Development of Multi Item Probabilistic Inventory Model by Considering Perishable and Purchase Bonus Factors

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***Abstract*— Probabilistic inventory model is used mostly in a condition when the demand has uncertainty but the pattern can be predicted, which is the most applicable model in real situation. There are two models considered in the study as the base. In the first previous model, purchase bonus policy was applied to probabilistic inventory model, considering purchase bonus that was given by the supplier. Other model was built considering perishable factor that affect inventory cost based on deterministic demand condition. The purpose of this research is to combine those models, a probabilistic inventory model considering perishable and purchase bonus factors. The model was built for multi item with single supplier case. By comparing the models, it can be concluded that the developed model was comprehensive and applicable in real condition.**

***Keywords*— probabilistic inventory model, multi item, joint order, purchase bonus, perishable**

I. Introduction

The existence of inventory in company activities cannot be avoided [1]. This is caused by the increase of inventory role in supporting companies to survive. This is also supported by the competition in industrial sector that is getting stronger. Here, a company can increase the competitiveness by applying the right inventory system. Well managed inventory can minimize inventory cost and guarantee stable fulfillment of the demand [5]. Determining the number of inventory to be stored is the main problem. This is related to the inventory cost that should be kept as low as possible, but still keeping a relative good service level. The problem becomes more complicated for perishable goods where the goods will expire if they are not used until a certain period. For food and chemical industries, the expiration of goods becomes one of many factors affecting the total cost of inventory [4]. If a company keeps the inventory at high level, the holding cost will increase. Besides of that, if the stored goods are not used until they expire, there will be a stockout cost due to expired goods and cost incurred due to loss because of the goods cannot be sold. However, if a company stores a few goods, the service level will decrease because the company is not able to fulfill customer demand due to out of stock. Many studies have been done about perishable inventory. Research on simple perishable inventory had been done by Indrianti [2]. Indrianti did a research about economic order quantity inventory model by considering perishable factor. This research became a reference for further research that have higher complexity.

Limansyah [3] developed this research [2] by designing an EOQ inventory model with perishable and all unit discount factor. Then, Limansyah [4] developed his previous model [3] for multi item products. However, the demand pattern in [4] is still deterministic, which can be further developed to overcome probabilistic demand. Beside of perishable factor, there are other factors affecting inventory cost. One of them is purchasing policy. There are various purchasing policies such as discount and purchase bonus. There are still few researches have been done about inventory with purchase bonus factor. Silitonga [6] did a research on multi item probabilistic inventory model with purchase bonus factor, but perishable factor was not considered. Based on the explanation above, the purpose of this paper is to propose a probabilistic inventory model by considering perishable and purchase bonus factors. This inventory model is expected to deal with more realistic inventory problems.

II. Methods

A. Notations

There are several notations used in this paper as follow:

- D_i : Number of demand for the type i goods in a planning horizon (unit/year)
- S_i : Standard deviation of demand for the type i goods in a planning horizon (unit/year)
- T : Planning period (year)
- T^* : Time between of goods ordering from one cycle to the next cycle (year)
- Q_i : Optimal order quantity for the type i goods (unit)
- Q_{abi} : Optimal order quantity after purchase bonus for the type i goods (unit)
- Q_{ki} : Number of items that will expire for the type i goods (unit)
- Q_{bi} : Purchased goods quantity after purchase bonus in a planning horizon in units (unit)
- Q_{Bi} : Purchased goods quantity after purchase bonus in a planning horizon in cartons (carton)
- P_i : Purchasing cost of each unit for the type i goods (Rp/unit)

