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Forecasting Sales Cotton and Polyester Yarn at PT. Agung Sejahtera Sukaraharja Karanganyar

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Abstract

This study aims to determine the sales forecasting and polyester cotton yarn in January 2015 by using the Least Square Method and Method of Quadratic Trend. As well as to determine the most efficient methods of forecasting to predict sales of cotton yarn and polyester products at PT Agung Sejahtera. From the results of analysis based on the calculation of sales forecasts yarn products with sales data from January to December 2014 using the least squares method and quadratic trend method, in which the quadratic trend method is more suitable because it has a value of SKP lows while the predictive value of product sales yarn using trend quadratic result of cotton yarn 40 weaving of 1,538 ball, cotton yarn 40 amounted to 597.504 ball spandex, polyster yarn weaving amounted 411.348 40 ball, 30 Weaving Polyester yarn ball at 336.588.
Keywords: sales forecasting, least square, quadratic trend.

Abstrak

Penelitian ini bertujuan untuk mengetahui peramalan penjualan benang cotton dan polyester pada bulan Januari 2015 dengan menggunakan Metode Least Square dan Metode Trend Kuadratik. Serta untuk mengetahui metode peramalan yang paling efisien untuk meramalkan penjualan produk benang cotton dan polyster pada PT Agung Sejahtera. Dari hasil analisis diketahui berdasarkan perhitungan ramalan penjualan produk benang dengan data penjualan Januari-Desember 2014 yang menggunakan metode least square dan metode trend kuadratik, dimana metode trend kuadratik lebih cocok digunakan karena memiliki nilai SKP terendah sedangkan dari nilai ramalan penjualan produk benang dengan menggunakan metode trend kuadratik diperoleh hasil Benang cotton 40 weaving sebesar 1.538 ball, benang cotton 40 spandex sebesar 597,504 ball, benang polyster 40 weaving sebesar 411,348 ball, benang Polyester 30 Weaving sebesar 336,588 ball.

Kata kunci: peramalan penjualan, least square, trend kuadratik

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Introduction

An established company has a goal to produce goods and services into consumer needs and at the same time could make a profit from the venture. Besides being able to make a profit, it also aims to assist the government in reducing the unemployment rate, to create new jobs and aims to maintain and improve the viability of the company in the future. To make this happen, the leadership of the company must establish a proper policy in managing the company. Good management will increase the value of the goods. Goods produced by a company will compete with other companies, so that there will be competition. Industry competition becomes more intense and competitive. Globalization and technological developments into aspects affecting the quality of an industry position. Technology provides many positive effects and globalization provide easy access for industry around the world where globalization has penetrated into various aspects of life of both the cultural, economic, and industry.

Currently, many changes have occurred, among others, the development of technology and information. Which led to come a lot of companies, so there is competition between companies of the business with other companies. Every company is trying to win the competition by offering high quality production to the consumer, The goal of a business organization is to produce goods and services that can satisfy consumers (MT, 2011). Companies need to create a strategy in order to maintain consumer loyalty to the company. To overcome these problems, the company uses a way to improve the quality of the production process in order to create a good product quality. Good quality products will increase the selling value of the product. Aside from how the company needs to know the planing / plans regarding the sale of products in the future. Companies also should consider this aspect because it is one of the effective means used. One plan that can be realized is forecasting to product sales by using past data.

Forecasting is one very important element in the decision process. Forecasting is done generally based on past then analyzed using the methods or certain ways. Past data is collected, studied, analyzed and linked with the passage of time, due to the time factor, the data from the analysis, we can try to say something happening in the future. In this case we are faced with a state of uncertainty, so there will be accuracy or dissimilarity factor to be reckoned with. Forecasting is always intended that the prediction made to minimize forecast error means the difference between reality with the forecast is not too much because the forecast will not be "Perfect", nevertheless forecasting results will provide direction for planning. Good forecasts are predictions closer to reality. Therefore, forecasting is used as a reference in the decision making good forecasts are needed.

Common problems faced by managers is how to forecast sales of goods in the future based on the data that has been recorded previously. Forecasting is very influential on the manager's decision to determine the amount of production of goods that must be provided by the company.

PT. Agung Sejahtera is one company that is engaged in yarn spinning industry. The company manufactures and distributes products yarn with a local marketing and export include Solo, Yogyakarta, Jakarta, Bandung and for export to China, India, Thailand, Columbia, and Japan. Type of yarn produced, among others: Cotton Yarn, Rayon, Polyester and others.

