

OPTIMIZATION OF GAMIS PRODUCT INVENTORY MANAGEMENT AT TWENTY2 CLOTHING STORE

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Abstract

Twenty2 Clothing Store is a fashion business experiencing difficulties in inventory control due to demand uncertainty. The research was conducted from January to September 2025 at Twenty2 Clothing Store. The methods used were demand forecasting, probabilistic inventory modeling, and analysis according to the Committee of Sponsoring Organizations of the Treadway Commission (COSO). The study's results indicated that the most appropriate forecasting method was Holt-Winters exponential smoothing. The amount of safety stock needed from June 2025 to January 2026 was 129 pcs, from February to March 2026 was 112 pcs, and from April to May 2026 was 35 pcs. The reorder point for June 2025-January 2026 was 131 pcs, for February-March 2026 was 134 pcs, and for April-May 2026 was 38 pcs. The recommended optimal order quantity for June 2025-January 2026 was 396 pieces, for February-March 2026 was 176 pieces, and for April-May 2026 was 28 pieces. The analysis of inventory management internal control according to COSO control components at Twenty2 Clothing Store was good but still simple and not yet digitalized. Therefore, Twenty2 Clothing Store can use the forecasting results and improve internal control in a systematic, structured, and recorded manner with a digitalization system.

Keywords: COSO, forecasting, inventory management, probabilistic model

JEL Classification: (M31; L83; O33)

INTRODUCTION

The textile and apparel industry is an important sector of the Indonesian economy. As a labor-intensive industry, this sector is able to absorb 0.75% and 2% of the workforce, respectively (BPS, 2025a). In 2024, this industry contributed 142.39 trillion rupiah to the

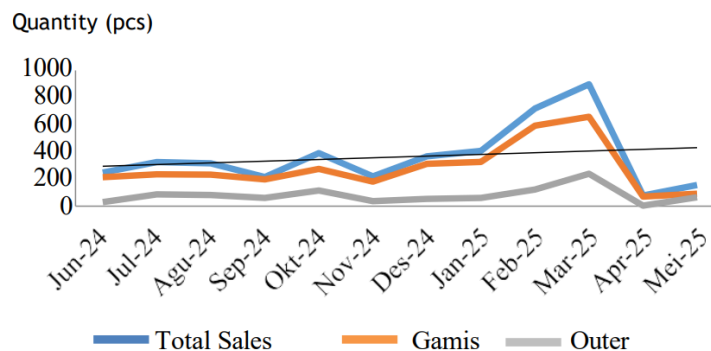
GDP and experienced an increase of 4.26% compared to 2023, which was -1.98% (BPS, 2025b).

The fashion industry, as a sub-sector of the textile and apparel industry, has undergone many transformations in its development. This industry has promising potential

and can be a driving force in Indonesia's economic development (Sono et al., 2023). The fashion business in Indonesia accounts for 17.6% of the total added value of the creative economy to the Indonesian economy (Kemenparekraf, 2024). The development of the fashion business in Indonesia is supported by the expansion of small and medium-sized businesses, which is accompanied by high competitiveness (Irmayanti et al., 2022). This intense business competition requires business actors to focus on their ability to compete by implementing appropriate and forward-looking business strategies (Novianti, 2020).

Twenty2 Clothing Store is a business engaged in the fashion industry. This store focuses on selling women's clothing in the form of gamis and outerwear. The store's revenue is derived from direct sales to consumers through its offline store. The largest sales come from gamis sales, accounting for 77% of total sales. The highest sales occurred in March 2025, amounting to 899 pieces. Sales declined in April 2025 to 79 pieces. Sales data for Twenty2 Clothing Store from June 2024 to May 2025 can be seen in Figure 1.

