Benchmarking of Russian ports

Case study from ports of Vladivostok and Nakhodka

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Abstract

Every year the processes of globalization and internationalization develop rapidly in the world economy. Economic entities are continuously looking for effective ways to survive in a competitive economic environment and the continuation of activity. Sea ports as the subject of the global economic system is not the exception to the rule.

The merger of international relations has its positive side: the distribution of capital and labor, the impact of synergies. In addition, the openness of the economies due to the economic growth in the field of competition, forced seaports to seek new and innovative ways to improve the efficiency of the global economic arena.

According to international experience, one of the beneficial and effective ways for sea ports as actors in the international economy is applying benchmarking as a basis for improving the efficiency of their operations. In a competitive environment it is important to determine not only their own position in the market, but also to correctly assess the location of competitors, identify the most similar competitors and take account of their activities. More important is the definition of the so-called leader and the best among the analyzed entity which is done by the application of benchmarking.

This thesis is devoted to the analysis of such sea ports and container terminals of one of the largest maritime markets - the Russian Federation. The analysis convers the sea ports of the Far East of Russia, and identifying key factors that affect the efficiency of their operations. It is relevant to use partial performance measures in the thesis work to assess the effectiveness of the Russian ports, and the most suitable methods are SFA approach, DEA-analysis, PPM approach.

To compare, first, BCG-Matrix applied in portfolio analysis of Russian sea ports. Then, the portfolio analysis has identified a strategy for further development of maritime

ports. Financial analysis of seaports placed an emphasis on the impact of their activities; identifying gaps and weaknesses, as well as the priorities for further development.

Proposals regarding the performance improvement of the two compared Russian seaports – Nakhodka and Vladivostok, are reflected in the further research and analysis. These proposals aim to improve the choice of efficiency models, and careful selection of the key performance parameters that affect the maximum efficiency of seaports in general.

Keywords: benchmarking, Russian sea ports, container terminal, efficiency, data envelopment analysis, partial productivity measures, BCG-Matrix, financial analysis

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After all, I express my gratitude to all those who helped me in writing the thesis, inspired, offered ideas, supported and believed.

List of Abbreviations

ADD	Additive model
BCC	Banker-Charnes-Cooper model
BCG	Boston Consulting Group Matrix
CCR	Charnes-Cooper and Rodes model
CRS	Constant returns to scale
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
IMF	International Monetary Fund
InvMult	Invariant multiplicative DEA-model
NOK	Norwegian Krone
PPA	Product Portfolio Analysis
PPM	Partial Productivity Measures
ROA	Return of assets
ROE	Return of equity
RONA	Return on net assets
ROS	Return on sales
SBU	Strategic Business Unit
SFA	Stochastic Frontier Analysis
SWOT	Strong Weak Opportunity Threats Analysis
TEU	Twenty-foot Equivalent Units
UNCTAD	United Nations Conference on Trade and Development
VarMult	Variant multiplicative DEA-model
VRS	Variable returns to scale
WEF	World Economic Forum

Introduction

Background

Growing influences of the globalization factors and perfect competition require ports and container terminals to enhance their operational efficiency. Thus, there is question of the evaluation and improvement of business efficiency of ports and terminals due to global economic changes. Seaports need to put more efforts not only to support their productivity, also lay a solid foundation of the economic system in their transportation links. Thus, the vital issue today is to understand the concept of benchmarking seaports and finding ways to improve their efficiency.

The analysis of the economic literature and information sources on the issue of benchmarking and the development of seaports reveals a fact that yet there is a need to develop a comprehensive benchmarking analysis of port terminals.

Researchers paid considerable attention to the theoretical and practical principles of fundamental scientific research related to the issues and debates about the efficiency of seaports. There is a significant contribution of the benchmarking theories in this thesis. However, despite the relatively large number of scientific publications, yet there is a need to develop a common approach in order to define the essence of port benchmarking.

It should be noted that the systematic guidelines of the sea ports effectiveness are not sufficiently reasoned in the economic literature. This fact had a decisive influence on the choice of this thesis topic, goals and objectives. While a large number of scientific papers based on the transformation of accumulated international experience to achieve competitive advantages, only a small number of them took into account the specificity of benchmarking seaports.

This thesis is done through the application of theories from the reviewed literature, and an analysis gathered data from Nakhodka and Vladivostok ports.

Purposes

The aim of this thesis is to develop a financial analysis and assessment of seaports, and also to present some recommendations (based on the financial analyses results) for improving the port effectiveness. The subject of the thesis is to study the nature of seaports benchmarking, and to analyze the aggregate factors and methods underlying it, as well as possible ways to increase seaports capacity. This thesis studies two selected sea ports, and the degree of their effective operations.

In the course of meeting the purpose of this thesis the following steps have been taken into account.

1. Theoretical foundations of benchmarking development.
2. Comprehensive analysis of financial and economic activity of selected sea ports.
3. Comparative analysis of sea ports.
4. Comparison effectiveness analysis methods of sea ports.
5. Forming the main directions of improving efficiency at sea ports and terminals.
6. Identify specific recommendations for seaports.

This thesis is done through collecting economic and financial data from ports, reviewing economic literature and scientific articles. The articles are used from various scientific websites; Science Direct, websites of European, American and Russian universities, electronic catalogs of libraries.

The analysis in the thesis work is aimed to identify trends in each of the analyzed sea ports, their fundamental differences, strategic plans. This analysis shows the best seaport in terms of efficiency in the use of certain parameters.

The results of the study will primarily be of interest to managers and financial analysts. Also, the results of the thesis will attract the attention of potential investors.

Research issues

In order to meet the thesis objectives in a systematic way, the following research questions are addressed. Answering the following questions can help the author to figure out the future practical recommendations and present a well-organized financial analyzes of ports and benchmarking.

Research question 1: What is benchmarking of container ports?

The answer lies in the theoretical approach. The analysis of the theoretical foundations of benchmarking proves its relevance in assessing the performance of seaports.

Research question 2: Which method is the most suitable for assessing effectiveness of sea port?

This thesis found PPM approach as one of the most applicable methods for assessing the effectiveness of the selected ports. PPM approach is chosen through a comprehensive review of the theories and scientific sources within the benchmarking field.

Research question 3: Which port is more efficient within the selected ports in this thesis?

In order to find the more efficient port the BCG-Matrix portfolio and financial analyses are applied in this thesis. BCG-Matrix helped the author to discover Nakhodka port as an efficient one. Also, the adoption of financial analyses significantly increased the estimation of the port performance effectiveness in terms of money.

Research question 4: Which parameters of each analyzed sea port made it more efficient than another?

The use of portfolio analysis and PPM approach will identify the key factors of effectiveness of each port, and specify a competitive advantage, which will be based on the recommendations and further research**.** It's important to distinguish during research between "efficiency" and "effectiveness".

Referring to economic periodical literature, term "efficiency" is quite often and still confused and misinterpreted with the term "effectiveness". In general, it should be noted that the efficiency of the concept of measurable quantitatively is determined by the ratio of input to the factors. "Effectiveness" is in turn a relatively vague and not a quantitative concept, mainly related to the achievement of certain goals. In some of these cases, the effectiveness can be expressed as a result, a percentage that is ideally expected, therefore, with 100% as the ideal case. But this concept is not always applicable, not even in all cases where the effectiveness can be assigned a numeric value.

Theoretical Aspects

The purpose of this chapter is to review the theoretical aspects of benchmarking and various methods for evaluating the effectiveness of sea ports and container terminals. In the theoretical section, the author explains the reasons of applying the selected methods for analyses in this thesis.

Benchmarking

Voevodina (2009) explains that benchmarking is the process of identifying, understanding and adapting existing examples of the effective operation of the company in order to improve its business performance. It equally involves two processes: evaluation and comparison. Usually it is taken a sample of the "best" products and marketing process used by direct competitors and firms working in similar areas to identify possible ways to improve the company of its own products and practices.

Benchmarking is the process of comparing the business processes and performance of an industry and the best practices of other industry. In the process of benchmarking the best company is determined by the industry or from other industries, where similar processes carries out. The results of the studied processes are compared with own results and processes of a company which makes a benchmarking (Voevodina, 2009). In this way, it is possible to learn how the business processes explain why these companies or firms are successful. Voevodina (2009) introduced benchmarking in a simplified form of four consecutive steps.

- Knowledge and analysis of parts from own business processes. Ideally, they should be known thoroughly at every stage of production, but it is best to check regularly the "health" of the organization to be aware of the weaknesses and try to iron out all the negative internal and external influences.

- An analysis of the business processes from others. As the secret of success is always achieved through hard work, both physical and intellectual; no one will agree to bring you everything "on a silver plate". Most often, if not to take into account the patented technology, it is a big trade secret, which is assiduously protected from competitors. But to analyze the dynamics of specific economic indicators, track marketing scheme is possible.
- Comparison of results of own processes with the results of the analyzed companies. It is necessary to connect professionals but often the organization may cope with it independently.
- The introduction of high-quality and (or) quantitative changes in order to overcome the separation. This action - the most difficult, as almost always requires financial investments, the expertise or the training of staff, the development of new technologies, the introduction of modern methods of management and decision-making. Thus, we can distinguish types of benchmarking. Below are introduced just a few of them.
- Internal - is subject to divisions within the company.
- Competitive - a comparison of organization with competitors, using the maximum number of parameters.
- The total - compared with indirect competitors of the company on certain parameters of interest.
- Functional - a comparison of the functions (sales, purchases).

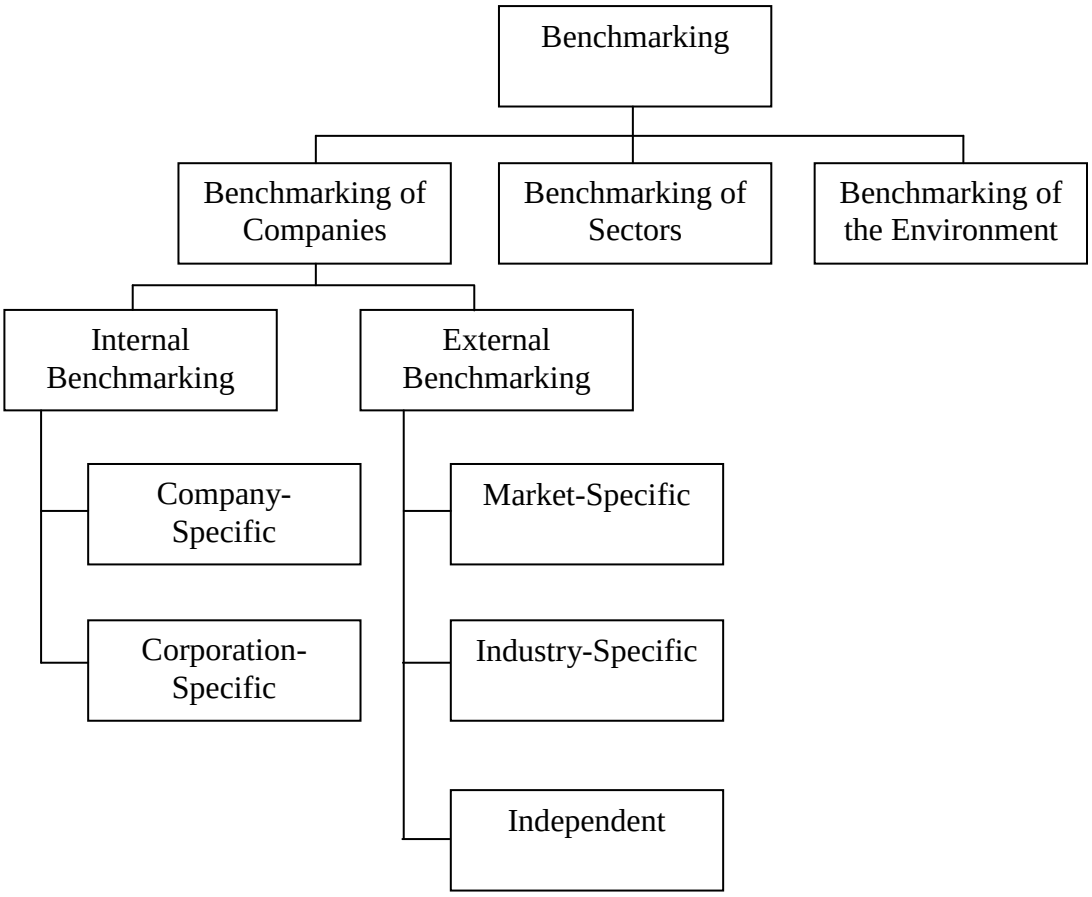


Figure 1: Principal scheme of benchmarking (Global Benchmarking, 2013)

Benchmarking is never a one-time analysis. To increase the efficiency of the enterprise, it is necessary to provide benchmarking work as the regular process of innovation and improvement in your business (Voevodina, 2009).

Types of benchmarking: According to economic literature (Boxwell, 1994) the most common types of benchmarking are as follows:

- Internal benchmarking: Benchmarking produced within the organization, which is based on comparison of the performance of production units, similar to similar processes.
- Competitive benchmarking: The study of the company competitiveness characteristics and its comparison with the current situation at the time of the competition also includes the study of specific products, features and options

to adjust or change of the manufacturing process or the administrative methods of management companies and competitors.

- Functional Benchmarking: Benchmarking engaged in comparing certain functions of two or more companies in the same sector.
- Benchmarking process: Involves work on changing certain parameters for the possibility of comparing them with firms whose characteristic is ahead of the enterprise in similar processes.
- Global Benchmarking: Increasing the share of strategic benchmarking, along with the use of benchmarking as an associative.
- The total Benchmarking: Benchmarking process that compares a function of two or more organizations, regardless of sector, rarely talking about the allocation of more specific types, such as benchmarking of costs, performance benchmarking, customer benchmarking, strategic benchmarking, operational benchmarking.
- Associative Benchmarking: Benchmarking carried out by organizations that are formed in a tight alliance benchmarking. The protocol of this cooperation is in the code of conduct benchmarking and usually is not advertised (Voevodina, 2009).

The Benchmarking of Companies has been spread mostly all over the world. Here, companies learn from another; they compare index numbers and exchange information about benchmarking objects. The benchmarking of sectors compares the performances of individual sectors. The goal is to learn from other sectors which according to certain criteria perform better.

Due to the fast developing of European Union countries, the benchmarking of the industries gains an increasing importance. In the future, countries can compare the political, social or economic environments and this will enable them to learn from each other.

Type of benchmarking used in thesis analysis the following chapter focuses on the benchmarking of companies. This type of benchmarking can be divided into internal and external benchmarking (Global Benchmarking, 2013).

From an analytical point of view, there are three main types of analysis.

1) The internal analysis involves comparing the performance superiority within the organization itself (between departments, branches or groups of goods).

2) External analysis draws attention to the superiority of similar activities in different areas (activity of competitors in different markets).

3) Functional analysis of the superiority compares similar functions or processes in various industries. The key is in finding the best possible results wherever they can be. Solution to a specific organization of choosing one of these three types depends ultimately on the actual situation.

The basic principles of benchmarking are introduced below.

1) Reciprocity- an activity that is not possible without the support of mutual relations, compliance and data exchange that provides a "winning", means the basis for the parties involved. It should be noted that reciprocity is not obliged to complete a blind trust (after all competitors). In benchmarking, each partner must be confident in the behavior of others, only then a good result can be achieved. Everything should be pre- installed and agreed not to call any other interpretations.

2) Analogy- operational processes of partners should be similar. Any process can be studied with the benefit of the case, and the results - easily translated or interpreted in relation

to the firm. The similarity of the processes and a clear definition of the parameters for selecting benchmarking partners significantly influence the success of the activity.

3) Dimension- benchmarking in some way is a comparison of the characteristics studied, measured, analyzed in several other organizations. The purpose of these processes (i.e. study, measure, and analyze) is to establish the causes of the differences in terms of efficiency, as well as finding ways to improve them.

4) Reliability- benchmarking must be based on the actual data, accurate analysis and study of all the business processes (Voevodina, 2009).

Benchmarking of the container ports benchmarking of container ports is a good performance measurement tool to identify the best practices. Whilst agreeing that ports are diverse and do not readily lend them to benchmarking, container terminals are generally less diverse and have sufficiently common themes to enable the use of benchmarking as a guide to relative performance against others of similar capacity and industry standards (Rankine, 2003). By this it means that during benchmarking in container terminals, benchmarker can see overall view of terminal performance and find out several shortcomings, which can improve the productivity.

During benchmarking study, it is important to pay into attention some of the local factors such as: each container terminal is different in terms of size, navigation, shape, linkage with the hinterland. For instance, the size of ships and percentage of loaded and offloaded containers have a great influence on crane productivity and vessel turn-around time. There are three main areas which can be studied during benchmarking of container terminals; charges, level of service and productivity of labor and capital.

According to Rankine (2003) all issues that improve productivity will ultimately reflect positively in improved levels of service and the charges that can be made for that

service. To evaluate throughput productivity the benchmarker should go through the following steps:

1. Defining terminal size in order to find out whether there is a probability to expand without huge capital investments;

2. Measuring workforce productivity, quay crane productivity, berth productivity and yard productivity.

Container terminals principally provide services for vessels, cargo and inland transportation (Rankine, 2003). It does not necessarily mean that a terminal which offers good services to vessels offers also good services to inland transportation. Therefore, it is important that in measuring the productivity, the benchmarker considers all the services which offer by a container terminal.

Applied methods in measuring the effectiveness

This thesis studies the most frequently methods for measuring the effectiveness, their advantages and disadvantages in order to find the most appropriate method for benchmarking the selected ports. Merkert and Pagliari (2010) introduce three measurement methods as follows:

1. Data envelopment analysis (DEA)
2. Partial productivity measures (PPM)
3. Stochastic Frontier Approach (SFA)

Data envelopment analysis (DEA)

In practical use data envelopment analysis (DEA) is regarded as one of the most successful methods for assessing the effectiveness by researchers in the field of economics and operations fields. DEA is a linear approach which is used to measure productive efficiency of the organization. It is also used for benchmarking in operations management,

where a set of measures is selected to benchmark the performance of manufacturing and service operations. Organizations can be complex (e.g. ports), individuals with the agency (e.g. container terminals) or a breakdown of the individual business units (e.g. stevedoring companies). In the last three decades, DEA has become the most popular method of evaluating the effectiveness in almost all sectors of the economy (Merkert and Pagliari, 2010).

DEA is used for the production, transport to determine the best way to practice the efficient frontier that is the most efficient units. The relative effectiveness of the remaining units is measured as the distance from the frontier. Best practice is to limit the nonparametric, i.e. not form functional requirements specified or assumed, in contrast to other parametric production boundary such as boundary stochastic analysis (SFA). DEA method allows for the inclusion of multiple outputs and inputs (Merkert and Pagliari, 2010).

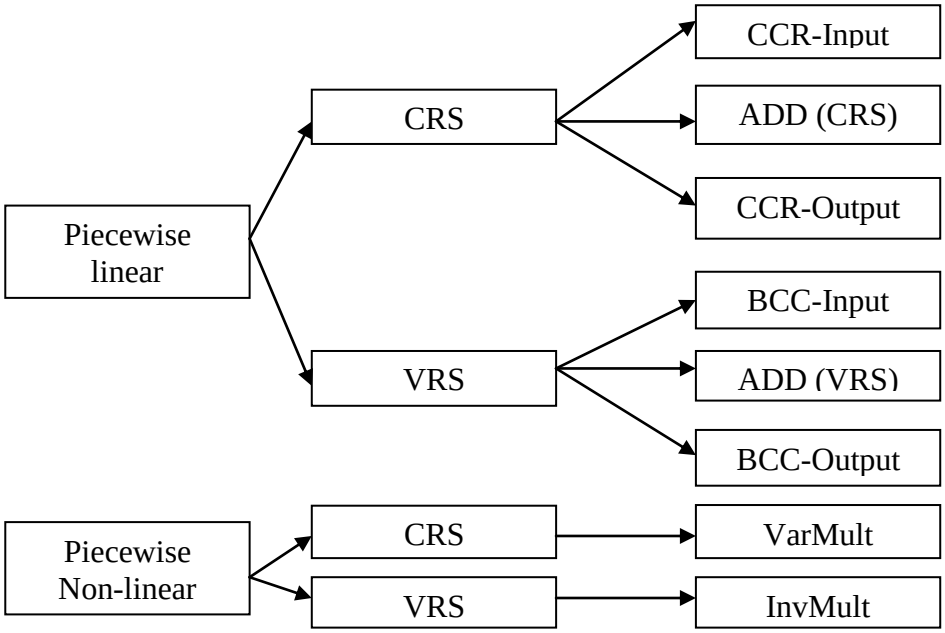
Inputs can be variable and fixed, where the values of input variables can be changed in the short term (for seaports such as: number of employees, number of visits of ships), the value of fixed inputs can be changed only in the long term (fixed inputs such as number of berths, wharves, cranes).

Varieties of DEA models and approaches to measure efficiency classification of DEA models can be carried out according to the following criteria:

Piecewise linear or piecewise non-linear type of productivity function.

2. Selected orientation (input-or output-oriented models, and models without orientation).

3. Constant returns to scale (CRS) or variable returns to scale (VRS).



ADD – Additive model

BCC – Banker-Charnes-Cooper model

CCR – Charnes-Cooper and Rodes model

CRS – Constant returns to scale

DEA: Data Envelopment Analysis

InvMult – Invariant multiplicative DEA-model

VarMult – Variant multiplicative DEA-model

VRS – variable returns to scale

Figure 2 Classification of the main DEA models (Charnes and Cooper , 1994)

A significant disadvantage of this model is the CCR- linear homogeneity assumption (Dyckhoff and Allen, 1999). For this reason, the further development of DEA was aimed at eliminating this drawback. Bunker and Cooper developed a model BCC-Output and BCC-Input, which differ from the CCR- making models of variable scale (Banker, Charnes and Cooper, 1984). These models allow the recognition of the increasing or decreasing scale for each plant, as well as, in this regard, the separation efficiency of the technical efficiency and effectiveness, depending on the scale.

At the same time, both in the BCC-based models on the measurement of input- or output- oriented models of efficiency in Farrell, in the aggregate models of ADD applied simultaneously input- and output- oriented efficiency (Charnes, Cooper, Seiford and Sturz, 1982). These models are called the input- and output- oriented models, or models without orientation. In the publications, these models are discussed in most cases only with the adoption of variable scale ADD (VRS), although formally by visual transformation, such as transformation between models and CCR- BCC- models, a transition to the total pattern ADD (CRS) from the effect constant scale (Charnes and Cooper, 1994).

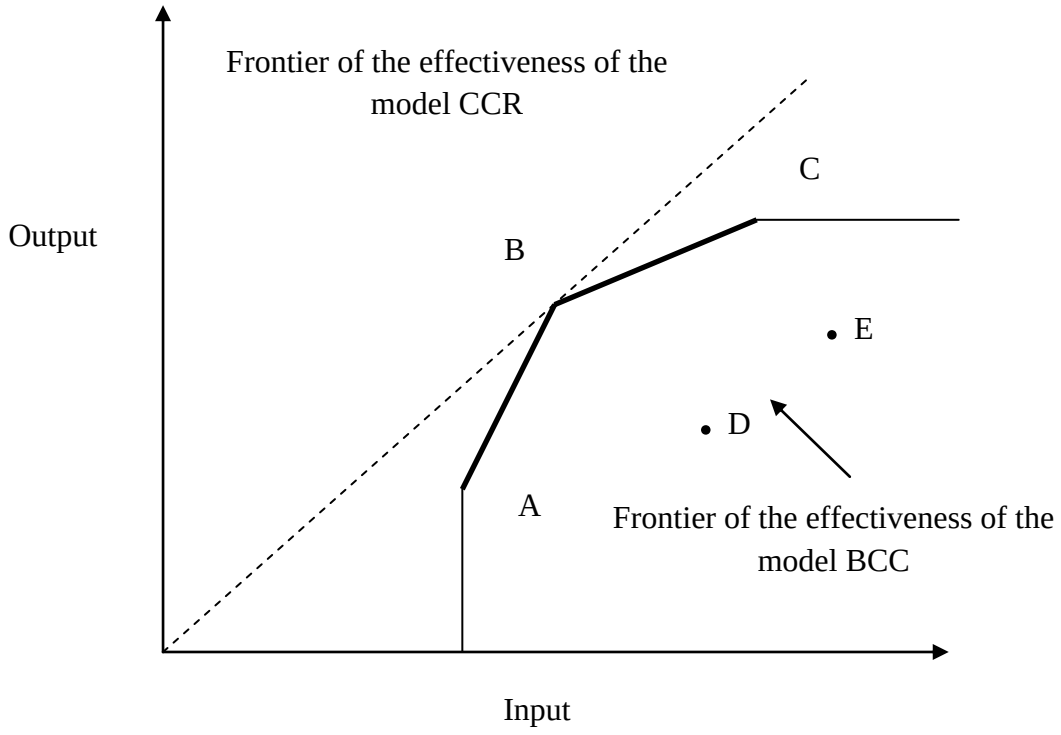


Figure 3 The frontier of the effectiveness of the models CCR and BCC using DEA-analysis (Cooper W. W., Seiford L., Tone K., 1999)

Further development of the DEA based on the four "basic models". Recent developments in this area are involved in both the differences and the relationships of these basic models, the sensitivity of the results, the values of the components of the efficiency and the elimination of problems in the practical application of DEA, such as taking into account

the ordinal, categorical and exogenously fixed inputs and outputs (Dyckhoff and Allen, 1999).

