

# STOCK PARTS FORECASTING USING LEAST SQUARE IN PT. DUNIA BARUSA LHOKSEUMAWE

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## Abstract

Analysis of demand, particularly demand for spare part stock is to measure the current and forecast demand conditions - the condition in the future. Methods least square is a method that is most widely used to determine the equation of trend data. Least square forecasting system to capture the pattern of past data is then used to project the data that will come. Measuring demand now means analyzing the present conditions and previously as a source of information to predict the conditions that will come with the assumption that the past situation will be repeated again in the future and how to forecast the demand for spare part stocks for the future and analyze the needs of the spare parts stock in PT. Dunia Barusa. The purpose of the system can allow companies to predict shortages of spare parts and predict stock inventory of spare parts. With the ability of the forecasting system is expected will be used to measure the current demand and the predicted demand for future inventory stock inventory of spare parts in order to remain stable.

*Keyword : forecasting, least square, spare part*

## 1. INTRODUCTION

Marketing is to measure and predict market demand. Good demand from domestic and external demand. As the market demand (market demand) is defined as the total number of products or services to be purchased by a group of consumers in a particular area, within a certain time, in a specific marketing environment, and in a particular marketing program.

Problems faced in conducting the analysis of demand, especially demand for the stock of spare parts is to measure the current and predicted demand conditions - the condition in the future. Measuring demand now means analyzing the present conditions and previously as a source of information to predict the conditions that will come with the assumption that the past situation will be repeated again in the future.

Least square method is a method that is most widely used to determine the equation of trend data. Method of least squares, divided into two cases, namely the case of the data even and odd data case. Least Square method (least squares) is most often used to predict Y, because the calculation more accurately.

Least square forecasting system to capture the pattern of past data is then used to project the data to come. In this study, the authors will perform inventory forecasting by using the least squares method based on data products in 2010 until 2014. The input variables used in this study are variable demand, while the output variables that forecasting results. With the ability of the forecasting system is expected will be used to measure the current demand and the predicted demand for future inventory stock inventory of spare parts in order to remain stable.

## 2. LITERATURE REVIEW

### 2.1. Decision Support Systems

According Kusri (2007), Decision Support System is a system that is intended to support decision-making managerial decisions in a situation of semi-structured. DSS is intended to be a tool for decision makers to expand their capabilities, but not to substitute their judgment. DSS is intended to decisions that require judgment or on decisions that absolutely can not be supported by the algorithm.

According to Dadan Umar Daihani (2001: 54), the concept of Decision Support Systems (DSS) was first disclosed in the early 1970s by Michael S.Scott Morton explained that the decision support system is a computer-based system intended to help decision makers in particular utilize data and models to solve unstructured problems. In addition Efraim Turban suggests that the Decision Support System is a system that is intended to support decision-making managerial decisions in a situation of semi-structured.

From the definition above, it can be said that the Decision Support System is a system of specific information intended to assist management in making decisions related to issues that are semi structure and structure. This system has the facility to produce various alternatives that can be used interactively by the user. The computer-based system designed to increase the effectiveness of decision-making in solving the problems that are semi-structured and unstructured. The word-based computer is the key word, because it is almost impossible to build DSS without utilizing the computer as a tool primarily for storing data and managing models.

## 2.2. Statistics

According to Suharyadi and Purwanto (2008), Statistics is the science of collecting, organizing, presenting, analyzing, and interpreting data into information to support effective decision-making. Statistics have broad utility in business and other fields. Statistics used in marketing, accounting, management, quality control, see customer satisfaction, and so on.

According to Suharyadi and Purwanto (2008), The types of data is divided into two, namely:

- a. Qualitative data is data on non-numeric (numeric) such as gender, favorite color and ethnic origin. Qualitative data is used when we are interested in seeing the proportion or parts that are included in the category.
- b. Quantitative data are data numbers or numeric. So, all of these measures in the form of numbers.

## 2.3. Forecasting

According to Hery Prasetya (2009) Forecasting is an attempt to predict the future state through testing condition in the past. The essence forecasting is an estimate of the events in the future on the basis of the patterns in the past, and the use of policy towards the projections with patterns in the past. Forecasting is an art and science to predict future events. This can be done by involving the retrieval of past data and placing it into the future with a mathematical model forms.