A : Ordering cost for each order with joint order policy (Rp/order)
H_i : Holding cost of each unit of each holding period for the type i goods (Rp/unit/period)
C_{ui} : Stockout cost of each unit for the type i goods (Rp/unit)
J_i : Selling price of goods that will expire for the type i goods (Rp/unit)
n : Number of goods type managed in inventory system (type)
$z_{\alpha i}$: The z value of the standard normal distribution for the type i goods
N_i : Expectation of inventory shortage for the type i goods
ss_i : Number of safety stock for the type i goods (unit)
m_i : Number of goods in a carton for the type i goods (unit)
a_i : Minimum purchase lot size to get bonus from the supplier for type i goods (carton)
b_i : Number of bonus given by the supplier for the type i goods (carton)
y_i : Binary number determined by purchase bonus policy that is used for the type i goods (y_i is worth 0 or 1)
t_i : Small cycle of holding period for the type I goods (year)
t_{1i} : Holding period before the goods expire for the type i goods (year)
t_{2i} : Inventory shortage period for the type i goods (year)
θ_i : Fraction of good condition goods for the type i goods ($0 < \theta_i < 1$)
$1-\theta_i$: Fraction of goods that will expire for the type i goods ($0 < 1 - \theta i < 1$)
L : Lead time for all goods (year)
O_b : Total purchasing cost in a planning horizon (Rp)
O_p : Total ordering cost in a planning horizon (Rp)
O_s : Total holding cost in a planning horizon (Rp)
O_k : Total stockout cost in a planning horizon (Rp)
O_{kd} : Total expired cost in a planning horizon (Rp)
O_T : Total inventory cost in a planning horizon (Rp)

B. Development of Model

This research refered and combined the two previous models. For probalistic demand and purchase bonus policy it refers to Silitonga [6] and for perishable factor it refers to Limansyah [5]. There are several assumptions used in this research as follow, (1). The existence of expired goods has consequences on two cost components, namely stockout cost and expired cost (the consequence on stockout cost is inventory shortage and the consequence on expired cost is losses from selling goods at a lower price than the purchase price), (2). All expired goods will be sold at the end of t_{1i} period simultaneously so there is no expired goods left during the t_{2i} period, (3). All expired goods are not sold to customer but to the special parties so the selling price of the expired goods will always be lower than the purchase price, (4). Purchase of three types of goods (MV, CR, and MCB) applying a purchase bonus policy must be made in carton units, (5). Stockout cost for each unit is assumed to be equal to the profit earned from each item or the difference between the selling price to the customer and the purchase price from the supplier, (6). Stockout cost due to expired goods and due to probabilistic demand pattern is considered the same, (7). The fraction of good condition goods for each item is assumed to be 95%, (8). All goods are ordered from the same supplier (single supplier).

There are five cost components, namely purchasing cost, ordering cost, holding cost, stockout cost, and expired cost. Purchasing cost is the cost spent to buy goods or materials. Purchasing cost equation is a multiplication of purchasing cost of each unit with purchased goods quantity after purchase bonus in units.

$$O_b = \sum_{i=1}^{n} P_i Q_{bi} \quad (1)$$

Q_{bi} represents the number of purchased goods after purchase bonus which is different from the number of demand. The value of Q_{bi} is obtained by multiplying purchased goods quantity after purchase bonus in cartons with the number of goods in a carton.

$$Q_{bi} = Q_{Bi}\, m_i \quad (2)$$

The value of Q_{Bi} is obtained from this equation:

$$Q_{bi} = \frac{D_i - \left(\left|\frac{D_i}{m_i(a_i+b_i)}\right|\right) b_i m_i y_i}{m_i} \quad (3)$$

Q_{bi} value is also affecting optimal order quantity. Q_{abi} value will be changed because of purchase bonus policy. The equation to calculate the number of goods that should be ordered in each cycle is:

$$Q_{abi} = \lceil T * Q_{bi} \rceil \quad (4)$$

Ordering cost is the cost occurred to order goods or material from the suppliers. In this research, joint order policy is used, so all goods will be ordered at the same time. There is only one supplier for all goods in this research. Ordering cost equation is obtained by multiplying ordering cost for each order with order frequency in a planning horizon.

$$O_p = \frac{A}{T^*} \quad (5)$$

Holding cost is the cost occurred when the goods are stored. Because of demand pattern in this research is probabilistic, there is safety stock that should be added in the equation.

$$O_s = \sum_{i=1}^{n} \left(\frac{H_i(T^* D_i Q_i + T^* D_i Q_i (1 - Q_i) + 2ss_i}{2} \right) \quad (6)$$

In Bahagia [1], there is an equation to calculate the number of safety stock that is needed based on simple probabilistic inventory model.