DEA-constant model (CCR) and variable (BCC) of scale can be represented graphically in Example production ratio, wherein one factor is proportional to the input one output parameter. In this example, the effectiveness of border is formed by one company (point B) with constant returns to scale and the three companies (points A, B, C) with variable returns to scale. Under constant returns of scale all the companies except Company B, ineffective. If the variable returns of scale all the companies that lie on the solid line border BCC-efficiency model can be considered effective.

The figure 3 shows that the ratio of the output parameter to the input factor at point B is most favorable. If we consider the dotted line as the efficiency frontier in making constant economies of scale, it is necessary to proceed from the fact that, regardless of the input parameter, the ratio of the output parameter to the input factor should be achieved as at point B. The solid line shows, in turn, increasing to the point B, and then decreasing returns to scale. With the BCC-models can not only be recognized the increasing or decreasing returns to scale for individual enterprises, but also can be made the differentiation between technical efficiency and effectiveness, depending on the scale.

When the model of DEA has to decide at first time about the choice of constant or variable economies of scale: in the case of constant returns to scale the output parameter is proportional to the input factor. If the variable returns of scale change in input factors, it can lead to a disproportionate change in the output parameter. The establishment of the form that best describes the reality, of course, has an effect on the value of efficiency. The adoption of variable scale DEA provides the user with the opportunity to address the issue of the optimal size of the agricultural enterprise empirical method.

In contrast to the models with constant returns to scale, while taking the variable scale, the differences in performance "neutralized", which means failure to use it when evaluating the performance. In determining the effectiveness of enterprise adoption of the meaning of a particular scale depends to a large extent on how much responsible for the effect size formed media solutions able to continuously influence the value of the enterprise and to bear responsibility for it (Schefczyk, 1996).

The adoption of variable scale encompasses the fact that productivity is growing steadily at first along the boundary of the production, and then continually decreases. This flexible consideration unlike the models CCR, which exclude the effects of scale, is restrictive and therefore criticized. Practices criticized in models of BCC image fictitious companies on the border of the production, a combination of input-output, which has never really been implemented and are unlikely to lend them to the implementation (Seiford, 1996).

Benefits and drawbacks of DEA approach: according to the research, mentioned above, DEA is an appropriate method for assessing efficiency for sea ports. The main advantages of DEA over other methods and which are relevant for the assessment of sea ports are as follows:

1. DEA is easy to grasp and understand for managers; the benchmark is other service providers providing the same type of services using the same types of inputs and, these other providers are observable and not derived from some assumed production function.

2. DEA readily incorporates multiple inputs and outputs and, it does not require price data to calculate technical efficiency. This makes it especially suitable for analyzing the efficiency of service production, where it is often difficult to assign prices to many of the outputs.

3. DEA identifies the “peers” for units (airports) that are not efficient. It thus provides a set of role models that the inefficient units can look to for way of improving its operations. This makes DEA a potential tool for benchmarking that other methods do not.

4. DEA method determines sources of inefficiency and efficiency levels and provides a means of decomposing economic (cost) efficiency into technical and allocates efficiency. Furthermore, technical efficiency is decomposed scale effects and non-scale effects (Rico Merkert, Romano Pagliari, 2010).

Of course, DEA method is based on a number of disadvantages that need to be considered. The main are follows:

1. DEA only measures efficiency relative to best practice within a particular sample. Thus it is not meaningful to compare efficiency scores across samples or across different studies.

2. DEA is a deterministic rather than a statistical approach. Its results would therefore be sensitive to measurement errors. However, recently it has been proven that applying DEA together with bootstrapping takes account of noise adequately.

3. DEA scores are sensitive to the number of inputs and outputs, and the sample size. In thesis could not be applied as a measure of productivity, as the sample size (two DMUs) is too small research is used two Russian ports: Nakhodka and Vladivostok, and DEA-analysis. Increasing the sample size will tend to reduce the average efficiency score because including more observations provides greater scope for DEA to find a comparison partner (Rico and Pagliari, 2010). And only in this situation, when the sample size will be increased, two DMUs could be compared with DEA-analysis.

Review of previous research and analysis using DEA approach: as the DEA method is popular in the analysis of enterprises and organizations efficiency, we make a comparative analysis from previous research work of scientists who have used this method

for the characterization of sea ports and container terminals. Table 1 shows general analysis of DEA method practical application in seaports efficiency analysis from previous studies.

Table 1 Input factors and output variables in previous research using DEA approach (drawn by author)

Authors	The year of study	Input factors	Output variable
Roll and Hayuth Y.	1993	Financial data	Turnover
Martinez-Budria E., Diaz-Armas R	1999	Technical data	Cargo throughput
Tongzon J.	2001	Technical data for two models	Cargo throughput
Turner H., Windle R.	2004	Port authority, ocean carrier and rail carrier	Port productivity

As we could see in table, DEA applications in ports are quite recent with the first attempt being attributed to Roll and Hayuth (Roll and Hayuth, 1993). They presented a theoretical exposition and used a cross-sectional data for financial reports in order to render the DEA approach operational. Following Roll and Hayuth's DEA theoretical work on ports, many empirical studies have used DEA to measure technical efficiency of ports. Martinez-Budria estimated the efficiency of 26 Spanish ports over the period 1993-1997, and classified the 26 ports into three groups; namely, 'high complexity', 'medium complexity' and 'low complexity' ports (Martinez-Budria and Diaz-Armas, 1999). After examining the efficiency of these ports using DEA-BCC models, the authors concludes that the ports of 'high complexity' are associated with high efficiency, compared with the medium and low efficiency found in other groups of ports. Tongzon J. used both DEA-CCR and DEA-additive models to analyze the efficiency of 4 Australian and 12 other international container ports (Tongzon, 2001). Turner applied DEA approach and regression analyzing influence of port authority, ocean carrier and rail carrier conduct on port productivity in North America (Turner, Windle and Dresner, 2004). Thus, the presence of economies of scale at the container port and terminal level was observed.

As can be seen in the analysis in the table, DEA analysis to assess the effectiveness of seaports involves the use of various input factors, such as financial performance, technical data ports. In addition the use of different output variables: turnover, cargo throughput, port productivity.

Partial productivity measures (PPM) method in use

The applying of partial performance is the traditional and most commonly used method for comparing sea ports. Typically, these studies have focused on the following dimensions of performance seaports: 1. cost efficiency; 2. performance; 3. ability to generate income; 4. profitability.

For each of these performance indicators, measures were developed that relate parameters of inputs and outputs. The main indicators of system inputs seaports are: labor and capital.

Depending on the performance measure used, inputs are measured in physical or financial terms. For example, the work can be expressed in the number of employees, or in terms of total labor costs incurred by the sea ports. Capital is usually measured in physical conditions, and may be, for example, in a container berths or quantity of container terminals, cranes (Merkert and Pagliari, 2010).

Measurement of partial productivity refers to the measurement solutions which do not meet the requirements of total productivity measurement, yet, being practicable as indicators of total productivity. In practice, measurement in business means measures of partial productivity. In that case, the objects of measurement are components of total productivity, and interpreted correctly, these components are indicative of productivity development (Saari, 2006).

The term of partial productivity illustrates well the fact that total productivity is only measured partially – or approximately. In a way, measurements are defective but, by understanding the logic of total productivity, it is possible to interpret correctly the results of partial productivity and to benefit from them in practical situations. Typical solutions of partial productivity are:

1. Value-added productivity
2. Single-factor productivity
3. Efficiency ratios
4. Unit cost accounting.

Partial productivity measures (PPM) are physical measures, indicators of nominal prices and fixed price value measures. These arrangements differ from each other variables. Eliminating the variables of measurement makes it easier to focus on the measurement of this variable; however, it means a more narrow approach (Saari, 2006).

Table 2 Comparison of principal measure type (Saari, 2006)

Types of Measures	Variables to be measures	Variables excluded
Physical	Quantity	Quality and distribution
Fixed price value	Quantity and quality	Distribution
Nominal price value	Quantity, quality and distribution	None

The practical application of PPM approach to measure the performance of seaports is quite effective. This method of quality PPM explains its popularity. Many economists believe that method PPM is quite relevant, because it is necessary to provide information on the relative performance between similar seaports.

Benefits and drawback applying PPM analysis simple data indicators although have some inherent disadvantages. Besides, the existing defects will lead to inaccurate results if some corrective measures are not taken. Economists identified key approach, despite the fact that the analysis was aimed at studying the airports, it can be applied to analyze the performance of their ports and container terminals. (Merkert and Pagliari, 2010)

The main drawback on PPM approach when analyzing container terminals are:

1. PPM method of analysis can produce implausible results when compared seaports have different vertical integration structures. To enhance its competitiveness, many ports use outsourcing, and thus the accuracy of evaluating the effectiveness of ports suffers considerably. One of the solutions is the standardization of data and information.

2. A further disadvantage is the administration seaports. The fact, that the port authorities administer several sea ports, and therefore stevedoring companies and have common centralized administrative costs. If these costs are not given in the reports of each port, the results of their performance will be incorrect.

3. The use of different exchange rates does not solve the problem of standardizing the data. In the research paper the data was put to a single currency, but the standard of living is not the same in different countries and very different purchasing power parity. Therefore, the results obtained in the currency of their home country seaports are different, if we analyze them in the currency of another country.

4. The influence of external factors such as economic regulation, political instability, severe distortion of the final result, particularly if the ports are in different countries. To address this shortcoming, the author of the thesis uses to analyze the ports that are in the same country, in the same area, to minimize the error in the results.

Thus, the current shortcomings are minor PPM approach, and they can be eliminated in the process of analyzing the effectiveness of marine ports.

Stochastic frontier approach (SFA) as the efficiency method

A second approach that is common in the assessment of efficiency of production units is the so-called Stochastic Frontier Analysis (SFA); also sometimes called the parametric approach to differentiate it from DEA which is basically a linear programming approach. SFA proceeds by assuming that there is a well-defined frontier production function that defines the maximum feasible output as:

$$y_i = f(x_i; \beta) + v_t \tag{2.1}$$

Where y_i denotes output of the i'th producer (in our case: sea port); x_i is a vector of actual input quantities; β is a vector of parameters to be estimated; and $v_t$is a random error term. SFA defines technical efficiency (Ei) for unit i (or sea port i) as the ratio of observed output to feasible out as:

$$E_i = \frac{Y_i}{f(x_i;\beta)+v_t} \tag{2.2}$$

It becomes clear that unit i (or sea port i) will achieve its maximum feasible value, I.e, is efficient, only if Ei =1. Otherwise Ei <1 provides a measure for the shortfall of observed output from feasible output just as in the case of DEA. Further, SFA can be formulated to measure all the concepts of efficiency just as DEA can.

Stochastic frontier analysis is a parametric and stochastic approach to estimate productive efficiency. The difference and major breakthrough of SFA compared to traditional regression analyses is that SFA calculates the inefficiency of economic agents based on distribution assumptions, so different individuals can have different inefficiencies. As a common approach, SFA relaxes the assumption that the behavior of economic units is optimized (Walters, 1963). However, the procedure to calculate the frontier is different. SFA

includes two random terms in order to take into account both inefficiency and normal statistical noise. Thus, it acknowledges that each economic unit will exhibit its specific inefficiencies and the efficiency production/cost frontier is estimated without shifting (correcting a traditional regression line to a frontier) (Braeutigam, 1999).

Benefits and drawbacks of SFA method the advantages of SFA over other methods until recently, are that it builds on econometrics and therefore it is able to capture noise in the data more adequately as compared to other methods. It should be noted that DEA has recently been developed to account for noise in data and hence SFA is no longer advantageous over it. The major disadvantage of SFA however, is that it requires a functional form to be specified; when measuring efficiency in the service provision sector, it may be difficult to convince the management that their production of services is according to some pre-defined smooth production function that can be expressed mathematically. This is its major disadvantage; for how can one expect managers to follow a mathematically function in the management of their organizations. Further, when there are more than one output, SFA becomes complicated to use aggregation and weighting of outputs must be done.

Background of product portfolio analysis

The basis of the portfolio analysis was proposed by representatives of the New Economic School positioning the 19th century. Since the beginning of 1960 began to appear all over the place "strategic boutiques ", quite a climb which accounts for 1970-80. (Henderson, 2008) The focus of management was given to the systematization and analysis of performance of the company in order to identify the most influential of them. Highlight the most significant figures on the basis of systematic data on the development of a representative sample of companies and their strategic decisions, consultants simulated two - and three- dimensional matrix models to ascertain the current strategic position of the

company and to predict the desired future development. The researchers assessed the internal and external condition of the company on the basis of statements of the enterprise, without delving into the nature and causes of their practical value, allowing developing a strategy for further development of the company in the form of the desk for a limited period of time. Perhaps this was the reason for the decline popularity strategic boutiques, but developed at this stage of the strategic management methods and models used in the present, together with a deep internal company analysis and comprehensive assessment of the external environment. (Henderson, 2008)

Boston Consulting Group Matrix as an instrument of PPA the most influential and relevant approach of portfolio analysis is a matrix of Boston Consulting Group (BCG Matrix). This approach has made fundamental changes in the development of strategies to diversify the company. This matrix was proposed by Bruce Henderson for the research areas of distribution of resources among the various strategic areas of the business to a diversified enterprise (Bruce D. Henderson, 2008). Bruce Henderson believed that the successful development of the company is possible only in the presence of a diversified portfolio of goods or SBU, which are characterized by different rates of growth in sales and market shares. The main idea of this matrix is a strategic portfolio of businesses is a function of the balance of the cash flows. Sales growth or development of the enterprise requires a constant infusion of cash, goods, or the same sphere of business, sales of which is characterized by slow growth, generates excess cash flow.

The strategic portfolio of businesses created in order to maximize current profits of the enterprise and the distribution of cash flows between SBU's for future successful growth of the company. Volumes, coupled with SBU cash flows are determined by the following rules:

1. Net income and the availability of funds is a function of market share. A high level of profit and a significant proportion of the market always go together. This is the result of general observation, inexplicable experience curve.

2. Growth requires an infusion of funds to finance additional assets. Additional funds required to maintain market share, is a function of growth rate.

3. High market share has to be earned or redeemed; buying market share requires additional investment.

4. None of the commodity markets can grow indefinitely. The impact of the growth has come in the period of slower growth; otherwise it is not worth counting on. Returns - is money that cannot be invested in the same commodity.

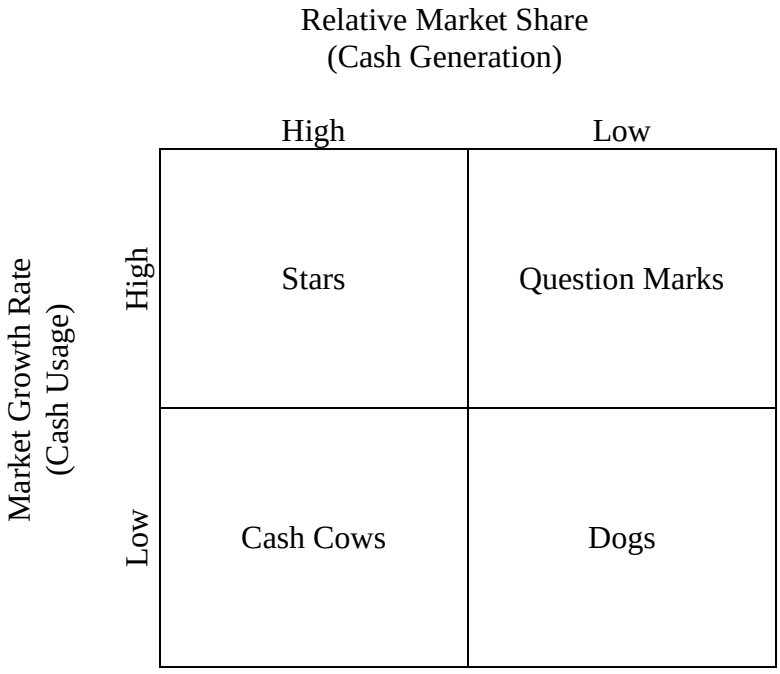


Figure 4 BCG Growth-Share Matrix (Vector Study, 2013)

Figure 4 shows strategies and cash flows in BGG Growth-Share Matrix. As we can see in the figure 4 the question marks characterize the position of DMU's high-growth market and a low relative market share. This quadrant describes the initial position of the enterprise market, as entrepreneurs are mainly interested in markets with high growth rates. In this

market, as a rule, there is a leader, so the enterprises entering this market belong to a small fraction of the market development of SBU. “Question mark” requires significant cash flow to keep up with the leaders and try to beat the competition.

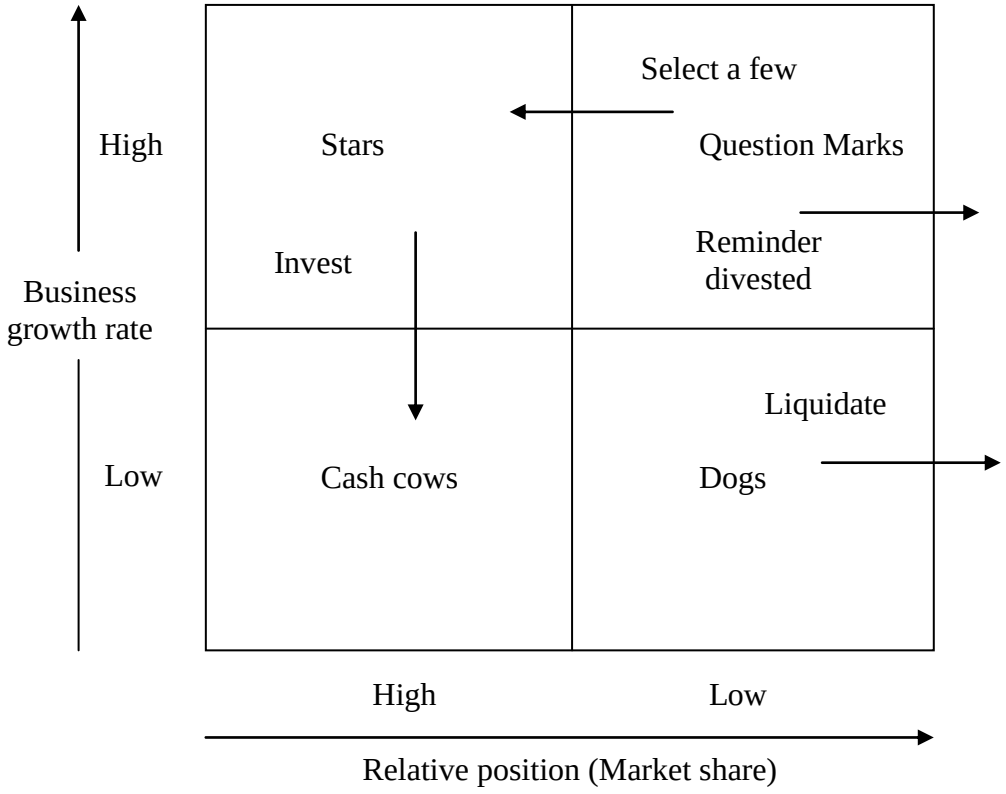


Figure 5. Strategies and cash flows in BGG Growth-Share Matrix (Stern and Stalk, 1998)

Develop strategies for SBU's quadrant " question marks " addresses the central dilemma: to invest heavily in the development of SBU's and turn into stars or stop the activity and direct resources to more promising areas of business. The result of solving this dilemma is the following:

1. Strategies for Growth (aggressive investment strategy provided a significant slope of experience that allows compete with companies that have low costs and a significant production expertise.

Analyzing the figure 5, the slope of experience related to the particularities of the enterprise and the stage of maturity of the market. The more knowledge-intensive industry -

the steeper the angle. The more mature market, the less likely a significant change in the total production capacity of a significant change in the direct costs of production.

2. Strategies for reducing the use, if the costs of expanding production capacity well above its own performance, and are characterized by a significant financial risk. Therefore, if the SBU will not be able to successfully pursue a strategy of rapid growth and win market share, it should stop its activities. Question marks should be reduced:

- If they do not support the required level of profitability, established by the company.

- If they are unprofitable and do not cover the costs associated with their existence in this quadrant.

- If there is a trend of moderate level of investment cash flows.

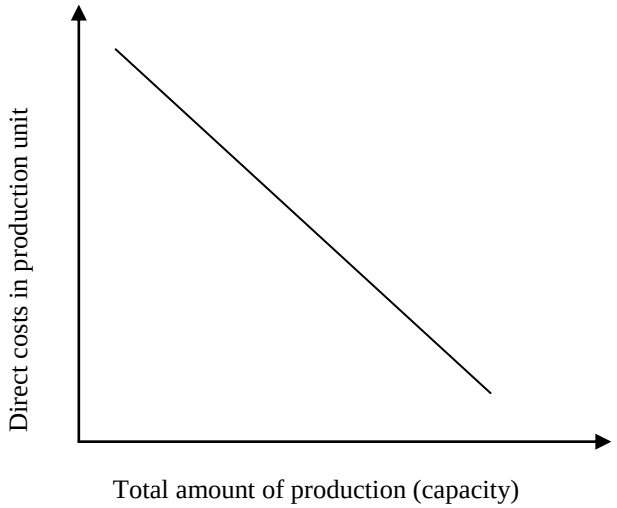


Figure 6 Experience Curve Effect in theory (Henderson, B.D., 1984)

Stars - it's SBU's, which are characterized by a high share of the fast-growing market. In this quadrant are located SBU's, which are aimed at the main efforts of the company. From these strategic components of the portfolio depends on the general condition of the company. Most often, the company quadrants are beginning to cover the costs associated with their development through economies of scale and production expertise. However, in general, companies located in the quadrant can be divided into:

Budding star - typically require significant investments that do not cover their own activities. These invaders are SBU's resources.

Emerging star - there is not so much due to the inflow of funds of their own, but rather because of the support of the parent's investment, especially in the context of slower growth.

Developed star - exist only for its own account and do not require additional investments, are gradually moving in the quadrant "cash cows ".

Undeveloped star - there exist mainly due to the parent company and in the absence of the trend towards further growth (Henderson, 1984).

In this case, the solution for beginners and developing stars are the growth strategies related to the investments and the increase in the share of the enterprise market. Developed stars have to apply the adjustment strategy, and sometimes reduce, in order to extend its life cycle in a quadrant and stimulate demand. Undeveloped Star, fainting, become question marks or dog, therefore, it is required the use of strategies to reduce and restructure (Ghemawat, 1985).

Cash cows - to the extent of saturation of demand and a slowdown in the market is gradually transformed into stars dairy cows, which are characterized by significant volumes of sales, higher profits at the expense of the stability of its leading position in the industry, safety, since the market with slowing the growth rate is not as attractive for new operators and surplus funds. The available surplus cash is the source of all areas of the current portfolio of strategic enterprises, as cash cows, as a rule, does not need to reinvest capital. The main efforts of enterprises should focus on maintaining the current status of dairy cows and the extension of their life cycle in this quadrant. Therefore, the main purpose of the strategic decisions in this quadrant is to strengthen and protect the market position of dairy cows during the period when they are able to generate high income. The main strategies for successful dairy cows are all kinds of competitive strategies, policies of stabilization and

growth. Sagging dairy cows, that go into the quadrant of dogs, is characterized by the use reduction strategies and restructuring (Henderson, 1984).

