

A Maritime Forecasting Method for Analysing the Total Cargo Handling at Johor Port Berhad from 2013 to 2020

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Abstract

The volatility of total cargoes volume handled by Johor Port between 2008 and 2012 has reflected the profit margin of the port. Therefore, it rises an issue concerning on the sustainability of the port services in continuing the business. This situation has occurred because of a number of uncertainties factors, such as global economy condition, factory production volume, bunker fuel price, market demand volume, seaborne trade pattern and government policies. The objective of this paper is to forecast the total cargo volume handled by Johor Port from 2013 to 2020 using a maritime forecasting method. The result shows that the cargo handling trend is gradually increased from 2013 to 2017, but huge decreases in 2018 and 2019, before return back to the normal trend in 2020. This study helps Johor Port to plan their future strategy in order to sustain the business by increasing the port revenue, profitability and customer satisfaction.

Keywords:

Forecasting Method; Maritime Business; Uncertainty Assessment; Cargo Handling; Port Performance.

I. INTRODUCTION

This study uses the Maritime Forecasting method for investigating the total cargo handling at Johor Port Berhad from 2013 to 2020. The objective of this study is to forecast or predict the total cargo handling in freight weight tonnes (FWT) unit for those cargoes rate of dry bulk cargo, liquid bulk cargo, general cargo handling, and container cargo handling that handled by Johor Port. The motivation of conducting this study is because of the volatility of the total cargoes volume handled by Johor Port in the last 5 to 7 years. The issue is highlighted on how this particular port needs to sustain the services in the next 5 years till 2020. Finally, this study is expected to transfer the results to Johor Port as it can be used for planning their business strategy. The study is organised into 3 main sections which are 1) overview of Johor Port and its surrounding, 2) the description of the forecasting method used in this study, and 3) findings of the forecasting method to the study case which is on the total cargo volume handled by Johor Port for the year of 2013 till 2020.

II. JOHOR PORT OVERVIEW

Johor Port Berhad (JPB) is an element of Iskandar Malaysia which makes JPB-logistics hub or belong in the 5 Flagship Zones which includes the Senai Airport, Port of Tanjung Pelepas (PTP), Tanjung Langsat Port, Rapid Pengerang and Johor Port Berhad. Located at the southern-most tip of Peninsular Malaysia, Johor Port is strategically positioned in the heart of the sprawling 8,000 acre Pasir Gudang Industrial Estate. The area is a comprehensive range of industries specialising in petrochemicals, engineering, furniture, telecommunications, electronic goods and food products among others. This port is linked to important commercial and industrial centres in Malaysia as well as other ports and Singapore as neighbouring country. This network is supported by the nation's road infrastructure and rail connections.

JPB runs core business such as Liquid Bulk Service. Liquid Bulk Terminal provides specialised facilities to cater for edible liquid and petrochemical cargoes. The terminal also thrives on the usage of a network of pipelines

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with multiple high capacity loading arms to allow cargo to be conveyed directly to tank farms at high transfer rates. Non-Edible Liquid Terminal, Cater for fuel oil, petrochemicals, gas and other petroleum products. Supporting tank farms provide up to 517,451mt of storage capacity. Stringent safety procedures and remote fire-fighting devices provide a safe operating environment for users. Next an Edible Liquid Terminal, Handle various edible liquid cargoes such as palm oil, soybean oil, corn oil, and coconut among others. Besides, the core business of the JPB also carries Bulk & Break-bulk Services. In JPB terminal covers 2.4 km of berthing length, with a maximum draft of 13.5m. Dry bulk, cargo, facilities including the edible and non-edible cargo-cement clinkers, steel, iron ore, wood chips, PKE, cereals, etc. break-bulk cargo handled, including palletized, unitized cargo, drums, pipes, coils and project cargo, etc. It also provides facilities for cargo handling for the O & G companies, PGGT, Lafarge and Holcim.