$$ss_i = z_{\propto} s_i \sqrt{L} \quad (7)$$

Stockout cost is the cost occurred when there are no goods left (shortage) and the company cannot fulfill the demand from the customer. In this research, stockout cost is assumed to be the same as profit of each goods. In this research also, stockout cost is the combination between cost that occurred due to inventory shortage and due to probabilistic demand pattern.

$$O_k = \sum_{i=1}^{n} \left(\frac{C_{ui}(D_i(1-Q_i)^2 T^{*2} + 2N_i}{2T^*} \right) \quad (8)$$

Expired cost is the cost occurred when the goods will expire and the company sells them with lower price. The company will get losses as much as the difference between selling price to the special parties and purchase price from the supplier.

$$O_{kd} = \sum_{i=1}^{n} (D_i + ss_I)(1 - Q_1)(P_i - J_i) \quad (9)$$

Total inventory cost is the sum of equation (1), (5), (6), (8), and (9).

$$O_T = \frac{A}{T^*} + \sum_{i=1}^{n} \left(P_1 Q_{b1} + \frac{H_i(T^* D_i Q_1 + T^* D_i Q_1 (1 - Q_i) + 2ss_i)}{2} + \frac{C_{ui}(D_i(1 - Q_i)^2 T^{*2} + 2N_i)}{2T^*} + (D_i + ss_i) + (1 - Q_1) + (P_i - J_i) \right)$$
(10)

To optimize the value of time between goods ordering from one cycle to the next cycle (T^*), we should calculate the derivation of equation (10).

$$T^* = \sqrt{\frac{A + \sum_{i=1}^{n} C_{ui} N_i}{\sum_{i=1}^{n} \left(\frac{H_i D_i Q_i (2 - Q_i) + Cu_i D_i (1 - Q_i)^2}{2} \right)}} \quad (11)$$

C. Procedures

Based on the explanation above, there are several procedures or algorithms to calculate total inventory cost as follow:

1. Calculate the amount of time between of goods ordering from one cycle to the next cycle (T^*).
2. Calculate the number of purchased goods quantity after purchase bonus in cartons for each item (Q_B).
3. Calculate the number of purchased goods quantity after purchase bonus in units for each item (Q_b).
4. Calculate the number of optimal order quantity after purchase bonus for each item (Q_{ab}).
5. Calculate the number of safety stock that is needed for each item (ss).
6. Calculate the amount of total inventory cost (O_T).

III. Results and Discussion

This developed model will be applied to inventory problem faced in Silitonga [7]. This research uses data of five products in category A from Silitonga [6]. There are two components assumed by the researcher because of data unavailability in Silitonga [6]. The value of θ_i for each item is assumed to be 0.95. Meanwhile, the value of J_i is assumed to be 84.73% of P_i as in Limansyah [4]. Data of products in category A can be seen in Table 1 and data of cost component of products in category A can be seen in Table 2.

The first step of data processing in this paper is to calculate the value of T^* to determine when the company should make an order. Equation (11) is used to calculate the value of T^* and the result is 0.06695 years. This means the company should order goods every 24.43 days.

The second step is to calculate the value of Q_{Bi} and Q_{bi} for each item. Both variables represent purchased quantity after bonus. Purchase bonus policy used in this research is the supplier will give 1 carton as bonus every purchase of 10 cartons. Purchase bonus policy is only applied to 3 products (MV, CR, and MCB) of 5 products in category A. Equation (2) and equation (3) are used to calculate. The result can be seen in Table 3.

The third step is to calculate the value of Q_{abi} for each item. Q_{abi} represents optimal order quantity after purchase bonus that the company should order in every cycle. Equation (4) is used to calculate. The result can be seen in Table 4.

Based on the data processing above, the developed inventory model is compared with model [6] to see the advantages. The aspects that will be compared are cost component, total inventory cost, and ordering scenario.