Due to some products produced by PT. Agung Sejahtera very attentive to market demands and desires of consumers. With the method of forecasting, it is expected that the company can determine the number of products to be sold at a particular time.

Forecasting

According Heizer and Render (2006: 46) forecasting is the art and science that predicts future events. Forecasting requires retrieval of historical data and project it into the future. Ishak (2010: 104) Forecasting is thinking on a large scale, for example, the demand for one or more products in the coming period.

According to Nasution (2003: 25) Forecasting is predicting several future needs which includes the need to measure the quantity, quality, when and where needed in order to meet the demand for goods or services.

According to Hendra Poerwanto Sales forecasting is technically estimates or projections of potential consumer demand for a certain time with a range of assumptions. Sales forecasting is an estimate of something that has not happened. Sales forecasting is a budget that contains those estimates on activities of the company within a certain period to come, and contain those estimates on the state or financial position of the company at some time to come.

Forecasting Objectives

The purpose of forecasting is to obtain information about changes in the future that will affect the implementation of the policies and their consequences, the following are the steps to their forecasting, namely: 1.To determine policies in the problems of constructing a budgets; 2.To monitor the supply of a product to be sold; 3.To assist the planning and supervision of the reproduction of goods and services; 4.To conduct surveillance for the expenditure of the company; and 5.To draw up policies that effectively and efficiently.

Characteristics of a Good Forecasting

Good forecasting has several important criteria, such as accuracy, cost, dankemudahan. The explanation of these criteria are as follows: 1.accuracy of the results of forecasting is measured by results and the consistency of the forecasting habits. The result of said bias when forecasting forecasting is too high or low compared with the fact that actually happened. Forecasting results is said to be consistent if the relatively small size of the forecast error; 2.The cost required in making a prediction is dependent on the number of items that are foreseen, the length of the forecast period, and the forecasting method used. These three factors trigger these costs will affect how much data is needed, how the processing of data (manual or computerized), how the data storage, and who seconded experts; 3.The use of forecasting methods that are simple, easy to make and easy to apply will benefit the company. Useless wearing a

sophisticated method, but it can not be applied to the company's system because of limited funds, human resources, as well as technological equipment.

Nature of Forecasting Results

In making the forecast or apply the results of a prediction, then there are several things to be considered, namely: 1.Exact predictions contains an error means that forecasters could only reduce the uncertainty that occurs, but can not eliminate this uncertainty; 2.Forecasting should provide information about how the size of the error, means for forecasting certainly contains errors, it is important for the psychic to tell you how big a mistake that might occur; 3.Short-term forecasting is more accurate than the long-term forecasting. This is due to the short-term forecasting, the factors that affect the demand is still relatively constant, whereas the longer the forecasting period, the greater the possibility that changes in the factors affecting demand.

Type Forecasting

According to Render & Heizer (2001: 46), forecasting can be divided into three types, namely: 1.Economic Forecasting: explain the business cycle to predict the rate of inflation, the availability of money, the funds needed to build housing and other planning indicator; 2.Forecasting Technology: considering the level of technology that can launch exciting new products, requiring new plants and equipment; 3.Demand Forecasting: the projected demand for the products or services of a company. This prediction is also called sales forecasting, which controls production, capacity and scheduling system and becomes an input for financial planning, marketing and human resources.

Types of Forecasting

Here are some forecasting methods that can be used for the benefit of sales forecasting: 1. Qualitative Forecasting Methods, 2. Quantitative Model (Statistics / Statistic Method) and 3. Custom Models.

Qualitative Forecast is based on the opinion (judgment method). Used to compile the forecast sales and forecast of business conditions in general. Opinions were used as a basis for Forecast is: a.Opinion Salesman. Salesman asked to measure whether there is progress or regress all things associated with the level of sales in their respective regions; b.Opinions Sales Manager. In general, estimates of head of sales can be more objective because it takes many factors. It is also due to the relatively higher education and broader experience in the field of sales; c.Expert opinion. Sometimes estimates made by the salesman and sales manager for any contradiction. Companies need to employ consultants in the company; d.Consumer survey. If the opinion of the three parts of the above it is less then the company needs to ask the opinion of the consumer. By conducting surveys or research to consumers.

