FINAL PROJECT – TI 141501

A JOINT ORDER INVENTORY MODEL WITH PERMISSIBLE *DELAY IN PAYMENT* IN PHARMACEUTICAL SUPPLY CHAIN (CASE STUDY: BLAMBANGAN BANYUWANGI PUBLIC HOSPITAL)

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DEPARTMENT OF INDUSTRIAL ENGINEERING
Faculty of Industrial Technology
Institut Teknologi Sepuluh Nopember
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A JOINT ORDER INVENTORY MODEL WITH PERMISSIBLE *DELAY IN PAYMENT* IN PHARMACEUTICAL SUPPLY CHAIN
(CASE STUDY: BLAMBANGAN BANYUWANGI PUBLIC HOSPITAL)

FINAL PROJECT

Proposed to Fulfill the Requirements to Obtain
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SURABAYA, JULY 2018

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ABSTRACT

Healthcare is one of the sectors in which Indonesia's spending is yearly increasing towards Gross Domestic Product. Its highest contributor, pharmaceutical spending, is known also to increase up to 2017, showing +10.2% growth in IDR currency terms. In addition, it shows an increase in forecast trend projected up to 2021 according to Business Monitor International (BMI) Research. The fact that pharmaceutical spending contributes high to total hospital expenditure in specific and has to hold critically vital products, urged the pharmacy to continuously provide excellent service to the patient. Blambangan Banyuwangi Public Hospital (RSUD Blambangan) is one of regional public service hospital or BLUD (Badan Layanan Umum Daerah) since 2009. This hospital had just received B-class certification on February 2017. Looking at its hospital pharmacy which contributes up to around 60% of the total hospital revenue, observation and evaluation are worth taking place on its pharmaceutical inventory management.

This research is aimed to evaluate current inventory management and to observe the impact of delay in payment using joint order policy and periodic review to some of the A-class pharmaceutical products, from the ABC classification, in RSUD Blambangan. This aim is obtained from the finding that the hospital has a tendency to postpone the order payment to the supplier and it is permitted by the supplier. In addition, the pharmacy depot intuitively determined its review period in its inventory. The ignored permissible delay in payment is the key consideration of this research to be compared to the current inventory management by modifying general total inventory cost equation as well as proposing the periodic review policy. The expected results are a recommendation on Economic Order Interval (EOI) for each scenario (initial condition, consider EOI only, and consider both EOI and delay in payment). It will also analyze each scenario performance gap to know when and which to apply. The current best scenario seen from financial aspects in regards to the least total inventory cost is considering EOI only without the delay in payment. However, the gap towards that of considering both factors is very little depicted by one and two-way sensitivity analysis.

Keywords: *Delay in Payment,* EOI, Joint Order, Periodic Review, Total Inventory Cost

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MODEL PERSEDIAAN *JOINT ORDER* DENGAN *PERMISSIBLE DELAY IN PAYMENT* PADA RANTAI PASOK FARMASI RUMAH SAKIT (STUDI KASUS: RSUD BLAMBANGAN BANYUWANGI)

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ABSTRAK

Healthcare adalah salah satu sektor dengan tingkat belanja tahunan yang meningkat dalam Produk Domestik Bruto. Kontributor tertingginya, belanja farmasi, diketahui juga meningkat hingga 2017, menunjukkan pertumbuhan + 10.2% dalam mata uang Rupiah. Selain itu, tren ramalannya pun diproyeksikan meningkat hingga 2021 oleh Business Monitor International (BMI) Research. Fakta bahwa farmasi berkontribusi tinggi terhadap total pengeluaran rumah sakit dan memiliki otoritas mengatur alat serta obat sebagai produk yang sangat penting availabilitasnya, mendesak apotek untuk terus memberikan pelayanan yang terbaik kepada pasien. Rumah Sakit Umum Blambangan Banyuwangi (RSUD Blambangan) adalah salah satu Badan Layanan Umum Daerah (BLUD) sejak tahun 2009. Rumah sakit ini baru saja menerima sertifikasi kelas B pada Februari 2017. Observasi dan evaluasi layak dilakukan pada manajemen inventori farmasi melihat depo farmasi rumah sakit yang berkontribusi hingga sekitar 60% terhadap total pendapatan rumah sakit.

  Penelitian ini bertujuan untuk mengevaluasi manajemen persediaan aktual dan untuk mengamati dampak keterlambatan pembayaran (*delay in payment*) menggunakan kebijakan pesanan bersama (*joint order*) dan peninjauan periodik untuk beberapa produk farmasi kelas A, dari klasifikasi ABC, di RSUD Blambangan. Tujuan ini diperoleh dari temuan bahwa rumah sakit memiliki kecenderungan menunda pembayaran pesanan kepada pemasok dan hal tersebut diizinkan. Selain itu, depo farmasi secara intuitif menentukan periode *review* dalam inventarisnya. Penundaan pembayaran yang diabaikan adalah fokus utama penelitian ini untuk dibandingkan dengan manajemen inventaris actual dengan memodifikasi persamaan total biaya persediaan serta mengusulkan kebijakan peninjauan periodik. Hasil yang diharapkan adalah rekomendasi pada *Economic Order Interval* (EOI) untuk setiap skenario (kondisi aktual, mempertimbangkan EOI, dan mempertimbangkan EOI serta penundaan pembayaran). Gap kinerja antar skenario juga akan dianalisis untuk mengetahui kapan dan skenario mana yang akan diterapkan. Skenario terbaik dari aspek keuangan terkait biaya persediaan paling kecil adalah mempertimbangkan EOI tanpa penundaan pembayaran. Namun, selisih dengan skenario yang mempertimbangkan dua faktor cukup sedikit, digambarkan oleh analisis sensitivitas satu dan dua-arah.

Kata Kunci: *Delay in Payment, Economic Order Interval, Joint Order, Periodic Review*, Total Biaya Persediaan

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10. Author's parents, the entire author's family who always give support, prayers, and guidance during the author's study.

The author recognized that further development is needed in this research. Therefore, a constructive suggestions and critics will be highly appreciated. May this research be useful for both academics and practical needs.

Surabaya, July 2018

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CHAPTER 1
INTRODUCTION

This chapter explained the background, problem formulation, and research objectives, benefits, scope, and outline of the research.

1.1 Background

Healthcare is one of the sectors in which Indonesia's spending is yearly increasing towards Gross Domestic Product (GDP). Business Monitor International (BMI, 2018) said that around 2.9% of Indonesia's GDP is healthcare spending. Though it seems quite a small percentage, surprisingly, the spending from 2009 to 2015 is known to be growing at 14% Compounded Annual Growth Rate (CAGR). Healthcare spending is increasing from IDR363.7T in 2016 to IDR403.1T in 2017. It is +10.9% growth in IDR currency terms. Meanwhile, pharmaceutical spending is increasing from IDR85.6T in 2016 to IDR94.2T in 2017, showing +10.2% growth in IDR currency terms. The table below shows the pharmaceutical sales towards GDP and healthcare expenditure year 2015 and 2016 together with its forecast (f = BMI Forecast) 2017-2021.

Table 1.1 Headline Pharmaceutical and Healthcare Forecast (Indonesia 2015-2021)

	2015	2016	2017f	2018f	2019f	2020f	2021f
Pharmaceutical sales USD billion	5.79	6.43	7.04	7.61	8.20	8.89	9.63
Pharmaceutical sales, % of GDP	0.67	0.69	0.70	0.69	0.69	0.68	0.68
Pharmaceutical sales, % of healthcare expenditure	23.6	23.5	23.4	23.2	22.9	22.6	22.3
Health spending, USD billion	24.58	27.33	30.13	32.85	35.83	39.34	43.27

(BMI, 2018)

Even though pharmaceutical sales contribution to GDP lies around 0.7% in stagnant, the USD billion sales show an increase in forecast trend. Taking a further look, pharmaceutical sales contribute around 23% of healthcare expenditure in total,

but pharmaceutical sales in the hospital are appointed to be a high contributor to total hospital expenditure. It is shown by Sari (2017), almost 80% of total hospital expenditures is used to fulfill pharmaceutical products and consumable medical supplies, while 20% of the remaining is spent for another expense like human resources. Based on DBS Vickers Securities Indonesia 2015 report, here is the graphic showing increasing trend of Indonesia's healthcare spending.
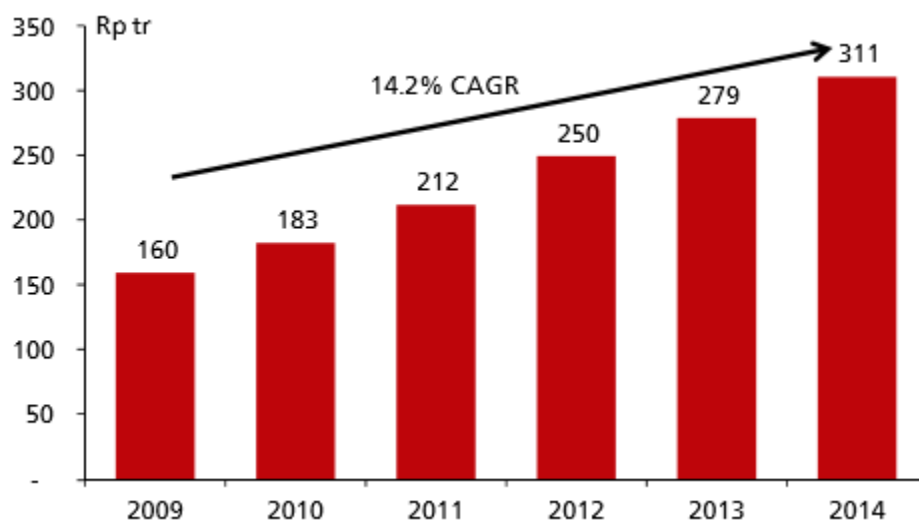
Figure 1.1 Indonesia's Healthcare Spending in IDR Trillion *(DBS Vickers Securities Indonesia, 2015)*

The fact that pharmaceutical expenses contributes high to total hospital expenditure and has to hold critically vital products, urges the pharmacy to continuously provide excellent service to the patient. This is a high responsibility as it is said by Daniel P. O'Neil, et al. (2014), hospital pharmacy has high responsibility for "purchasing, storing, handling, and distributing the correct medicines, in the correct dosage, to the correct patient, at the correct time, and through the correct step". Another statement arises that 'good' service of the achieved service level must be accompanied by a decrease in total expenditure. However, there is no such perfect world and therefore, the pharmacy should struggle to cope with it.

By procuring the right amount of medicines and consumable medical supplies then holding them in inventory for the upcoming demand efficiently, pharmacy is known to strive well in handling the inventory management. "Inventory management seeks to maximize the net benefit minus cost of the inventory" (Chambers & Lacey, 2010). In general, inventory is said to be the largest single part investment. It is commonly composed of 20%-30% of the total assets, that is why effectively managed becomes important to maintain and strive for better financial performance (Shardeo, 2015).

According to the official portal of Government of Banyuwangi (2017), Blambangan Banyuwangi Public Hospital (RSUD Blambangan) has been included into a regional public service or BLUD (Badan Layanan Umum Daerah) since 2009, as one of two public hospitals in Banyuwangi, out of 15 hospitals in total: public and private. RSUD Blambangan is known to be one of the hospitals with highest market coverage in Banyuwangi. Moreover, according to the information from Ministry of Health, RSUD Blambangan had just received B class-type certified hospital on February 2017 after having a massive progress to develop its facilities, services, and resources. Thus, RSUD Blambangan must be ready to be a reference hospital from neighborhood regency, as it is said by Abdullah Azwar Anas, the Regent of Banyuwangi on some news portal.

However, RSUD Blambangan needs to always improve its services to get A-certification and to increase its service level. Redirecting to one of the biggest contributors to the hospital expenditure: the pharmaceutical expense takes place. Moreover, pharmaceutical expenses of this hospital in terms of purchasing pharmaceutical products and consumable medical supplies is said to be around 40% of the total hospital expenditures. While the revenue gained by the hospital pharmacy contributes up to around 60% of the total hospital gain, according to the latest data taken by direct dialog, 2017. Based on 2017 data presented by the Head of Pharmacy Depot, hospital expenditures lie around IDR79T, while the pharmaceutical expense is

IDR24.5T. Additionally, the pharmaceutical income ranges around IDR33T towards IDR45T of total income. It is clear that the common sense of hospital as a service institution is to save a life as the main goal and to maintain the pharmaceutical products available to be 100% whenever it is needed. However, there is another statement to be highlighted. It is, said the Head of Pharmacy Depot, the hospital pharmacy is the "revenue-center" for the hospital and no wonder the hospital is a profit-oriented business, without neglecting the social values and aims. Below are figures of RSUD Blambangan and its Pharmaceutical Warehouse.

Figure 1.2 Blambangan Banyuwangi Public Hospital and its Pharmaceutical Warehouse. Source: direct capture and *Government of Banyuwangi (2017)*.

RSUD Blambangan, therefore, struggles to manage its inventory well. There are five pharmacy depots: three outpatient depots and two inpatient depots. There are three warehouses to keep medical devices, infusion solution, and pharmaceutical products. In this hospital, in order to determine the number of products ordered to the

supplier from the Pharmaceutical Warehouse, the hospital takes the previous year demand pattern to project the forecast for the current year by adding or reducing some percentages due to some concerns such as voluminous product, epidemiology, etc. Voluminous products are said as products which consume more spaces in inventory. In this case, the space availability is the constraint. Thus, the hospital can only hold several amounts and not much of this product. Then, the hospital decides intuitively to order this type of product weekly, without considering daily demand or a structured review policy. Another concern is to revisit current year epidemiology. Hence, those products used as the medicines of the epidemic diseases must be ordered several percentages higher than usual. The Head of Pharmacy Depot added, it is not surprising also to count up its order frequency. The rest of the pharmaceutical products are managed and analyzed by the ABC classification or the Always, Better, Control classification in which already calculated regarding 2016 demand data. However, the Pharmaceutical Warehouse did not utilize what is already calculated and reviewing back to validate the accuracy. This can be considered as this hospital is improving but the awareness to optimize its inventory management is not high enough. From this point, this work attempts to re-structure the inventory management using the suitable control technique.

Another finding is that one factor which, not only lately, becomes habitual in Pharmacy Depot viewpoint that is to postpone the purchasing payment to the distributor only if the budget runs low especially at the end of the year. The 2017 and 2016 delay in payment was not an offer from the supplier. It was proposed by the Pharmaceutical Warehouse through a letter with its subjectively determined delay period. However, it is permissible. If the management could be more sensitive to this pattern, it would actually be an opportunity for the hospital to re-project its order interval and review period adapting to this permissible delay parameter setting. This yearly funding from the government and the permissible delay in payment by the distributor can make the hospital keeps the postponement as habitual or tends to postpone to keep the cash safe and probable to earn a profit. Otherwise, if the one who

firstly aware to this pattern was the supplier side, it would be a threat for the hospital that the supplier can set an amount that is receivable for the supplier whenever the hospital attempt to delay the payment. In short, there might be a payable amount by the hospital. This point becomes the main consideration in this research, to seek the optimum order interval to understand the impact of the permissible delay.

This is quite a novel research that there has never been a research in RSUD Blambangan's pharmaceutical inventory management. The previous research was to implement Balance Score Card (BSC) to measure the service quality, analyzed patient's satisfaction, evaluate the environmental health, information system, etc. None of them focused on inventory management. This research gap will be discussed later in the following chapter. Moreover, from this work's humble references, there has not been any research or international journal discussed the impact of permissible delay in payment to a Pharmaceutical Supply Chain (PSC) practices. However, this is considered feasible from the theoretical viewpoint as the previous joint order deterministic inventory model research existed, the gap shows that it is applied to other types of business. The output of this work is intended to be beneficial for the hospital to manage its inventory with the Economic Order Interval (EOI) considering the permissible delay in payment for cost minimization.

1.2 Problem Formulation

Based on the aforementioned background, the problem formulation going to be discussed and solved in this research is to evaluate the current inventory management and to observe the impact of permissible *delay in payment* using joint order policy and periodic review to the A class pharmaceutical products in RSUD Blambangan. The expected results are a recommendation on Economic Order Interval (EOI) for each scenario. It will also analyze each scenario performance gap to know when and which to apply.

1.3 Objectives of Research

The objectives that are going to be achieved in this research are as follows:

1. To evaluate the current inventory management without Economic Order Interval (EOI) and without considering the permissible *delay in payment.*

2. To find out the inventory decision recommendation while considering the EOI but without considering the permissible *delay in payment.*

3. To find out the inventory decision recommendation while considering both the EOI and the permissible *delay in payment.*

4. To find out a more comprehensive inventory decision recommendation regarding when to apply each of the scenarios and how far each scenario yields a different result in total inventory cost to each other.

1.4 Intended Benefit of Research

The benefit intended to be obtained in this research is that the hospital will be able to understand the current inventory management performance and evaluate compared to the proposed scenarios. The hospital will also be able to understand and differ the decision regarding certain conditions due to the structured control techniques practices mainly the review period (Economic Order Interval or EOI) as an approach desiring cost minimization.

1.5 Scope of Research

The scope used to describe the boundaries of this research is explained in the limitations and assumptions as follows:

1.5.1   Limitations

The limitation used in this research are as follows:

1. The research focuses on joint order of only pharmaceutical products of A class from the resulted ABC classification by the hospital (consumable medical supplies are excluded).

2. The demand data used is the Pharmaceutical Warehouse data (Medical Devices and Infusion Solution Warehouse data are excluded). The demand data used is the total demand from 3 Outpatient Depot and 2 Inpatient Depot).

3. The research data (stock, demand, price, and related measures) is ranged limitedly from January 1st to December 31st, 2017.

4. The term pharmaceutical products are defined as medicines or drugs prescribed and consumed rationally used for patients by the medical forces.

5. The delay period considered is not more than the period in which inventory level is positive.

1.5.2 Assumptions

The assumption used in this research are as follows:

1. Demand rate is known, constant, and continuous during the time horizon. The same as the lead time of delivery, it is known and constant.

2. No quantity discounts. Hence, cost structure is fixed (holding cost is linear function based on average inventory, purchase cost is constant, order cost is calculated both on the joint order and on each item).

3. No lost sale, backorder, special sale price, and known price increase. Products are always available when it is needed.

4. There is sufficient space, capacity, and capital to procure the desired lot size.

5. Entire lot size is added to inventory at the same time.

6. No inspection errors, so the rejected units are discarded prior to storage. Rejected units are never added to warehouse. No defective products put on warehouse.

7. Holding cost is assumed to be 25% of the purchase cost, as the average inventory cost commonly used in various industry (Durlinger Consultancy, 2012).

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1.6 Research Outline

This subchapter explained the research outline used in this research report, which is explained as follows:

CHAPTER 1 INTRODUCTION

In introduction, will be explained about the background of the research, the problem formulation aimed to be solved, the objectives planned to be accomplished, the benefits expected to be obtained, the scope broken down to the limitation and assumption used as the system under discussion, and the research outline as the report systematically brief-described in order per chapter.

CHAPTER II LITERATURE REVIEW

In literature review, will be explained about the theory used to assess the research. This will be used as the basis to solve the problem formulation with the detail explanation about the conceptual thinking. The theory is usually taken from research journal, paper, books, previous researches, and other qualified resources.

CHAPTER III RESEARCH METHODOLOGY

In research methodology, will be explained about the systematical thinking regarding the steps to do the research starting from the problem formulation until the end. It provides thorough comprehension about the research procedure.

CHAPTER IV DATA COLLECTING & PROCESSING

In data collecting and processing will be explained the data collected regarding the completion of research. The data can be either or both the primary or/and secondary data. As it becomes the input for the research after being collected, the data is then processed with the chosen method to solve the problem that has been clearly stated.

CHAPTER V ANALYSIS & INTERPRETATION

In analysis and interpretation will be explained in detailed analysis, elaboration, and further explanation regarding the result obtained. The content follows the data that has been processed previously.

CHAPTER VI CLOSURE

In the closure, will be explained the conclusion and suggestion. The conclusion is usually obtained from the result of data processing and analysis regarding the problem formulation. The suggestion is usually proposed for the upcoming research regarding the absence, points outside focus of the research, and related topics to complete the continuation of research enhanced to support the development.

CHAPTER 2
LITERATURE REVIEW

This chapter explained the study from the literature related to the research. It is about Healthcare Supply Chain (HSC) and Pharmaceutical Supply Chain (PSC) regarding to its inventory management, inventory control techniques (replenishment policy both continuous and periodic review policy are compared, Economic Order Interval (EOI) or T-method compared to Economic Order Quantity (EOQ) or Q-method, Safety Stock (SS), Average Inventory Level (AIL), and ABC classification), permissible *delay in payment*, and the corresponding approach with the research gap.

2.1 Healthcare and Pharmaceutical Supply Chain Management

Supply chain is an emerging and growing concerned-sector in which the growth is considerably fast in many kinds of industry. In healthcare institution, based on Simchi-Levi, et al. (2004), supply chain management practice on its early existence was focusing more on supplier side to reduce cost as the desired objective. However, the study brings proof that focusing more on supplier side is not enough (Simchi-Levi, et al., 2004). Healthcare institution, which considerably more complex and immature compared to another type of businesses, needs also to concern on another side of supply chain to gain more revenue and reduce more costs. Matter of fact in practical, common problems arise on HSC that previous researchers attempted to deal with: (1) internal or external system missed-coordination, (2) problems on order quantity, stock level, availability, and stock review, (3) demand information, (4) human resource dependencies, (5) procurement management including planning, ordering, etc., (6) avoiding shortage, (7) expiration and deterioration, (8) warehousing, (9) temperature controlling, and also (10) delivery visibility including transit, postponement, and arrival visibility. Based on those 10 common problems, some of those are inventory cases, suit what this work attempted to cope with. Moreover, inventory could probably be the case on each of the three major roles in its supply chain (up to healthcare

provider). Explained by Burns (2002), HSC management has four major roles. Figure 2.1 below shows the general model of HSC.

| Manufacturer | → | GPO/Purchaser and Wholesaler | → | Healthcare Provider | → | Customer |

Figure 2.1 General Model of Healthcare Supply Chain Role *(Burns, 2002)*

Healthcare Supply Chain which focuses on drugs or medicines is commonly named as Pharmaceutical Supply Chain (PSC). PSC is truly important to handle the availability, stock level, and performance of the hospital inventory management dealing with both pharmaceutical products and consumable medical supplies. Pharmaceutical products are critical in usage for disease prevention program or treatment plan (International Pharmaceutical Federation, 2012). Therefore, it is expected that the practice could significantly contribute to improving healthcare service. Must be noticed that the prescribed pharmaceutical products are timely manner distributed (Pedersen, et al., 2009). PSC cope with demand, inventory management, and distribution commonly to achieve the minimum total inventory cost which also satisfies the targeted service level. Below is the figure of the pharmacy care unit in this work's object as the overview of distribution system flow (pharmacy depot order to warehouse, and warehouse directly order to the distributor).
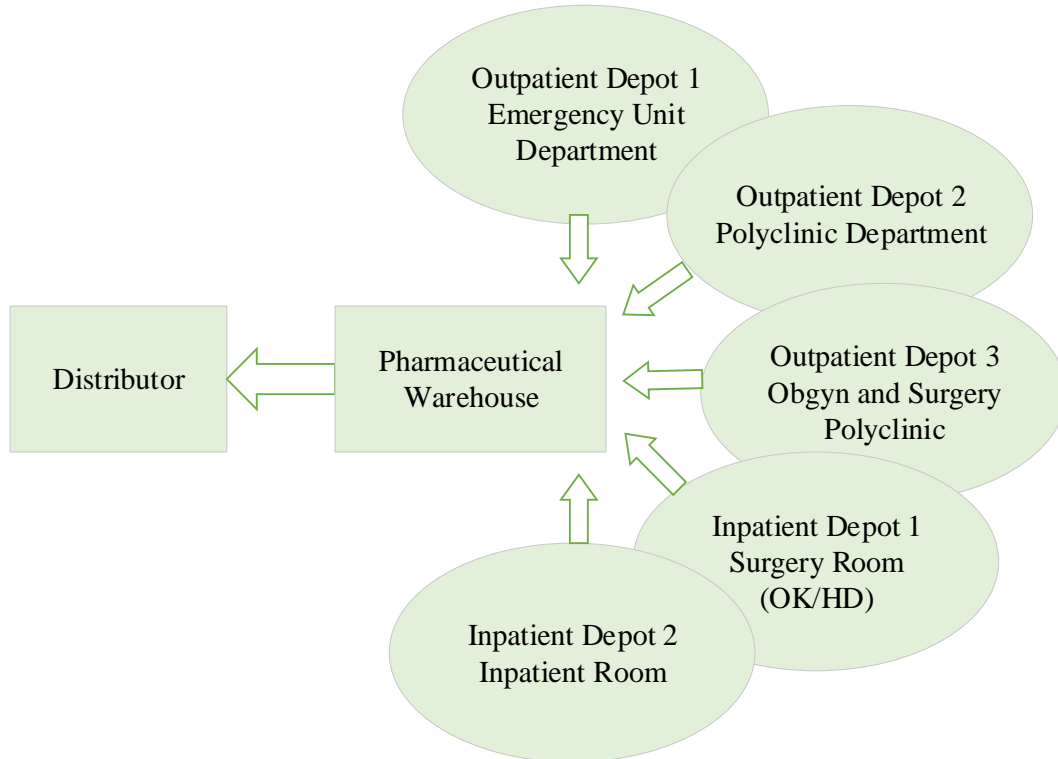
Figure 2.2 Overview of Pharmaceutical Order Flow in Blambangan Banyuwangi Public Hospital

2.2 Pharmaceutical Inventory Management

Pharmaceuticals already become the largest investment in any healthcare delivery system. The total hospital pharmacy cost is all the acquisition costs through all purchased pharmaceutical products including one which is still in stock, plus costs required to convert drugs or medicines into patient doses, and another cost related to typically this consumable inventory – such as spoilage, expiration, shrinkage, and recalls (Federal Accounting Standards Advisory Board, 2006).

Explained by Gebicki, et al. (2013), there are constraints in any pharmaceutical inventory management activities related. First, each pharmaceutical products and consumable medical supplies need customer service level, the performance as the consequences of stock out, that is dependent on its criticality and also the life of a patient. Second, drugs and medicines are perishable products meaning that they have a specific time length of when to use. If it exceeds the expiry date, it is a waste causing

a negative impact to finance. According to the Regulation of Health Ministry of Indonesian Republic No. 58/2014: "Every pharmaceutical products and consumable medical supplies are said to be deadstock or expired whenever its demand is zero for three months respectively". Third, pharmacy order is not always fully granted by the supplier. It is due to the limited availability of products from the supplier, meaning the lead time for each product may also considerably vary.

However, operational costs in pharmaceutical inventory obviously contribute to hospital expenses. There are lots of factors influencing the management level to set its inventory system strategy. Some factors included here are the order interval/review period, order frequency, order quantity, unit price and other hidden costs. To have efficient inventory management, as the number of stock will yield to an increase in carrying/holding cost, thus it must be handled by adding the order frequency in the aims of to reduce the cost of carrying. However, order frequency stimulates the purchasing and ordering cost increase. Hence, there are several methods especially in pharmaceutical inventory management commonly used.

2.2.1 ABC Classification

One of the common method used to control the stock is by conducting the ABC (Always, Better, Control) classification. It is a basic technique of inventory control as the classification of stores according to value: high, medium, and low. It is also known as Selective Inventory Control (SIC) or Pareto Analysis (Datta, 1984). This ABC classification is beneficial in stating the strategy of pharmaceutical products selection, procurement, distribution, and to give rational ranged consumption of products. ABC classification helps to determine various decision making such as the ordering frequency, supplier selection for each class of category, review policy to maintain service level and avoid sudden purchase, priority control to procure pharmaceutical products and day-to-day control implementation. One common sense is the higher order frequency together with a smaller lot size for A class category usually preferable and capable to reduce the carrying cost. According to Ravinder & Misra (2014), "ABC

Inventory Analysis divides inventory into three classes based on its annual dollar volume". Each of items will be categorized as A, B, or C class.

- Class A are items with high value but constitute a very small percentage of total number of items. In example, class A represent around 10% - 15% of the total inventory items, but they represent 60% - 80% of the total dollar usage.
- Class B are items with average movement and thus constitutes a quite good percentage in value. Those items carry medium annual dollar volume. This class represent around 30% of the total inventory items and spend 15% - 25% of the total dollar usage.
- Class C are those who carry low annual dollar volume. This class may represent around 55% of the total inventory items, but only spent 5% of the total dollar usage.

Here is the table showing the percentage of total inventory items and values for each class.

Table 2.1 Percentage of ABC Classification to Total Item and Value of Inventory

Class	Items in Inventory, % to total inventory items	Value of item, % to total inventory value
A	10 - 15 %	60 - 65 %
B	30 %	30 %
C	55 - 60 %	5 - 10 %

(Datta, 1984)

2.2.2 VEN and Therapy Analysis

Another method to evaluate the inventory management performance is by the VEN method and therapy analysis. The VEN method is an abbreviation for vital, essential, and non-essential. It categorizes pharmaceutical products into three categories: vital, essential, or non-essential. This categorization is granted by global

health institution in which usually referred to the VEN Classification Guide by WHO or from the published list by the Ministry of Health of Indonesia. Beside the VEN, therapy method, in which is alike, also helps the pharmaceutical manager in hospital to control the spread of the product together with the usage of the therapy. Also, this analysis can give recommendation on which pharmaceutical product yield to the best therapy effect together with having the low price. If the company can manage its inventory system effectively and efficiently, it can considerably reduce operating costs.

2.3 Control Techniques in Inventory Management

Inventory management focuses on balancing the order and holding cost with service level (Gebicki, et al., 2013). The order cost consists of the cost for time and energy on order placement, transporting materials, receiving cost, and other related cost. The holding cost consists of the opportunity cost or the money tied up in inventory, space requirement cost, condition settings such as the temperature, lighting, etc., spoilage cost, and other costs. The service level is represented by the probability or percentage of not having stock out sales (Gebicki, et al., 2013). The higher the inventory level, the higher the holding cost will be. However, increase in inventory level will deny the probability of sales stock out due to the inadequate inventory, hence it increases the service level for the company (Sari, 2017).

Therefore, to make sure there are enough stocks available, some techniques are used to control the inventory level, such as safety stock, reorder point, replenishment policy, economic order quantity, economic order interval, and average inventory level (Hafnika, et al., 2016). Each of those techniques will be explained below.

2.3.1   Replenishment Policy (SS, ROP, EOQ, EOI, AIL)

One of the techniques used to control inventory level is the replenishment policy. According to Chopra & Meindl (2013), replenishment policy includes the decision about when and how much to reorder. There are two types of replenishment policy, those are continuous and periodic review policy. These inventory system

policies sufficiently provide solutions, as the nearest approach representing the real-world practices to problems concerning on the inventory management system. Figure below are each graph of continuous and periodic review policy, with the OH inventory projected towards time.
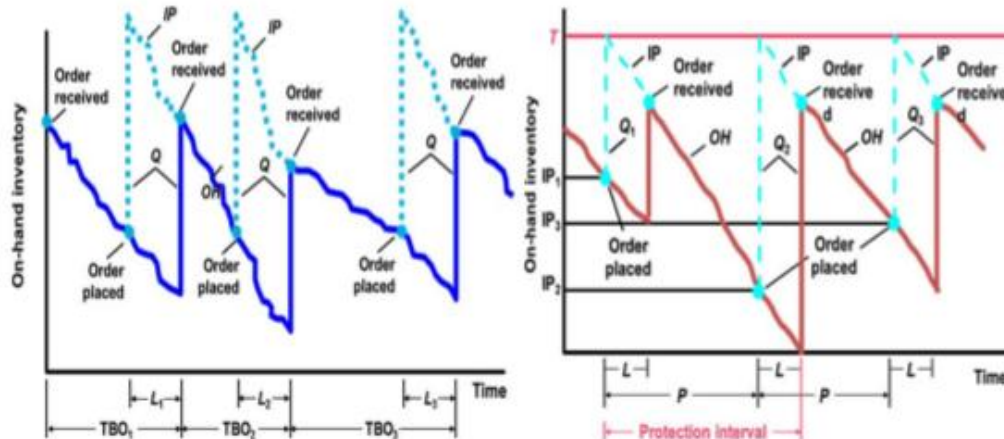
Figure 2.3 Continuous Review Policy and Periodic Review Policy *(Jungfeng Ma & Gul E., 2013)*

Here is the above figure notation explanation:

Q   = quantity

P   = protection

TBO_x = time between order

L_x = lead time

2.3.1.1 Continuous Review Policy

In the continuous review policy, according to Chopra & Meindl (2013), inventory is simultaneously tracked. An order is placed when inventory depletes up to the reorder point (ROP). In this scenario, order size does not change between orders, but time between orders probably fluctuates up based on the demand variability. By using continuous review policy, company may retain positive impacts such as real time update of stock level which makes the company easier to predict when to reorder in

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future. Some said that it also eases the accounting calculation because of the real time Cost of Goods Sold (COGS) provision. It can also address when the product has high demand. However, some disadvantages are higher in implementation cost since it requires more personnel to track stocks and needs high reliability information system to review (Jungfeng Ma & Gul E., 2013).