Figure 1. Sales data for Twenty2 Clothing Store June 2024-May 2025



Based on Figure 1, sales at Twenty2 Clothing Store from June 2024 to May 2025 fluctuated, indicating uncertainty in demand. Basically, the main motive of the company is to make a profit by meeting all consumer needs through maximizing cost effectiveness. The profit that is the goal of this company can be achieved not only through cost efficiency but also by maximizing production and sales (Pramesti & Izzati, 2022). Sales are a very important activity for the

sustainability of a business. With consumer demand changing every day, business actors are required to make more detailed strategic plans to increase their sales. One of these plans is related to inventory, which is a major factor in the company's production and sales processes (Prihasti & Nugraha, 2021).

Uncertainty in demand is the main reason for holding inventory (Nisa et al., 2020). The purpose of inventory procurement is to meet customer needs, where inventory is an asset of the company's goods that will be sold

within a certain period (Abdallah et al., 2023). Inventory is one of the important aspects that affect sales revenue (Ferawati et al., 2020). Efficient and well-organized inventory management is one of the keys to the operational success of a business (Kusumawati et al., 2023).

Effective inventory management is important to maintain inventory levels and prevent situations of excess or shortage through inventory control (Abdallah et al., 2023). Inventory control is very important because if a company has excess inventory, it will result in overstocking, which will increase the capital required for procurement and storage. Conversely, if inventory is insufficient, it will result in stockouts, which will lead to costly emergency procurement costs or customer dissatisfaction (Lopenzo et al., 2024).

Based on interviews conducted with the owner, it is known that inventory planning and control in inventory management at Twenty2 Clothing Store still relies on the owner's estimates or intuition and does not yet use supporting calculations, methods, and theories. As a relatively new micro and small-scale business, Twenty2 Clothing Store needs a method to determine optimal inventory levels. This is necessary to improve operational efficiency, reduce costs, and ensure product availability in line with demand so as to optimize inventory management and minimize the risk of loss (Sekarwangi & Miharja, 2024).

METHOD, DATA, AND ANALYSIS

This study employs a mixed

methode approach aimed at gaining an in-depth understanding of the forecasting, inventory management, and internal controlling in Twenty2 Clothing Store. The research was conducted at Twenty2 Clothing Store, located in Tanah Abang Shopping Center, Central Jakarta, Special Capital Region of Jakarta. The research was conducted from January to September 2025. The data used in this research was primary and secondary data. Primary data was obtained through interviews and observations, while secondary data was obtained from internal data and various literature. This research is limited to gamis products, which are the main products at Twenty2 Clothing Store.

This study used *exponential smoothing* forecasting methods, namely *single exponential smoothing*, *double exponential smoothing*, and *Holt-Winters exponential smoothing*; probabilistic inventory control models; and COSO internal control analysis. These methods were chosen because they are suited to the conditions of the research object, which is newly established and still micro in scale. In addition, the monthly demand trend for gamis products made this forecasting method applicable. The calculation of *safety stock*, *reorder point*, and optimum inventory level used a probabilistic model for gamis product inventory management.

RESULT AND DISCUSSION

Overview of Twenty2 Clothing Store

Twenty2 Clothing Store is a micro and small business engaged in the fashion industry. The types of clothing sold are women's clothing, specifically gamis and outerwear. This business was established in June 2024

and is located at Tanah Abang Shopping Center Building, Block A, LG Floor, Los C No. 72, Tanah Abang District, Central Jakarta City. In operating its business, the store is open daily from 8:00 AM to 4:00 PM WIB. The business is independently run by the owner and assisted by one employee.

Demand Forecasting

The data used in forecasting is sales from June 2024 to May 2025. This

study uses three exponential smoothing forecasting methods, namely single exponential smoothing, double exponential smoothing, and Holt-Winters exponential smoothing. Based on the forecasting calculations using Minitab22 software, the following is a comparison of data from the forecast of demand for gamis products at the Twenty2 Clothing Store, which can be seen in Table 1.