Dogs are called such SBU's, which have a low market share in slow-growing markets. These SBU's have weak growth prospects, significantly lagging behind the market leaders and will never be able to take a leading position at the expense of the experience curve effect, which limits the size of the profits that are not covered or barely covers the requirements for their content. Consequently, in most cases, SBU's quadrants are used strategy downsizing, restructuring or liquidation depending on the situation in the industry and restrictions on output. An exception might be a strong dog, investments which could lead to the displacement of its quadrant in dairy cows.

Thus, balanced portfolio company must contain:

1. Question marks that have the potential for significant growth in additional investment collapses;

2. Star, with its tendency to retain a high proportion in the rapidly growing market;

3. Cash cows, which are a source of strategic investment portfolio;

4. Dogs are not required, but sometimes their presence contributes to the successful development of the other quadrants of the strategic portfolio.

Benefits and drawbacks of using BCG Matrix in PPA approach: the main disadvantages of BCG Matrix:

1. An oversimplification of the situation. The model takes into account only two factors, however, high relative market share - is not the only factor in the success and rapid growth – is not the only indicator of the attractiveness of the market.

2. Failure to account for the financial aspect, the removal of dogs can result in higher costs of cows and stars, as well as a negative impact on the loyalty of customers using the product;

3. The assumption that the market share corresponding to earnings, this rule can be broken by bringing to market a new product with high investment costs;

4. The assumption that the market decline caused by the end of the product life cycle. There are other situations in the market, for example, ending the excessive demand or economic crisis.

Among the main advantages of BCG Matrix include:

1. Theoretical study of the relationship between financial income and analyzed parameters.

2. The objectivity of the analyzed parameters (relative market share and market growth rate).

3. Visualization of the results and ease of construction.

4. It allows you to combine the analysis of the portfolio with a model of product life cycle.

5. Simple and easy to understand.

6. Easy to develop a strategy for the SBU's and investment policies.

The merit of BCG Matrix is that it is by one key indicator of the environmental assessment (market growth) and external environment (market share) arranged them along the axis of the matrix, which allows you to organize the investment cash flows between the various SBU's.

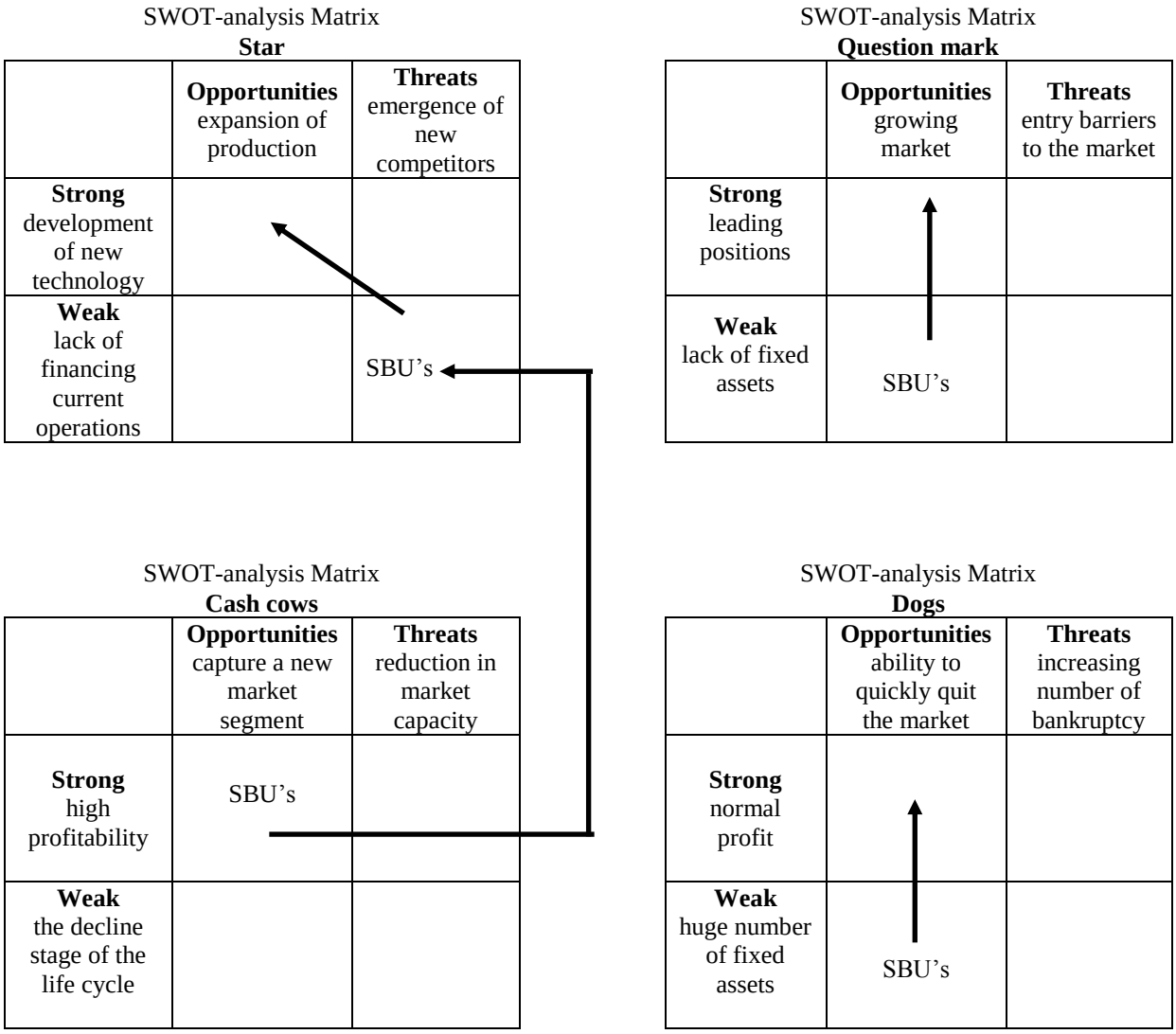
SWOT-analysis in PPA approach SWOT–analysis is a methodical approach to assess the strengths and weaknesses of the enterprise, opportunities and threats to the environment, in order to achieve long-term competitive advantages in the industry and extend its life cycle.

Based on the method of ball- based assessment of expert opinion this type of analysis can comprehensively assess the disparate quantitative and qualitative characteristics of the external and internal environment.

Conducting the SWOT-analysis is based on the filling of the control chart analysis of the strengths and weaknesses of the company, the threats and opportunities of the external environment. The main elements of the map are the indicators analyzed the leadership in the diagnostic process of external and internal environment of the enterprise. In this case, the threats and opportunities of the environment indicators expressed the enterprise, strengths and weaknesses - internal reserves of the company (Tang and Zhong, 2013).

Figure 7 shows the Cycle on investment cash flows in SWOT-analysis on SBU's. As you can see, investment flows are directed from dairy cows in the stars. To SBU's, which belong to the dogs and question marks are used investment flows go from weaknesses in the exiles by building assets (question marks), and the reduction of capital assets and income equalization (dogs). For stars are characterized by the infusion of investment in the expansion of production and operation.

The next stage of the SWOT f–analysis is a compilation of SWOT–matrix, which in strategic management takes on a somewhat broader meaning and is used not only to identify combinations of strengths and opportunities, threats and opportunities, but also helps to identify synergy effects, the most effective use of available reserves of the enterprise development and the industry as a whole.



SWOT – Strong Weak Opportunity Threats
SBU – Strategic Business Unit

Figure 7 Cycle on investment cash flows in SWOT-analysis on SBU's (Drawn by author based on Tang and Zhong, 2013)

Thus, the company conducted SWOT–analysis in addition to decisions on strengthening the capabilities and strengths and threats and weaknesses allows you to use targeted investment cash flows and accurately predetermines the development of strategic options as a separate SBU, and enterprise sector as a whole. This kind of the SWOT–analysis is an essential part of strategy prior to the construction of a more detailed profile of a competitive enterprise, enabling a comparative analysis of the company with its closest competitors.

Financial analysis theory

Analysis of financial stability in economic literature, stability is presented like organization's ability to maintain business in the long run and drive, without no significant impact and a significant loss in activities. Assessment of the financial stability of the enterprise implies the use of the income, balance sheet and other financial items.

The equity ratio is a financial ratio indicating the proportion of equity used to finance the company's assets. These two components are often taken out of the company balance sheet or statement of financial position (the so-called book value), but the ratio can also be calculated at market value for both, if the company's shares are traded on the open market.

$$\text{Equity ratio} = \frac{\text{Total Equity}}{\text{Total Assets}} \tag{2.3}$$

Measure the effectiveness of the company leverage is calculated by the proportion of total liabilities and total equity. This indicator shows the proportion of equity and debt used to finance the company assets.

$$\text{Debt to Equity ratio} = \frac{\text{Total Liabilities}}{\text{Total Equity}} \tag{2.4}$$

Indicator of financial leverage is designed to assess the percentage change in net income of the company, which has a one percent change in operating income (Blazenko and George, 1996).

$$\text{Leverage ratio} = \frac{\text{Total Assets}}{\text{Total Equity}} \tag{2.5}$$

Capitalization ratio shows a comparison of total debt to total capitalization companies as capital structure. Capitalization ratio reflects the degree to which the company can use to equity.

Capitalization rate is found in the literature as the coefficient of financial leverage. This figure clearly shows investors about the extent to which the company is using its capital to support its operations and growth. This ratio is used to assess the risk of the enterprise. Company with a high degree of capitalization is considered risky because it is at risk of insolvency if it is unable to repay existing debts on time. For companies with a high degree of capitalization is very difficult to count on getting more credit in the future.

$$\text{Capitalization ratio} = \frac{\text{Long-term debt}}{\text{Long-term debt+Total Equity}} \tag{2.5}$$

Thus, the analysis of financial stability is an important element in the analysis of the effectiveness of both enterprises and seaports. It is thanks to this analysis we can draw conclusions about its own debt, capital structure.

Profitability analysis operating margin operating Income Margin, Operating profit margin or Return on sales (ROS) (Williams and Haka, 2008).

$$\text{ROS} = \frac{\text{Operating Income}}{\text{Total Revenue}} \tag{2.7}$$

Operating income is the difference between operating income and operating costs of the company, but is also sometimes used as a synonym for EBIT and operating profits. This statement is acceptable if the company does not have non-operating income.

Return on equity (ROE) shows the rate of return on the share of the total equity capital of the enterprise. Indicator shows the degree of efficiency of the company at a profit on each unit of equity. The economic literature is often used indicators such as net assets or assets minus liabilities. ROE shows how well a company uses investment funds to generate earnings growth (Angelico and Nikbakht, 2000).

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder's Equity}} \tag{2.8}$$

The return on assets (ROA) percentage shows how profitable a company's assets are in generating revenue (Crosson, Belverd and Needles, 2008).

ROA could be valued as:

$$\text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}} \tag{2.9}$$

This figure says that the company is able to operate with capital that it has, that is, how much currency revenue it receives from each invested asset is determined in the currency. This index is effective for comparing competing companies operating in the same industry. Index value will vary widely across different industries. Return on assets gives an almost complete picture of asset-intensive industries, which depend on the industry, the enterprise, require a large initial investment.

Return on net assets (RONA) is an indicator of financial performance of a company and the extent of its financial performance. The high value of RONA means that the company uses its assets and working capital efficiently.

$$\text{RONA} = \frac{\text{Net Income}}{\text{Fixed Assets+Working Capital}} \tag{2.10}$$

Consequently, the cost-benefit analysis shows how profitable are the ports in its activities. That is how much money unit's net profit brings each monetary unit invested in the cost of, capital, and assets.

Liquidity analysis current ratio represents the ratio of financial performance measures and indicators to measure whether the company has or not resources to pay its own debts over the next 12 months. Ratio compares the current assets of the company and its current liabilities. The indicator is expressed as follows (Angelico and Nikbakht, 2000):

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} \tag{2.11}$$

Current ratio indicates the market liquidity of the company and of the ability to meet the demands made by the creditors of the enterprise. Valid data for this factor depends on the industry, as a rule, the value can be of 1,5 to 3 for many brunches. If the current ratio of the enterprise is within this value, it usually indicates a good short-term financial strength of the company itself. When current liabilities exceed current assets, at which current ratio is lower than 1, then the company may have problems meeting its short-term obligations. If the current ratio is too high, then the company cannot effectively use their assets and short-term means of financing. This fact may also indicate problems in working capital management.

Activity analysis Asset turnover is the coefficient of financial activity that characterizes the efficiency of the company of its assets in the formation of sales revenue or income (Bodie, Kane and Marcus, 2004).

$$\text{Assets turnover} = \frac{\text{Net Sales Revenue}}{\text{Total Assets}} \tag{2.12}$$

Financial coefficient of which characterizes the company's debts is a financial indicator that shows what percentage of the company’s assets is provided through debt. This is a ratio of total debt as current liabilities and long-term commitment, and its total assets as the sum of current assets, fixed assets and other assets (Williams and Haka 2008).

$$\text{Debt ration} = \frac{\text{Total Liability}}{\text{Total Assets}} \tag{2.13}$$

The ratio of Long-term Debt to equity:

$$\text{LT Debt to equity} = \frac{\text{Long-term debt}}{\text{Total Assets}} \tag{2.14}$$

The higher ratio is, the more risk is associated with the activities of the enterprise. Moreover, the high level of debt to assets ratio may indicate low borrowing capacity of the enterprise which in turn will reduce the financial flexibility and stability of the company. As

with all financial ratios, the debt ratio should be analyzed in the enterprise compared to industries in the middle or with other competing companies.

Appropriateness of the use of methods and measurements for research questions

Evaluating the effectiveness of sea ports begins with the individual metrics for each functional or operational level. The measure of performance is presented numerically quantifying one or more attributes of an object, product, process, or any other relevant factor and should allow for the comparison and evaluation of the performance criteria. Performance measure may fall within one or a combination of the three main categories, namely input measures (time, cost and resources), output measures (production, capacity, profit) and composite indicators (productivity, efficiency, profitability, use performance). The last figure is usually presented in the form of output / input ratios, in order to maximize the first and / or minimize the last one (Wheelwright, 1978).

In the literature, analysis of seaports, the lack of uniformity that is standard industry practice was moved from port to measure the performance and effectiveness of the use of dimensions for measuring the efficiency, although financial and utilization metrics are commonly used in trade. The effectiveness of the measure can be loosely defined as the ratio of the actual output value of the actual volume of the input (Brooks and Cullinane, 2007).

Financial results of the analysis of the effectiveness of marine ports are used for management accounting in a systems approach, similar to that for physical performance, but the difference is in the use of units of currency values for the input and output parameters.

In addition, the financial evaluation of the efficiency of seaports is always determined by income and costs. In the field of development of sea port, the financial indicators are widely used, and almost all the ports publish their financial reports as public information for public use. Among the most encountered financial indicators to analyze the effectiveness of sea ports include return on investment, capital structure, return on assets, and short-term

liquidity. Usually used financial indicators may not be appropriate for the analysis of the efficiency of seaports, and they cannot be linked to the overall performance and efficient use of resources (Brooks and Cullinane, 2007).

Also, it should be noted that short-term profitability of the seaport is often not consistent with the goals of its long-term investment. Consequently, the physical performances are considered more reliable in the analysis of the efficiency of ports, but the financial indicators are needed in comparing these ports, harbors, competitors. They answer the efficiency of not only physical resources, but also money.

Some studies applying the BCG matrix for measuring seaport competition and effectiveness are founded in economic literature. Chul-hwan Han showed the dynamic change of container ports' competitive position during recent years using two empirical methodologies, Portfolio Analysis (BCG Matrix) and the Total Shift Analysis. Thus, he estimated the competitive position of Asian container ports using a dynamic portfolio analysis, and total shift analysis. Haezndock also used and developed the BCG matrix for measuring the strategic positioning of the seaport industry (Haezendonck, Verbeke, and Coeck. 2006).

Therefore, BCG matrix can be used in the marine industry for the industry portfolio analysis of not only the activities of sea ports, but also to compare the two sampled ports in this thesis.

Based on the analysis of many economists, in thesis work I also used the BCG matrix for the characterization of portfolio analysis of sea ports of Russia. Also, the analysis corresponds to a question thesis by comparing these ports.

Comparison of sea ports, on their core activities and the underlying data, which are included in turnover. Therefore, the use of BCG matrix is relevant for the purposes of the thesis.

As for SWOT-analysis, its use is always a positive influence on the development strategy of any company. However, this method is analytical and does not give a clear answer to the question of development. BCG matrix may also fulfill the task, highlighting the strengths and weaknesses of the activities of sea ports. Using SWOT-analysis positively influences the choice of strategy for the ports, but this method is ineffective when analyzing the performance of seaports, because it is the nature of recommendation, rather than specific prescriptions for action. Therefore, BCG matrix will serve as an analytical matrix in the thesis.

It should be noted that all methods of evaluating the effectiveness of sea ports and container terminals are relevant and are suitable for use in a research paper. Although to analyze the efficiency of seaports, in current thesis was chosen method PPM. The reason for this choice is that it is less complicated than all the above introduced theoretical aspects, but also requires less data in the analysis, which is quite hard to find in terms of confidentiality of the Russian ports, and will be further explained in Chapter "Case Russian Sea Ports" in this thesis. Also, when comparing the two selected seaports the PPM approach fits much better than the DEA analysis, which requires a sufficient array of data. Despite some inaccuracies for the PPM method, it still is one of the most effective methods of assessment, as shown in Rico Merkert work (Rico Merkert, Romano Pagliari, 2010). That in the basis of the use proposed approaches in the thesis when analysis benchmarking of Russian seaports.

Conclusion on theoretical aspects

Thus, in the theoretical section were analyzed using benchmarking in analyzing the effectiveness of marine ports and container terminals, the main types of benchmarking, and also features of container ports benchmarking. The analysis of methods overview showed that the most frequent approaches include: DEA analysis, the PPM approach, SFA approach. All

of them meet the goals of the thesis, but some cannot be used to analyze the selected seaports because of their disadvantages. To identify the key performance parameters of seaports author of the thesis uses a portfolio analysis using the BCG Matrix. For completeness scores were analyzed by the theoretical foundations of the financial analysis and the analysis of marine ports productivity (see Chapter “Discussions” in this thesis). The results obtained from this type of evaluation of efficiency (effectiveness) will help to identify the main factors that drive the development of sea ports and identify future trends in their performance.

RESEARCH METHODOLOGY

Research is a process of collecting, analyzing and interpreting information to answer questions. But to qualify as research, the process must have certain characteristics: it must be controlled, rigorous, systematic, valid and verifiable, empirical and critical. This study adopts a qualitative approach to fulfill its desire; means to answer the research questions. As the first step a literature review has done in order to clarify the measures and factors which determine a seaport competitive position. Further, reviewed literature on ports benchmarking helped the researcher to draw a line between port competitive and benchmarking factors.

As the second step, in order to apply and study the benchmarking and competition factors on ports cases, this study has selected 2 main ports in Russia: Nakhodka and Vladivostok. As this research is limited its objective on the port financial analysis (as one the benchmarking tool), therefore, financial and economical data of the aforementioned ports has collected in order to conduct the analysis.

Competition in maritime ports is laying on the several services they offer to their customers. Investigating and studying the factors that help a port to offer better services than its competitor can be traced in the benchmarking theories. Financial and comparative analysis of the efficiency of seaports revealed a number of criteria by which to compare these ports performances. The analysis also highlights the important financial factors which shipping companies can apply in selecting a port.

Literature review introduces the main influential factors in selecting sea ports as follows: availability seaports, the cost of services for vessels calling at the port, the stability and quality of the infrastructure of the port itself, the flexibility of customs policy (Kreukels, and Wever, 1998). Kreukels, and Wever (1998) advocate that benchmarking is more accurate and efficient when chosen ports are situated in the same area and have similar features.

Nakhodka and Vladivostok are situated in the Sea of Japan, in Nakhodka Bay and Amur Bay (see map in Appendix IV). It should be noted that the ports of Nakhodka and Vladivostok are similar both in terms of cargo turnover, number of berths for vessels entering, cost-effectiveness, productivity and economic development (Ministry of maritime transport of Russia, 2013).

Research design of the thesis issues

In the context of globalization, customers are demanding better services and ports are competing in having more competitive advantages. Therefore, ports need to fundamentally apply new business approaches to ensure their competitiveness measures. To do so, there is a need to conduct an in-depth study of the ports and container terminals efficiency and benchmarking factors. Figure 8 graphs the research design of benchmarking analysis in Nakhodka and Vladivostok ports.

Generally, benchmarking in ports and container terminals in the literature is considered as one of the competitiveness components. That competitiveness of ports is a condition that:

1) Ensures financial balance, stability, solvency and liquidity seaports and terminals in the long run;

2) Meet the needs of seaports and terminals in financial resources for sustainable enterprise expanded reproduction;

3) Provide sufficient financial independence of seaports and terminals;

4) Is able to withstand the current and emerging threats and threats, trying to inflict financial damage seaports and terminals;

5) Provide sufficient flexibility in making strategic decisions.

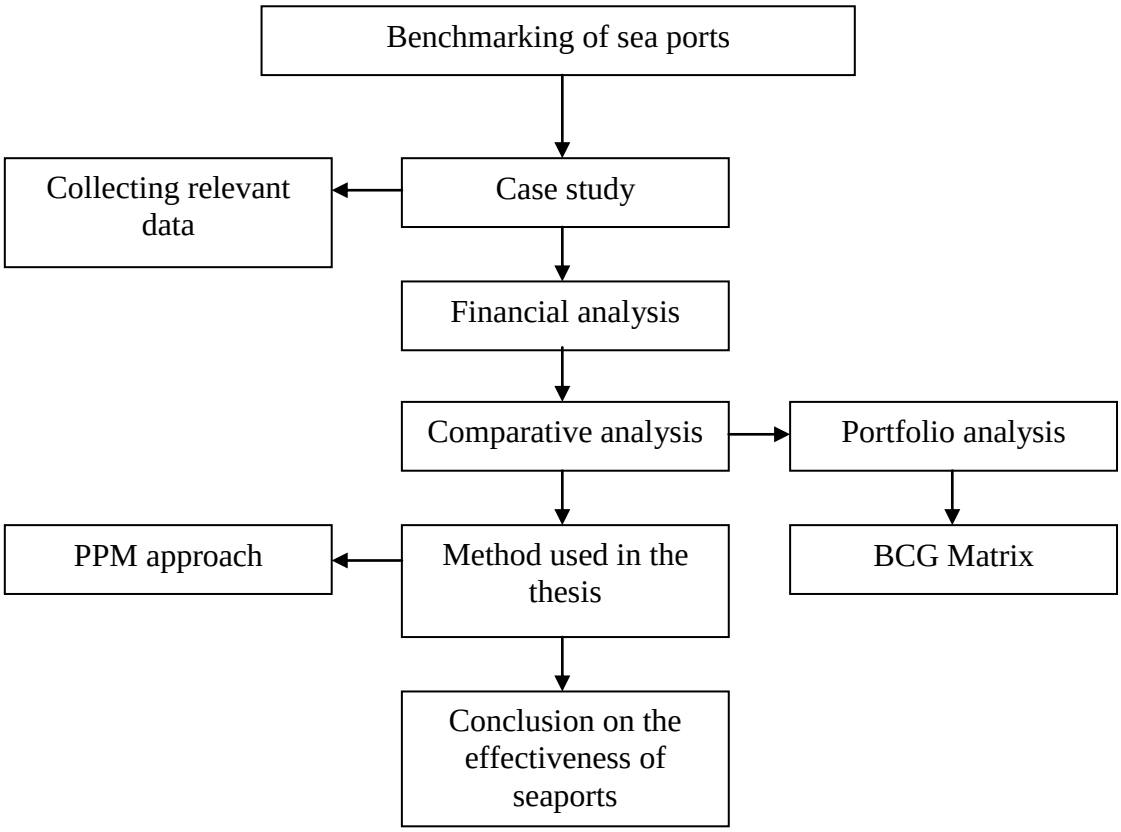


Figure 8 The process of benchmarking of Nakhodka and Vladivostok ports (Source: drawn by author)

According to Figure 8, benchmarking of sea ports method collects relevant data of Nakhodka and Vladivostok ports. The data are collected from multiple sources over the past few years. The following important step is financial analysis of seaports. It will identify the strengths and weaknesses of each seaport's performance and factors affecting the effectiveness.

Benchmarking in its basis involves the use of comparative analysis for seaports. This adopts a portfolio analysis; BCG Matrix. Comparative analysis of seaports leads to a reasonable use of PPM approach for evaluating the effectiveness of seaports which are compared by the selected criteria and indicators. Therefore, benchmarking of sea ports ends with the conclusion of the best of the analyzed seaports in terms of performance and effectiveness.