2.3.1.2 Periodic Review Policy

Differ from continuous review, in the periodic review policy according to Chopra & Meindl (2013), stock is checked at constant periodic interval. An order is placed to raise the stock level. In this case, size of an order is not constant as it signs the demand variability. However, order interval remains the same. By using periodic review policy, company can get positive impact such as time reduction to analyze stock level, and very practical and feasible for joint order or for multiple items. Meanwhile, the disadvantage is the inaccuracies in tracking, moreover if it is a high-sales volume business (Jungfeng Ma & Gul E., 2013). The application of periodic review policy somewhat was simpler to implement than the continuous review policy, since it did not require real time tracking, thus the implementation cost is lower, and fewer resources used (Chopra & Meindl, 2013). Table 2.2 below summarizes the differences between continuous review with periodic review policy.

Table 2.2 Differences between Continuous Review Policy and Periodic Review Policy

Aspects	Continuous Review Policy	Periodic Review Policy
Time to reorder	Variable order intervals	Fixed order intervals
Quantity to reorder	Fixed order quantity	Variable order quantity
Ease of management	Review with high frequency	Review with low frequency
Safety stock	Smaller	Larger
Advantages	Easy to know when to reorder	Reducing the time of analyzing inventory count
	Accurate inventory counting	Lower cost of implementation
Disadvantages	Higher cost of implementation	Not accurate inventory counting

(Jungfeng Ma & Gul E., 2013)

2.3.2 Safety Stock and Reorder Point

Other control techniques commonly used to control inventory level alongside the continuous review policy are safety stock and reorder point (ROP). Chopra & Meindl (2013) defined safety stock as "A number of inventory that is held by company to fulfill demand that exceeds the amount forecasted for a given period". Safety stock is held as an awareness to uncertain demand or uncertain lead time, and shortage probably occur if actual demand exceeds forecasted demand. Customer service level becomes the input in calculating safety stock. Chopra & Meindl (2013) explained that customer service level is obtained from the stock out sales probability.

Meanwhile, Chen, et al. (1998) defined reorder point as "The minimum inventory level that triggers the placement of orders for additional units". Reorder point is presented by the consequence of lead time. Reorder point is affected by daily demand and lead time only if there is no any variable demand and lead time. However, when demand or lead time are uncertain, reorder point will be also affected by safety stock (Ravinder & Misra, 2014). The equation for both safety stock and reorder point remain actually the same to various model implementation. However, there is no reorder point in periodic review policy. It can be seen in the table below.

Table 2.3 Safety Stock and Reorder Point Equation

	Source	Safety Stock (SS)	Reorder Point (ROP)
General equation	Tersine, 1994	$SS = z\sigma L$	$ROP = dL + SS$
For continuous review (EOQ)	Basri, Hasan., 2013	$SS = FS^{-1}(CSL) \; x \; \sigma_L$	$ROP = dL + SS$
For periodic review (EOI)	Basri, Hasan., 2013	$SS = FS^{-1}(CSL) \; x \; \sigma_{T+L}$	-

(Hani, et al., 2013)

Here is the notation explanation:

z = standard deviation of demand

σ = service level constant

L = lead time

d = average demand during lead time

SS = safety stock

CSL = cycle service level

FS^{-1} = normsinv

σ_{T+L} = demand standard deviation during T+L

T = review interval

L = average lead time for replenishment

2.3.3 Average Inventory Level

Average inventory level, also known as cycle inventory, explained in definition by Chopra & Meindl (2013) as the average number of stock in warehouse due to company purchase or production in lots which are usually larger than demanded by customers. Average inventory level is simply the result from dividing lot size (Q) by two if there is no any uncertainty both in demand and lead time. However, when demand and lead time is uncertain, average inventory level is also increased by safety stock (Chopra & Meindl, 2013). Below is the equation of Average Inventory Level (Tersine, 1994):

$$AIL = \frac{Q}{2} + SS \qquad\qquad (2.1)$$

2.3.4 Economic Order Quantity

This control technique used by companies along with continuous review policy is Economic Order Quantity (EOQ). It was first developed by Haris in 1913, then the following improvement was contributed from Wilson due to his in-depth analysis about this traditional control technique (Shardeo, 2015). The goal of EOQ is to find the optimal quantity to order each time that can minimize the total inventory cost, consists of purchasing cost, order cost, and holding cost (Chambers & Lacey, 2010).

According to Chopra & Meindl (2013), EOQ model uses tradeoff between order cost and holding cost to determine the optimal order quantity. The larger the quantity, the lower the ordering frequency and the lower the total order cost will be. However, a larger quantity leads to higher holding cost. Otherwise, a lower quantity will decrease average stock level and holding cost, but will increase ordering frequency and total order cost.

Optimal order quantity occurs when the order and holding cost graph intersect each other. There are some assumptions while using this model, such as constant holding cost, constant lead time, instantaneous replenishment, no stocks out are allowed, and no discount is allowed. Matter of fact, those assumption makes EOQ model cannot be feasible to all situation, such as for the joint order of multiple items, therefore this model must be compositely modified in the real inventory system analysis (Rachmania & Basri, 2013). Below is the Economic Order Quantity equation (Tersine, 1994):

$$Q^* = \sqrt{\frac{2CR}{H}} \qquad\qquad (2.2)$$

Here is the notation explanation of the equation:

Q*   = Economic Order Quantity

R   = annual demand in units

C   = order cost per order

P   = purchase cost of an item

F   = annual fraction of holding cost per unit

H   = annual holding cost per unit (PF)

2.3.5 Economic Order Interval (EOI) – Multiple Item

This control technique differs from the Q-method. It is used for the fixed order interval in periodic review policy, can be both the EOI for single item and multiple item inventory management. This part explained about the EOI for multiple item. In EOI, common sense is that order must be rarely placed separately, moreover in a hospital pharmacy with many type of products. It is more economical to place joint order. When it is joint, the inventory level review can be coordinated and maintenance are kept to minimum. Furthermore, there is adjustment in review period thus it will not be too frequent and easy to adapt to another business activities. There may also be logistics cost savings, moreover transporting cost, due to the smaller material handling costs and weight breaks (Tersine, 1994).

In preparing joint order, the quantity of each item to order depends on the time interval between orders for the entire group. The point in this model is to find the time interval T which will minimize inventory costs for the group as a whole. Once the optimum time to order interval is established, the desired maximum inventory level E_i for each item can be determined. From that maximum stock level, the individual order quantities can be calculated as well, by calculating the difference between each item's maximum inventory level and its stock position at the time of the order review.

The economic order interval can be obtained by deriving the total annual cost. Neglecting stockout cost, the formulation by Tersine (1994) is shown below.

Total annual cost = purchase cost + order cost + holding cost

$$TC\ (T) = \sum_{i=1}^{n} P_i R_I + \frac{C+nc}{T} + \frac{TF}{2} \sum_{i=1}^{n} P_i R_I \qquad\qquad (2.3)$$

Here is the notation explanation:

R_i = annual requirement for item i

P_i = purchase cost of item i

n = total number of joint order items

C = order cost for the joint order

c = order cost to each individual item

T = order interval in years

F = annual holding cost as a fraction of purchase cost

By taking its derivative with respect to T, the EOI (Tersine, 1994) results in:

$$T^* = \sqrt{\frac{2(C+nc)}{F\sum_{i=1}^{n} P_i R_i}}$$
(2.4)

The maximum inventory level for each item must be large enough to satisfy demand during the respective order interval and also during the lead time L. The amount to order each individual item is simply obtained by the maximum inventory level (E_i) minus the inventory position (Tersine, 1994). The maximum inventory level is determined (when the order interval (T) and lead time (L) expressed in days and there are N operating days):

$$E_i = \frac{R_i T}{N} + \frac{R_i L}{N} = \frac{R_i(T+L)}{N}$$
(2.5)

The minimum total cost per year (Tersine, 1994) is obtained by replacing the T with the EOI in the annual cost equation:

$$TC\ (T^*) = (1 + FT^*)\sum_{i=1}^{n} P_i R_i$$
(2.6)

2.4 Permissible *Delay in Payment*

In receiving the payment, suppliers usually received a request of payment postponement from customer. Moreover, on some companies the credit period is confidently provided by the supplier. The benefits of this permissible payment delay not only attract new customer who claimed it an opportunity to reduce the purchasing

cost, but also to provide a competitive strategy for suppliers—not cutting down the wholesale price only. In this case from the hospital point of view as the customer, it is critical to determine the optimal inventory cycle time in procurement process when they face permissible *delay in payment*.

Delay in payment can be either provided by supplier or proposed by the retailer. In the way that it is proposed by the retailer, the supplier can optionally refuse the proposal and cut the chain or permit the delayed payment under a considerable delay period. It is said as permissible based on the retailer's allowance to pay back the dues without paying any interest to the supplier. The retailer can pay the supplier either at the end of the delay period or later incurring interest charges on the unpaid balance for the overdue period. This is the principle of permissible *delay in payment*.

Now let's say the hospital is the retailer. As it is mentioned in background, if the retailer could capture this opportunity of permissible delay, there probably be some receivable amount or can be called as the interest earned. It is also in relation to constraints, that is the delay period (M) faced to the period in which inventory is still positive (t_1). Interest earned can be obtained if the retailer can pay before the delay period reaches to an end. That case is where the $M > t_1$. Otherwise, if it is the supplier who already captured this pattern of payment delay, it could be a threat for the retailer because there will be an interest charged. This can be applied if the $M < t_1$, thus the retailer probably pay exceeds the delay period and yield to an interest charged consequently.

The retailer is expected to settle the account at a time before the end of the inventory cycle time because the payable interest rate is generally higher than the earned interest rate. However, recently, Cheng et al. (2012) discussed an economic order quantity model with trade credit policy in different financial environments. They discussed and found that the interest earned rate can be higher than the interest charged rate.

The saving in cost as a result of permissible delay in settling the replenishment account largely comes from the ability to delay payment without paying any interest

(that payment period before the end of M). As a result of increased order quantity under conditions of permissible *delay in payment*s, retailer needs to order less often. All of the interest formulas will be used further in this work (charged and earned) are based on the International Journal of Statistics and Systems (Behera & Tripathy, 2017)

There are two conditions may arise:

1. When the retailer earned interest but the payment is done exceeding the delay period because the positive-stock period is longer than the delay period. It is represented by $(0 < M \leq t_1)$

2. When the retailer earned interest with no payable interest because the positive stock period is shorter than the delay period thus retailer has to pay under the delay period. It is represented by $(M > t_1)$

Here is the notation explanation:

P = purchasing cost per unit

S = selling price per unit

T = the length of the order cycle (order interval)

t = the respective time to trace inventory level

I_e = interest earned per IDR per year, where $I_e < I_c$

I_c = interest charged in stock by the supplier

M = delay period

t_1 = length of positive-stock period (represent actual payment time)

The scenario will be discussed in the following chapter. However, this is the formulation for Condition 1. $(0 < M \leq t_1)$:

- Interest Earned (IE_1) (I_e) during the length of *delay in payment* (0, M) is:

$$IE_1 = SI_e \int_0^M \frac{dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} t \, dt = \frac{dPI_e}{T^{\frac{1}{n}}(n+1)} M^{\frac{1}{n}+1} \tag{2.7}$$

- Interest Charged (IC_1) (I_C) during the (M, t_1) is:

$$IC_1 = PI_C \int_M^{t_1} I(t)dt = \frac{PI_C d}{T^{\frac{1}{n}}} \left[t_1^{\frac{1}{n}}(t_1 - M)\left(1 + \frac{\theta t}{n+1}\right) - \frac{n}{n+1}(t_1^{\frac{1}{n}+1} - \right.$$

$$\left. M^{\frac{1}{n}}) - \frac{\theta t_1^{\frac{1}{n}}}{2}(t_1^2 - M^2) + \frac{2\theta}{n+2}(t_1^{\frac{1}{n}+2} - M^{\frac{1}{n}+2})(1 - \frac{1}{n+1}) \right] \qquad (2.8)$$

Meanwhile, this is the formulation for Condition 2. ($M > t_1$):

- Interest Earned during time period (0, T):

$$IE_2 = SI_e \left[\int_0^{t_1} D(t)dt + (M - t_1)t_1 D(t_1) \right] = SI_e \frac{d}{nT^{\frac{1}{n}}} \left[t_1^{\frac{1}{n}} M - \frac{n}{n+1} t_1^{\frac{1}{n}+1} \right] \quad (2.9)$$

- Interest Charged $= 0$ thus $IC_2 = 0$

2.5 Corresponding Approach

This subchapter explained about previous research based on the international journal and other related references to determine the position of this research. Explained also the tools used in this work according to the aforementioned literature review.

This work is no wonder to have previous research in working on this scope and problem. Here is the table showing the related international journal and research about joint order inventory management with permissible *delay in payment*:

Table 2.4 Related International Journal and Previous Research

Research	Method	Output
(Behera & Tripathy, 2017) An Optimal Replenishment Policy for Deteriorating Items with Power Pattern under Permissible *delay in payments*	Economic Order Quantity, Credit period with Power Pattern	Effect of delay period, tradeoff between delay period and total inventory cost.

Research	Method	Output
(Kumar & Kumar, 2016) An Inventory Model for Deteriorating Items Under Inflation and Permissible *Delay in payment*s by Genetic Algorithm	Genetic algorithm, Weibull distribution	Economic Order Quantity
(Huang, 2003) Retailer's Replenishment Policies Under Conditions of Permissible *Delay in Payments*	EOQ, trade credit, Goyal's model modification	Optimal cycle time
(Tian, 2014) Joint Order of Multi-Item Inventory Model	ABC classification, joint order policy	Optimum order cycle, reduce inventory cost
(Hafnika, et al., 2016) Improvement of Inventory Control Using Continuous Review Policy in A Local Hospital at Bandung City, Indonesia	Continuous Review Policy, EOQ.	Inventory cost saving, AIL
(Musa & Sani, 2012) Inventory Ordering Policies of Delayed Deteriorating Items Under Permissible *Delay in payment*	Inventory control techniques	Cycle period, total cost saving
(Present Work) A Joint Order Inventory Model with Permissible *Delay in payment* in Pharmaceutical Supply Chain (Case Study: Blambangan Banyuwangi Public Hospital)	Periodic Review Policy, Economic Order Interval, Joint Order Policy	EOI, order quantity, control techniques (SS, AIL)

Meanwhile, here is the table showing some of the previous research done on Blambangan Banyuwangi Public Hospital:

Table 2.5 Some Previous Research on Blambangan Banyuwangi Public Hospital on Various Topics

Research	Method	Output
(Nurul, 2017) Influence of Organization Support, Work Discipline, Motivation, and Training on Nurse Performance in	Linear Regression, Determination Coefficient Test, another screen test.	Variable analysis, performance measurement analysis

Research	Method	Output
Blanbangan Banyuwangi (Dr. Soetomo University)		
(Wicaksono, 2014) Balanced Score Card (BSC) in Blambangan Banyuwangi Public Hospital	Accidental Sampling, stratified random sampling questionnaire	BSC analysis
(Purwanto, et al., 2015) Factors Causing the Length of Waiting Time in Outpatient Pharmacy Installation Service of RSUD Blambangan (Brawijaya University)	Fishbone diagram, FGD, USG (Urgency, Serious, and Growth), Mc. Namara	Roots of problem, improvement scenario to decrease waiting time
(Suyanto, et al., 2015) Factors Inhibiting the Implementation of Hospital Management Information System at RSUD Blambangan Banyuwangi (Brawijaya University)	Interview, fishbone diagram	Roots of problem, solution alternative
(Sigit, S., 2009) The Influence of the Function of Head Direction and Team Leader on Job Satisfaction of Nurses in RSUD Blambangan Banyuwangi (University of Indonesia)	Quasi experiment, pre-posttest with control group	Job satisfaction analysis

Beside the previous research and international journals, this work needs to summarize the corresponding approach. Thus, below is the elaboration of tools that are going to be used in this work in sequence based on the aforementioned literature review are:

1. ABC Classification Data

Based on the previous literature review, it is known that there are more than two methods in pharmaceutical inventory management. Always, Better, Control is chosen to be used because it represents the real condition in inventory based on the SKUs and by initially projecting the Pareto law (80-20%). With around 1200 pharmaceutical products, this ABC classification can result in the very high value product with the small inventory items (A class category). The advantage is that the number and types of items relatively small but the contribution to the total inventory

cost is high. In this case, the supporting background of choosing ABC classification is that the hospital pharmacy management is currently projecting its ABC classification.

2. Calculating Economic Order Interval – Joint Order Policy

Based on the aforementioned literature, joint order policy is more suitable than that of the Q-method or Economic Order Quantity method. EOQ is more applicable to individual item inventory management. However, in this case, the A class category pharmaceutical products as the object of research are multiple-items. Hence, joint order policy is chosen. In the real world, the hospital pharmacy is very seldom to place individual order. They tend to always have joint order. However, it is done without the structured calculation of order interval/review period. The practice is done intuitively. Thus, this work will deliver the problem solution by first calculating the EOI to each proposed scenario. Scenario will be discussed in the following chapter. After the T^* is obtained on each scenario, the maximum inventory level (E_i) is calculated to further calculate the order quantity of each item. Then the minimum total cost can be calculated.

The initial total cost equation is used and taken by granted for the scenario without permissible *delay in payment* (Scenario 1). Later, the total cost equation will expand after having the permissible delay equation for the second scenario (considering the permissible *delay in payment*). Here is the formula used from the initial total cost equation:

Total annual cost = purchase cost + order cost + holding cost

$$TC\ (T) = \sum_{i=1}^{n} P_i R_I + \frac{C+nc}{T} + \frac{TF}{2} \sum_{i=1}^{n} P_i R_I \qquad (2.3)$$

$$T^* = \sqrt{\frac{2(C+nc)}{F \sum_{i=1}^{n} P_i R_i}} \qquad (2.4)$$

$$E_i = \frac{R_i T}{N} + \frac{R_i L}{N} = \frac{R_i (T+L)}{N} \qquad (2.5)$$

$$TC\ (T^*) = (1 + FT^*) \sum_{i=1}^{n} P_i R_i \qquad (2.6)$$

3. Periodic Review Policy (T-method)

Periodic review policy is chosen compared to continuous review policy because continuous review policy tends to cope with individual order in the inventory management. While in periodic review, the order interval is fixed for some products (joint order) and this clearly represents the practice in real world. Not only the T* and order quantity that are calculated, another control techniques can be used in order to have the solution more comprehensive and add points to compare to each other's proposed scenario and to the base condition. It is by calculating the Safety Stock (SS) and Average Inventory Level (AIL). By knowing the safety stock, the hospital can have the anticipation stock for the future uncertainty, also AIL is intended to be useful to control how much the current inventory level towards the average inventory level. Below is the formula that will be used under periodic review policy (T-method):

$$SS = FS^{-1}(CSL) \; x \; \sigma_{T+L} \tag{2.10}$$

$$AIL = \frac{DT}{2} + SS \tag{2.1}$$

This is the notation explanation:

SS = safety stock

CSL = cycle service level

FS^{-1} = normsinv

σ_{T+L} = standard deviation of demand during T+L

T = review interval

L = average lead time for replenishment

D = average demand per period

AIL = average inventory level

4. Permissible *Delay in Payment* Setting

Permissible *delay in payment* clearly states both opportunity and threat for the hospital. Opportunity is represented by the interest earned: it is, if the hospital can be more sensitive to capture the opportunity, the hospital can re-project the payment

period to obtain minimum cost. While threat is represented by the interest payable or interest charged to the supplier if the supplier capable of to be aware first to this permissible delay condition. This tool is used to optimize hospital's opportunity. The setting is the delay period is compared to the period with positive inventory. The scenario will be discussed in the following chapter.

However, the condition used in this research will be the Condition 1 (based on the previous literature review) that is the case with ($0 < M \leq t_1$). In order to consider both joint order policy and the permissible *delay in payment* for this case, the initial total annual cost of periodic review will be modified and added with the interest charged and interest earned.

Furthermore, since this work deals with no significant demand variability, the n in both IC and IE formula will be set to 1 ($n = 1$) because it is assumed to be constant. While the deterioration rate will be set to 0. Here is the modified total annual cost that will be used for Scenario 3 (will be further explained on the following chapter):

Total annual cost = purchase cost + order cost + holding cost + interest charged − interest earned

$$TC\ (T) = \sum_{i=1}^{n} P_i R_I + \frac{C+nc}{T} + \frac{TF}{2}\sum_{i=1}^{n} P_i R_I + IC_1 - IE_1 \qquad (2.11)$$

While the EOI equation will be conducted on the following chapter in data processing. However, the modified total inventory cost has been determined. The formulation results in:

$$TC\ (T) = \sum_{i=1}^{n} P_i R_I + \frac{C+nc}{T} + \frac{TF}{2}\sum_{i=1}^{n} P_i R_I + \frac{PI_c d}{T}\left[t_1(t_1 - M) - \frac{1}{2}(t_1^2 - M)\right] - \frac{dPI_e}{2T}M^2 \qquad (2.12)$$

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CHAPTER 3
RESEARCH METHODOLOGY

This chapter explains about the methodology used in this research. The explanations are structured based on the step of the process.

3.1 Variable Identification and Conceptual Modelling

The initial stage is conducting the variable identification and conceptual modelling. In this subchapter, will be explained the summary and the data requirements to study the system and identify the variable.

3.1.1 Variable Identification

In this part will be mentioned the variable addressed to work with the problem formulation. The variables used are based on the corresponding approach in literature review, as the tool techniques in procedure to obtain the solution. The variables will be such as EOI or T^* as the optimum order interval, E_i as the maximum inventory level for joint order, Service Level, Safety Stock (SS), the interest charged, etc. The detailed list and explanation will be conducted in the following chapter.

3.1.2 Study of the System under Discussion

This part will explain about the scope of Blambangan Banyuwangi Public Hospital inventory management, which consists of five pharmacy depots: three outpatient depots and two inpatient depots. There are three warehouses to keep medical devices, infusion solution, and pharmaceutical products. The outpatient depot consists of polyclinic department, emergency unit department, and O*bgyn* and surgery polyclinic. While the inpatient depot consists of surgery room (OK/HD) and inpatient room. Detailed explanation about the order and supply flow, together with the

composition of role for each manager in the unit regarding to inventory management decision making will be explained in the following chapter.

Conceptual model will also be built to have a more comprehensive understanding regarding to the problem formulation from the real system. The identified variable will exhibit at this point subjected to the corresponding Pharmacy Depot or unit. There will also be the explanation as the elaboration of the model.

3.2 Data Collection

This subchapter explained about the data required to complete this work. It is to collect data regarding to the ABC classification A-class category result, periodic review policy, Economic Order Interval. In this stage, the data required will be collected.

3.2.1 ABC Classification and Periodic Review Policy Component

The data required from the ABC classification is the resulted and classified A-class category of pharmaceutical products (consumable medical supplies excluded). It is no need to process the ABC classification since it is confidential for the management to process the whole (around 1200 types) pharmaceutical products data. While for the periodic review policy, the data required is like the lead time constant, service level, demand data, etc. Further explanation will be conducted on the following chapter.

3.2.2 Economic Order Interval and Joint Order Cost Component

In this part, data that should be gathered is regarding to the order cost, purchase cost, and holding cost. It is like procurement taxes, administrative expenses, for the order cost. Sale price of the item for the purchase cost and its demand data. Holding cost can be obtained by either using fraction as assumption or manually calculating in the real practice to gather primary data. After all, the detailed explanation will be discussed on the following chapter.

3.3 Data Processing

This subchapter explained about the data processing based on the input from the data collection, modify the initial total annual cost and project it to the scenario generation. After that, the what—if analysis is conducted based on the numerical experiment by changing the parameter settings.

3.3.1 Total Inventory Cost Modification

In this part will be explained about the additional parameter which is interest charged and earned. Firstly, the initial total annual cost is taken. It only consists of three cost components: purchase cost, order cost, and holding cost. Second, interest charged and earned are referred and revisited. Both of the interest variables will be simplified under validation to the real practice. Third, the interest factor is added to the total inventory cost equation. Lastly, the T* equation is obtained by taking the modified total cost first derivative with respect to T.

3.3.2 Scenario Generation

The scenario generation is formulated based on the problem formulation and objectives, thus it needs an input from the data collection stage. It will be tested then to certain scenarios: with/without the review policy considering the *delay in payment* variable. It has 3 conditions. The first one is the initial condition, the real condition from the field. The second is only joint order. The third is joint order with the permissible *delay in payment* and thus it is broken down into two detail scenarios. Detailed explanation will be discussed on the following chapter.

3.3.3 Numerical Experiment and What-If Analysis

The numerical experiment is used as the sensitivity analysis by testing the total cost difference using parameter changes. It is then constructed into a rule sentences or the what-if analysis, based on the numerical experiment. The resulting interpretation

will be brought to discussion, conclusion, and recommendation. The more comprehensive detail will be conducted on the following chapter.

3.4 Discussion, Conclusion, and Recommendation

This stage consists of the analysis on the scenario chosen and the interpretation of the experiment result. Based on the previous numerical experiment, what-if analysis, and the discussion, conclusion and recommendation are made.

3.4.1 Discussion

This sub-stage compares the chosen scenario to another scenarios, analyze its performance gap, and the interpretation on real activity for the supply chain.

3.4.2 Conclusion and Recommendation

This sub-stage consists the conclusion for the research based on the problem formulation and revisit the research objectives, while the recommendation is made for the future research.

After all, based on the whole brief description above, the research methodology is shown in the flowchart below:

```mermaid
```

START

Identifying Variable
Variable identification used to visualize the system concept.

Studying the System Under Discussion
Graphical illustration of System Under Discussion:
Pharmaceutical Warehouse by the demand of Outpatient Depot
and Inpatient Depot.

Variable Identification and
Conceptual Modelling

Collecting ABC Classification, Demand, and Review Period Data
Data collection regarding to the demand per product period in
2017, the class category for ABC classification including its
percentage and value contribution, and the actual review period

Collecting Periodic Review Policy and Permissible *Delay in Payment* Settling Data
Data collection of the review policy component (lead time,
joint order cost, current review period), and he permissible
delay in settling the accounts (interests and delay component).

Data Collection

Modifying Total Inventory Cost
1. To revisit initial total inventory cost
2. Referring to interest charged and earned equation
3. Adding the interest charged and earned to modify total
inventory cost equation
4. Taking first derivative of modified total inventory cost to
obtain new Economic Order Interval equation.

Generating Scenario
Scenario generation is done to explain the condition and the formula used for each calculation:
- Scenario 1 (initial condition): inventory model without considering both EOI and *delay in payment*
- Scenario 2: inventory model considering EOI, without *delay in payment*
- Scenario 3: inventory model considering both EOI and *delay in payment*.

Assessing Numerical Experiment and Analysis
Experiment on each scenario based on specified variables and parameters. Sensitivity analysis is done one-way and two-way.

Data Processing

Generating Discussion and Interpretation
Interpretation is made about: the best scenario seen from financial aspect, when to apply each of the scenarios and its performance gap, behavior/reaction of the output based on the parameter setting on sensitivity analysis, and so forth.

Making Conclusion and Recommendation
Conclusion is made based on problem formulation and research objectives, while recommendation is made for the upcoming research.

Discussion, Conclusion and Recommendation

STOP

Figure 3.1 Flowchart of Methodology

CHAPTER 4
MODEL BUILDING

In this chapter will be explained about the system under discussion including the variable identification, conceptual modelling, data collection, and data processing.

4.1 Conceptual Modelling

In formulating conceptual model, identified variable in the system will be the components that build the order interval model. Below is the figure of order flow in Blambangan Banyuwangi Public Hospital:
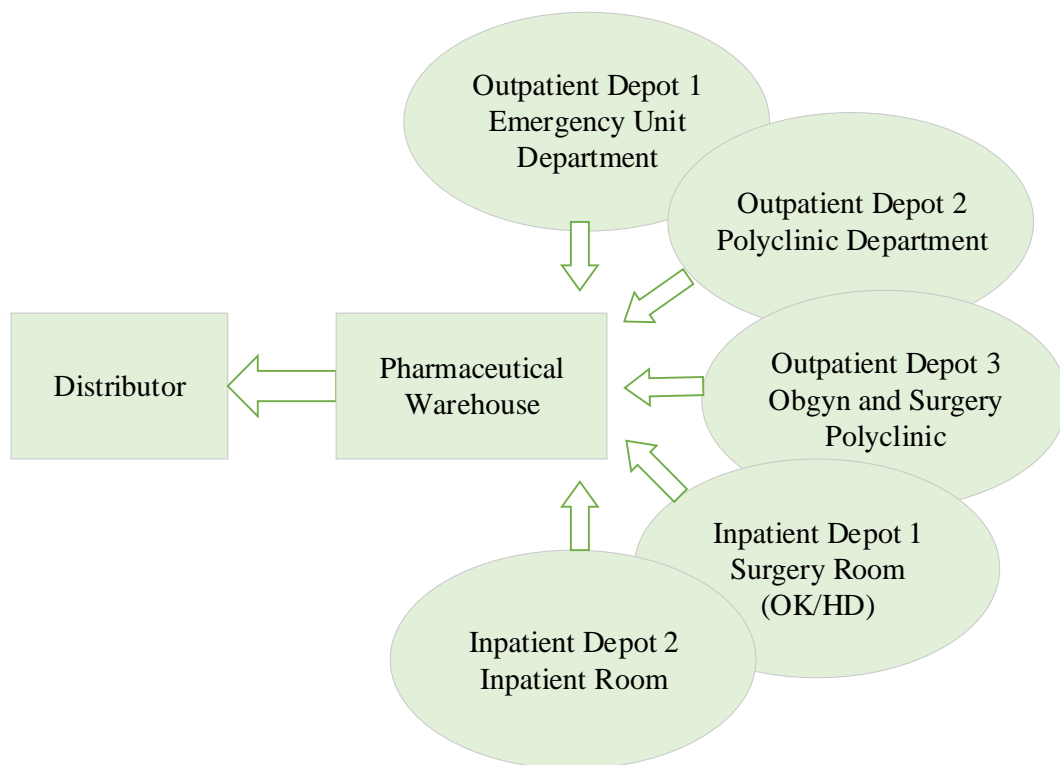
Figure 4.1 Order Flow in Blambangan Banyuwangi Public Hospital

This figure explains about the order flow of consumable medical supplies in Blambangan Banyuwangi Public Hospital inventory management. It consists of five pharmacy depots: three outpatient depots and two inpatient depots. There are three warehouses to keep medical devices, infusion solution, and pharmaceutical products. The outpatient depot consists of polyclinic department, emergency unit department, and obgyn and surgery polyclinic. While the inpatient depot consists of surgery room (OK/HD) and inpatient room. In parallel, three outpatient depots and two inpatient depots order the medical supplies and pharmaceutical products to pharmaceutical warehouse, as one of the three warehouses in the hospital. This amount of demand becomes the total demand ordered to the distributor, by the pharmaceutical warehouse. Based on the total demand from five depots, here is the conceptual model of the pharmaceutical warehouse fixed order interval system:
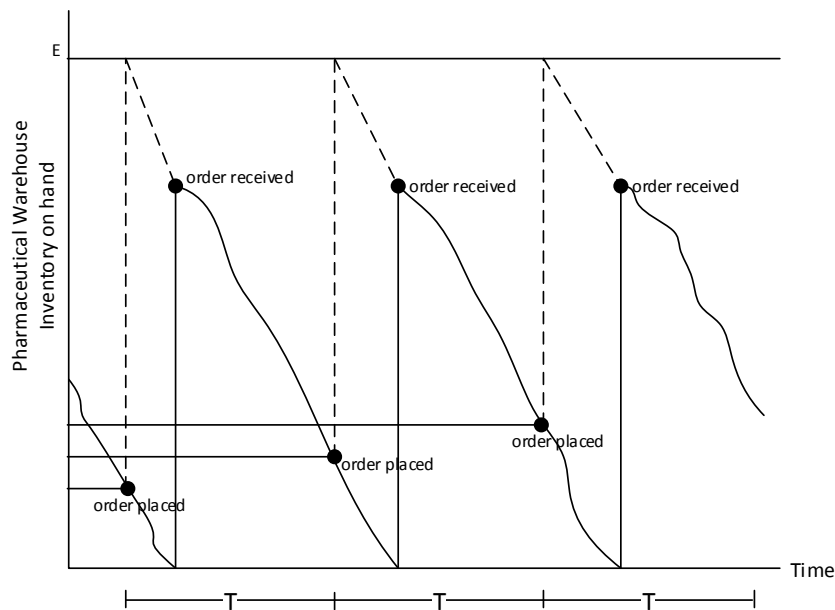
Figure 4.2 Conceptual Model: Fixed Order Interval System of Pharmaceutical Warehouse Demand

In the figure above, it is known that the T (order interval) remains the same on each cycle, said as constant. Meanwhile, the quantity on order each cycle whenever an

order is placed is variable. Initially, inventory level drops until certain time reaches the review period. At this review period, the warehouse placed an order, with the quantity to order that is variable. After the lead time, order is received and is ready to deplete until it reaches the next review period.

