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Major Ports of India

Performance Appraisal of Selected Financial Parameters Using Correlation Analysis

N. Bhanu Prakash, B.V. Ramalingeswara Rao and T. Anupama

Major ports of India play vital role in the economy and their contribution to the development of nation is reflected in the ever-growing quantities of cargo handled by them. India has 13 major ports and the overall cargo handled by all these ports stood to the tune of 930 MT in 2011-12. However, one of the major concerns for the government has been the performance standards of these ports which, unfortunately, are not in line of the expected efficiency levels. Major ports in India are running under multiple constraints like congestion, outdated technology, improper hinterland connectivity, and higher dependence on manual cargo handling procedures. At the same time, they are dependent on the government for their financing and investment decisions. It may be observed that the government is slowly releasing the major ports from clutches of its control. Privatisation of port services through PPP mode and granting of administrative autonomy to the management of the port trusts are two major steps taken by the government to improve the work efficiencies of the major ports. Result-oriented initiatives such as National Maritime Development Program 2007-2012 and Maritime Agenda: 2010-20, initiated by the ministry, to improve the infrastructural set-up at major ports are being implemented to increase the efficiencies among the major ports.

The objective of the present study is to analyse the performance of major ports using some financial metrics during the period 1995-96 to 2010-11. It is quite interesting to note that all the major ports work with different efficiency levels and the study aspires to find about the performance levels of these ports on the basis of their financial performances.

The study aims to find if there is any significant impact on the revenue generated by the ports and the ever-growing costs in handling the cargo.

N. Bhanu Prakash, Assistant Professor (Senior Scale), Department of Accounting & Finance, College of Management & Economic Studies, University of Petroleum & Energy Studies, Dehradun, Uttarakhand. E-mail: *nbprakash@ddn.upes.ac.in*

Dr B.V. Ramalingeswara Rao, Academic Coordinator, Indian Maritime University, Visakhapatnam Campus, Gandhigram, Visakhapatnam. *E-mail: profbhavana@gmail.com*

T. Anupama, Assistant Professor, Department of Statistics & Operations Research, College of Management & Economic Studies, University of Petroleum & Energy Studies, Dehradun, Uttarakhand. E-mail: *anu1078@gmail.com*

I. Introduction

Ports play a vital role in the economy and their contribution to the developing economies is enormous due to the fact that in the 21st century these nations have greater scope for development. Growth in foreign trade observed in these countries is abnormal as the developed nations have reached a constant growth stage, where the growth rate is more or less steady. To extend their efficiencies and enhance profits, the industries in the developed nations have realised the need to expand and stretch their area of operations beyond their territorial boundaries. So the latter part of the 20th century has seen most of the industries of developed nations turning towards the third-world countries for investment. It was during the same time that most of the economies of most of the third-world countries were on the verge of economic and financial distress. The governments of these countries have also realised that to revive their economies, they needed some helping hand from external sources, especially the developed nations. So there existed a balance between the demand for investments by the third world nations and the supply of funds from the industries of the developed nations.

Ports across the world have been the key routers of foreign trade across the world. Existence of vibrant ports and hinterland connectivity would synergise the growth of any nation. One of the key highlights of most of the major ports in India is that they are working beyond their registered capacity and for most of them, the berth occupancy is at the highest ebb. However, this is not being reflected in their financial performances and especially on their revenue generation abilities. Realising the need for development, government, today, is proactively striving to enhance the overall performance of these ports. The need for developed port sector is more felt especially after the Liberalisation, Privatisation and Globalisation (LPG) programme and the Industrial Policy of 1991 initiated by the Government of India (GoI).

One of the features of the third world nations is existence of vast untapped markets that have become a great boon in attracting huge investments. Investments into the third-world nations during the earlier times were not easy due to stringent government policies and sociopolitical conditions prevailing in these countries. However, various factors like failure of public sector, lack of capital building by government and public sector and high demand for products have forced the policy makers to have a relook in their approach. The changing world economic scenario, collapse of socialism followed by disintegration of USSR, compulsions of World Bank in advancing loans, etc., have mandated the process of LPG by these nations.

India, one of the third-world countries, is the second most populous country with vast scope of development due to greater presence of middle income group people. The existence of educated and skilled youth in the country also helped it to be an attractive destination for huge investments. The economic crisis of the late 1980s has forced the government to aggressively opt for private investments from both local and foreign

investors. The failure of public sector to develop infrastructure in the country has forced the government to allow private investments into infrastructure sector like telecommunications, banking, power, roads, airports, ports and many other sectors. For speedy economic development, great emphasis was laid on the enlargement of infrastructure sector.

