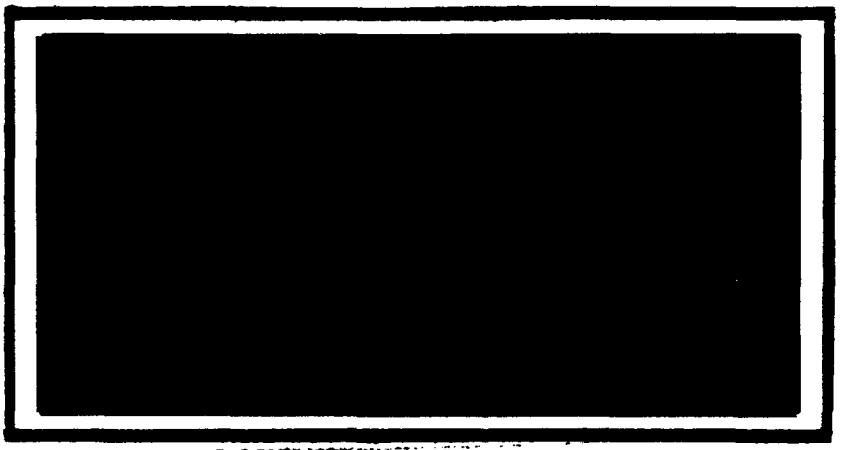

DEPARTMENT OF THE AIR FORCE

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AFIT/GLM/LSC/90S-56

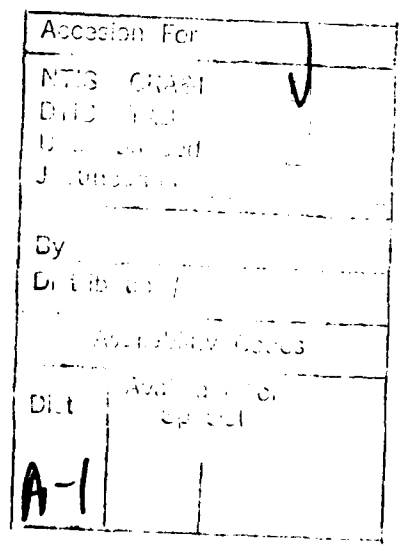
A COMPARISON OF INVENTORY SAFETY STOCK CALCULATION METHODS FOR THE AIR FORCE COMMISSARY SERVICE

THESIS

Robert A. Stead, First Lieutenant, USAF

AFIT/GLM/LSC/90S-56

The opinions and conclusions in this paper are those of the author and are not intended to represent the official position of the DOD, USAF, or any other government agency.



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THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

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First Lieutenant, USAF

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Preface

The purpose of this study was to compare the performance of three alternative methods of calculating inventory safety stock in the commissary environment to the performance of the current safety stock levels.

I wish to extend my thanks to Lieutenant Colonel Larry Emmelhainz for his sound guidance, encouragement and understanding. I am also indebted to Captain Mike Stark at Air Force Commissary Service headquarters for providing the data and simulation model used in this study.

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Abstract

The purpose of this research was to study alternative methods of computing safety stock in the commissary operating environment. Safety stock calculation methods designed to deliver a predetermined level of customer service were the primary area of concentration. The Air Force Commissary Service (AFCOMS) provided the data for this research, which was from the Randolph AFB commissary store. The current safety stock levels constituted the baseline for this study. Another method, recommended by Bytronic Technologies Corporation in a 1987 report to AFCOMS, was also tested.

A regression model was built to relate customer service level (Not-In-Stock Rate (NIS)) to measures of buffer stock and demand variability. Four 1100 item samples were prepared with safety stock levels computed with each of the methods. Each sample was input to a SLAM II simulation model of a commissary store inventory system. The performance statistics the model produced were the primary means of comparing the techniques.

After analyzing the performance of each technique, it was determined that none of the methods was clearly superior to the others. Baseline safety stock levels are set too low to attain AFCOMS' goal of a two percent NIS rate. The targeted service level methods over-allocated safety stock to all but

the high demand items. NIS rates of other than high demand items were consistently below the target level. The Bytronic method performed well with high variability items, but was ineffective with other items.

A COMPARISON OF INVENTORY SAFETY STOCK CALCULATION METHODS FOR THE AIR FORCE COMMISSARY SERVICE

I. INTRODUCTION

General Issue

The Air Force Commissary Service (AFCOMS) operates 146 grocery stores on Air Force installations throughout the world. These stores sell grocery products at cost plus a five percent surcharge. Commissary patrons save an estimated 25 percent on their groceries, and as a result, commissary privileges are considered a key personnel retention factor. In a recent survey the commissary was judged the second most important nonpay compensation, ranking just behind medical benefits. AFCOMS sales totaled $2.2 billion in 1987, making AFCOMS the tenth largest food retailer in the United States. (Air Force Commissary Service, 1988: 152-153)