Next, Container Services, Johor Port Container Terminal constantly improve services and increase choice for logistics and connections. It is a dedicated terminal services port's major shipping lines calling regularly. Total berth length of 760m with a draft of 13.5m and can accommodate vessels up to 104,000 dwt. A special train depot is developed with the purpose to connect JCT national railway grid and its neighbouring countries. Between shippers use this facility including Pacific International Lines, Evergreen Marine Corporation, MSC, Wan Hai Lines, MISC, and others. besides, BIC loading capacity of 1.2 million TEUs, 6 post-panamax gantry cranes, 19 yard transfer cranes, 4 reach stackers (40-tonne capacity), 5 FELs empty containers, and 50 prime mover / trailers to facilitate efficient terminal services. The container yard area is around of 250,000 square metres (sq.m). Web-based Johor Port Container Terminal System (JCTS), facilitating real-time, integrated, paperless transactions for optimal commercial and operational efficiency. The dedicated rail depot within terminal is to connect to the nationwide rail network and efficiently running of daily basis intra-port logistics by JP Logistics 11,000 sq.m. Container Freight Station (CFS) facilities adjacent to the Container Yard provide cost-effective stuffing and non-stuffing, less container load (LCL) cargo consolidation, and temporary storage of break bulk cargo.

As reported in Berita Harian, January (2012), Johor Port allocate resources between the capital expenditure of RM400 million to RM500 million for the reconstruction and modernization plan of its five-year until 2016. Through the Chief Executive, Shahrull Allam Shah Abdul Halim, the main purpose of the BIC implement reconstruction and modernization plan is to ensure Johor Port remains a dynamic entrance to the industrial area south of Pasir Gudang and Johor. According to the STAR newspaper in 23 November 2012, Johor Port Berhad plans to create an offshore supply base that stays in the port known as the Central Inspection, Maintenance and Repair Offshore Johor Port (JPOIMR) for the convenience of the players' regional oil and gas industry. Johor Port has an advantage that the port is located in a strategic position near the South China Sea exploration activities are looking at oil and gas excavation.

III. A GENERIC METHODOLOGY

i) EViews

EViews (Econometric Views) is a statistical package for Windows, used mainly for time-series oriented econometric analysis. It is developed by Quantitative Micro Software (QMS), now a part of IHS. Version 1.0 was released in March 1994, and replaced MicroTSP. EViews provides regression and forecasting tools on Windows computers. With EViews you can develop a statistical relation from your data and then use the relation to forecast future values of the data. Areas where EViews can be useful include Sales forecasting, Cost analysis and forecasting, Financial analysis, Macroeconomic forecasting, Simulation, and Scientific data analysis and evaluation.

ii) Microsoft Office Excel-Forecast

Calculates, or predicts, a future value by using existing values. The predicted value is a y-value for a given x-value. The known values are existing x-values and y-values, and the new value is predicted by using linear regression. You can use this function to predict future sales, inventory requirements, or consumer trends.

Syntax FORECAST (x,known_y's,known_x's)

X - is the data point for which you want to predict a value.

Known_y's - is the dependent array or range of data.

Known_x's - is the independent array or range of data.

Remarks

- If x is nonnumeric, FORECAST returns the error value.
- If known_y's and known_x's are empty or contain a different number of data points, FORECAST returns the error value.
- If the variance of known_x's equals zero, then FORECAST returns the error value.

The equation for FORECAST is $a + bx$, where:

$$a = \bar{y} - b\bar{x}$$

and

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

and where \bar{x} and \bar{y} are the sample means AVERAGE(known_x's) and AVERAGE(known_y's).

The data **Forecast** column had been calculated in excel using the formula as below:

=forecast(x, known_y's, known_x's)

The data for the **Lower Boundaries** (LB) column had been calculated using the formula as below:

=alpha*a+(1-alpha)*b

The data for the **Upper Boundaries** (UB) column had been calculated using the formula as below:

=B16*alpha+C16

Forecasting models has used to develop a sensitivity analysis which explores how much the forecast changes as resulted of a small change in one of the assumptions. A 'base case' forecast is first established using a reasonable set of assumptions, then small changes are made to the input assumptions and the resulting changes in the target variable are recorded (Evangelos and Nikolaos, 2008). For example, the model might be used to explore the impact of lower industrial growth or higher scrapping on projected freight rates and a table compiled showing the change in each exogenous variable and the corresponding change in the target variable. Further detailed information of this particular method can be referred to several literatures that have been written by previous researchers such as Andre (1996), Evangelos and Nikolaos (2008), and Ursula and Brandon (2014).