One of the key areas of infrastructure sectors is the sea ports. Foreign investments that come in and go out, most often are in terms of equipment and machinery, goods, technology transfer. Most of these imports and exports are routed through sea transport. Major ports of India are all strategically located on the world's shipping routes and have a great chance for growth. India has 13 major ports and over 187 non-major minor ports that are spread over 7,517 km coast and extending into 10 states in the peninsular part of the country. Apart from these, one port in the Andaman Islands is also recently declared as a major port.

Major ports in India come under the control of the central government and are set up in trusts. Out of 13 major ports, 12 are run under trusts and only Ennore Port in Tamil Nadu is set up as a body corporate. Each of the major ports in India was set up to handle a particular dedicated type of cargo. Later, as the demand for varied products from the importers and exporters increased, all these ports were modified to handle different and diverse type of cargo. As time progressed, ports have enhanced their efficiencies to handle wide range of cargo like POL (petroleum, oil & lubes), containers, heavy equipment, over dimension cargo (ODC) apart from the traditional dry and break bulk cargo. Trade and business among countries have increased across the continents by the end of 20th century. Formations of newer blocks and agreements, bilateral as well as multilateral, have given a greater scope for international trade among the countries. Increase in cargo both by volume and variety has given a chance to the ports to develop at a faster pace. But, the major ports in India could not develop at the expected pace and so could not stand in competition with most of the international ports in the region. Indian ports could not register any significant jump in their trade volumes and value of income in comparison to the standards set by most of the major ports across the world.

Major ports in India, under the government's control could not develop due to numerous constraints. The general feature of inadequate capital formation in the country has influenced the government spending towards the infrastructure sector. The basic objective of public welfare advocated by the successive governments has curtailed the investments in infrastructure in general and ports in particular, a non-priority segment for the government. Government's indifference to release desired funds has worsened the situation. Issues like inadequate funding, political interference, outdated technology, congestion at ports, mismanagement (or lack of freedom to the boards), etc., have all played spoil sport in the progress and growth of ports in India. Government control, often times, resulted in centralised decision making has slowed the growth of ports and at the

same time government control on foreign trade during the Licence Raj has curtailed the business prospects of the ports in India. High financial costs, low employee productivity, lower draft both at the channel and at the berths at the ports, high and frequent dredging costs have also contributed to the poor performance of major ports in India. Inadequate development of logistics that supplement the transportation sector has also aggravated the problems for the development of ports in India.

The Industrial Policy 1991, however, has brought-in a new trend in the development of ports in India. The impact of the Industrial Policy 1991 is evident on the port and shipping industry from 1995-96 due to policy implementations. Government has given greater powers to the port trusts in decision making and at the same time allowed private and foreign equity participation in the port sector. Foreign direct investment (FDI) to the tune of 100 per cent through automatic route has given a new impetus to the sector with international players to bid for port operations in India. Indian ports, in the recent past, have developed in the right direction to support the foreign trade in the country and thereby giving greater confidence to the foreign investors.

The performance of ports in India is equally significant to the economy and the sub-continent as India acts as a hub for the investments in the region. The performance of the ports is, therefore, detrimental for most of the stakeholders in the region. Investments by multinational corporations (MNCs) into the country have come in anticipation of expanding their markets into the neighbouring countries. This has resulted in more stress on the ports in India to handle enhanced cargo movement. With a task to handle enhanced cargo, the performance of Indian ports has attracted numerous parties across the economists, policy makers and many others. Numerous attempts were made to evaluate the performance of the ports in India. From the following sections, we get a certain feel about the comments on the performance of Indian ports.

II. Review of Literature

K. Lubza Nihar (2011) attempted to identify the different variables influencing the performance of Indian port. He has considered different financial and operational parameters like dredging expenditure, operating expenditure, operating surplus, idle time to berth time, vessels handled at ports and forecasts capacities of major ports. The study identified that technological investments are imperative to improve port performance. Indian ports need to invest in huge capital and also need business and operational acumen to improve operational efficiencies matching global standards.

K.M. Chudasama (2009) argues that increasing world output and resulting expansion in world merchandise trade in the era of globalisation has consequently demanded efficient maritime infrastructure for global logistic services. Ports being the nodal points have numerous challenges and need to concentrate on continuous improvement in their performances as they have become an important contributor to a nation's international

competitiveness and play a significant role in trade-oriented economic development. He summarised the performance appraisal of Indian ports based on the results of port ranking model. The study concluded that Indian ports are expanding significantly in line with the world trade making them competitive with respect to their operational performance and physical infrastructure. He has used weighted score method for overall performance appraisal of the ports. The weights were derived from the factor loading of principal component analysis to obtain realistic results. He has found that physical facilities of ports significantly contribute to overall performance of a port. Volume of cargo handled, one of the operational parameters, significantly influenced the port performance.

