

PREDICTION OF MATERIAL PRICE USING PREDICTION TOOLS- A COMPARISON

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Abstract :The rate of some kinds of construction material can change every stages of time. the capability of a building contractor to exactly forecast upcoming construction material prices is critical to the achievements of his/her company. A building contractor with capacity to accurately predict future material prices can have a thoughtful benefit over their opponents when it comes to competing for future projects. Facts of upcoming material prices can give a contractor the assurance to be more abundant with their cost estimates. On the other hand, the competition will carry on being conventional with their estimates to account for the detail that they do not have a good knowledge what material prices will do in the future. Various ideal predicting tools are used to help the contractor to predict the material prices in construction projects. This paper discusses the function of Artificial neural network and Trend analysis prediction tools in the construction field for the prediction of construction material price. To achieve the main objective of this research artificial neural network and trend analysis involves the use of historic data to predict the future outcomes and the associated risks. Prices of aluminium were collected for the period from 2000 to 2015. In order to show the effectiveness of this approach, the result of this study compared using artificial neural network and trend analysis and proved that the artificial neural network is best predicting tool.

Keywords -Construction materials, Material prices, Prediction price, Artificial neural network, Construction cost.

1. INTRODUCTION

The construction industry is the second mainbusiness of the country after agriculture. It makes a significant contribution to the national economy and provides employment to large number of people. The usage of several new technologies and deployment of project management policies has made it possible to accept projects of mega scale. In its path of advancement, the industry has to overcome a number of challenges. However, the industry is still dared with some major challenges, including housing, disaster resistant construction, water management and mass transportation. There are numerous challenges facing today's construction manager. Some are new to the industry, and some are centuries old. Various of these challenges are a straight result of construction operations, while others a result of indirect, peripheral activities. Construction projects represent a unique set of activities that must take place to produce a unique product. The achievement of a project is refereed by meeting the criteria of cost, time, safety, resource allocation, and quality as determined by the landlord. Cost Estimation from Client's viewpoint is necessary to know the expected project cost for division of the budget and the

viability of any project. On the other hand, the Contractor's accepts the cost estimate training basically for the tendering purpose in order to get the project with good profit margin. Usually, the Client provides the bill of quantities for tendering purpose, which has been prepared by the Project Consultant. However, on receipt of the tender whole documents, it is the Contractor's Estimator's responsibility to cross check all quantities with contract drawings and specification. It is very common practice that Contractor's Estimator always finds ambiguity in the BOQ (Brook, 2008).

The issue of the cost of construction work is one that is rarely far from the minds of construction clients, design teams, constructors and, of course, quantity surveyors. The cost of constructing a building project is a primary concern for the vast majority of construction clients. Indeed, one of the most common initial questions a client has is "what is it going to cost me?" often followed closely by "can we do it any cheaper?" Providing answers to such questions is a key objective of quantity surveyors, whose task it is to predict the likely cost of building work and to manage the evolving project design to ensure that the client's approved budget is not exceeded. This is a

challenging task, which frequently involves one-off, unique, purpose made buildings, and the QS typically operates within a design team brought together specifically for that particular project

Since construction material price is very important in estimating the budget of a construction project. It is very complex to estimating a budget for a upcoming project in an accurate manner because the fluctuations will be raised in the material price. Sometimes the changes in the construction material price may leads to profit to the contractor or leads loss to the contractor. Changes in the price of construction material price may have a great impact on construction project cost by over run the price of construction materials is not stable /same all the time it changes in very short periods of time. Due to this the contractor could not able to predict the future construction prices and construction project cost due to this there will be obligation occurs between the owners and the contractors.in order to avoid that there is a need of a system that is capable to predict the size and of change in materials prices at on acceptable accuracy. And it is needed to predict the material prices changes during the execution of the project and also for preparing the tenders. And it also enables the serious competition among the various contractors. These unforeseen price changes affect projects execution rates and even impacts the ability to finish the projects. As a result of the quick and enormous changes that occur all over the world in construction materials prices, the construction market in India is affected. The increases in building materials prices have become huge and rapid to an extent that a contractor who provides a fair offer becomes unable to meet the technical requirements and specifications of the different construction items.

Forecasting of material price is an important function for effectively managing projects in terms of more accurately estimating, tracking and controlling projects. There are many tools that can be help the construction contractors by its ability to accurately predict the future price of the materials. Some of the methods normally used for prediction of materials prices are Artificial Neural Network, Fuzzy Logic, and Statistical Method (includes Regression Analysis, MONTE CARLO method, ANOVA), Trend Analysis. The analysis

introduced here in is limited to the prices of some materials in the period from 2000 to 2015. These selected time periods can be divided into stable economic period from 2000 to 2010 and growth economic period from 2011 to 2015. The analysis was differentiated by the status of the economy. The following sections discuss international prediction material prices, forecasting with various prediction tools, data collections and analyses, validation of results and finally conclusion and recommendations.