Table 1 Comparison of gamis product forecast results at Twenty2 Clothing Store

No	Period	Single Exponential Smoothing	Double Exponential Smoothing	Holt-Winters
1	Jun-25	276,928	104,975	228,023
2	Jul-25	276,928	111,871	244,249
3	Aug-25	276,928	118,768	242,747
4	Sep-25	276,928	125,664	207,000
5	Oct-25	276,928	132,561	288,021
6	Nov-25	276,928	139,457	189,121
7	Dec-25	276,928	146,354	327,700
8	Jan-26	276,928	153,251	341,281
9	Feb-26	276,928	160,147	623,640
10	Mar-26	276,928	167,044	691,750
11	Apr-26	276,928	173,940	74,514
12	May-26	276,928	180,837	95,485

Based on Table 1, it is known that the forecasting results show different patterns. Forecasting calculations using the single exponential smoothing method show stable forecasting results with α of 0.130197. Meanwhile, using the double exponential smoothing method shows forecasting results with an ever-increasing trend with α of 0.887823 and γ of 0.078835. The Holt-Winters

exponential smoothing method shows fluctuating forecasting results with α , γ , and β of 0.9. To assess the accuracy of the forecasting model, a comparison of forecasting error measurement indicators can be made using MAPE (Mean Absolute Percentage Error), MAD (Mean Absolute Deviation), and MSD (Mean Square Deviation). A comparison of the forecasting error values for each method is shown in Table 2.

Table 2 Comparison of error values for gamis forecasting methods

Method	MAPE	MAD	MSD
<i>Single exponential smoothing</i>	71.5	12127.9	32,951.3
<i>Double exponential smoothing</i>	106.8	129.8	43,444.5
<i>Holt-Winters exponential smoothing</i>	2.780	6.270	168.541

Based on Table 2, it is known that the smallest forecasting error values with MAPE, MAD, and MSD indicators are obtained using the Holt-Winters exponential smoothing demand forecasting method. This forecasting method produces a MAPE error value of 2.780; MAD of 6.270; and MSD of 168.541. The error value using this forecasting method is 2.78%, which indicates that the forecast results are very accurate (on a scale of ≤ 10).

Probabilistic Inventory Control Model Analysis based on Demand Forecasting

The probabilistic inventory control model in this study is to

determine safety stock (SS), reorder point (ROP), and optimal order quantity (Q^*) for gamis products by referring to the results of demand forecasting using the Holt-Winters exponential smoothing method for the period June 2025-May 2026. Inventory control calculations are divided into three based on the demand situation.

Safety Stock

Safety stock is additional inventory or a reserve that is prepared to anticipate possible delays in goods delivery (Purba et al., 2022). The safety stock calculation for gamis products at the Twenty2 Clothing Store can be seen in Table 3.

Table 3 Safety Stock Calculation

Demand Type	Z(95%)	STDEV (σ_D)	Lead Time (LT)	JLT	Safety Stock (pcs)	—
Other months	1.65	55.25	2	1.42	128.93	
February-March	1.65	48.08	2	1.42	112.2	
April-May	1.65	14.85	2	1.42	34.65	

Based on Table 3, it is known that the optimal safety stock for gamis products for February-March, which has a high surge in demand, April-May, which has a decline in demand, and other months. The amount of safety stock needed in other months, namely June 2025-January 2026, is 128.93 pcs

or 129 pcs. For February-March 2026, the required safety stock is 112.2 pcs or 112 pcs in terms of quantity. For April-May 2026, the required safety stock is 34.65 pcs or 35 pcs. This amount indicates the minimum additional inventory that needs to be provided to deal with changes in demand and

uncertainty during the lead time.

Reorder Point (ROP)

The reorder point is the point that indicates when it is necessary to reorder inventory items in order to

ensure availability (Purba et al., 2022).

The reorder point calculation for gamis products at Twenty2 Clothing Store can be seen in Table 4.

Table 4 Reorder point calculation

Type of Demand	LT (Days)	Average Demand (Months)	Average Demand (Days)	SS (pcs)	ROP (pcs)
Other	2	258.5	1,078	128.93	131
Other					8
February-March	2	658	10.97	112.2	134
March					13
April-May	2	85.5	1.43	34.65	37.5

Based on Table 4, the reorder point for the other months, namely June 2025 to January 2026, is 131.08 pcs or 131 pcs in terms of the number of items. This means that when the inventory reaches 131 pcs, a reorder must be placed immediately to prevent the inventory from running out before the goods are delivered.