Atul Deshmukh (2002) in his study on port efficiency has found that only Jawaharlal Nehru Port Trust (JNPT) port has shown some positive efficiency in comparison to other major ports of India. While most other ports have observed increase in cost of handling cargo, JNPT has shown a decline. The study concluded that Indian ports need to be compared to some of the international ports to judge their performance efficiencies.

Oum *et al.* (1992) provided in transport sector concentrated on two main purposes to study economic performance: gross measures of productivity and shift measures of technical change. They widely used approaches such as traditional regression estimation methods, index-number, etc., to calculate productivity/efficiency include.

III. Objective of the Present Study

Port performance can be analysed through operational and financial aspects as reported by the port authorities and available in public domain. Guidelines on Port Performance Indicators, issued in the year 1976, by United Nations Conference on Trade and Development (UNCTAD) are used to measure the performance of ports across the world. The present study, however, confines itself to the analysis of financial performance at major ports and tries to find the significance of these parameters on the total income earned by the ports. Three key factors namely cargo handling costs, dredging costs, and cost on salaries and wages are considered and they are tested with the total income generated by the major ports. All the parameters selected are important as each of them influences the efficiencies with which a port operates and influence the port performance.

IV. Hypothesis of the Study

For the purpose of the study, the following hypothesis are considered:

H0: There is no correlation between average total income and average cargo handling costs.

H1: There is correlation between average total income and average cargo handling costs.

H0: There is no correlation between average total income and average dredging costs.

H1: There is correlation between average total income and average dredging costs.

H0: There is no correlation between average total income and average cost per employee.

H1: There is correlation between average total income and average salaries and wages.

V. Methodology

The researcher administered secondary data analysis and collected the data from the year-wise publications *Major Ports of India—A Profile* by Indian Ports Association, New Delhi. The researcher collected the published data from the year 1995-96 to 2010-11 for all the major ports of India. The publication covers a complete overview of the ports in India covering details such as financial, operational, physical facilities, employee strength, achievements of these ports, apart from certain data relating to the performance of non-major ports. However, the present study is confined to the performance of the major ports only and so the data pertaining to non-major ports are not considered. The data collected are initially converted into simple averages and are used as one of the basic statistical tool. Simple average is the value around which other figures congregate, or which divides their number in half. It represents a single value that is based on all the observations of the time series data considered. In the present study, simple average is used to represent a single value for the all the considered costs incurred by the port in correspondence to the total income generated.

Performance of all the major ports is evaluated using the following financial parameters such as average cargo handling cost (ACHC), average dredging costs (ADC), and average salaries and wages (ASW) and compared with the average total income (ATI) generated by the respective port.

Total income refers to the revenue generated by a port through its operations and other activities by a port. It covers both the operating and non-operating income generated by the ports. It is a barometer used to gauge the income generating capacity of the port. It is generally depended on the various activities taken-up by the port. A port generates revenue from various operational and non-operational activities and so is depended on various factors such as cargo handled. It is also depended on the ability of the port to handle cargo.

Cargo handling cost refers to the operational cost incurred by the port while loading and unloading the cargo. As the cargo handled by the port increases, the cargo handling cost tends to increase. However, economies of scale help reduce the handling costs for a port. Generally, an increase in cargo is reflected by an increase in the cargo handling cost.

Dredging costs refer to the amount spent by the port to deepen its channel and berth area. Dredging helps in increase and maintenance of the draft in the port and help handle bigger ships to call at the ports. Thus, increase in dredging costs results in more business

and subsequently more income to the port. Dredging can be capital dredging, referring to deepening of channel to support bigger ships, or operational dredging, referring to routine activity to clear the silt created.

The parameter salaries and wages paid to employees refers to the amount spent on the workforce employed by the port. In an efficient port, more cargo handled results in more employee costs and in-turn results in more income to the port. Usage of mechanisation and technology in handling cargo would reduce the cost per employee. However, most Indian ports are depended on workforce as the ports are not yet equipped with latest machinery and technology.

Performance of individual ports is calculated using the further statistical tools such as correlation analysis. Correlation analysis is a statistical tool used to describe the degree to which one variable is linearly related to another. It explains the strength of the relationship between the selected variables. If two quantitative variables 'A' and 'B' are selected, when high values of 'A' are associated with high values of 'B,' positive correlation exists. Like same if high values of 'A' are associated with low values of 'B' then a negative correlation exists. In the present study, the researcher aims to find the cause and effect relation between the selected variables. Further analysis is carried through coefficient of determination R square which is used to calculate the ratio between the explained variation and the total variation. Essentially this enumerates that R square indicates the percentage of the total variation in **Y** accounted for by the variable **X**. The closer R square is to 0, the less impact **X** has on **Y**, and the closer R square to 1, the more is **Y** dependent on **X**.