Method description

Case study is generally used where there is a need to understand complex matter, process or facility. Moreover, the use of case study adds to the analytical study of the situation that already exists. A concrete example in this study emphasizes the need for a detailed analysis of the limited amount of data and conditions. It should be noted that many scientists and economists use the case study method as a reliable method of analysis for many years in various disciplines: mathematical programming, strategic planning, and competitive analysis.

As it known from the literature, the scientist Robert K. Yin defines a case study as a method of empirical research that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not obvious, and in which multiple sources of evidence are used (Yin, 1984).

The following stages of the case study method are used in this study:

- Collection and analysis of data to the important case study;
- Data collection in the subject area ;
- Analysis and evaluation of the data collected in the method of case study;
- Preparation of findings and research results.

Case study method is inherently difficult, as it usually contains the analysis of multiple sources of data of different nature and level. The main reason for choosing case study in this study is the applicability in real life with real examples. Finally, this study applied case study, due to another advantage of this method, means; availability of the results to public.

Reliability and validity of the method used

During the analysis, in thesis work were used the tools to collect important data. They are designed for the systematic and proper use during the research and evidence. Stage design is intended to be able to make sure that research is built well thought out and has a clear structure. This step is used to ensure internal validity, external validity and reliability studies selected for the thesis. Basic is internal validity. From a scientific point of view, this process can be explained as follows: when the existing certain conditions lead to other conditions and require the use of several sound evidence from different sources.

It should be noted that the external validity reflects a situation where the results of the study are collected outside of the ordinary and immediate events or phenomena. That is, the greater the differences in the data sources for the study, and thus their use reflects the same results, the greater the degree of external validity of the results of research thesis. More clearly can be traced to the external validity of such methods as cross-examination of the case and in some studies (Susan, 2006). Reliability of results of research in the research paper is that the procedures used are well known and they can be repeated with the same results again (Yin, 1984).

Evaluation of sea ports effectiveness

Objective and reliable assessment of the control object is an essential element of any management system, which largely determines its capacity and efficiency. Due highly dynamic foreign markets, and increased risk of international business the system of performance management ports and terminals is of particular importance.

Analysis of existing literature in modern theoretical approaches to evaluating the effectiveness of seaports and terminals gives rise to a classification into two main groups: analytical and graphical.

For status are shown in figure 9 methods for evaluating efficiency of seaports and container terminals are scientific, they are advisory and not binding for their application.

Rating of seaports evaluation are based on the definition of indicators to measure economic performance and their standardization (reduction to the relative scale and weight of individual indicators), calculating a single integral index - rating assessment of ports and container terminals, the distribution of ports and container terminals biggest rating and determine its location (status) within a scope or market.

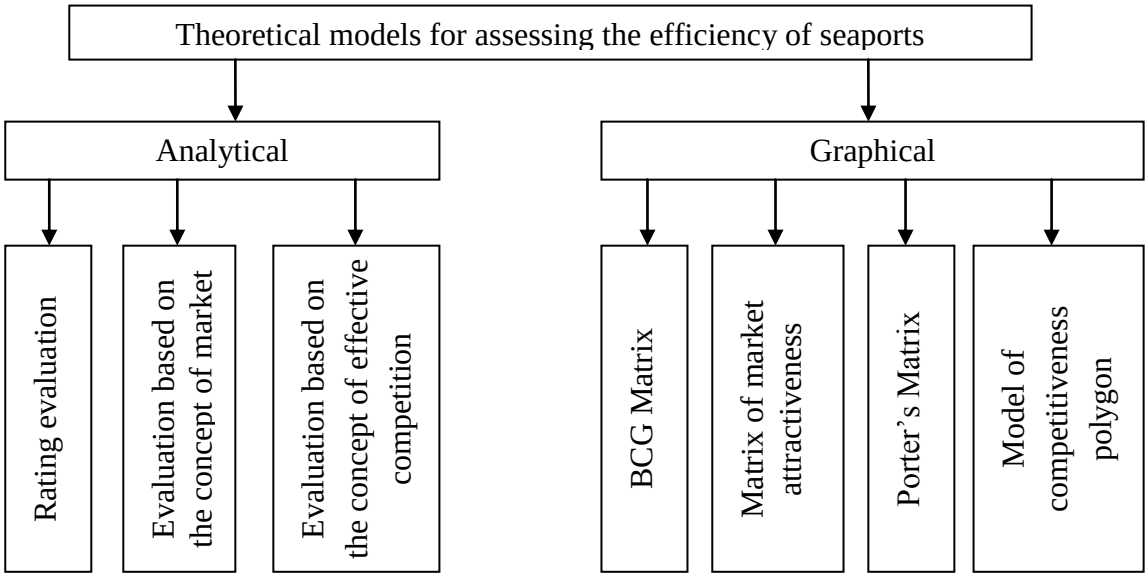


Figure 9 Methods for assessing the efficiency of seaports and container terminals (Source: made by author)

All matrix and strategic methods have their advantages and disadvantages. Indicator methods directly evaluate the efficiency of ports and container terminals with other seaports in the industry. The purpose of strategic analysis seaports and container terminals is to identify positive and negative factors that can influence the formation and development of effective elements in a competitive environment. Through strategic analysis may find those ways of ports and container terminals that will improve their performance.

Forming resource development business marketing strategy has significant features that are associated with sector characteristics and sector affiliation. The nature and direction of scientific and technological progress in each area according to the study is influenced by two major factors: the features of the market (including the requirements of consumers) and springs technologies, the ability of developers to assign the effects of new technology on its own use.

Gathering relevant data

As widely known, most of the sea ports usually publish detailed statistics of traffic and freight traffic, as well as information can be obtained from the annual financial statements, which are common costs, operating costs, labor costs and depreciation. Moreover, in these annual financial statements are presented data about employees in the administration of maritime ports.

Regarding the availability of separate financial information for every sea port, which were analyzed in the thesis work, it has been obtained by direct appeal to the sea ports. These requirements are more complicated when doing benchmarking between the two ports, which are in the same area and are the closest competitors. In addition to data traffic, which is usually available at the individual level, the seaport, financial and employee data by individual seaport may be more difficult to obtain. Some Russian ports do not publish detailed information about some of their individual units, container terminals, and so on.

Data on personnel, capital expenditures, revenues and profits are available. It would mean that the ports have an internal accounting system, where more detailed information about costs can be obtained (Merkert and Pagliari, 2010).

Performance is most appropriate to define as a combined result of the use of resources and the required efficiency. Resource use measures against output power, usually expressed

as a percentage. Performance of the asset can be increased by increasing the use of or by increasing the efficiency (Improving marine container terminal productivity, 2008).

Table 3 Sources to collect relevant data for the measurement sea ports productivity (Cargo Handling Cooperative Program, 2010)

Available port data	Source
Always available	
Berth depth, Berth length, Berths, Cranes & types, Gross acres, Port TEU, Revenue, Profit, Assets, Liabilities, Labor	Port, Directories
Vessel calls	BTS
Sometimes available	
Average crane moves per hour	Port
Rail acres	Port, Directories
TEU slots	Port, Terminals
Estimated	
Vessel TEU	TEU relationship
Vessel length	Length relationship
Average dwell time, Berth capacity, Crane capacity	Benchmarks, Assumptions
Profitability, Revenue generating capability, Cost efficiency, Labor productivity	
Confidential data	
Costs, Man-hours, Vessel turn time, Rates, Working crane hours	Modeling

BTS – Bureau of Transportation Statistics
TEU – twenty-foot equivalent unit

Evidence performance measures can be made from several different sources. As shown in the Table 3, it indicates the most necessary data is received from the published catalogs of ports or port and fall into four groups depending on the relative availability.

1. Elements of the data and information that is almost always available from seaports, public directories, or public and private organizations, such as the Bureau of Transportation Statistics (BTS), World Economic Forum (WEF).

2. The data elements that is often, but not always is available. Important information for analysis is often confidential.

3. Data that should normally be evaluated. These are usually not collected or calculated, but may be helpful in understanding the performance of seaports.

4. Work-related costs. Generally, the data are confidential and rarely made public.

As Table 3 shows, most of the necessary data for the analysis of sea ports, port published in catalogs and reports. Many seaports publish information about their activities for universal accessibility. But very often sea ports do not provide important information for the analysis; it makes it impossible for reliable analysis of their performance and effectiveness.

For the analysis in the thesis work used data obtained by direct e-mail marketing appeal to the hotel and financial planning seaports. Thus, important information was collected for comparative analysis of seaports. Analysis of the data indicates that the original data can be divided into four groups according to their relative availability.

1. The data are always available. These data are almost always available from public directories or government agencies such as the Bureau of Transportation Statistics (BTS), or Federal Agency for Marine and River Transport (Federal Agency of Maritime and River Transport).

2. The data are sometimes available. These data are often, but not always available in a wide access. Important in the analysis of the effectiveness of marine ports.

3. Calculated data. These data are usually calculated and they are important to evaluate the performance and efficiency of seaports. Moreover , depending on the method used in the study are taken into consideration various design data .

4 . Confidential data. These data are related , usually confidential and rarely available outside seaports information (Improving marine container terminal productivity,2010).

Conclusion on research methodology

Thus, the chosen method of analysis by the author of the thesis has a lot of advantages for using, despite the difficulties in collecting data and the accuracy of their estimates. Case study aims to find answers to the questions posed at the beginning of the thesis. This method

is intended to assist in evaluating the effectiveness of maritime ports, as well as choosing a more efficient and productive out of it.

Almost all the available data for analysis was only in Russian language. Maybe it was a reason why it is difficult to find similar works about benchmarking of Russian ports. Due to this research work, it becomes possible to make benchmarking between Russian and ports from other countries.

Case Russian sea ports

Description of Russian sea ports and their container terminals

My review of the economic literature, data sources, Internet resources, online libraries revealed that in Russia there are 63 commercial sea ports, which are located in five offshore basins, and 12 are located on the Seas (Federal Agency of Maritime and River Transport, 2013). The main role of seaports of the Russian Federation is the export-import operations, inland transportation. It's vital to use sea ports in economic system, because they are one of the most important parts of transportation and delivering.

An important observation of the analysis is the fact that the greatest turnover accounted for the ports of the Black Sea, and in the present structure of exports are oil, metals, coal, building materials, wood. Structure of imports includes machinery and equipment, grain, sugar, food, pipes for pipelines.

Baltic Sea region of the Russian Federation is used for the export of oil, timber, metals and machinery imported into the country, industrial and consumer goods. Far pool provides transportation within the country and export-import transportation. Through the sea ports of the Far East take out coal, oil, fish, timber, food, imported metals, equipment, and machinery. North Basin is a region of rapid growth of maritime transport, where an important role is played by the Northern Sea Route. The export structure is dominated by non-ferrous metal ores, coal, petroleum, timber, equipment (Vinokuro., Glushkov, 2008).

Seaports occupy an important place in the transport infrastructure of Russia through which provided much of the handling of export, import and transit of goods, and the delivery of fuel and supplies to the Far North. Russia has a powerful seaport potential. The total length of wharfage in the ports is about 100 km. Ports employ more than 1,000 cranes, several thousand units of various cargo handling equipment. Technical capabilities allow

transshipment facilities handle about 10,000 cars per day, storage area in the ports can provide a lump-sum deposit of 15 million tons of cargo (Nakhodka Commercial Sea Port, 2012).

Russian ports until the year 2015 will increase their cargo throughput and reach 774 million tons. This is achieved by increasing the production capacity of Russian seaports to 454,0 million tons, including the handling of crude oil and petroleum products - by 96,0 million tons, liquefied gas - about 43 million tons, coal - 78 million tons, general cargo - at 216,3 million tons, of which containerized cargo - by 156 million tons.

During the period of strong economic growth that began in 2001, thanks to the developed countries and the countries of East Asia, the volume of world trade flows increased (Nakhodka Commercial Sea Port, 2012).

The growth of world trade between Europe and Asia contributes to transit through the territory of Russia. In this case, the existing system of international transport corridors passing through the territory of the Russian Federation, and their arrangement does not allow the full use of domestic transportation routes for international transcontinental connections. Transit through the territory of Russia is less than 1% of the trade between Europe and Asia (estimated to be used for about 5 - 7% of the transit potential of the country), largely due to imbalances in the development of different modes of transport (Ministry of maritime transport of Russia, 2013).

Nakhodka sea port

In the transport infrastructure of the Russian Federation important are ports through which the transportation is provided by most of the export, import and transit of goods, and

the delivery of fuel and supplies to the Far North. The Russian Federation has a strong seaport potential.

The "Nakhodka Commercial Sea Port" (OJSC "NCSP" enterprise "Evraz Group") is one of the largest in Russia and one of the four leading ports in the Far East. Nakhodka sea port is able to deliver at its moorings at the same time two dozen ships and handle in a year, more than 1500 large marine transports. Port Nakhodka has eighteen cargo berths, two passengers and one jetty port fleet. The total length of berths is 3.3 km away.

Nakhodka sea port operates in the sector of maritime transport. Nakhodka port specializes in handling general cargo (metal), timber and bulk cargo and containers. Since a large share of the cargo throughput of the port Nakhodka is occupied in metals, it depends on the activity of plants for the production, as well as world prices for metallurgical products. Also it is of great importance in the activity of playing the tariff policy of the Ministry of Transport and Russian Railways.

In recent years, the main focus of port services Nakhodka is an overload of foreign goods. This specialization is highly undesirable for society, as it increases the risk of falling in the future, with a decrease for steel products in demand. The main risk for the Nakhodka sea port is a possible drop in the ferrous metals market in countries in connection with which the port vacant warehouse space that can be designed to attract additional volume of forest products, as well as the raw materials needed in the steel industry. Due to the fall of the market in forest products in Japan (the main buyer countries) associated with an increase in duties on round wood, port Nakhodka increases the volume of transshipment of bulk exports, ferrous and non-ferrous metals.

Overall, the world economic situation increases the traffic through the ports of the Far East, including Nakhodka sea port. Countries continue to actively continue to buy Russian commodities. The growing demand clearly shows port statistics for 2011 - the share of cargo

handling Russian Far East ports increased by 6.7%, exceeding the growth of the North-Western and Southern basins (Nakhodka Commercial Sea Port, 2012).

Also one of the main factors of influence on the turnover of the Nakhodka sea port in 2011 is the insufficient capacity of the port railway stations. In the face of rising freight ports of the Far East, which in 2011 was 28%, reaching a volume of 125.3 million tons, as well as the commissioning of specialized Koz'mino sea port, which is the end point of the oil transportation system "Eastern Siberia - Pacific Ocean" (ESPO) - is becoming a serious deterrent. Throughput of Koz'mino sea port in 2011 amounted to more than 15,199 million tons. Transportation of export cargo in this area is a priority for the state, in this connection, the other stevedoring companies were unable to meet the demands of customers and reach the planned volumes. Railway stations are not able to provide timely filing and cleaning of empty cars, cannot cope with the increased shunting and may not arrive in time to take the train. As a result, in 2011 JSC "Russian Railways" was forced to deny the ports of the Far Eastern basin, including those of Nakhodka sea port declared by shippers to transport volumes, which in turn led to a decline in cargo handling (Nakhodka Commercial Sea Port, 2012)..

Nakhodka sea port has in the structure unit - container terminal. The need for such a unit due to the fact that conventional general cargo port quite intensively container – 5-7% per year to save the cargo port of the decision on the allocation of such a structure (Nakhodka Commercial Sea Port (Processing of large containers. 2012).

The water area of the port consists of internal and external raids. The depth of the fairway leading to the port, is 10-13 meters, cargo berths can accommodate vessels with a deadweight of 35-40 tons. In the winter time the seawater is non-freezing, thus bay can handle vessels all year round (Nakhodka Commercial Sea Port. Processing of large containers, 2012).

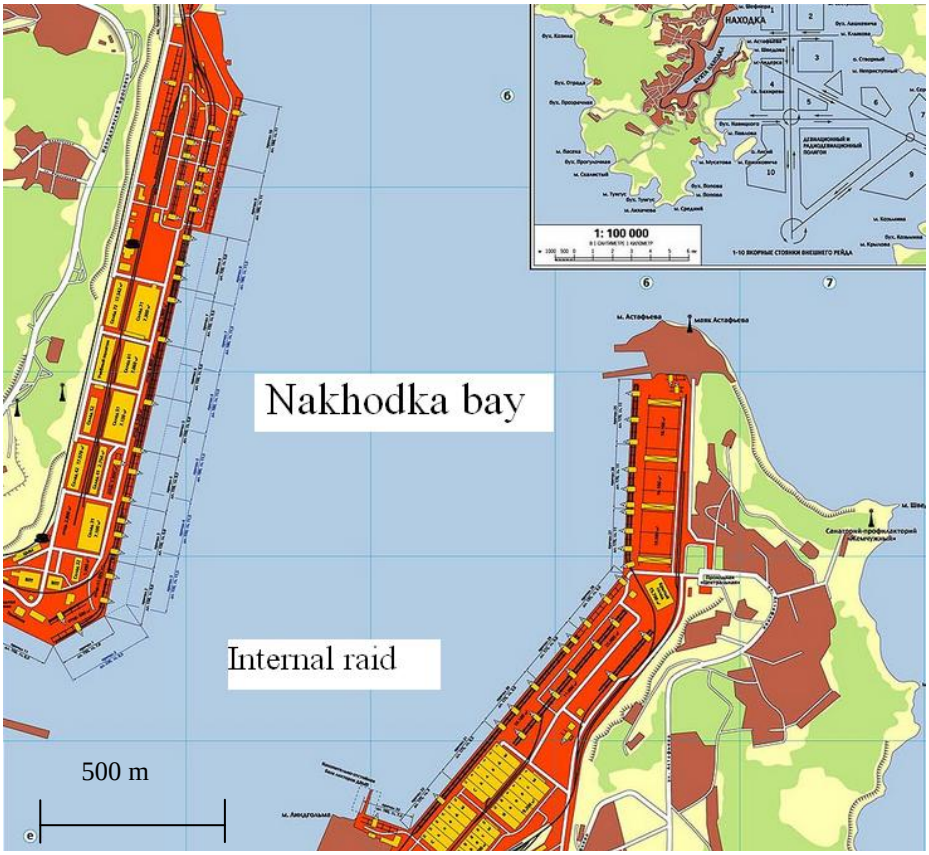


Figure 10 Scheme of Nakhodka sea port in 2011 (Unified state system of information on the world's oceans, 2012)

Table 4 The main technical characteristics of Nakhodka sea port in 2011
(Federal State Unitary Enterprise Rosmortport, 2013)

Indicators	Value
The area of the seaport	284,24 hectares
The water area of the seaport	127,45 square km
Number of berths	108
Length of waterfront	16810,35 meters
The capacity of cargo terminals, incl.:	26472,25 thousand tons per year
- liquid	7360 thousand tons per year
- dry	13694,97 thousand tons per year
- containers	458,94 thousand TEU's per year
The maximum dimensions of vessels in seaport:	
- draft	11,5 meters
- length	245 meters
- width	44 meters
Area of warehouses	316,13 thousand square meters
Open storage area	481,83 thousand square meters

In fact, such is the gateway Nakhodka Commercial Sea Port. The port is connected to a point of the Eurasian continent, the Trans-Siberian railway line and plays an important role

in the transportation system serving the freight Asia-Europe and Asia. More than 40 regular lines connect Nakhodka sea port in the world. Motorway port is connected to the airport Vladivostok, located 130 km, which is soon to become an international in the near future, due to the construction start of an international airport in the vicinity of Nakhodka (Nakhodka Commercial Sea Port, 2012).

The table 4.1 shows the main technical characteristics of the sea port of Nakhodka in 2011. Seaport area is 284,24 hectares, an area seaport - 127,45 square km. It is important to note that the capacity of the cargo terminal is 7360 thousand tons per year of liquid cargo; 13694,97 thousand tons per year of dry goods; 458,94 thousand TEU's per year among the containers.

The analyzed the technical parameters of Nakhodka sea port gave the opportunity to present its size, power and performance. The figure shows a diagram of the sea port of Nakhodka in berths, terminals. Nakhodka Bay separates the two major sea port terminals that can accept not only dry, bulk cargo and containers and cargo. Also, the sea port of Nakhodka include passenger terminals, taking 174,000 passengers a year (Federal State Unitary Enterprise Rosmortport, 2009).

After analyzing the characteristics of Nakhodka sea port, let's consider its key financial indicators for the 2009-2011 years. Sea Port has been operating in a competitive environment, so the financial analysis is important for the prospects of enhancing the effectiveness of the sea port of Nakhodka in the near future.

Table 4 presents the main financial activities showed the Nakhodka sea port, which have been translated into Norwegian kroner at the Norwegian interbank average exchange rate of the bank in 2009-2011 (Norges Bank, 2013). Author believes that in this thesis is useful to use one currency as Norwegian Krone, and to examine all changes. For instance, it’s very good for comparison with Norwegian ports, which estimate their financial results in

native currency. Inflation does not impact on current thesis results, as both ports currency were changed, using the same data. Also during benchmarking analysis is important to analyze one port with another, in the same year, which means that change of currency did not impact in any way on benchmarking results. Author of this thesis used original reports of Russian ports Nakhodka and Vladivostok and converted results into Norwegian Krone by currency exchange rate in corresponding analyzing year.

Table 5. Comparative analysis of key financial results of Nakhodka sea port (1000 NOK) (Nakhodka Commercial Sea Port, 2012)

Figures	2009	2010	2011
Total operating revenues	520849,84	456768,66	441560,86
Total operating costs	277241,59	290482,08	305898,39
Operating profit	243608,24	166286,58	135662,48
Net financial costs	30267,38	32648,74	-30008,69
Ordinary profit	213340,86	133637,84	165671,16
Profit for the year	167470,44	99069,32	135472,81

As we could examine, it's very comfortable to convert into national currency on Norway for further analysis. And currency exchange rate will give more accurate results for the main study of this thesis.

Table 4 shows the main components of the port of Nakhodka assets in 2009-2011.

Table 6 Comparative analysis of major asset classes of balance sheet of Nakhodka sea port (1000 NOK) (Nakhodka Commercial Sea Port, 2012)

Figures	2009	2010	2011
Property and equipment	125474,91	129505,87	153685,82
Financial assets	3203,71	3079,88	2992,28
Fixed assets	128678,62	132585,75	156678,10
Receivables	252593,72	118938,05	209396,61
Bank deposit and cash	16506,91	30994,72	56119,32
Current assets	252593,72	118938,05	209396,61
Total assets	381272,34	251523,80	366074,71

As we can see, operating income decreased from 2009 to 2011 with NOK 520849840 to NOK 441560860, respectively, while operating costs increased, which is a negative trend.

Also, operating profit was reduced and the net annual profit from NOK 167470440 to NOK 135472810 in 2011.

In 2010, total assets decreased to Nakhodka port 251523800 NOK, and in 2011, total assets increased to port 366074710 NOK. Non-current assets increased to Nakhodka port 153685820 NOK.

Table 7 Summarizing the main parts of the port of Nakhodka liabilities in 2009-2011 Nakhodka sea port (1000 NOK) (Nakhodka Commercial Sea Port, 2012)

Figures	2009	2010	2011
Equity	340547,73	182780,03	310800,87
Total long-term liabilities	6202,63	14629,17	7195,45
Currents liabilities	34521,98	54114,59	48078,40
Total liabilities	40724,61	68743,77	55273,84
Total Equity and liabilities	381272,34	251523,80	366074,71

The main part of the port of Nakhodka liabilities is net worth; hence the port uses its own funds for operating activities, and a bit of leverage. But, in 2011, rising current liabilities port Nakhodka to 48078400 NOK, and long-term liabilities increased to 7195450 NOK, which lead to a decrease in shareholders' equity 310800870 to NOK.

Table 8 Cargo throughput of Nakhodka sea port 2009-2011 years (1000 tons) (Nakhodka Commercial Sea Port, 2012)

Figures	2009	2010	2011
Import	64,1	132,7	158,031
Export	7751,1	6 411,00	6 015,53
1) ferrous metals	4853,4	3 967,50	2 885,42
2) non-ferrous metals	318,4	354,6	452,198
- cast iron	104,3	0	134,21
- forest	225,6	158,9	97,082
- coal	2022,3	1 854,10	2 145,06
Total amount	7803,3	6544	6182,79

For a more complete analysis of the effectiveness of the port Nakhodka in Table 8 presented the analysis of the total cargo throughput of the port from 2009-2011.