IV. FINDINGS

The study case is focussing on the application of the maritime forecasting method in order to predict the total cargo volume handled by Johor Port in the next 8 years which starts from 2013. Data collection process is conducted through quantitative dataset that has been obtained from Johor Port Berhad's statistical database from 2000 to 2012 (13 years). These data regard to the total amount of cargo volumes in Freight Weight Tonnes (FWT) unit of dry-bulk, container cargo, liquid bulk and general cargo.

Table 1: Statistical data of the total cargo handling in freight weight tonnes (FWT) at Johor Port Berhad from 2000 to 2012

YEAR	DRY BULK	LIQUID BULK	GENERAL CARGO	CONTAINER CARGO	TOTAL (FWT)
2000	4,511,484	8,559,802	950,849	10,513,935	24,536,070
2001	3,919,232	11,027,518	857,697	9,964,424	25,768,871
2002	3,801,257	12,452,021	1,209,245	8,462,044	25,924,568
2003	4,242,413	12,037,765	1,522,653	8,960,960	26,763,791
2004	4,038,832	13,016,157	1,813,156	9,412,276	28,280,421
2005	4,426,576	11,676,866	1,978,261	10,010,169	28,091,872
2006	4,499,528	10,160,451	2,055,686	10,178,178	26,893,843
2007	4,125,367	9,395,814	2,387,037	9,404,564	25,312,782
2008	3,990,155	11,090,307	2,096,634	10,390,247	27,567,343
2009	3,490,395	9,492,404	1,406,539	9,519,490	23,908,828
2010	3,737,275	10,796,681	1,175,731	9,901,758	25,611,445
2011	4,072,131	11,615,658	1,214,629	9,356,276	26,258,694
2012	4,551,057	10,645,026	1,172,105	9,542,256	25,910,444

Source: Johor Port Berhad's statistical database, 2013

Table 1 shows the statistical data for each category of cargo handled by Johor Port in FWT unit of includes dry-bulk, liquid bulk, general cargo and container cargo. The data of four cargoes are added according to the particular year in order to obtain the total volume of cargoes handled by Johor Port. For example, in 2000, all data of four cargoes are summed up as a lead to the total cargo volume for the year 2000 is 24,536,070 fwt.

The total cargo volume handled by Johor Port in 2004 was 28,280,421 fwt which is 15.26% or 3,744,351 fwt of increment compared to the year 2000. The reason was Johor Port Berhad has obtained the new market shares from both the London Metal Exchange and Bernas Logistics Sdn. Bhd. that leads to boost the market demand. After the favourable increment in the particular years, the total cargo handling (fwt) has gradually decreased from the years 2005 to 2007 due to the high port competition from Port of Tanjung Pelepas (PTP), Port of Singapore Authority (PSA) and Tanjung Langsat Port (TLP) after having their new technology improvement. The cargo volumes decrease of the particular year was about of 10.50% or 2,967,639 fwt. The volatility trend of the total cargo volume handled by Johor Port continues until 2012.

This phenomenon has occurred because of a number of uncertainties factors, such as 1) the instability of global economy condition (e.g, in 2009 was recession and affect to economy development of Johor Port), 2) the decrement of factory production volume (e.g, due to economic recession, the factory production in Pasir Gudang Industrial Estate was dramatically declined), 3) the high bunker fuel price (e.g, affects the speed of the vessel, that leads to the low vessel frequency entering Johor Port), 4) the lower market demand volume (e.g, due to the instable of global economy condition, the market demand volume was decreased globally in most of the business sectors) , 5) the change of seaborne trade pattern (e.g, most shipping companies was focussing to China as the hub of distribution due to the boost up of the factory industrial back to ten years ago) and 6) government policies (e.g, the government of China has opened up the door and welcomes any foreign direct investment from European Countries in order to increase the country's incomes).