Product Type	Inventory Element	Value
MV	D_i	1,586 units
	S_i	182.0539 units
	L	0.0054795 years
	N_i	0.03318
	θ_i	0.95
	$z_{\alpha i}$	3.10
CR	D_i	1,500 units
	S_i	136.6535 units
	L	0.0054795 years
	N_i	0.0249
	θ_i	0.95
	$z_{\alpha i}$	3.00
SMR	D_i	11,239 units
	S_i	985.6986 units
	L	0.0054795 years
	N_i	0.912
	θ_i	0.95
	$z_{\alpha i}$	2.50
JCT	D_i	457 units
	S_i	57.4448 units
	L	0.0054795 years
	N_i	0.02406
	θ_i	0.95
	$z_{\alpha i}$	2.80
MCB	D_i	47 units
	S_i	9.8489 units
	L	0.0054795 years
	N_i	0.01442
	θ_i	0.95
	$z_{\alpha i}$	2.30

TABLE 1
DATA OF PRODUCTS AND INVENTORY ELEMENT IN CATEGORY A

TABLE 2
DATA OF COST COMPONENT OF PRODUCTS IN CATEGORY A

Product Type	Cost Component	Value
MV	P_i	Rp 678,333.00
	A	Rp 113,888.38
	H_i	Rp 34,969.50
	C_{ui}	Rp 1,921,667.00
	J_i	Rp 574,746.22
CR	P_i	Rp 412,500.00
	A	Rp 113,888.38
	H_i	Rp 21,615.97
	C_{ui}	Rp 1,387,500.00
	J_i	Rp 349,508.00
SMR	P_i	Rp 16,500.00
	A	Rp 113,888.38
	H_i	Rp 1,469.50
	C_{ui}	Rp 28,500.00
	J_i	Rp 13,980.32
JCT	P_i	Rp 268,333.00
	A	Rp 113,888.38
	H_i	Rp 14,276.02
	C_{ui}	Rp 1,031,667.00
	J_i	Rp 227,356.44
MCB	P_i	Rp 1,833,333.00
	A	Rp 113,888.38
	H_i	Rp 92,766.46
	C_{ui}	Rp 1,966,667.00
	J_i	Rp 1,553,368.65

TABLE 3
PURCHASED QUANTITY AFTER BONUS IN UNITS AND CARTONS

Product Type	Q_{Bi} (cartons)	Q_{bi} (units)
MV	121	1,452
CR	114	1,368
SMR	-	11,239
JCT	-	457
MCB	4	48

There are differences between cost component of both models. Perishable factor has not been considered in Silitonga [6]. Perishable factor will affect ordering cost, holding cost,

TABLE 4
OPTIMAL ORDER QUANTITY AFTER PURCHASE BONUS

Product Type	Q_{abi} (units)
MV	98
CR	92
SMR	753
JCT	31
MCB	4

TABLE 5
THE NUMBER OF SAFETY STOCK

Product Type	ss_i (units)
MV	42
CR	31
SMR	183
JCT	12
MCB	2

TABLE 6
TOTAL INVENTORY COST OF THE MULTI ITEM PROBABILISTIC INVENTORY MODEL BY CONSIDERING PERISHABLE AND PURCHASE BONUS FACTORS

Cost Component	Product Type	Value
O_b	MV	Rp 984,939,516.00
	CR	Rp 564,300,000.00
	SMR	Rp 185,443,500.00
	JCT	Rp 122,628,181.00
	MCB	Rp 87,999,984.00
	Total	Rp 1,945,311,181.00
O_p	All	Rp 113,888.38
	Total	Rp 1,701,231.27
O_s	MV	Rp 3,320,508.31
	CR	Rp 1,752,687.42
	SMR	Rp 820,335.91
	JCT	Rp 389,144.56
	MCB	Rp 331,108.26
	Total	Rp 6,613,804.47
O_k	MV	Rp 1,207,481.28
	CR	Rp 690,239.87
	SMR	Rp 415,064.82
	JCT	Rp 410,064.82
	MCB	Rp 431,358.39
	Total	Rp 3,154,379.92
O_{kd}	MV	Rp 8,431,963.77
	CR	Rp 4,822,036.90
	SMR	Rp 1,438,989.04
	JCT	Rp 960,900.27
	MCB	Rp 685,912.66
	Total	Rp 16,339,802.64
O_T		Rp 1,973,120,399.30

There are differences between cost component of both models. Perishable factor has not been considered in Silitonga [6]. Perishable factor will affect ordering cost, holding cost, stockout cost, and expired cost that does not exist in Silitonga [6]. The comparation of cost component between two models can be seen in Table 7. In Table 7, we can see that ordering cost in developed model is higher in the amount of 6.20% or Rp 99,357.45. On the other hand, holding cost in developed model is lower in the amount of 3.67% or Rp 251,661.53. Stockout cost in developed model is higher in the amount of 26.36% or Rp 658,080.92. Purchasing cost in both models has the same amount because they use the same purchase bonus policy. Expired cost in developed model has the amount of Rp 15,948,995.38 or 100% higher because there is no expired cost in the previous model [6]. If we see the model from cost component view, developed model has more complete cost component than previous model [6]. It is indicated by a new cost component named expired cost.