Increased import and export cargo to the port of Nakhodka, it counts 158031 tons and 6015530 tons in 2011, respectively. Among the exports of significance weight are ferrous

metals in the amount of 2885420 tons in 2011, and coal (2145050 tons). Throughput of non-ferrous metals is 452198 tons.

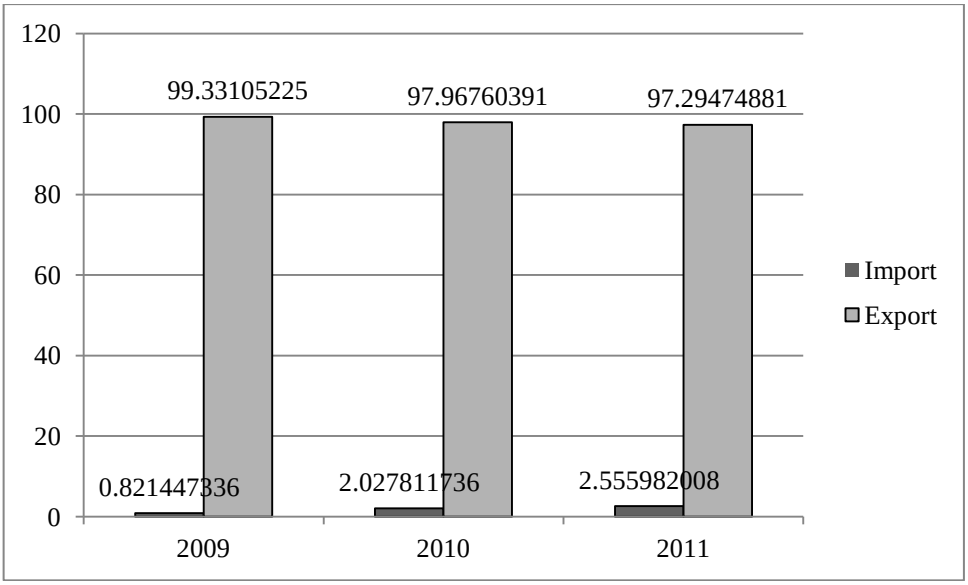


Figure 11. The structure of cargo throughput of Nakhodka sea port 2009-2011 years (in %)

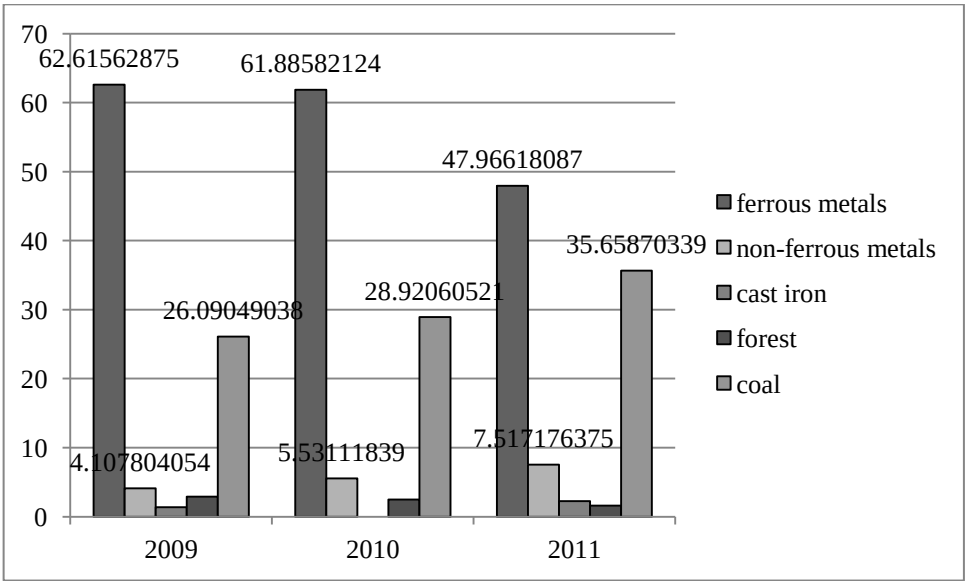


Figure 12 The structure of cargo throughput by type of Nakhodka sea port 2009-2011 years (in %)

Figure 11 shows the structure of Nakhodka port capacity in terms of imports and exports. Despite the fact that the share of export cargo throughput of the port of Nakhodka 97.29% in 2011, its volume is reduced to 99.33%, which was in 2009. Therefore, the operation of the port Nakhodka is more directed at imports from year to year.

Figure 12 shows the structure of Nakhodka sea port capacity by type of cargo in 2009-2011. It may be noted that the share of ferrous metals decreases in total cargo with 62.62% in 2009 to 47.97% in 2011. Meanwhile the growing share of non-ferrous metals is from 4.11% in 2009 to 7.52% in 2011, and the share of coal is from 26.09% to 35.66% in 2009-2011. Therefore, it is necessary to note the redistribution of goods in the total cargo throughput of the Nakhodka port.

Thus, today Nakhodka sea port is able to put at their moorings 20 vessels simultaneously and handle more than 1500 large ships per year. The water area of the port consists of internal and external raids. The port has 22 freight and passenger support pier. Available port Nakhodka covered warehouses and open areas for the storage of goods total useful floor area of over 300 thousand square meters, modern gantry cranes carrying capacity of 40 tons, a harbor mobile crane load-carrying capacity up to 84 tons. Since the Nakhodka port is an important component of the marine transportation system of the Russian Federation, it is necessary to analyze the efficiency of the port as a whole to identify the strengths and weaknesses of its sides as well as directions for further development of the port of Nakhodka.

Vladivostok Sea port. Production capacity of Vladivostok Sea port is on the 15 berths. The total length of berths is over 4 kilometers. The company is among the largest universal port in the Russian Far East. Vladivostok Sea port is a leader in the port complex of the region in terms of technical equipment. Park reloading equipment stevedoring company makes a number of proposals Vladivostok Sea port unique cargo handling.

Availability of rail infrastructure gives the company a competitive advantage of being able to provide customers of Vladivostok Sea port further transportation of goods to other regions of Russia.

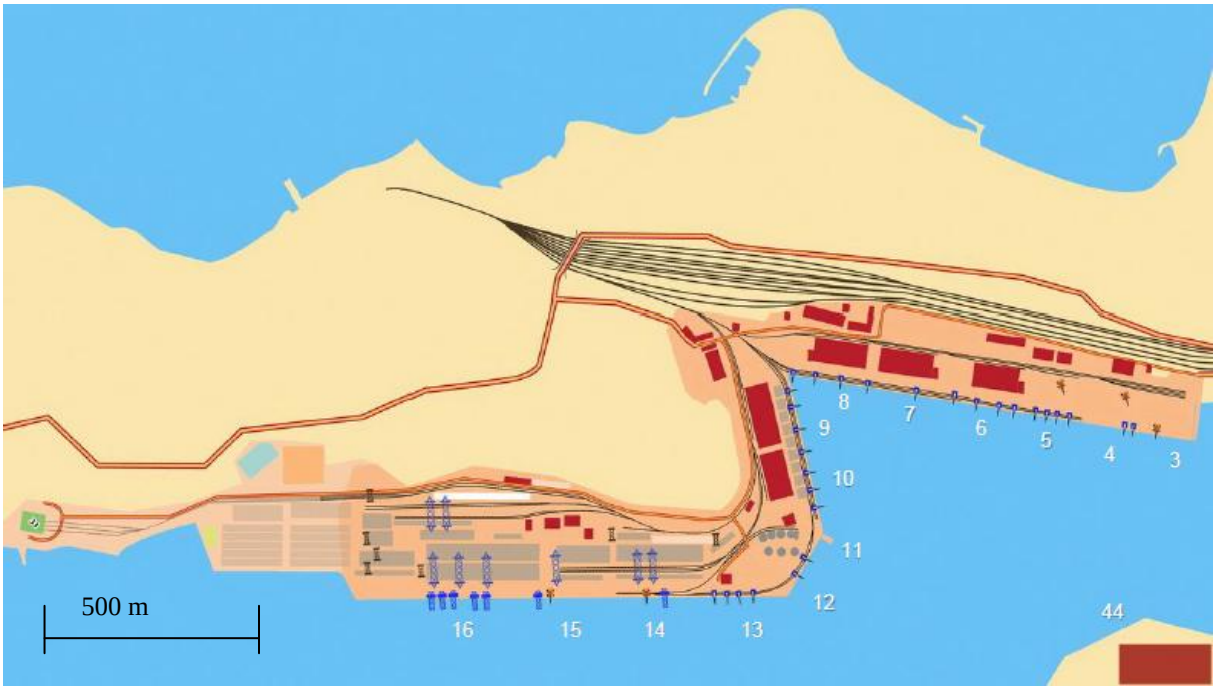
As a transport gateway to the Russian Pacific of Vladivostok Sea Port ensures delivery of a large part of consumer and industrial goods. Vladivostok Sea port is one of the largest employers and taxpayers in the region.

The convenient location of Vladivostok Commercial Seaport in the Asia-Pacific region determines the geography of cargo port. The main directions of cargo handling, performed in South Korea, Japan, China, Taiwan, Thailand and Vietnam. Geography of cargo cabotage traditionally includes Petropavlovsk-Kamchatsky, Magadan, Anadyr, Korsakov and ports of the Chukotka Autonomous District.

Vladivostok sea port in the past few years has been actively working towards the modernization and development of its container facilities. Because of this, now the port has a leading position among the ports of the Far East of Russia in terms of containers taken to the treatment. In this case, due to the implementation of the project activities of Vladivostok sea port is expected to further increase in container handling - 650 thousand TEUs by 2015 (Vladivostok Commercial Sea Port., 2012).

The geography of foreign container cargo Vladivostok sea port binds directly to the ports of Korea, China, Japan, Taiwan, Singapore, Malaysia, Indonesia, the Philippines, the United States. In this case, through the ports of hubs shipping containers can be carried out anywhere in the world.

Container traffic in the export-import trade and coastal areas is sustainable and stable for a long time thanks to the precise organization of liner shipping in the port. See the schedule lines in the section "Schedule lines".



3-5 – Vladivostok car terminal
6-8 – First terminal of general cargo (universal terminal)
9,10,12,13 –Second universal terminal
11 – Vladivostok port bunker (Specific oil terminal)
14-16 – Vladivostok container terminal
44 – Universal terminal (FEMSTA – shipping agency)

Figure 13 Scheme of berths' locations in Vladivostok sea port in 2011 (Vladivostok Commercial Sea Port, 2012)

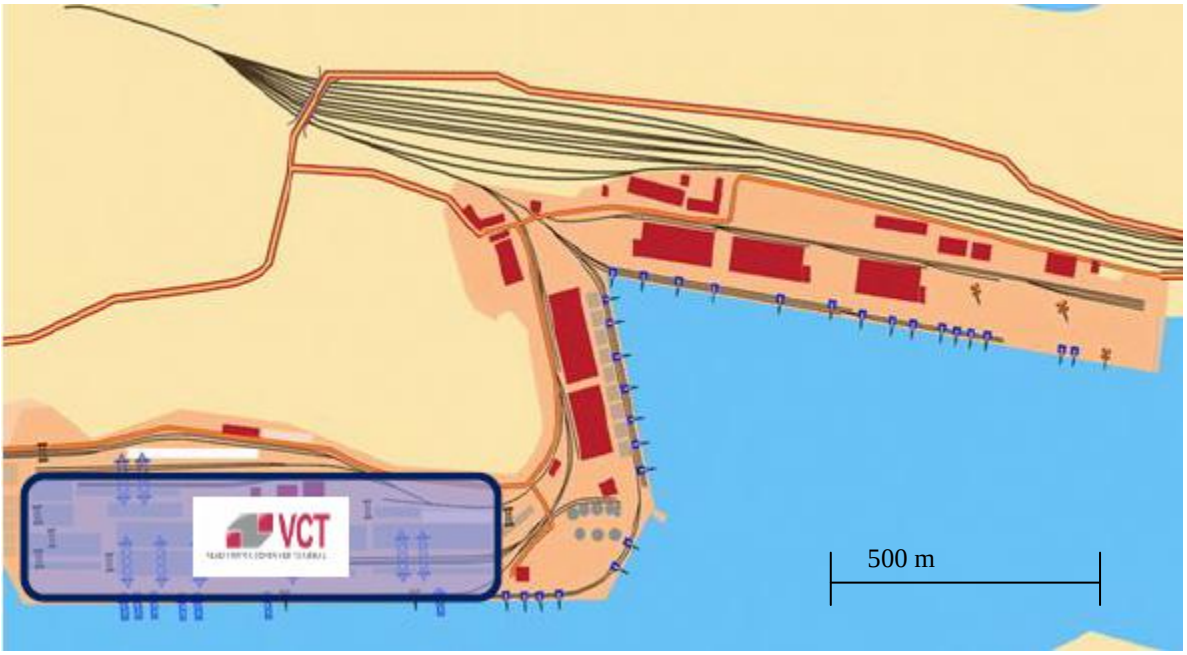
Vladivostok sea port conducts foreign trade of cabotage and bulk cargoes different nomenclature. Vladivostok sea port is the only port in the Far East of the Russian Federation on the export-import grain cargoes and raw sugar in bulk (Vladivostok Sea Trade Port).

Tried and tested technology to quickly and efficiently process sets of data traffic on the version of the car - the ship and back. Loading of grain on a ship made of specialized covered hopper cars by raising and feeding shore cranes in the hold of the ship. Unloading from ship grain and raw sugar, followed by loading into hopper car is by using a bucket of bunker installation.

As we see at Figure, specialized container terminal berths is № 14-16. The total area of container terminal is 170,000 m2, long berth - 741 meters, berth depth – 11,5 meters,

capacity – 500,000 TEU's per year; storage capacity – 14354 TEU's (Vladivostok Commercial Sea Port, 2012).

The figure 15 summarizes the cargo throughput of Vladivostok sea port for the 2009-2011 years. As we can see, in 2010, there was an increase in turnover to 6913,7 thousand tons, but in 2011 the turnover of the Vladivostok sea port significantly decreased to 6391,5 thousand tons.



VCT – Vladivostok container terminal

Figure 14 Scheme of Vladivostok container terminal in 2011

(Vladivostok Commercial Sea Port, 2012)

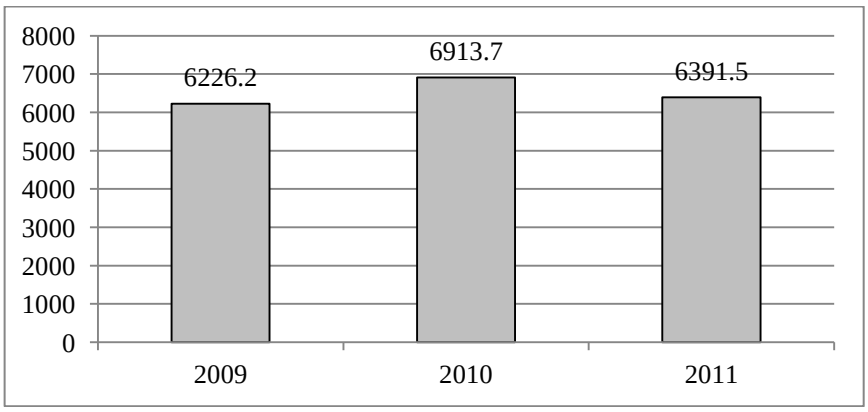


Figure 15 Total cargo throughput of Vladivostok se port in 2009-2011 (1000 tons) (Vladivostok Commercial Sea Port, 2012)

The reason for this fact may be irrational policy of cost sharing guidance seaport of Vladivostok activities. Therefore, in the future it is necessary to review some of the cost items seaport and to improve to increase turnover.

The table 9 shows major asset classes of balance sheet of Vladivostok sea port in 2009-2011 years in thousands Norwegian Krone.

Thus, the analysis of the technical characteristics of Vladivostok sea port, it is necessary to pay attention to the financial component of the seaport. The following table includes the financial results of Vladivostok sea port from 2009 to 2011. Also, the main balance sheet: assets and liabilities.

Table 9 Key Financial Results of Vladivostok sea port (1000 NOK)
(Information disclosure in the securities market)

Figures	2009	2010	2011
Total operating revenues	108132,8	125572,6	149322,4
Total operating costs	89589,06	102390,9	122623,1
Operating profit	18543,76	23181,68	26699,3
Profit for the year	24261,6	31175,15	40050,08

Table 10 Major asset classes of balance sheet of Vladivostok sea port in 2009-2011 (1000 NOK)
(Information disclosure in the securities market)

Figures	2009	2010	2011
Property and equipment	102382,4	111649,9	142389,5
Financial assets	30736,04	30062,29	23752,01
Fixed assets	148048,7	154900,3	178533,2
Receivables	14223,38	11260,86	10940,21
Bank deposit and cash	32478,89	7,54072	3537,676
Current assets	21825,39	12396,79	47601,86
Total assets	169874,1	167297,1	226135,1

The table 10 shows Major liabilities classes of balance sheet of Vladivostok sea port from 2009 till 2011 in thousands Norwegian Krone.

Table 11 Major liabilities classes of balance sheet of Vladivostok sea port in 2009-2011 (1000 NOK) (Information disclosure in the securities market)

Figures	2009	2010	2011
Equity	107056,1	120485,9	161193,4
Total long-term liabilities	33511,3	30642,07	42698,14
Currents liabilities	29306,75	16169,11	22243,54
Total liabilities	62818,05	46811,18	64941,68
Total Equity and liabilities	169874,1	167297,1	226135,1

Thus, it was presented technical parameters and financial performance of Vladivostok sea port. For making analysis of the effectiveness of the ports, it was chosen two similar to each other seaports: Nakhodka and Vladivostok. Many causes, factors and criteria determined their similarity, one area of the sea, like container terminals, the connection to the railway, almost the same cargo throughput. The analysis showed that many of the trends determine the activities of ports, which are competing with each other. In the development of their common features, so it is necessary to conduct a comparative analysis of the productivity of sea ports of Nakhodka and Vladivostok, as well as their financial analysis to determine the reserves to increase their effectiveness.

Financial analysis of Russian sea ports

Statement. In this section, we analyze the financial indicators that affect the efficiency of the seaports, will identify the main trends in Russian ports, the degree of effectiveness in monetary terms. Financial indicators are designed to identify the best seaport in comparison with similar, and reveal the reasons for the financial efficiency.

Financial stability analysis on Russian sea ports. In the first chapter of thesis was analyzed the theoretical aspects of financial stability analysis of seaports. The practical interpretation of the results presented in this section.

As evidence of financial stability indicators port Nakhodka, growth Equity ratio amounted to 16,83% in 2011, which is undoubtedly a positive impact on the financial stability of the port. However, reducing the Leverage ratio shows an increase in the rate of

growth of equity in relation to the obligations of the port of Nakhodka. Capitalization Index ratio increased in 2010 due to higher long-term liabilities port, but in 2011 fell sharply to 0,0226, which indicates a decrease liabilities and increase equity port Nakhodka.

The financial sustainability of the Vladivostok sea port indicates that Equity ratio decreased from 0,7202 in 2010 to 0,7128 in 2011, which negatively affects the financial stability of the port, and increases its dependence on foreign creditors. Leverage ratio increased to 140,29 % in 2011, indicating a sharp increase in credit to the Vladivostok sea port, and a reduction of equity. Increase in Capitalization ratio in 2011, illustrates the growth of long-term obligations of the port, which is not always positive for financial stability.

Table 12 Analysis of financial stability of Nakhodka sea port in 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Equity ratio	0,8932	0,7267	0,8490	0,8136	1,1683
Debt to equity ratio	0,1196	0,3761	0,1778	3,1450	0,4729
Leverage ratio	1,1196	1,3761	1,1778	1,2291	0,8559
Capitalization ratio	0,0179	0,0741	0,0226	4,1428	0,3053

Table 13 Analysis of financial stability of Vladivostok sea port in 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Equity ratio	0,6302	0,7202	0,7128	1,1428	0,9898
Debt to equity ratio	0,5868	0,3885	0,4029	0,6621	1,0370
Leverage ratio	1,5868	1,3885	1,4029	0,8751	1,0103
Capitalization ratio	0,2384	0,2028	0,2094	0,8505	1,0328

Thus, figure 16 shows a comparative analysis of the financial stability of the two ports in 2011. The largest index Equity ratio is 0,849 and belongs to the sea port of Nakhodka, thus the port of Nakhodka has the larger financial independence from external creditors. Therefore, it has the lowest rate Debt to equity ratio in 2011, estimated at 0,1778. Also, the lowest rate of Leverage ratio in 2011 has port of Nakhodka, indicating that port has a

sufficient amount of equity. The highest rate Capitalization ratio in 2011 in the sea port of Vladivostok, indicating that port has a sufficient amount of long-term liabilities.

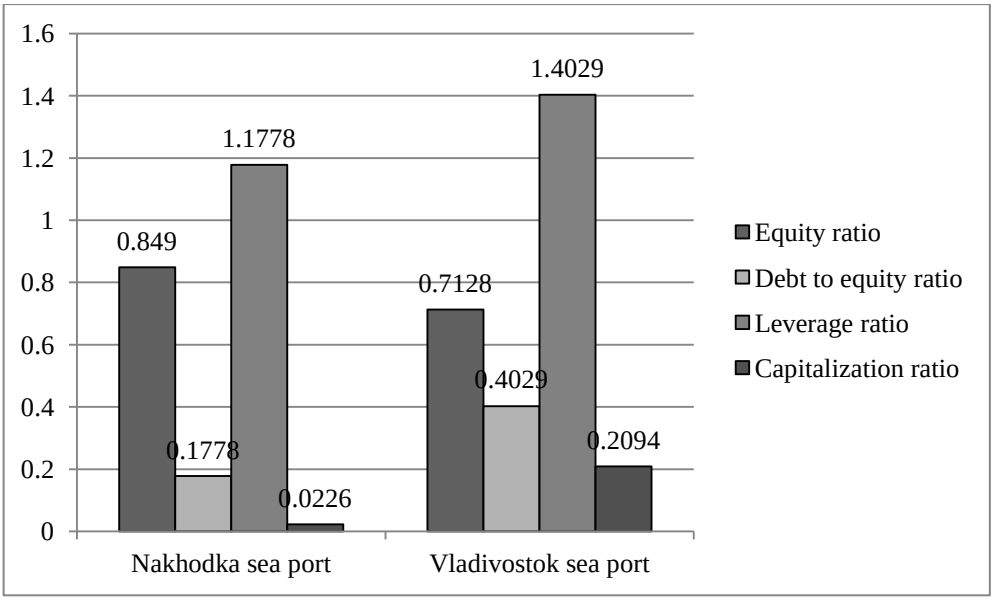


Figure 16 Comparative analysis of financial stability ratios of the ports in 2011 (index)

Therefore, the best indicators of financial stability has the port of Nakhodka, and the worst performance has the port of Vladivostok. Using the analysis of indicators financial stability, it must be concluded that the sea port of Nakhodka has the best indicators of financial security than the seaport of Vladivostok. Consequently, the port of Nakhodka is more resistant to all kinds of fluctuations in the market, both financial and non-financial. Although, one analysis of the sea port financial stability is not enough for the full picture, which characterizes the two analyzed port. Next will be performed an analysis of profitability, liquidity and business activity.

Profitability analysis of Russian sea ports. Profitability analysis of Russian sea ports is shown on Table 14 where were the main four parameters analyzed.

The profitability of the port of Nakhodka is one of the highest among the analyzed sea ports. However, Return on sales decreases from 0,4677 in 2009 to 0,3072 in 2011 due to

higher overall costs and reduce the rate of growth in net profit. Return on equity increased in 2010 to 0,542, but in 2011 declined to 0,4359, indicating a decrease in the efficiency of the equity use in port Nakhodka. Similarly, it can be seen reducing in returns on the assets and net assets of the port because the Return on assets is 0,3701 in 2011, and Return on net assets was 0,426 in 2011.

