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FORECASTING THE INTERNATIONAL TRADE AND THE SHIP ARRIVAL RATE FOR YANGON PORT

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ABSTRACT

This paper deal with the forecasting of ship arrival rate to Yangon port and its relating international trade capacity based on existing data using Linear Regression Method. In this regard, annual vessel calls to Yangon port and annual import and export trade of Myanmar via Yangon port are applied in the calculations. Through linear regression analysis, long term forecasting data of 2011 to 2030 is presented. The statistics trucked in this respect are overall vessel calls, import and export data of Myanmar Port Authority from 2001 to 2010. The results indicate that there will be a greater demand of port throughput and vessel calls to Yangon port in coming years and in 2030 it would amount to approximately two times of existing vessel calls and relating import and export demand would also increase over 1.5 times. According to calculating results and existing conditions of Yangon port and river access channel, port facilities developments and navigation channel improvements are the needs to be carried out to accommodate larger number of vessels with greater dimension also.

KEYWORDS: Linear Regression, Yangon Port, International Trade, Vessel Calls, Navigation Channel

INTRODUCTION

Myanmar, located in Southeast Asia, bordering with China, India, Bangladesh, Thailand and Laos, has the opportunities to serve as a crucial trading hub for the region. The country with a population of more than 55 million people is ripe for investment and exponential economic growth in coming decades. Myanmar is a country rich in natural resources such as precious gems, priceless jade, natural gas, petroleum, copper, nickel, zinc, tin, gold, silver and a lot of other raw materials. Myanmar also rich in terms of agricultural and fishery resources and has a volume of annual exports from those two sectors. In these days, Myanmar has become a vital component in the East-West Economic Corridor, ASEAN's economic development,

and the provision of regional commerce link between China, India and Southeast Asia countries.

Yangon, former capital of Myanmar up to 2005, continues to be a country's commercial and logistic hub for international trade. Most of the industrial production facilities in Myanmar are located in Yangon and almost the entire international overseas container and cargo trade are facilitated by ports and harbors in the Yangon River and its access channel.

Wharves are mainly built up and located at two spots namely Thilawar Terminal Wharves (container, grain, LPG) and Upstream Monkey Point (container, general cargo).Yangon River Estuary is of a wide shallow waterway with 40 km long and 5 km wide gradually narrowing to the wide of 2.8 km. The main navigation channel crosses through the estuary and is restricted at two bottlenecks, Inner Bar near Yangon area (approximated minimum depth of 3.8 m) and Outer Bar off the mouth of the estuary (approximated minimum depth of 3.6 m). Currently all vessels access the Yangon River channel are not more than 20,000 DWT due to the channel condition and no more than 15,000 DWT due to the wharf capacities, and the water depth of 10 m.

Yangon River has a history of more than 200 years as a commercial maritime route since Konbaung Dynasty(1752 - 1885) for handling import and export or raw and manufactured commodities. The river goes geographically through Myanmar inland to outer sea and is the only main channel to access to the Yangon Port area and become an important access channel for international trade. Almost 90% of annual import and export trade transport has been transported through this channel. Therefore to improve the access channel of Yangon River to accommodate future larger shipping vessels so as to develop Myanmar trade and economy is an urgent need to accomplish.

In this respect, the motivation behind this study is to analyze the trade and port of call growth pattern of Yangon river and port system and then to apply these analysis results in future step by step implementations of Yangon river, port and access channel improvement appropriately so as to allocate country's rare resources to the best.

1.0 Literature Review

In statistics, linear regression is an approach to modeling the relationship between a scalar dependent variable denoted Y and one or more explanatory variables denoted X. The case of one explanatory variable is called simple regression. More than one explanatory variable is multiple regressions. In linear regression, data is modeled using linear predictor functions, and unknown model parameters are estimated from the data. Such models are called linear models. Most commonly, linear regression refers to a model in which the conditional mean of Y given the value of X is an affine function of X. Like all forms of regression analysis, linear regression focuses on the conditional probability distribution of Y givenX, rather than on the joint probability distribution of Y and X, which is the domain of multivariate analysis.

Linear regression was the first type of regression analysis to be studied rigorously, and to be used extensively in practical applications. This is because models which depend linearly on their unknown parameters are easier to fit than models which are non-linearly related to their parameters and because the statistical properties of the resulting estimators are easier to determine.