Quantitative Model (Statistics / Statistic Method). Forecasting requires a blend of quantitative scientific analysis using statistics as a primary tool in making the forecast. Here are some methods of forecasting using statistical approaches are: a.Free trend. In general, smoking trends tend dignakan method as the preliminary analysis that will provide a preliminary picture of a problem that is faced. Free trend method trying to see data

patterns through the scattered observations of pairs of data points panjualan at any time; b.Trend Half Average. Spring average trend method can be used for forecast to form an equation such as regression analysis. This method can be used if the data amount is even, so it can be divided into two groups of equal size; c.Mathematically trend. Here are various methods of mathematical trend, namely: 1)Trend Method of Moment. A moment trend analysis method that can be used for forecasting by forming the equation Y = a + bX. In application of this method does not require the amount of data must be an even number. The difference with the trend Methods semi Average score value lies in giving his X. In this case X starts giving scores of 0,1,2 and so on.

2)Least Square method. In this case the data do the division into two groups. For data that is odd number or even number, namely: Even, then score the value of X is ..., -5, -3, -1,1,3,5, ... Odd, then score the value of X is ..., -2, -1,0,1,2, ...

3)Trend method Quadratic. Quadratic trend method is used for forecasting analysis to establish the equation Y = a + bX + CX2. In application of this method requires that the amount of data even or odd. In this case the score X Award as the least squares method.

4)Regression methods. Correlation and regression analysis showed a relationship between one variable with one or more other variables. With the correlation analysis can know the relationship of the variable-variable concern while the regression analysis hubngan form of variables that concern. By regression analysis the magnitude of the changes sought variables when other factors affecting these variables change.

Custom Models. This particular method is a special way to forecast sales by market share analysis, analysis of product line, and end-user analysis. Model quantitative (statistics), in reality the overall usage is still less reliable results. Here's an explanation of sorts - kind of specific methods are: a.Industry analysis.

In this analysis is more emphasis on "Market Share" owned by the company. This analysis connects the potential sale of the company with the industry in general (volume, position in competition). Stages in the use industriyaitu analysis: 1)Creating industrial demand projections. 2)Assessing the company's position in the competition. b.Analysis Product Line. Generally, analysis of product line used in a company that produces some sort and do not have in common, thus making forecasting should be separate. c.Analysis of End Use. For companies that produce semi-finished products, still require further processing into finished products ready for consumption, hence in making forecasting determined by end use in connection with the resulting product

Previous Research

1.Rita Budi Hastuti Research in the title Evaluation Budgeting Sales in the printing and publishing division PD Anindya Yogyakarta in 2004 with the results show that the company does not take into account the moment method. But the company is using a calculation budget with an increase of 10% per month, and with the realization of 75% of the sales budget. 2.Herry Anggita Research in the title Study Implementation of the sales budget as a tool of Control Sales (Case

Study at PT Perkebunan Nusantara IX Surakarta) with the results of the process of drafting budgets of sales at PT Perkebunan Nusantara IX has been inadequate, due to the characteristics of the budget, terms of Personality tanggaran, the functioning anggran sales. In addition, the sales budget function sebaga isebagai control device sales, because there is a phase control stage very effective sales.

Methods

Use descriptive research design techniques to create a picture or description of a systematic, factual and accurate information on an object under study (Sumarni and Wahyuni, 2006: 52). Object of research conducted at PT. Agung Sejahtera Sukaraharja located on Highway 7 KM Solo-Sragen, Karanganyar. The data used is secondary data. Subagyo (2002), secondary data is data that is obtained in the form of ready-made, had collected other people, either individuals or organizations that later quoted by the author. In this case, which is included in the secondary data, data on the number of office employees, data on the number of employees, production and sales data yarns during the period January to December 2014, which will be used to forecast sales in 2015.

Data Collection Technique

1.Observation techniques. Researchers conduct direct observation of something that is researched and keep records of what has been observed. 2.Literature review. Researchers studying the books and other articles that may help solve the underlying problem of research. 3.Documentation. Performed by recording and copying the data in the company as a source of research information.

Data analysis

After collecting the data will be analyzed using the least squares method and the method of quadratic trend.

a.Least Square method. If the number / odd number of data then the value of X of data amid zero (0). While the data on it (previous data) is negative and the value of the underlying (data thereafter) is positive.

1)Establish a table to find the value of X, X^2, and XY. 2)Finding the value of a and b to get the equation Y = a + bX. 3)Including the value of X in accordance year to be searched.

