Sales Forecasting Analysis using Trend Moment Method: A Study Case of a Fast Moving Consumer Goods Company in Indonesia

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Abstract

The market of Fast-Moving Consumer Goods (FMCG) companies in Indonesia is enormous. Unilever has 400 brands in more than 190 countries, making it a global business that is as influential in the consumer product market as it is in Indonesia. Sales forecasting at this company is very useful for planning expenses and the company's total costs on the business strategy. This study uses trend moment method to forecast the sales and earnings of Unilever Indonesia companies at the end of the year. This article aims to test the performance of the trend moment method calculation on the prediction of net sales and profits in FMCG companies. At the end of the analysis process, it can be concluded that forecasting using trend moment method is going very well. This indicator of success is shown by the error level of MAPE, which is below 10%.

Keywords: Fast Moving Consumer Goods, FMCG, forecast, sales, trend moment.

1. Introduction

Every company must maintain the availability of sufficient goods so that the company's operational activities can run smoothly. Companies must decide to procure production goods based on accurate and reliable data (Ramadhan & Utama, 2019). The production in question is the concept of activity flow, measured as the output level per unit period. In contrast, the output itself is always assumed to be of consistent quality (Utami et al., 2020). Efforts to produce products with consistent quality by considering market demand from historical sales data in the market.

Increasing the value of sales and profit is the primary goal of a business. Sales forecasting can help calculate the budget for production materials to reduce the excessive Cost of Goods Sold (COGS) in each production batch to maximize profit. This forecasting analysis can also help determine the targets the company must achieve from the perspective of marketing work. Companies can use historical sales data to analyze the factors influencing product sales to choose the right sales strategy (Firmansyah et al., 2021). PT. Unilever Indonesia, Tbk., As a company whose products experience rapid stock movements, it must continue to monitor sales activities in the market so that the marketing strategy implemented can be effective and efficient.

Fast-Moving Consumer Goods (FMCG) companies in Indonesia rely heavily on traditional and mini-market sales. FMCG products also have a fast turnaround at a relatively low cost; besides that, the shelf life of these FMCG products is relatively short. Indonesia's market growth value in 2018-2021 is 8.8%, occupying the top three consumer countries for FMCG products in the Asia Pacific (Nurhayati-Wolff, 2022). Multinational FMCG companies such as PT. Unilever Indonesia should maintain its existence in the Indonesian market with an appropriate and measurable marketing strategy through a forecasting method.

Prediction or forecast is something that will be known or prepared in the future based on past data with structured analysis (Pataropura et al., 2019; Rusmala & Susilawati, 2021; Tahyudin et al., 2021). The

benefit of sales forecasting is that it can predict sales accurately from time to time so that a production plan can be made by sales forecasting (Alfons & Batlajery, 2018). Companies need sales forecasting to help companies determine future sales to avoid high costs (Pataropura et al., 2020). In this case, if it is applied in a decision support system, this is a semi-structured decision (Tahyudin, 2014). The sales forecasting method that will be analyzed in this article is the trending moment. Researchers have widely used the trend moment method for forecasting sales, stock levels, and other variables in business. This article will present sales predictions for FMCG company PT. Unilever Indonesia, Tbk., and test the error level with the MAPE method (Mean Absolute Percentage Error).

2. Literature Review

There are several forecasting techniques in data mining, two of which are linear regression and trend moment. Data mining aims to obtain relationships or patterns that may provide valuable indications (Mutiara et al., 2021). Research conducted by Batubara et al. (2022) has compared the performance of these two methods. The parameter of this study is to find the minor error accuracy rate using the MAPE (Mean Absolute Percentage Error) calculation method. Comparative analysis of the count of the linear regression method and the trending moment regarding sales predictions produces different MAPE values. The results show that the trend moment method in sales prediction performs better than the linear regression method.

The problem of the supply of food products in the market is a concern for several retail and wholesale shopping centers (Candra et al., 2018). The supply chain for egg production from farms needs to be maintained so that it remains stable in the sense that each supply and demand can be balanced. A sales forecasting system based on historical data with the trend moment method was carried out in this study. Researchers calculated the MSE (Mean Square Error) to determine the forecasting accuracy level. The results of this study are that by using forecasting techniques in laying hens farms, egg production can be maximized and controlled to suit market demand.

