International Journal of Information System & Technology
Akreditasi No. 158/E/KPT/2021 | Vol. 8, No. 6, (2025), pp. 326-332

Optimization of Spareparts Stock Data Management at PT. Astra Motor Kaltim 2 using the Trend Moment Method

James Adeputra[1], Heny Pratiwi[2], Wahyuni[3]*
[1,2,3]STMIK Widya Cipta Dharma, Indonesia
Email: 2143001@wicida.ac.id[1], henypratiwi@wicida.ac.id[2], wahyuni@wicida.ac.id[3]*

Abstract

Spareparts inventory management is a crucial aspect of operations in automotive companies, including PT. Astra Motor Kaltim 2. An imbalance between demand and spareparts availability can lead to stockpiling or stock shortages, ultimately resulting in operational cost inefficiencies. Therefore, this study aims to analyze and forecast spareparts sales using the Trend Moment method to optimize stock management. The Trend Moment method is used to identify sales trend patterns for sparepart 44711K59A12, based on historical sales data from September 2024 to February 2025. The forecasted results are then adjusted using a seasonal index to improve accuracy. Forecast accuracy is evaluated using the Mean Absolute Percentage Error (MAPE), which provides an overview of how close the forecasted results are to the actual data. The results of the study show that the Trend Moment method can provide fairly accurate predictions in estimating the demand for sparepart 44711K59A12 in the upcoming periods. By implementing this method, the company can develop a more efficient stock procurement strategy, reduce the risk of overstocking or stockouts, and improve customer satisfaction. In conclusion, this forecasting approach can serve as a solution to enhance the effectiveness of spareparts inventory management at PT. Astra Motor Kaltim 2.

Keywords: *Stock Optimization, Inventory Management, Spareparts, Forecasting, Trend Moment Method.*

1. Introduction

The importance of information in decision-making continues to grow alongside technological advancements. Accurate information can assist in determining the right strategic steps in various fields, including inventory management. One technique that can be used to extract information from historical data is data mining. Data mining is the process of exploring large volumes of data to discover patterns or previously unseen information within a database [1]. One commonly used method in data mining for forecasting is prediction. Prediction aims to estimate future values based on previously known historical data patterns [2].

PT. Astra Motor Kaltim 2 is a company engaged in the distribution and stock management of spareparts for motor vehicles, particularly for Honda motorcycles. In its operations, the company must ensure the availability of spareparts to optimally meet customer demand. An imbalance between demand and stock availability can cause service issues, either in the form of stock shortages that hinder distribution or excess stock that can lead to waste. Therefore, a system is needed that can predict the optimal stock amount based on previous demand patterns to make inventory management more effective and efficient.

Research related to demand forecasting using the Trend Moment method has been widely conducted. For instance, a study by [3] used the Trend Moment method to forecast currency exchange rates. The results showed that this method could generate predictions with a high level of accuracy. Another study by [4] applied the same method to predict the number of new students at a university, with results showing an accuracy rate of up to 98.25%. Meanwhile, research by [5] used the Trend Moment method to forecast demand

ISSN : 2580-7250

for chicken eggs, resulting in a high level of accuracy with an average error rate of just 1.4%.

From previous studies, it can be concluded that the Trend Moment method has strong potential in generating predictions based on historical data. Therefore, this research aims to apply the Trend Moment method to forecast spareparts stock requirements at PT. Astra Motor Kaltim 2 to optimize inventory management. With accurate forecasts, the company is expected to make better decisions in stock planning, thereby avoiding the risks of both stock shortages and overstocking, which can impact operational efficiency.

The Trend Moment method itself is a time series analysis technique used to identify trends in historical data and project them into the future. If the data shows an upward pattern, the resulting trend is positive, while a downward pattern indicates a negative trend [6]. One advantage of the Trend Moment method compared to other methods lies in the use of the X parameter, which always starts at zero. This makes it applicable to both even and odd data sets without significant differences [7].

Based on the background described above, this study focuses on optimizing spareparts stock management at PT. Astra Motor Kaltim 2 by applying the Trend Moment method to predict stock requirements more accurately. With the implementation of this forecasting system, inventory management is expected to run more effectively, thus supporting the company's goal of meeting customer needs optimally.

2. Research Methodology

2.1. Spareparts Stock Management

Stock management is the process of managing inventory to ensure that items are always available in sufficient quantities to meet operational needs and customer demands [12]. In the automotive industry, optimal stock management plays a crucial role in enhancing supply chain efficiency and preventing losses caused by either stock shortages or excess inventory [2].

According to Silver et al. [12], there are three main strategies in stock management:

a) Demand forecasting – accurately predicting demand to avoid stock shortages or overstocking.
b) Inventory optimization – determining the optimal stock level that balances storage costs with market demand.
c) Supply chain coordination – ensuring good integration between suppliers, main dealers, and dealers to maintain a smooth flow of goods.