Testing of hypothesis with respect to correlation (t-test) is applied to find the significance between the variables considered. The study considered the data pertaining to the period between the years 1995-96 and 2010-11.

VI. Limitations of the Study

The study considers only the major ports and the minor ports are not considered. The output of the study may not be applicable to the non-major and minor ports that are operating in India. Ennore Port, which is considered, is a new port and the results obtained from the present study need not hold good for this port in the long run. The data collected from the publications of Indian Ports Association, at times, differ with the publications of other associations and bodies. There are various other financial parameters that are not considered in the study. The results need to be generalised with caution and may not entirely be valid for non-major ports.

VII. Analysis and Discussions

Tabulation of the variables gives a clear picture to identify the main factors that influence the port performance. There are numerous expenses and incomes observed in the

operations of the ports ranging from operating to non-operating, capital to operational. The present study, however, considered only three of the key variables that influence the port performance as these would significantly affect the performance of the ports. On the same lines, total income is considered as it represents the sum total of all the incomes earned by a port. Table 1 gives the details of the correlation analysis.

Table 1

Details of Correlation Analysis

	Average (1995-2011)			
Port	*ATI*	*ACHC*	*ADC*	*ASW*
Kolkata	1091.94	175.87	296.86	207.23
Paradip	450.37	80.13	25.11	56.21
Visakhapatnam	478.28	50.39	13.62	109.14
Ennore	37.46	51.39	1.90	1.94
Chennai	575.70	70.43	4.01	179.73
Chidambaranar	163.15	42.40	0.33	26.72
Cochin	213.27	109.43	53.99	65.02
New Mangalore	238.51	47.35	28.85	41.10
Mormugao	218.24	49.92	15.04	61.48
Mumbai	952.22	149.84	24.88	377.25
JNPT	697.43	105.20	13.25	47.06
Kandla	408.23	34.18	49.96	74.08
Correlation between Total Income and Cargo Handling				0.815
Correlation between Total Income and Dredging Cost				0.608
Correlation between Total Income and salaries and wages				0.796

Source: *Major Ports of India—A Profile*, Indian Port Association publications, 1995-96 to 2010-11

Table 1 depicts the ATI, ACHC, ADC and ASW at various ports during the period 1995-96 to 2010-11. It also shows the correlation between ATI and ACHC, ATI and ADC, and finally ATI and ASW. From these averages, the correlation values are calculated and compared. The correlation between ATI and AVCH is 0.8156, the correlation between ATI and ADC is 0.6089, and the correlation between ATI and ASW is 0.796. These correlation values are tested using the t-test statistics for checking the significance. Where, r is the sample correlation value for the ports considered, n is number of ports, i.e., 12 that are considered for the study. The calculated values of 't' for the three parameters are calculated and represented in Table 2.

Table 2

Calculated Values for the Three Parameters

Parameter	t_{cal}
Average Total Income (ATI) to Average Cargo Handling Cost (ACHC)	4.457
Average Total Income (ATI) to Average Dredging Cost (ADC)	9.679
Average Total Income (ATI) to Average salaries and wages (ASW)	4.159

VIII. Findings

Now, comparing the t-calculated value to t-table values at 5 per cent level of significance at 10 degrees of freedom, we observe that the calculated values are greater than the table values for the three hypotheses, so we can conclude stating that there is a significant correlation between ATI and ACHC, ADC and average cost per employee. When we look at the coefficient of determination R^2 between the variables i.e., ATI and ACHC is 0.665, since it is a good value, we can consider it as one of the main variables for the study because ACHC explain the total income with 67 per cent and when the regression line is calculated it is given by Y (ATI) = -5.7 + 5.787 X (ACHC). The coefficient of determination R^2 between the variables i.e., ATI and ADC is 0.371; since it is a not a strong value, we may not consider it as one of the main variables for the study as this variable explains only 37 per cent about the total income, but the regression line is calculated and it is given by Y (ATI) = 354.12 + 2.416 X (ADC). The coefficient of determination R^2 between the variables i.e., ATI and ASW is 0.633; since it is a not a strong value, we may not consider it as one of the main variables for the study, but the regression line is calculated and it is given by Y (ATI) = 205.73 + 2.451 X (ASN).

IX. Conclusion

Since, for all the considered parameters, there is evidence of a liner relationship at 5 per cent level of significance. We can conclude that there exists a correlation between ATI and ACHC, ADC and ASW. Since there is correlation between the variables, we can reject the null hypothesis (H_0) for all the three parameters and the alternate hypothesis (H1) is considered. Also it is proved that the variables that are considered i.e., the independent variables explain with a good per cent about the average total income. For the further scope of the analysis, other variables that can be considered are average costs on stores, office and administration, operations and maintenance, medical, etc.

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