Every manufacturing company must be faced with production planning. Execution of the right amount of production will minimize the risk of loss. Implemented stock prediction techniques to overcome production planning problems in their research (Siregar et al., 2022). The method used in this study is the trending moment. Researchers tested this prediction technique with MAD (Mean Absolute Deviation), MSE, and MAPE to measure the calculation error rate. The result of this research is that the prediction error rate using the trend moment method is 10.60%. According to researchers, forecasting techniques need to be added to the influence of cycles or other factors that affect the sales process. Forecasting can be tested with other technical methods to compare the accuracy value.

Implementation of forecasting techniques on sales of bakery products is something that needs to be done (Siregar et al., 2022). The researchers said excessive production does not occur because the market does not optimally absorb it. Bread products have a reasonably fast expiry date, so proper production planning is needed. The prediction method applied to this bakery company is trend moment. Researchers created a system to calculate forecasting sales of bread based on historical data. The result of this study is that the forecasting system applied to bakery companies can help companies avoid excessive production. The trend moment method can also be used in other research, which is applied to a decision support system to predict the increase in the number of vehicles entering an area to detect air pollution with a MAPE (Pakpahan et al., 2019).

3. Methods
3.1. Data collection

Data collection is the process of the data collection stage. The data collected is then validated according to the variables that have been determined. Data irrelevant to the research and data not validated are then reduced (data reduction) and validated data is then displayed (data display), shown in Fig. 1. Data collection techniques are carried out by extracting financial data from companies by selecting essential data (Lisnawati & Sinaga, 2020). This study collected critical data, namely net sales and profit every quarter from 2014 to 2021.

3.2. Trend moment

This method separates the three components of the archetypes that characterize economic and business data sets. These are the trend, cyclical, and seasonal factors (Pangestuti & Pasaribu, 2021). In Eq. (1), y is the trend or variable value to be predicted, a is the number of constants, b is the slope or trend line coefficient, and x is time (Putra et al., 2020).

$$y = a + bx \tag{1}$$

The way to get the values of a and b is by solving the substitution and elimination methods by operating Eq. (2) and (3).

$$a = \frac{\sum x^2 \sum y - \sum x \sum xy}{n \sum x^2 - (\sum x)^2} \tag{2}$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \tag{3}$$

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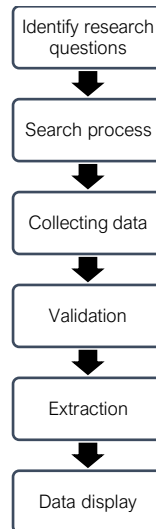
Fig. 1. The steps of data collection.

After knowing the values of a and b, the calculation is continued by finding the final result of sales data (y) by considering the season index obtained from the Eq. (4) calculation. The values obtained from forecasting results with the trend moment method will be corrected for seasonal effects using the season index (Khairina et al., 2021).

$$season\ index = \frac{average\ of\ Q4\ data}{average\ of\ every\ data} \tag{4}$$

Prediction results in Q4 are obtained by calculating the final value of the predicted variable multiplied by the season index.

3.3. Mean absolute percentage error (MAPE)

The mean absolute percentage error (MAPE) is calculated using the fundamental error for each period divided by the actual observed value for a certain period. MAPE is a measure of relative error (Nirmala et al., 2021). This approach is beneficial for evaluating the accuracy of predictions. In Eq. (5), Y_t stands for actual data, and $\hat{Y}_t$ is the prediction value, n is the amount of data, and t is the initial data or in this research case, the initial time (Candra et al., 2018).

$$MAPE = \frac{1}{n} \sum_{t=1}^{n} \frac{|Y_t - \hat{Y}_t|}{Y_t} \times 100\% \tag{5}$$

The value resulting from this MAPE calculation can be evaluated with the criteria based on Table 1. A MAPE value below 20% is interpreted as good, and if it is below 10%, it means excellent (Pakpahan et al., 2019; Widians et al., 2019). The stages of the research carried out in this article can be seen in Fig 2.

Table 1
MAPE criteria.

MAPE	Interpretation
< 10%	Very Good
10% - 20%	Good
20% - 50%	Enough
>50%	Bad

4. Results and Discussion

4.1. Forecasting analysis

Forecasting analysis carried out on net sales and company profits using the trend moment method has been tested by researchers to have better performance than other prediction methods.