Linear regression has many practical uses. Most applications of linear regression fall into one of the following two broad categories:

- If the goal is prediction, or forecasting, linear regression can be used to fit a predictive model to an observed data set of y and X values. After developing such a model, if an additional value of X is then given without its accompanying value of Y, the fitted model can be used to make a prediction of the value of Y.
- Given a variable Y and a number of variables X_1,... X_p that may be related to Y, linear regression analysis can be applied to quantify the strength of the relationship between Y and the X_j, to assess which X_j may have no relationship with Y at all, and to identify which subsets of the X_j contain redundant information about Y.

This study falls into the first category according to the available data structure. With the merit of Myanmar Port Authority, the following data of annual import, export and number of vessel calls to Yangon port from 2001 to 2010 is available to make linear

regression analysis and forecasting of trade and vessel growth for Yangon River channel.

Table – 1 Current amount of Annual import, export and number of vessel in Yangon port (2001 to 2011)

Fiscal Year	Number of Vessel	Import (Metric Tonnage)	Export (Metric Tonnage)	Total (Metric Tonnage)
2000-01	915	4381934	6286311	10668245
2001-02	915	4978070	5201138	10179208
2002-03	1188	4834614	6005218	10839832
2003-04	1045	4609417	5190954	9800371
2004-05	1517	4773347	5207580	9980927
2005-06	1252	4724960	5513755	10238715
2006-07	1219	5332093	5622693	10954786
2007-08	1529	5619362	6240124	11859486
2008-09	1739	6165473	6150475	12315948
2009-10	2016	6655370	9492079	16147449
2010-11	2155	6131245	12307396	18438641

Source: Myanmar Port Authority

2.0 Forecasting

Regression analysis is a method for investigating relationships among variables. Linear Regression tries to find a linear relationship between two variables. The general form of such a relationship is "y = mx + c", which is also an equation of straight line. But in linear regression, to predict a value of response variable, there are some conditions that should be met such as;

There exit a linear relationship between response and prediction variable. In other words, if we plot a scatter diagram between X &Y, there should exit a straight line or it should be a straight line.

There should be strong correlation strength between response and prediction variables.Correlation coefficient measures the strength and direction of the linear relationship between response and prediction variables. It's number between -1 and +1. The higher the absolute value of correlation coefficient, the strong the liner relationship between the variables is. Correlation coefficient of a set of X and Y values can be calculate by using the following formula;

$$Correlation\ Coefficient = \frac{\Sigma\ (Yt-Y)(Xt-X)}{\sqrt{\Sigma(Xt-Y)^2(Xt-X)^2}}$$

Actually all these works can be done in excel work sheet in easy implementation.

In this study, annual import, export and number of vessels with respect to corresponding budget year would be respective variables couples. In the following graphs, each Y axis represents metric tonnage of annual import, annual export and number of vessel calls and X axis represent respective Year.