Figure 1 shows the statistical data of the total cargo handling (fwt) in Johor Port Berhad and four different market stages. **Stage 1: Trough** describes in 2000. However, in the early 2000, more investment from foreign countries and big companies has been used to set up factories and development especially in the area of Johor Port. For example, industrial area Pasir Gudang, Tebrau, Ulu Tiram, Tampoi, Senai, Batu Pahat and Pontian. As a result, the development of the manufacturing industry, manufacturing and more advanced. Among which there are factories that have gained international fame such as Shimano, Sony, Philips, Panasonic, Brother, Fujitsu, Hitachi and more. This led to the demand and supply of dry bulk cargo and general cargo were increasing from year to year. In addition, advances in liquid demand, such as chemical, oil, gas and more are increased respectively because Johor is the largest contributor of Malaysian palm oil. Besides, there are a number of larger chemical companies operated in Pasir Gudang, Malaysia namely Felda Johor Bunker, Oil Depo Felda, Sime Darby, Akzo Nobel Oleochemical, Mox Gases and others. This is also contributed to the increase in total liquid bulk cargo volume handled by Johor Port.

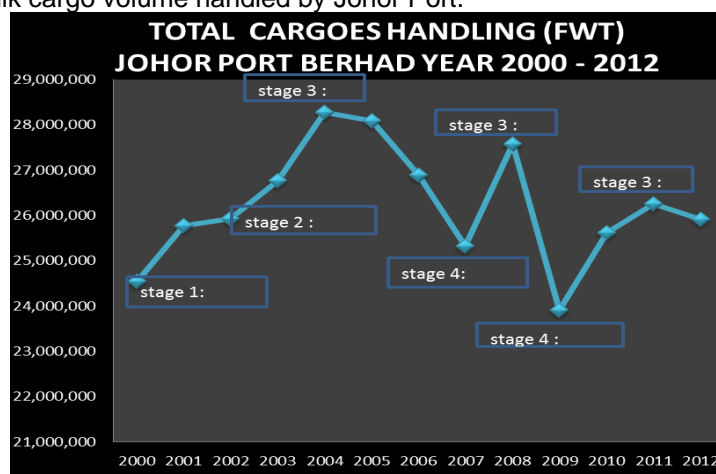


Figure 1: Total cargoes handling (fwt) at Johor Port Berhad from 2000 to 2012

The market trend has gradually increased due to the high volume of factories and product supplies as show as **Stage 2: Recovery** which was between 2000 and 2004. During this period, Johor Port enjoyed in servicing their customers and high profit margin has earned. This trend continues till the graph is reaching the maximum level of increment or **Stage 3: Peak** in 2004. This was due to Johor Port Berhad has owned the big market shares of London Metal Exchange listings and Bernas Logistics Sdn. Bhd. and these both companies became a subsidiary of Johor Port Berhad. In addition, an increase or in a place **Stage 3: Peak** from 2008, is probably due to the Malaysian ringgit fell sharply and led importers to import goods and so on. Quote from the report of the Economic Development of Malaysia in 2008 that "The Malaysian economy registered a growth of 4.6 % in 2008, despite the international financial crisis and the sharp deterioration in global economic conditions on the supply side, growth in the first six months of the year was driven by the performance of the services sector strong because the strong domestic demand, and the expansion of trade and tourism". The manufacturing

sector due to robust external demand from non-US markets and resource-based exports higher have also benefited from higher commodity prices. The agricultural sector also grew at a stronger rate due primarily to the expansion of palm oil. However, the manufacturing sector, especially export-oriented industries, weakened in the second half of the year, in line with falling global demand and a sharp correction in commodity prices. The services sector continued to support the economy in the second half of the year, although growth moderated due to the slow growth of the services sector depends on trade-related and capital markets.