4.1.1. Net Sales Forecasting

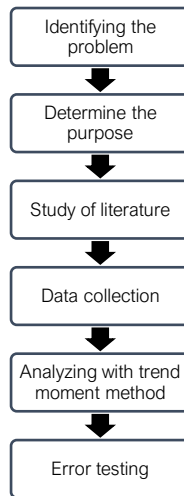The net sales data taken is the recapitulation of each quarter from 2014-2021 to predict net sales at the end of 2022.

Fig. 2. Research framework.

Table 2

Net sales 2014 – 2021.

Fiscal Quarters	Net Sales*	x	y	x^2	xy
Q1 2014	8,725,116	1	8,725,116	1	8,725,116
Q2 2014	17,582,488	2	17,582,488	4	35,164,976
Q3 2014	26,089,807	3	26,089,807	9	78,269,421
Q4 2014	34,511,534	4	34,511,534	16	138,046,136
Q1 2015	9,413,452	5	9,413,452	25	47,067,260
Q2 2015	18,801,546	6	18,801,546	36	112,809,276
Q3 2015	27,546,680	7	27,546,680	49	192,826,760
Q4 2015	36,484,030	8	36,484,030	64	291,872,240
Q1 2016	9,988,220	9	9,988,220	81	89,893,980
Q2 2016	20,745,536	10	20,745,536	100	207,455,360
Q3 2016	30,101,448	11	30,101,448	121	331,115,928
Q4 2016	40,053,732	12	40,053,732	144	480,644,784
Q1 2017	10,845,687	13	10,845,687	169	140,993,931
Q2 2017	21,263,708	14	21,263,708	196	297,691,912
Q3 2017	31,213,506	15	31,213,506	225	468,202,590
Q4 2017	41,204,510	16	41,204,510	256	659,272,160
Q1 2018	10,746,621	17	10,746,621	289	182,692,557
Q2 2018	21,183,734	18	21,183,734	324	381,307,212
Q3 2018	31,531,499	19	31,531,499	361	599,098,481
Q4 2018	41,802,073	20	41,802,073	400	836,041,460
Q1 2019	10,664,618	21	10,664,618	441	223,956,978
Q2 2019	21,457,234	22	21,457,234	484	472,059,148
Q3 2019	32,360,986	23	32,360,986	529	744,302,678
Q4 2019	42,922,563	24	42,922,563	576	1,030,141,512
Q1 2020	11,152,919	25	11,152,919	625	278,822,975
Q2 2020	21,772,010	26	21,772,010	676	566,072,260
Q3 2020	32,456,673	27	32,456,673	729	876,330,171
Q4 2020	42,972,474	28	42,972,474	784	1,203,229,272
Q1 2021	10,282,521	29	10,282,521	841	298,193,109
Q2 2021	20,176,770	30	20,176,770	900	605,303,100
Q3 2021	30,029,530	31	30,029,530	961	930,915,430
Q4 2021	39,545,959	32	39,545,959	1,024	1,265,470,688
$\sum$		528	805,629,184	11,440	14,073,988.861
Average		16.5	25,175,912	357.5	439,812,152

*) in million rupiah

After getting the data in Table 2, with Eq. (1), the writer can predict net sales data at the end of 2022 or $x = 36$. The (y) value is 5,219,392, with the Q4 season index of 1.58, resulting in a final net sales forecast in Q4 2022 of IDR 48,794,226 million. This means an increase in net sales of 23.4% at the end of 2022.

4.1.2. Profit Forecasting

The company's profit calculation allows us to read how the company controls the cost of goods sold (in Indonesian: HPP/ Harga Pokok Produksi) costs incurred each period.

After getting the data in Table 3, with Eq. (1), the author can predict profit data at the end of 2022 or $x = 36$. The value (y) is 5,219,392, with the Q4 season index of 1.6, producing a final profit forecast in Q4 2022 of 8,384,722 million rupiahs. This means that a profit increase of 45.6% will be obtained at the end of 2022.

Table 3
Profit 2014 – 2021.

