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Application of the Trend Moment Method in Product Sales Forecasting at TB. Mitra Baru

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Abstract

Advances in information technology have made it easier for companies to manage sales data and conduct forecasting to support decision-making. TB. Mitra Baru, a trading company, often faces challenges in predicting future product sales, which impacts stock availability and business planning. This study aims to design and implement a website-based sales forecasting system using the Trend Moment method, a time series method that utilizes a trendline equation based on the average value over time and sales volume. Sales data is used as input to generate predictions for the next period in a systematic and structured manner. Test results indicate that the Trend Moment method is capable of providing sales estimates with a relatively low error rate, thus providing a basis for consideration in inventory management and sales strategies. With this website-based system, TB. Mitra Baru can easily access actual sales reports and forecast results at any time in real time, thus supporting operational effectiveness and more informed decision-making.

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1. Introduction

Forecasting is the process of estimating/predicting future events based on past data, which is then scientifically analyzed using statistical methods with the aim of improving future events. Forecasting is a crucial tool for effective and efficient planning, particularly in the economic sector. In modern organizations, knowing future conditions is not only crucial for predicting positive and negative outcomes but also for preparing forecasts.

The trend-moment method is a method for finding trend lines using specific statistical and mathematical calculations to determine the function of a straight line as a substitute for the broken lines formed by historical data. This way, the influence of subjective elements can be avoided. (Imam Wahyudi: 2021).

TB. Mitra Baru is a company that provides construction sales services, also known as a building supply store. However, the company faces several obstacles: the current system is still semi-computerized, resulting in significant time-consuming efforts to achieve greater profits, and the process of inputting product sales data often does not align with existing transactions. In this study, the company required an application to determine the number of product sales in the coming period

so that the company would achieve increasingly rapid profits. The company's current system was still semi-computerized, resulting in significant time constraints in achieving greater profits. The process of inputting product sales data often did not align with existing transactions. Customer purchase fulfillment could not be fully met due to unstable stock levels, which could lead to inability to meet consumer demand.

In this study, the author applied the Trend Moment method to calculate the predicted number of product sales. Applying the Trend Moment method overcomes the challenges faced by the company because it is one of the most important engineering approaches for regression or equation formation from discrete data points (in modeling) and measurement error analysis (in model validation).

By implementing this method, the company can quickly determine the distribution volume of medical devices and produce timely distribution reports. The purpose of forecasting is to minimize risk and uncertainty. With the forecasting results, it is hoped that the actions or decisions of a company or organization can have a better impact in the future.

2. Research Methodolgy

In completing this research, the author used two research methods:

1. Field Study

The field study was conducted by the author by conducting direct fieldwork to collect data, specifically by visiting the study location. The data collection techniques used by the author were:

a. Observation
   The author observed product data, customer data, and product sales forecast data, specifically in the sales department at TB. Mitra Baru.
b. Interview
   This technique involved direct face-to-face meetings with relevant parties to obtain clarification on previously unclear issues, specifically regarding the system mechanisms used by the company, and to ensure that the data collected was accurate. Questions were also posed to the sales department, specifically to Mrs. Ratna. The interviews were as follows:
   1. How does the system at TB. Mitra Baru calculate product sales?
   2. What problems have been encountered so far in handling product sales forecasts?
   3. What solutions are expected to address these problems, particularly in product sales?

2. Library Research

The author conducted a library study to obtain data related to the writing of this thesis from various sources, such as PHP application development guides, data management, and forecasting books or journals that discuss the concept of product sales prediction at TB. Mitra Baru.

3. Sampling

Researched and selected available data relevant to the selected field as attachments, specifically sales documents at TB. Mitra Baru. In developing the system, the author uses the waterfall model or software life cycle, the software life cycle has the following stages:

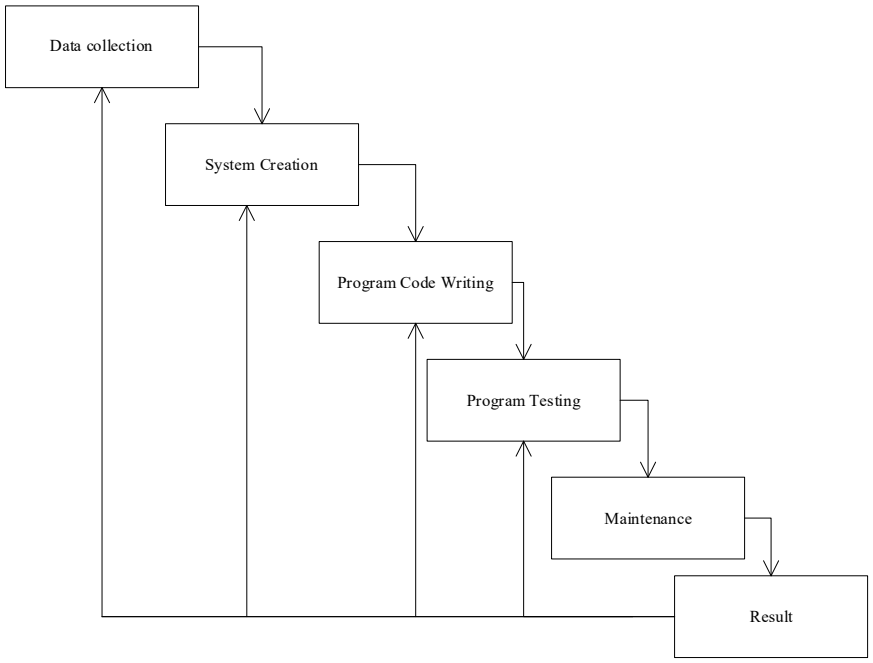

Figure 1. Waterfall Diagram

The Waterfall method has several stages in its development: requirements analysis, system design, coding, program testing, and system maintenance.

1. Data Collection

The researcher collected data containing the elements that must be present in the design results to be able to solve the existing problems according to the objectives. The data required for system design include product sales prediction data, user data, and the programming language used to create the application, PHP.

2. System Design

In general, the Product Sales Prediction Information System Using the Trend Moment Method at TB. Mitra Baru uses the Unified Modeling Language design model, namely use case diagrams, class diagrams, activity diagrams, and sequence diagrams.

3. Program Code Writing

The author chose the Trend Moment method to design the Product Sales Prediction Information System using the Trend Moment method at TB. Mitra Baru. This is because the least squares method is one of the most important approaches in engineering for: (a) regression or equation formation from discrete data points (in modeling), and (b) measurement error analysis (in model validation).

4. Program Testing

At this stage, comprehensive application testing is conducted, including functional testing and system robustness testing. Black-box (interface) testing is software testing that tests the application's functionality against its internal structure or operation.

5. Results

The researcher is a user of the product sales prediction information system that has been designed at TB. Mitra Baru.

3. Results and Discussion

The following flowchart of the application of the trend moment method can be seen in Figure 2 below:

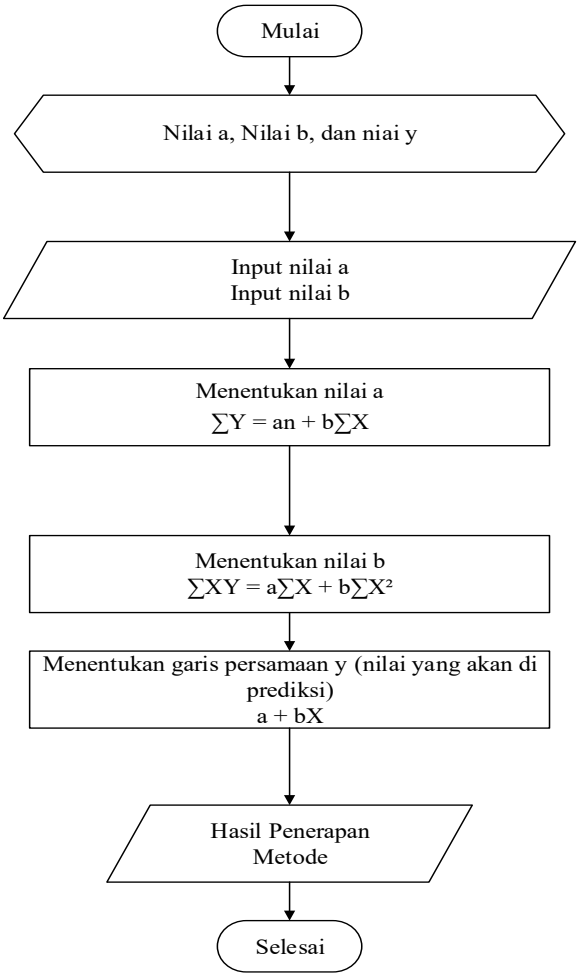

Figure 2. Method Flowchart

Cement Product Sales Case Study

The following shows cement product sales from January 2023 to August 2025 at TB Mitra Baru:

Table 1. Sales Data

Number	Month	Sales Year	Sales Amount	Unit
1	Januari	2023	122	Unit
2	Februari	2023	199	Unit
3	Maret	2023	112	Unit
4	April	2023	34	Unit
5	Mei	2023	126	Unit
6	Juni	2023	91	Unit
7	Juli	2023	40	Unit
8	Agustus	2023	122	Unit
9	September	2023	141	Unit
10	Oktober	2023	94	Unit
11	November	2023	107	Unit
12	Desember	2023	136	Unit
13	Januari	2024	119	Unit
14	Februari	2024	123	Unit
15	Maret	2024	171	Unit
16	April	2024	150	Unit