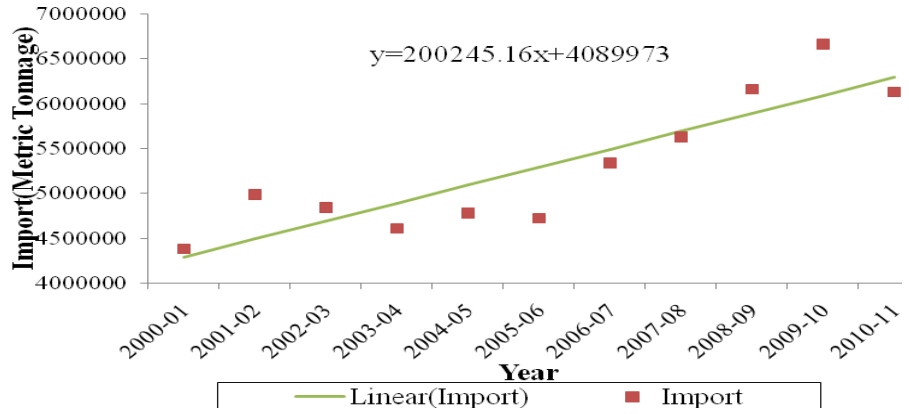

Fig 2-1 Forecasting Import Tonnage

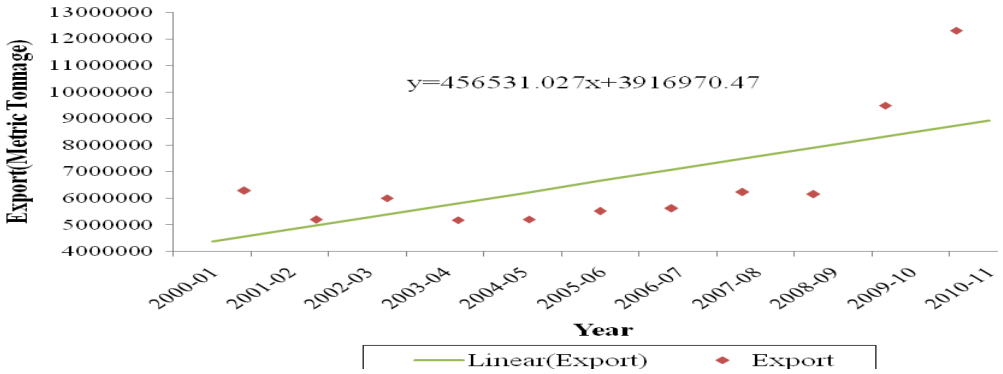

Fig 2-2 Forecasting Export Tonnage

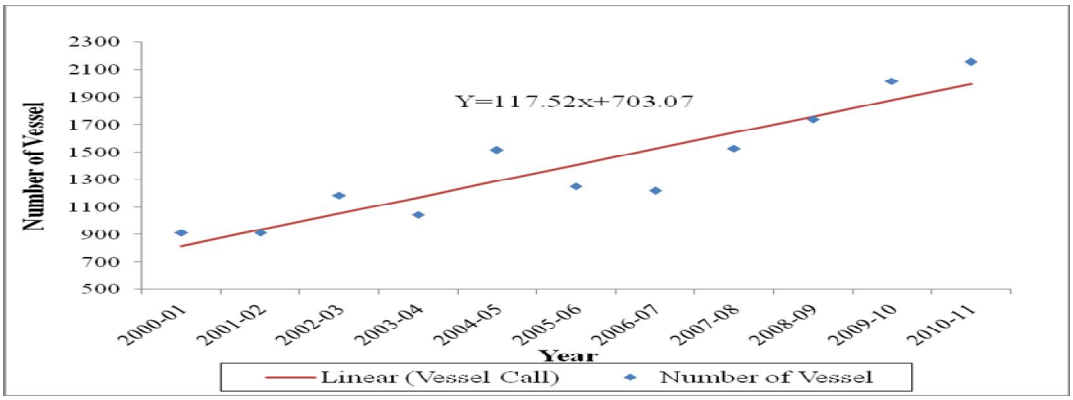

Fig 2-3 Forecasting Number of vessel

3.0 Results

Coefficient of correlation of annual import is 0.89, annual export is 0.8 and number of vessel is 0.97 respectively. All of the values of coefficient of correlation get more than 80% and therefore all these response and predicting variables have strong liner relationship and the forecasting model can be assumed reliable.

The forecasting data up to Year 2030 predicted year by year from these models are presented in Table-2.

Table – 2 Forecasting amount of annual import, export and number of vessel in Yangon Port (2011 to 2030)

Fiscal Year	Number of Vessel	Import (metric tonnage)	Export (metric tonnage)
2011-12	2113	6492915.07	9395342.8
2012-13	2231	6693160.24	9851873.83
2013-14	2348	6893405.40	10308404.85
2014-15	2466	7093650.56	10764935.88
2015-16	2583	7293895.73	11221466.91
2016-17	2701	7494140.89	11677997.94
2017-18	2818	7694386.05	12134528.96
2018-19	2936	7894631.22	12591059.99
2019-20	3053	8094876.38	13047591.02

2020-21	3171	8295121.55	13504122.05
2021-22	3288	8495366.71	13960653.07
2022-23	3406	8695611.87	14417184.10
2023-24	3524	8895857.04	14873715.13
2024-25	3641	9096102.20	15330246.15
2025-26	3759	9296347.36	15786777.18
2026-27	3876	9496592.53	16243308.21
2027-28	3994	9696837.69	16699839.24
2028-29	4111	9897082.85	17156370.26
2029-30	4229	10097328.02	17612901.29

4.0 CONCLUSION

The forecasting show number of vessel in 2030 will be 4229 and it is over two times the existing number. Import tonnage amount to over 1.5 times of existing amount and the export value also amount to over 1.8 times. According to these forecasting data, trade and port of call of the Yangon port continuously increase and further study in port facilities and access navigation channel should also be done in order to assure that whether existing wharves are capable to be in operation or not and the channel in the Yangon River can accommodate or not the future growing trade and larger number of vessels. There also has a demand of bigger vessel as global shipping vessels trend to get larger. If it is need to carry out all round improvement in Yangon River access channel and port infrastructure, these year by year forecasting data would be a contribution to allocate the country's rare resources to its optimum.

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