According Rosnani Ginting (2007) concept of forecasting is the initial part of a decision-making process. Before performing trelebih forecasting should be known in advance what exactly the problems in making that decision.

According Subagyo (2002) the purpose of forecasting is getting forecasting that minimize errors predict (forecast error) is usually measured by Mean Absolute Error (MAD), and Mean Squire Error (MSE). So with the forecast production company's management will get an overview of the state of production in the future, and will provide facilities management company in determining the policy to be made by the company. According Gaspersz (2005) the purpose of forecasting is to predict the demand of independent demand items in the future.

According Render and Heizer (2005) on the type of forecasting can be divided into several types. Judging from the planning of future operations, the forecasting is divided into three kinds:

- a. Economic Forecasting (economic forecast) explains the business cycle to predict the rate of inflation, the availability of money, the funds needed to build perumahan and other planning indicator.
- b. Forecasting technology (technological forecast) take into account the level of technological progress that can launch exciting new products, requiring new factories and equipment.
- c. Forecasting demand (demand forecast) are projected demand for the company's products or services. Projections of demand for the products or services of a company. Forecasting is also called forecasting sales, which controls production, capacity and scheduling system and becomes an

input for financial planning, marketing, and human resources.

According Rosnani (2007) good forecasting has several important criteria, such as accuracy, cost, and convenience. Explanation of the criteria is as follows:

- a. Accuracy  
The accuracy of forecasting an outcome is measured by the results of habit and consistency of the forecasting. Kosisten said forecasting results when the magnitude of forecasting error is relatively small. Forecasting that is too low will result in supply shortages, forecasting that is too high will result in the accumulation of inventories. Then the accuracy of forecasting results is instrumental in menyeimbangkan ideal inventory
- b. Charge  
Costs required in making a forecast adalah depending on the number of items predicted, the length of the forecast period, and the forecasting method used.
- c. Easiness  
The use of forecasting methods that are simple, easy to make, easy to apply and will benefit the company.

## 3. RESEARCH METHODOLOGY

In a study conducted by the author in PT. Dunia Barusa Lhokseumawe, the authors collected data is based on the following method:

- a. Field Research (Field Research) is through direct observation of daily activities at PT. Dunia Barusa Lhokseumawe.
- b. Library Research (Research Library) is through the books and other materials related to this research.
- c. Interview (interview) that the authors collected data in face-to-face with managers and employees or in order to obtain the information necessary.

Data input is entered in the Least Square method (Least Squares) were as follows:

- a. Data Parts
- b. Data Stock Parts
- c. Data needs Stock Parts

The assessment procedure in forecasting stock of spare parts using the least squares method in PT. Dunia Barusa Lhokseumawe represented in tabular form as follows:

Table 1. Data Stock Spare Part 2010 until 2014

No	Years	Stock Spare Part
1	2010	9200
2	2011	11227
3	2012	23661
4	2013	19422
5	2014	22527
	<b>Amount</b>	86037

## 4. RESULT AND DISCUSSION

Forecasting Stock Spare Part Method Using Least Square at PT. Dunia Barusa Lhokseumawe is a system that processes the data and make the process of forecasting the stock of spare parts to the forecasting system in the future, for example, the data so inputted in 2010, 2011, 2012, 2013, and 2014 will be obtained forecast the amount of the stock of spare parts until 2017. The system involves forecasting between tbsp manager, chief engineer, and data stock of spare parts. In the processing system spare part stocks assessed from data on the number TGMO, Oil Filters, Spark Plugs, Padkit, Air Filter, a year which is calculated using the least squares method.

Forecasting of the stock of spare parts at the moment still in the process of using the manual method like using handwriting and Microsoft Office programs, Word or Excel. System is running in PT. Dunia Barusa felt still less effective and efficient, it is not uncommon stock of spare parts is less than is needed, on the other hand also sometimes happens the stock of spare parts with an excessive amount. In this section will be developed a database application that has a good job, in producing a report that accurately forecast the amount of stock of spare parts. With the capability of this system, it is expected in the stock of spare parts becomes more optimized and increased.