Table 14 Profitability analysis of Nakhodka sea port in 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Return on sales (ROS)	0,4677	0,3640	0,3072	0,7783	0,8440
Return on equity (ROE)	0,4918	0,5420	0,4359	1,1021	0,8042
Return on assets (ROA)	0,4392	0,3939	0,3701	0,8969	0,9396
Return on net assets (RONA)	0,4830	0,5018	0,4260	1,0389	0,8489

Table 15 Profitability analysis of Vladivostok sea port in 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Return on sales (ROS)	0,1715	0,1846	0,1788	1,0765	0,9686
Return on equity (ROE)	0,2266	0,2587	0,2485	1,1417	0,9602
Return on assets (ROA)	0,1428	0,1863	0,1771	1,3048	0,9504
Return on net assets (RONA)	1,0433	1,1858	0,8155	1,1366	0,6877

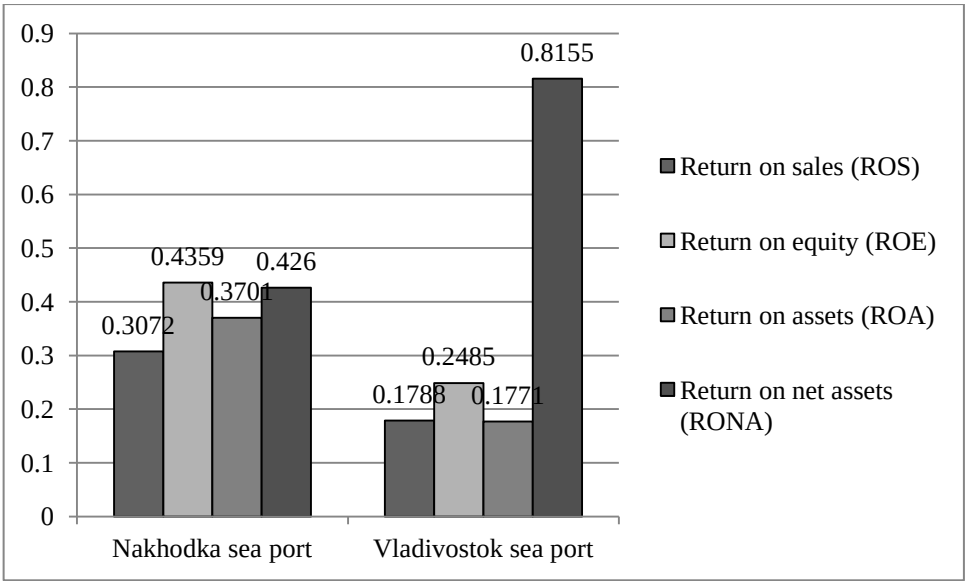


Figure 17 Comparative analysis of profitability ratios of the ports in 2011 (index)

The analysis of profitability Vladivostok seaport enables to notice a trend of growing profitability until 2010, and then it decreased in 2011 due to the fact that the increase in costs exceed revenue growth seaport. Return on sales rose by 7,65% in 2010, and fell to 0,1788 in 2011 (index). A similar trend is happening with the profitability of capital assets. Thus, the sea port of Vladivostok should review their costs and optimize them, as well as the port of Nakhodka.

A comparative analysis of the profitability of seaports in 2011 is presented in the following figure 17. This figure shows a comparative analysis of the four ports profitability level in 2011. It should be noted that the best profit margins in the port of Nakhodka in three components (ROS, ROE, ROA, RONA), and worst-case margins has the port of Vladivostok except return of net assets. Consequently, the port of Vladivostok has the best ratio of current assets to current liabilities, and a sufficient amount of fixed assets.

Thus, to increase the profitability of sea ports is necessary to reduce the level of expenditures in the total revenue from the sale. The necessary measures to optimize the cost-policy seaports will increase profitability in almost all respects.

Liquidity analysis of Russian sea ports. This section presents the main results of liquidity analysis of Nakhodka and Vladivostok sea ports. Comparison is conducted by one parameter which is liquidity index.

This analysis will help to determine the degree of solvency of seaports and their level of current assets. Also, this analysis will determine how quickly sea ports will be able to pay off the accounts payable and the level of excess over its debts.

Table 16 Liquidity analysis of sea port in 2009-2011 (Current Ratio Index)

Sea Ports	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Nakhodka sea port	6,2025	1,7302	3,7883	0,2790	2,1895
Vladivostok sea pot	0,7447	0,7667	2,1400	1,0295	2,7912

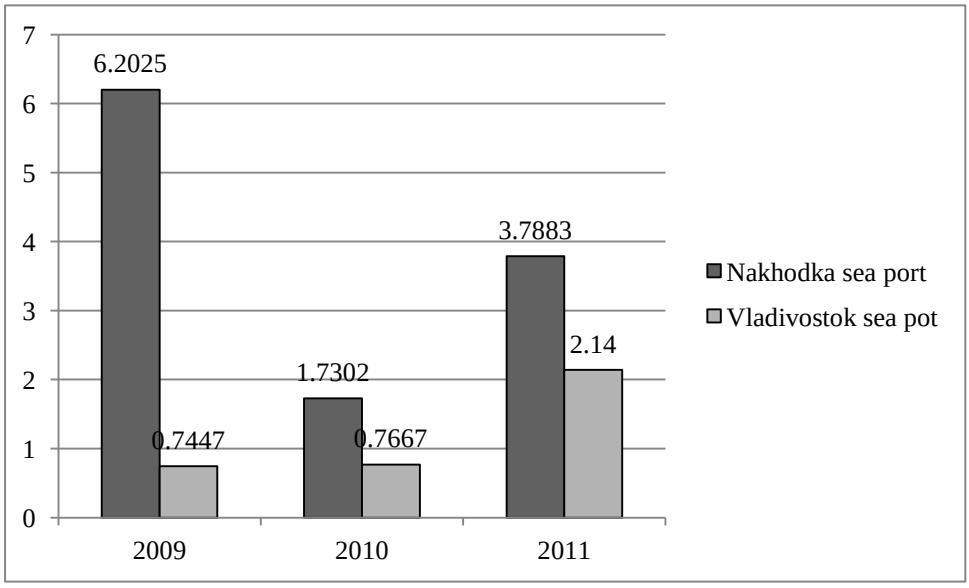


Figure 18 Comparative analysis of current liquidity ratio of the ports in 2009-2011 (index)

As we can see from Table 16, in 2011 the figure increased Current Ratio Index for the Port of Nakhodka at 118,95%, indicating the financial solvency of these ports. It should be noted that the liquidity in the seaport of Vladivostok grew significantly from 0,7447 in 2009

to 2.14 in 2011, which means a rapid increase in current assets of the port at the expense of cash and accounts receivable. The highest liquidity ratio has the port of Nakhodka, but in 2010 it decreased, and it can be seen that within observed period the ratio has gradually increased at the Vladivostok seaport.

Comparative liquidity analysis from 2009-2011is presented in the figure 18. As we can see from the figure, liquidity in the port of Nakhodka is rather higher than at the port of Vladivostok. This means that it is easier to pay with obligations for current creditors for the port of Nakhodka. But in 2010, the liquidity ratio has fallen sharply due to the growth of the port obligations, loans. But in 2011, liquidity increased in both ports, which indicates a positive change of financial activity.

Thus, the liquidity analysis showed that the sea ports of Nakhodka and Vladivostok have a positive tendency to improve the financial situation in the market, the growth of current assets in the form of cash due to higher profits, as well as to reduce current liabilities.

Activity analysis of Russian sea ports. The author in the research paper uses the analysis of the activity of sea ports to determine their position in the market, the ability to adapt to change, confrontation and instability activity operations.

Table 17 presents the activity analysis of Nakhodka sea port in 2009-2011

Table 17 Activity analysis of Nakhodka in sea port 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Assets turnover	1,3661	1,8160	1,2062	1,3293	0,6642
Debt ratio	0,0163	0,0582	0,0197	3,5706	0,3385
LT Debt to equity	0,1068	0,2733	0,1510	2,5590	0,5525

Indicators of Nakhodka port activity increased in 2010, and further reduced in 2011 because of the reduction in the rate of revenue growth and an increase in asset growth of

seaport. Reduction the LT Debt to equity in 2011 to 0,151 indicates a decline in the value of long-term liabilities, which has a positive effect on the financial condition of the port of Nakhodka.

Table 18 Activity analysis of Vladivostok sea port in 2009-2011 (index)

Indicator	2009	2010	2011	Growth rate index in 2010 to 2009	Growth rate index in 2011 to 2010
Assets turnover	0,6365	0,7506	0,6603	1,1792	0,8797
Debt ratio	0,3698	0,2798	0,2872	0,7567	1,0263
LT Debt to equity	0,1973	0,1832	0,1888	0,9285	1,0309

The negative is the fact that the growth rate Debt ratio for the port Vladivostok in 2011 was 2,63% and the growth rate LT Debt to equity is equal to 3,09 %. Increasing the share of long-term as well as short-term liabilities port Vladivostok lead to a decrease in its activity in the market, and the reduction of the assets turnover to 0,6603 in 2011 indicates a decline in the rate of revenue growth against growth of total assets of the port.

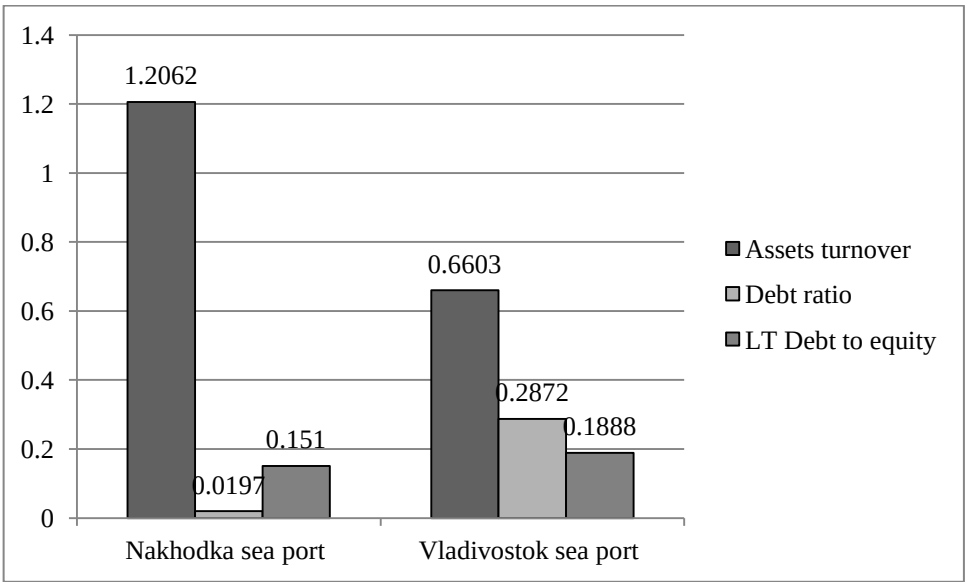


Figure 19 Comparative analysis of activity ratios of the ports in 2011 (index)

Thus, as evidenced by the figure 19, the comparative analysis of the activity of the two ports on the market shows the greatest Assets turnover in port Nakhodka in 2011, on the point of 1,2062. Port Vladivostok has the highest rates Debt ratio and LT Debt to equity.

Therefore the port of Nakhodka has the best indicators of financial activity in 2011, and the worst performance is in the port of Vladivostok.

Conclusion on the financial analysis: financial analysis of the two Russian sea ports showed that there is a positive and negative side of the profitability of ports, their financial stability, activity and liquidity. Consequently, because the ports have certain problems with activities, their existing resources are used inefficiently. Therefore, it is important to analyze the current efficiency of the ports, to identify key factors that influence the effectiveness and application of measures to maximize the efficiency.

Comparative analysis of Russian sea ports

In the economic literature that analyzes the effectiveness of the commercial sea port, the so-called common single indicator of productivity. In other words, it describes the effect of a single factor "input" to a single result "exit", that is, the relationship between the 2 of these indicators of effectiveness. Very often, the factors of "entry" into the system is the cost of labor, capital and land resources, and the results of the "output" of the system described in terms of value as indicators of profitability by using different factors.

Still, many performance indicators used in economic literature only provide a unique measurements in a given time for all the seaport operations (loading, unloading, storage, distribution) and / or the object (crane, wharf, warehouses, container terminals) (Bendall and Stent, 1987). The annual container throughput of 20-foot equivalent units (TEU's) is a typical example of such measures, and wide, and quite controversial, is used to estimate container ports and terminals in the world.

For many scientists and researchers common mistake is confusing in the production of its performance or efficiency, as the latter is a relative, not an absolute concept. Sometimes,

the measurements are used to determine the effectiveness of benchmarking purposes, for example, the number of containers per hour depending on the size of vessel and net crane rate for liner shipping trade (Drewry Market Report, 1997).

Coordination with land transport may also feature in the performance indicators of sea ports, for example, the waiting time of goods or the time elapsed from the time when the goods are unloaded from the ship, and while it does not come out of the port. The latter is usually used in conjunction with the use of time-based indicators, such as employment berth and an average time of service of the vessel. The utilization factor is usually used comparing the input against the available resources, such as working hours from the time of service.

Figure 20 Location of Nakhodka and Vladivostok sea ports relative to each other (Nakhodka online)

As can be seen in Figure 20, ports of Nakhodka and Vladivostok are in the same bay, and almost close to each other. But this fact does not prevent them from being independent ports of the Far East region of Russia and fully implement their functions. Sea ports are competing with one another, and still have enough turnover, which is much greater than in

other ports of the Far East. Therefore, we analyze the ports of Nakhodka and Vladivostok in comparison with each other and with other ports.

However, the use of these indicators has a number of drawbacks, as one performance measure may not be suitable for benchmarking of sea ports. In the complex sea port and its control system can simply be used incomplete measures of performance efficiency.

Competitors of Nakhodka sea port in the Far East are stevedoring companies federal transit ports – Nakhodka (Nakhodka Sea fishing port, Port of East Gate - Seaside plant), East (East Port, Eastern Stevedoring Company), Vladivostok (Vladivostok sea port), Busan, Posiet. Among the western ports of Russia competition Nakhodka sea port are the ports of Novorossiysk, the Big Port of St. Petersburg. Stevedoring regional port of Petropavlovsk-Kamchatsky, Magadan, Korsakov, Kholmsk is not engaged in transshipment of goods in transit, so the competition for the Nakhodka sea port does not exist. Higher than at the port of Vladivostok railway tariff creates Nakhodka sea port less favorable competitive conditions, increasing the value of the goods (Nakhodka Commercial Sea Port, 2012).

Table 19 Cargo throughput of basic universal ports Far Eastern Region of Russia in 2010-2011 (1000 tons) (Nakhodka Commercial Sea Port, 2012)

Name of the port	2010	2011	Relative change, %
East sea port	14,7	16,5	112
Vladivostok sea port	6,919	6,391	92
Nakhodka sea port	6,544	6,182	94
Vanino sea port	6,12	15,99	261
Posiet sea port	4,67	4,0219	86
Olga sea port	1,37	1,497	109
Others	1,76	2,2683	129
Total	42,083	52,8512	126

Despite the decline in turnover, Nakhodka sea port on the results of work in 2011 was listed in the top three of the largest universal ports of the Far East (after of East sea port and Vladivostok sea port). The share of the port in the common market of services provided basic universal ports is 6,182 %. The main competitors of Nakhodka sea port in the industry are

still the major ports of the Far East (Vladivostok, Vanino, East, Posiet) due to their geographical proximity and the interchangeability of traffic. Assessing the level of competition we can talk about the steady distribution of cargo between the ports. East sea port specializes in the transshipment of coal production and in 2011 materials handling increased by 12 % due to increased volumes of coal.

In total, the Vanino sea port handled cargo volume of 15,9 million tons (+26%) due to a significant increase in coal transfer by 2,12 mln. tons., mainly due to the capacity of the new specialized transshipment terminal JSC "Daltransugol." Port cargo handling volume, "Posiet", is decreased by 14%, by reducing the amount of processed coal. On Olga sea port the increase of processed goods was mainly due to timber. Vladivostok sea port reduced the volume of cargo handling at 8%, this reduction is most likely due to changes in the composition of the Port Authority and the owners.

Nomenclature of transshipped cargo in 2011 Nakhodka sea port has not changed compared to the previous year. It should be noted the growth of transshipment base metals, which accounted for 27% and reached a volume of 452 thousand tons, and a significant more than tripled, increasing cargo handling other dry bulk (coke, slag), which amounted to 301.5 thousand tons. A role in the continuing increase in the volume of imported goods (19%) play major projects related to the summit in Vladivostok in 2012 and the construction of the Eastern Siberia - Pacific Ocean. A significant increase in cargo ports of the Far East has a significant impact on the competitiveness of Nakhodka sea port. In order to increase the competitive ability of the Company during the year continued to increase the size and improve the quality of storage facilities that meet modern requirements of cargo storage. At present Nakhodka sea port can be placed on storage space of about 1 million tons of steel, which is 200-300 thousand tons more than in previous years.

The Figure 21 shows a comparative analysis of sea ports of the Far Eastern basin along two dimensions: market share and the relative change in 2011. The figure 21 shows that the sea port of Nakhodka and Vladivostok has almost identical dimensions of development. They relative change is less than 100%, and increase market share not more than 10%, therefore they can be called lagging ports. At seaports, whose share of more than 15% roar, evident signs of successfully developing ports.

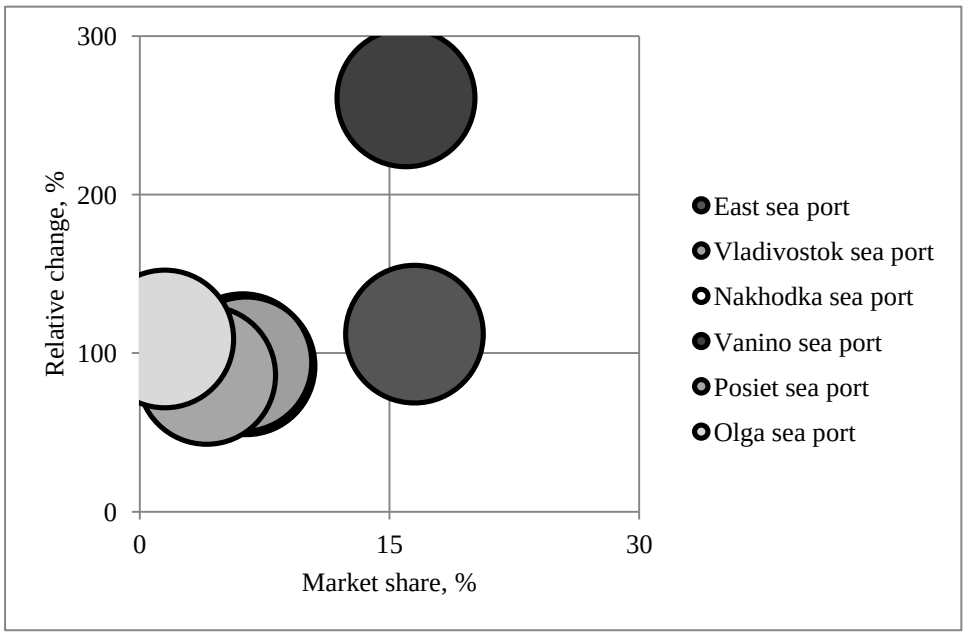


Figure 21 Comparison of Russian ports on the two parameters: relative change and market share in 2011 (Business Port, 2012)

In the ports of the Far Eastern basin turnover increased to 134,2 million tons (+6,9%). Total deliveries of bulk carriers rose to 78,5 million tons (+10,3%), liquid bulk - up to 55,.7 million tons (+2,5%). Increased output ports of the East to 42,5 million tons (+10,9%), Busan to 20,3 million tons (+6,5%), Nakhodka to 16,9 million tons (+12,8%), Vladivostok to 13,2 million tons (+10,9%), Posiet to 5,8 million tons (+9,5%), Petropavlovsk-Kamchatsky to 2,6 million tons (+7,1%), Shahtersk to 1,7 million tons (+11,3%) and Magadan to 1,3 million tons (+10,2%). Throughput of the port DeKastri decreased by 8,3% to 7.4 million tons, Kholmsk - by 15,3% to 1,9 million tons (Association of commercial seaports).

From the Figure 22 it should be noted that the sea port of Nakhodka has slightly higher level of turnover than the seaport of Vladivostok. But they are almost identical on these indicators, as well as the number of containers and types of goods.

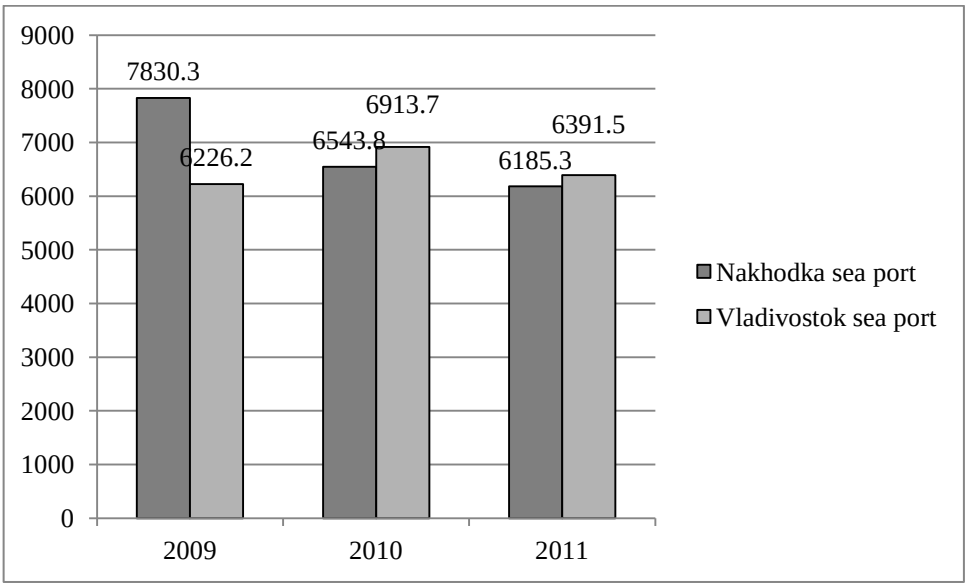


Figure 22 Comparative analysis of total cargo throughput of sea ports used in analysis in 2009-2011 years (1000 tons) (Unified state system of information on the world's oceans)

In 2010, the total cargo throughput of the sea port of Nakhodka significantly decreased to 6543,8 thousand tons, and the amount of cargo in 2010 was 6913,7 thousand tones in seaport of Vladivostok. Also, in 2011 the total cargo throughput of the seaport of Vladivostok exceeded the total cargo throughput of the sea port of Nakhodka, although there was a reduction of freight turnover of both ports. Most likely, this is due to the cause of the fall in demand for port services the Sea of Japan. Therefore, both ports must be revised cost items in order to increase the turnover and performance.

Thus, the comparative analysis of two ports showed that they have a lot in common; the ports are in the same area, almost similar in terms of cargo turnover. Therefore, it is reasonable to carry out a comparative analysis to identify strengths and weaknesses, particularly the development of benchmarking, prospects and trend of development of seaports in the future.

Conclusion on case study of Russian sea ports

Comparative analysis of sea ports of Nakhodka and Vladivostok showed that they are almost identical in terms of cargo turnover, market share, functions. Financial analysis of seaports identified that seaports are profitable, financially stable and active in the market. According to some indicators, such as cargo throughput, Vladivostok seaport is superior but in other cases it is vice versa. Weighty superiority of one over the other ports do not actually exist, hence it once again proves the feasibility of selected ports for the thesis analysis.

DISCUSSION

The purpose of the analysis of the efficiency of seaports

The purpose of this section of the thesis is the practical application of methods to assess the effectiveness of sea ports (their performance) that have been described in the theoretical section. The urgency of the methods was tested in practice by many scientists and economists, who used portfolio analysis about the assessment of the effectiveness of European sea ports, Asian. (Saari, 2006).

Thus, an effective method of analysis of BCG Matrix in this section of the thesis the author uses Russian ports of Nakhodka and Vladivostok in order to identify priority activities, competitive advantages and develop areas for further development.

Moreover, portfolio analysis is performed not only by product and activity of Russian sea ports, but between them as strategic business units in order to determine the position of each port in the industry.

This section focuses on the use of PPM approach to analyze the efficiency of seaports. It identifies the factors of entry and exit to the seaports of Nakhodka and Vladivostok over the past three years. Details for the efficiency analysis are taken from the annual reports of port, publications and funding sources.

Conducting BCG Matrix as an analysis of effectiveness

Analytical BCG Matrix is used to determine the distribution of the different views of seaports prioritize food products and solutions. As noted in the theoretical section, to build a BCG Matrix requires two components: the relative market share position in each product, as well as the growth rate of the product position in a particular period in the previous period.

Using the data in Table 20, we calculate the main categories of products seaport of Nakhodka, which are analyzed. It should be noted that the main categories of products of sea port of Nakhodka are ferrous metals, non-ferrous metals, cast iron, forest, coal. They create the specifics of the seaport.

Table 20 shows the basic performance of the sea port of Nakhodka, which are used in constructing the BCG Matrix.