In order to work with the fixed order interval system of pharmaceutical warehouse demand above, variables need to be mentioned. The variables used are based on the corresponding approach in literature review, as the tool techniques in procedure to obtain the solution. Here is the list of variables will be used:

P_i = purchasing cost of item i

T = the length of the order cycle (order interval)

I_e = interest earned per IDR per year, where $I_e < I_c$

I_c = interest charged in stock by the supplier

M = delay period

t_1 = the length of positive-stock period (represent actual payment time)

C = order cost for the joint order

n = total number of joint order items

c = order cost associated with each individual item

F = annual holding cost as a fraction of purchase cost

R_i = annual requirement for item i

Conceptual model above is built to have a more comprehensive understanding regarding to the problem formulation from the real system. It gives connection to ease the work to identify relevant factors, and it is usually visualized to give comprehensive approach to that fixed order interval system in Blambangan Banyuwangi Public Hospital pharmaceutical warehouse. This model will be used as guidance for the following data needed to be collected and processed.

4.2 Data Collection

This subchapter explained about the data required to complete this work. It is to collect data regarding to the ABC classification result, demand data, review data such as lead time constant, service level, etc. In this stage, the data required will be collected and presented in following.

4.2.1   ABC Classification

The ABC classification is generally processed by dividing items into three different classes regarding to its value contribution. Based on the theory, it is known that small percentage of number of items will likely contribute the highest in percentage of value. In this case, the value is the annual expense of pharmaceutical products and is compared to the number of items.

After the demand data of each medical supplies and pharmaceutical products are collected and reviewed monthly in a year, the total actual expense is obtained. The total purchasing cost of pharmaceutical products, 58% to the total annual pharmaceutical expenditure including medical supplies, is IDR 14.278.806.493 in 2017. It consists of 1397 items out of 1521 items in total. While the remaining medical supplies data is then excluded. As the remaining data, pharmaceutical products demand will be processed. The classification result is used to make clear of which products are classified into A-category to be taken further as the object of observation. Based on the 2017 data, starting from January 1st to December 31st, here is the resulted ABC Classes:

Table 4.1 ABC Classification Result

Class	Value Contribution Percentage	Value (IDR)	Number of Items	Number of Item Percentage
A	75.02%	10,711,464,693	161	11.52%
B	20.65%	2,948,976,369	445	31.85%
C	4.33%	618,365,431	791	56.63%
Total	**100%**	**14,278,806,493**	**1397**	**100%**

Table 4.1 clearly shows the result according to the ABC classification principle. Large percentage of number of items usually contributes the smallest towards percentage of value, vice versa. In this case, the C-class items contributes 4.33% in value with a high percentage: 56.63% number of items. While the B-class items contributes 20.65% in value with only 31.85% number of items. Lastly, the A-class items contributes the highest in value which is 75.02% with only 11.52% items.

The ABC classification result shown on Table 4.1 above is assessed based on its financial aspect, which is the value contribution to the total expense. However, it does not put aside the criticality factor. The Head of the Pharmacy Depot said that pharmaceutical product is said to be critical based on its usage frequency. The more frequent the product demanded, the higher the criticality. Furthermore, frequency of usage is linear towards the total expense. Thus, if it is seen from the A-class product, it is not only a set of products with high product price, but also high frequency of usage (in example: compare *Koate 970 IU-1060 IU (BLB)* to *Clopidogel*). On that way criticality factor is included, without decreasing the sense of classifying products to ABC classes. Because at last, in integration, the sum of all A-class products' value contribution is 75.02% composed of only 11.52% number of items.

In addition, the hospital pharmacy annually ranks their ten highest contributors to the total pharmaceutical products' values. Based on 2017 data, the total expense of the ten highest contributors is still higher than that of B and C class total expenses. As the highest value contributor in terms of cost including criticality factor, these products becomes the object of observation. Here is the ten biggest pharmaceutical products from the A-class in 2017:

Table 4.2 Top Ten Pharmaceutical Products in 2017 (Price in IDR)

Pharmaceutical Products	Annual Demand	Unit Price	Total Expenditure
Koate 970 IU-1060 IU (BLB)	252	3,600,000	907,154,046
Micardis 80 mg Tablet	88,583	5,409	531,485,081
Clopidogel	222,681	1,650	397,687,100
Anbacin Inj	10,319	36,960	381,447,780
Ceftriaxon	33,806	8,003	353,465,657
Inviclot	7,586.6	43,995	329,129,362
Nimotop Tab	67,229	3,520	233,096,223
Micardis 40mg	59,704	3,045	209,581,050
Ferriprox Tab	6,062	33,000	200,045,800
Asering Infus	21,374	9,275	198,247,528

4.2.2   Demand Data and Review Period

Detailed demand data of each products going to be observed is also critical to note. Currently, it is reviewed monthly or if conversed to days, it is due to the amount of days in a month. This data will be used to determine the Average Inventory Level (AIL) and the Safety Stock (SS) next in the following data processing. Based on the appointed pharmaceutical products observed, here is the annual demand data of *Koate 970 IU-1060 IU (BLB)* reviewed monthly:

Table 4.3 *Koate 970 IU-1060 IU (BLB)* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (IDR)
31/01/2017	21	75,593,479.5
28/02/2017	29	104,390,995.5
31/03/2017	13	46,795,963.5
30/04/2017	21	75,593,479.5
31/05/2017	19	68,395,653
30/06/2017	17	61,199,379
31/07/2017	28	100,794,411
31/08/2017	17	61,200,000
30/09/2017	19	68,400,000
31/10/2017	26	93,599,379
30/11/2017	19	68,394,411

Review Date	Monthly Demand	Monthly Purchase Cost (IDR)
31/12/2017	23	82,796,895
Total	**252**	**907,154,046**

Koate 970 IU-1060 IU (BLB) is known to have the biggest contribution to total expenditure to the hospital which is IDR 907,154,046 with only 252 units of annual demand. This product is composed of *antihemopilic* factor VIII for those with hemophilia type A given through intra-veins and must be safely stored in room temperature. Compared to another ten biggest contributor of pharmaceutical products class A in which the annual demands are in thousands, this product has the least annual demand which is below a thousand unit. It is followed by the second ranked contributor which demand data is shown in the table below, *Micardis 80 mg Tablet*:

Table 4.4 *Micardis 80mg Tablet* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	6,227	40,475,500
28/02/2017	5,760	37,440,000
31/03/2017	6,949	45,168,500
30/04/2017	6,989	45,428,500
31/05/2017	7,431	48,301,500
30/06/2017	7,084	46,046,000
31/07/2017	8,683	55,185,941
31/08/2017	8,463	45,776,367
30/09/2017	7,926	42,871,734
31/10/2017	8,217	44,445,753
30/11/2017	7,896	42,709,464
31/12/2017	6,958	37,635,822
Total	**88,583**	**531,485,081**

Micardis 80 mg Tablet is significantly higher in amount of annual demand (88,583 units) compared to the first ranked pharmaceutical products (*Koate IU-1060 IU (BLB)* which is 252 units). This product is saved in room temperature, used to treat high blood pressure patient (patient with hypertension). Since it is quite frequent to be

issued and depleted, it has another type of dosage included into ten biggest product, which is *Micardis 40 mg Tablet*. Meanwhile, the third ranked pharmaceutical products is *Clopidogel* as it is shown below:

Table 4.5 *Clopidogel* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	17,532	35,064,000
28/02/2017	16,234	32,468,000
31/03/2017	17,642	35,284,000
30/04/2017	17,225	34,450,000
31/05/2017	18,565	36,874,150
30/06/2017	15,368	25,357,200
31/07/2017	18,963	31,288,950
31/08/2017	18,815	31,044,750
30/09/2017	18,908	31,198,200
31/10/2017	20,239	33,394,350
30/11/2017	21,296	35,138,400
31/12/2017	21,894	36,125,100
Total	**222,681**	**397,687,100**

Clopidogel, a tablet used to prevent heart attacks, strokes, or peripheral vascular diseases, has the highest annual demand compared to another ten biggest pharmaceutical products. It reaches hundred-thousand while other products stayed on thousands units per annum. However, the value contribution is still below *Koate IU-1060 IU (BLB)* with only 252 units in demand per annum. *Clopidogel* is not significantly different in value contribution to the following product, *Anbacin Inj.* The following pharmaceutical product is shown below with the demand data in 2017:

Table 4.6 *Anbacin Inj* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	844	31,229,722
28/02/2017	935	34,583,933
31/03/2017	1,202	44,425,319

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
30/04/2017	942	34,815,849
31/05/2017	958	35,407,201
30/06/2017	717	26,499,960
31/07/2017	783	28,939,287
31/08/2017	807	29,826,316
30/09/2017	886	32,746,117
31/10/2017	786	29,050,167
30/11/2017	625	23,099,688
31/12/2017	834	30,824,222
Total	**10,319**	**381,447,780**

Anbacin Inj is a pharmaceutical product used to cure patient with *bacteria* infection as an antibiotic. It is quite fast in depletion knowing that the demand reaches more than ten thousands units per annum. Meanwhile, the value contribution is not much different with the following product which is *Ceftriaxon*. The demand data is shown in the table below:

Table 4.7 *Ceftriaxon* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	3,104	61,239,654
28/02/2017	3,112	36,725,714
31/03/2017	3,057	30,577,031
30/04/2017	3,084	30,848,268
31/05/2017	2,686	27,332,571
30/06/2017	2,356	25,916,000
31/07/2017	2,659	27,630,987
31/08/2017	2,693	24,726,873
30/09/2017	2,557	20,464,080
31/10/2017	3,069	24,561,698
30/11/2017	2,465	19,727,789
31/12/2017	2,964	23,714,991
Total	**33,806**	**353,465,657**

Ceftriaxon is a pharmaceutical product which needs special handling in the inventory. It is an antibacterial product to cure patient with infections on the respiratory tract, urinary tract, skin structure, bone, and joint, etc. It must be sterilized in refrigerator and protected from light. However, it is quite frequent to be used and depleted. This product is followed by the sixth ranked, *Inviclot*, as it is shown in the table below:

Table 4.8 *Inviclot* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	614,6	26,362,284
28/02/2017	579.8	24,869,593
31/03/2017	623.2	26,731,167
30/04/2017	617	26,465,228
31/05/2017	638	27,365,989
30/06/2017	598.2	25,658,832
31/07/2017	665.4	28,674,921
31/08/2017	677.7	29,815,412
30/09/2017	643.9	28,328,381
31/10/2017	669.4	29,450,253
30/11/2017	640.2	28,165,599
31/12/2017	619.2	27,241,704
Total	**7586.6**	**329,129,362**

Inviclot is an anticoagulant for venous thrombosis and embolism treatment. It has quite smaller amount of annual demand compared to the previous mentioned ten biggest products. It is below ten thousands, but with three hundred million IDR in value contribution per annum, not much different with the previous product. However, it is significant from the following product, *Nimotop Tab*, which reaches two hundred million IDR as it is shown in the table below:

Table 4.9 *Nimotop Tab* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	5,576	18,817,980
28/02/2017	5,392	18,197,016
31/03/2017	6,257	21,116,236
30/04/2017	5,773	19,483,011
31/05/2017	6,417	21,657,375
30/06/2017	6,003	20,759,505
31/07/2017	5,470	19,254,400
31/08/2017	6,534	22,999,680
30/09/2017	6,411	22,566,720
31/10/2017	6,265	22,052,800
30/11/2017	6,786	23,886,720
31/12/2017	345	2,304,780
Total	**67,229**	**233,096,223**

Nimotop Tab, product to cure patient with bleeding, has more significant amount in annual demand compared to *Inviclot*. It reaches almost seventy thousand units per annum. However, the value contribution is below *Inviclot* (with only below ten thousand units in annual demand). It is followed by the second type of *Micardis* as it is shown below:

Table 4.10 *Micardis 40mg Tablet* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	4,236	16,520,400
28/02/2017	3,971	15,486,900
31/03/2017	4,459	17,390,100
30/04/2017	4,641	18,099,900
31/05/2017	5,228	20,389,200
30/06/2017	3,882	15,139,800
31/07/2017	5,471	21,336,900
31/08/2017	5,276	16,583,550
30/09/2017	5,832	17,758,440
31/10/2017	5,415	16,488,675
30/11/2017	5,539	16,866,255
31/12/2017	5,754	17,520,930

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
Total	**59,704**	**209,581,050**

Micardis 40 mg Tablet is the other dosage type of the second ranked pharmaceutical products. It has the same characteristics with the 80 mg dosage of tablet, which is typically high in value contribution by being large in amount (units demanded per annum). *Micardis* is followed by *Ferriprox Tab,* as shown in the table below:

Table 4.11 *Ferriprox Tab* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	540	17,819,982
28/02/2017	210	6,929,993.1
31/03/2017	406	13,397,987
30/04/2017	495	16,334,984
31/05/2017	511	16,862,983
30/06/2017	403	13,298,987
31/07/2017	435	14354,986
31/08/2017	765	25,244,975
30/09/2017	482	15,905,984
31/10/2017	420	13,859,986
30/11/2017	765	25,244,975
31/12/2017	630	20,789,979
Total	**6,062**	**200,045,800**

Ferriprox Tab, tablet for thalassemia major patient with overload iron, is the second least in annual demand compared to another ten biggest pharmaceutical products, after *Koate IU-1060 IU (BLB).* It is only 6,062 units demanded in 2017. However, the unit purchase cost is 120 times lower than the first ranked products. Thus, the annual value is also the second least, but it is toward *Asering Infus,* as the lowest in value contribution. The demand data is shown below:

Table 4.12 *Asering Infus* Monthly Demand Data in 2017

Review Date	Monthly Demand	Monthly Purchase Cost (in IDR)
31/01/2017	2,257	20,934,126
28/02/2017	1,940	17,993,888
31/03/2017	1,991	18,466,923
30/04/2017	1,843	17,094,194
31/05/2017	1,721	15,962,351
30/06/2017	1,159	10,749,829
31/07/2017	1,464	13,578,892
31/08/2017	1,664	15,433,932
30/09/2017	1,516	14,061,052
31/10/2017	2,078	19,273,817
30/11/2017	1,924	17,845,485
31/12/2017	1,817	16,853,038
Total	**21,374**	**198,247,528**

Asering Infus is the tenth product, with 21,374 annual demand yielding to IDR 198,247,528 in total. It is to cure patient with dehydration through the solution and to treat the loosing blood patient. The annual demand is quite high, however, the unit purchase cost is not enough supporting the value contribution.

4.2.3　Periodic Review Policy and Permissible Delay Component

After the pharmaceutical products for further observation is sorted and determined, secondary data regarding to make complete of periodic review policy and permissible delay component is obtained. In periodic review policy, in this case to calculate the Economic Order Interval (EOI) of multiple items, the components are: annual requirement of each item, purchase cost of each item, order cost for joint order, order cost associated with each individual item, order interval in year, lead time constant, service level, and annual holding cost. While the permissible delay components are the delay period, actual payment period, interest charged, and interest earned. Those are the data required to make complete of this review policy.

This secondary data is obtained based on 2017 historical data and the assumption is only put on the holding cost. Here is the data gathered and the explanation will be after the following:

Table 4.13 Secondary Data Recap of Periodic Review Policy and Delay Component

Component	Value	Unit
Periodic Review Policy Component		
Lead time constant	1	day
Current review period	28/30/31	days (monthly)
Service level (SL)	95	%
Order cost	1	%
Joint-order cost	950,000,000	IDR
Holding cost	25	%
Permissible Delay Component		
Interest earned	around 5	%
Interest charged	around 6	%
Delay period	60	days
Actual payment period	76	days

The lead time is known daily and constant. Once an order is placed on Tuesday morning, Wednesday morning the order has arrived. While the service level is said to be 95% in evaluation from 2016 known from the stock out sales probability. The order cost is 1% per unit in estimation by the Head of the Pharmacy Depot knowing the needs to pay on taxes: procurement taxes paid to the distributor. Holding cost is said to be 25% stated from previous chapter as the research scope. Meanwhile, the joint-order cost is obtained from the administrative expenses such as document printing, and copying. However, it is mainly for the material handling cost accounted to worker in charge. It is for put-away process, from unboxing the order received up to the products is put on the shelf. It needs handling, specially, for *Ceftriaxon* and *Koate* that have special space in refrigerator.

In permissible delay component, the delay period that has happened started from December 31st 2017 up to February 28th 2018. However, March 15th 2018 is the

actual payment. Due to this situation, the interest charged by the distributor as the cause of the lateness in payment is 6%. While the interest earned, obtained from the interest bearing account, is 5%.

4.3 Data Processing

In data processing will be explained about the total inventory cost modification, scenario generation, and numerical experiment. The total inventory cost modification is used as one of the input for scenario generation. While scenario generation is used as the input to process the numerical experiment as the sensitivity analysis.

4.4.1   Total Inventory Cost Modification

As it is explained in previous chapters, for the model building, total inventory cost in this permissible delay case needs to be modified. The result of this subchapter will be used in the following subchapter which is the scenario generation, specifically, for scenario considering both the Economic Order Interval (EOI) and *delay in payment*.

The initial total inventory consists only purchase cost, order cost (plus joint order cost), and holding cost. This initial total inventory cost will be used for scenario in which *delay in payment* is not permissible, while the EOI is calculated. However, in the case where *delay in payment* is permissible, there will be two additional variables called interest charged and interest earned depending on delay period and actual payment time. In this part, initial total inventory cost formula needs to be modified. To clearly show the steps of the modification process, firstly, here is the initial total inventory cost formula:

Total annual cost = purchase cost + order cost + holding cost

$$TC\ (T) = \sum_{i=1}^{n} P_i R_i + \frac{C+nc}{T} + \frac{TF}{2} \sum_{i=1}^{n} P_i R_i \qquad (2.3)$$

As it is known that the period considered is $0 < M \leq t_1$, the interest earned as the amount the pharmaceutical warehouse can sale during (0,M) which interest rate is I_e in an interest bearing account is obtained by Formula 2.13 below.

$$IE = \frac{\sum_{i=1}^{n} P_i R_i I_e}{2T} M^2 \qquad (2.13)$$

While the interest charged, during (M,t_1) is:

$$IC = \frac{\sum_{i=1}^{n} P_i R_i I_c}{T} \left[t_1(t_1 - M) - \frac{1}{2}(t_1^2 - M) \right] \qquad (2.14)$$

Based on the interest charged and earned, it is known that the interest earned will decrease total inventory cost at some amount. While interest charged is the reverse. Hence, the modified total inventory cost is obtained by adding the initial total inventory cost by the interest charged and subtracting it with the interest earned. Hence, the modified total inventory cost is:

$$TC\ (T) = \sum_{i=1}^{n} P_i R_I + \frac{C + nc}{T} + \frac{TF}{2} \sum_{i=1}^{n} P_i R_I + \sum_{i=1}^{n} P_i R_I \frac{I_c}{T} \left[t_1(t_1 - M) - \right.$$
$$\left. \frac{1}{2}(t_1^2 - M) \right] - \sum_{i=1}^{n} P_i R_I \frac{I_e}{2T} M^2 \qquad (2.15)$$

Finally, taken its first derivative towards order interval (T) to obtain the economic order interval formula, here is the result:

$$T *= \sqrt{\frac{2\left[C + nc + \frac{I_c}{2} \sum_{i=1}^{n} P_i R_i (t_1^2 + M - 2t_1 M) - \frac{I_e}{2} M \sum_{i=1}^{n} P_i R_i \right]}{F \sum_{i=1}^{n} P_i R_i}} \qquad (2.16)$$

Hence, by replacing T with T* in the modified total inventory cost, the obtained minimum total cost is:

$$TC\ (T^*) = \sum_{i=1}^{n} P_i R_i + \frac{C+nc}{T^*} + \frac{T^*F}{2}\sum_{i=1}^{n} P_i R_i + \sum_{i=1}^{n} P_i R_i \frac{I_c}{T^*}\left[t_1(t_1 - M) -\right.$$

$$\left.\frac{1}{2}(t_1^2 - M)\right] - \sum_{i=1}^{n} P_i R_i \frac{I_e}{2T^*} M^2 \qquad (2.17)$$

4.4.2 Scenario Generation

After the total inventory cost modification is done, the scenario generation takes place. It consists of three scenarios, the objective is to find out the total annual cost and the behavior of the order interval, followed by the result of the sensitivity analysis in numerical experiment as the following subchapter. Besides finding out the total annual cost and another variables behavior, there are additional factors to consider as the input for the analysis (safety stock and average inventory level). Value of these two variables will also vary regarding to the order interval. These scenarios will be compared in terms of costs, practicality, and economic. The following subchapter will explain one by one the scenario plus the additional factors to analyze.

4.4.2.1 *Scenario 1 (Initial Condition) – Without EOI and Delay in Payment*

Scenario 1 describes the real condition where the current inventory management takes place. EOI is not considered here. Hence, no calculation on economic order interval, rather, using the current review period. No holding cost considered and calculated. *Delay in payment* is also considered as permissible but ignored. Therefore, here is the formula used to process scenario 1:

Total annual cost = purchase cost + order cost

$$TC\ (T) = \sum_{i=1}^{n} P_i R_i + \frac{C+nc}{T} \qquad (2.18)$$

4.4.2.2 Scenario 2 – With EOI, Without Delay in Payment

Scenario 2 describes the proposed scenario using periodic review policy calculating Economic Order Interval (EOI) on multiple items without considering *delay in payment*. Here is the formula used to process scenario 2:

1. Calculating the EOI (T*)

$$T^* = \sqrt{\frac{2(C+nc)}{F \sum_{i=1}^{n} P_i R_i}} \qquad (2.4)$$

2. Calculating the minimum total cost per year

   Insert T* to this formula:

   Total annual cost = purchase cost + order cost + holding cost

$$TC\ (T) = \sum_{i=1}^{n} P_i R_i + \frac{C+nc}{T} + \frac{TF}{2} \sum_{i=1}^{n} P_i R_i \qquad (2.3)$$

   so that the minimum total cost per year is:

$$TC\ (T^*) = (1 + FT^*) \sum_{i=1}^{n} P_i R_i \qquad (2.6)$$

4.4.2.3 Scenario 3 – With both EOI and Delay in Payment

Scenario 3 describes the condition where all possible variables are considered. It is the condition with both EOI and *delay in payment*. The total inventory cost used is the modified formula, the same with the EOI formula and the minimum total inventory cost formula. Here are the formula used for scenario 3:

1. Calculating the EOI

Basically, the order cost is attached as the numerator with the interest component. Meanwhile, the de-numerator is the holding cost. Here is the obtained formula used to calculate the EOI in Scenario 3:

$$T* = \sqrt{\frac{2\left[C+nc+\frac{I_c}{2}\sum_{i=1}^{n} P_i R_i(t_1^2+M-2t_1 M)-\frac{I_e}{2}M\sum_{i=1}^{n} P_i R_i\right]}{F \sum_{i=1}^{n} P_i R_i}} \qquad (2.16)$$

2. Calculating the minimum total annual cost

By replacing T with T* in the modified total inventory cost, the obtained minimum total cost is:

$$TC\ (T^*) = \sum_{i=1}^{n} P_i R_i + \frac{C+nc}{T^*} + \frac{T^*F}{2}\sum_{i=1}^{n} P_i R_i + \sum_{i=1}^{n} P_i R_i \frac{I_c}{T^*}\left[t_1(t_1 - M) - \frac{1}{2}(t_1^2 - M)\right] - \sum_{i=1}^{n} P_i R_i \frac{I_e}{2T^*} M^2 \qquad (2.17)$$

4.4.2.4   Safety Stock and Average Inventory Level

As it is already explained previously in this subchapter headings (Subchapter 4.4.2), safety stock is calculated to anticipate future uncertainty, also AIL is intended to be beneficial to control how much is the current inventory level towards the average inventory level. It needs information around demand data (the average and standard deviation), service level, and order interval/review period. So here is the formula of safety stock and average inventory level that will be used:

$$SS = FS^{-1}(CSL)\ x\ \sigma_{T+L} \qquad (2.10)$$

$$AIL = \frac{DT}{2} + SS \qquad (2.1)$$

This is the notation explanation:

SS = safety stock

CSL = cycle service level

FS^{-1} = normsinv

σ_{T+L} = standard deviation of demand during T+L

T   = review interval

L   = average lead time for replenishment

D   = average demand per period

AIL = average inventory level

4.4.3 Numerical Experiment

Numerical experiment explains the result of the calculation and sensitivity analysis on each scenario. Here is the result of the numerical experiment.

4.4.3.1 Scenario 1 (Initial Condition) – Without EOI and Delay in Payment

Stated in scenario generation, total cost of Scenario 1 is composed of purchase and joint order cost with the current or actual review period. Thus, without calculating the economic review period, the initial condition evaluation is done directly by the sum of the total annual purchase cost and total annual order cost. Here is the result of the calculation shown step by step regarding to the component:

1. Total Purchase Cost

It is obtained that the total purchase cost is IDR 3,741,339,700. Here is the table showing the count up calculation of purchase cost:

Table 4.14 Total Annual Purchase Cost per Product Based on 2017 Data

Item	Ri	Pi	PiRi	Total Cost
Koate IU-1060 IIU (BLB)	252	3,600,000	907,154,046	907,154,053.3
Micardis 80 mg Tablet	88583	5,409	531,485,081	531,485,088.3
Clopidogel	222681	1,650	397,687,100	397,687,107.3
Anbacin Inj	10319	36,960	381,447,780	381,447,787.3
Ceftriaxon	33806	8,003	353465,657	353,465,664.3
Inviclot	7586.6	43,995	329,129,362	329,129,369.3
Nimotop Tab	67229	3,520	233,096,223	233,096,230.3
Micardis 40mg Tablet	59704	3,045	209,581,050	209,581,057.3
Ferriprox Tab	6062	33,000	200,045,800	200,045,807.3
Asering Infus	21374	9,275	198,247,528	198,247,535.3
Total				3,741,339,700

2. Total Order Cost

The order cost, the overhead cost related to the purchasing process, is attached to both the lot (joint-order) and the unit ordered. Based on the secondary data obtained, here is the summary of order cost component:

- Joint-order cost per period, the cost component is:

1. Labor or material handling cost

The worker obliged to handle the order receipt, shipping, and transporting up to the storage is only one person. However, the job is not only on pharmaceutical warehouse, but also on the other 2 warehouses (solution and medical devices warehouse). Based on the secondary data, it is known that the workload is 25%-25%-50% towards pharmaceutical-solution-medical devices warehouse. Medical devices warehouse takes the greatest workload since the shipping takes more time and energy, the procedure is more complicated since the partner to work with and the destination is various. Differ from the other two warehouses, the flow is only warehouse-depot, vice versa.

The cost associated to this component is calculated to the proportion of the worker's wages. It is IDR 3,000,000 per month. Thus, the material handling cost is 25% of the wages, equals to IDR 750,000 per month (the same period with the review/order interval).

2. Administrative expenses

This component is composed of document printing, photocopy, administrative files transferred, meeting files, telephone bill to order monthly, etc. It is monthly estimated to be IDR 500,000.

Thus, the joint-order cost per period is the sum of administrative expense and material handling cost which is IDR 1,250,000 in total per order.

- Order cost per unit

Order cost per unit is attached to each unit purchase cost and the order quantity. In this case, the order cost per unit is the procurement taxes (1%) need to be paid to the distributor.

Based on two components of order costs mentioned previously, here is the summary of order cost calculation based on 2017 data:

Table 4.15 Total Annual Joint Order Cost

Order Date	Total Purchase Cost per Order	Order Cost
31/01/2017	IDR 344,057,127	IDR 4,690,571
28/02/2017	IDR 329,086,033	IDR 4,540,860
31/03/2017	IDR 299,353,227	IDR 4,243,532
30/04/2017	IDR 318,613,412	IDR 4,436,134
31/05/2017	IDR 318,548,973	IDR 4,435,490
30/06/2017	IDR 270,625,491	IDR 3,956,255
31/07/2017	IDR 341,039,675	IDR 4,660,397
31/08/2017	IDR 302,651,854	IDR 4,276,519
30/09/2017	IDR 294,300,708	IDR 4,193,007
31/10/2017	IDR 326,176,878	IDR 4,511,769
30/11/2017	IDR 301,078,785	IDR 4,260,788
31/12/2017	IDR 295,807,462	IDR 4,208,075
Total	**IDR 3,741,339,627**	**IDR 52,413,396**

By having the complete information regarding to annual purchase and order cost, the result of Scenario 1 is obtained:

1. The order interval (T) is 0.082 in years, or 30 days.

2. The total annual cost is:

   Total annual cost = Total purchase cost + total order cost

   Total annual cost = 3,741,339,700 + (52,413,396/0.082)

   Total annual cost = IDR 4,379,035,948

4.4.3.2   Scenario 2 – With EOI, Without Delay in Payment

Based on the scenario generation, total cost of Scenario 2 is composed of purchase, joint-order, and holding cost with the Economic Order Interval (EOI). Thus, by calculating the EOI, the minimum total inventory cost (TC(T*)) will be obtained.