2. METHODOLOGY

This research proposes a methodology for identification of most sensitive problem in construction field in India is changes in the materials prices. Fluctuation in the materials price cause serious impact on the success of a construction project. To avoid these problems, the factors which are affecting the prices of materials are identified with an attempt to predict the amount of future changes in the materials prices. Various prediction tools are identified to predict the materials prices of the construction. The various tools identified are artificial neural network, SPSS and Trend analysis. These techniques are used to make the prediction in an effort to end up with a reasonable estimate of future projects cost. To achieve the main objective of this research historical data are obtained from India market to build and test the proposed methodology. After the analysis all the tools are compared with the result of artificial neural network. After the comparison it will be proved that Artificial Neural Network model is best among all the software's.

3. PREDICTION SOFTWARES

3.1 ARTIFICIAL NEURAL NETWORK

Artificial Neural Network is a predicting tool that has the ability to predict the future price of materials accurately. Artificial Neural Network is a nonlinear model that is easy to use and understand when compared with statistical methods. It is non-parametric model while statistical methods are parametric model that need higher background of statistic. ANN with Back propagation learning algorithm is widely used in forecasting problems. Even though Back Propagation convergence is slow but it is guaranteed with better accuracy. But, Artificial

Neural Network cannot interpret relationship between input and output and cannot deal with uncertainties.

Artificial neural networks (ANNs) are systems that can learn. A neural system can be trained on a set of input and output data belonging to a particular problem. If new data of the same problem, but not in the training set, are presented to the system, the ANN can use the learned data to predict outcomes without any specific programming relating to the category of events involved. The fields of application of ANNs have increased dramatically in the past few years. A large variety of possible ANN applications now exist for non-computer specialists. Therefore, with only a very modest knowledge of the theory behind ANNs, it is possible to tackle complicated problems in a researcher's own area of specialty with the ANN technique

3.2 TREND ANALYSIS

Trend Analysis is a mathematical technique that uses historical records of results and data to predict future outcome. The predicted outcome is achieved by tracking variances in cost and schedule performance. Applications for trend analysis seem almost limitless as there is availability of data is large in virtually every field and the ability of computer to process it. This method can be replicated, checked, updated and refined when necessary. A trend analysis is an aspect of technical analysis that tries to predict the future movement of a stock based on past data. Trend analysis is based on the idea that what has happened in the past gives traders an idea of what will happen in the future.

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4. DATA COLLECTION

All the prices of aluminium materials were obtained from the cement manufacturing industry and India statistics. Data was obtained from 2000 to 2015 of every individual month. Nowadays aluminium materials are heavily used in the construction industry and their cost greatly affects the construction sector, which in both affects and is affected by the economy in terms of its indicators such as Gross Domestic Product (GDP). Furthermore, experiences in developed countries have shown that construction investments and activities increase with the state of economic development of the country (Ali 2005). To assess the effect of economic activity or status on prices, the Gross Domestic Product (GDP) in India was considered. GDP is the market value of all final goods and services produced within a country in a given period of time (Edgmand *et al.* 2001). Real GDP shoes how the economy's overall production of goods and services changes over time, which is taking into consideration inflation (Colander C. 2006). Bade and Parkin (2007) explained that real GDP has been considered as the primary measurement of growth.

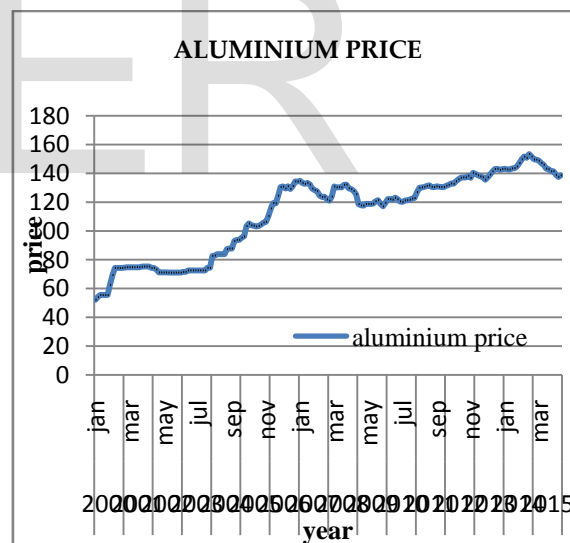


Fig 1 Average Annual Price of Aluminium in India

5. DATA ANALYSIS

The data's of aluminium price and the identified influencing factors was collected from the period of 2000 to 2015. From the collected data the coefficient of correlation is estimated between the cement prices and identified influencing factors. The Linear relation can be measured by these coefficients.