If the number / amount of data even then the second X value of data amid worth -1. While the data on it (previous data) is negative odd number and the value of the underlying (data thereafter) is positive odd.

1)Establish a table to find the value of X, X2, and XY. 2)Finding the value of a and b to get the equation Y = a + bX. 3)Including the value of X in accordance year to be searched.

b.Trend method Quadratic

If the number / odd number of data then the value of X of data amid zero (0). While the data on it (previous data) is negative and the value of the underlying (data thereafter) is positive.

1)Tabulated like to find the value of X, X^2, XY, X2Y, and X4. 2)Finding the value of a, b and c of the equation Y = a + bX + CX2. 3)Including the value of X in accordance year to be searched.

If the number / amount of data even then the second X value of data amid worth -1 and 1. While the data on it (previous data) is negative odd number and the value

of the underlying (data thereafter) is positive odd.

1)Establish a table to find the value of X, X ², XY, X2Y, and X4. 2)Finding the value of a, b and c of the equation Y = a + bX + CX2. 3)Including the value of X in accordance year to be searched.

Having in mind the results of any of the above methods it uses standard forecasting error by the

formula:

$$SKP = \frac{\sqrt{\sum(X-Y)^2}}{n}$$

Note: X: real sales

Y: Sales Forecast

n: data

Discussion

PT. Agung Sejahtera perform sales forecasting activities have not been using a method. However, simply using customized estimates with sales data Polyester and Cotton in the previous period. For this type of Polyester and Cotton yarn is 40 Weaving Polyester (PE 40 WV), Polyester 30 Weaving (PE 30 WV), Cotton 40 Weaving (CT 40 WV), and Cotton 40 Spandex (CT 40 SPDX)

In conducting the sales forecast, first prepare the data that will be used to predict which sales data Polyester yarn and Cotton in the previous year, then choose forecasting methods to be used, in this case the method to be used is twofold method of Least Square and Methods Trend Quadratic ,

By comparing the forecasting results of both methods, it is expected to obtain the smallest error rate, which can be used as a guide for forecasting the next period.

Tabel 1. Sales Data Polyester and Cotton in 2014 (the ball)

Month	Type - Type Yarns			
	CT 40 WV	CT 40 SPDX	PE 40 WV	PE 30 WV
January	1061.916	417,000	270.021	314.031
February	701.875	388,000	451.500	257,000
March	496.385	430.000	302.000	224.042
April	606.000	468.000	295.104	187.104
May	649.250	490.010	443,000	206.875
June	1289.125	478.135	497.500	215.010
July	778.500	463.625	305,000	274,000
August	1016.625	444.500	407,000	323.000
September	892.625	363.250	497.958	433.000
October	527.020	487.500	358.500	415,000
November	808.875	502.125	382.500	408.000
December	1822.229	648.500	457.531	146.010

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Analysis of Cotton Yarn Sales Forecasting by Least Square method

Analysis using the least squares method is similar to the trend of the moment method. However, in contrast to the use of the X value, because in this method differentiated analysis of the data is split between odd and even. The following analysis of Polyester and Cotton yarn sales at PT. Agung Sejahtera.

Sales Forecasting 40 Weaving Cotton Yarn

Value forecasting sales of cotton yarn 40 weaving obtained by finding the value of support to form the forecasting function with the least squares method. In the table below will look for the value of the number of X, Y amount, number and amount X2 XY.

Tabel 2. Calculation of cotton yarn sales forecasting 40 Weaving.

Month	Sales (Y)	X	X. Y	X^2
January	1061.916	-11	-11,681.076	121
February	701.875	-9	-6,316.875	81
March	496.385	-7	-3,474.695	49
April	606.000	-5	-3030	25
May	649.250	-3	-1947.75	9
June	1289.125	-1	-1,289.125	1
July	778.500	1	778.5	1
August	1016.625	3	3049.875	9
September	892.625	5	4463.125	25
October	527.020	7	3689.14	49
November	808.875	9	7279.875	81
December	1822.229	11	20044.519	121
Total	**10650.425**	**0**	**11565.513**	**572**

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 2. shows the value of the number of X, Y amount, the number of XY and the amount X^2, the next calculation will be done to look for forecasting equation is: Y = a + bX

By using the above formula is obtained:

$$a = \frac{\sum Y}{N} = \frac{10.650{,}425}{12} = 887{,}535$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{11.565{,}513}{572} = 20{,}219$$

Cotton sales forecasting equation 40 Weaving is Y = a + bX

Y = 887.535 + 20.219 X

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 887.535 + 20.219 (13) = 1150.282. So in January 2015 the value of sales forecasting is 1150.282 ball.