However, the total purchase and order cost remains the same. Here is the result of the calculation shown step by step regarding to the component:

1. Economic Order Interval (T*)

Knowing that the annual fraction of holding cost is 25%, total order cost is IDR 52,413,396, and total purchase cost is IDR 3,741,339,700, here is the result of the calculation:

$$T^* = \sqrt{\frac{2(C+nc)}{F \sum_{i=1}^{n} P_i R_i}} \qquad (2.4)$$

$$T^* = \sqrt{\frac{2(52,413,396)}{0,25 \; x \; 3,741,339,700}}$$

T* = 0.3348 year (4 months or 122 days)

2. Minimum Total Inventory Cost, TC (T*)

Based on the obtained T*, here is the result of minimum total inventory cost calculation:

$$TC\,(T^*) = (1 + FT^*) \sum_{i=1}^{n} P_i R_i \qquad (2.6)$$

$$TC\,(T^*) = (1 + 0,25 \; x \; 0,3348) x \; 3,741,339,700$$

TC (T*) = 4,054,466,052

Based on two steps of calculation above, Scenario 2 obtained:

1. The Economic Order Interval is 0.3448 year, or 4 months, or 122 days.
2. The minimum total inventory cost is IDR 4,054,466,052

4.4.3.3   Scenario 3 – With both EOI and Delay in Payment

Scenario 3 has some additional components differ from the previous scenario. In this model, besides considering EOI, as it is stated in scenario generation, the *delay in payment* is permissible. Thus, there are two interest components: interest charged

and interest earned. Based on the secondary data obtained, the interest charged is 6% while the interest earned is 5%.

The total inventory cost component is the same as Scenario 2, which is purchase, joint-order, and holding cost with the Economic Order Interval (EOI) and the permissible *delay in payment*. Here is the result of the calculation shown step by step regarding to the component:

1. Economic Order Interval (T*)

Initially on previous data processing, Subchapter 4.4.1, the Economic Order Interval equation has been modified in order to fit the *delay in payment* parameter setting. It is resulted from the first derivation of total inventory cost equation. Thus, the calculation can be obtained. Knowing that the annual fraction of holding cost is 25%, total order cost is IDR 52,413,396, total purchase cost is IDR 3,741,339,700, actual payment time is 76 days (0,2082 year), and the delay period is 60 days (0,1644 year), here is the result of the calculation:

$$T* = \sqrt{\frac{2\left[C+nc+\frac{I_c}{2}\sum_{i=1}^{n}P_iR_i(t_1^2+M-2t_1M)-\frac{I_e}{2}M\sum_{i=1}^{n}P_iR_i\right]}{F\sum_{i=1}^{n}P_iR_i}} \tag{2.16}$$

T* = 0,3356 year (4 months or 122 days)

2. Minimum Total Inventory Cost, TC (T*)

Based on the obtained T*, here is the result of minimum total inventory cost calculation:

$$TC(T^*) = \sum_{i=1}^{n}P_iR_I + \frac{C+nc}{T^*} + \frac{T^*F}{2}\sum_{i=1}^{n}P_iR_I + \sum_{i=1}^{n}P_iR_I\frac{I_c}{T^*}\left[t_1(t_1-M) - \frac{1}{2}(t_1^2-M)\right] - \sum_{i=1}^{n}P_iR_I\frac{I_e}{2T^*}M^2 \tag{2.17}$$

TC (T*) = 4,093,518,931

Based on two steps of calculation above, Scenario 2 obtained:

1. The Economic Order Interval is 0.3448 year, or 4 months, or 122 days.
2. The minimum total inventory cost is IDR 4,093,518,931

Based on the scenario generation, the additional evaluation needed to do the performance analysis is the calculation of Safety Stock (SS) and Average Inventory Level (AIL). The amount of SS per unit will be the same for all scenario. However, the AIL depends on the review period (T*). Here is the result of the calculation on SS and AIL:

1. Safety Stock

By using this following formula, SS is obtained. Knowing that the Service Level is 95% based on the secondary data, the formula is followed by the summary table of all ten pharmaceutical products SS calculation:

$$SS = FS^{-1}(CSL) \; x \; \sigma_{T+L} \tag{2.10}$$

Table 4.16 Safety Stock (SS) Calculation Recapitulation

Item	Demand Standard Deviation	SS
Koate IU-1060 IU (BLB)	5	8
Micardis 80 mg Tablet	889	1,462
Clopidogel	1,932	3,177
Anbacin Inj	145	238
Ceftriaxon	277	456
Inviclot	29	48
Nimotop Tab	1,715	2,821
Micardis 40mg	699	1,150
Ferriprox Tab	157	259
Asering Infus	299	492

2. Average Inventory Level of Scenario 1

AIL is composed of SS, demand, and order interval. Known that the order interval (T) of Scenario 1 is 0.0822 year, here is the obtained AIL with the following formula:

$$AIL = \frac{DT}{2} + SS \tag{2.1}$$

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Table 4.17 Average Inventory Level of Scenario 1

Item	Annual Demand	SS	AIL
Koate IU-1060 IU (BLB)	252	8	18
Micardis 80 mg Tablet	88,583	1462	5,103
Clopidogel	222,681	3177	13,239
Anbacin Inj	10,319	238	662
Ceftriaxon	33,806	456	1,845
Inviclot	7,586.6	48	360
Nimotop Tab	67,229	2821	5,583
Micardis 40mg	59,704	1150	3,603
Ferriprox Tab	6,062	259	508
Asering Infus	21,374	492	1,371

3. Average Inventory Level of Scenario 2

AIL of Scenario 2 will yield different value to those in Scenario 1, it is influenced by the order interval. Known that the EOI (T*) of Scenario 2 is 0.3348 year, here is the obtained AIL of Scenario 2:

Table 4.18 Average Inventory Level of Scenario 2

Item	Annual Demand	SS	AIL
Koate IU-1060 IU (BLB)	252	8	50
Micardis 80 mg Tablet	88,583	1,462	16,290
Clopidogel	222,681	3,177	40,451
Anbacin Inj	10,319	238	1,965
Ceftriaxon	33,806	456	6,115
Inviclot	7,586.6	48	1,318
Nimotop Tab	67,229	2,821	14,074
Micardis 40mg	59,704	1,150	11,144
Ferriprox Tab	6,062	259	1,273
Asering Infus	21,374	492	4,070

4. Average Inventory Level of Scenario 3

The same towards what is stated in Scenario 2, AIL of Scenario 3 will yield different value by the influence of the order interval. Known that the EOI (T*) of Scenario 2 is 0.3356 year, here is the obtained AIL of Scenario 3:

Table 4.19 Average Inventory Level of Scenario 3

Item	Annual Demand	SS	AIL
Koate IU-1060 IU (BLB)	252	8	50
Micardis 80 mg Tablet	88,583	1,462	16,327
Clopidogel	222,681	3,177	40,543
Anbacin Inj	10,319	238	1,970
Ceftriaxon	33,806	456	6,128
Inviclot	7,586.6	48	1,321
Nimotop Tab	67,229	2,821	14,101
Micardis 40mg	59,704	1,150	11,169
Ferriprox Tab	6,062	259	1,276
Asering Infus	21,374	492	4,079

4.4.3.5   Sensitivity Analysis

After conducting the complete data processing, sensitivity analysis is done to enhance the assessment and be able to obtain accurate evaluation of comparison on scenario. The sensitivity analysis is done on Scenario 3 setting. It is done on two parameter settings (delay period and interest charged) and two conditions (one-way and two-way analysis). The output is to know how the order interval moves together with the reaction of total inventory cost. Here is the result of the sensitivity analysis:

4.4.3.5.1   One-Way Sensitivity Analysis

One-way sensitivity analysis is assessed to test the behavior of a single parameter setting. Here will be explained the result (sensitivity analysis is done only on Scenario 3):

      a.   Sensitivity Analysis on Delay Period

The delay period is 0.1644 year (60 days) in actual. In this calculation, the delay period will be changed in ±5, 10, 15, 20, 25, 50, 75, 80, and 100 in percentage of M value. The table below shows the summary of the result:

Table 4.20 One-Way Sensitivity Analysis on Total Inventory Cost and EOI with Delay Period as the Parameter Setting

% change	Parameter Setting (M)	T* Reaction	TC(T*) Reaction
100	0.3288	0.3206	4,105,575,167
80	0.2959	0.3236	4,104,261,603
75	0.2877	0.3244	4,103,844,731
50	0.2466	0.3282	4,101,240,746
25	0.2055	0.3319	4,097,790,342
20	0.1973	0.3326	4,097,000,956
15	0.1890	0.3334	4,096,178,930
10	0.1808	0.3341	4,095,324,457
5	0.1726	0.3349	4,094,437,728
0	0.1644	0.3356	4,093,518,931
-5	0.1562	0.3363	4,092,568,252
-10	0.1479	0.3371	4,091,585,875
-15	0.1397	0.3378	4,090,571,980
-20	0.1315	0.3385	4,089,526,748
-25	0.1233	0.3392	4,088,450,355
-50	0.0822	0.3429	4,082,607,019
-75	0.0411	0.3464	4,076,010,013
-80	0.0329	0.3471	4,074,601,942
-100	0.0000	0.3500	4,068,679,220

b. Sensitivity Analysis on Interest Charged

The interest charged is 6% in actual. In this calculation, the interest charged will be changed the same as the previous assessment of sensitivity analysis on delay period which is ±5, 10, 15, 20, 25, 50, 75, 80, and 100 in percentage of I_c value.

However, there is one factor differs from the previous sensitivity analysis. Initially, the total cost of Scenario 2 (IDR 4,054,466,052) is lower than that of Scenario 3 (IDR 4,093,518,931). In the middle of running the sensitivity calculation, it is known that when the interest charged is set to 0 (decreased by 100%), the total cost (Scenario 3) becomes lower than Scenario 2. In fact, if it is decreased by 80%, the total cost is still above the Scenario 2. This becomes the additional analysis to assess at what percentage does Scenario 3 will approximately be the same total cost to that Scenario 2 with interest charged as the parameter changing between 80-100% decreased in value. The table below shows the summary of the result:

Table 4.21 One-Way Sensitivity Analysis on Total Inventory Cost and EOI with Interest Charged as the Parameter Setting

% Change	Parameter Setting (Ic)	T* Reaction	TC(T*) Reaction
100	0.1200	0,3822	4,132,414,185
80	0.1080	0,3733	4,124,933,979
75	0.1050	0,3711	4,123,042,101
50	0.0900	0,3596	4,113,445,945
25	0.0750	0,3478	4,103,610,445
20	0.0720	0,3454	4,101,613,182
15	0.0690	0,3430	4,099,605,542
10	0.0660	0,3405	4,097,587,384
5	0.0630	0,3381	4,095,558,563
0	0.0600	0,3356	4,093,518,931
-5	0.0570	0,3331	4,091,468,340
-10	0.0540	0,3306	4,089,406,638
-15	0.0510	0,3280	4,087,333,673
-20	0.0480	0,3255	4,085,249,289
-25	0.0450	0,3229	4,083,153,330
-50	0.0300	0,3097	4,072,494,310
-75	0.0150	0,2959	4,061,521,721
-80	0.0120	0,2931	4,059,287,798
-90,69	0.0056	0,2869	4,054,466,193
-100	0.0000	0,2814	4,050,215,639

4.4.3.5.2 *Two-Way Sensitivity Analysis*

Two-way sensitivity analysis is assessed to test the behavior of two parameter settings simultaneously. In this case, the parameter setting is the same to the one-way: delay period and interest charged. The output is also the same. What differs the analysis is the calculation process. It is started with Random Number Generation.

Because there are two parameter setting assessed simultaneously, there are four probabilities of conditions to capture the whole behavior of M and Ic together with the reaction of T* and TC(T*). Delay period is limited from 1 (0.0027 year) up to 365 (1 year) days. Meanwhile, interest charged is limited from 0.05 (the interest earned, as it is stated in literature review that interest charged is higher than the interest earned) up to 1. Here is the summary table of the four conditions, range of M and Ic, together with the behavior to capture to have a complete analysis:

Table 4.22 Conditions to Capture on Two-Way Sensitivity Analysis

Condition	Range	Characteristic to Capture
M and Ic are above the actual value	M: $0.1644 < M < 1$ Ic: $0.06 < Ic < 1$	$M > Ic$ and $M < Ic$
M and Ic are below the actual value	M: $0.0027 < M < 0.1644$ Ic: $0.05 < Ic < 0.06$	$M > Ic$ and $M < Ic$
M is above the actual value while Ic is below	M: $0.1644 < M < 1$ Ic: $0.05 < Ic < 0.06$	$M > Ic$
M is below the actual value while Ic is above	M: $0.0027 < M < 0.1644$ Ic: $0.06 < Ic < 1$	$M > Ic$ and $M < Ic$

Based on those conditions, random number is generated. There are 30-50 random numbers per conditions generated. Thing to note is that all the generated numbers must occupy all characteristics to capture within the range. The output will be about to analyze behavior and reaction of T* and TC (T*).

There are 55 random numbers of M and Ic generated in form of column and is converted to matrix to fill the minimum total inventory cost. The random number generation table together with the result of two-way sensitivity analysis will be provided in Attachment.

CHAPTER 5

ANALYSIS

In this chapter will be explained about the numerical experiment analysis related to each performance of scenario generated, Safety Stock and Average Inventory Level, and sensitivity analysis.

5.1 Performance Gap on Each Scenario

Based on previous calculation that has been done in data processing, it can be concluded that the result and the performance gap of each scenario is shown in the table below:

Table 5.1 Total Inventory Cost Recapitulation of Each Scenario Generated

Scenario	T* in year (days)	Order Frequency	TC(T*)	Percentage in Decrease
1	0.0822 (30)	12	4,379,035,948	-
2	0.3348 (122)	3	4,054,466,052	7.41%
3	0.3356 (122)	3	4,093,518,931	6.52%

It is known that scenario 2 is most preferable seen from financial aspect as the lowest in total inventory cost. The gap is 7.41% from the initial condition (Scenario 1, as the highest in total inventory cost). However, the performance is not significantly different from that of Scenario 3. Scenario 3 yield 6.52% decreased in percentage compared to Scenario 1. It only differ IDR 39,052,879 from Scenario 2, thus it gives 0.89% difference in total inventory cost.

Scenario 1, the actual condition, considered no holding cost in calculator. It may decrease the total cost in calculation but not in reality. In fact, by ignoring holding cost, the calculated total cost is still far beyond that of Scenario 2 and 3. Moreover, the total order cost is only 1.5% to the total annual purchase cost. It is, again, not

considering interest as the delay component. Still, the actual condition yields the highest total cost, even if the difference is below 10%. This evaluation will be seen in enhance in the following sensitivity analysis subchapter.

Meanwhile, Scenario 2 has the least total inventory cost. This is the most preferable condition due to 2017 data. However, the result may vary, regarding to the components' behavior. Scenario 2 has the same EOI with Scenario 3 which is 122 days or 4 months long, it is shown in Scenario 3 T* equation:

$$T* = \sqrt{\frac{2\left[C + nc + \frac{I_c}{2}\sum_{i=1}^{n}P_iR_i(t_1^2 + M - 2t_1M) - \frac{I_e}{2}M\sum_{i=1}^{n}P_iR_i\right]}{F\sum_{i=1}^{n}P_iR_i}} \qquad (2.16)$$

What differs 3rd T* to 2nd Scenario is starting from variable Ic up to Ie, which are multiplied by purchase cost and combination operation of delay period and actual payment time. In fact, that side yields only IDR 257,801 difference in the numerator. This behavior can be predicted, the higher the value (moreover, the interest charged as the component with the plus sign), the higher the T* will be. IDR 257,801 is only 0.0002 of the annual holding cost as the de-numerator. Thus, the T* in year is not significantly different, and the review period is in the same day-length.

Scenario 3 has the second least total inventory cost. What affects the count up is the interest charged.

5.2 Average Inventory Level Analysis

AIL is affected by SS, annual demand, and order interval. It varies on each scenario due to different order interval. Here is the summary of AIL on all scenario:

Table 5.2 Average Inventory Level Recapitulation on Each Scenario

Item	AIL Scenario 1	Ail Scenario 2	AIL Scenario 3
Koate IU-1060 IU (BLB)	18	50	50
Micardis 80 mg Tablet	5,103	16,290	16,327
Clopidogel	13,239	40,451	40,543
Anbacin Inj	662	1,965	1,970
Ceftriaxon	1,845	6,115	6,128
Inviclot	360	1,318	1,321
Nimotop Tab	5,583	14,074	14,101
Micardis 40mg	3,603	11,144	11,169
Ferriprox Tab	508	1,273	1,276
Asering Infus	1,371	4,070	4,079

It is known that the AIL of Scenario 1 is the least on all products in 2017 compared to Scenario 2 and 3. On the other hand, Scenario 2 and 3 have no significant difference or they have relatively the same AIL. It can be concluded that the behavior of AIL follows the order interval behavior linearly. Since the order interval is the numerator, beside annual demand and SS which affect the value, AIL increases by the increase of order interval.

AIL is used to estimate the average space required at a period of time. If the AIL keep on increasing, it is no wonder yielding to an increase in future holding cost. The probability of insufficient space and capacity may also raise. Right or wrong in determining review period will critically determine the sufficiency of space and capacity in inventory. This urges the hospital to carefully calculate the EOI with highly confident on demand data accuracy and service level fulfillment (avoiding stockout).

5.3 One-Way Sensitivity Analysis

The one-way sensitivity analysis has been done on each of delay period and interest charged. To comprehend the behavior and reaction of the EOI and the minimum total inventory cost, here is the result shown in graph:
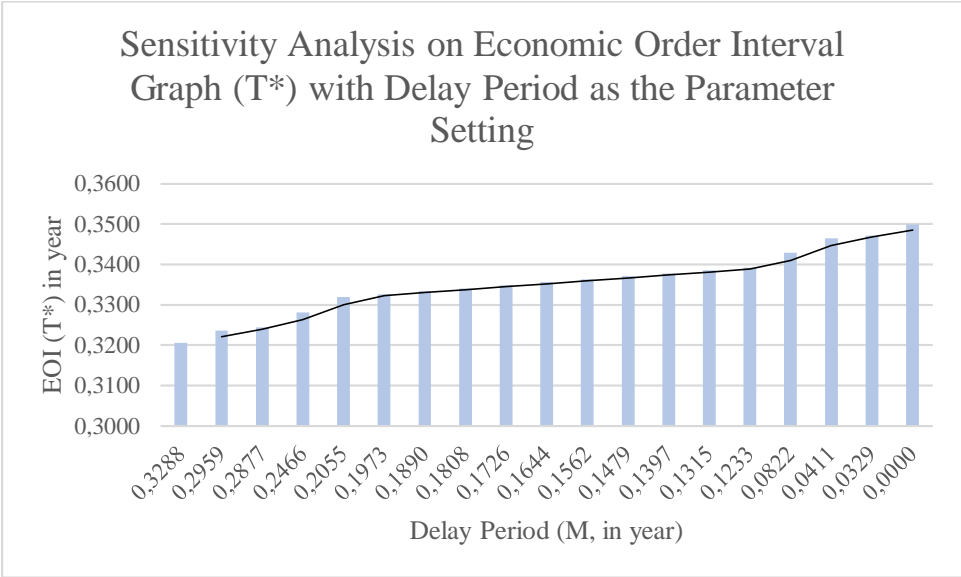
Figure 5.1 Sensitivity Analysis on the Economic Order Interval (T*) Graph with Delay Period as the Parameter Setting
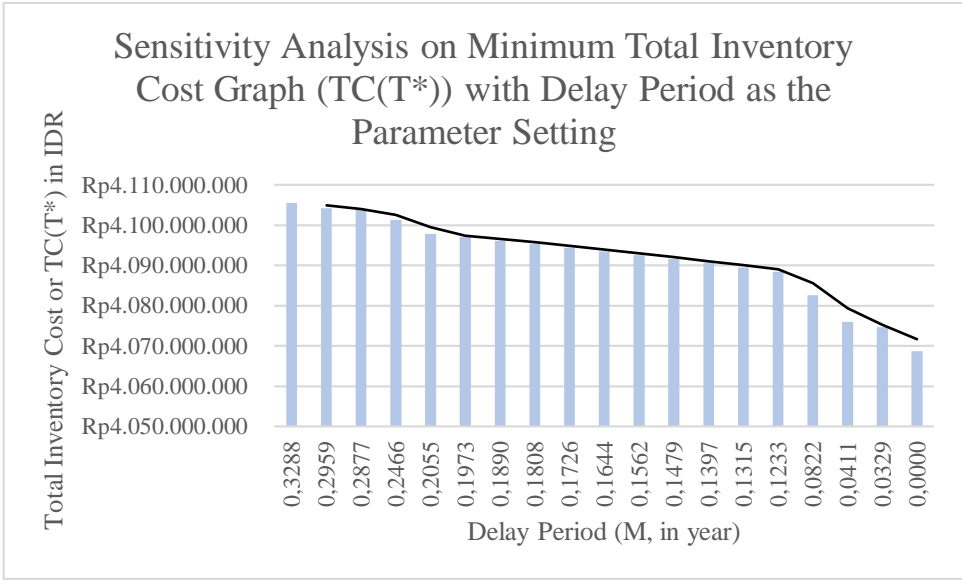
Figure 5.2 Sensitivity Analysis on the Minimum Total Inventory Cost or TC (T*) Graph with Delay Period as the Parameter Setting

The figure above shows the result with delay period as the parameter setting, T* as the output. It can be concluded that:

1. The shorter the delay period (M), the longer the EOI (T*), the lower the TC (T*). This has a meaning that: a strict tolerance on delay period will trigger the hospital to push down the total inventory cost by lengthening the review period.

2. The longer the delay period (M), the shorter the EOI (T*) and the higher the total cost TC (T*) will be. Loose in delay period (high tolerance) will trigger the hospital wants more accuracy on its review policy by shortening the review period. It moves closer to continuous review policy hence the expense is getting bigger by inclining review frequency.

After having the delay period as the parameter setting, interest charged is the next parameter assessed. Here is the resulted graph:
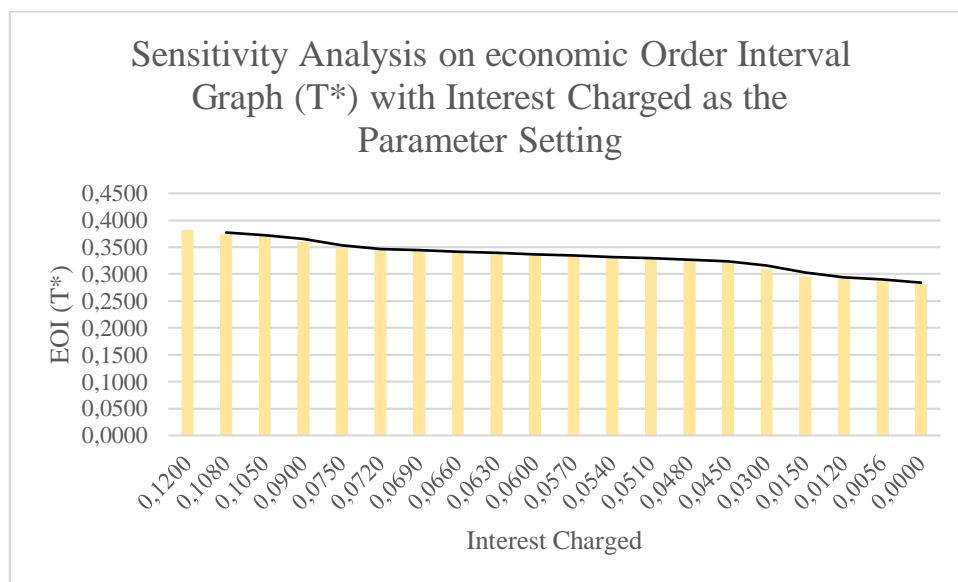
Figure 5.3 Sensitivity Analysis on the Economic Order Interval (T*) Graph with Interest Charged as the Parameter Setting
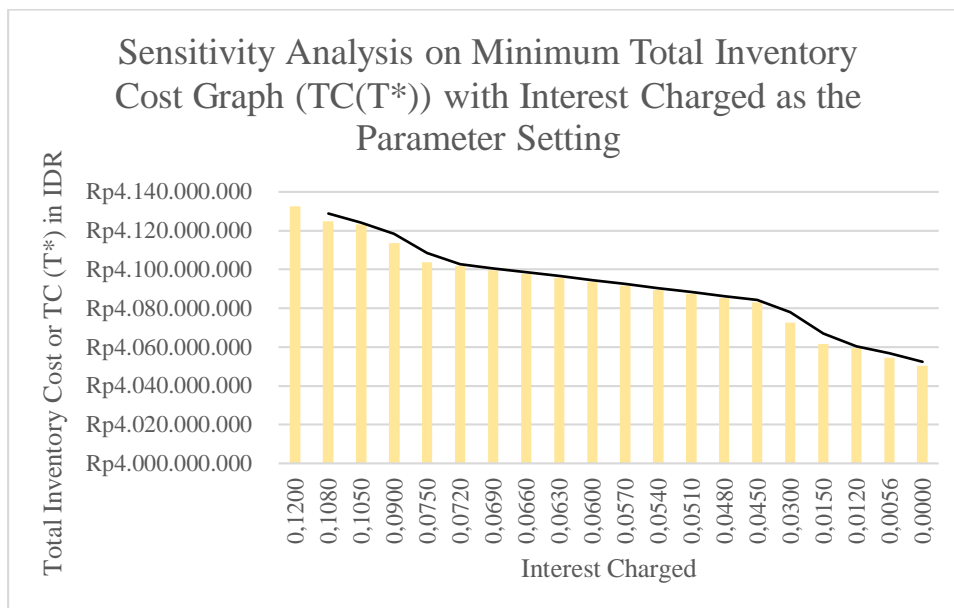
Figure 5.4 Sensitivity Analysis on the Minimum Total Inventory Cost or TC (T*) Graph with Interest Charged as the Parameter Setting

The figure above shows the result with interest charged as the parameter setting, T* and TC (T*) as the output. It can be concluded that:

1. The smaller the interest charged (I_c), the shorter the EOI (T*), and the lower the TC (T*). This has a meaning that the lesser the supplier charges the hospital, the hospital will be triggered to increase the review frequency. It becomes shorter (the EOI) move closer to continuous review policy and yield to lower total cost, supported by the least interest charged.

2. The higher the interest charged (I_c), the longer the EOI (T*), the higher the TC (T*) will be. This means, effect of adding I_c is bigger than lengthening the order interval. Because by the addition of interest charged, even if the review period is longer, total cost is still inclining affected by the charge.

3. When interest charge drops reaching 90.69%, the resulted TC (T*) is the closest to that of Scenario 2. Total cost of Scenario 2 is IDR 4,054,466,052 while IDR 4,054,466,193. Hence, Scenario 3 is more preferable when the interest charge drops up to 90.69%.

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5.4 Two-Way Sensitivity Analysis

The two-way sensitivity analysis is done simultaneously on the delay period and interest charged. Here is the result shown in 3D Surface graph after generating random number to capture all possibilities of conditions. Based on the graph in the following page, it can be concluded that:

1. Total inventory cost will increase by the increase of both delay period and interest charged at an unknown different rate.

2. Interest charged has higher effect in contribution of adding total inventory cost, known from the orange area (the second lowest category in total inventory cost shown in the legend). Whatever the delay period may vary (0.0062 year or 0.9278 year), the inventory cost remains in range of IDR 4,000,000,000 up to IDR 4,100,000,000.

3. Based on 55x55 matrix generated from random number of M and I_c , Scenario 3 is more preferable due to total inventory cost when Ic and M are on this range:

    a. When M reaches (from below) 0.7015 and Ic reaches 0.0512 (from below) up to the Ic reaches 0.0543.

    b. When M reaches (from below) 0.7314 and Ic reaches 0.0551 (from below) up to the Ic reaches 0.0578.

    c. When M reaches (from below) 0.7514 and Ic reaches 0.0585 (from below) up to the Ic reaches 0.0590.

    d. When M reaches (from below) 0.8580 and Ic reaches 0.07 (from below).

    e. When M reaches (from below) 0.9906 and Ic reaches 0.0782 (from below).

    f. In summary, M is ranged on 0.7015 until 0.9993 and Ic is ranged on 0.0512 until 0.0782.

Below is shown both of the graph, two-way sensitivity analysis toward total inventory cost and Economic Order Interval:

3D Surface Interaction Graph between Delay Period, Interest Charged, and Minimum Total Inventory Cost
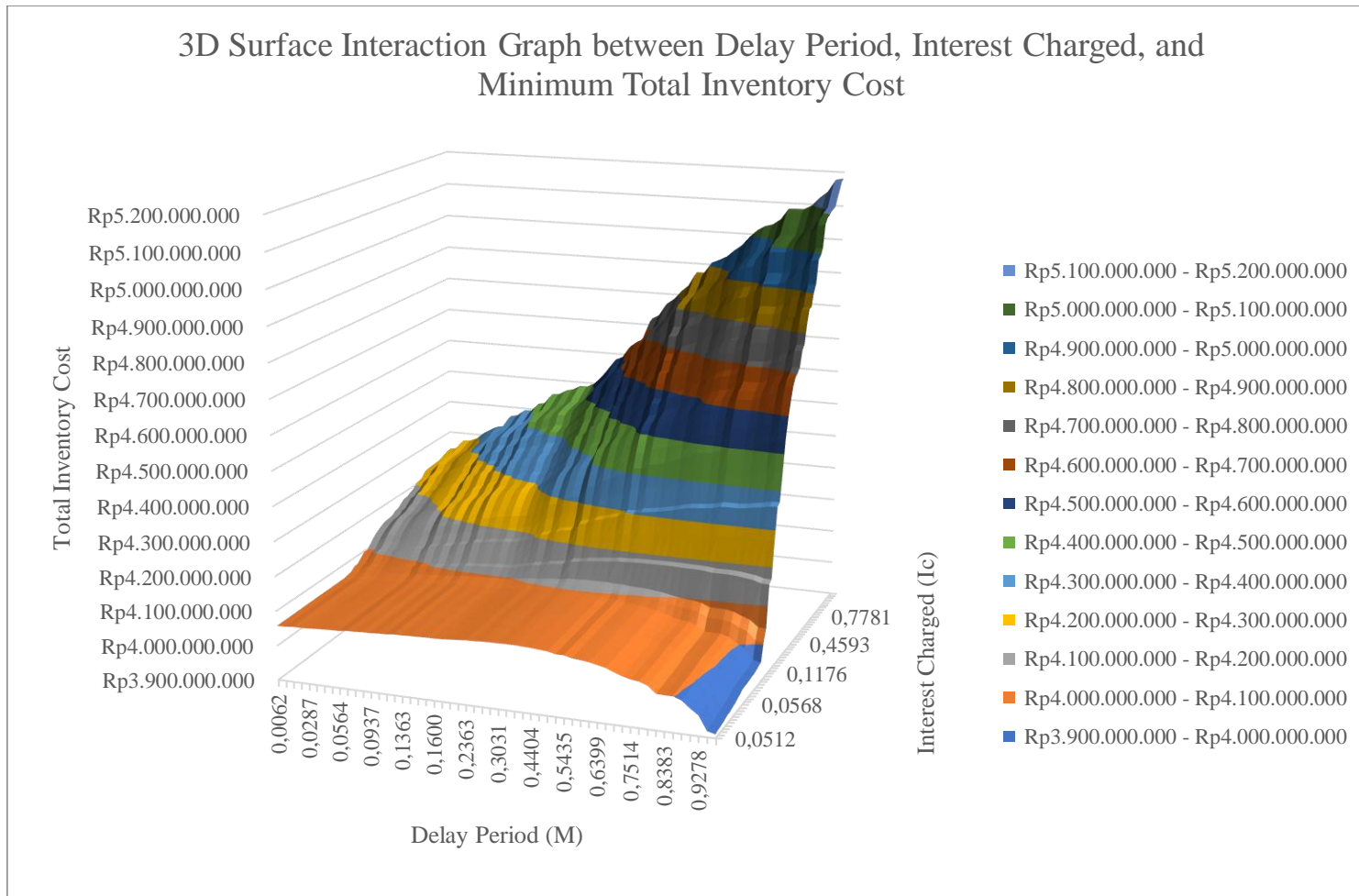
Figure 5.5 Two-Way Sensitivity Analysis Result: 3D Surface Graph between Delay Period, Interest Charged, and Minimum Total Inventory Cost
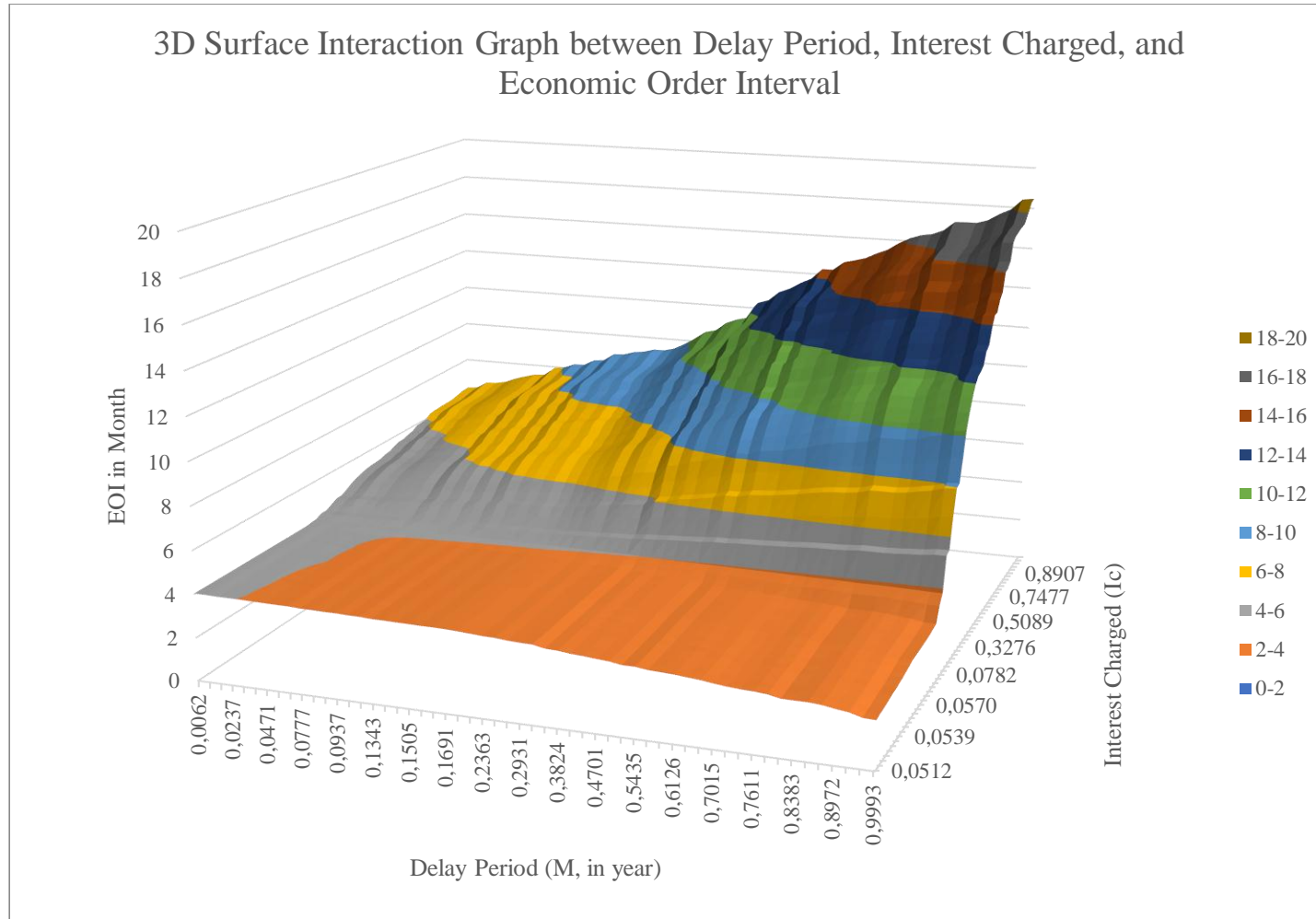
Figure 5.6 Two-Way Sensitivity Analysis Result: 3D Surface Graph between Delay Period, Interest Charged, and Economic Order Interval

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CHAPTER 6
CLOSURE

In this chapter will be explained about the conclusion obtained based on the objectives of research and recommendation for future research and the research object.