Meanwhile, total inventory cost of both models also has a difference. By considering perishable factor, total inventory cost will be higher because perishable factor affects cost component

of the model. The comparation of total inventory cost between two models can be seen in Table 8. As we can see, total inventory cost in developed model is higher in the amount of 0.86% or Rp 16,845,565.30. Even, total cost of all items is higher if we compare it with previous model [6]. The biggest cost difference contained in product type MV with the amount of Rp 7,368,637.62. If

we see the model from total inventory cost view, developed model has greater amount and it proves that perishable factor can be properly applied in this model. Ordering scenario is used to compare optimal order quantity between two models. The difference of ordering scenario is caused by the difference between the value of $T*$ in both models. If the company make an order in big lot size, ordering cost will be relatively low, but it will make holding cost become higher. The comparation of ordering scenario between two models can be seen in Table 9. As we can see in Table 9, optimal order quantity in developed model is smaller than previous model [6] for all items. This is caused by the value of $T*$ in developed model is smaller than previous model [6]. Ordering cost in

developed model is higher than previous model [6], but holding cost in developed model has smaller amount. Ordering cost is higher in the amount of 6.20% or Rp 99,357.45, meanwhile holding cost is lower in the amount of 3.67% or Rp 251,661.53. If a model has a great value of $T*$, it will decrease ordering cost but it will increase holding cost, and vice versa. Developed model has better ordering scenario. Ordering cost difference (Rp 99,357.45) is smaller than holding cost difference (Rp 251,661.53), so the developed model has smaller cost based on ordering scenario.

IV. CONCLUSIONS

In this paper, a multi item probabilistic inventory model by considering perishable and purchase bonus factors has been developed. With this model, a company has an alternative inventory model specifically in the areas of perishable inventory and purchase bonus policy. Goods expiration should be considered by a company especially for food company because this factor can affect total inventory cost. Perishable factor causes higher total inventory cost consequently. On the other hand, purchase bonus policy can reduce purchasing cost. Developed model can be applied in real situation. In this case, it is applied in a condition faced in Silitonga [7]. Perishable factor can also be applied properly in this developed model indicated by higher total inventory cost. This model offers more comprehensive inventory model to help decision maker in determining inventory policy. Moreover, this paper can give a contribution to inventory discipline. Further research can be done in case of products have different expiry date seen from different value of θi. Another case that can be done is when the supplier gives different purchasing policy for each item.

REFERENCES

[1] Bahagia, S. N., *Sistem Inventori*. Penerbit ITB, Bandung, 2006.

[2] Indrianti, N., Ming, T., and Toha, I. S., “*Model Perencanaan Kebutuhan Bahan dengan Mempertimbangkan Waktu Kedaluwarsa Bahan*.” Jurnal Media Teknik, vol. 2(XXIII), pp. 60- 65, 2001.

[3] Limansyah, T., “*Analisis Model Persediaan Barang EOQ dengan Mempertimbangkan Faktor Kedaluwarsa dan Faktor All Unit Discount.”* Lembaga Penelitian dan Pengabdian kepada Masyarakat, Universitas Katolik Parahyangan, 2011.

[4] Limansyah, T., and Lesmono, D., “*Model Persediaan Multi Item dengan Mempertimbangkan Faktor Kedaluwarsa dan All Unit Discount.”* Jurnal Teknik Industri, vol. 13(2), pp. 87-94, 2011.

[5] Silitonga, R. Y. H. and Kawet, M., “*Pengembangan Model untuk Aplikasi Pengendalian Persediaan Probabilistik Multi Item Single Supplier.”* Jurnal Telematika, vol. 12(1), 2017.