In the process of designing computer-based systems, problem analysis plays an important role in making the details of the application to be developed, the analysis of the problem is a step in understanding the issue before taking action or decision final settlement.

Analysis of the new system will be developed to explain about the system that will be created which will be applied in determining activity forecast stoke spare part in PT. Dunia Barusa. In this system, any system users no longer have to re-create the table every new page in the process peningputan data by using the application Microsoft Office, data users enter data on the forms that have been available on the results of data processing systems forecast the stock of spare parts, so that it will directly appear on the page reports that have been made. So to create a database application forecasts the stock of spare parts need the computer for data entry facilities are made. In order to do that we need a program that can provide a better system.

At this stage of system design aims to determine measures overall system operations applications that starts from the design diagram Context and proceed with designing DFD (Data Flow Diagram), ERD (Entity Relationship Diagram), table structure and interface design. In the Data Flow Diagrams (DFD) describes how the functional processes detailed system that connects between the one with the other parts.

### 4.1. Context Diagram

Context diagram is a diagram related to external systems, and in this context diagram describes a general overview of forecasting stock of spare parts using the least squares method. More clearly seen in Figure 1 below.

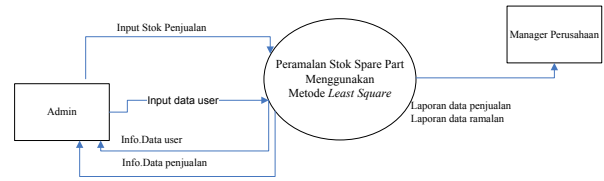


Figure 1. Context Diagram

### 4.2. Data Flow Diagram Level 0

In designing the data flow diagram above illustrates in detail, for example, the admin does inputting the data management process of forecasting the stock of spare parts are stored in a database that was named the fulfillment of the water and so are other processes. Can be explained more clearly in Figure 2 below.

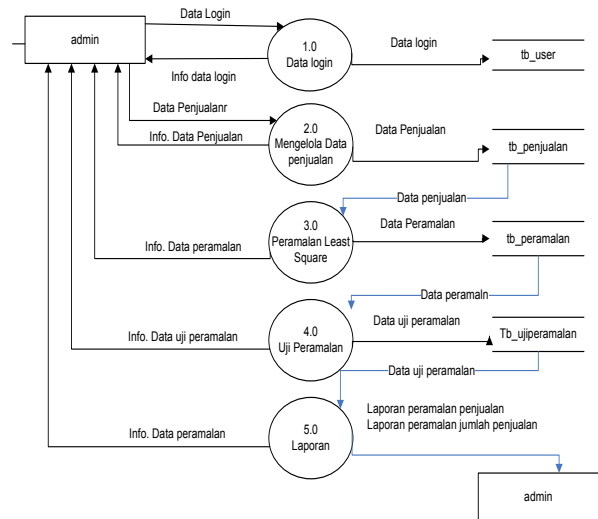


Figure 2. DFD Level 0

### 4.3. DFD Level 1 Process 1 Managing Data Login

Figure 3 below DFD level 1 process 1 (Managing Data Login), described in more detail in managing data login, namely the processes needed by the system, for example the process save, edit, update and delete then the data is stored in a database that is named admin and the system is in use by admin.

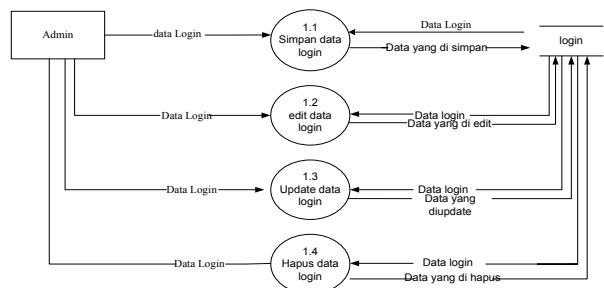


Figure 3. DFD Level 1 Process 1 Managing Data Login

### 4.4. DFD Level 1 Process 2 Data Sales

Figure 4 below DFD level 1 process 2 (Managing Data Sales), described in more detail in managing address data location, namely the processes needed by the system, for example, the process is stored, edited, updated and deleted then the data is stored at a given

address location database and the system is in use by admin.