6.1 Conclusion

By modifying total inventory cost equation, as the theoretical contribution and a novel research, with the permissible *delay in payment* parameter, this research has come into conclusions. The conclusion obtained is explained in the following.

1. Seen from financial aspect, Scenario 2 is the most preferable with only IDR 4,054,466,052, a 7.41% decreased from the initial condition (Scenario 1) which is IDR 4,379,035,948. However, it is not significantly different from the second least total inventory cost, Scenario 3, which is IDR 4,093,518,931. 6.52% decreased from the initial condition. In addition, the EOI for both (Scenario 2 and Scenario 3) is the same. The EOI is 122 days or 4 months, 3 times per annum as the order frequency.

2. Based on one-way sensitivity analysis on delay period, it is concluded that: the shorter the delay period (M), the longer the EOI (T*), the lower the TC (T*). This has a meaning that: a strict tolerance on delay period will trigger the hospital to push down the total inventory cost by lengthening the review period. In reverse, the longer the delay period (M), the shorter the EOI (T*) and the higher the total cost TC (T*) will be. Loose in delay period (high tolerance) will trigger the hospital wants more accuracy on its review policy by shortening the review period. It moves closer to continuous review policy hence the expense is getting bigger by inclining review frequency.

3. Based on one-way sensitivity analysis on the interest charged, it can be concluded that the smaller the interest charged (I_c), the shorter the EOI (T*), and the lower the TC (T*). This has a meaning that the lesser the supplier charges the hospital, the hospital will be triggered to increase the review frequency. It becomes shorter (the EOI) move closer to continuous review policy and yield to lower total cost, supported by the least interest charged. However, in reverse, the higher the interest charged (I_c), the longer the EOI (T*), the higher the TC (T*) will be. This means, effect of adding I_c is bigger than lengthening the order interval. Because by the addition of interest charged, even if the review period is longer, total cost is still inclining affected by the charge.

4. Based on two-way sensitivity analysis, the total inventory cost will increase by the increase of both delay period and interest charged at an unknown different rate. However, interest charged has higher effect in contribution of adding total inventory cost. Whatever the delay period may vary, the inventory cost remains low as long as the interest charged from the supplier is low.

5. Scenario 3 can be more preferable than Scenario 2 whenever these situation is occupied. It is when the interest charge drops reaching up to 90.69% and more. Total cost of Scenario 2 is IDR 4,054,466,052 while IDR 4,054,466,193 at that point. Scenario 3 can also be more preferable whenever M is ranged on 0.7015 until 0.9993 simultaneously with Ic that is ranged on 0.0512 until 0.0782.

6.2 Recommendation

The recommendation is made for future research and the research object. It is formulated as follows.

1. Multiplayer decision making is needed to be considered, such as the application of game theory involving the supplier, and other type of warehouse inside the hospital. It is to know the behavior and the player reaction regarding to the hospital decision making, thus the hospital would be completely ready to implement this research method. Multi-supplier can also be considered toward wide variety of pharmaceutical products and its sources' probability.

2. In implementing the method or assessing future research, older data needs to be considered, besides calculating forecast that yields to inaccuracy of result (reality blurred).

3. Scheme in which the delay period is higher than the period in which inventory level is positive is also needed to be considered.

4. To raise accuracy, manual or actual calculation needs to be considered on holding cost regarding to the space requirement, capacity, overhead cost regarding to electricity, etc.

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ATTACHMENTS

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3)

TC(T*)		Dellay Period (M)				
		0.0062	0.0085	0.0226	0.0237	0.0287
	0.0512	Rp 4,057,124,366.55	Rp 4,057,502,097.87	Rp 4,059,750,473.33	Rp 4,059,924,241.72	Rp 4,060,710,498.85
	0.0518	Rp 4,057,283,743.88	Rp 4,057,665,861.32	Rp 4,059,940,646.99	Rp 4,060,116,479.36	Rp 4,060,912,119.23
	0.0519	Rp 4,057,309,780.83	Rp 4,057,692,614.61	Rp 4,059,971,713.38	Rp 4,060,147,882.80	Rp 4,060,945,054.89
	0.0523	Rp 4,057,405,768.94	Rp 4,057,791,243.09	Rp 4,060,086,239.07	Rp 4,060,263,650.78	Rp 4,061,066,470.09
	0.0528	Rp 4,057,538,539.90	Rp 4,057,927,664.93	Rp 4,060,244,640.87	Rp 4,060,423,770.11	Rp 4,061,234,396.83
	0.0532	Rp 4,057,655,894.15	Rp 4,058,048,244.89	Rp 4,060,384,639.80	Rp 4,060,565,286.37	Rp 4,061,382,810.25
	0.0533	Rp 4,057,666,184.49	Rp 4,058,058,818.02	Rp 4,060,396,915.32	Rp 4,060,577,694.90	Rp 4,061,395,823.40
Interest Charged (Ic)	0.0539	Rp 4,057,828,837.37	Rp 4,058,225,939.66	Rp 4,060,590,937.02	Rp 4,060,773,818.32	Rp 4,061,601,500.15
	0.0543	Rp 4,057,925,331.86	Rp 4,058,325,084.20	Rp 4,060,706,032.69	Rp 4,060,890,160.18	Rp 4,061,723,506.43
	0.0551	Rp 4,058,139,920.06	Rp 4,058,545,562.86	Rp 4,060,961,964.20	Rp 4,061,148,861.26	Rp 4,061,994,795.92
	0.0558	Rp 4,058,316,835.95	Rp 4,058,727,332.18	Rp 4,061,172,941.81	Rp 4,061,362,120.41	Rp 4,062,218,424.85
	0.0568	Rp 4,058,576,365.14	Rp 4,058,993,976.42	Rp 4,061,482,399.97	Rp 4,061,674,922.54	Rp 4,062,546,424.99
	0.0568	Rp 4,058,585,507.07	Rp 4,059,003,368.87	Rp 4,061,493,299.82	Rp 4,061,685,940.12	Rp 4,062,557,977.61
	0.0569	Rp 4,058,604,607.77	Rp 4,059,022,992.98	Rp 4,061,516,073.24	Rp 4,061,708,959.50	Rp 4,062,582,114.83
	0.0570	Rp 4,058,642,421.47	Rp 4,059,061,842.79	Rp 4,061,561,157.13	Rp 4,061,754,530.26	Rp 4,062,629,898.29
	0.0573	Rp 4,058,721,621.32	Rp 4,059,143,212.35	Rp 4,061,655,581.08	Rp 4,061,849,973.70	Rp 4,062,729,975.04
	0.0574	Rp 4,058,729,736.30	Rp 4,059,151,549.61	Rp 4,061,665,255.71	Rp 4,061,859,752.78	Rp 4,062,740,228.77
	0.0578	Rp 4,058,840,160.91	Rp 4,059,264,998.39	Rp 4,061,796,898.89	Rp 4,061,992,816.80	Rp 4,062,879,749.98

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0062	0.0085	0.0226	0.0237	0.0287
Interest Charged (Ic)	0.0585	Rp 4,059,033,457.97	Rp 4,059,463,586.78	Rp 4,062,027,319.08	Rp 4,062,225,722.63	Rp 4,063,123,951.79
	0.0590	Rp 4,059,166,477.61	Rp 4,059,600,245.89	Rp 4,062,185,870.84	Rp 4,062,385,983.79	Rp 4,063,291,981.06
	0.0700	Rp 4,061,986,231.25	Rp 4,062,496,804.29	Rp 4,065,544,088.80	Rp 4,065,780,224.06	Rp 4,066,849,876.47
	0.0782	Rp 4,064,080,332.12	Rp 4,064,647,525.18	Rp 4,068,034,725.63	Rp 4,068,297,354.54	Rp 4,069,487,320.30
	0.1176	Rp 4,073,972,242.53	Rp 4,074,802,279.31	Rp 4,079,763,066.23	Rp 4,080,148,037.19	Rp 4,081,893,048.14
	0.1207	Rp 4,074,731,980.34	Rp 4,075,581,902.02	Rp 4,080,661,455.39	Rp 4,081,055,640.65	Rp 4,082,842,421.29
	0.1668	Rp 4,085,900,756.61	Rp 4,087,038,343.24	Rp 4,093,831,968.26	Rp 4,094,358,856.13	Rp 4,096,746,711.13
	0.2144	Rp 4,097,078,919.07	Rp 4,098,496,253.42	Rp 4,106,950,067.89	Rp 4,107,605,026.90	Rp 4,110,572,188.91
	0.2190	Rp 4,098,128,895.18	Rp 4,099,572,115.13	Rp 4,108,179,243.72	Rp 4,108,846,008.86	Rp 4,111,866,538.21
	0.2676	Rp 4,109,153,529.07	Rp 4,110,864,747.81	Rp 4,121,056,364.88	Rp 4,121,844,955.52	Rp 4,125,415,852.05
	0.3276	Rp 4,122,327,948.40	Rp 4,124,350,943.28	Rp 4,136,379,991.53	Rp 4,137,309,459.66	Rp 4,141,516,129.83
	0.3695	Rp 4,131,267,170.50	Rp 4,133,496,908.75	Rp 4,146,741,289.33	Rp 4,147,763,731.39	Rp 4,152,389,644.83
	0.4046	Rp 4,138,584,291.05	Rp 4,140,980,582.75	Rp 4,155,202,426.52	Rp 4,156,299,538.22	Rp 4,161,261,979.47
	0.4046	Rp 4,138,584,291	Rp 4,140,980,583	Rp 4,155,202,427	Rp 4,156,299,538	Rp 4,161,261,979
	0.4355	Rp 4,144,936,206	Rp 4,147,475,239	Rp 4,162,533,745	Rp 4,163,694,700	Rp 4,168,944,764
	0.4537	Rp 4,148,610,321	Rp 4,151,231,173	Rp 4,166,768,831	Rp 4,167,966,322	Rp 4,173,380,939
	0.4593	Rp 4,149,744,001	Rp 4,152,389,991	Rp 4,168,074,808	Rp 4,169,283,516	Rp 4,174,748,648
	0.4706	Rp 4,152,016,983	Rp 4,154,713,224	Rp 4,170,692,128	Rp 4,171,923,249	Rp 4,177,489,299
	0.5089	Rp 4,159,598,900	Rp 4,162,461,351	Rp 4,179,412,255	Rp 4,180,717,401	Rp 4,186,616,707

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)								
		0.0062		0.0085		0.0226		0.0237		0.0287	
Interest Charged (Ic)	**0.5216**	Rp	4,162,089,801	Rp	4,165,006,399	Rp	4,182,273,717	Rp	4,183,602,945	Rp	4,189,610,643
	0.5730	Rp	4,172,017,417	Rp	4,175,147,665	Rp	4,193,662,462	Rp	4,195,086,569	Rp	4,201,521,197
	0.6114	Rp	4,179,278,478	Rp	4,182,562,911	Rp	4,201,977,018	Rp	4,203,469,462	Rp	4,210,211,486
	0.6138	Rp	4,179,730,506	Rp	4,183,024,482	Rp	4,202,494,224	Rp	4,203,990,894	Rp	4,210,751,925
	0.6531	Rp	4,187,026,475	Rp	4,190,473,606	Rp	4,210,835,876	Rp	4,212,400,316	Rp	4,219,466,122
	0.6739	Rp	4,190,859,399	Rp	4,194,386,348	Rp	4,215,213,500	Rp	4,216,813,222	Rp	4,224,037,668
	0.7477	Rp	4,204,139,795	Rp	4,207,940,067	Rp	4,230,357,834	Rp	4,232,078,194	Rp	4,239,844,937
	0.7562	Rp	4,205,648,408	Rp	4,209,479,424	Rp	4,232,075,991	Rp	4,233,809,904	Rp	4,241,637,562
	0.7781	Rp	4,209,506,851	Rp	4,213,416,226	Rp	4,236,468,417	Rp	4,238,236,861	Rp	4,246,219,704
	0.8532	Rp	4,222,520,398	Rp	4,226,691,294	Rp	4,251,263,132	Rp	4,253,146,686	Rp	4,261,646,752
	0.8723	Rp	4,225,773,784	Rp	4,230,009,421	Rp	4,254,957,245	Rp	4,256,869,265	Rp	4,265,497,219
	0.8781	Rp	4,226,752,446	Rp	4,231,007,509	Rp	4,256,068,139	Rp	4,257,988,699	Rp	4,266,655,016
	0.8873	Rp	4,228,295,743	Rp	4,232,581,397	Rp	4,257,819,641	Rp	4,259,753,646	Rp	4,268,480,363
	0.8907	Rp	4,228,875,989	Rp	4,233,173,130	Rp	4,258,478,067	Rp	4,260,417,120	Rp	4,269,166,515
	0.8956	Rp	4,229,695,540	Rp	4,234,008,892	Rp	4,259,407,948	Rp	4,261,354,126	Rp	4,270,135,522
	0.9226	Rp	4,234,230,544	Rp	4,238,633,332	Rp	4,264,551,530	Rp	4,266,536,997	Rp	4,275,494,877
	0.9483	Rp	4,238,489,045	Rp	4,242,975,404	Rp	4,269,378,576	Rp	4,271,400,738	Rp	4,280,523,440
	0.9752	Rp	4,242,920,471	Rp	4,247,493,382	Rp	4,274,398,707	Rp	4,276,458,857	Rp	4,285,752,173
	0.9845	Rp	4,244,445,250	Rp	4,249,047,847	Rp	4,276,125,375	Rp	4,278,198,550	Rp	4,287,550,363

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0392	0.0471	0.0541	0.0564	0.0777
Interest Charged (Ic)	0.0512	Rp 4,062,307,855.66	Rp 4,063,481,408.30	Rp 4,064,487,751.17	Rp 4,064,824,994.09	Rp 4,067,781,196.02
	0.0518	Rp 4,062,528,771.47	Rp 4,063,716,716.18	Rp 4,064,735,559.67	Rp 4,065,077,026.71	Rp 4,068,071,096.18
	0.0519	Rp 4,062,564,857.98	Rp 4,063,755,152.73	Rp 4,064,776,037.33	Rp 4,065,118,194.08	Rp 4,068,118,446.16
	0.0523	Rp 4,062,697,885.75	Rp 4,063,896,841.40	Rp 4,064,925,248.23	Rp 4,065,269,946.73	Rp 4,068,292,982.82
	0.0528	Rp 4,062,881,866.33	Rp 4,064,092,794.58	Rp 4,065,131,599.45	Rp 4,065,479,811.37	Rp 4,068,534,339.26
	0.0532	Rp 4,063,044,461.10	Rp 4,064,265,964.82	Rp 4,065,313,953.90	Rp 4,065,665,268.99	Rp 4,068,747,609.78
	0.0533	Rp 4,063,058,717.39	Rp 4,064,281,148.11	Rp 4,065,329,942.23	Rp 4,065,681,529.33	Rp 4,068,766,307.93
	0.0539	Rp 4,063,284,035.53	Rp 4,064,521,112.31	Rp 4,065,582,624.98	Rp 4,065,938,509.30	Rp 4,069,061,799.58
	0.0543	Rp 4,063,417,687.01	Rp 4,064,663,446.74	Rp 4,065,732,499.27	Rp 4,066,090,931.00	Rp 4,069,237,049.64
	0.0551	Rp 4,063,714,854.60	Rp 4,064,979,908.13	Rp 4,066,065,713.48	Rp 4,066,429,805.11	Rp 4,069,626,640.13
	0.0558	Rp 4,063,959,798.92	Rp 4,065,240,742.91	Rp 4,066,340,344.88	Rp 4,066,709,097.47	Rp 4,069,947,693.35
	0.0568	Rp 4,064,319,035.94	Rp 4,065,623,264.20	Rp 4,066,743,080.72	Rp 4,067,118,662.10	Rp 4,070,418,435.00
	0.0568	Rp 4,064,331,688.19	Rp 4,065,636,736.07	Rp 4,066,757,264.11	Rp 4,067,133,085.85	Rp 4,070,435,011.89
	0.0569	Rp 4,064,358,122.76	Rp 4,065,664,882.98	Rp 4,066,786,897.53	Rp 4,067,163,221.42	Rp 4,070,469,645.71
	0.0570	Rp 4,064,410,453.71	Rp 4,065,720,603.36	Rp 4,066,845,560.29	Rp 4,067,222,878.12	Rp 4,070,538,206.00
	0.0573	Rp 4,064,520,052.42	Rp 4,065,837,299.00	Rp 4,066,968,416.66	Rp 4,067,347,815.58	Rp 4,070,681,784.94
	0.0574	Rp 4,064,531,281.59	Rp 4,065,849,255.17	Rp 4,066,981,003.92	Rp 4,067,360,616.02	Rp 4,070,696,494.90
	0.0578	Rp 4,064,684,072.44	Rp 4,066,011,935.66	Rp 4,067,152,269.12	Rp 4,067,534,781.05	Rp 4,070,896,633.99

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0392	0.0471	0.0541	0.0564	0.0777
Interest Charged (Ic)	0.0585	Rp 4,064,951,486.13	Rp 4,066,296,647.46	Rp 4,067,451,995.71	Rp 4,067,839,579.31	Rp 4,071,246,856.09
	0.0590	Rp 4,065,135,476.76	Rp 4,066,492,531.96	Rp 4,067,658,203.48	Rp 4,068,049,273.93	Rp 4,071,487,777.60
	0.0700	Rp 4,069,029,423.72	Rp 4,070,636,712.71	Rp 4,072,019,455.69	Rp 4,072,483,821.64	Rp 4,076,578,235.40
	0.0782	Rp 4,071,913,663.08	Rp 4,073,704,508.19	Rp 4,075,246,340.50	Rp 4,075,764,395.49	Rp 4,080,338,673.24
	0.1176	Rp 4,085,455,278.06	Rp 4,088,088,736.66	Rp 4,090,359,424.26	Rp 4,091,123,160.70	Rp 4,097,887,256.64
	0.1207	Rp 4,086,489,963.80	Rp 4,089,186,569.03	Rp 4,091,511,787.42	Rp 4,092,293,886.77	Rp 4,099,221,276.64
	0.1668	Rp 4,101,619,533.44	Rp 4,105,221,104.81	Rp 4,108,326,545.06	Rp 4,109,371,124.68	Rp 4,118,627,370.30
	0.2144	Rp 4,116,622,065.48	Rp 4,121,089,841.10	Rp 4,124,940,062.95	Rp 4,126,234,795.68	Rp 4,137,702,191.10
	0.2190	Rp 4,118,024,675.36	Rp 4,122,571,980.74	Rp 4,126,490,494.43	Rp 4,127,808,146.76	Rp 4,139,477,766.34
	0.2676	Rp 4,132,688,911.00	Rp 4,138,054,006.88	Rp 4,142,673,961.31	Rp 4,144,226,868.51	Rp 4,157,968,981.29
	0.3276	Rp 4,150,073,940.50	Rp 4,156,378,851.67	Rp 4,161,803,305.25	Rp 4,163,625,713.97	Rp 4,179,735,589.27
	0.3695	Rp 4,161,793,013.66	Rp 4,168,715,167.70	Rp 4,174,667,181.78	Rp 4,176,666,159.77	Rp 4,194,324,119.63
	0.4046	Rp 4,171,343,244.56	Rp 4,178,759,594.09	Rp 4,185,133,591.27	Rp 4,187,273,722.73	Rp 4,206,167,663.68
	0.4046	Rp 4,171,343,245	Rp 4,178,759,594	Rp 4,185,133,591	Rp 4,187,273,723	Rp 4,206,167,664
	0.4355	Rp 4,179,604,872	Rp 4,187,442,785	Rp 4,194,176,485	Rp 4,196,436,887	Rp 4,216,382,939
	0.4537	Rp 4,184,372,003	Rp 4,192,450,784	Rp 4,199,389,908	Rp 4,201,718,975	Rp 4,222,265,324
	0.4593	Rp 4,185,841,280	Rp 4,193,993,958	Rp 4,200,996,092	Rp 4,203,346,218	Rp 4,224,076,621
	0.4706	Rp 4,188,784,804	Rp 4,197,085,057	Rp 4,204,213,002	Rp 4,206,605,173	Rp 4,227,702,970
	0.5089	Rp 4,198,581,786	Rp 4,207,368,820	Rp 4,214,911,591	Rp 4,217,442,360	Rp 4,239,750,588

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)								
		0.0392		0.0471		0.0541		0.0564		0.0777
	0.5216	Rp 4,201,793,389	Rp 4,210,738,579		Rp 4,218,416,073		Rp 4,220,991,845		Rp 4,243,692,895	
	0.5730	Rp 4,214,560,774	Rp 4,224,128,151		Rp 4,232,335,415		Rp 4,235,088,102		Rp 4,259,332,561	
	0.6114	Rp 4,223,867,535	Rp 4,233,882,211		Rp 4,242,470,122		Rp 4,245,349,885		Rp 4,270,702,157	
	0.6138	Rp 4,224,446,081	Rp 4,234,488,397		Rp 4,243,099,824		Rp 4,245,987,437		Rp 4,271,408,121	
	0.6531	Rp 4,233,771,128	Rp 4,244,256,386		Rp 4,253,244,586		Rp 4,256,257,949		Rp 4,282,774,273	
	0.6739	Rp 4,238,660,505	Rp 4,249,376,135		Rp 4,258,560,236		Rp 4,261,638,971		Rp 4,288,724,665	
Interest Charged (Ic)	0.7477	Rp 4,255,553,664	Rp 4,267,055,930		Rp 4,276,908,694		Rp 4,280,210,512		Rp 4,309,238,217	
	0.7562	Rp 4,257,468,210	Rp 4,269,058,758		Rp 4,278,986,541		Rp 4,282,313,383		Rp 4,311,558,841	
	0.7781	Rp 4,262,360,914	Rp 4,274,176,303		Rp 4,284,295,129		Rp 4,287,685,692		Rp 4,317,485,575	
	0.8532	Rp 4,278,822,610	Rp 4,291,386,742		Rp 4,302,141,565		Rp 4,305,744,227		Rp 4,337,388,859	
	0.8723	Rp 4,282,928,806	Rp 4,295,677,933		Rp 4,306,589,853		Rp 4,310,244,896		Rp 4,342,344,983	
	0.8781	Rp 4,284,163,311	Rp 4,296,967,922		Rp 4,307,926,957		Rp 4,311,597,709		Rp 4,343,834,375	
	0.8873	Rp 4,286,109,418	Rp 4,299,001,373		Rp 4,310,034,573		Rp 4,313,730,054		Rp 4,346,181,703	
	0.8907	Rp 4,286,840,909	Rp 4,299,765,656		Rp 4,310,826,699		Rp 4,314,531,464		Rp 4,347,063,817	
	0.8956	Rp 4,287,873,894	Rp 4,300,844,914		Rp 4,311,945,245		Rp 4,315,663,109		Rp 4,348,309,336	
	0.9226	Rp 4,293,586,045	Rp 4,306,812,192		Rp 4,318,129,130		Rp 4,321,919,210		Rp 4,355,193,175	
	0.9483	Rp 4,298,944,034	Rp 4,312,408,371		Rp 4,323,927,511		Rp 4,327,785,000		Rp 4,361,644,841	
	0.9752	Rp 4,304,513,720	Rp 4,318,224,542		Rp 4,329,952,904		Rp 4,333,880,139		Rp 4,368,346,084	
	0.9845	Rp 4,306,428,801	Rp 4,320,224,117		Rp 4,332,024,196		Rp 4,335,975,336		Rp 4,370,649,014	

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0813	0.0929	0.0937	0.1096	0.1129
Interest Charged (Ic)	0.0512	Rp 4,068,258,976.93	Rp 4,069,768,717.36	Rp 4,069,870,669	Rp 4,071,837,340	Rp 4,072,227,399
	0.0518	Rp 4,068,555,153.99	Rp 4,070,085,058.89	Rp 4,070,188,392	Rp 4,072,182,237	Rp 4,072,577,817
	0.0519	Rp 4,068,603,528.75	Rp 4,070,136,725.66	Rp 4,070,240,284	Rp 4,072,238,565	Rp 4,072,635,047
	0.0523	Rp 4,068,781,841.77	Rp 4,070,327,169.71	Rp 4,070,431,559	Rp 4,072,446,187	Rp 4,072,845,990
	0.0528	Rp 4,069,028,417.56	Rp 4,070,590,511.39	Rp 4,070,696,048	Rp 4,072,733,269	Rp 4,073,137,662
	0.0532	Rp 4,069,246,297.40	Rp 4,070,823,197.06	Rp 4,070,929,748	Rp 4,072,986,918	Rp 4,073,395,364
	0.0533	Rp 4,069,265,399.55	Rp 4,070,843,596.88	Rp 4,070,950,237	Rp 4,073,009,155	Rp 4,073,417,956
	0.0539	Rp 4,069,567,273.10	Rp 4,071,165,969.23	Rp 4,071,274,013	Rp 4,073,360,550	Rp 4,073,774,962
	0.0543	Rp 4,069,746,305.87	Rp 4,071,357,151.74	Rp 4,071,466,027	Rp 4,073,568,933	Rp 4,073,986,671
	0.0551	Rp 4,070,144,299.51	Rp 4,071,782,134.47	Rp 4,071,892,858	Rp 4,074,032,123	Rp 4,074,457,246
	0.0558	Rp 4,070,472,271.36	Rp 4,072,132,326.30	Rp 4,072,244,571	Rp 4,074,413,768	Rp 4,074,844,971
	0.0568	Rp 4,070,953,147.25	Rp 4,072,645,747.58	Rp 4,072,760,221	Rp 4,074,973,254	Rp 4,075,413,361
	0.0568	Rp 4,070,970,080.78	Rp 4,072,663,826.43	Rp 4,072,778,378	Rp 4,074,992,953	Rp 4,075,433,374
	0.0569	Rp 4,071,005,459.71	Rp 4,072,701,598.09	Rp 4,072,816,314	Rp 4,075,034,112	Rp 4,075,475,187
	0.0570	Rp 4,071,075,494.79	Rp 4,072,776,369.13	Rp 4,072,891,409	Rp 4,075,115,585	Rp 4,075,557,956
	0.0573	Rp 4,071,222,161.40	Rp 4,072,932,950.96	Rp 4,073,048,670	Rp 4,075,286,200	Rp 4,075,731,283
	0.0574	Rp 4,071,237,187.63	Rp 4,072,948,992.81	Rp 4,073,064,781	Rp 4,075,303,679	Rp 4,075,749,040
	0.0578	Rp 4,071,441,628.70	Rp 4,073,167,248.14	Rp 4,073,283,982	Rp 4,075,541,484	Rp 4,075,990,623

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0813	0.0929	0.0937	0.1096	0.1129
Interest Charged (Ic)	0.0585	Rp 4,071,799,373.59	Rp 4,073,549,148.82	Rp 4,073,667,536	Rp 4,075,957,568	Rp 4,076,413,314
	0.0590	Rp 4,072,045,466.26	Rp 4,073,811,845.46	Rp 4,073,931,370	Rp 4,076,243,759	Rp 4,076,704,046
	0.0700	Rp 4,077,244,463.17	Rp 4,079,359,214.21	Rp 4,079,502,581	Rp 4,082,283,775	Rp 4,082,839,238
	0.0782	Rp 4,081,084,213.46	Rp 4,083,453,368.35	Rp 4,083,614,137	Rp 4,086,737,322	Rp 4,087,362,176
	0.1176	Rp 4,098,993,759.10	Rp 4,102,519,066.84	Rp 4,102,758,834	Rp 4,107,432,372	Rp 4,108,371,339
	0.1207	Rp 4,100,354,634.60	Rp 4,103,965,853.38	Rp 4,104,211,485	Rp 4,108,999,979	Rp 4,109,962,206
	0.1668	Rp 4,120,142,880.41	Rp 4,124,975,115.22	Rp 4,125,304,017	Rp 4,131,722,806	Rp 4,133,014,486
	0.2144	Rp 4,139,579,190.62	Rp 4,145,564,065.00	Rp 4,145,971,446	Rp 4,153,923,666	Rp 4,155,524,534
	0.2190	Rp 4,141,387,767.23	Rp 4,147,477,765.76	Rp 4,147,892,299	Rp 4,155,984,127	Rp 4,157,613,115
	0.2676	Rp 4,160,216,680.24	Rp 4,167,381,499.54	Rp 4,167,869,109	Rp 4,177,386,214	Rp 4,179,302,009
	0.3276	Rp 4,182,368,067.82	Rp 4,190,755,773.75	Rp 4,191,326,431	Rp 4,202,460,961	Rp 4,204,701,709
	0.3695	Rp 4,197,207,663.37	Rp 4,206,392,413.98	Rp 4,207,017,152	Rp 4,219,203,825	Rp 4,221,655,703
	0.4046	Rp 4,209,251,403.71	Rp 4,219,071,276.52	Rp 4,219,739,086	Rp 4,232,763,152	Rp 4,235,382,944
	0.4046	Rp 4,209,251,404	Rp 4,219,071,277	Rp 4,219,739,086	Rp 4,232,763,152	Rp 4,235,382,944
	0.4355	Rp 4,219,636,934	Rp 4,229,996,671	Rp 4,230,701,077	Rp 4,244,436,315	Rp 4,247,198,635
	0.4537	Rp 4,225,616,400	Rp 4,236,283,870	Rp 4,237,009,132	Rp 4,251,149,516	Rp 4,253,993,003
	0.4593	Rp 4,227,457,454	Rp 4,238,219,235	Rp 4,238,950,887	Rp 4,253,215,405	Rp 4,256,083,757
	0.4706	Rp 4,231,143,191	Rp 4,242,093,175	Rp 4,242,837,579	Rp 4,257,349,767	Rp 4,260,267,724
	0.5089	Rp 4,243,386,369	Rp 4,254,955,922	Rp 4,255,742,298	Rp 4,271,069,429	Rp 4,274,150,562