Number	Month	Sales Year	Sales Amount	Unit
17	Mei	2024	169	Unit
18	Juni	2024	72	Unit
19	Juli	2024	21	Unit
20	Agustus	2024	107	Unit
21	September	2024	177	Unit
22	Oktober	2024	57	Unit
23	November	2024	149	Unit
24	Desember	2024	40	Unit
25	Januari	2025	180	Unit
26	Februari	2025	77	Unit
27	Maret	2025	41	Unit
28	April	2025	108	Unit
29	Mei	2025	68	Unit
30	Juni	2025	78	Unit
31	Juli	2025	102	Unit
32	Agustus	2025	97	Unit

The application of the trend moment method can be seen in Table 2 below:

Table 2. Actual Sales Data

Number	Month	Sales Year	Sales Amount	Unit	(X)	X*Y	X^2
1	Januari	2023	122	Unit	0	0	0
2	Februari	2023	199	Unit	1	199	1
3	Maret	2023	112	Unit	2	224	4
4	April	2023	34	Unit	3	102	9
5	Mei	2023	126	Unit	4	504	16
6	Juni	2023	91	Unit	5	455	25
7	Juli	2023	40	Unit	6	240	36
8	Agustus	2023	122	Unit	7	854	49
9	September	2023	141	Unit	8	1.128	64
10	Oktober	2023	94	Unit	9	846	81
11	November	2023	107	Unit	10	1.070	100
12	Desember	2023	136	Unit	11	1.496	121
13	Januari	2024	119	Unit	12	1.428	144
14	Februari	2024	123	Unit	13	1.599	169
15	Maret	2024	171	Unit	14	2.394	196
16	April	2024	150	Unit	15	2.250	225
17	Mei	2024	169	Unit	16	2.704	256
18	Juni	2024	72	Unit	17	1.224	289
19	Juli	2024	21	Unit	18	378	324
20	Agustus	2024	107	Unit	19	2.033	361
21	September	2024	177	Unit	20	3.540	400
22	Oktober	2024	57	Unit	21	1.197	441
23	November	2024	149	Unit	22	3.278	484
24	Desember	2024	40	Unit	23	920	529
25	Januari	2025	180	Unit	24	4.320	576
26	Februari	2025	77	Unit	25	1.925	625
27	Maret	2025	41	Unit	26	1.066	676
28	April	2025	108	Unit	27	2.916	729
29	Mei	2025	68	Unit	28	1.904	784
30	Juni	2025	78	Unit	29	2.262	841
31	Juli	2025	102	Unit	30	3.060	900
32	Agustus	2025	97	Unit	31	3.007	961
	Total		3.430		496	50.523	10.416

Calculation of b Value

∑Y	= an + b∑X
∑XY	= a∑X + b∑X²
32a + 496b	= 3430 (x15.5)
496a + 10416b	= 50523 (x1)
496a + 7688b	= 53165
496a + 10416b	= 50523 -
-2728b	= 2642
b	= 2642 / 2728
b	=0.97

Calculation of Value a

∑Y	= an + b∑X
32a + 496b	= 3430
32a + (496 * 0.97)	= 3430
32a + 481.12	= 3430
32a	= 3430 + (-481.12)
32a	= 2948.88
a	= 2948.88 / 32
a	= 92.15

The following is the forecasting process for a 6 month period:

Periode	Formula 1	Formula 2	Hasil	Rounding
September 2025	Y = a + b.X	Y = 92.15 + (0.97 * 33)	124.16	124
Oktober 2025	Y = a + b.X	Y = 92.15 + (0.97 * 34)	125.13	125
November 2025	Y = a + b.X	Y = 92.15 + (0.97 * 35)	126.1	126
Desember 2025	Y = a + b.X	Y = 92.15 + (0.97 * 36)	127.07	127
Januari 2026	Y = a + b.X	Y = 92.15 + (0.97 * 37)	128.04	128
Februari 2026	Y = a + b.X	Y = 92.15 + (0.97 * 38)	129.01	129

4. Conclusion

The conclusion of the research report on the Application of the Trend Moment Method in Forecasting Product Sales at TB. Mitra Baru based on this website is as follows: The designed system can help companies overcome the constraints of forecasting product sales at TB. Mitra Baru in the future period. TB. Mitra Baru can reduce the level of error in determining and fulfilling product demand from customers and the creation of product sales reports can make it easier and faster for users to record product sales using the Trend Moment method using PHP applications and MySQL Database.

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