NST | PROCEEDINGS

🔒 OPEN ACCESS

Conference Paper

Sales Forecasting Analysis of Sea Snack at PD. Adi Anugrah Food Industry

Zella Azzahra Achmadani*, R. Rochmoeljati

Department of Industrial Engineering, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya 60294, Indonesia

*Corresponding author:
E-mail:
zellazzahra03@gmail.com

ABSTRACT

Covid-19 pandemic affects the industry players. The manufacturing industry, the culinary industry, and other industries face the hardship of running their business. The pandemic has seriously impacted the prospects for selling products and services. Sales that are classified as increasing and decreasing cause a lack of material preparation and prediction of needs. PD. Adi Anugrah Food Industry experienced erratic sales and lacked preparation in raw materials and other requirements. In this study, an analysis of sales forecasting of snacks made from sea juice was carried out. Sales forecasting is carried out during the period January – December 2020. The estimated sales forecast using the weighted moving average method is 1167 units, and the moving average method is 1166 units. Forecasting analysis was carried out using WinQsb and PomQM software.

Keywords: Forecasting, weighted moving average, single exponential smoothing

Introduction

Industrial companies, both large and small, are currently helping the movement of the country's economy, in the Riau Archipelago, of course, which has a different geographical area from other regions, of course, the role of industry is very large, both in terms of industrial output and human resources. By utilizing local resources, namely marine products, industrial development is widely developed in the Tanjung pinang area and other islands in this archipelago. One of them is the Trade Company (PD) Adi Anugrah's "Food Industry." It produces snacks from basic ingredients from marine products such as cuttlefish or squid and various kinds of fish. This company is categorized as a make-to-stock company, and it produces continuously without considering the consumer order (Suswaini, 2016).

The problem faced by PD Adi Anugrah is the frequent excess warehouse stock and the return of expired goods from the distributors. It has an impact on profits and losses for the company. The company's superior products are sugar and non-sugar cuttlefish, which will be used as a calculation sample in this study. Conducting research at a Cigarette Company and focusing on the supply of cloves from the main ingredient of cigarettes, Not focusing on the collection of cigarette raw materials, solving problems using forecasting methods aimed at providing information on clove needs in predicting time series to predict the future from historical data (Chukwulozie et al., 2017).

The title of the previous research was "Using Exponential Smoothing Method to Predict Clove Needs in Adi Bungsu Cigarette Factory." This study focuses on forecasting or forecasting sales of sugar and non-sugar cuttlefish, which are the company's flagship products. It aims to find out future deals based on the results of previous sales history. The purpose of using the single exponential smoothing method is to determine product sales forecasting for the next period.

In working on this article, we will discuss forecasting using methods in forecasting using POMQM and WinQSB software. POMQM program is a computer program used to solve problems in the field of production and operations that are quantitative. WinQSB is software that can help facilitate decision-making related to optimization and production systems (Nasution, 2003; Siti, 2018; Wijaya, 2013).

Material and Methods

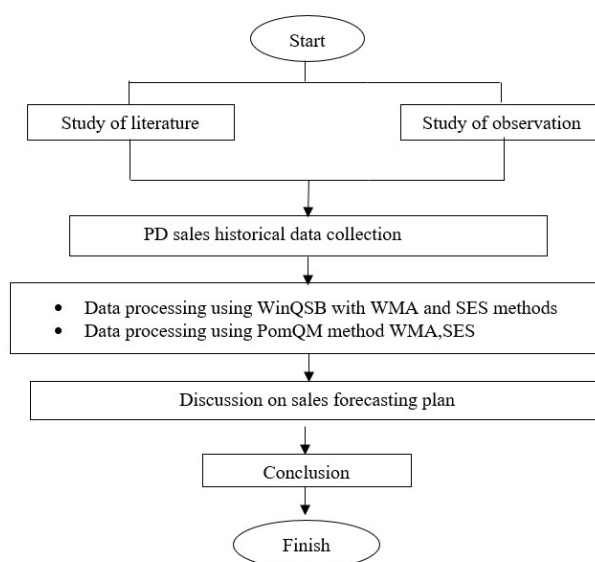The flow chart used in this study is as follows :

Figure 1. Research flowchart

The research was conducted in PD. Adi Anugrah "Food Industry" is a company engaged in snacks made from marine resources in North Surabaya. The time of the study was carried out in January - December 2020. The dependent variable or dependent variable is a research variable that is measured to determine the magnitude of the effect or influence of other variables. At the same time, the independent variable or independent is a variable whose variations affect other variables. It can also be said that the independent variable is a variable whose influence on other variables is to be known. Processing data with weights 0.2, 0.3, 0.4 and = 0.3. The following is the data obtained and will be processed:

Table 1. Historical sales data

Period (2020)	Actual Sales (2020)
January	980
February	1366
Maret	1306
April	1350
May	1278
June	1220
July	1260
August	1220
September	1298
October	1190
November	1107
December	1200

Results and Discussion
Result of WinQsb

Month	Historical Data
1	980
2	1366
3	1306
4	1350
5	1287
6	1220
7	1260
8	1220
9	1298
10	1190
11	1107
12	1200

Figure 2. data input on WinQsb

Weighted moving average

11-19-2020 Month	Actual Data	Forecast by 3-WMA	Forecast Error	CFE	MAD	MSE	MAPE (%)	Tracking Signal	R-square
1	980								
2	1366								
3	1306								
4	1350	1253,556	96,44446	96,44446	96,44446	9301,533	7,144034	1	
5	1287	1338,889	-51,88892	44,55554	74,16669	5996,997	5,587903	0,6007487	
6	1220	1312,222	-92,22229	-47,66675	80,18522	6832,981	6,245004	-0,594458	0,540532
7	1260	1271,222	-11,22241	-58,88916	62,94452	5156,222	4,90642	-0,9355725	0,6000637
8	1220	1252,667	-32,66675	-91,55591	56,88897	4338,4	4,460656	-1,609379	0,6416774
9	1298	1233,333	64,66663	-26,88928	58,18524	4312,296	4,547551	-0,4621323	0,6599861
10	1190	1263,556	-73,55554	-100,4448	60,381	4469,17	4,780921	-1,663517	0,5306957
11	1107	1232,667	-125,6667	-226,1116	68,54172	5884,541	5,602306	-3,29889	0,4167315
12	1200	1177,111	22,88879	-203,2228	63,46917	5288,914	5,191761	-3,201913	0,5446613
13		1166,778							
CFE		-203,2228							
MAD		63,46917							
MSE		5288,914							
MAPE		5,191761							
Trk.Signal		-3,201913							
R-square		0,5446613							
		m=3							
		W(1)=0,2							
		W(2)=0,3							
		W(3)=0,4							

Figure 3. Result of weighted moving average forecasting

The data obtained for the average number of demand forecasts are 1166.778 or 1167 product units, Cumulative of Forecast Error (CFE) of -203.2228, Mean Absolute Deviation (MAD) or average absolute error of 63,46917, Mean Square Error (MSE) of 5288.914, Mean Absolute Percentage Error (MAPE) or relative error size of 5.191761, Tracking Signal of -3.201913 and R-Square of 0.5446613 with an average period of 3 months and with a weighting of 1, 2,3 in a row are 0.2, 0.3, 0.4.

Single exponential smoothing

11-19-2020 Month	Actual Data	Forecast by SES	Forecast Error	CFE	MAD	MSE	MAPE (%)	Tracking Signal	R-square
1	980								
2	1366	980	386	386	386	148996	28,25769	1	
3	1306	1095,8	210,2	596,2	298,1	96590,01	22,17632	2	
4	1350	1158,86	191,14	787,34	262,4467	76571,51	19,50372	3	
5	1287	1216,202	70,79797	858,1379	214,5345	58681,72	16,00304	4	
6	1220	1237,441	-17,44141	840,6965	175,1159	47006,21	13,08836	4,800801	
7	1260	1232,209	27,79102	868,4875	150,5617	39300,57	11,27457	5,768316	
8	1220	1240,546	-20,54626	847,9413	131,9881	33746,51	9,904506	6,424377	
9	1298	1234,382	63,61768	911,559	123,4418	30034,1	9,279094	7,384525	
10	1190	1253,468	-63,46765	848,0913	116,778	27144,55	8,840686	7,262424	
11	1107	1234,427	-127,4274	720,6639	117,8429	26053,87	9,107722	6,115462	
12	1200	1196,199	3,800903	724,4648	107,4755	23686,65	8,308542	6,740746	
13		1197,339							
CFE		724,4648							
MAD		107,4755							
MSE		23686,65							
MAPE		8,308542							
Trk.Signal		6,740746							
R-square									
		Alpha=0,3							
		F(0)=980							

Figure 4. Result of single exponential smoothing forecasting

From the results of data processing, the data obtained are the average number of demand forecasting as much as 1197.339 or 1198 product units, Cumulative of Forecast Error (CFE) of 724.4648, Mean Absolute Deviation (MAD) or the average absolute error of 107.4755, Mean Square Error (MSE) is 23686.65, Mean Absolute Percentage Error (MAPE) or relative error size is 8.308542, Tracking Signal is 6.740746 and R-Square is 0 with a constant smoothing alpha of 0.2.