[6] Silitonga, R. Y. H. and Kezia, C., “*Model Pengendalian Persediaan Probabilistik Multi Item Single Supplier dengan Bonus Pembelian*,” in *Proc*. the 4th Annual Conference in Industrial and System Engineering, Universitas Diponegoro, 2017, pp. 1-9.

[7] Silitonga, R. Y. H. and Yuli, F., “*Analisis Kebijakan Manajemen Persediaan Probabilistik dengan Model Q dan P Lost Sales*.” Jurnal Telematika, vol. 10(1), pp. 27-34, 2016.

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TABLE 7
COMPARATION OF COST COMPONENT BETWEEN BOTH MODEL

Cost Component	Product Type	Previous Model [6]	Developed Model	Difference
O_b	MV	Rp 984,939,516.00	Rp 984.939,516.00	0
	CR	Rp 564,300,000.00	Rp 564,300,000.00	0
	SMR	Rp 185,443,500.00	Rp 185,443,500.00	0
	JCT	Rp 122,628,181.00	Rp 122,628,181.00	0
	MCB	Rp 87,999,984.00	Rp 87,999,984.00	0
	Total	Rp 1,945,311,181.00	Rp 1,945,311,181.00	0
O_p	All	Rp 113,888.38	Rp 113,888.38	0
	Total	Rp 1,601,873.82	Rp 1,701,231.27	Rp 99,357.35
O_s	MV	Rp 3,432,941.00	Rp 3,320,508.31	Rp 112,432.69
	CR	Rp 1,830,611.00	Rp 1,752,681.42	Rp 77,923.58
	SMR	Rp 856,477.00	Rp 820,335.91	Rp 36,121.09
	JCT	Rp 403,576.00	Rp 389,144.56	Rp 14,431.44
	MCB	Rp 341,861.00	Rp 331,108.26	Rp 10,752.74
	Total	Rp 6,865,466.00	Rp 6,613,804.47	Rp 251,661.53
O_k	MV	Rp 896,733.00	Rp 1,207,481.28	Rp 310,748.28
	CR	Rp 485,961.00	Rp 690,239.87	Rp 204,278.87
	SMR	Rp 365,588.00	Rp 415,064.82	Rp 49,476.82
	JCT	Rp 349,131.00	Rp 410,064.82	Rp 61,104.55
	MCB	Rp 398,886.00	Rp 431,358.39	Rp 32,472.39
	Total	Rp 2,496,299.00	Rp 3,154,379.92	Rp 658,080.92
O_{kd}	MV	-	Rp 8,431,963.77	Rp 8,431,963.77
	CR	-	Rp 4,822,036.90	Rp 4,822,036.90
	SMR	-	Rp 1,438,989.04	Rp 1,438,989.04
	JCT	-	Rp 960,900.27	Rp 960,900.27
	MCB	-	Rp 685,912.66	Rp 685,912.66
	Total	-	Rp 16,339,802.64	Rp 16,339,802.64

TABLE 8
Comparation of Total Inventory Cost Between Both Model

Product Type	Previous Model [6]	Developed Model	Difference
MV	Rp 990,871,078.00	Rp 998,239,715.62	Rp 7,368,637.62
CR	RP 566,616,572.00	Rp 571,905,210.45	Rp 5,288,638.45
SMR	Rp 186,665,565.00	RP 188,458,156.03	Rp 1,792,591.03
JCT	Rp 123,380,888.00	Rp 124,728,707.64	Rp 1,347,819.64
MCB	Rp 88,740,731.00	Rp 89,788,609.57	Rp 1,047,878.57
O_T	Rp 1,956,274,834.00	Rp 1,973,120,399.30	Rp 16,845,565.30

TABLE 9
Comparation of Ordering Scenario Between Both Model

Component		Previous Model [6]	Developed Model	Difference
T*		0.06694 years	0.07109 years	0.00415 years
Product Type	MV	104 units	98 units	6 units
	CR	98 units	92 units	6 units
	SMR	800 units	753 units	47 units
	JCT	33 units	31 units	2 units
	MCB	4 units	4 units	0 units
O_p		Rp 1,601,873.82	Rp 1,701,231.27	Rp 99,357.45
O_s		Rp 6,865,466.00	Rp 6,613,804.47	Rp 251,661.53