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.0813	0.0929	0.0937	0.1096	0.1129
Interest Charged (Ic)	0.5216	Rp 4,247,392,109	Rp 4,259,162,578	Rp 4,259,962,562	Rp 4,275,553,844	Rp 4,278,687,852
	0.5730	Rp 4,263,280,869	Rp 4,275,840,080	Rp 4,276,693,473	Rp 4,293,321,222	Rp 4,296,662,640
	0.6114	Rp 4,274,829,135	Rp 4,287,953,890	Rp 4,288,845,567	Rp 4,306,216,019	Rp 4,309,706,006
	0.6138	Rp 4,275,546,130	Rp 4,288,705,794	Rp 4,289,599,834	Rp 4,307,016,119	Rp 4,310,515,273
	0.6531	Rp 4,287,088,894	Rp 4,300,807,429	Rp 4,301,739,294	Rp 4,319,889,164	Rp 4,323,535,019
	0.6739	Rp 4,293,131,032	Rp 4,307,139,840	Rp 4,308,091,348	Rp 4,326,622,115	Rp 4,330,344,128
	0.7477	Rp 4,313,957,369	Rp 4,328,955,534	Rp 4,329,973,978	Rp 4,349,802,443	Rp 4,353,783,854
	0.7562	Rp 4,316,313,052	Rp 4,331,422,089	Rp 4,332,448,034	Rp 4,352,421,878	Rp 4,356,432,343
	0.7781	Rp 4,322,329,039	Rp 4,337,720,317	Rp 4,338,765,354	Rp 4,359,109,239	Rp 4,363,193,654
	0.8532	Rp 4,342,529,194	Rp 4,358,859,085	Rp 4,359,967,605	Rp 4,381,541,724	Rp 4,385,871,944
	0.8723	Rp 4,347,558,590	Rp 4,364,120,112	Rp 4,365,244,297	Rp 4,387,121,933	Rp 4,391,512,787
	0.8781	Rp 4,349,069,953	Rp 4,365,700,928	Rp 4,366,829,809	Rp 4,388,798,447	Rp 4,393,207,481
	0.8873	Rp 4,351,451,863	Rp 4,368,192,153	Rp 4,369,328,427	Rp 4,391,440,293	Rp 4,395,877,938
	0.8907	Rp 4,352,346,959	Rp 4,369,128,284	Rp 4,370,267,333	Rp 4,392,432,962	Rp 4,396,881,346
	0.8956	Rp 4,353,610,795	Rp 4,370,450,019	Rp 4,371,592,982	Rp 4,393,834,468	Rp 4,398,298,005
	0.9226	Rp 4,360,595,599	Rp 4,377,753,951	Rp 4,378,918,494	Rp 4,401,578,060	Rp 4,406,125,108
	0.9483	Rp 4,367,141,484	Rp 4,384,597,626	Rp 4,385,782,305	Rp 4,408,831,953	Rp 4,413,456,914
	0.9752	Rp 4,373,940,188	Rp 4,391,704,346	Rp 4,392,909,851	Rp 4,416,362,938	Rp 4,421,068,475
	0.9845	Rp 4,376,276,518	Rp 4,394,146,232	Rp 4,395,358,874	Rp 4,418,950,208	Rp 4,423,683,355

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1343	0.1363	0.1461	0.1505	0.1599
Interest Charged (Ic)	0.0512	Rp 4,074,674,714	Rp 4,074,892,649	Rp 4,075,931,324	Rp 4,076,384,286	Rp 4,077,324,228
	0.0518	Rp 4,075,060,961	Rp 4,075,282,198	Rp 4,076,336,909	Rp 4,076,797,030	Rp 4,077,752,187
	0.0519	Rp 4,075,124,039	Rp 4,075,345,816	Rp 4,076,403,145	Rp 4,076,864,434	Rp 4,077,822,075
	0.0523	Rp 4,075,356,535	Rp 4,075,580,298	Rp 4,076,647,272	Rp 4,077,112,868	Rp 4,078,079,660
	0.0528	Rp 4,075,677,990	Rp 4,075,904,499	Rp 4,076,984,803	Rp 4,077,456,348	Rp 4,078,435,788
	0.0532	Rp 4,075,961,991	Rp 4,076,190,924	Rp 4,077,282,998	Rp 4,077,759,797	Rp 4,078,750,405
	0.0533	Rp 4,075,986,888	Rp 4,076,216,034	Rp 4,077,309,139	Rp 4,077,786,399	Rp 4,078,777,985
	0.0539	Rp 4,076,380,300	Rp 4,076,612,801	Rp 4,077,722,200	Rp 4,078,206,733	Rp 4,079,213,779
	0.0543	Rp 4,076,613,585	Rp 4,076,848,075	Rp 4,077,967,129	Rp 4,078,455,972	Rp 4,079,472,180
	0.0551	Rp 4,077,132,082	Rp 4,077,370,989	Rp 4,078,511,489	Rp 4,079,009,906	Rp 4,080,046,463
	0.0558	Rp 4,077,559,254	Rp 4,077,801,797	Rp 4,078,959,949	Rp 4,079,466,247	Rp 4,080,519,554
	0.0568	Rp 4,078,185,411	Rp 4,078,433,278	Rp 4,079,617,281	Rp 4,080,135,118	Rp 4,081,212,953
	0.0568	Rp 4,078,207,457	Rp 4,078,455,512	Rp 4,079,640,424	Rp 4,080,158,667	Rp 4,081,237,365
	0.0569	Rp 4,078,253,516	Rp 4,078,501,962	Rp 4,079,688,774	Rp 4,080,207,866	Rp 4,081,288,367
	0.0570	Rp 4,078,344,690	Rp 4,078,593,911	Rp 4,079,784,484	Rp 4,080,305,255	Rp 4,081,389,325
	0.0573	Rp 4,078,535,613	Rp 4,078,786,455	Rp 4,079,984,902	Rp 4,080,509,187	Rp 4,081,600,728
	0.0574	Rp 4,078,555,172	Rp 4,078,806,181	Rp 4,080,005,434	Rp 4,080,530,079	Rp 4,081,622,385
	0.0578	Rp 4,078,821,269	Rp 4,079,074,536	Rp 4,080,284,758	Rp 4,080,814,300	Rp 4,081,917,014

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1343	0.1363	0.1461	0.1505	0.1599
Interest Charged (Ic)	0.0585	Rp 4,079,286,817	Rp 4,079,544,034	Rp 4,080,773,433	Rp 4,081,311,535	Rp 4,082,432,445
	0.0590	Rp 4,079,607,004	Rp 4,079,866,936	Rp 4,081,109,514	Rp 4,081,653,499	Rp 4,082,786,914
	0.0700	Rp 4,086,359,392	Rp 4,086,676,192	Rp 4,088,194,841	Rp 4,088,862,057	Rp 4,090,257,411
	0.0782	Rp 4,091,332,043	Rp 4,091,690,259	Rp 4,093,409,942	Rp 4,094,166,880	Rp 4,095,752,929
	0.1176	Rp 4,114,373,779	Rp 4,114,918,940	Rp 4,117,545,537	Rp 4,118,706,987	Rp 4,121,152,332
	0.1207	Rp 4,116,114,946	Rp 4,116,673,913	Rp 4,119,367,449	Rp 4,120,558,736	Rp 4,123,067,425
	0.1668	Rp 4,141,292,735	Rp 4,142,046,678	Rp 4,145,684,934	Rp 4,147,297,001	Rp 4,150,698,379
	0.2144	Rp 4,165,792,317	Rp 4,166,728,325	Rp 4,171,247,738	Rp 4,173,251,744	Rp 4,177,483,564
	0.2190	Rp 4,168,061,603	Rp 4,169,014,127	Rp 4,173,613,435	Rp 4,175,652,954	Rp 4,179,959,971
	0.2676	Rp 4,191,591,636	Rp 4,192,712,276	Rp 4,198,124,388	Rp 4,200,524,996	Rp 4,205,596,193
	0.3276	Rp 4,219,073,407	Rp 4,220,383,833	Rp 4,226,712,753	Rp 4,229,520,255	Rp 4,235,451,764
	0.3695	Rp 4,237,378,266	Rp 4,238,811,667	Rp 4,245,734,284	Rp 4,248,805,085	Rp 4,255,292,918
	0.4046	Rp 4,252,178,940	Rp 4,253,709,983	Rp 4,261,103,819	Rp 4,264,383,511	Rp 4,271,312,523
	0.4046	Rp 4,252,178,940	Rp 4,253,709,983	Rp 4,261,103,819	Rp 4,264,383,511	Rp 4,271,312,523
	0.4355	Rp 4,264,905,202	Rp 4,266,519,025	Rp 4,274,312,251	Rp 4,277,768,935	Rp 4,285,071,645
	0.4537	Rp 4,272,217,914	Rp 4,273,878,842	Rp 4,281,899,294	Rp 4,285,456,654	Rp 4,292,971,888
	0.4593	Rp 4,274,467,429	Rp 4,276,142,782	Rp 4,284,232,814	Rp 4,287,820,998	Rp 4,295,401,297
	0.4706	Rp 4,278,968,082	Rp 4,280,672,206	Rp 4,288,901,005	Rp 4,292,550,663	Rp 4,300,260,712
	0.5089	Rp 4,293,892,301	Rp 4,295,691,005	Rp 4,304,375,920	Rp 4,308,227,601	Rp 4,316,363,982

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1343	0.1363	0.1461	0.1505	0.1599
Interest Charged (Ic)	0.5216	Rp 4,298,766,937	Rp 4,300,596,270	Rp 4,309,428,876	Rp 4,313,345,960	Rp 4,321,620,346
	0.5730	Rp 4,318,064,520	Rp 4,320,013,920	Rp 4,329,425,379	Rp 4,333,598,763	Rp 4,342,413,855
	0.6114	Rp 4,332,055,000	Rp 4,334,090,332	Rp 4,343,916,009	Rp 4,348,272,757	Rp 4,357,474,608
	0.6138	Rp 4,332,922,696	Rp 4,334,963,328	Rp 4,344,814,553	Rp 4,349,182,610	Rp 4,358,408,311
	0.6531	Rp 4,346,877,342	Rp 4,349,002,773	Rp 4,359,262,693	Rp 4,363,811,639	Rp 4,373,418,823
	0.6739	Rp 4,354,171,681	Rp 4,356,341,116	Rp 4,366,813,096	Rp 4,371,455,891	Rp 4,381,260,975
	0.7477	Rp 4,379,263,677	Rp 4,381,582,912	Rp 4,392,776,711	Rp 4,397,738,909	Rp 4,408,217,431
	0.7562	Rp 4,382,097,190	Rp 4,384,433,195	Rp 4,395,707,802	Rp 4,400,705,752	Rp 4,411,259,649
	0.7781	Rp 4,389,329,391	Rp 4,391,708,077	Rp 4,403,188,320	Rp 4,408,277,250	Rp 4,419,022,947
	0.8532	Rp 4,413,572,593	Rp 4,416,093,095	Rp 4,428,256,548	Rp 4,433,647,722	Rp 4,445,030,540
	0.8723	Rp 4,419,599,397	Rp 4,422,154,871	Rp 4,434,486,788	Rp 4,439,952,482	Rp 4,451,492,374
	0.8781	Rp 4,421,409,802	Rp 4,423,975,759	Rp 4,436,358,179	Rp 4,441,846,214	Rp 4,453,433,192
	0.8873	Rp 4,424,262,369	Rp 4,426,844,826	Rp 4,439,306,727	Rp 4,444,829,919	Rp 4,456,491,000
	0.8907	Rp 4,425,334,134	Rp 4,427,922,784	Rp 4,440,414,518	Rp 4,445,950,906	Rp 4,457,639,801
	0.8956	Rp 4,426,847,235	Rp 4,429,444,624	Rp 4,441,978,448	Rp 4,447,533,453	Rp 4,459,261,589
	0.9226	Rp 4,435,205,838	Rp 4,437,851,378	Rp 4,450,617,148	Rp 4,456,274,748	Rp 4,468,219,120
	0.9483	Rp 4,443,033,483	Rp 4,445,723,941	Rp 4,458,706,074	Rp 4,464,459,373	Rp 4,476,605,438
	0.9752	Rp 4,451,157,795	Rp 4,453,894,702	Rp 4,467,100,559	Rp 4,472,952,809	Rp 4,485,307,418
	0.9845	Rp 4,453,948,367	Rp 4,456,701,188	Rp 4,469,983,699	Rp 4,475,869,851	Rp 4,488,295,909

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1600	0.1691	0.1872	0.2100	0.2363
Interest Charged (Ic)	0.0512	Rp 4,077,334,690	Rp 4,078,205,881	Rp 4,079,825,953	Rp 4,081,645,083	Rp 4,083,427,005
	0.0518	Rp 4,077,762,821	Rp 4,078,648,610	Rp 4,080,297,368	Rp 4,082,151,929	Rp 4,083,973,747
	0.0519	Rp 4,077,832,737	Rp 4,078,720,909	Rp 4,080,374,350	Rp 4,082,234,696	Rp 4,084,063,028
	0.0523	Rp 4,078,090,426	Rp 4,078,987,380	Rp 4,080,658,077	Rp 4,082,539,740	Rp 4,084,392,081
	0.0528	Rp 4,078,446,697	Rp 4,079,355,787	Rp 4,081,050,332	Rp 4,082,961,457	Rp 4,084,846,985
	0.0532	Rp 4,078,761,440	Rp 4,079,681,246	Rp 4,081,396,850	Rp 4,083,333,994	Rp 4,085,248,836
	0.0533	Rp 4,078,789,032	Rp 4,079,709,776	Rp 4,081,427,227	Rp 4,083,366,651	Rp 4,085,284,062
	0.0539	Rp 4,079,225,001	Rp 4,080,160,579	Rp 4,081,907,184	Rp 4,083,882,632	Rp 4,085,840,638
	0.0543	Rp 4,079,483,506	Rp 4,080,427,876	Rp 4,082,191,759	Rp 4,084,188,559	Rp 4,086,170,630
	0.0551	Rp 4,080,058,019	Rp 4,081,021,915	Rp 4,082,824,177	Rp 4,084,868,409	Rp 4,086,903,947
	0.0558	Rp 4,080,531,299	Rp 4,081,511,269	Rp 4,083,345,124	Rp 4,085,428,406	Rp 4,087,507,974
	0.0568	Rp 4,081,224,976	Rp 4,082,228,483	Rp 4,084,108,606	Rp 4,086,249,084	Rp 4,088,393,156
	0.0568	Rp 4,081,249,398	Rp 4,082,253,733	Rp 4,084,135,484	Rp 4,086,277,975	Rp 4,088,424,317
	0.0569	Rp 4,081,300,420	Rp 4,082,306,486	Rp 4,084,191,638	Rp 4,086,338,334	Rp 4,088,489,419
	0.0570	Rp 4,081,401,418	Rp 4,082,410,908	Rp 4,084,302,793	Rp 4,086,457,811	Rp 4,088,618,284
	0.0573	Rp 4,081,612,906	Rp 4,082,629,566	Rp 4,084,535,544	Rp 4,086,707,986	Rp 4,088,888,116
	0.0574	Rp 4,081,634,572	Rp 4,082,651,966	Rp 4,084,559,387	Rp 4,086,733,615	Rp 4,088,915,758
	0.0578	Rp 4,081,929,318	Rp 4,082,956,700	Rp 4,084,883,755	Rp 4,087,082,258	Rp 4,089,291,789

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1600	0.1691	0.1872	0.2100	0.2363
Interest Charged (Ic)	0.0585	Rp 4,082,444,956	Rp 4,083,489,799	Rp 4,085,451,183	Rp 4,087,692,133	Rp 4,089,949,559
	0.0590	Rp 4,082,799,567	Rp 4,083,856,411	Rp 4,085,841,388	Rp 4,088,111,514	Rp 4,090,401,865
	0.0700	Rp 4,090,273,030	Rp 4,091,581,253	Rp 4,094,060,515	Rp 4,096,942,198	Rp 4,099,923,400
	0.0782	Rp 4,095,770,707	Rp 4,097,261,927	Rp 4,100,101,044	Rp 4,103,428,149	Rp 4,106,913,015
	0.1176	Rp 4,121,179,838	Rp 4,123,495,158	Rp 4,127,953,699	Rp 4,133,283,849	Rp 4,139,032,508
	0.1207	Rp 4,123,095,648	Rp 4,125,471,673	Rp 4,130,049,382	Rp 4,135,526,728	Rp 4,141,441,481
	0.1668	Rp 4,150,736,698	Rp 4,153,967,399	Rp 4,160,220,716	Rp 4,167,763,710	Rp 4,176,003,794
	0.2144	Rp 4,177,531,267	Rp 4,181,555,696	Rp 4,189,361,371	Rp 4,198,811,175	Rp 4,209,188,354
	0.2190	Rp 4,180,008,524	Rp 4,184,104,765	Rp 4,192,050,718	Rp 4,201,672,519	Rp 4,212,242,046
	0.2676	Rp 4,205,653,374	Rp 4,210,478,864	Rp 4,219,847,883	Rp 4,231,211,880	Rp 4,243,726,216
	0.3276	Rp 4,235,518,653	Rp 4,241,164,113	Rp 4,252,130,422	Rp 4,265,444,848	Rp 4,280,129,778
	0.3695	Rp 4,255,366,083	Rp 4,261,541,294	Rp 4,273,538,223	Rp 4,288,108,759	Rp 4,304,188,513
	0.4046	Rp 4,271,390,663	Rp 4,277,985,751	Rp 4,290,798,914	Rp 4,306,363,155	Rp 4,323,544,921
	0.4046	Rp 4,271,390,663	Rp 4,277,985,751	Rp 4,290,798,914	Rp 4,306,363,155	Rp 4,323,544,921
	0.4355	Rp 4,285,153,997	Rp 4,292,104,597	Rp 4,305,608,487	Rp 4,322,012,964	Rp 4,340,125,687
	0.4537	Rp 4,293,056,635	Rp 4,300,209,365	Rp 4,314,105,830	Rp 4,330,987,609	Rp 4,349,628,851
	0.4593	Rp 4,295,486,778	Rp 4,302,701,384	Rp 4,316,718,005	Rp 4,333,745,838	Rp 4,352,548,763
	0.4706	Rp 4,300,347,656	Rp 4,307,685,641	Rp 4,321,941,827	Rp 4,339,260,814	Rp 4,358,385,993
	0.5089	Rp 4,316,455,731	Rp 4,324,199,034	Rp 4,339,241,989	Rp 4,357,516,775	Rp 4,377,699,341

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.1600	0.1691	0.1872	0.2100	0.2363
Interest Charged (Ic)	0.5216	Rp 4,321,713,649	Rp 4,329,588,127	Rp 4,344,885,638	Rp 4,363,469,546	Rp 4,383,993,936
	0.5730	Rp 4,342,513,250	Rp 4,350,901,570	Rp 4,367,195,937	Rp 4,386,989,871	Rp 4,408,851,644
	0.6114	Rp 4,357,578,361	Rp 4,366,334,128	Rp 4,383,341,084	Rp 4,403,999,541	Rp 4,426,816,263
	0.6138	Rp 4,358,512,332	Rp 4,367,290,756	Rp 4,384,341,645	Rp 4,405,053,389	Rp 4,427,928,959
	0.6531	Rp 4,373,527,141	Rp 4,382,667,925	Rp 4,400,421,342	Rp 4,421,985,064	Rp 4,445,801,301
	0.6739	Rp 4,381,371,522	Rp 4,390,700,262	Rp 4,408,818,015	Rp 4,430,823,465	Rp 4,455,127,274
	0.7477	Rp 4,408,335,563	Rp 4,418,303,794	Rp 4,437,660,856	Rp 4,461,168,367	Rp 4,487,129,495
	0.7562	Rp 4,411,378,630	Rp 4,421,418,427	Rp 4,440,914,155	Rp 4,464,589,689	Rp 4,490,736,152
	0.7781	Rp 4,419,144,088	Rp 4,429,365,984	Rp 4,449,214,530	Rp 4,473,317,537	Rp 4,499,935,475
	0.8532	Rp 4,445,158,856	Rp 4,455,985,578	Rp 4,477,005,777	Rp 4,502,528,026	Rp 4,530,710,878
	0.8723	Rp 4,451,622,459	Rp 4,462,598,278	Rp 4,483,907,263	Rp 4,509,779,254	Rp 4,538,347,656
	0.8781	Rp 4,453,563,807	Rp 4,464,584,320	Rp 4,485,979,871	Rp 4,511,956,694	Rp 4,540,640,655
	0.8873	Rp 4,456,622,449	Rp 4,467,713,299	Rp 4,489,245,078	Rp 4,515,386,870	Rp 4,544,252,676
	0.8907	Rp 4,457,771,563	Rp 4,468,888,813	Rp 4,490,471,722	Rp 4,516,675,431	Rp 4,545,609,485
	0.8956	Rp 4,459,393,794	Rp 4,470,548,289	Rp 4,492,203,335	Rp 4,518,494,396	Rp 4,547,524,735
	0.9226	Rp 4,468,353,759	Rp 4,479,713,490	Rp 4,501,766,012	Rp 4,528,538,367	Rp 4,558,099,177
	0.9483	Rp 4,476,742,348	Rp 4,488,293,507	Rp 4,510,716,739	Rp 4,537,937,939	Rp 4,567,993,410
	0.9752	Rp 4,485,446,676	Rp 4,497,195,754	Rp 4,520,002,251	Rp 4,547,687,461	Rp 4,578,254,261
	0.9845	Rp 4,488,435,972	Rp 4,500,252,859	Rp 4,523,190,658	Rp 4,551,034,826	Rp 4,581,776,786

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.2456	0.2768	0.2931	0.3031	0.3680
Interest Charged (Ic)	0.0512	Rp 4,083,981,258	Rp 4,085,508,067	Rp 4,086,106,846	Rp 4,086,406,557	Rp 4,087,024,866
	0.0518	Rp 4,084,542,045	Rp 4,086,114,949	Rp 4,086,737,453	Rp 4,087,051,686	Rp 4,087,762,926
	0.0519	Rp 4,084,633,620	Rp 4,086,214,053	Rp 4,086,840,432	Rp 4,087,157,039	Rp 4,087,883,473
	0.0523	Rp 4,084,971,126	Rp 4,086,579,311	Rp 4,087,219,982	Rp 4,087,545,338	Rp 4,088,327,819
	0.0528	Rp 4,085,437,718	Rp 4,087,084,282	Rp 4,087,744,720	Rp 4,088,082,183	Rp 4,088,942,260
	0.0532	Rp 4,085,849,894	Rp 4,087,530,369	Rp 4,088,208,281	Rp 4,088,556,447	Rp 4,089,485,175
	0.0533	Rp 4,085,886,025	Rp 4,087,569,474	Rp 4,088,248,917	Rp 4,088,598,022	Rp 4,089,532,773
	0.0539	Rp 4,086,456,902	Rp 4,088,187,334	Rp 4,088,890,995	Rp 4,089,254,938	Rp 4,090,284,939
	0.0543	Rp 4,086,795,373	Rp 4,088,553,668	Rp 4,089,271,696	Rp 4,089,644,443	Rp 4,090,730,997
	0.0551	Rp 4,087,547,533	Rp 4,089,367,762	Rp 4,090,117,735	Rp 4,090,510,064	Rp 4,091,722,496
	0.0558	Rp 4,088,167,080	Rp 4,090,038,338	Rp 4,090,814,643	Rp 4,091,223,118	Rp 4,092,539,428
	0.0568	Rp 4,089,075,004	Rp 4,091,021,063	Rp 4,091,835,984	Rp 4,092,268,142	Rp 4,093,736,977
	0.0568	Rp 4,089,106,966	Rp 4,091,055,658	Rp 4,091,871,939	Rp 4,092,304,931	Rp 4,093,779,141
	0.0569	Rp 4,089,173,740	Rp 4,091,127,934	Rp 4,091,947,057	Rp 4,092,381,792	Rp 4,093,867,233
	0.0570	Rp 4,089,305,916	Rp 4,091,271,001	Rp 4,092,095,749	Rp 4,092,533,934	Rp 4,094,041,612
	0.0573	Rp 4,089,582,679	Rp 4,091,570,571	Rp 4,092,407,097	Rp 4,092,852,509	Rp 4,094,406,768
	0.0574	Rp 4,089,611,031	Rp 4,091,601,259	Rp 4,092,438,992	Rp 4,092,885,145	Rp 4,094,444,177
	0.0578	Rp 4,089,996,722	Rp 4,092,018,734	Rp 4,092,872,887	Rp 4,093,329,114	Rp 4,094,953,111

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.2456	0.2768	0.2931	0.3031	0.3680
Interest Charged (Ic)	0.0585	Rp 4,090,671,386	Rp 4,092,749,002	Rp 4,093,631,888	Rp 4,094,105,746	Rp 4,095,843,500
	0.0590	Rp 4,091,135,307	Rp 4,093,251,161	Rp 4,094,153,810	Rp 4,094,639,799	Rp 4,096,455,857
	0.0700	Rp 4,100,900,801	Rp 4,103,820,850	Rp 4,105,139,921	Rp 4,105,881,779	Rp 4,109,354,882
	0.0782	Rp 4,108,068,443	Rp 4,111,576,111	Rp 4,113,199,969	Rp 4,114,129,280	Rp 4,118,819,292
	0.1176	Rp 4,140,987,899	Rp 4,147,135,209	Rp 4,150,127,415	Rp 4,151,897,877	Rp 4,162,032,436
	0.1207	Rp 4,143,455,496	Rp 4,149,795,955	Rp 4,152,888,083	Rp 4,154,719,888	Rp 4,165,249,529
	0.1668	Rp 4,178,837,063	Rp 4,187,870,724	Rp 4,192,352,150	Rp 4,195,035,376	Rp 4,211,017,544
	0.2144	Rp 4,212,772,062	Rp 4,224,262,892	Rp 4,230,005,579	Rp 4,233,459,507	Rp 4,254,332,358
	0.2190	Rp 4,215,893,187	Rp 4,227,604,393	Rp 4,233,459,935	Rp 4,236,982,732	Rp 4,258,290,842
	0.2676	Rp 4,248,058,259	Rp 4,261,991,270	Rp 4,268,982,505	Rp 4,273,197,617	Rp 4,298,867,844
	0.3276	Rp 4,285,220,076	Rp 4,301,621,006	Rp 4,309,869,913	Rp 4,314,850,394	Rp 4,345,319,346
	0.3695	Rp 4,309,765,294	Rp 4,327,746,772	Rp 4,336,799,444	Rp 4,342,268,493	Rp 4,375,790,521
	0.4046	Rp 4,329,505,703	Rp 4,348,733,484	Rp 4,358,419,180	Rp 4,364,272,755	Rp 4,400,193,193
	0.4046	Rp 4,329,505,703	Rp 4,348,733,484	Rp 4,358,419,180	Rp 4,364,272,755	Rp 4,400,193,193
	0.4355	Rp 4,346,410,652	Rp 4,366,689,823	Rp 4,376,909,089	Rp 4,383,086,627	Rp 4,421,025,077
	0.4537	Rp 4,356,097,781	Rp 4,376,973,310	Rp 4,387,495,055	Rp 4,393,856,191	Rp 4,432,937,350
	0.4593	Rp 4,359,073,961	Rp 4,380,131,854	Rp 4,390,746,075	Rp 4,397,163,334	Rp 4,436,593,672
	0.4706	Rp 4,365,023,325	Rp 4,386,444,595	Rp 4,397,243,050	Rp 4,403,772,112	Rp 4,443,897,872
	0.5089	Rp 4,384,704,485	Rp 4,407,317,230	Rp 4,418,719,511	Rp 4,425,614,914	Rp 4,468,017,877

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.2456	0.2768	0.2931	0.3031	0.3680
Interest Charged (Ic)	0.5216	Rp 4,391,117,946	Rp 4,414,115,604	Rp 4,425,712,874	Rp 4,432,726,552	Rp 4,475,864,261
	0.5730	Rp 4,416,440,557	Rp 4,440,943,106	Rp 4,453,302,398	Rp 4,460,778,182	Rp 4,506,784,717
	0.6114	Rp 4,434,736,997	Rp 4,460,313,165	Rp 4,473,215,808	Rp 4,481,020,998	Rp 4,529,070,897
	0.6138	Rp 4,435,870,138	Rp 4,461,512,444	Rp 4,474,448,551	Rp 4,482,274,027	Rp 4,530,449,721
	0.6531	Rp 4,454,069,235	Rp 4,480,768,398	Rp 4,494,239,160	Rp 4,502,388,697	Rp 4,552,573,377
	0.6739	Rp 4,463,564,539	Rp 4,490,811,267	Rp 4,504,558,965	Rp 4,512,876,333	Rp 4,564,101,063
	0.7477	Rp 4,496,142,186	Rp 4,525,249,114	Rp 4,539,937,307	Rp 4,548,824,539	Rp 4,603,578,889
	0.7562	Rp 4,499,813,178	Rp 4,529,128,039	Rp 4,543,921,333	Rp 4,552,872,237	Rp 4,608,020,809
	0.7781	Rp 4,509,176,154	Rp 4,539,019,902	Rp 4,554,080,502	Rp 4,563,193,341	Rp 4,619,344,371
	0.8532	Rp 4,540,494,648	Rp 4,572,093,178	Rp 4,588,040,452	Rp 4,597,690,370	Rp 4,657,164,975
	0.8723	Rp 4,548,265,206	Rp 4,580,295,916	Rp 4,596,461,522	Rp 4,606,243,672	Rp 4,666,536,308
	0.8781	Rp 4,550,598,302	Rp 4,582,758,538	Rp 4,598,989,575	Rp 4,608,811,353	Rp 4,669,349,116
	0.8873	Rp 4,554,273,416	Rp 4,586,637,465	Rp 4,602,971,457	Rp 4,612,855,587	Rp 4,673,779,034
	0.8907	Rp 4,555,653,905	Rp 4,588,094,444	Rp 4,604,467,074	Rp 4,614,374,604	Rp 4,675,442,787
	0.8956	Rp 4,557,602,560	Rp 4,590,151,008	Rp 4,606,578,146	Rp 4,616,518,686	Rp 4,677,791,045
	0.9226	Rp 4,568,361,044	Rp 4,601,503,955	Rp 4,618,231,355	Rp 4,628,353,734	Rp 4,690,750,692
	0.9483	Rp 4,578,426,884	Rp 4,612,124,049	Rp 4,629,131,378	Rp 4,639,423,272	Rp 4,702,868,477
	0.9752	Rp 4,588,865,112	Rp 4,623,135,133	Rp 4,640,431,761	Rp 4,650,898,837	Rp 4,715,427,198
	0.9845	Rp 4,592,448,396	Rp 4,626,914,635	Rp 4,644,310,351	Rp 4,654,837,427	Rp 4,719,736,736