Fiscal Quarters	Profit*	x	y	x^2	xy
Q1 2014	1,360,981	1	1,360,981	1	1,360,981
Q2 2014	2,847,991	2	2,847,991	4	5,695,982
Q3 2014	4,048,929	3	4,048,929	9	12,146,787
Q4 2014	5,738,523	4	5,738,523	16	22,954,092
Q1 2015	1,591,699	5	1,591,699	25	7,958,495
Q2 2015	2,930,640	6	2,930,640	36	17,583,840
Q3 2015	4,183,173	7	4,183,173	49	29,282,211
Q4 2015	5,851,805	8	5,851,805	64	46,814,440
Q1 2016	1,570,040	9	1,570,040	81	14,130,360
Q2 2016	3,298,207	10	3,298,207	100	32,982,070
Q3 2016	4,750,551	11	4,750,551	121	52,256,061
Q4 2016	6,390,672	12	6,390,672	144	76,688,064
Q1 2017	1,960,841	13	1,960,841	169	25,490,933
Q2 2017	3,623,958	14	3,623,958	196	50,735,412
Q3 2017	5,229,400	15	5,229,400	225	78,441,000
Q4 2017	7,004,562	16	7,004,562	256	112,072,992
Q1 2018	1,839,131	17	1,839,131	289	31,265,227
Q2 2018	3,529,869	18	3,529,869	324	63,537,642
Q3 2018	7,303,493	19	7,303,493	361	138,766,367
Q4 2018	9,109,445	20	9,109,445	400	182,188,900
Q1 2019	1,748,520	21	1,748,520	441	36,718,920
Q2 2019	3,697,232	22	3,697,232	484	81,339,104
Q3 2019	5,509,603	23	5,509,603	529	126,720,869
Q4 2019	7,392,837	24	7,392,837	576	177,428,088
Q1 2020	1,862,681	25	1,862,681	625	46,567,025
Q2 2020	3,619,635	26	3,619,635	676	94,110,510
Q3 2020	5,438,339	27	5,438,339	729	146,835,153
Q4 2020	7,163,536	28	7,163,536	784	200,579,008
Q1 2021	1,698,080	29	1,698,080	841	49,244,320
Q2 2021	3,045,892	30	3,045,892	900	91,376,760
Q3 2021	4,378,794	31	4,378,794	961	135,742,614
Q4 2021	5,758,148	32	5,758,148	1,024	184,260,736
∑		528	135,477,207	11,440	2,373,274,963
Average		16.5	4,233,663	357.5	74,164,843

*) in million rupiah

Forecasting analysis on sales could have better techniques explained by Ensafi et al. (2022) in their paper which compared several previous studies on the same case. In this article, the authors only want to show that a simple forecasting technique can be performed for a case with a small dataset. MAPE is recommended in sales forecasting studies to test the accuracy level.

4.2. MAPE calculations

MAPE calculations are performed by comparing actual conditions with the results of prediction calculations in each period so that it is more relevant to describe the errors that occur in forecasting.

Based on what is shown in Table 4 and 5, we can calculate MAPE using Eq. (5). MAPE calculation results for net sales of PT. Unilever Indonesia is 0.000174563%, and MAPE calculation results for the profit of PT. Unilever Indonesia, is 0.000188084%. By the criteria of Table 1, these results show a perfect calculation condition.

In this case, forecasting using the trend moment technique shows excellent performance. The analysis process using trend moment predictions could be ideal for predicting the other same case.

5. Conclusions

Based on the research results and discussion of sales forecasting analysis at PT. Unilever Indonesia, it can be seen that net sales and profits increased according to predictions. The results of the above calculations imply that the forecasting analysis using the trend moment method works well in FMCG companies' net sales and profits. Error level testing using MAPE shows that this method is ideal for forecasting similar cases.

This study aims to determine the performance of trend moment calculations in forecasting net sales

and profits of FMCG companies in Indonesia. Based on the analysis results, the trend moment method can predict FMCG companies' net sales and profits with the MAPE error level calculation indicator.

Table 4
Net sales prediction.