In 2005 and 2007 occurred because the **Stage 4: Collapse** has occurred competition between ports in Malaysia and neighbouring countries, namely Singapore causeway to invest and increase in services. Between the ports of the growing point is Port of Tanjung Pelepas (PTP) is a port that receives investment from companies such as maritime and Evergreen Mearsk for the umpteenth time after Tan Sri Syed Mokhtar Al-Bukhary holds a stake in PTP and attract investors as Mearsk and Evergreen to build a new terminal and pier and a large opening. Besides, the other port is Tanjung Langsat Port and Port of Singapore (PSA). This is because in the range of about 2005 to 2007 was the best performance of the PSA has successfully positioned itself as the most important and busiest ports in the world with Shanghai Port as Mega Port. However, in 2009 the decline or **Stage 4: Collapse** spared from the economic market in 2008 due to a second term in 2008 a severe economic downturn and as a result in 2009 the average decline for many companies that make their export-import market restructuring. However, 2010 is the year of recovery as described in the **Stage 2: Recovery**. After that, in 2011, an increase hold or **Stage 3: Peak** due to the strengthening of the global market and Malaysia itself apart manufacturing industry includes goods, electronics, chemicals, oil, etc. is increasing. However, the total fwt has declined (**Stage 4: Collapse**) in 2012 as reflected to the recognition of Singapore Port (PSA) as the busiest port in the world. In addition, the opening of the new wharf and additional terminal in Port of Tanjung Pelepas (PTP) are also contributing to the decline in total volume of fwt handled by Johor Port.

By using the EvIEWS software tool and Microsoft Office Excel-Forecast as described in Section III, the total cargo handling freight weight tonnes (fwt) handled by Johor Port has predicted from the years 2013 until 2020. Table 2 shows the forecasting data for the total cargo handling in freight weight tonnes (fwt) at Johor Port Berhad from 2013 to 2020. Besides that, the lower and upper bounds level are also determined.

Table 2: Forecasting data for the total cargo handling in freight weight tonnes (fwt) at Johor Port Berhad from 2013 to 2020

YEAR	TOTAL CARGO (FWT)	ACTUAL	FORECAST	LOWER BOUND	UPPER BOUND
2000	24,536,070	24,536,070			
2001	25,768,871	25,768,871			
2002	25,924,568	25,924,568			
2003	26,763,791	26,763,791			
2004	28,280,421	28,280,421			
2005	28,091,872	28,091,872			
2006	26,893,843	26,893,843			
2007	25,312,782	25,312,782			
2008	27,567,343	27,567,343			
2009	23,908,828	23,908,828			
2010	25,611,445	25,611,445			
2011	26,258,694	26,258,694			
2012	25,910,444	25,910,444			
2013			26,968,401	25,910,444	31,092,533
2014			27,592,649	26,122,035.4	31,304,124
2015			26,908,391	26,416,158.12	31,640,565
2016			28,417,328	26,514,604.7	31,797,836
2017			30,820,822	26,895,149.36	32,198,070
2018			29,519,960	27,680,283.89	33,059,314
2019			28,815,615	28,048,219.11	33,584,276
2020			29,008,482	28,201,698.29	33,811,342

Figure 2 shows the time series data for 13 years of the cargo handling (fwt) at Johor Port Berhad. The forecasting data shows a significant improvement in 2013 and 2014. This is because of the strengthening of investment from foreign companies in Malaysia especially in Johor. Investment with the opening of many industries and investments as Pontian, Senai, Ulu Tiram, Tebrau, Pasir Gudang, Gelang Patah, and Kulai. This

has driven by improvement of Iskandar Malaysia project to develop the logistics industry, maritime, aviation, industrial, oil and gas as well as administration and tourism in Johor. However, in 2015 is forecast to fall as competition from ports that are also under the same watch list in Johor Port Authority (JPA), the Port of Tanjung Pelepas (PTP), in addition to restructuring the alignment of the Johor Port Authority (JPA).