Table 20 Relevant data for conducting BCG Matrix of Nakhodka sea port in 2011 (Nakhodka Commercial Sea Port, 2012)

Production categories	Market share, %	Relative growth rate, %
Ferrous metals	0,4667	-0,4055
Non-ferrous metals	0,0731	0,4202
Cast iron	0,0217	0,2868
Forest	0,0157	-0,5697
Coal	0,3469	0,0607

Based on Table 20, it should be noted that the largest share in the total turnover of sea port of Nakhodka have ferrous metals (0,4667 of the total). Also important is coal, which has a share of 0,3469 in 2011. Other categories of products seaport do not have such a significant value in the operation of the port, but still have an impact on the total turnover.

Also, it was analyzed the product category in seaport Vladivostok. Although the data of Russian seaports was analyzed practically identical in many indicators of financial and economic development, yet there are different categories of main products, which is turnover.

Table 21 shows the main categories of products used seaport of Vladivostok in the activity. Among them are the following: ferrous metals, bulk cargo, general cargo, oil products, vehicle, grain, containers.

Table 21 Relevant data for conducting BCG Matrix of Vladivostok sea port in 2011 (Vladivostok Commercial Sea Port, 2012)

Production categories	Market share, %	Relative growth rate, %
Ferrous metals	0,21	0,056
Bulk cargo	0,11	-0,067
General cargo	0,06	0,124
Oil products	0,06	0,035

Vehicle	0,03	0,157
Grain	0,01	-0,128
Containers	0,52	0,052

According to the Table 21, it can be seen that the largest share in the total turnover Vladivostok seaport occupy containers (0,52) and ferrous metals (0,21) and bulk cargo (0,11). These categories of products, some of them have a negative growth in 2011 due to the decrease not only the volume but also share in the total turnover of the Vladivostok seaport. Other categories of products are not as weighty share of turnover, but are really important to the sea port, because they shape its specificity.

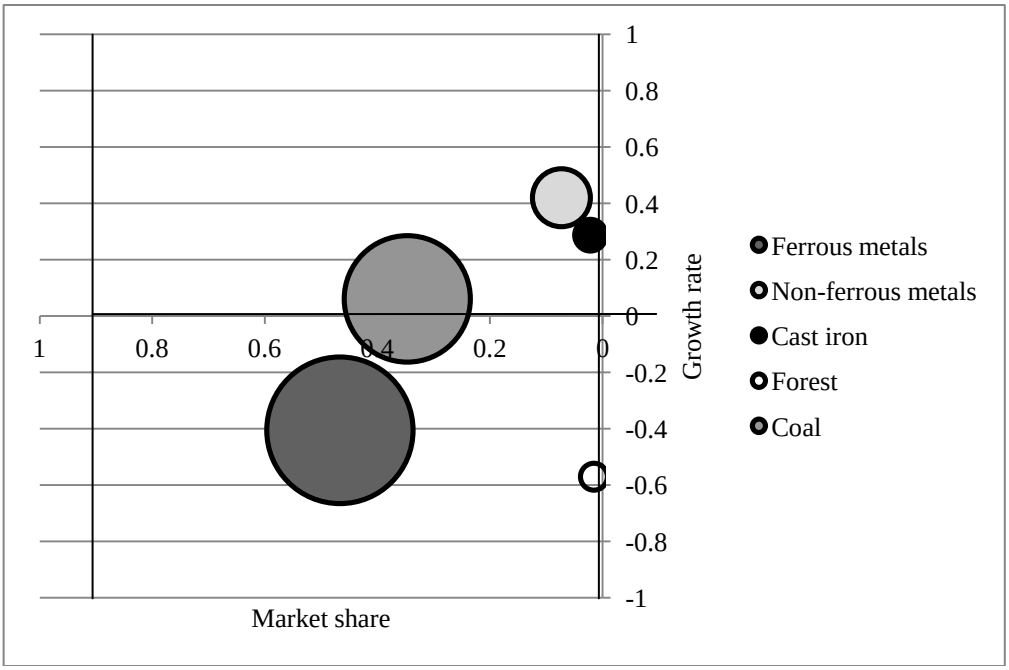


Figure 23 Product portfolio BCG Matrix of Nakhodka sea port in 2011

Using data from tables 20 and 21, we'll stand analytical BCG Matrix for sea ports of Nakhodka and Vladivostok and analyze the features of the matrices for each of the ports.

Figure 24 shows the portfolio analysis BCG Matrix for the seaport of Nakhodka in 2011. As we can see in Figure 24, portfolio analysis of Nakhodka seaport in 2011 is quite diverse. Each category has its share of production and growth rate. In the position of the

"star" gets coal with a share of roaring growth rate of 0,3469 and 0,0607. Consequently, the sea port of Nakhodka needs to focus on this category of products. In the position of the "cash cows" fall ferrous metals due to the negative growth rate in 2011 in the value of -0,4055. This category of products is the basis for investment products "question marks", and may soon become the products of the "stars."

In the "question marks" fall two categories of products of sea port of Nakhodka: non-ferrous metals and cast iron. The growth rate of their turnover is quite good, even higher than the production of "stars" and "question marks ", that's only a fraction of this category of products is below 10 %. If the emphasis is on the products of sea port, it can be that "question marks" become “stars” in the future, but for this it is necessary to significantly increase market share.

Production "dogs" for seaport of Nakhodka is the wood. This category of products does not bring enough profit. Soon port needs to give it up, as it hinders growth and efficiency.

Next will be conducted portfolio analysis of Vladivostok seaport and to identified the main product categories in 2011. In Figure 24 is a portfolio analysis BCG Matrix of Vladivostok sea port in 2011.

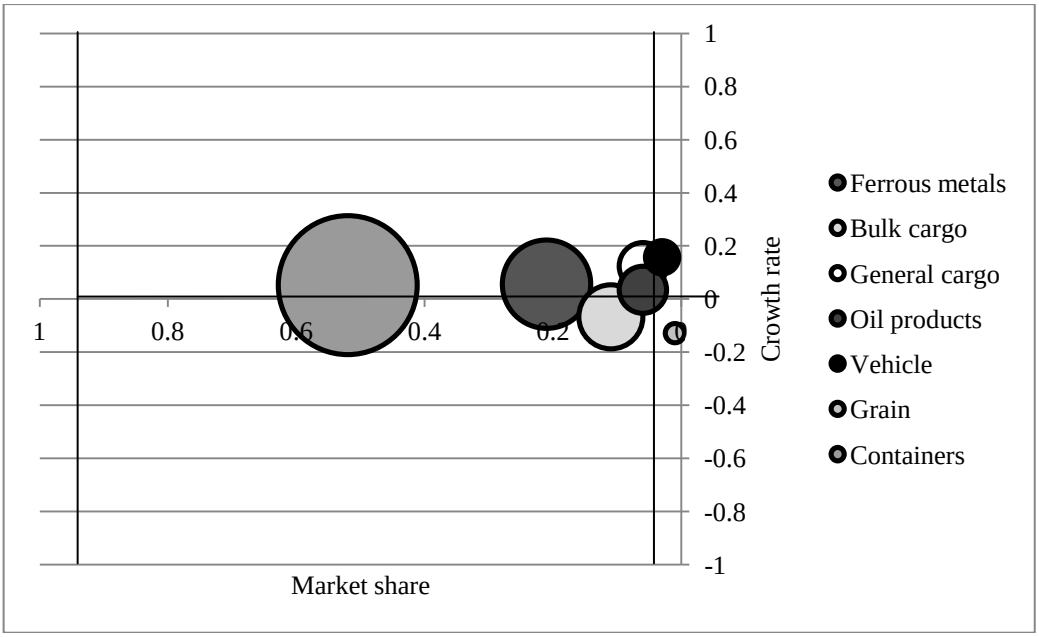


Figure 24 Product portfolio BCG Matrix of Vladivostok sea port in 2011

As we could see in Figure 24, a portfolio analysis of sea port of Vladivostok in 2011 is even more diverse than seaport of Nakhodka. Each category has its share of production and growth rate. In the position of the "stars" get two product categories: ferrous metals and containers. Consequently, the sea port of Vladivostok needs to focus on those product categories, as they bear the bulk of revenue in 2011. In the position of the "cash cows" get bulk cargo because of the negative growth rate in 2011. This category of products is the basis for investment products "question marks", and may soon become the products of the "stars."

In the "question marks" fall three product categories of Vladivostok seaport: general cargo, oil products and vehicle. The growth rate of their turnover is quite good, even higher than the production of "stars" and "question marks", there is only a fraction of this category of products which is below 10 %. If to make emphasis on the products of sea port, it can be possible to change "question marks" to “stars” in the future, but it is necessary to increase significantly market share.

Production "dogs" for the sea port of Vladivostok is the grain. This category of products does not bring enough profit. Soon port needs to give it up, as it hinders for growth and efficiency.

PPM approach in thesis analysis

One of the key performance output indicators of sea ports is their turnover for the current year or a specific period. Ports, which are used in the thesis work, have container terminals. But, as the seaport - a structure that consists of a number of stevedoring companies and units in sea ports of Nakhodka and Vladivostok different analyzes of container traffic. This is despite the fact that, as used in the analytical process of ports are virtually identical.

Consequently, a measure of the efficiency of the Russian sea ports will assume their total turnover, and it does not differentiate on the definition of the category of products. For a more reliable analysis of the efficiency of the ports, were taken a few periods of activity. The following table shows cargo sea ports of Nakhodka and Vladivostok for years, beginning in 2003.

Table 22 Analytical comparison between two sea ports by cargo throughput in 2003-2011(Unified state system of information on the world's oceans, 2013)

Analyzed years of study	Cargo throughput, 1000 (tons)	
	Nakhodka sea port	Vladivostok sea port
2003	6213,3	7127,4
2004	7949,0	7193,1
2005	6548,4	6416,5
2006	6896,1	4049,5
2007	5468,3	4853,1
2008	7367,3	5884,9
2009	7830,3	6226,2
2010	6543,8	6923,7
2011	6185,3	6391,5

Using the data in the table 22 it should be noted that trends in the various seaports from 2003 to 2011. Cargo turnover increases in the volume decreases and becomes

ambiguous on this period of activity. For a more complete picture is necessary to analyze the turnover in the tendency to change for each of the analyzed sea ports.

The figure 25 shows the dynamics of the cargo seaport of Nakhodka for 2003-2011.

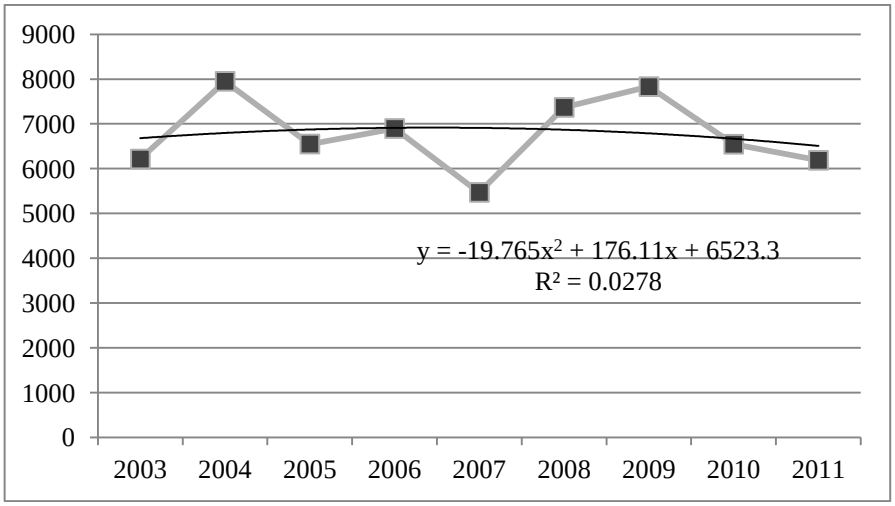


Figure 25 Dynamics of cargo throughput in Nakhodka sea port during 2003-2011 periods (1000 tons)

As you can see in the figure, the sea port of Nakhodka has a mixed structure of the turnover. It increases and decreases during the analyzed years. But, in principle, there is a strong vibration turnover. The trend line shows the trend of further development of the seaport and the direction of increasing turnover. As you can see in the future turnover of the seaport of Nakhodka will decline, as evidenced by the trend line. Although, the probability of such forecasts is not more than 2,78%.

The figure 26 shows the dynamics of the cargo sea port of Vladivostok for 2003-2011.

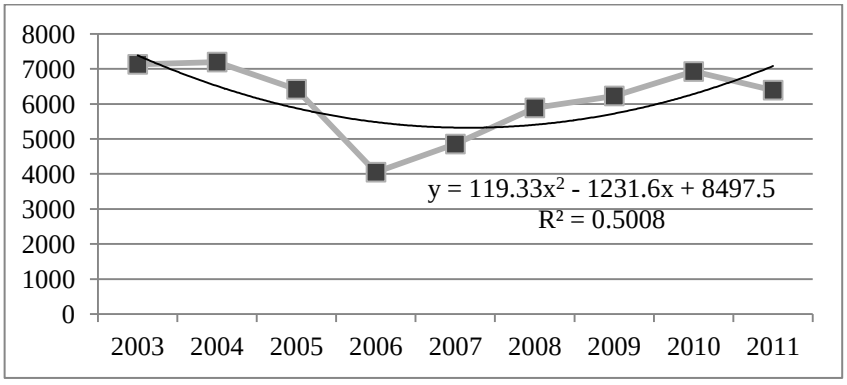


Figure 26 Dynamics of cargo throughput in Vladivostok sea port during 2003-2011 periods (1000 tons)

As you can see in the figure 26, the sea port of Vladivostok has a mixed structure of the turnover. It increases and decreases during the analyzed years. But, in principle, there is a strong vibration turnover. The trend line shows the trend of further development of the seaport and the direction of increasing turnover. As you can see in the future turnover of sea port of Vladivostok will be reduced, as evidenced by the trend line. Although the probability of such forecasts is not more than 50,08 %.

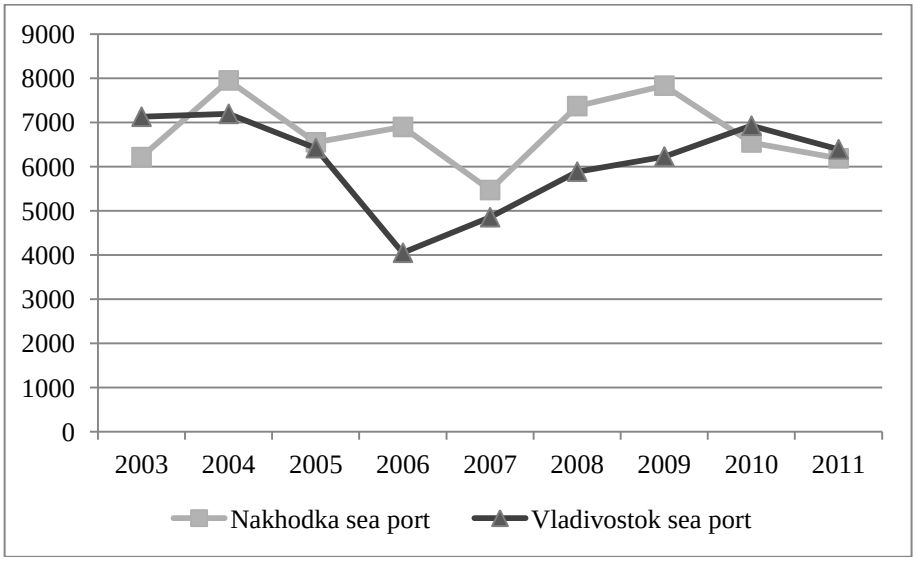


Figure 27 Comparative dynamics of cargo throughput in Nakhodka and Vladivostok sea ports during 2003-2011 period (1000 tons)

As you can see, the linear approximation of the trend does not provide sufficient probability and does not claim that we can predict the future behavior of cargo seaports. The author of the thesis offers to compare graphically the dynamics of the turnover of the two Russian seaports. Throughput of the sea port of Nakhodka is slightly larger than turnover sea port of Vladivostok, but the dynamics of the turnover of these seaports practically identical. This fact shows the influence of the spirit of the sea ports and other competitive dependence.

Selection of the indicators in PPM approach: PPM approach uses a lot of performance indicators. All of them tend to fall into two groups: financial and non-financial indicators. These indicators are designed to measure the financial performance of seaports.

PPM analysis is used to determine the efficiency of seaports directly, according to Graham (2005). Despite the fact that the PPM approach is simple, it is very effective for the detection efficiency of seaports.

In order to select the indicators of productivity changes in sea ports of Nakhodka and Vladivostok is necessary to determine the characteristics of their activities. It must be chosen the most appropriate, based on existing data.

As the leading seaport of Vladivostok in the Far East by sea basin of container turnover, and the sea port of Nakhodka leader in cargo handling, it is advisable to base the analysis of the PPM to take identical values for both ports. Input indicators should be, as a rule, the physical parameters. For both seaports may be the number of employees and turnover. Output indicators could be financial value indicators, such as total revenue, total costs and turnover.

Since the sea port of Vladivostok and Nakhodka - are commercial organizations, and they operate under a profit, so the financial indicators, such as profitability, revenue generating capability, cost efficiency will be suitable for the study in the thesis work.

The table presented by the indicators chosen PPM analysis for sea ports of Nakhodka and Vladivostok

Table 23 PPM indicators used in case study (Graham, 2005)

Category	Indicators
Profitability	Operating profit per one ton of cargo throughput
Revenue generating capability	Total revenue per one ton of cargo throughput
Cost efficiency	Total costs per one ton of cargo throughput

Labor productivity (physical aspect)	Cargo throughput per employee
Labor productivity (financial aspect)	Operating profit per employee

Thus, the use of these indicators will allow PPM to analyze the effectiveness of the sea ports of Nakhodka and Vladivostok during a selected period of analysis.

Selected PPM indicators are used as basis. To find them, it is necessary to analyze the values of some indicators of sea ports of Nakhodka and Vladivostok. Among these indicators is isolated: total revenue, total costs, operating profit, cargo throughput and number of employee. Due to insufficient data for analysis and for proper analysis of both ports, was taken the period from 2008 to 2011.

Tables 24 and 25 contains all indicators that will be used for the PPM analysis.

Table 24Selected parameters for assessing PPM indicators for Nakhodka seaport in 2008-2011 (Nakhodka Commercial Sea Port, 2012)

Year	Total revenue (1000 NOK)	Total costs (1000 NOK)	Operating profit (1000 NOK)	Cargo throughput (1000 tons)	Labor (number of employees)
2008	466007,80	278275,38	187732,4	7367,3	2700
2009	520849,84	277241,59	243608,3	7830,3	2517
2010	456768,66	290482,08	166286,6	6543,8	2148
2011	441560,86	305898,39	135662,5	6185,3	2033

Table 25Selected parameters for assessing PPM indicators for Vladivostok seaport in 2008-2011 (Information disclosure in the securities market)

Year	Total revenue (1000 NOK)	Total costs (1000 NOK)	Operating profit (1000 NOK)	Cargo throughput (1000 tons)	Labor (number of employees)
2008	89355,67	65195,15	24160,52	5884,9	455
2009	108132,8	89589,06	18543,74	6226,2	439
2010	125572,6	102390,9	23181,7	6923,7	443
2011	149322,4	122623,1	26699,3	6391,5	461

Thus, using the data in Tables 24 and 25, it is necessary to calculate the PPM indicators to analyze the efficiency of ports and compare them.

First, will be calculated the index of profitability for sea ports of Nakhodka and Vladivostok. It is the ratio of operating profit for seaports in tones. More precisely, this PPM indicator shows how much operating profit brings each additional ton of cargo seaport. Moreover, in the calculation of turnover accounted for as a whole, using containers and dry bulk cargoes.

Further, the index is calculated PPM revenue generating capability by dividing the total revenue for cargo throughput. It shows how much gross income brings each additional ton of cargo, given the containers, dry bulk cargoes.

Indicator of cost efficiency is calculated by dividing the total costs by cargo throughput. It shows how much gross expenses brings each additional ton of cargo, given the containers, dry bulk cargoes.

PPM indicator labor productivity (physical aspect) is calculated as the ratio of turnover to the total number of employees in seaport. It shows how many tons of cargo per employee has a seaport which is, the actual productivity. Labor productivity (financial aspect) is calculated as the ratio of gross profit to total number of employees of the seaport. It shows how much gross income brings each employee to the seaport.

PPM calculated indicators for sea ports of Nakhodka and Vladivostok are presented in Tables 26 and 27.

Table 26 PPM indicators for Nakhodka seaport in 2008-2011 used in case study

PPM indicators	2008	2009	2010	2011
Profitability (NOK per ton)	25,4818	31,1110	25,4113	21,9331
Revenue generating capability (NOK per ton)	63,2535	66,5172	69,8017	71,3888
Cost efficiency (NOK per ton)	37,7717	35,4063	44,3904	49,4557
Labor productivity (physical aspect) (ton per man)	2,7286	3,1110	3,0465	3,0424
Labor productivity (financial aspect) (NOK per man)	172,5955	206,9328	212,6484	217,1967

Table 27 PPM indicators for Vladivostok seaport in 2008-2011 used in case study

PPM indicators	2008	2009	2010	2011
Profitability (NOK per ton)	4,1055	2,9783	3,3482	4,1773

Revenue generating capability (NOK per ton)	15,1839	17,3674	18,1366	23,3627
Cost efficiency (NOK per ton)	11,9784	14,3890	14,7885	19,1853
Labor productivity (physical aspect) (ton per man)	12,9338	14,1827	15,6291	13,8644
Labor productivity (financial aspect) (NOK per man)	196,3861	246,3162	283,4596	323,9098

As we see in Tables 26 and 27 PPM indicators calculated for the two sea ports of Nakhodka and Vladivostok. To visualize the results in the form of diagrams for each indicator where they are compared to the two ports, taken for analysis in the thesis work.

The figure 28 represents PPM indicator Profitability (NOK per ton) for sea ports of Nakhodka and Vladivostok in the period from 2008 to 2011.

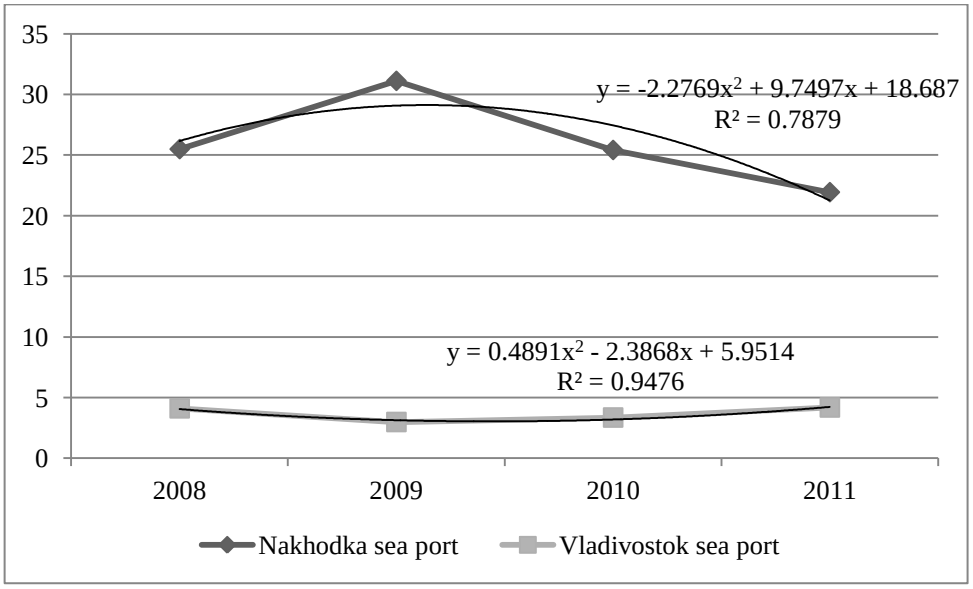


Figure 28 Comparative dynamics of profitability as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (NOK per ton)

Figure 28 shows comparative dynamics of profitability as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 periods (NOK per ton). As can be seen, the figure is much higher in the sea port of Nakhodka, rather than at the seaport of Vladivostok. Therefore, one ton of cargo brings more operating profit for the maritime port of Nakhodka than Vladivostok. Although, you can notice a decrease in the PPM indicator for sea port of Nakhodka in 2010 and 2011.

Correlation and regression analysis PPM indicators showed that with a probability of 78,79% profitability will decline in the sea port of Nakhodka, and with a probability of 94.76% is expected to grow at the seaport of Vladivostok.