In the context of a main dealer such as PT. Astra Motor Kaltim 2, the main challenges in managing spareparts inventory are demand fluctuations and supply uncertainty. Without the right strategy, stockout conditions can hinder distribution and customer service, while overstocking can increase unnecessary operational costs [6]. Therefore, a data-driven approach to stock planning is highly necessary.

2.2. Forecasting Methods in Stock Management

Demand forecasting is a key element in effective stock management. Various methods can be used to estimate the amount of stock needed in the future, including:

a) Time series methods, such as ARIMA and Trend Moment.
b) Machine learning methods, such as Random Forest and Neural Networks [7].
c) Conventional statistical methods, such as Linear Regression and Moving Average [13].

Among the various available methods, the Trend Moment method is chosen in this study due to its simplicity and its ability to identify stock change patterns based on historical data.

2.3. Trend Moment Method in Stock Forecasting

Trend Moment is a forecasting method that utilizes historical data analysis to identify trends and patterns of change in a given variable. This method has been applied across various fields, including stock management and supply chains. The Trend Moment method can be used to determine the demand trend of goods by utilizing the statistical moments of historical data. This approach can produce reasonably accurate estimates with lower computational costs compared to more complex methods such as ARIMA or machine learning.

Previous studies have shown that the Trend Moment method is effective in forecasting demand across various sectors, including:

a) Retail industry, where this method is used to forecast the demand for consumer goods.
b) Manufacturing industry, which uses it to predict raw material requirements.
c) Automotive industry, which applies it in spareparts stock management to improve distribution efficiency.

By observing the success of this method across various sectors, this study will apply the Trend Moment method to optimize spareparts stock management at PT. Astra Motor Kaltim 2.

2.4. Gap Analysis and Research Contribution

Based on the literature review, most previous studies have focused on the use of stock forecasting methods in the manufacturing and retail sectors. However, there is still limited research that specifically applies the Trend Moment method in spareparts stock management at automotive main dealers.

This study contributes by:

a) Implementing the Trend Moment method in spareparts stock management at PT. Astra Motor Kaltim 2.
b) Analyzing the forecasting accuracy of the Trend Moment method compared to the actual spareparts demand trend during the period of January 2025 – March 2025.
c) Providing strategic recommendations for spareparts stock optimization, aimed at improving distribution efficiency and reducing operational costs.

Thus, this study not only provides a practical solution for PT. Astra Motor Kaltim 2, but also contributes to the development of stock forecasting methods in the automotive industry.

2.5. Flowchart

A flowchart is a graphical representation that illustrates the steps and sequence of procedures of a program or process. A flowchart uses standard symbols such as ovals to indicate the start and end of a process, rectangles for activities, diamonds for decisions, and arrows to connect the steps. Flowcharts make it easier to understand the workflow by providing a clear visual representation, thereby simplifying the identification of problems or the streamlining of procedures.

According to Lalang Erawan, M.Kom in the e-book *Flowchart*, flowcharts help analysts and programmers break down problems into smaller segments and analyze operational alternatives in a more structured manner. Thus, flowcharts play an important role in the design and documentation process of programs, especially in the context of software or complex system development. Below is the flowchart for calculating the future value:

a) Start – The process begins.
b) Input Data – Enter historical spareparts sales data.
c) Calculate Mean of X & Y – Determine the average values of the time variable (X) and sales (Y).

d) Calculate values of a and b – Calculate the linear regression parameters: the constant (a) and the coefficient (b).
e) Form Trend Equation Y = a + bX – Construct the prediction equation based on the Trend Moment method.
f) Forecast Future Values – Use the generated equation to forecast future sales.
g) Display Results – Show the calculated prediction results.
h) End – The forecasting process is completed.

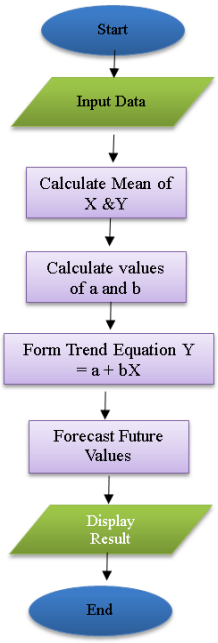

Figure 1. Flowchart

2.6. Method

Based on observations, PT. Astra Motor Kaltim 2 frequently experiences fluctuations in motorcycle spareparts sales. This instability affects stock management, where excess inventory can lead to waste and increased storage costs, while stock shortages can hinder distribution and cause customer dissatisfaction due to longer waiting times. Therefore, a system is needed to support decision-making in forecasting spareparts demand, so that the planning and control of inventory can be optimized. One method that can be used to address this issue is the Trend Moment method.