The wide geographic separation of commissary stores creates difficult logistical problems. Most grocery retailers have many stores in the same geographic area. These stores can be restocked from a centrally located distribution center. With few exceptions, AFCOMS stores are geographically isolated from one another. Because it is not practical to restock stores from a distribution center, each commissary maintains its own warehouse. At the Wright-Patterson AFB commissary,

for example, the in-store warehouse stocks about 60 percent of the store's 12,000 line items. Each commissary deals directly with food brokers and manufacturers' representatives who visit the store regularly to take an order to restock the store's warehouse. Delivery lead time varies from several days to several weeks for the different products, and is often variable for any one product as well. Because of the reordering and delivery lead times, these are the products the commissary sometimes experiences difficulty keeping in stock all the time. (Johnson, 1990)

The remaining 40 percent of the Wright-Patterson AFB commissary's inventory items are either restocked by the vendor, e.g. soft drinks and potato chips, or are frequent delivery items. Frequent delivery items are high volume items that are ordered daily from a local grocery distributor and delivered the next day. Both frequent delivery and commissary warehouse items are restocked in the evenings by a contractor. (Johnson, 1990)

Variable and sometimes long lead times, and inventory constraints make it difficult to avoid stockouts of the warehouse stocked items. At the Wright-Patterson AFB commissary there are typically 200 items not in stock on any given day (Solheim, 1990). Stockouts are costly to the commissary in the form of lost sales and annoyed customers. Generally, inventory availability is the single most important element in the mix of customer service elements (Armstrong, 1985:43).

The Automated Commissary Operations System (ACOS) is the computerized system AFCOMS developed in the early 1980's (Bytronics, 1987:9). ACOS is used in managing "all aspects of the commissary store- and region-level operations, including troop-support, receiving, accounting, checkout, inventory control, purchasing, pricing, and shelf stocking" (Bytronics, 1987:10).

One important element of ACOS is the Suggested Order Program. Shortly before a vendor is scheduled to call on a store, ACOS produces a Suggested Order Report that lists all of the vendor's products with a suggested order quantity. The vendor reviews the ACOS-generated Suggested Order with commissary management to decide what the actual order should be (Kleaver, 1990). ACOS generates the Suggested Order based on an algorithm that takes into account average daily demand, lengths of the review period and lead times, number of safety days, and demand trend (Stark, 1987:78). Commissary management typically overrides fifty percent of the suggested orders with their own qualitatively derived order. Management generally increases the suggested order based on their experience. The override could be caused by a variety of factors, such as seasonality or an upcoming price discount. (Kleaver, 1990).

The header information on each Suggested Order Report lists certain information about the vendor: the order review period, order lead time, and number of safety days of inventory that must be maintained. These three key values are

determined by the vendor - but must be agreed upon by the item buyer. These values can be changed at the commissary store level to reflect changes agreed upon by store management and the vendor (Berger, 1990). The same inventory safety days level is assigned to all of a vendor's products regardless of the variability in demand of individual items within the vendor's product line (Berger, 1990). Management at the Wright-Patterson AFB Commissary noted that the vendor header information can become outdated if it is not closely monitored. There is no automated procedure for updating inventory safety days (Solheim, 1990). Inaccurate information for safety days can contribute to excess inventory if the number is too high, or to not in stock conditions if the number is too low.

It is an AFCOMS goal to maintain commissary store inventory values at 65 percent of monthly store sales. However, at Wright-Patterson AFB this figure is typically closer to 80 percent, and sometimes approaches 100 percent (Solheim, 1990). It is an AFCOMS objective to maintain a two percent Not-In-Stock (NIS) rate - the NIS rate representing a measure of customer service. In many companies safety stock and customer service are tradeoffs (Stock and Lambert, 1987:416). High safety stocks translate into high inventory carrying costs and good customer service levels, whereas low safety stocks mean lower inventory carrying costs and a poor customer service level (Stock and Lambert, 1987:360, 416). Inventory levels increase disproportionately as customer

service levels approach 100 percent (Stock and Lambert, 1987:416).

Specific Problem

Assigning the same safety day value to all of a vendor's products, regardless of each product's demand variability, is not likely to produce an optimum number of safety days of inventory for each item stocked. Such a method of allocating safety stock inventory is much more likely to produce excess safety stock inventory for some items, and inadequate levels of inventory for others. AFCOMS does not currently have an effective method for determining the optimum number of safety days of inventory for each item stocked.

Research Objective and Questions

It is the objective of this research to connect a measure of customer service (NIS rate) with the safety stock level by developing a method for assigning a safety day level. This research will attempt to develop a method that will effectively match products, based on their variability of demand, to a particular safety day level that will maintain the desired NIS rate. The cost and effectiveness of three service level approaches, as well as one other method of setting safety stock levels, will be compared with the cost and effectiveness of the commissary's current safety stock levels (baseline). Specific research questions are:

1. To what extent can an equation be fitted to the response surface that relates a measure of an item's demand

variability and the desired NIS level to the required number of safety days?