Thus, each ton of cargo brings more operating profit for the sea port of Nakhodka, but a more efficient use of each ton of cargo is at the seaport of Vladivostok.

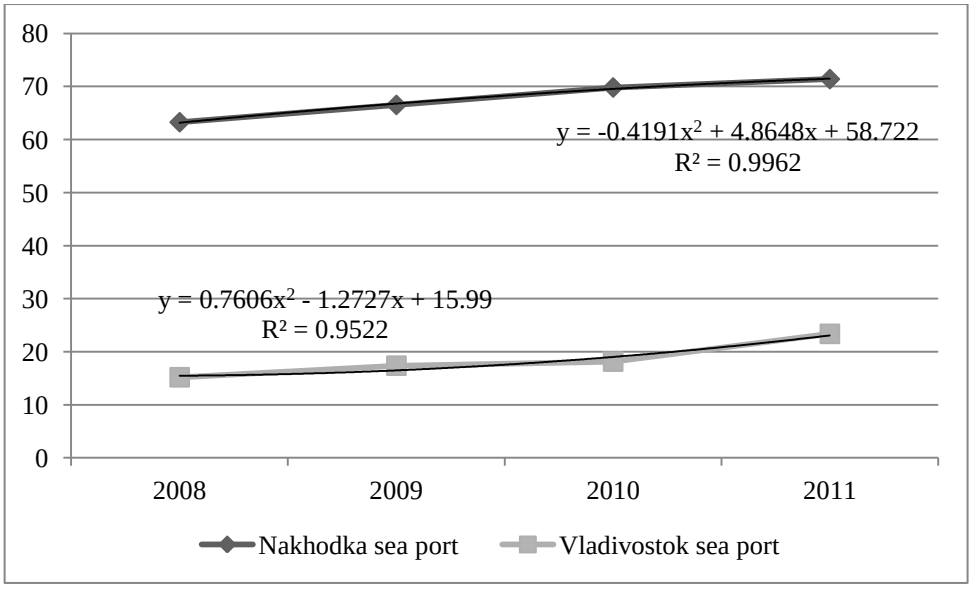


Figure 29 Comparative dynamics of revenue generating capability as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (NOK per ton)

Figure 29 shows comparative dynamics of revenue generating capability as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 periods (NOK per ton). As can be seen, the line is also higher in the sea port of Nakhodka, rather than at the seaport of Vladivostok. Therefore, one ton of cargo brings more gross income for the sea port of Nakhodka, than to Vladivostok. For both seaports can be seen an increase of this index from 2008 to 2011.

Correlation and regression analysis of PPM indicators showed that with a probability of 99,62% revenue generating capability will be increased at the sea port of Nakhodka, as well as with the probability of 95.22 % is expected to grow at the seaport of Vladivostok.

Thus, each ton of cargo brings more operating profit for the sea port of Nakhodka, and more efficient use of each ton of cargo is at the port of Nakhodka .

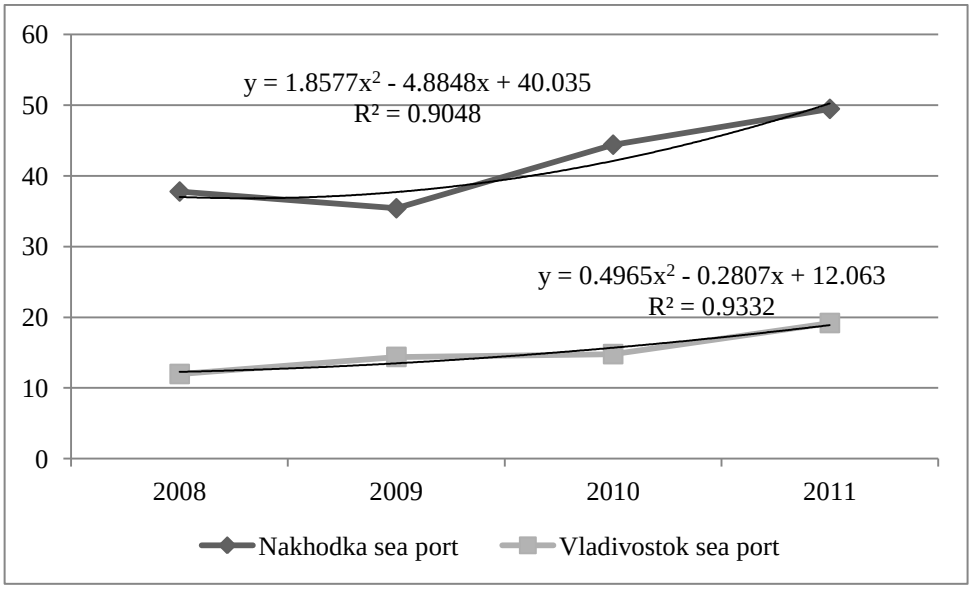


Figure 30 Comparative dynamics of cost efficiency as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (NOK per ton)

Figure 30 shows comparative dynamics of cost efficiency as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 periods (NOK per ton). As can be seen, this figure again is higher in the sea port of Nakhodka than the seaport of Vladivostok. Therefore, one ton of cargo brings more total expenses for the sea port of Nakhodka, than to Vladivostok. For both seaports can be seen an increase of this index from 2008 to 2011.

Correlation and regression analysis of PPM indicators showed that with a probability of 90,48% cost efficiency will be increased at the sea port of Nakhodka, as well as with the probability of 93.32 % is expected to grow at the seaport of Vladivostok. Thus, each ton of cargo brings more total expenses for the sea port of Nakhodka.

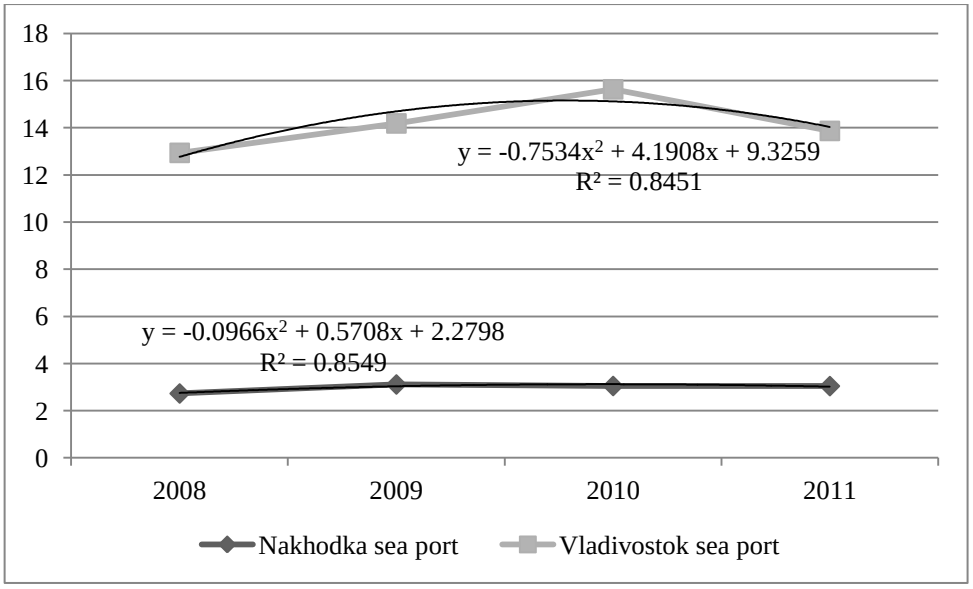


Figure 31 Comparative dynamics of labor productivity (physical aspect) as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (ton per man)

Figure 31 shows comparative dynamics of labor productivity (physical aspect) as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (ton per man). As you can see, the figure is more at sea port of Vladivostok, rather than at the sea port of Nakhodka. Consequently, one person brings more cargo to sea port of Vladivostok, than Nakhodka. Although, you can notice a decrease in the PPM indicator for sea port of Vladivostok in 2011.

Correlation and regression analysis PPM indicators showed that with a probability of 84,51% labor productivity (physical aspect) will decline in the sea port of Vladivostok , and with a probability of 85.49 % will rise from the sea port of Nakhodka.

Thus, each employee brings more cargo to sea port of Vladivostok, but the more efficient use of each ton of cargo employees at the sea port of Nakhodka.

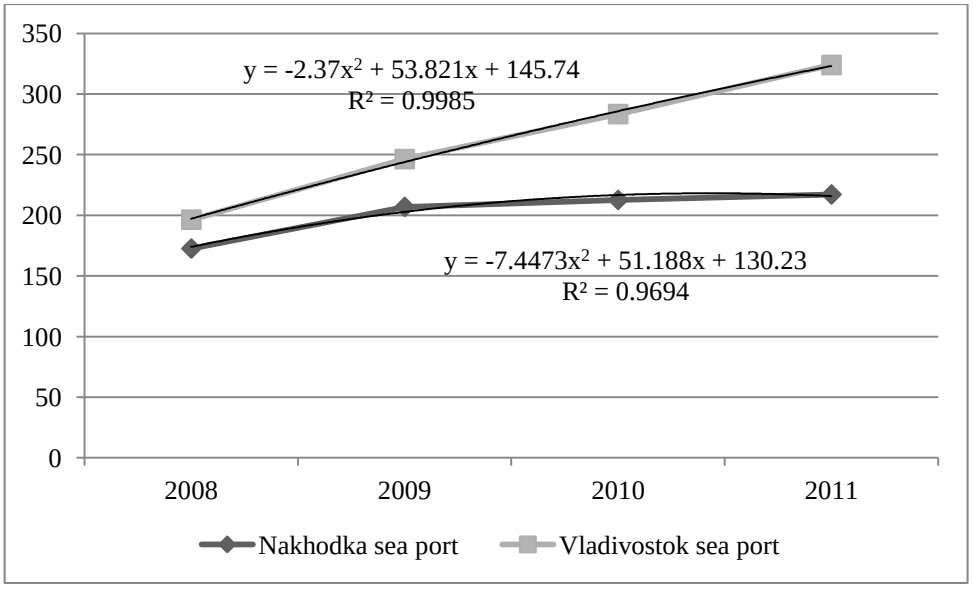


Figure 32 Comparative dynamics of labor productivity (financial aspect) as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (NOK per man)

Figure 32 shows comparative dynamics of labour productivity (financial aspect) as PPM indicator for Nakhodka and Vladivostok sea ports during 2008-2011 period (NOK per man). As you can see , this figure is higher in the seaport of Vladivostok , rather than at the sea port of Nakhodka. Consequently, one person brings in more gross income for the maritime port of Vladivostok, than Nakhodka.

Correlation and regression analysis PPM indicators showed that with a probability of 99,85% labor productivity (financial aspect) will increase in the sea port of Vladivostok , as well as with the probability of 96.84 % will remain at the same level at the seaport of Vladivostok . Thus, each employee brings more of the gross income for the seaport of Vladivostok.

Conclusion on product portfolio analysis and PPM approach

Thus, the analysis of Russian seaports assistance BCG Matrix shows that the categories of products distributed by species and the functions they perform in the activities of seaports. And the sea port of Nakhodka and Vladivostok seaport products are the "stars", "cash cows", "question marks" and "dogs", which distribute among themselves share and growth rate in 2011. As you can see, the port of Vladivostok there are 2 kinds of products, which bring major profits, and for the port of Nakhodka only one type of product. Also, the sea port of Vladivostok has 3 kinds of products "question marks", and the port of Nakhodka to two. Therefore, we can conclude the following: the port of Vladivostok has a differentiated product portfolio and is therefore less prone to risk. The entire product portfolio of Vladivostok has about a different growth rate, significantly equalizes the differences in the productions.

Comparing the two seaports on portfolio analysis the author of the thesis answers the research question 3 and defines more productive seaport in terms of benchmarking. The usual analysis of the productivity of the two most similar to each other seaports identified advantages in efficiency of the port of Nakhodka in section 4 of the thesis. But used the principle of benchmarking for ports and container terminals, author dispelled doubts in the most efficient seaport from a position of analytical comparison.

CONCLUSION AND PRACTICAL AND THEORETICAL IMPLICATIONS

This thesis is devoted to the analysis of the effectiveness of Russian seaports such as Vladivostok and Nakhodka. In the introduction, were set goal of the thesis, objects, jobs and research questions. To achieve the objectives of the thesis the author finds the answers to the four questions that are posed.

Research question 1. What is benchmarking of container ports?

The analysis of the theoretical foundations of benchmarking, as well as its development in the course of maritime ports showed that the use of benchmarking methods effectively and allows to increase the performance of seaports and container terminals. In the research paper provides examples of methods for analyzing the efficiency of ports, but by the rationale was chosen PPM method of analysis that is simple and at the same time efficient

Research question 2. Which method is the most suitable for assessing effectiveness of sea port?

The process of analyzing benchmarking methods in the theoretical foundations has shown that currently use a variety of approaches to determine the quality of performance of many economies. Analysis of the proposed methods to assess the effectiveness of marine ports has led to the conclusion that the most appropriate method - a PPM approach. Let it not be the most effective, but the best in the evaluation of various factors. This approach does not require the PPM data set and variables, it varies simple and accessible indicators are easy to use in practice.

Research question 3. What is the most productive sea port selected in the study?

The practical part of the thesis was devoted to the careful preparation of the analysis of the effectiveness of the seaports of the Russian Federation. But first, proved the feasibility of using these particular sea ports: Nakhodka and Vladivostok. Their striking resemblance,

such as location are almost identical, intact development, the value of turnover given the opportunity to analyze the two seaports in almost all respects activities. In the process of comparative analysis identified factors resemblance sea ports of Nakhodka and Vladivostok, including the proximity to the railway, to each other. All of the selected indicators will help determine the most efficient and productive seaport of the two analyses.

Research question 4

What parameters of each analyzed sea port made it more efficient than another?

In the course of the analysis of the thesis was defined scientific method and approach, which is the best of the candidates. For sea ports of Nakhodka and Vladivostok, as evidenced by the theoretical section, the most appropriate is the PPM analysis because of its simplicity, if there are no set of indicators and the author of the thesis is limited to the input factors. A similar analysis of the PPM is designed to evaluate the parameters of ports and determine their performance. On the basis of the PPM analysis was made on the projected output growth rates of key performance indicators seaports. The results of research can be used for further development and research in the field of benchmarking.

Suggestion for further research

In the thesis work is has been investigated by the author the benchmarking of Russian seaports. The method used for case study has shown that there are advantages in the sea port of Nakhodka and Vladivostok seaport. They were compared on technical parameters, performance indicators, financial indicators.

In the theoretical section was highlighted the usefulness of the PPM method in the comparative analysis of the two seaports. However, further research benchmarking seaports can be directed to the use of more sophisticated methods of analysis, such as Data Envelopment Analysis and Stochastic Frontier Analysis. Future studies may be based on past studies, the subjects of which are devoted to the effectiveness of sea ports. But, for a more precise analysis of two or more seaports will continue to be appropriate to use factor analysis, the method of expert assessments to determine the level of competitiveness of sea ports.

Also, future research can be focused on the careful selection of the input parameters in the performance evaluation system for sea ports. That is, the parameters of the seaports. There is necessity to distinguish between essential and non-essential factors that affect the efficiency of seaports. It is the use of appropriate factors is vital for the future evaluation of the seaports.

In future research will not be easy to find the information for the analysis of the efficiency of ports, so the information should be structured and analyzed. Also, a comprehensive performance evaluation should include an analysis of parameters of productivity, competitiveness, and financial indicators. It will be important to use two or more alternative methods for the analysis to select the most appropriate for this situation.

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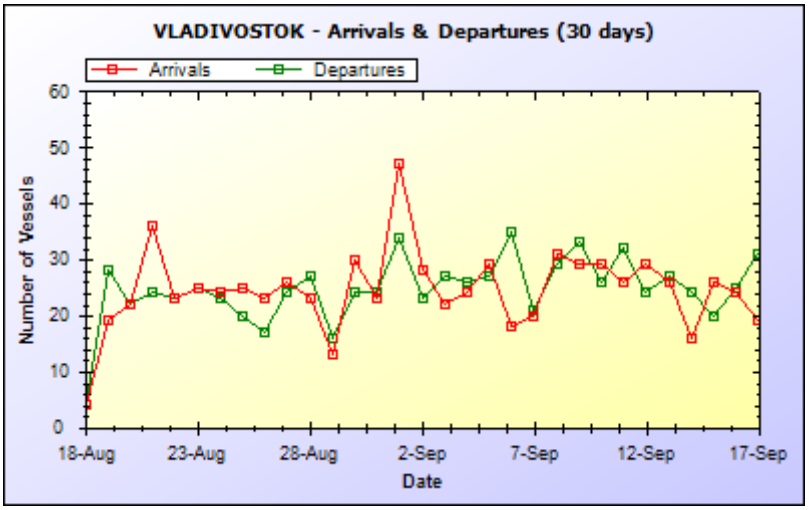
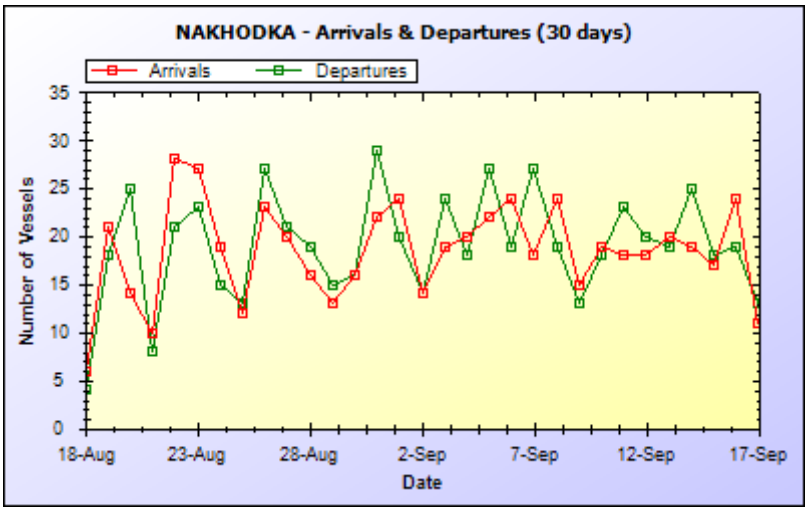
APPENDIX I: ARRIVALS AND DEPARTURES IN VLADIVOSTOK AND NAKHODKA

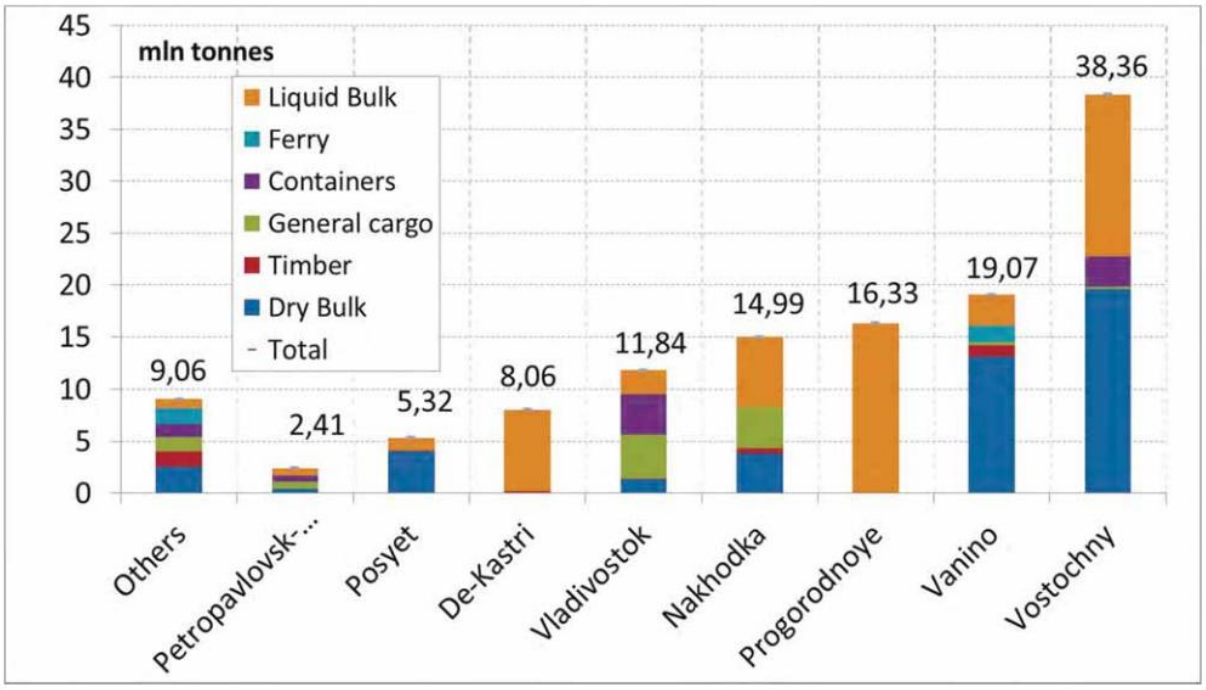
All indicators shown in this figure are collected from the period for one month
18.08.2013 – 17.09.2013
In Vladivostok and Nakhodka sea port
(type of vessels: container and cargo ships)
(Marine Traffic)





APPENDIX II: CARGO THROUGHPUT OF THE FAR ESTERN RUSSIAN PORTS IN 2011

All indicators shown in this figure are collected from the period for the year 2011 (Marine construction and technology)



APPENDIX III: RUSSIAN PORT SYSTEM GEOGRAPHY IN 2011

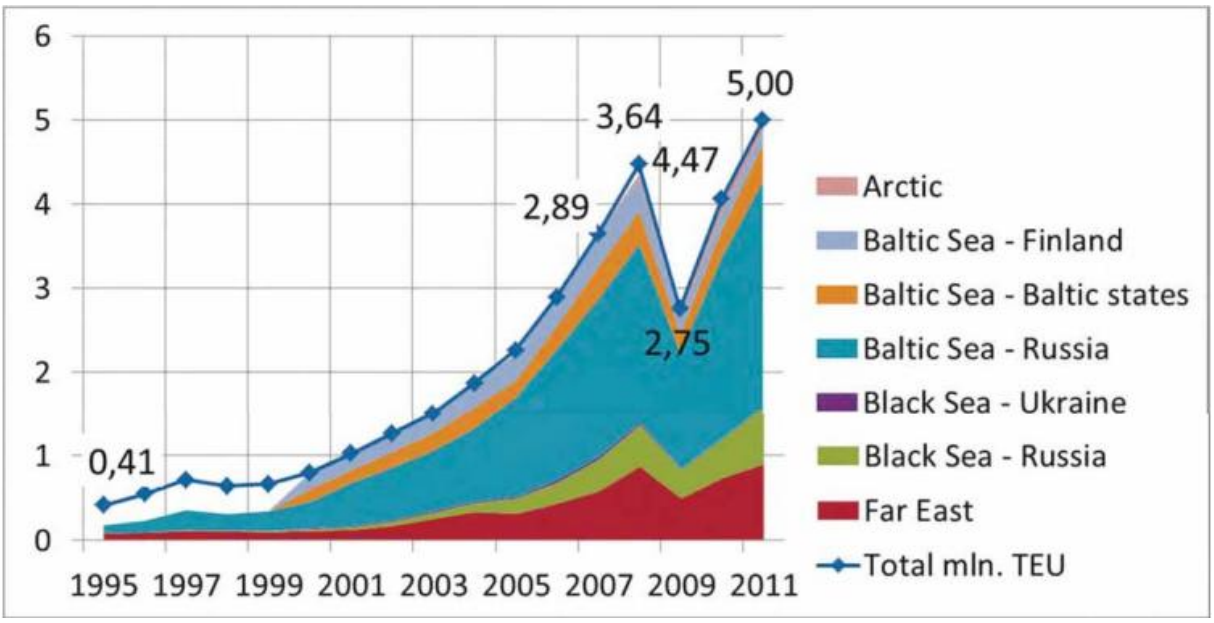
All indicators shown in this figure are collected from
(Marine construction and technology)

APPENDIX IV: RUSSIAN TRANSPORT SYSTEM GEOGRAPHY IN 2011
FAR EASTERN PORTS

All indicators shown in this figure are collected from
(Marine construction and technology)

APPENDIX V: RUSSIAN CONTAINER MARKET
TOTAL PORT CONTAINER HANDLING IN MLN TEU'S IN 2011

All indicators shown in this figure are collected from
(Marine construction and technology)



APPENDIX VI: CONTAINER CARGO FLOWS

All indicators shown in this figure are collected from
(Marine construction and technology)