method for the better price.

2.1.3 Delphi Method: It is a group decision making technique. Until a final decision is derived from the discussion on the prices of the commodities from a group of experts, questions are asked to the individuals [8]. In this method, the members of the panel receive a list of questions and experts who are participating in it must provide feedback at every stage and are allowed to refine their responses before they proceed to the next round.

2.2 Statistical Methods:
Statistical methods are used to make accurate, long-term forecasting of prices. Statistical methods use certain complex strategies and approaches to predict the prices of various agricultural commodities. There are different types of approaches to utilize the statistical methods, one is based on the historical data means collecting the past data like spreadsheets and reports to perform analysis on it [10]. Another is based on the cross-sectional data, data collected from various market surveys and interviewing individuals who are experts in the field. The varied approaches for the statistical methods are as follows:
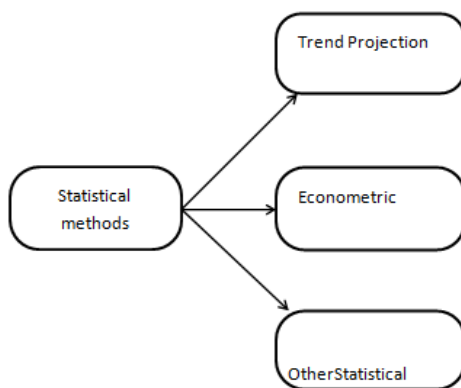

Fig 1.1: Types of statistical methods for price prediction

1. Trend Projection
2. Econometric
3. Other statistical methods

2.2.1 Trend Projection:
This method is also known as least square method. It is one of the oldest method used for forecasting of prices and demands in sales. This method uses time-series data which are collected year-wise or monthly etc. for prediction [3]. The trend projection method focuses on projecting the trend that is followed for the price of each commodity. The categories for projecting the trends are as follows:
1. Linear Trend
2. Exponential Trend

Linear Trend:
One of the simplest techniques that uses time-series data as an input for interpreting the data. This method shows how well the prediction can be done linearly.

Exponential Trend:
This technique shows how the predicted value's trend might grow exponentially.

2.2.2 Econometric
This method involves predicting of price using certain statistical techniques or tools with the techniques and theories. It is one of the most reliable statistical methods that is used for prediction [6]. It uses the statistical techniques for forecasting. The subtypes of econometric method are:

1. Regression
2. Classification
3. Simultaneous Equations

Regression model:
Regression model defines two variables: dependent and independent variables. Regression technique defines a relation between the various dependent and independent variables for an application in the form of an equation [4]. It helps to find the causal relationship between the predictor variables. The types of regression models depend on the number of variables being used. The types are as follows:

1. Multivariate/ Multiple
2. Polynomial

Multiple Regressions: This type of regression has more than one independent variables based on which the dependent variable is predicted [5].If an application has multiple inputs which are interdependent of each other then, this method can be applied.

Polynomial Regression: The equation for polynomial regression is:

$$Y = a + b * X^n$$

The above equation utilizes the least squares method for computation and inferring inferences for the predictor variable.

Classification:

Classification is one of the mostly used approaches for prediction. These techniques are usually the machine learning techniques which aim at training the machine first i.e. the machines learn themselves with the input dataset given which is called the training dataset, later to know whether the price is precisely forecasted a testing data is provided to examine the accuracy of prediction [9]. Artificial Neural Networks is one such technique that is used widely. Recent advances show that Support Vector Machines provide the results in a more correct and detailed way for further analysis of the outcomes.

Simultaneous Equations

This method consists of two variables i.e. endogenous and exogenous variables. Endogenous variables are controlled inputs and are determined while building the model. Exogenous variables are determined outside the model that will be developed [7]. Both the variables are used for forecasting the price of the commodity.

III. PROPOSED WORK AND RESULTS

The paper uses regression technique to predict the price for the various agricultural commodities. The datasets are collected from the Indian government site. The site provides diversified sets of data for diverse applications. The data is acquired from the website data.gov.in which supplies information about the crops depending on the commodity-wise, daily-wise data. The data contains details such as market name, variety, name of the commodity, date of arrival, minimum price, maximum price, modal price, unit of arrival (tonnes/ quintals).

The proposed technique uses the csv files of commodities as an input for reading. The applied method utilizes the price parameters of the input file and calculates the next price that has to be predicted. The graph for the commodity and the price that is considered for making the plot is figured out and the graph gets plotted accordingly using the plotting functions and its libraries. The graph provides the predicted price of the agricultural commodity. The dots in the graph represent the proper predicted values for future for each commodity. The Y-axis represents the Minimum Price/ Maximum Price and the X-axis depicts commodity.
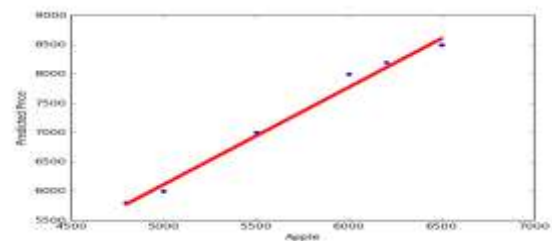

Fig 3.1: Graph for the predicted price of the commodity Apple

The predicted price of the commodity is displayed in the console of the Python IDE that is being used. The datasets collected is a yearly data so the price predicted is for a year.

Fig 3.2: The predicted price being displayed on the IDE for the commodity Apple

The daily price of the commodity can also be predicted utilizing different algorithm on the datasets to be applied.

IV. CONCLUSION

The paper utilizes the technique efficiently to predict the agricultural price. Many other approaches are available which can be applied and the price can be forecasted appropriately. The data collected here was commodity-wise and hence the forecasted price is for a year. We can also collect the data daily-wise, weekly-wise and

monthly-wise for a detailed analysis of the commodity. The collected is a static data that is used to generate the plots and the graphs. The future work would be considering the data that is dynamic and producing the future outcome on the fly for a better market availability for the farmer.

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