The forecast data for the years 2016 to 2017 shows gradually improvement on total cargo handled as a result of the restructuring of the Johor Port Authority (JPA) with the increase in maritime own investments as Mearsk, Evergreen and forth like this has happened before in the Port of Tanjung Pelepas (PTP). In addition, upon completion, Rapid Pengerang (petrochemicals and oil and gas) leads to the improvement and advancement of Johor Port Berhad as trade interdependence for survival.

Next, the economic recession is expected to occur in the year 2018 in accordance with the long cycles of history and the world recession occurs. By forecast, the assumption decreased in 2018 and 2019, as the global economic slowdown affecting trade in the port. However, the decline is not as sharp as expected strengthening of the economy that is increasingly dependent Malaysia again. However, after that, the economy recovered in 2020 and expects the economy will start to increase and support the government efforts in 2020 that Malaysia as a developed nation (WAWASAN, 2020).

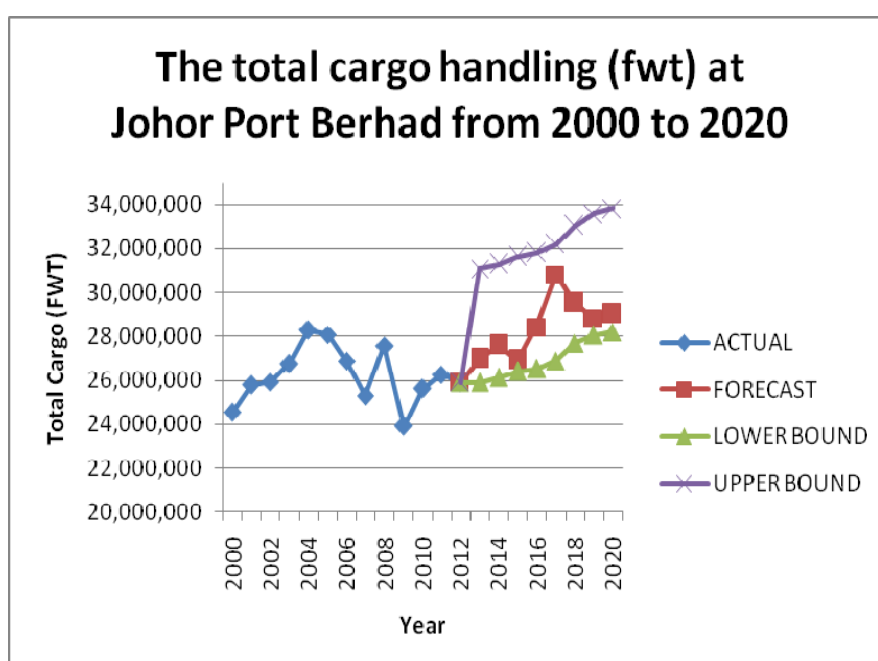


Figure 2: Total cargo handling (Fwt) at Johor Port Berhad after conducting a forecasting from 2013 to 2020

V. CONCLUSIONS

The review of the literature on efficiency measures applied in the port sector undertaken in this study has allowed us to delve into the knowledge on this industry and highlight the following considerations. While the port industry has been analysed extensively from various perspectives, the study of global efficiency and productivity is a relatively recent endeavour just starting in the 2000. These studies appear to overcome the limitations of the partial indicators of productivity, that centre on specific aspects of port activity and which do not consider the possibilities of substitution among factors. Studies evaluating port efficiency have been carried out in different countries, in all continents, with studies that analyze various aspects of the Johor Port Berhad being particularly noteworthy due to their number. Finally, observing generally lower efficiency of publicly operated ports, the research concludes that port productivity is shaped not just by the intensity of spatial inter-port competition, but also by the capacity of port authorities to implement innovative institutional practices, given the globalized, competitive world trade system. Many global ports in the contemporary era should certainly have the institutional flexibility to respond to external challenges and to overcome external limitations. According to planners in globally competitive port authorities, medium and long-term strategic planning scenarios are essential for achieving flexibility, which ultimately leads to higher productivity for leading ports. In terms of policy making, crafting appropriate scenario levels for inter-port competition are meaningful tools for inducing better port productivity and addressing organizational inertia.

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