The coefficient of correlation between the aluminium price and electricity price ($R^2 = 0.93$)
 The coefficient of correlation between the aluminium price and production ($R^2 = 0.90$)
 The coefficient of correlation between the aluminium price and consumption aluminium ($R^2 = 0.89$)
 The coefficient of correlation between the aluminium price and electricity demand ($R^2 = 0.82$)
 The coefficient of correlation between the aluminium price and excise duty ($R^2 = 0.82$)

5.1 ARTIFICIAL NEURAL NETWORK ANALYSIS

The input variables can take for this forecasting function as diesel price, production, aluminium consumption, electricity demand, excise duty as followed by the years of 2000 to 2015 is proposed. Training data was chosen 80% and testing sizes 20% and it can be made further activation functions and changing the input neuron weights. The prescribed data which that can be normalized identified value and it is done with the range of 0 to 1 and it to be de-normalized into forecasted result. Before the selected input variable, the value should be output aluminium price will be coincide into different selected input variables and minimum value of correlation coefficient phenomena is taken as better input for the model from selected.

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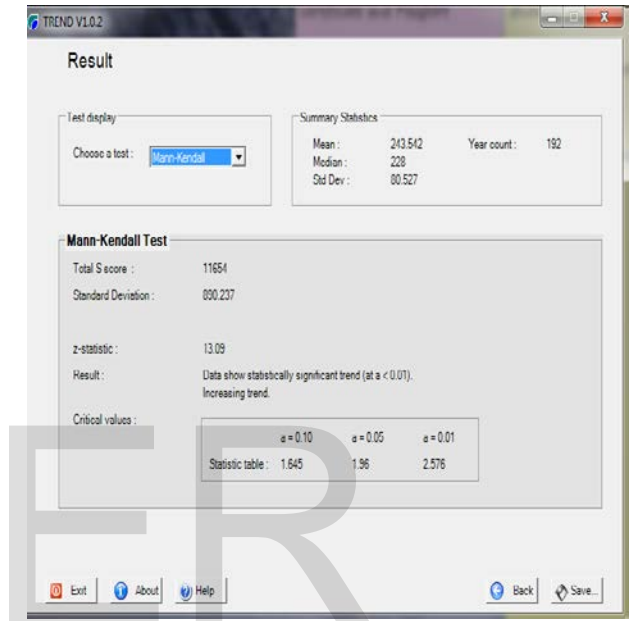


Fig 3 Aluminium Data Analysis using Trend Analysis

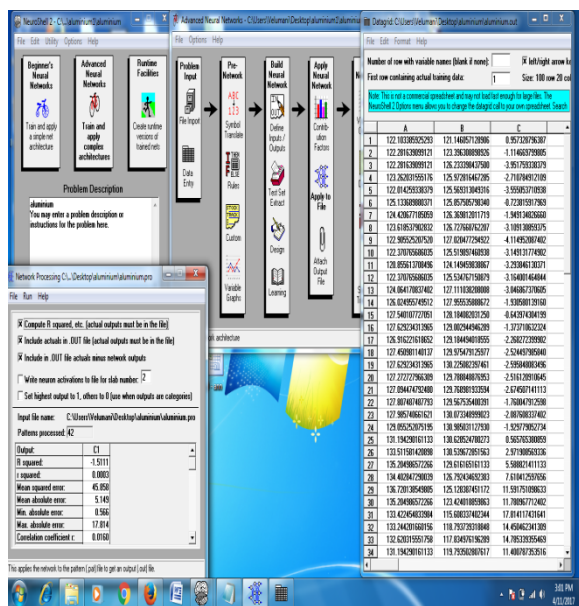


Fig 2 Aluminium Data Analysis using ANN

5.2 TREND ANALYSIS

6. VALIDATION AND RESULT COMPARISON

Validation is the process of determining the degree to which a model or simulation is an accurate representation of the real world from the perspective of the intended uses of the model or simulation. To validate the results of this research, a comparison between the two methods results. The analysis of aluminium price prediction using artificial neural network and trend analysis were done. From the analysis the average against of actual value were got. The result of artificial neural network and trend analysis with least MAPE are given in the below table

Table 1 Predicted value (MAPE) – Average against of Actual Value

Trend	Analysis	ANN
(Increase/Positive trend)		
6.3		2.6

7. CONCLUSION

The accurate estimation of construction material prices is an essential practice, especially in developing countries where high price fluctuations can negatively affect projects success and even viability. Factors affecting aluminium prices have been related in previous literatures to cost of raw materials, cost of production, electricity price, diesel price, consumption of aluminium price and other various factors. All the data were well trained and applied as inputs. From the result of aluminium price prediction artificial neural network gives minimum error than the trend analysis. Artificial neural network is a best prediction tool than all the prediction tools. It is easy to learn and use the software and it gives better prediction.

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