Just arrived for February-March 2026, the reorder point is 134.13 pcs or 134 pcs in terms of quantity. This means that when the inventory reaches 134 pcs, a reorder must be placed immediately to prevent the inventory

from running out before the new shipment arrives. For April-May 2026, the reorder point is 37.5 pcs or 38 pcs in terms of quantity. This means that when the inventory reaches 38 pcs, a reorder must be placed immediately to prevent the inventory from running out before the new shipment arrives.

Optimal Order Quantity (Q*)

In calculating the optimal number of orders per order, the number of requests, ordering costs, and storage costs are required. The calculation of the optimal number of orders for gamis products at Twenty2 Clothing Store can be seen in Table 5.

Table 5 Calculation of the optimal order quantity

Order Type	Demand (pcs)	Ordering Cost (Rp)	Storage Cost (Rp)	Q* (pcs)
Other Months	2,068	240,000	6,343	395.59
February-March	1,316	75,000	6,343	176.41
April-May	171	15,000	6,343	28.44

Based on Table 5, it is known

that the recommended optimal order quantity for the other months, namely

June 2025- January 2026, is 395.59 pcs or 396 pcs, for February-March 2026 it is 176.41 pcs or 176 pcs, and for April-May 2026 is 28.44 pcs or 28.44 pcs.

Internal Control Analysis of Inventory using the COSO Framework

The role of internal control in inventory management is considered very important because inventory is the main source of income for trading companies (Ratiani & Masdiantini, 2022). The analysis of internal control of inventory according to the COSO control components at Twenty2 Clothing Store is as follows:

- **Control Environment**

Twenty2 Clothing Store has implemented a fairly good control environment through the application of the principles of establishing structure, authority, and responsibility. Twenty2 Clothing Store has a well-defined organizational structure, as evidenced by the clear separation of duties and responsibilities between the owner and employees. Although the control environment principles implemented are quite good, there are weaknesses in the application of the supervision principle, which has not been maximally carried out by the owner.

- **Risk Assessment**

Risk assessment in inventory management involves identifying and analyzing risks at Twenty2 Clothing Store that could disrupt inventory management. The risks faced by Twenty2 Clothing Store are excess, shortage, and loss of inventory items

due to the lack of an accurate inventory control system, incomplete inventory records, and weak supervision.

- **inventory management by the owner**

The recording system used at Twenty2 Clothing Store is still manual and lacks the use of technology. The owner's failure to fully implement oversight principles also risks causing overstocking, obsolete goods, and potential loss of goods due to a lack of direct supervision.

- **Control Activities**

Control activities at Twenty2 Clothing Store include policies and procedures implemented in managing and controlling inventory to minimize the risk of loss. In this case, Twenty2 Store needs to implement inventory management controls by considering the most effective and efficient methods so that the company does not experience stock shortages or surpluses and obtains the maximum profit as expected (Bu'ulolo et al., 2024). In addition, inventory management controls in this study were carried out using demand forecasting and probabilistic inventory control models. Inventory recording that is not yet systematic and comprehensive needs to be controlled with a more integrated and systematic inventory recording system, and an internal monitoring system needs to be implemented through periodic stock-taking to ensure consistency between inventory data reports and physical stock, as well as developing standard inventory management procedures that cover the process and recording of incoming and

outgoing goods.

- **Information and Communication**

Twenty2 Clothing Store has implemented the principles of information and communication well. This can be seen from the fact that internal communication between work units is running quite well, with each department performing its respective functions. Employees perform their function of conveying stock information to the owner. With the information provided, the owner communicates externally with suppliers regarding orders for supplies. This demonstrates good coordination in procurement and supply management between employees and owners, and between owners and suppliers.

- **Monitoring Activities**

Monitoring and checking inventory at Twenty2 Clothing Store has not been carried out properly. The owner does not directly monitor incoming and outgoing goods, resulting in suboptimal inventory control and the potential for recording errors, loss of goods, and inventory buildup. Although the owner does not monitor activities directly, surveillance cameras can help the owner monitor activities. However, this situation indicates that the monitoring component of internal control is still weak, so the owner needs to improve oversight by conducting regular direct monitoring of goods activities.