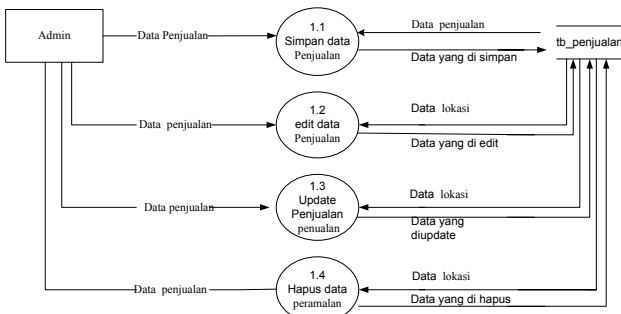


Figure 4. DFD Level 1 Process 2 Data Sales

#### 4.5. DFD Level 1 Process 3 Forecasting Data Stock Spare Part

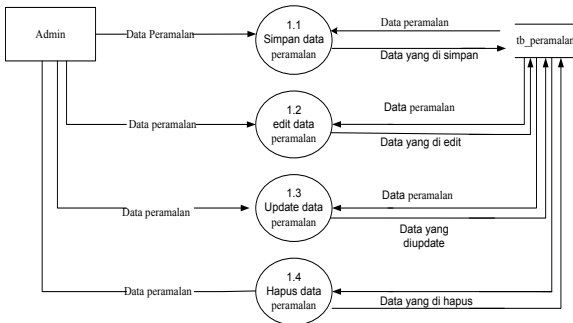


Figure 5. DFD Level 1 Process 3 Forecasting Data Stock Spare Part

Figure 5 above DFD level 1 process 3 (Managing Data Availability of stock of spare parts forecasting), described in more detail in managing the data stock of spare parts forecasting, namely the processes needed by the system, for example, the process is stored, edited, updated and deleted then the data is stored on a database that was named tb\_forecasting and the system is in use by admin.

#### 4.6. DFD Level 1 Proses 4 Test Data Forecasting

Figure 6 above DFD level 1 process 4 (Data stock spare forecasting test), described in more detail in managing test data forecasting.

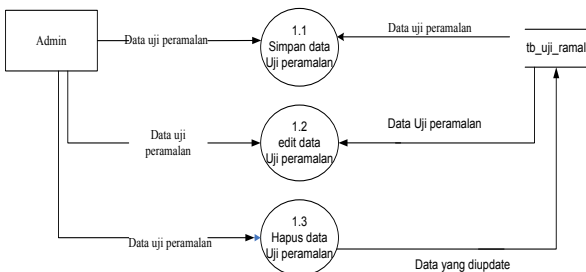


Figure 6. DFD Level 1 Proses 4 Test Data Forecasting

#### 4.7. System Implementation

The interface is designed to have some form of which form the input file stock sales, forecasts, reports and forms printed on. Clearer will be described below as follows:

##### 4.7.1. Form File Data Login

Form login data is the first form arises when the application is run, this form and closes automatically. Login form serves to enter the program input and reports, how the login form is a way to fill in the appropriate username and password and click login here. More clearly seen in Figure 7 below:

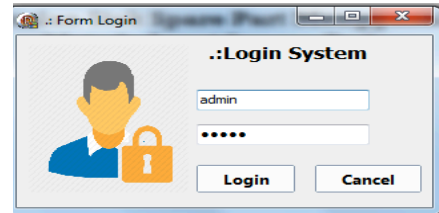


Figure 7. Form File Data Login

##### 4.7.2. Form Main Menu

Form the main menu is the form in which the first caller from the main menu we can open all the forms, procedures, or reports desired. To more clearly seen in Figure 8 below:

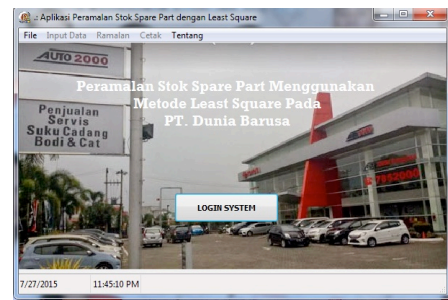


Figure 8. Form Main Menu

##### 4.7.3. Form Input Data

Input data is designed to have some form of them form file sales data, sales data input form, form input user data, form data forecasts least square, forecasting all form data, forecasting graph form, and form the print menu. Clearer will be described below as follows:

##### 4.7.3.1. Form File Data Penjualan

Form Input Data stock of spare parts can be displayed through the main form menu > Input Data. See file Form stock data sales. This form is used to view data files sales data, sales data can be input file, save, delete, and out of form. To more clearly could dilihat in Figure 9 below:

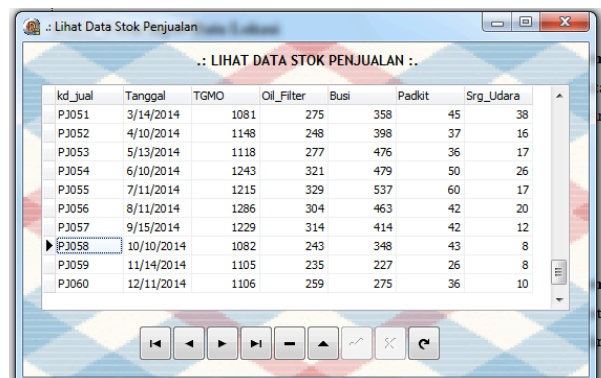


Figure 9. Form Input Data Location

#### 4.7.3.2. Form Input Data Penjualan

Form Input sales data can be displayed through the main form menu > Input Data. Form Input sales data. This form is used to enter, save, delete, update and out of form. To more clearly could dilihat in figure 10 below:

Figure 10. Form Input Data Stock Sales

#### 4.7.3.3. Form Input Data User

Form Input user data can be displayed via the main form menu > Input Data. Form user data. This form is used to enter, save, delete, update and out of form. To more clearly could dilihat in figure 11 below:

ID_USER	USERNAME	PASSWORD	AKSES
US02	angga	1234	Operator
US03	admin	admin	Admin
US04	direktur	direktur	Direktur

Figure 11. Form Input Data User

#### 4.7.4. Form Data Forecasting Least Square

Form Forecasting Input data can be displayed through the main form menu > select Data Input Data forecasting. Input Form forecasts least square. To more clearly be seen in Figure 12 below:

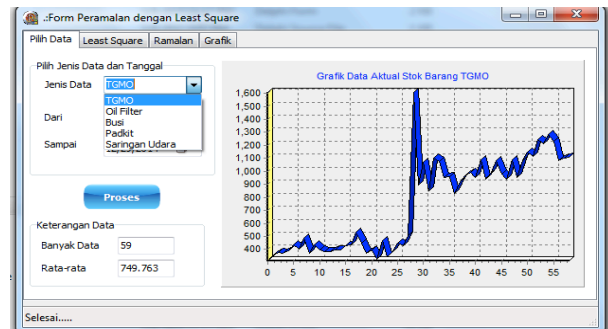


Figure 12. Form Data Forecasting Least Square

#### 4.7.5. Form Data All Forecasting

Data reports forecasting the stock of spare parts consists of consists of the year, the number of spare parts, spare parts fulfillment amount, total demand and total stock of spare parts. How to call a water distribution report that is on the main Form menu > Reports, click a report forecasting all the data, it will come out form the decision of forecasting stock of spare parts. To more clearly seen in Figure 13 below:

id	tanggal	barang	Y	X	X_Kuadrat	XY
1	2/12/2010	TGMO	312	-29	841	-9048
2	3/14/2010	TGMO	350	-28	784	-9800
3	4/10/2010	TGMO	378	-27	729	-10206
4	5/13/2010	TGMO	372	-26	676	-9672
5	6/10/2010	TGMO	387	-25	625	-9675
6	7/11/2010	TGMO	433	-24	576	-10392
7	8/11/2010	TGMO	405	-23	529	-9315
8	9/15/2010	TGMO	487	-22	484	-10714
9	10/10/2010	TGMO	373	-21	441	-7833
10	11/14/2010	TGMO	437	-20	400	-8740