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.3824	0.4217	0.4404	0.4701	0.4936
Interest Charged (Ic)	0.0512	Rp 4,086,839,612	Rp 4,085,713,790	Rp 4,084,844,528	Rp 4,083,006,010	Rp 4,081,146,687
	0.0518	Rp 4,087,598,372	Rp 4,086,529,229	Rp 4,085,687,532	Rp 4,083,893,863	Rp 4,082,071,173
	0.0519	Rp 4,087,722,307	Rp 4,086,662,442	Rp 4,085,825,260	Rp 4,084,038,941	Rp 4,082,222,257
	0.0523	Rp 4,088,179,152	Rp 4,087,153,538	Rp 4,086,333,029	Rp 4,084,573,856	Rp 4,082,779,361
	0.0528	Rp 4,088,810,911	Rp 4,087,832,784	Rp 4,087,035,406	Rp 4,085,313,912	Rp 4,083,550,228
	0.0532	Rp 4,089,369,161	Rp 4,088,433,108	Rp 4,087,656,238	Rp 4,085,968,165	Rp 4,084,231,821
	0.0533	Rp 4,089,418,104	Rp 4,088,485,746	Rp 4,087,710,676	Rp 4,086,025,539	Rp 4,084,291,597
	0.0539	Rp 4,090,191,567	Rp 4,089,317,680	Rp 4,088,571,129	Rp 4,086,932,495	Rp 4,085,236,611
	0.0543	Rp 4,090,650,280	Rp 4,089,811,156	Rp 4,089,081,570	Rp 4,087,470,610	Rp 4,085,797,383
	0.0551	Rp 4,091,669,970	Rp 4,090,908,336	Rp 4,090,216,589	Rp 4,088,667,379	Rp 4,087,044,725
	0.0558	Rp 4,092,510,191	Rp 4,091,812,615	Rp 4,091,152,171	Rp 4,089,654,067	Rp 4,088,073,281
	0.0568	Rp 4,093,741,969	Rp 4,093,138,612	Rp 4,092,524,238	Rp 4,091,101,384	Rp 4,089,582,263
	0.0568	Rp 4,093,785,341	Rp 4,093,185,307	Rp 4,092,572,559	Rp 4,091,152,361	Rp 4,089,635,417
	0.0569	Rp 4,093,875,955	Rp 4,093,282,867	Rp 4,092,673,516	Rp 4,091,258,869	Rp 4,089,746,474
	0.0570	Rp 4,094,055,328	Rp 4,093,475,994	Rp 4,092,873,371	Rp 4,091,469,717	Rp 4,089,966,332
	0.0573	Rp 4,094,430,949	Rp 4,093,880,438	Rp 4,093,291,918	Rp 4,091,911,306	Rp 4,090,426,809
	0.0574	Rp 4,094,469,430	Rp 4,093,921,874	Rp 4,093,334,800	Rp 4,091,956,551	Rp 4,090,473,989
	0.0578	Rp 4,094,992,964	Rp 4,094,485,633	Rp 4,093,918,244	Rp 4,092,572,165	Rp 4,091,115,973

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.3824	0.4217	0.4404	0.4701	0.4936
Interest Charged (Ic)	0.0585	Rp 4,095,908,934	Rp 4,095,472,105	Rp 4,094,939,230	Rp 4,093,649,561	Rp 4,092,239,611
	0.0590	Rp 4,096,538,910	Rp 4,096,150,656	Rp 4,095,641,568	Rp 4,094,390,782	Rp 4,093,012,708
	0.0700	Rp 4,109,811,973	Rp 4,110,456,549	Rp 4,110,453,714	Rp 4,110,030,352	Rp 4,109,329,723
	0.0782	Rp 4,119,551,553	Rp 4,120,955,938	Rp 4,121,325,093	Rp 4,121,508,262	Rp 4,121,302,209
	0.1176	Rp 4,163,989,494	Rp 4,168,756,128	Rp 4,170,758,157	Rp 4,173,580,636	Rp 4,175,502,459
	0.1207	Rp 4,167,294,868	Rp 4,172,302,383	Rp 4,174,420,515	Rp 4,177,429,269	Rp 4,179,499,913
	0.1668	Rp 4,214,272,858	Rp 4,222,563,901	Rp 4,226,254,581	Rp 4,231,771,690	Rp 4,235,832,817
	0.2144	Rp 4,258,661,475	Rp 4,269,843,364	Rp 4,274,905,991	Rp 4,282,593,932	Rp 4,288,361,958
	0.2190	Rp 4,262,715,091	Rp 4,274,152,251	Rp 4,279,335,583	Rp 4,287,213,914	Rp 4,293,131,111
	0.2676	Rp 4,304,242,242	Rp 4,318,222,927	Rp 4,324,605,810	Rp 4,334,371,990	Rp 4,341,764,669
	0.3276	Rp 4,351,733,372	Rp 4,368,486,814	Rp 4,376,172,053	Rp 4,387,980,869	Rp 4,396,963,984
	0.3695	Rp 4,382,863,610	Rp 4,401,370,548	Rp 4,409,877,224	Rp 4,422,971,550	Rp 4,432,953,162
	0.4046	Rp 4,407,782,981	Rp 4,427,662,787	Rp 4,436,811,651	Rp 4,450,909,754	Rp 4,461,669,995
	0.4046	Rp 4,407,782,981	Rp 4,427,662,787	Rp 4,436,811,651	Rp 4,450,909,754	Rp 4,461,669,995
	0.4355	Rp 4,429,049,005	Rp 4,450,081,246	Rp 4,459,768,643	Rp 4,474,707,800	Rp 4,486,119,850
	0.4537	Rp 4,441,206,892	Rp 4,462,890,734	Rp 4,472,882,429	Rp 4,488,296,573	Rp 4,500,076,519
	0.4593	Rp 4,444,938,237	Rp 4,466,821,059	Rp 4,476,905,653	Rp 4,492,464,770	Rp 4,504,356,975
	0.4706	Rp 4,452,391,813	Rp 4,474,670,752	Rp 4,484,940,245	Rp 4,500,787,864	Rp 4,512,903,432
	0.5089	Rp 4,477,000,617	Rp 4,500,575,153	Rp 4,511,449,105	Rp 4,528,239,482	Rp 4,541,084,615

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.3824	0.4217	0.4404	0.4701	0.4936
Interest Charged (Ic)	0.5216	Rp 4,485,004,610	Rp 4,508,996,717	Rp 4,520,065,395	Rp 4,537,159,363	Rp 4,550,239,334
	0.5730	Rp 4,516,540,021	Rp 4,542,160,646	Rp 4,553,988,372	Rp 4,572,265,256	Rp 4,586,259,842
	0.6114	Rp 4,539,263,838	Rp 4,566,042,756	Rp 4,578,410,029	Rp 4,597,527,333	Rp 4,612,171,362
	0.6138	Rp 4,540,669,594	Rp 4,567,519,780	Rp 4,579,920,242	Rp 4,599,089,232	Rp 4,613,773,193
	0.6531	Rp 4,563,223,245	Rp 4,591,211,007	Rp 4,604,141,120	Rp 4,624,134,797	Rp 4,639,455,775
	0.6739	Rp 4,574,973,445	Rp 4,603,549,722	Rp 4,616,753,764	Rp 4,637,173,854	Rp 4,652,824,119
	0.7477	Rp 4,615,206,007	Rp 4,645,777,705	Rp 4,659,910,166	Rp 4,681,775,009	Rp 4,698,540,550
	0.7562	Rp 4,619,732,186	Rp 4,650,526,593	Rp 4,664,762,642	Rp 4,686,788,642	Rp 4,703,678,553
	0.7781	Rp 4,631,269,982	Rp 4,662,630,579	Rp 4,677,129,954	Rp 4,699,565,587	Rp 4,716,771,598
	0.8532	Rp 4,669,800,578	Rp 4,703,037,099	Rp 4,718,408,684	Rp 4,742,200,820	Rp 4,760,453,315
	0.8723	Rp 4,679,346,600	Rp 4,713,044,576	Rp 4,728,630,661	Rp 4,752,756,327	Rp 4,771,266,068
	0.8781	Rp 4,682,211,751	Rp 4,716,047,986	Rp 4,731,698,335	Rp 4,755,923,921	Rp 4,774,510,724
	0.8873	Rp 4,686,724,021	Rp 4,720,777,775	Rp 4,736,529,225	Rp 4,760,912,003	Rp 4,779,620,034
	0.8907	Rp 4,688,418,677	Rp 4,722,554,054	Rp 4,738,343,441	Rp 4,762,785,200	Rp 4,781,538,718
	0.8956	Rp 4,690,810,528	Rp 4,725,061,046	Rp 4,740,903,945	Rp 4,765,428,904	Rp 4,784,246,584
	0.9226	Rp 4,704,010,263	Rp 4,738,894,869	Rp 4,755,032,452	Rp 4,780,015,540	Rp 4,799,186,497
	0.9483	Rp 4,716,351,805	Rp 4,751,827,302	Rp 4,768,239,465	Rp 4,793,649,388	Rp 4,813,149,459
	0.9752	Rp 4,729,141,700	Rp 4,765,227,628	Rp 4,781,923,420	Rp 4,807,774,210	Rp 4,827,614,181
	0.9845	Rp 4,733,530,402	Rp 4,769,825,353	Rp 4,786,618,259	Rp 4,812,619,993	Rp 4,832,576,331

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.5435	0.5842	0.5972	0.6126	0.6399
Interest Charged (Ic)	**0.0512**	Rp 4,075,912,348	Rp4,070,288,865	Rp 4,068,215,213	Rp 4,065,590,735	Rp 4,060,455,752
	0.0518	Rp 4,076,920,445	Rp4,071,373,046	Rp 4,069,325,767	Rp 4,066,733,918	Rp 4,061,661,336
	0.0519	Rp 4,077,085,240	Rp4,071,550,319	Rp 4,069,507,365	Rp 4,066,920,864	Rp 4,061,858,505
	0.0523	Rp 4,077,693,015	Rp4,072,204,204	Rp 4,070,177,226	Rp 4,067,610,483	Rp 4,062,585,875
	0.0528	Rp 4,078,534,266	Rp4,073,109,498	Rp 4,071,104,701	Rp 4,068,565,380	Rp 4,063,593,133
	0.0532	Rp 4,079,278,336	Rp4,073,910,405	Rp 4,071,925,286	Rp 4,069,410,281	Rp 4,064,484,431
	0.0533	Rp 4,079,343,601	Rp4,073,980,664	Rp 4,071,997,273	Rp 4,069,484,403	Rp 4,064,562,627
	0.0539	Rp 4,080,375,609	Rp4,075,091,788	Rp 4,073,135,771	Rp 4,070,656,714	Rp 4,065,799,396
	0.0543	Rp 4,080,988,175	Rp4,075,751,444	Rp 4,073,811,712	Rp 4,071,352,761	Rp 4,066,533,742
	0.0551	Rp 4,082,351,142	Rp4,077,219,483	Rp 4,075,316,061	Rp 4,072,901,921	Rp 4,068,168,176
	0.0558	Rp 4,083,475,430	Rp4,078,430,699	Rp 4,076,557,293	Rp 4,074,180,170	Rp 4,069,516,782
	0.0568	Rp 4,085,125,393	Rp4,080,208,564	Rp 4,078,379,275	Rp 4,076,056,520	Rp 4,071,496,331
	0.0568	Rp 4,085,183,523	Rp4,080,271,207	Rp 4,078,443,473	Rp 4,076,122,633	Rp 4,071,566,078
	0.0569	Rp 4,085,304,980	Rp4,080,402,092	Rp 4,078,577,608	Rp 4,076,260,771	Rp 4,071,711,806
	0.0570	Rp 4,085,545,434	Rp4,080,661,216	Rp 4,078,843,166	Rp 4,076,534,254	Rp 4,072,000,315
	0.0573	Rp 4,086,049,082	Rp4,081,203,986	Rp 4,079,399,416	Rp 4,077,107,101	Rp 4,072,604,622
	0.0574	Rp 4,086,100,688	Rp4,081,259,603	Rp 4,079,456,413	Rp 4,077,165,799	Rp 4,072,666,542
	0.0578	Rp 4,086,802,937	Rp4,082,016,438	Rp 4,080,232,045	Rp 4,077,964,569	Rp 4,073,509,141

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.5435	0.5842	0.5972	0.6126	0.6399
Interest Charged (Ic)	0.0585	Rp 4,088,032,234	Rp4,083,341,358	Rp 4,081,589,870	Rp 4,079,362,874	Rp 4,074,984,057
	0.0590	Rp 4,088,878,140	Rp4,084,253,101	Rp 4,082,524,248	Rp 4,080,325,085	Rp 4,075,998,890
	0.0700	Rp 4,106,735,980	Rp4,103,491,621	Rp 4,102,233,940	Rp 4,100,611,385	Rp 4,097,366,573
	0.0782	Rp 4,119,823,433	Rp4,117,562,856	Rp 4,116,637,049	Rp 4,115,417,792	Rp 4,112,920,613
	0.1176	Rp 4,178,728,826	Rp4,180,503,734	Rp 4,180,913,660	Rp 4,181,300,055	Rp 4,181,728,780
	0.1207	Rp 4,183,050,641	Rp4,185,098,233	Rp 4,185,597,258	Rp 4,186,089,986	Rp 4,186,710,316
	0.1668	Rp 4,243,678,528	Rp4,249,289,815	Rp 4,250,943,906	Rp 4,252,809,123	Rp 4,255,886,207
	0.2144	Rp 4,299,842,173	Rp4,308,418,288	Rp 4,311,023,473	Rp 4,314,012,583	Rp 4,319,084,705
	0.2190	Rp 4,304,927,372	Rp4,313,759,681	Rp 4,316,446,743	Rp 4,319,532,412	Rp 4,324,775,426
	0.2676	Rp 4,356,676,239	Rp4,368,023,112	Rp 4,371,511,760	Rp 4,375,541,502	Rp 4,382,452,014
	0.3276	Rp 4,415,216,063	Rp4,429,241,907	Rp 4,433,581,302	Rp 4,438,611,008	Rp 4,447,282,470
	0.3695	Rp 4,453,295,486	Rp4,468,990,779	Rp 4,473,859,056	Rp 4,479,509,624	Rp 4,489,272,379
	0.4046	Rp 4,483,639,332	Rp4,500,631,205	Rp 4,505,909,701	Rp 4,512,041,502	Rp 4,522,649,260
	0.4046	Rp 4,483,639,332	Rp4,500,631,205	Rp 4,505,909,701	Rp 4,512,041,502	Rp 4,522,649,260
	0.4355	Rp 4,509,449,503	Rp4,527,523,767	Rp 4,533,144,410	Rp 4,539,677,398	Rp 4,550,989,114
	0.4537	Rp 4,524,173,360	Rp4,542,857,476	Rp 4,548,670,785	Rp 4,555,429,618	Rp 4,567,137,448
	0.4593	Rp 4,528,687,832	Rp4,547,557,894	Rp 4,553,429,932	Rp 4,560,257,601	Rp 4,572,086,136
	0.4706	Rp 4,537,699,805	Rp4,556,939,652	Rp 4,562,928,466	Rp 4,569,892,990	Rp 4,581,961,480
	0.5089	Rp 4,567,400,564	Rp4,587,846,586	Rp 4,594,216,130	Rp 4,601,626,751	Rp 4,614,477,131

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.5435	0.5842	0.5972	0.6126	0.6399
Interest Charged (Ic)	0.5216	Rp 4,577,044,132	Rp4,597,877,906	Rp 4,604,369,795	Rp 4,611,923,732	Rp 4,625,025,228
	0.5730	Rp 4,614,967,372	Rp4,637,309,242	Rp 4,644,276,753	Rp 4,652,387,719	Rp 4,666,464,886
	0.6114	Rp 4,642,228,951	Rp4,665,639,884	Rp 4,672,944,373	Rp 4,681,449,880	Rp 4,696,217,815
	0.6138	Rp 4,643,913,768	Rp4,667,390,390	Rp 4,674,715,580	Rp 4,683,245,322	Rp 4,698,055,681
	0.6531	Rp 4,670,919,820	Rp4,695,443,706	Rp 4,703,098,866	Rp 4,712,014,858	Rp 4,727,501,250
	0.6739	Rp 4,684,972,039	Rp4,710,036,831	Rp 4,717,862,372	Rp 4,726,977,779	Rp 4,742,813,123
	0.7477	Rp 4,733,003,580	Rp4,759,898,382	Rp 4,768,300,156	Rp 4,778,089,860	Rp 4,795,104,810
	0.7562	Rp 4,738,399,653	Rp4,765,498,353	Rp 4,773,964,311	Rp 4,783,829,113	Rp 4,800,975,407
	0.7781	Rp 4,752,148,523	Rp4,779,765,301	Rp 4,788,394,331	Rp 4,798,449,918	Rp 4,815,929,872
	0.8532	Rp 4,798,000,657	Rp4,827,331,218	Rp 4,836,499,538	Rp 4,847,185,980	Rp 4,865,768,989
	0.8723	Rp 4,809,346,769	Rp4,839,098,311	Rp 4,848,399,073	Rp 4,859,240,426	Rp 4,878,094,248
	0.8781	Rp 4,812,751,190	Rp4,842,628,823	Rp 4,851,969,251	Rp 4,862,856,999	Rp 4,881,791,923
	0.8873	Rp 4,818,111,818	Rp4,848,187,787	Rp 4,857,590,608	Rp 4,868,551,328	Rp 4,887,613,814
	0.8907	Rp 4,820,124,799	Rp4,850,275,180	Rp 4,859,701,409	Rp 4,870,689,507	Rp 4,889,799,848
	0.8956	Rp 4,822,965,669	Rp4,853,221,008	Rp 4,862,680,253	Rp 4,873,706,965	Rp 4,892,884,804
	0.9226	Rp 4,838,637,856	Rp4,869,470,985	Rp 4,879,111,970	Rp 4,890,351,230	Rp 4,909,900,587
	0.9483	Rp 4,853,282,907	Rp4,884,654,138	Rp 4,894,464,361	Rp 4,905,901,540	Rp 4,925,796,811
	0.9752	Rp 4,868,451,986	Rp4,900,378,796	Rp 4,910,363,737	Rp 4,922,005,232	Rp 4,942,257,573
	0.9845	Rp 4,873,655,257	Rp4,905,772,237	Rp 4,915,816,979	Rp 4,927,528,403	Rp 4,947,902,948

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.7015	0.7314	0.7514	0.7611	0.7853
Interest Charged (Ic)	0.0512	Rp 4,046,360,818	Rp 4,038,185,757	Rp 4,032,213,029	Rp 4,029,119,317	Rp 4,020,996,261
	0.0518	Rp 4,047,736,258	Rp 4,039,662,644	Rp 4,033,766,477	Rp 4,030,713,379	Rp 4,022,700,443
	0.0519	Rp 4,047,961,206	Rp 4,039,904,144	Rp 4,034,020,449	Rp 4,030,973,958	Rp 4,022,978,914
	0.0523	Rp 4,048,791,041	Rp 4,040,794,936	Rp 4,034,957,118	Rp 4,031,934,920	Rp 4,024,005,589
	0.0528	Rp 4,049,940,116	Rp 4,042,028,136	Rp 4,036,253,507	Rp 4,033,264,724	Rp 4,025,425,635
	0.0532	Rp 4,050,956,789	Rp 4,043,118,952	Rp 4,037,399,894	Rp 4,034,440,458	Rp 4,026,680,484
	0.0533	Rp 4,051,045,977	Rp 4,043,214,630	Rp 4,037,500,433	Rp 4,034,543,561	Rp 4,026,790,494
	0.0539	Rp 4,052,456,443	Rp 4,044,727,443	Rp 4,039,089,768	Rp 4,036,173,241	Rp 4,028,528,717
	0.0543	Rp 4,053,293,752	Rp 4,045,625,233	Rp 4,040,032,685	Rp 4,037,139,919	Rp 4,029,559,209
	0.0551	Rp 4,055,156,795	Rp 4,047,622,081	Rp 4,042,129,130	Rp 4,039,288,721	Rp 4,031,848,356
	0.0558	Rp 4,056,693,370	Rp 4,049,268,189	Rp 4,043,856,530	Rp 4,041,058,774	Rp 4,033,732,469
	0.0568	Rp 4,058,947,585	Rp 4,051,681,697	Rp 4,046,387,892	Rp 4,043,651,848	Rp 4,036,490,158
	0.0568	Rp 4,059,026,980	Rp 4,051,766,673	Rp 4,046,476,988	Rp 4,043,743,099	Rp 4,036,587,148
	0.0569	Rp 4,059,192,862	Rp 4,051,944,205	Rp 4,046,663,122	Rp 4,043,933,732	Rp 4,036,789,760
	0.0570	Rp 4,059,521,242	Rp 4,052,295,622	Rp 4,047,031,541	Rp 4,044,311,040	Rp 4,037,190,733
	0.0573	Rp 4,060,208,945	Rp 4,053,031,452	Rp 4,047,802,863	Rp 4,045,100,908	Rp 4,038,029,944
	0.0574	Rp 4,060,279,402	Rp 4,053,106,831	Rp 4,047,881,869	Rp 4,045,181,809	Rp 4,038,115,883
	0.0578	Rp 4,061,237,988	Rp 4,054,132,211	Rp 4,048,956,440	Rp 4,046,282,061	Rp 4,039,284,391

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.7015	0.7314	0.7514	0.7611	0.7853
Interest Charged (Ic)	0.0585	Rp 4,062,915,144	Rp 4,055,925,476	Rp 4,050,835,048	Rp 4,048,205,171	Rp 4,041,325,587
	0.0590	Rp 4,064,068,524	Rp 4,057,158,146	Rp 4,052,125,878	Rp 4,049,526,288	Rp 4,042,726,944
	0.0700	Rp 4,088,225,347	Rp 4,082,873,120	Rp 4,078,966,777	Rp 4,076,948,011	Rp 4,071,669,923
	0.0782	Rp 4,105,653,942	Rp 4,101,315,673	Rp 4,098,127,805	Rp 4,096,475,172	Rp 4,092,142,050
	0.1176	Rp 4,181,518,355	Rp 4,180,840,030	Rp 4,180,183,771	Rp 4,179,802,467	Rp 4,178,694,744
	0.1207	Rp 4,186,950,646	Rp 4,186,500,008	Rp 4,185,998,899	Rp 4,185,694,806	Rp 4,184,780,917
	0.1668	Rp 4,261,825,197	Rp 4,264,211,541	Rp 4,265,628,322	Rp 4,266,274,174	Rp 4,267,732,264
	0.2144	Rp 4,329,570,809	Rp 4,334,180,386	Rp 4,337,085,505	Rp 4,338,464,273	Rp 4,341,740,363
	0.2190	Rp 4,335,648,609	Rp 4,340,446,243	Rp 4,343,476,827	Rp 4,344,917,255	Rp 4,348,345,940
	0.2676	Rp 4,397,086,672	Rp 4,403,704,151	Rp 4,407,946,163	Rp 4,409,981,156	Rp 4,414,879,094
	0.3276	Rp 4,465,865,023	Rp 4,474,380,643	Rp 4,479,881,989	Rp 4,482,533,845	Rp 4,488,952,740
	0.3695	Rp 4,510,292,077	Rp 4,519,974,882	Rp 4,526,248,983	Rp 4,529,278,892	Rp 4,536,628,622
	0.4046	Rp 4,545,552,123	Rp 4,556,134,886	Rp 4,563,004,144	Rp 4,566,325,024	Rp 4,574,390,636
	0.4046	Rp 4,545,552,123	Rp 4,556,134,886	Rp 4,563,004,144	Rp 4,566,325,024	Rp 4,574,390,636
	0.4355	Rp 4,575,458,562	Rp 4,586,788,899	Rp 4,594,152,154	Rp 4,597,714,438	Rp 4,606,373,669
	0.4537	Rp 4,592,487,600	Rp 4,604,237,820	Rp 4,611,878,396	Rp 4,615,576,160	Rp 4,624,568,430
	0.4593	Rp 4,597,704,557	Rp 4,609,582,624	Rp 4,617,307,621	Rp 4,621,046,622	Rp 4,630,140,246
	0.4706	Rp 4,608,113,052	Rp 4,620,245,131	Rp 4,628,137,836	Rp 4,631,958,749	Rp 4,641,253,682
	0.5089	Rp 4,642,364,742	Rp 4,655,323,332	Rp 4,663,761,513	Rp 4,667,848,791	Rp 4,677,798,175

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.7015	0.7314	0.7514	0.7611	0.7853
Interest Charged (Ic)	0.5216	Rp 4,653,470,019	Rp 4,666,693,695	Rp 4,675,306,763	Rp 4,679,479,422	Rp 4,689,638,535
	0.5730	Rp 4,697,072,974	Rp 4,711,325,119	Rp 4,720,616,439	Rp 4,725,120,149	Rp 4,736,092,235
	0.6114	Rp 4,728,356,164	Rp 4,743,335,168	Rp 4,753,105,605	Rp 4,757,843,102	Rp 4,769,389,122
	0.6138	Rp 4,730,287,976	Rp 4,745,311,589	Rp 4,755,111,424	Rp 4,759,863,265	Rp 4,771,444,492
	0.6531	Rp 4,761,230,154	Rp 4,776,964,151	Rp 4,787,232,069	Rp 4,792,212,264	Rp 4,804,353,944
	0.6739	Rp 4,777,314,202	Rp 4,793,414,559	Rp 4,803,923,819	Rp 4,809,021,735	Rp 4,821,452,296
	0.7477	Rp 4,832,214,660	Rp 4,849,552,014	Rp 4,860,875,892	Rp 4,866,371,085	Rp 4,879,776,323
	0.7562	Rp 4,838,375,600	Rp 4,855,850,560	Rp 4,867,265,034	Rp 4,872,804,403	Rp 4,886,318,004
	0.7781	Rp 4,854,067,521	Rp 4,871,891,940	Rp 4,883,536,471	Rp 4,889,188,013	Rp 4,902,976,754
	0.8532	Rp 4,906,343,569	Rp 4,925,322,262	Rp 4,937,726,492	Rp 4,943,748,401	Rp 4,958,445,443
	0.8723	Rp 4,919,266,892	Rp 4,938,528,753	Rp 4,951,119,313	Rp 4,957,232,050	Rp 4,972,151,808
	0.8781	Rp 4,923,143,658	Rp 4,942,490,305	Rp 4,955,136,654	Rp 4,961,276,584	Rp 4,976,263,020
	0.8873	Rp 4,929,247,216	Rp 4,948,727,205	Rp 4,961,461,289	Rp 4,967,643,983	Rp 4,982,735,277
	0.8907	Rp 4,931,538,918	Rp 4,951,068,926	Rp 4,963,835,921	Rp 4,970,034,657	Rp 4,985,165,283
	0.8956	Rp 4,934,772,903	Rp 4,954,373,457	Rp 4,967,186,867	Rp 4,973,408,227	Rp 4,988,594,323
	0.9226	Rp 4,952,608,881	Rp 4,972,597,644	Rp 4,985,666,457	Rp 4,992,012,301	Rp 5,007,503,604
	0.9483	Rp 4,969,268,649	Rp 4,989,618,745	Rp 5,002,925,257	Rp 5,009,386,949	Rp 5,025,162,268
	0.9752	Rp 4,986,517,455	Rp 5,007,240,415	Rp 5,020,792,190	Rp 5,027,373,411	Rp 5,043,441,752
	0.9845	Rp 4,992,432,504	Rp 5,013,283,047	Rp 5,026,918,739	Rp 5,033,540,855	Rp 5,049,709,446

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.8383	0.8385	0.8580	0.8972	0.9278
Interest Charged (Ic)	0.0512	Rp 4,000,617,392	Rp 4,000,543,860	Rp 3,992,099,994	Rp 3,973,291,865	Rp 3,956,854,226
	0.0518	Rp 4,002,623,413	Rp 4,002,551,042	Rp 3,994,244,373	Rp 3,975,770,298	Rp 3,959,659,544
	0.0519	Rp 4,002,950,743	Rp 4,002,878,560	Rp 3,994,594,016	Rp 3,976,173,610	Rp 3,960,115,121
	0.0523	Rp 4,004,156,444	Rp 4,004,084,948	Rp 3,995,881,276	Rp 3,977,656,593	Rp 3,961,788,129
	0.0528	Rp 4,005,821,273	Rp 4,005,750,712	Rp 3,997,657,134	Rp 3,979,697,758	Rp 3,964,085,466
	0.0532	Rp 4,007,289,736	Rp 4,007,219,988	Rp 3,999,222,042	Rp 3,981,492,094	Rp 3,966,100,059
	0.0533	Rp 4,007,418,355	Rp 4,007,348,679	Rp 3,999,359,044	Rp 3,981,648,992	Rp 3,966,276,004
	0.0539	Rp 4,009,448,102	Rp 4,009,379,531	Rp 4,001,519,717	Rp 3,984,119,524	Rp 3,969,042,071
	0.0543	Rp 4,010,649,235	Rp 4,010,581,311	Rp 4,002,797,151	Rp 3,985,576,774	Rp 3,970,669,902
	0.0551	Rp 4,013,311,777	Rp 4,013,245,260	Rp 4,005,625,817	Rp 3,988,795,071	Rp 3,974,255,583
	0.0558	Rp 4,015,497,517	Rp 4,015,432,132	Rp 4,007,944,942	Rp 3,991,425,252	Rp 3,977,176,940
	0.0568	Rp 4,018,687,746	Rp 4,018,623,977	Rp 4,011,325,246	Rp 3,995,246,183	Rp 3,981,407,262
	0.0568	Rp 4,018,799,761	Rp 4,018,736,048	Rp 4,011,443,839	Rp 3,995,379,970	Rp 3,981,555,104
	0.0569	Rp 4,019,033,719	Rp 4,018,970,123	Rp 4,011,691,514	Rp 3,995,659,323	Rp 3,981,863,744
	0.0570	Rp 4,019,496,563	Rp 4,019,433,198	Rp 4,012,181,415	Rp 3,996,211,657	Rp 3,982,473,753
	0.0573	Rp 4,020,464,582	Rp 4,020,401,697	Rp 4,013,205,673	Rp 3,997,365,502	Rp 3,983,747,088
	0.0574	Rp 4,020,563,660	Rp 4,020,500,823	Rp 4,013,310,481	Rp 3,997,483,498	Rp 3,983,877,228
	0.0578	Rp 4,021,909,860	Rp 4,021,847,682	Rp 4,014,734,055	Rp 3,999,084,917	Rp 3,985,642,127