Forecasting is a very important tool in effective and efficient planning processes [4]. The accuracy of a forecast is measured by the error rate between the forecast result and the actual data [7]. The main objective of forecasting is to obtain an estimate of future trends with the highest probability of occurrence [5]. Some fundamental principles of forecasting that need to be considered include the following [10]: Forecasts always contain a degree of error, as their goal is to reduce uncertainty, not eliminate it entirely.Forecasts should be evaluated using forecasting error metrics to determine their accuracy.Short-term forecasts tend to be more accurate than long-term forecasts.

The Trend Moment method, also known as the Secular Trend, is a time-series analysis technique used to fit a trend line based on historical data, which is then projected into the future. If the data shows an upward pattern, the trend is considered positive, whereas if it shows a downward pattern, the trend is considered negative [5].

The main advantage of the Trend Moment method compared to other methods lies in its use of the X parameter, which always starts from 0 as the first sequence. This makes the method more flexible, as it can be applied to both even and odd amounts of data without significant differences in forecasting results [6].

3. Results and Discussion

In the prediction analysis process using the Trend Moment method, historical data on motorcycle spareparts sales from previous periods is required. This data serves as the foundation for calculations to project future demand trends. Once the sales data is obtained, the Trend Moment method is applied to identify the trend patterns formed.

The prediction results obtained from this method are then adjusted for seasonal factors to improve forecasting accuracy. This process is carried out by multiplying the initial prediction value by a seasonal index derived from historical data. After that, a final calculation is performed to obtain a more accurate prediction value.

As an evaluation step, the accuracy of the prediction results is measured using the Mean Absolute Percentage Error (MAPE). MAPE is used to assess the difference between the actual data and the forecasted results. A lower MAPE value indicates that the Trend Moment method has a higher level of accuracy in projecting spareparts stock needs.

As an example of a manual implementation of the Trend Moment method, this study uses motorcycle spareparts sales data from September 2024 to February 2025. This data will be analyzed to forecast the stock requirement for March 2025 to ensure optimal spareparts availability. The following table presents the data used in this prediction analysis.

Table 1. Motorcycle Spareparts Sales Data

			SPAREPART TYPE					
No	**YEAR**	**MONTH**	**44711K59A12**	**31500KZR602**	**082322MBK2LN9**	**33100K1AN01**	**43130KZL930**	**9805657723**
1	2024	Sep	230	780	21.600	34	2.880	9.350
2	2024	Okt	211	810	22.000	24	2.680	8.700
3	2024	Nov	344	860	19.200	45	3.120	10.800
4	2024	Des	413	1.032	23.040	54	3.744	12.960
5	2025	Jan	351	877	19.584	46	3.182	11.016
6	2025	Feb	333	833	18.605	44	3.023	10.465

Based on the data previously presented in Table 1, the next step is to calculate the sales prediction for the motorcycle sparepart type 44711K59A12 using the Trend Moment method. The prediction process using the Trend Moment method can be carried out through the following steps:

a) Calculate the total sales data (Y), which is the total number of 44711K59A12 units sold from September 2024 to February 2025 based on historical data.
b) Determine the parameter values (Y), where (X) represents the time index. The sum of the time index values for the sales of sparepart 44711K59A12 is calculated based on the available time periods.
c) Calculate the values of (XY) and (X^2), as this step is necessary to determine the constant and coefficient values that will be used in the Trend Moment equation. In this calculation:
   (X) is the time index
   (Y) is the historical monthly sales data
   (XY) is the result of multiplying the time index (X) by the number of sales (Y)
   (X^2) is the squared value of the time index

The calculation results of the values (Y), (X), (XY), and (X^2) for the sales of sparepart type 44711K59A12 will be presented in Table 2 as the basis for prediction analysis using the Trend Moment method.

Table 2. Data Sales 44711K59A12

No	Year	Month	Total Sales (Y)	Time Index (X)	XY	XX
1	2024	Sep	230	0	0	0
2	2024	Okt	211	1	211	1
3	2024	Nov	344	2	688	4
4	2024	Des	212	3	636	9
5	2025	Jan	250	4	1.000	16

No	Year	Month	Total Sales (Y)	Time Index (X)	XY	XX
6	2025	Feb	263	5	1.315	25
Jumlah			1.510	15	3.850	55
Rata-rata			252	3	642	9

In accordance with Table 2, the following values are obtained:
$\sum X = 15$
$\sum Y = 1.510$
$\sum XY = 3.850$
$\sum X^2 = 55$

The prediction result testing is conducted to determine the accuracy level of the motorcycle spare part sales forecast using the Trend Moment method. In this study, the parameter used to assess the prediction accuracy is the Mean Absolute Percentage Error (MAPE). The results of the prediction accuracy testing are presented in Table 3.