Fiscal Quarters	x	Actual Data $(Y_t)^*$	Prediction $(\hat{Y}_t)^*$
Q1 2014	1	8,725,116	8,424,469
Q2 2014	2	17,582,488	17,013,170
Q3 2014	3	26,089,807	25,534,608
Q4 2014	4	34,511,534	34,259,470
Q1 2015	5	9,413,452	8,889,740
Q2 2015	6	18,801,546	17,939,986
Q3 2015	7	27,546,680	26,906,951
Q4 2015	8	36,484,030	36,076,315
Q1 2016	9	9,988,220	9,355,011
Q2 2016	10	20,745,536	18,866,802
Q3 2016	11	30,101,448	28,279,294
Q4 2016	12	40,053,732	37,893,159
Q1 2017	13	10,845,687	9,820,282
Q2 2017	14	21,263,708	19,793,618
Q3 2017	15	31,213,506	29,651,637
Q4 2017	16	41,204,510	39,710,004
Q1 2018	17	10,746,621	10,285,553
Q2 2018	18	21,183,734	20,720,434
Q3 2018	19	31,531,499	31,023,981
Q4 2018	20	41,802,073	41,526,848
Q1 2019	21	10,664,618	10,750,824
Q2 2019	22	21,457,234	21,647,250
Q3 2019	23	32,360,986	32,396,324
Q4 2019	24	42,922,563	43,343,693
Q1 2020	25	11,152,919	11,216,095
Q2 2020	26	21,772,010	22,574,066
Q3 2020	27	32,456,673	33,768,667
Q4 2020	28	42,972,474	45,160,537
Q1 2021	29	10,282,521	11,681,367
Q2 2021	30	20,176,770	23,500,882
Q3 2021	31	30,029,530	35,141,010
Q4 2021	32	39,545,959	46,977,382
$\sum$		805,629,184	810,129,431

Error level analysis using other techniques can be carried out in this trend moment calculation. The prediction method presented in this article can also be compared with other methods to see the level of forecasting quality. Forecasting analysis in FMCG companies can be done in several other companies to measure the validity and reliability.

6. CRediT Authorship Contribution Statement

Ammar Fauzan: Conceptualization, Investigation, Resources, Writing - Original Draft, and Funding acquisition. **Dania G. Rahayu:** Software, Formal analysis, Data Curation, Visualization, and Project administration. **Annisa Handayani:** Software, Formal analysis, Data Curation, Visualization, and Project administration. **Imam Tahyudin:** Methodology, Validation, Supervision, Writing - Original Draft, and Writing - Review & Editing. **Dhanar I. S. Saputra:** Investigation, Methodology, Project administration, Supervision, Writing - Original Draft, and Writing - Review & Editing. **Purwadi:** Supervision and Writing - Review & Editing.

7. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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9. Data Availability

Data for this article can be found online here.

10. Funding

No funding was received for this study.

11. Ethical Approval

Ethical approval No patient-identifying parts in this paper were used or known to the authors. Therefore, no ethical approval was requested.

Table 5

Profit prediction.

Fiscal Quarters	x	Actual Data $(Y_t)^*$	Prediction $(\hat{Y}_t)^*$
Q1 2014	1	1,360,981	1,388,636
Q2 2014	2	2,847,991	2,748,660
Q3 2014	3	4,048,929	4,282,359
Q4 2014	4	5,738,523	5,786,107
Q1 2015	5	1,591,699	1,470,019
Q2 2015	6	2,930,640	2,907,423
Q3 2015	7	4,183,173	4,526,189
Q4 2015	8	5,851,805	6,110,934
Q1 2016	9	1,570,040	1,551,403
Q2 2016	10	3,298,207	3,066,187
Q3 2016	11	4,750,551	4,770,019
Q4 2016	12	6,390,672	6,435,761
Q1 2017	13	1,960,841	1,632,786
Q2 2017	14	3,623,958	3,224,951
Q3 2017	15	5,229,400	5,013,849
Q4 2017	16	7,004,562	6,760,588
Q1 2018	17	1,839,131	1,714,170
Q2 2018	18	3,529,869	3,383,714
Q3 2018	19	7,303,493	5,257,679
Q4 2018	20	9,109,445	7,085,414
Q1 2019	21	1,748,520	1,795,553
Q2 2019	22	3,697,232	3,542,478
Q3 2019	23	5,509,603	5,501,509
Q4 2019	24	7,392,837	7,410,241
Q1 2020	25	1,862,681	1,876,936
Q2 2020	26	3,619,635	3,701,242
Q3 2020	27	5,438,339	5,745,339
Q4 2020	28	7,163,536	7,735,068
Q1 2021	29	1,698,080	1,958,320
Q2 2021	30	3,045,892	3,860,005
Q3 2021	31	4,378,794	5,989,169
Q4 2021	32	5,758,148	8,059,895
Σ		135,477,207	136,292,604

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