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.8383	0.8385	0.8580	0.8972	0.9278
Interest Charged (Ic)	0.0585	Rp 4,024,257,287	Rp 4,024,196,244	Rp 4,017,214,322	Rp 4,001,869,437	Rp 3,988,705,094
	0.0590	Rp 4,025,865,892	Rp 4,025,805,614	Rp 4,018,912,474	Rp 4,003,771,938	Rp 3,990,793,766
	0.0700	Rp 4,058,629,253	Rp 4,058,582,814	Rp 4,053,282,492	Rp 4,041,720,605	Rp 4,031,907,599
	0.0782	Rp 4,081,391,586	Rp 4,081,353,241	Rp 4,076,975,548	Rp 4,067,425,114	Rp 4,059,326,936
	0.1176	Rp 4,175,454,949	Rp 4,175,442,437	Rp 4,173,978,989	Rp 4,170,586,482	Rp 4,167,547,066
	0.1207	Rp 4,181,981,631	Rp 4,181,970,609	Rp 4,180,674,211	Rp 4,177,628,098	Rp 4,174,866,953
	0.1668	Rp 4,270,258,360	Rp 4,270,265,205	Rp 4,270,965,717	Rp 4,272,023,464	Rp 4,272,524,906
	0.2144	Rp 4,348,287,760	Rp 4,348,307,962	Rp 4,350,495,732	Rp 4,354,576,683	Rp 4,357,451,101
	0.2190	Rp 4,355,229,138	Rp 4,355,250,451	Rp 4,357,561,827	Rp 4,361,893,094	Rp 4,364,963,133
	0.2676	Rp 4,424,984,777	Rp 4,425,016,732	Rp 4,428,510,632	Rp 4,435,230,871	Rp 4,440,162,635
	0.3276	Rp 4,502,377,724	Rp 4,502,420,604	Rp 4,507,126,952	Rp 4,516,287,744	Rp 4,523,113,399
	0.3695	Rp 4,552,078,695	Rp 4,552,128,225	Rp 4,557,572,138	Rp 4,568,214,192	Rp 4,576,186,253
	0.4046	Rp 4,591,395,505	Rp 4,591,450,136	Rp 4,597,459,432	Rp 4,609,235,544	Rp 4,618,084,017
	0.4046	Rp 4,591,395,505	Rp 4,591,450,136	Rp 4,597,459,432	Rp 4,609,235,544	Rp 4,618,084,017
	0.4355	Rp 4,624,666,293	Rp 4,624,725,145	Rp 4,631,202,209	Rp 4,643,915,774	Rp 4,653,487,994
	0.4537	Rp 4,643,582,987	Rp 4,643,644,204	Rp 4,650,383,324	Rp 4,663,621,787	Rp 4,673,598,986
	0.4593	Rp 4,649,374,439	Rp 4,649,436,375	Rp 4,656,255,197	Rp 4,669,653,264	Rp 4,679,753,569
	0.4706	Rp 4,660,924,019	Rp 4,660,987,384	Rp 4,667,964,442	Rp 4,681,679,328	Rp 4,692,023,956
	0.5089	Rp 4,698,885,576	Rp 4,698,953,580	Rp 4,706,444,479	Rp 4,721,187,733	Rp 4,732,325,011

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Dellay Period (M)				
		0.8383	0.8385	0.8580	0.8972	0.9278
Interest Charged (Ic)	0.5216	Rp 4,711,179,803	Rp 4,711,249,292	Rp 4,718,904,683	Rp 4,733,977,006	Rp 4,745,367,804
	0.5730	Rp 4,759,391,801	Rp 4,759,467,042	Rp 4,767,759,328	Rp 4,784,105,215	Rp 4,796,476,680
	0.6114	Rp 4,793,929,089	Rp 4,794,008,385	Rp 4,802,749,666	Rp 4,819,992,898	Rp 4,833,054,895
	0.6138	Rp 4,796,060,527	Rp 4,796,140,072	Rp 4,804,908,880	Rp 4,822,207,115	Rp 4,835,311,427
	0.6531	Rp 4,830,180,564	Rp 4,830,264,065	Rp 4,839,470,845	Rp 4,857,644,026	Rp 4,871,421,302
	0.6739	Rp 4,847,902,672	Rp 4,847,988,211	Rp 4,857,420,579	Rp 4,876,044,301	Rp 4,890,167,998
	0.7477	Rp 4,908,330,215	Rp 4,908,422,625	Rp 4,918,615,403	Rp 4,938,757,247	Rp 4,954,047,723
	0.7562	Rp 4,915,105,669	Rp 4,915,198,842	Rp 4,925,476,097	Rp 4,945,786,545	Rp 4,961,206,561
	0.7781	Rp 4,932,357,911	Rp 4,932,453,022	Rp 4,942,944,717	Rp 4,963,683,118	Rp 4,979,431,894
	0.8532	Rp 4,989,785,125	Rp 4,989,886,629	Rp 5,001,085,730	Rp 5,023,235,496	Rp 5,040,068,148
	0.8723	Rp 5,003,971,566	Rp 5,004,074,637	Rp 5,015,447,085	Rp 5,037,942,614	Rp 5,055,040,722
	0.8781	Rp 5,008,226,495	Rp 5,008,330,035	Rp 5,019,754,373	Rp 5,042,353,397	Rp 5,059,530,957
	0.8873	Rp 5,014,924,747	Rp 5,015,029,024	Rp 5,026,534,956	Rp 5,049,296,713	Rp 5,066,599,195
	0.8907	Rp 5,017,439,523	Rp 5,017,544,077	Rp 5,029,080,612	Rp 5,051,903,405	Rp 5,069,252,741
	0.8956	Rp 5,020,988,108	Rp 5,021,093,052	Rp 5,032,672,746	Rp 5,055,581,612	Rp 5,072,997,018
	0.9226	Rp 5,040,555,096	Rp 5,040,662,185	Rp 5,052,479,302	Rp 5,075,861,640	Rp 5,093,640,459
	0.9483	Rp 5,058,825,710	Rp 5,058,934,796	Rp 5,070,972,788	Rp 5,094,795,550	Rp 5,112,912,370
	0.9752	Rp 5,077,736,460	Rp 5,077,847,606	Rp 5,090,113,417	Rp 5,114,390,399	Rp 5,132,855,767
	0.9845	Rp 5,084,220,107	Rp 5,084,331,957	Rp 5,096,675,696	Rp 5,121,108,040	Rp 5,139,692,616

Attachment 1. Two-Way Sensitivity Analysis toward Total inventory Cost (Scenario 3) (cont.)

TC(T*)		Delay Period (M)		TC(T*)		Delay Period (M)		TC(T*)		Delay Period (M)	
		0.9906	0.9993			0.9906	0.9993			0.9906	0.9993
Interest Charged (Ic)	0.0512	Rp 3,917,173,931	Rp 3,911,004,253	Interest Charged (Ic)	0.0585	Rp 3,957,932,946	Rp 3,953,280,809	Interest Charged (Ic)	0.5216	Rp 4,767,933,935	Rp 4,770,951,788
	0.0518	Rp 3,920,919,717	Rp 3,914,917,271		0.0590	Rp 3,960,499,260	Rp 3,955,924,776		0.5730	Rp 4,821,035,478	Rp 4,824,325,145
	0.0519	Rp 3,921,524,454	Rp 3,915,548,361		0.0700	Rp 4,009,386,329	Rp 4,006,034,399		0.6114	Rp 4,859,015,643	Rp 4,862,496,424
	0.0523	Rp 3,923,737,037	Rp 3,917,855,896		0.0782	Rp 4,040,798,246	Rp 4,038,049,183		0.6138	Rp 4,861,358,058	Rp 4,864,850,543
	0.0528	Rp 3,926,755,175	Rp 3,920,999,968		0.1176	Rp 4,160,214,624	Rp 4,159,093,521		0.6531	Rp 4,898,833,325	Rp 4,902,511,849
	0.0532	Rp 3,929,383,671	Rp 3,923,734,923		0.1207	Rp 4,168,132,063	Rp 4,167,095,895		0.6739	Rp 4,918,282,588	Rp 4,922,056,808
	0.0533	Rp 3,929,612,454	Rp 3,923,972,836		0.1668	Rp 4,272,701,088	Rp 4,272,637,392		0.7477	Rp 4,984,527,270	Rp 4,988,623,478
	0.0539	Rp 3,933,193,504	Rp 3,927,694,036		0.2144	Rp 4,362,570,853	Rp 4,363,194,213		0.7562	Rp 4,991,948,553	Rp 4,996,080,481
	0.0543	Rp 3,935,287,653	Rp 3,929,867,830		0.2190	Rp 4,370,488,108	Rp 4,371,167,548		0.7781	Rp 5,010,839,850	Rp 5,015,062,406
	0.0551	Rp 3,939,867,920	Rp 3,934,616,679		0.2676	Rp 4,449,530,067	Rp 4,450,739,829		0.8532	Rp 5,073,670,740	Rp 5,078,191,858
	0.0558	Rp 3,943,568,502	Rp 3,938,448,153		0.3276	Rp 4,536,368,251	Rp 4,538,112,341		0.8723	Rp 5,089,180,603	Rp 5,093,774,793
	0.0568	Rp 3,948,881,574	Rp 3,943,941,446		0.3695	Rp 4,591,786,061	Rp 4,593,851,628		0.8781	Rp 5,093,831,634	Rp 5,098,447,691
	0.0568	Rp 3,949,066,332	Rp 3,944,132,315		0.4046	Rp 4,635,473,111	Rp 4,637,783,625		0.8873	Rp 5,101,152,682	Rp 5,105,803,117
	0.0569	Rp 3,949,451,844	Rp 3,944,530,547		0.4046	Rp 4,635,473,111	Rp 4,637,783,625		0.8907	Rp 5,103,901,041	Rp 5,108,564,369
	0.0570	Rp 3,950,213,017	Rp 3,945,316,705		0.4355	Rp 4,672,352,752	Rp 4,674,865,078		0.8956	Rp 5,107,779,016	Rp 5,112,460,524
	0.0573	Rp 3,951,798,658	Rp 3,946,953,853		0.4537	Rp 4,693,288,771	Rp 4,695,913,858		0.9226	Rp 5,129,157,766	Rp 5,133,939,252
	0.0574	Rp 3,951,960,475	Rp 3,947,120,886		0.4593	Rp 4,699,694,055	Rp 4,702,353,396		0.9483	Rp 5,149,113,455	Rp 5,153,987,900
	0.0578	Rp 3,954,150,599	Rp 3,949,380,878		0.4706	Rp 4,712,461,872	Rp 4,715,189,168		0.9752	Rp 5,169,761,848	Rp 5,174,732,124
					0.5089	Rp 4,754,375,654	Rp 4,757,323,155		0.9845	Rp 5,176,839,789	Rp 5,181,842,835

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Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.0062	0.0085	0.0226	0.0237	0.0287	0.0392	0.0471	0.0541	0.0564	0.0777	0.0813	0.0929
0.0512	4	4	4	4	4	4	4	4	4	4	4	4
0.0518	4	4	4	4	4	4	4	4	4	4	4	4
0.0519	4	4	4	4	4	4	4	4	4	4	4	4
0.0523	4	4	4	4	4	4	4	4	4	4	4	4
0.0528	4	4	4	4	4	4	4	4	4	4	4	4
0.0532	4	4	4	4	4	4	4	4	4	4	4	4
0.0533	4	4	4	4	4	4	4	4	4	4	4	4
0.0539	4	4	4	4	4	4	4	4	4	4	4	4
0.0543	4	4	4	4	4	4	4	4	4	4	4	4
0.0551	4	4	4	4	4	4	4	4	4	4	4	4
0.0558	4	4	4	4	4	4	4	4	4	4	4	4
0.0568	4	4	4	4	4	4	4	4	4	4	4	4
0.0568	4	4	4	4	4	4	4	4	4	4	4	4
0.0569	4	4	4	4	4	4	4	4	4	4	4	4
0.0570	4	4	4	4	4	4	4	4	4	4	4	4
0.0573	4	4	4	4	4	4	4	4	4	4	4	4
0.0574	4	4	4	4	4	4	4	4	4	4	4	4
0.0578	4	4	4	4	4	4	4	4	4	4	4	4
0.0585	4	4	4	4	4	4	4	4	4	4	4	4
0.0590	4	4	4	4	4	4	4	4	4	4	4	4
0.0700	4	4	4	4	4	4	4	4	4	4	4	4
0.0782	4	4	4	4	4	4	4	4	4	4	4	4
0.1176	4	4	4	4	4	4	4	4	4	4	4	4

The leftmost rotated label reads: **Interest Charged (Ic)**

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.0062	0.0085	0.0226	0.0237	0.0287	0.0392	0.0471	0.0541	0.0564	0.0777	0.0813	0.0929
0.1207	4	4	4	4	4	4	4	4	4	4	4	4
0.1668	4	4	4	4	4	5	5	5	5	5	5	5
0.2144	5	5	5	5	5	5	5	5	5	5	5	5
0.2190	5	5	5	5	5	5	5	5	5	5	5	5
0.2676	5	5	5	5	5	5	5	5	5	5	5	5
0.3276	5	5	5	5	5	5	5	5	5	5	5	6
0.3695	5	5	5	5	5	5	5	5	5	6	6	6
0.4046	5	5	5	5	5	5	5	6	6	6	6	6
0.4355	5	5	5	5	5	6	6	6	6	6	6	6
0.4537	5	5	5	5	5	6	6	6	6	6	6	6
0.4593	5	5	5	5	5	6	6	6	6	6	6	6
0.4706	5	5	5	5	6	6	6	6	6	6	6	6
0.5089	5	5	6	6	6	6	6	6	6	6	6	6
0.5216	5	5	6	6	6	6	6	6	6	6	6	6
0.5730	6	6	6	6	6	6	6	6	6	6	7	7
0.6114	6	6	6	6	6	6	6	6	6	7	7	7
0.6138	6	6	6	6	6	6	6	6	6	7	7	7
0.6531	6	6	6	6	6	6	6	6	6	7	7	7
0.6739	6	6	6	6	6	6	6	7	7	7	7	7
0.7477	6	6	6	6	6	7	7	7	7	7	7	7
0.7562	6	6	6	6	6	7	7	7	7	7	7	7
0.7781	6	6	6	6	6	7	7	7	7	7	7	7
0.8532	6	6	6	7	7	7	7	7	7	8	8	8

Interest Charged (Ic)

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.0937	0.1096	0.1129	0.1343	0.1363	0.1461	0.1505	0.1599	0.1600	0.1691	0.1872	0.2100
0.0512	4	4	4	4	4	4	4	4	4	4	4	4
0.0518	4	4	4	4	4	4	4	4	4	4	4	4
0.0519	4	4	4	4	4	4	4	4	4	4	4	4
0.0523	4	4	4	4	4	4	4	4	4	4	4	4
0.0528	4	4	4	4	4	4	4	4	4	4	4	4
0.0532	4	4	4	4	4	4	4	4	4	4	4	4
0.0533	4	4	4	4	4	4	4	4	4	4	4	4
0.0539	4	4	4	4	4	4	4	4	4	4	4	4
0.0543	4	4	4	4	4	4	4	4	4	4	4	4
0.0551	4	4	4	4	4	4	4	4	4	4	4	4
0.0558	4	4	4	4	4	4	4	4	4	4	4	4
0.0568	4	4	4	4	4	4	4	4	4	4	4	4
0.0568	4	4	4	4	4	4	4	4	4	4	4	4
0.0569	4	4	4	4	4	4	4	4	4	4	4	4
0.0570	4	4	4	4	4	4	4	4	4	4	4	4
0.0573	4	4	4	4	4	4	4	4	4	4	4	4
0.0574	4	4	4	4	4	4	4	4	4	4	4	4
0.0578	4	4	4	4	4	4	4	4	4	4	4	4
0.0585	4	4	4	4	4	4	4	4	4	4	4	4
0.0590	4	4	4	4	4	4	4	4	4	4	4	4
0.0700	4	4	4	4	4	4	4	4	4	4	4	4
0.0782	4	4	4	4	4	4	4	4	4	4	4	4
0.1176	4	4	4	4	4	4	4	4	4	4	4	4

The left vertical axis is labeled "Interest Charged (Ic)".

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.0937	0.1096	0.1129	0.1343	0.1363	0.1461	0.1505	0.1599	0.1600	0.1691	0.1872	0.2100
0.1207	4	4	4	4	4	4	4	4	4	4	5	5
0.1668	5	5	5	5	5	5	5	5	5	5	5	5
0.2144	5	5	5	5	5	5	5	5	5	5	5	5
0.2190	5	5	5	5	5	5	5	5	5	5	5	5
0.2676	5	5	5	5	5	6	6	6	6	6	6	6
0.3276	6	6	6	6	6	6	6	6	6	6	6	6
0.3695	6	6	6	6	6	6	6	6	6	6	6	7
0.4046	6	6	6	6	6	6	6	7	7	7	7	7
0.4355	6	6	6	6	6	7	7	7	7	7	7	7
0.4537	6	6	6	7	7	7	7	7	7	7	7	7
0.4593	6	6	6	7	7	7	7	7	7	7	7	7
0.4706	6	6	6	7	7	7	7	7	7	7	7	7
0.5089	6	7	7	7	7	7	7	7	7	7	7	8
0.5216	6	7	7	7	7	7	7	7	7	7	7	8
0.5730	7	7	7	7	7	7	7	7	7	8	8	8
0.6114	7	7	7	7	7	7	8	8	8	8	8	8
0.6138	7	7	7	7	7	8	8	8	8	8	8	8
0.6531	7	7	7	8	8	8	8	8	8	8	8	8
0.6739	7	7	7	8	8	8	8	8	8	8	8	9
0.7477	7	8	8	8	8	8	8	8	8	8	9	9
0.7562	7	8	8	8	8	8	8	8	8	8	9	9
0.7781	8	8	8	8	8	8	8	8	8	9	9	9
0.8532	8	8	8	8	8	9	9	9	9	9	9	10

Interest Charged (Ic)

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.0062	0.0085	0.0226	0.0237	0.0287	0.0392	0.0471	0.0541	0.0564	0.0777	0.0813	0.0929
0.8723	6	6	7	7	7	7	7	7	7	8	8	8
0.8781	6	6	7	7	7	7	7	7	7	8	8	8
0.8873	6	6	7	7	7	7	7	7	7	8	8	8
0.8907	6	6	7	7	7	7	7	7	7	8	8	8
0.8956	6	6	7	7	7	7	7	7	7	8	8	8
0.9226	6	6	7	7	7	7	7	7	7	8	8	8
0.9483	6	6	7	7	7	7	7	7	7	8	8	8
0.9752	6	6	7	7	7	7	7	7	7	8	8	8
0.9845	6	6	7	7	7	7	7	7	8	8	8	8

EOI	Delay Period (M)											
	0.0937	0.1096	0.1129	0.1343	0.1363	0.1461	0.1505	0.1599	0.1600	0.1691	0.1872	0.2100
0.8723	8	8	8	9	9	9	9	9	9	9	9	10
0.8781	8	8	8	9	9	9	9	9	9	9	9	10
0.8873	8	8	8	9	9	9	9	9	9	9	9	10
0.8907	8	8	8	9	9	9	9	9	9	9	9	10
0.8956	8	8	8	9	9	9	9	9	9	9	9	10
0.9226	8	8	8	9	9	9	9	9	9	9	10	10
0.9483	8	8	8	9	9	9	9	9	9	9	10	10
0.9752	8	8	9	9	9	9	9	9	9	9	10	10
0.9845	8	9	9	9	9	9	9	9	9	10	10	10

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.2363	0.2456	0.2768	0.2931	0.3031	0.3680	0.3824	0.4217	0.4404	0.4701	0.4936	0.5432
0.0512	4	4	4	4	4	3	3	3	3	3	3	3
0.0518	4	4	4	4	4	3	3	3	3	3	3	3
0.0519	4	4	4	4	4	3	3	3	3	3	3	3
0.0523	4	4	4	4	4	3	3	3	3	3	3	3
0.0528	4	4	4	4	4	4	3	3	3	3	3	3
0.0532	4	4	4	4	4	4	3	3	3	3	3	3
0.0533	4	4	4	4	4	4	3	3	3	3	3	3
0.0539	4	4	4	4	4	4	4	3	3	3	3	3
0.0543	4	4	4	4	4	4	4	3	3	3	3	3
0.0551	4	4	4	4	4	4	4	3	3	3	3	3
0.0558	4	4	4	4	4	4	4	3	3	3	3	3
0.0568	4	4	4	4	4	4	4	4	3	3	3	3
0.0568	4	4	4	4	4	4	4	4	3	3	3	3
0.0569	4	4	4	4	4	4	4	4	3	3	3	3
0.0570	4	4	4	4	4	4	4	4	3	3	3	3
0.0573	4	4	4	4	4	4	4	4	4	3	3	3
0.0574	4	4	4	4	4	4	4	4	4	3	3	3
0.0578	4	4	4	4	4	4	4	4	4	3	3	3
0.0585	4	4	4	4	4	4	4	4	4	3	3	3
0.0590	4	4	4	4	4	4	4	4	4	4	3	3
0.0700	4	4	4	4	4	4	4	4	4	4	4	4
0.0782	4	4	4	4	4	4	4	4	4	4	4	4
0.1176	5	5	5	5	5	5	5	5	5	5	5	5

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.2363	0.2456	0.2768	0.2931	0.3031	0.3680	0.3824	0.4217	0.4404	0.4701	0.4936	0.5432
0.1207	5	5	5	5	5	5	5	5	5	5	5	5
0.1668	5	5	5	5	5	5	5	6	6	6	6	6
0.2144	6	6	6	6	6	6	6	6	6	6	6	7
0.2190	6	6	6	6	6	6	6	6	6	6	7	7
0.2676	6	6	6	6	6	7	7	7	7	7	7	7
0.3276	7	7	7	7	7	7	7	8	8	8	8	8
0.3695	7	7	7	7	7	8	8	8	8	8	8	9
0.4046	7	7	7	8	8	8	8	8	9	9	9	9
0.4355	7	7	8	8	8	8	8	9	9	9	9	9
0.4537	7	8	8	8	8	8	9	9	9	9	9	10
0.4593	7	8	8	8	8	9	9	9	9	9	9	10
0.4706	8	8	8	8	8	9	9	9	9	9	10	10
0.5089	8	8	8	8	8	9	9	9	10	10	10	10
0.5216	8	8	8	8	9	9	9	9	10	10	10	10
0.5730	8	8	9	9	9	9	10	10	10	10	10	11
0.6114	8	9	9	9	9	10	10	10	10	11	11	11
0.6138	9	9	9	9	9	10	10	10	10	11	11	11
0.6531	9	9	9	9	9	10	10	11	11	11	11	12
0.6739	9	9	9	9	10	10	10	11	11	11	11	12
0.7477	9	9	10	10	10	11	11	11	11	12	12	12
0.7562	9	9	10	10	10	11	11	11	12	12	12	13
0.7781	9	10	10	10	10	11	11	12	12	12	12	13
0.8532	10	10	10	11	11	11	12	12	12	13	13	13

Interest Charged (Ic)

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.5435	0.5842	0.5972	0.6126	0.6399	0.6634	0.7015	0.7314	0.7514	0.7611	0.7853	0.8359
0.0512	3	3	3	3	3	3	3	3	3	3	3	3
0.0518	3	3	3	3	3	3	3	3	3	3	3	3
0.0519	3	3	3	3	3	3	3	3	3	3	3	3
0.0523	3	3	3	3	3	3	3	3	3	3	3	3
0.0528	3	3	3	3	3	3	3	3	3	3	3	3
0.0532	3	3	3	3	3	3	3	3	3	3	3	3
0.0533	3	3	3	3	3	3	3	3	3	3	3	3
0.0539	3	3	3	3	3	3	3	3	3	3	3	3
0.0543	3	3	3	3	3	3	3	3	3	3	3	3
0.0551	3	3	3	3	3	3	3	3	3	3	3	3
0.0558	3	3	3	3	3	3	3	3	3	3	3	3
0.0568	3	3	3	3	3	3	3	3	3	3	3	3
0.0568	3	3	3	3	3	3	3	3	3	3	3	3
0.0569	3	3	3	3	3	3	3	3	3	3	3	3
0.0570	3	3	3	3	3	3	3	3	3	3	3	3
0.0573	3	3	3	3	3	3	3	3	3	3	3	3
0.0574	3	3	3	3	3	3	3	3	3	3	3	3
0.0578	3	3	3	3	3	3	3	3	3	3	3	3
0.0585	3	3	3	3	3	3	3	3	3	3	3	3
0.0590	3	3	3	3	3	3	3	3	3	3	3	3
0.0700	4	4	4	4	4	4	4	4	4	4	4	4
0.0782	4	4	4	4	4	4	4	4	4	4	4	4
0.1176	5	5	5	5	5	5	5	5	5	5	5	5

Interest Charged (Ic)

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.5435	0.5842	0.5972	0.6126	0.6399	0.6634	0.7015	0.7314	0.7514	0.7611	0.7853	0.8359
0.1207	5	5	5	5	5	5	5	5	5	5	5	5
0.1668	6	6	6	6	6	6	6	6	6	6	6	6
0.2144	7	7	7	7	7	7	7	7	7	7	7	8
0.2190	7	7	7	7	7	7	7	7	7	7	7	8
0.2676	7	8	8	8	8	8	8	8	8	8	8	9
0.3276	8	8	8	9	9	9	9	9	9	9	9	10
0.3695	9	9	9	9	9	9	10	10	10	10	10	10
0.4046	9	9	9	10	10	10	10	10	10	10	10	11
0.4355	9	10	10	10	10	10	10	11	11	11	11	11
0.4537	10	10	10	10	10	10	11	11	11	11	11	11
0.4593	10	10	10	10	10	10	11	11	11	11	11	11
0.4706	10	10	10	10	10	11	11	11	11	11	11	12
0.5089	10	11	11	11	11	11	11	11	12	12	12	12
0.5216	10	11	11	11	11	11	11	12	12	12	12	12
0.5730	11	11	11	11	12	12	12	12	12	12	13	13
0.6114	11	12	12	12	12	12	12	13	13	13	13	13
0.6138	11	12	12	12	12	12	12	13	13	13	13	13
0.6531	12	12	12	12	12	13	13	13	13	13	13	14
0.6739	12	12	12	12	13	13	13	13	13	14	14	14
0.7477	12	13	13	13	13	13	14	14	14	14	14	15
0.7562	13	13	13	13	13	14	14	14	14	14	15	15
0.7781	13	13	13	13	14	14	14	14	14	15	15	15
0.8532	13	14	14	14	14	14	15	15	15	15	15	16

Interest Charged (Ic)

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)											
	0.2363	0.2456	0.2768	0.2931	0.3031	0.3680	0.3824	0.4217	0.4404	0.4701	0.4936	0.5432
0.8723	10	10	10	11	11	12	12	12	12	13	13	13
0.8781	10	10	11	11	11	12	12	12	12	13	13	13
0.8873	10	10	11	11	11	12	12	12	12	13	13	14
0.8907	10	10	11	11	11	12	12	12	13	13	13	14
0.8956	10	10	11	11	11	12	12	12	13	13	13	14
0.9226	10	10	11	11	11	12	12	13	13	13	13	14
0.9483	10	10	11	11	11	12	12	13	13	13	13	14
0.9752	10	11	11	11	11	12	12	13	13	13	14	14
0.9845	11	11	11	11	11	12	12	13	13	13	14	14

EOI	Delay Period (M)											
	0.5435	0.5842	0.5972	0.6126	0.6399	0.6634	0.7015	0.7314	0.7514	0.7611	0.7853	0.8359
0.8723	13	14	14	14	14	15	15	15	15	15	16	16
0.8781	13	14	14	14	14	15	15	15	15	15	16	16
0.8873	14	14	14	14	14	15	15	15	15	16	16	16
0.8907	14	14	14	14	15	15	15	15	16	16	16	16
0.8956	14	14	14	14	15	15	15	15	16	16	16	16
0.9226	14	14	14	15	15	15	15	16	16	16	16	17
0.9483	14	14	15	15	15	15	16	16	16	16	16	17
0.9752	14	15	15	15	15	15	16	16	16	16	17	17
0.9845	14	15	15	15	15	15	16	16	16	16	17	17

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI		Delay Period (M)							EOI		Delay Period (M)		
		0.8383	0.8385	0.8580	0.8972	0.9278	0.9906	0.9993			0.8383	0.8385	0.8580
Interest Charged (Ic)	0.0512	3	3	3	2	2	2	2	Interest Charged (Ic)	0.1207	5	5	5
	0.0518	3	3	3	2	2	2	2		0.1668	6	6	7
	0.0519	3	3	3	2	2	2	2		0.2144	8	8	8
	0.0523	3	3	3	3	2	2	2		0.2190	8	8	8
	0.0528	3	3	3	3	2	2	2		0.2676	9	9	9
	0.0532	3	3	3	3	2	2	2		0.3276	10	10	10
	0.0533	3	3	3	3	2	2	2		0.3695	10	10	10
	0.0539	3	3	3	3	3	2	2		0.4046	11	11	11
	0.0543	3	3	3	3	3	2	2		0.4355	11	11	11
	0.0551	3	3	3	3	3	2	2		0.4537	11	11	12
	0.0558	3	3	3	3	3	3	3		0.4593	11	11	12
	0.0568	3	3	3	3	3	3	3		0.4706	12	12	12
	0.0568	3	3	3	3	3	3	3		0.5089	12	12	12
	0.0569	3	3	3	3	3	3	3		0.5216	12	12	12
	0.0570	3	3	3	3	3	3	3		0.5730	13	13	13
	0.0573	3	3	3	3	3	3	3		0.6114	13	13	13
	0.0574	3	3	3	3	3	3	3		0.6138	13	13	14
	0.0578	3	3	3	3	3	3	3		0.6531	14	14	14
	0.0585	3	3	3	3	3	3	3		0.6739	14	14	14
	0.0590	3	3	3	3	3	3	3		0.7477	15	15	15
	0.0700	4	4	4	3	3	3	3		0.7562	15	15	15
	0.0782	4	4	4	4	4	4	4		0.7781	15	15	15
	0.1176	5	5	5	5	5	5	5		0.8532	16	16	16

Attachment 2. Two-Way Sensitivity Analysis toward Economic Order Interval (Scenario 3) (cont.)

EOI	Delay Period (M)			
	0.8972	0.9278	0.9906	0.9993
0.1207	5	5	5	5
0.1668	7	7	7	7
0.2144	8	8	8	8
0.2190	8	8	8	8
0.2676	9	9	9	9
0.3276	10	10	10	10
0.3695	10	11	11	11
0.4046	11	11	11	12
0.4355	11	12	12	12
0.4537	12	12	12	12
0.4593	12	12	12	12
0.4706	12	12	12	12
0.5089	12	13	13	13
0.5216	13	13	13	13
0.5730	13	13	14	14
0.6114	14	14	14	14
0.6138	14	14	14	14
0.6531	14	14	15	15
0.6739	14	15	15	15
0.7477	15	15	16	16
0.7562	15	16	16	16
0.7781	16	16	16	16
0.8532	16	17	17	17

Interest Charged (Ic) (row label for the first table)

EOI	Delay Period (M)						
	0.8383	0.8385	0.8580	0.8972	0.9278	0.9906	0.9993
0.8723	16	16	16	17	17	17	17
0.8781	16	16	16	17	17	17	17
0.8873	16	16	16	17	17	17	18
0.8907	16	16	16	17	17	17	18
0.8956	16	16	16	17	17	18	18
0.9226	17	17	17	17	17	18	18
0.9483	17	17	17	17	18	18	18
0.9752	17	17	17	18	18	18	18
0.9845	17	17	17	18	18	18	18

AUTHOR BIOGRAPHY

The author, Immarita Dinar Fajriyani, was born on March 22nd 1997 in Banyuwangi, Indonesia. The author had completed her formal studies at SDN 1 Kebalenan (2004-2009) for the elementary school, SMPN 1 Banyuwangi (2009-2012) for the junior high school, and SMAN 1 Glagah Banyuwangi (2012-2014) for the senior high school. In 2014, the author started to continue her study in Industrial Engineering Department of Institut Teknologi Sepuluh Nopember (ITS). During the study, the author had involved in student unit which is the ITS Student Choir. Besides being an active member, the author had involved in the organization as the Head of Department of Musical Development (2016-2017) on her second year.. Beside university activities, the author had achieved an honor to win Banyuwangi Tourism Ambassador Competition (Jebeng-Thulik Banyuwangi) 2015 and required to actively participate the internal district and neighborhood duties such as cultural and tourism festivals. The author also had an opportunity to be the Djarum Foundation Scholarship Awardee 2016-2017 (Beswan Djarum Batch 32), one of the Corporate Social Responsibility (CSR) program in education by PT Djarum providing self-development trainings. In the final year of the study, the author had participated in the internship program of PT. Semen Indonesia in Corporate Marketing Department located in Gresik. For further discussion and suggestion regarding this research, the author can be reached at immaritadinar@gmail.com.