Table 3. Results of Prediction Accuracy Testing

No	Sparepart	Total Error MAPE (%)
1	44711k59a12	-0,16899%
2	31500kzr602	-1,90225%
3	082322mbk2l9	-0,20359%
4	33100k1an01	-3,34505%
5	43130kzl930	-2,01452%
6	9805657723	-2,46967%

4. Conclusion

Based on the results of the study on motorcycle spare part sales prediction using the Trend Moment method, it can be concluded that this method is capable of providing fairly accurate demand estimations by taking into account trends and seasonal factors. From the calculation of the Mean Absolute Percentage Error (MAPE), the resulting error value falls into the low category, indicating that this method has a high level of accuracy in forecasting spare part stock requirements. The sales prediction results for spare part 44711K59A12 demonstrate a trend pattern that can serve as a foundation for decision-making in inventory planning. With proper forecasting, stock levels can be better managed, thereby increasing operational efficiency. In addition, the sales forecast for March 2025 also indicates that this method is reliable for estimating demand in the following month. By consistently applying the Trend Moment method, it is expected that the spare parts inventory management system can be optimized to support smooth distribution and improved customer service.

References

[1] Amrin. (2016). Data Mining Dengan Regresi Linier Berganda Untuk Peramalan Tingkat Inflasi. Jurnal Techno Nusa Mandiri, Vol. XIII, No. 1.
[2] Chopra, S., & Meindl, P. (2022). Supply Chain Management: Strategy, Planning, and Operation. Pearson.
[3] Dliya'ul Izz. A. A. F, et al. (2020). Trend Moment Method for predicting Multimedia Equipment Rental Needs. Jurnal Ilmiah Bidang Teknologi Informasi dan Komunikasi, Vol. 5, No. 1.
[4] Hidayat, R., & Pratama, Y. (2021). Implementasi Peramalan dalam Manajemen Stok Industri Otomotif. Automotive Supply Chain Journal.
[5] Ilyas, et al. (2018). Implementasi Metode Trend Moment (Peramalan) Mahasiswa Baru Universitas Widyagama Malang. Journal of Information Technology and Computer Science (JOINTECS), Vol. 3, No. 2.
[6] Kurniawan, H., et al. (2021). Optimasi Stok Sparepart Menggunakan Metode

Peramalan. Journal of Supply Chain Management.
[7] Makridakis, S., Spiliotis, E., & Assimakopoulos, V. (2020). The M5 Competition: Results, Findings, and Conclusions. International Journal of Forecasting.
[8] Mehaninda, D.R et al. (2018). Peramalan Persediaan Spare Part Sepeda Motor Menggunakan Algoritme Backpropagation. Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer, Vol. 2, No. 12.
[9] Mulyani, E. D. S et al. (2019). Prediksi Kurs Rupiah Terhadap Dollar Amerika Menggunakan Metode Trend Moment. Jurnal Inovtek Polbeng - Seri Informatika, Vol. 4, No. 2.
[10] Prabowowati, I. (2018). Implementasi Metode Trend Moment Pada Peramalan Penjualan Guna Pengadaan Persediaan Obat Dan Benih Tanaman Pada Toko Pertanian Tani Makmur. Simki-Techsain, Vol. 02, No. 01.
[11] Santi, I. H & Saputra, A. R. (2019). Prediksi Jumlah Permintaan Telur Ayam Menggunakan Metode Trend Moment. Informatika Mulawarman : Jurnal Ilmiah Ilmu Komputer, Vol. 14, No. 2.
[12] Silver, E. A., Pyke, D. F., & Thomas, D. J. (2016). Inventory and Production Management in Supply Chains. CRC Press.
[13] Snyder, R. D., & Hyndman, R. J. (2021). Forecasting: Principles and Practice. OTexts.
[14] Wardah, S & Iskandar. (2016). Analisis Peramalan Penjualan Produk Keripik Pisang Kemasan Bungkus (Studi Kasus : Home Industry Arwana Food Tembilahan). Jurnal Teknik Industri, Vol. 11, No. 3.
[15] Yulian, I, et al. (2020). Penerapan Metode Trend Moment Dalam Forecasting Penjualan Produk CV. Rabbani Asyis. JURTEKSI (Jurnal Teknologi dan Sistem Informasi), Vol. 6 No. 2.
[16] Zunaidi, M, et al. (2016). Aplikasi Peramalan Laba/Rugi Untuk Meningkatkan Penjualan Dengan Metode Single Moving Average (SMA). Jurnal SAINTIKOM, Vol.15, No. 3.
[17] Liyadi, K. R., Pratiwi, H., & Aditnya, P. S. (2022). Penerapan Metode Single Moving Average Dalam Peramalan Persediaan Bahan Pangan. BRAHMANA: Jurnal Penerapan Kecerdasan Buatan, Vol. 4, No. 1, pp. 72-80.