Sales Forecasting Cotton 40 Spandex Yarn

Value sales forecasting spandex cotton yarn 40 obtained by finding the value of support to form the forecasting function with the least squares method. In the table below will look for the value of the number of X, Y amount, number and amount X2 XY.

Tabel 3. Calculation of cotton yarn sales forecasting 40 Spandex.

Month	Sales (Y)	X	X. Y	X^2
January	417,000	-11	-4587	121
February	388,000	-9	-3492	81
March	430.000	-7	-3010	49
April	468.000	-5	-2340	25
May	490.010	-3	-1470.03	9
June	478.135	-1	-478.135	1
July	463.625	1	463.625	1
August	444.500	3	1333.5	9
September	363.250	5	1816.25	25
October	487.500	7	3412.5	49
November	502.125	9	4519.125	81
December	648.500	11	7133.5	121
Total	**5580.645**	**0**	**3301.335**	**572**

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 3 shows the value of the number of X, Y amount, the number of XY and the amount X^2, the next calculation will be done to look for forecasting equation is: Y = a + bX. By using the above formula is obtained:

$$a = \frac{\sum Y}{N} = \frac{5.580{,}645}{12} = 465{,}054$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{3.301{,}335}{572} = 5{,}772$$

Sales forecasting equation Cotton 40 Spandex is Y = a + bX

Y= 465.054 + 5.772 X

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 465.054 + 5.772 (13) = 540.09. So the value of forecasting sales in January 2015 was 540.09 ball.

Analysis of Polyester Yarn Sales Forecasting Method of Least Square

Polyester Yarn Sales Forecasting 40 Weaving

Value sales forecasting polyester yarn 40 weaving obtained by finding the value of support to form the forecasting function with the least squares method. In the table below will look for the value of the number of X, Y amount, number and amount X^2, XY.

Table 4 sales forecasting calculations polyester yarn 40 weaving.

Month	Sales (Y)	X	X. Y	X^2
January	270.021	-11	-2,970.231	1
February	451.500	-9	-4063.5	8
March	302.000	-7	-2114	4
April	295.104	-5	-1475.52	2
May	443,000	-3	-1329	9
June	497.500	-1	-497.5	1
July	305,000	1	305	1
August	407,000	3	1,221	9
September	497.958	5	2489.79	2
October	358.500	7	2509.5	4
November	382.500	9	3442.5	8
December	457.531	11	5032.841	1
Total	4667.614	0	2550.841	5

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table.4 shows the value of the number of X, Y amount, the number of XY and the amount X^2, the next calculation will be done to look for forecasting equation is: Y = a + bX.

By using the above formula is obtained:

$$a = \frac{\sum Y}{N} = \frac{4.667,614}{12} = 388,968$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{2.550,841}{572} = 4,460$$

Equation 40 weaving polyester sales forecasting is Y = a + bX

Y = 388.968 + 4.460 X

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 388.968 + 4.460 (13) = 446.948.

So the value of forecasting sales of January 2015 is 446.948 ball.

Polyester Yarn Sales Forecasting 30 Weaving

Value sales forecasting polyester yarn 30 weaving obtained by finding the value of support to form the forecasting function with the least squares method. In the table below will look for the value of the number of X, Y amount, number and amount X^2, XY.

Table 5 shows the value of the number of X, Y amount, the number of XY and the amount X^2, the next calculation will be done to look for forecasting equation is: Y = a + bX.

By using the above formula is obtained:

$$a = \frac{\sum Y}{N} = \frac{3.403,072}{12} = 283,589$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{2.484,320}{572} = 4,343$$

Table 5 sales forecasting calculations polyester yarn 30 weaving.

Month	Sales (Y)	X	X. Y	X^2
January	314.031	-11	-3,454.341	121
February	257,000	-9	-2313	81
March	224.042	-7	-1,568.294	49
April	187.104	-5	-935.52	25
May	206.875	-3	-620.625	9
June	215.010	-1	-215.01	1
July	274,000	1	274	1
August	323.000	3	969	9
September	433.000	5	2165	25
October	415,000	7	2905	49
November	408.000	9	3672	81
December	146.010	11	1606.11	121
Total	3403.072	0	02,484.320	572

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Equation 40 weaving polyester sales forecasting is Y = a + bX

Y = 283.589 + 4.343 X

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 283.589 + 4.343 (13) = 340.048. So the value of forecasting sales of January 2015 is 340.048 ball.