Total X\_Kuadrat (a) 17110      Rata-rata Y 749.762711864407  
 Total XY (b) 298014      C (b/a) 17.4175336060783  
 Hasil Formula Ramalan:  $Y = 749.8 + 17.4 X$

Figure 13. Form Data Forecasting Least Square

#### 4.7.6. Form Forecasting Graphs

Form forecasting graphs can be displayed through the main form menu > Reports. Form charts forecasting. This form is used to enter, correcting, processing, and returns. This form consists of a selection of data, and a year-tellers. To more clearly could dilihat in Figure 14 below:

tanggal	aktual	ramalan
2/12/2010	312	245
3/14/2010	350	262
4/10/2010	378	279
5/13/2010	372	297
6/10/2010	387	314
7/11/2010	433	332
8/11/2010	405	349
9/15/2010	487	367
10/10/2010	373	384
11/14/2010	437	401
12/11/2010	393	419
1/10/2011	383	436
2/12/2011	380	454

Bulan Ke	Barang	Ramalan
1	TGMO	1290
2	TGMO	1307
3	TGMO	1325
4	TGMO	1342
5	TGMO	1359

Figure 14. Form Forecasting Graphs

The report consists of the forecasting graph consists of a selection of data reports, charts, and year. How to call graphs forecasting that the main form menu > Reports, click a report forecasting charts and click process, it will exit the decision graph form forecasting. To more clearly seen in Figure 15 below:

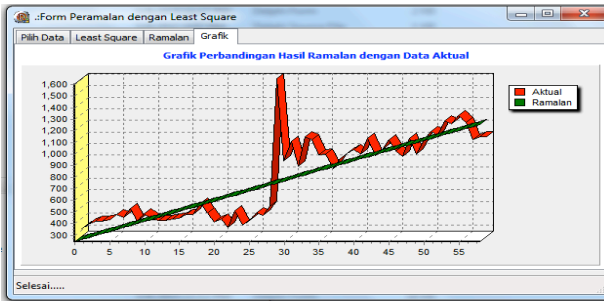


Figure 15. Form Result of Forecasting Graphs

#### 4.7.7. Form Report Menu

Form a report forecasting the print menu can be displayed through the main form menu > Print. For more details on the picture may in Figure16 below:

PT  
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LAPORAN DATA STOK PENJUALAN

TANGGAL	TGMO	Oil Filter	Bu-ii	Padlet	Saringan Udara
1/10/2010	352	108	112	13	0
2/12/2010	312	115	180	20	1
3/14/2010	350	132	200	23	1
4/19/2010	378	138	184	17	0
5/13/2010	372	151	194	21	0
6/19/2010	387	153	186	18	4
7/14/2010	433	170	246	19	7
8/14/2010	405	181	298	44	4
9/19/2010	487	178	200	33	4
10/10/2010	373	136	149	26	4
11/14/2010	437	141	203	25	7
12/11/2010	393	191	262	27	2
1/19/2011	383	118	240	29	4
2/19/2011	380	181	281	31	4
3/14/2011	397	183	243	33	6

Figure 16. Results Report Form Data Sales

Furthermore, the report form of prediction results are used to seeing the results of the forecast. Admin to form images can be seen in Figure 17 below:

PT  
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LAPORAN DATA HASIL PERAMALAN STOK PENJUALAN

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Keterangan

Jumlah Data : x

Tahun : 2015

Detail Hasil Peramalan

Bulan	Barang	Data Peramalan
1	TGMO	1285
2	TGMO	1303
3	TGMO	1320
4	TGMO	1337
5	TGMO	1354

Figure 17. Form Result Forecasting

## 5. CONCLUSION

From the results of the design Parts Stock Forecasting Method Using Least Square At PT. Dunia Barusa Lhokseumawe, the writer can draw conclusions:

- The research resulted in a system application Forecasting Inventory stock spare parts that can be used to predict the amount of inventory stock based on the type of goods.

- Forecasting given by the least squares method in the periodic data is not good, because the graph shown there is a difference that is very much to be a reference.

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