Result of PomQM

	Demand(y)
January	988
February	1366
Maret	1306
April	1350
May	1287
June	1220
July	1260
August	1220
September	1298
October	1190
November	1107
December	1200

Figure 5. Data input on PomQM

Weighted moving average

GLOBAL EXAM Solution	Demand(y)	Forecast	Error	|Error|	Error^2	|Pct Error|
January	988					
February	1366					
Maret	1306					
April	1350	1184.667	165.333	165.333	27335.08	12.247%
May	1287	1342.444	-55.444	55.444	3074.088	4.308%
June	1220	1316.444	-96.444	96.444	9301.533	7.905%
July	1260	1300.111	-40.111	40.111	1608.909	3.183%
August	1220	1258.667	-38.667	38.667	1495.117	3.169%
September	1298	1233.333	64.667	64.667	4181.772	4.982%
October	1190	1255.111	-65.111	65.111	4239.469	5.472%
November	1107	1239.333	-132.333	132.333	17512.12	11.954%
December	1200	1219.556	-19.556	19.556	382.419	1.63%
TOTALS	14792		-217.667	677.667	69130.52	54.85%
AVERAGE	1232.667		-24.185	75.296	7681.168	6.094%
Next period forecast		1164.556	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	99.377	

Figure 6. Result of weighted moving average forecasting

The data processing results show that the average number of demand forecasting data is 1164.556 or 1165 product units, Mean Error of -24.185, Mean Absolute Deviation (MAD) or average absolute error of 75.296, Mean Square Error (MSE) of 7681.168, Standard Error of 99.377, Mean Absolute Percentage Error (MAPE) or relative error size of 6.094%.

Single exponential smoothing

GLOBAL EXAM Solution	Demand(y)	Forecast	Error	|Error|	Error^2	|Pct Error|
January	988					
February	1366	988	378	378	142884	27.672%
Maret	1306	1101.4	204.6	204.6	41861.15	15.666%
April	1350	1162.78	187.22	187.22	35051.32	13.868%
May	1287	1218.946	68.054	68.054	4631.341	5.288%
June	1220	1239.362	-19.362	19.362	374.894	1.587%
July	1260	1233.553	26.447	26.447	699.419	2.099%
August	1220	1241.487	-21.487	21.487	461.71	1.761%
September	1298	1235.041	62.959	62.959	3963.818	4.85%
October	1190	1253.929	-63.929	63.929	4086.896	5.372%
November	1107	1234.75	-127.75	127.75	16320.13	11.54%
December	1200	1196.425	3.575	3.575	12.779	.298%
TOTALS	14792		698.325	1163.383	250347.4	90.002%
AVERAGE	1232.667		63.484	105.762	22758.86	8.182%
Next period forecast		1197.498	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	166.782	

Figure 7. Result of single exponential smoothing forecasting

From the results of data processing, the data obtained are the average number of demand forecasting as much as 1197,498 or 1198 product units, Mean Error of 63,484, Mean Absolute

Deviation (MAD) or average absolute error of 105.762, Mean Square Error (MSE) of 22758, 86, Standard Error of 166.782, Mean Absolute Percentage Error (MAPE) or relative error size of 8.182%.

Conclusion

The results showed that the problem of PD Adi Anugrah Food Industry had been solved. Both software offers the best result of selling forecasts. Through the study results, it can be concluded that the use of WinQSB and POM-QM optimization programs can overcome forecasting problems by companies to determine the number of product requests. The results show that this two software can solve optimization problems very well. From the analysis results, it can be concluded that data processing using both software with the best method is moving average because this method has the smallest MSE value, which is the best value that can minimize errors in forecasting. With an average demand of 1166 units with a Mean Square Error (MSE) of 6249,191, Standard Error of 89,636, Mean Absolute Percentage Error (MAPE), or a relative error size of 5.455%.

References

Chukwulozie, O. P., Chinagorom, E., Chukwuneke, J., & Christopher, C. T. (2017). The analysis of cigarette production using double exponential smoothing model. *Academic Journal of Science, 07*(02), 293-308.

Nasution. (2003). *Perencanaan dan pengendalian produksi edisi kedua*. Surabaya: Prima Printing

Siti, D. (2018). Aplikasi POM QM for window. Bekasi: Elang Buana.

Suswaini. (2016). Forecasting penjualan produk pada PD. Adi Anugrah "food industry" Tanjungpinang dengan metode single exponential smoothing. *Jurnal Sustainable, 5*(1),1-5.

Wijaya. (2013). *Pengantar riset operasi*. Jakarta: Mitra Wacana Media