Analysis of Cotton Yarn Sales Forecasting Method of Trend quadratic

Sales Forecasting 40 Weaving Cotton Yarn

Value forecasting sales of cotton yarn 40 weaving obtained by finding the value of support to form functions quadratic trend forecasting method. In the table below will look for the value of the number of X, Y amount, the number of XY, the number of X^2, X^4 and total number X^2Y.

Table 6 calculation is forecasting sales of cotton yarn 40 weaving.

Month	Y	X	XY	X^2	X^2 Y	X^4
January	1061.916	-11	-1.1681,076	121	128,491.8	14
February	701.875	-9	-6,316.875	81	56851.88	6,56
March	496.385	-7	-3,474.695	49	24322.87	2,40
April	606.000	-5	-3030	25	15.150	625
May	649.250	-3	-1947.75	9	5843.25	81
June	1289.125	-1	-1,289.125	1	1289.125	1
July	778.500	1	778.5	1	778.5	1
August	1016.625	3	3049.875	9	9149.625	81
September	892.625	5	4463.125	25	22315.63	625
October	527.020	7	3689.14	49	25823.98	2,40
November	808.875	9	7279.875	81	65518.88	6,56
December	1822.229	11	20044.519	121	220,489.7	14
Total	10650.425	0	11565.513	572	576,025.265	48

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 6 shows the value of the number of X, Y amount, the number of XY, X2 amount, number and amount X2.Y X4, the next calculation will be done to look for forecasting equation, namely:

Y = a + bX + CX2

By using the above formula can be obtained values of a, b and c:

$$b = \frac{11.565,513}{573} = 20,219$$

12a+572c=10.650,425	X 143	1.716a+81.796c=1.523.011,775
572a+48620b=576.025,265	X 3	1.716a+145.860c=1.728.075,795

Sales forecasting equation Weaving Polyester 40 is Y = a + bX + CX2

Y = 734.957 + 20.219 + 3.201 X X2

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 734.957 + 20.219 (13) + 3.201 (13) 2 = 1538.769. So in January 2015 the value of sales forecasting is 1538.769 ball.

Sales Forecasting Cotton 40 Spandex Yarn

Value sales forecasting spandex cotton yarn 40 obtained by finding the value of support to form functions quadratic trend forecasting method. In the table below will look for the value of the number of X, Y amount, the number of XY, the number of X2, X4 and total number X2.Y.

Table 7. calculation is forecasting sales of cotton yarn 40 spandex

Month	Y	X	XY	X^2	X^2 Y	X
January	417,000	-11	-4587	121	50 457	14 641
February	388,000	-9	-3492	81	31 428	6,561
March	430.000	-7	-3010	49	21 070	2,401
April	468.000	-5	-2340	25	11,700	625
May	490.010	-3	-1470.03	9	4410.09	81
June	478.135	-1	-478.135	1	478.135	1
July	463.625	1	463.625	1	463.625	1
August	444.500	3	1333.5	9	4000.5	81
September	363.250	5	1816.25	25	9081.25	625
October	487.500	7	3412.5	49	23887.5	2,401
November	502.125	9	4519.125	81	40672.13	6,561
December	648.500	11	7133.5	121	78468.5	14 641
Total	5580.645	0	3301.335	572,000	276,116.7	48 620

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 7. shows the value of the number of X, Y amount, the number of XY, X2 amount, number and amount X2.Y X4, the next calculation will be done to look for forecasting equation, namely:

Y = a + bX + CX2.

By using the above formula can be obtained values of a, b and c

$$b = \frac{3.301,335}{572} = 5,772$$

12a+572c=5.580,645 | X 143 | 1.716a+81.796c=798.032,235

572a+48620b=576.116,725 X 3 1.716a+145.860c=828.350,175

Sales forecasting equation Polyester 40 Spandex is

Y = a + bX + CX2 = 442.496 + 5.772 X + 0.473 X2

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X

December 2014 is 11), then Y = 442.496 + 5.772 (13) + 0.473 (13) 2 = 597.504. So the value of forecasting sales of January 2015 is 597.504 ball.