Managerial Implications

Based on the results of research conducted on inventory management control, it can be a useful reference in the form of managerial implications that can be taken into consideration by

Twenty2 Clothing Store. The following are managerial implications based on the research results that can be implemented in inventory management:

Based on the results of forecasting using the Holt-Winters exponential smoothing method, Twenty2 Clothing Store can optimize the amount of stock that must be provided for the period June 2025-May 2026. In addition, these forecast results help Twenty2 Clothing Store in adjusting the supply of gamis products so as to minimize excess stock and stock shortages. The forecast results can be used as a reference in evaluating sales performance through sales levels.

With a probabilistic inventory control model based on forecasting analysis results, stores can better manage inventory in the face of demand uncertainty. Setting safety stock can help stores prepare reserve inventory and ensure the availability of goods to anticipate demand uncertainty and lead times, thereby avoiding stockouts. Setting a reorder point can help in reordering inventory when the inventory point reaches the minimum limit to avoid shortages and excess stock. The optimal order quantity can help in determining the quantity of inventory orders so that inventory procurement is in line with demand, thereby avoiding excess or shortage of inventory.

Internal control analysis aims to determine whether inventory management at Twenty2 Clothing Store is efficient and effective by evaluating procedures, policies, and oversight mechanisms in inventory management

so that the store can identify weaknesses, prevent errors, and ensure that inventory is managed optimally.

The application of a probabilistic model based on forecasting analysis can help Twenty2 Clothing Store optimize its product inventory planning by taking into account demand uncertainty and lead time. With these calculations, Twenty2 Clothing Store can predict fluctuations in product demand, determine the appropriate amount of product inventory, thereby reducing the risk of excess or shortage of stock and improving efficiency in inventory management.

CONCLUSION

Sales of gamis products at Twenty2 Clothing Store during June 2024-May 2025 experienced sales fluctuations that illustrate uncertainty in demand, which has an impact on the readiness of Twenty2 Clothing Store's inventory management, which currently does not have inventory management controls through calculations, methods, and theories that support dealing with uncertainty in demand. Therefore, demand forecasting and probabilistic inventory control were carried out to anticipate demand uncertainty, as well as an internal control analysis of inventory using COSO to assess the implementation of the internal control system for inventory management at Twenty2 Clothing Store.

The most appropriate forecasting method for predicting demand for gamis products at Twenty2 Clothing Store is *Holt-Winters exponential smoothing*, which produces the smallest forecasting error value of 2.78%, indicating that the forecast

results are very accurate. These forecast results are then used to perform probabilistic inventory control calculations, which are divided into three categories based on the demand situation. The amount of *safety stock* required in other months, namely June 2025-January 2026, is 129 pcs, February-March 2026 is 112 pcs, and April-May 2026 is 35 pcs. *The reorder point* for other months, namely June 2025-January 2026, is 131 pcs, for February-March 2026 is 134 pcs, and for April-May 2026 is 38 pcs. The recommended optimal order quantity for the other months, namely June 2025- January 2026, is 396 pcs, for February-March 2026 is 176 pcs, and for April-May 2026 is 28 pcs.

Internal control of inventory according to COSO control components at Twenty2 Clothing Store shows that inventory management is already well implemented in the information and communication components and needs improvement in the control environment and monitoring activities components. In the risk assessment component, it is known that the risks faced by Twenty2 Clothing Store are excess, shortage, and loss of inventory items caused by the absence of an accurate inventory control system, incomplete inventory records, and weak inventory supervision by the owner. This risk can be controlled by implementing inventory management controls using the most effective and efficient methods through demand forecasting and probabilistic inventory control models. In addition, inventory recording needs to be controlled using a more integrated and systematic inventory recording system, and monitoring activities carried out by the

owner can be controlled by implementing an internal monitoring system through regular *stock-taking*.

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