Analysis of Polyester Yarn Sales Forecasting Method trend Quadratic

Polyester Yarn Sales Forecasting 40 Weaving

Value sales forecasting polyester yarn 40 weaving obtained by finding the value of support to form functions quadratic trend forecasting method. In the table below will look for the value of the number of X, Y amount, the number of XY, the number of X2, X4 and total number X2.Y.

Table 8 sales forecasting calculations polyester yarn 40 weaving.

Month	Y	X	XY	X^2	X^2 Y	X^4
January	270.021	-11	-2,970.231	121	32672.541	14 641
February	451.500	-9	-4,063.500	81	36571.500	6,561
March	302.000	-7	-2,114.000	49	14798.000	2,401
April	295.104	-5	-1,475.520	25	7377.600	625
May	443,000	-3	-1,329.000	9	3987.000	81
June	497.500	-1	-497.500	1	497.500	1
July	305,000	1	305,000	1	305,000	1
August	407,000	3	1221.000	9	3663.000	81
September	497.958	5	2489.790	25	12448.950	625
October	358.500	7	2509.500	49	17566.500	2401
November	382.500	9	3442.500	81	30982.500	6561
December	457.531	11	5032.841	121	55361.251	14 641
Total	4667.614	0	2550.880	572	216,231.342	48 620

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 8 shows the value of the number of X, Y amount, the number of XY, X2 amount, number and amount X2.Y X4, the next calculation will be done to look for forecasting equation is: Y = a + bX + CX2

By using the above formula can be obtained values of a, b and c:

$$b = \frac{2.550,880}{572} = 4,460$$

12a+572c=4667.614	X 143	1.716a+81.796c=667468.802
572a+48620b=576.025,265	X 3	1.716a+145.860c=648694.026

Sales forecasting equation Weaving Polyester 40 is

Y = a + bX + CX2 = 402.937 + 4.460 X - 0,293 X2

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X in December 2014 was 11), then Y = 402.937 + 4.460 (13) - 0,293 (13) 2 = 411.348. So the value of forecasting sales of January 2015 is 411.348 ball.

Polyester Yarn Sales Forecasting 30 Weaving

Value sales forecasting polyester yarn 30 weaving obtained by finding the value of support to form functions quadratic trend forecasting method. In the table below will look for the value of the number of X, Y amount, the number of XY, the number of X2, X4 and total number X2.Y.

Table 9. sales forecasting calculations polyester yarn 30 weaving.

Month	Y	X	X. Y	X^2	X^2 Y	X^4
January	314.031	-11	-3,454.341	121	37.997,751	14.641
February	257,000	-9	-2,313.000	81	20.817,000	6.561
March	224.042	-7	-1,568.294	49	10.978,058	2.401
April	187.104	-5	-935.520	25	4.677,600	625
May	206.875	-3	-620.625	9	1.861,875	81
June	215.010	-1	-215.010	1	215.010	1
July	274,000	1	274,000	1	274,000	1
August	323.000	3	969.000	9	2.907,000	81
September	433.000	5	2.165,000	25	10.825,000	625
October	415,000	7	2.905,000	49	20.335,000	2.401
November	408,000	9	3.672,000	81	33.048,000	6.561
December	146.010	11	1.606,110	121	17.667,210	14.641
Total	3403.072	0	2484.320	572	161,603.504	48 620

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

Table 9 shows the value of the number of X, Y amount, the number of XY, X2 amount, number and amount X2.Y X4, the next calculation will be done to look for forecasting equation is: Y = a + bX + CX2.

By using the above formula can be obtained values of a, b and c:

$$b = \frac{2.484,320}{573} = 4,343$$

12a+572c=3403.072	X 143	1.716a+81.796c=486.639,296
572a+48620b=61.603,504	X 3	1.716a+145.860c=484.810,512

Sales forecasting equation Weaving Polyester 30 is Y = a + bX + CX2.

From the equation above can be searched value forecasting for the month of January 2015 by entering the value X = 13 (because the value of X

December 2014 is 11), then Y = a + bX + cX = 284.950 + 4.343 X - 0.029 X2. So the value of forecasting sales of January 2015 is 336.588 ball.

Comparative Analysis

Forecasting great value is the value that is approximately correct predictions and has the smallest error. In this comparative analysis conducted analysis to compare the value of forecasting by the least squares method and the method of quadratic trend in all four types of yarn. The following table states the forecast value comparison with the actual values.

Table 10. forecasting value and the actual value of the yarn sales in January 2015 (in units of ball).

	Cotton 40 WV	cotton 40	polyester 40 WV	polyester 30
methods Least *Square*	1150.282	540.09	446.948	340.048
methods Trend quadratic	1538.769	597.504	411.348	336.588
Actual Data	1457.125	577.000	418,000	324,000

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

From the data obtained over the forecast values obtained from Trend Quadratic of the actual sales value. But it can not be as a measure in the selection of appropriate methods for forecasting sales. To find a good method used then tested the forecasting error standard (SKP). Large calculation errors of forecasting (in the appendix) can be seen in the table below:

Table 11 standard value error of two methods of forecasting

	cotton 40 WV	cotton 40 SPDX	polyester 40 WV	polyester 30
Least Square method	95.733	16.147	20.863	24.990
Trend method Quadratic	**39.795**	**7.105**	**3.417**	**15.272**

(Data Source: PT. Agung Sejahtera Sukaraharja, 2014)

From the test results obtained SKP forecasting of sales of cotton and polyester is better to use Quadratic Trend method because it has a value of SKP smaller than Least Square method.

Conclusion

Based on the calculation of sales forecasts yarn products with sales data from January to December 2014 using the least squares method and quadratic trend method, in which the quadratic trend method is more suitable because it has the lowest SKP.

Acquired value of product sales forecasts yarn using quadratic trend is: a.Cotton yarn 40 Weaving of 1.538,769 ball. b.Cotton 40 Spandex yarn ball at 597.504. c.Polyester yarn ball 40 Weaving at 411.348. d.Weaving yarn Polyester 30 amounted 336.588

References

Arsyat, L. (1997). Peramalan Bisnis.Edisi Pertama, BPFE Yogyakarta.

Charles W. Lamb, Joseph F. Hair, dan Carl Mcdaniel. (2001). Pemasaran. Edisi Pertama, Jakarta, Salemba Empat.

Fred E, Halim dan Kenneth G. Mangun. (1999). Do-it-Your-Self Advertising and Promotion – Beriklan dan Berpromosi Sendiri, Jakarta, Grasindo.

Ishak, Aulia. (2010). Manajemen Operasi. Edisi Pertama. Graha Ilmu. Yogyakarta

Kasali, R. (2001). Manajemen Periklanan – Konsep dan Aplikasinya di Indonesia, Jakarta, Pustaka Utama Grafiti.

Kotler, Philip dan Gary Armstrong. (2008). Prinsip-Prinsip Pemasaran (Terjemahan Bob Sabran, MM). Edisi 12. Jilid 2. Jakarta : Erlangga.

Nasution, H. A. (2003). Perencanaan dan Pengendalian Produksi. Edisi Pertama. Guna Widya. Jakarta.

Prasetya, H & Lukiastuti, F. (2009). Manajemen Operasi.Edisi Pertama. Media Pressindo, Yogyakarta.

Render dan Heizer. (2005). Prinsip-Prinsip Manajemen Operasi.Salemba Empat, Jakarta.

Render, Barry dan Jay Heizer. (2006). Manajemen Operasi. Salemba Empat. Jakarta.

Subagyo, P. (2002). Forecasting Konsep dan Aplikasi. BPFE. Yogyakarta.

Sumarni, Murti dan Wahyuni. 2006. Metode Penelitian Bisnis. Yogyakarta.

Sumayang, L. (2003). Dasar-Dasar Manajemen Produksi dan Operasi.Salemba Empat, Jakarta.

Swastha, DH Basu dan Irawan. (2005). Manajemen pemasaran modern edisi 12 Yogyakarta Liberty.

Tho'in, M. (2011). Pengaruh Faktor-faktor Kualitas Jasa terhadap Kepuasan Nasabah di Baitul Mal Wat Tamwil (BMT) Tekun Karanggede Boyolali. Muqtasid: Jurnal Ekonomi dan Perbankan Syariah, 2(1), 73-89.

Tjiptono, Fandi. (2000). Perspektif Manajemen dan Pemasaran Kontemporer, Edisi 1. Yogyakarta: Andi.

Tim Pengembangan Laboratorium Manajemen Menengah. (2006). Manajemen Operasional. Jakarta: Fakultas Ekonomi Gunadarma.