2. To what extent can four alternate methods of computing safety stock be used in the commissary operating environment to produce lower inventory and/or better in-stock rates?

Justification

With 146 stores, each with an inventory of as many as 10,000 individual items, AFCOMS has an enormous investment in inventory. The current method of determining safety stock probably does not allocate AFCOMS' limited inventory funds so that customer service is maximized, nor does it necessarily keep inventory at the appropriate level. This research should allow AFCOMS to establish inventory levels policy with much greater confidence. This improved policy can then be used to better control funds invested in inventory.

Scope

This research will be conducted using daily demand data for the warehoused items at the Randolph AFB commissary. These data were collected electronically by AFCOMS. The primary interest of this research is the service level technique of establishing safety stock. AFCOMS' current safety stock levels are used as a baseline for this analysis, and three alternate methods of establishing safety stock are included for comparison.

Plan of the Research

Chapter two is a review of literature pertaining to inventory safety stock and methods for establishing it. The ramifications of not-in-stock conditions, and means of measuring customer service are also discussed. A previous AFIT Masters thesis on topics related to this research is examined. Chapter three explains the methodology that will be used to carry out this research. Chapter four is an analysis of the results of this study. Based on the results developed in chapter four, conclusions and recommendations are discussed in chapter five.

II. LITERATURE REVIEW

Introduction

The objective of this chapter is to provide background in the areas of inventory control and safety stocks, on which this study is based. Beginning with fundamental information about safety stock, the review also examines stockout cost models. Next, recent research that analyzed exactly how commissary customers reacted to actual not-in-stock conditions is discussed. This serves to establish which stockout cost model is appropriate in the commissary environment. Five methods of modeling safety stocks are described as an exploration of alternative ways of approaching the problem of setting safety stocks. Recommendations regarding safety stock calculations contained in a report by the Bytronic Technologies Corporation present another way to establish safety stock. The approach of setting safety stock to provide a certain level of service, an idea which is of paramount importance to this research, is also discussed. Finally, significant thesis work by Captain Michael B. Stark in the area of inventory simulation and the use of simulation to test various inventory models is examined.

Safety Stock

Risk and uncertainty are the reasons for the existence of safety stock. Safety stocks are kept on hand to cushion against stockouts due to random fluctuations in demand or lead time. Safety stocks cover demand during the replenishment

lead time if actual demand exceeds expected demand, or if actual lead time exceeds expected lead time. Safety stock is also defined to be the average net stock just before a replenishment arrives (Silver and Peterson, 1985:254). Safety stock decreases the firm's stockout costs, but increases inventory carrying costs. (Tersine, 1976:210)

Safety stock provides diminishing marginal benefit. As the level of safety stock is increased the probability of a stockout decreases. When the safety stock level is increased to a point where the probability of a stockout approaches zero, adding additional safety stock is not beneficial and only increases inventory holding costs. The optimum safety stock level is at the point where the inventory carrying cost of additional units plus the expected stockout cost is at a minimum. (Tersine, 1976:210)

Aucamp describes three stockout cost models:

1. Expedite Model. In this situation stockouts result in backorders which are quickly filled by expediting. A one-time expedite charge and possibly a loss of goodwill are experienced in this case.

2. Backorder/Nonexpedite Model. This model applies in situations where stockouts are back ordered, but there is no expediting. The primary stockout cost is assumed to be the loss of goodwill. The loss of goodwill builds up day by day until the order is received.

3. Lost Sales Model. In this model stockouts are not backordered. A stockout is a lost sale, and results in a loss

of profits and possibly goodwill. (Aucamp, 1986:127-131)

Because backordering is not practical nor widely practiced in the food retailing industry the Lost Sales Model best applies to the commissary environment. This situation of the consumer going elsewhere to satisfy his or her needs is most common in the retail-consumer link (Silver and Peterson, 1985:253). In the commissary environment stockouts are definitely costly. When faced with an out of stock condition the customer can take one of three actions: substitute another item, delay purchase until the item is back in stock, or purchase the item at another store. In research into how commissary customers react to not-in-stock conditions by Emmelhainz et al., 1182 Wright-Patterson AFB commissary customers who had faced at least one out of stock condition where queried. Figure 1 is a decision tree which shows consumers' possible behavior options when faced with a stockout, and how consumers actually reacted at the Wright-Patterson commissary. While 36.2 percent of these customers elected to substitute another item, 63.8 percent decided to delay purchasing the item or go to another store. Of the latter group of customers, 60.6 percent planned to buy the item at a different store. Of the total 2810 customers contacted, 42.1 percent had been unable to buy at least one product due to out-of-stock conditions (Emmelhainz et al., 1989:5-7). The revenue loss of the lost sale is a direct stockout cost and possibly results in an erosion of customers' goodwill (Tersine, 1976:212). As Millar states, "A run of

out-of-stocks means lost sales for every other item, when the customer is lost" (Millar, 1980:109).

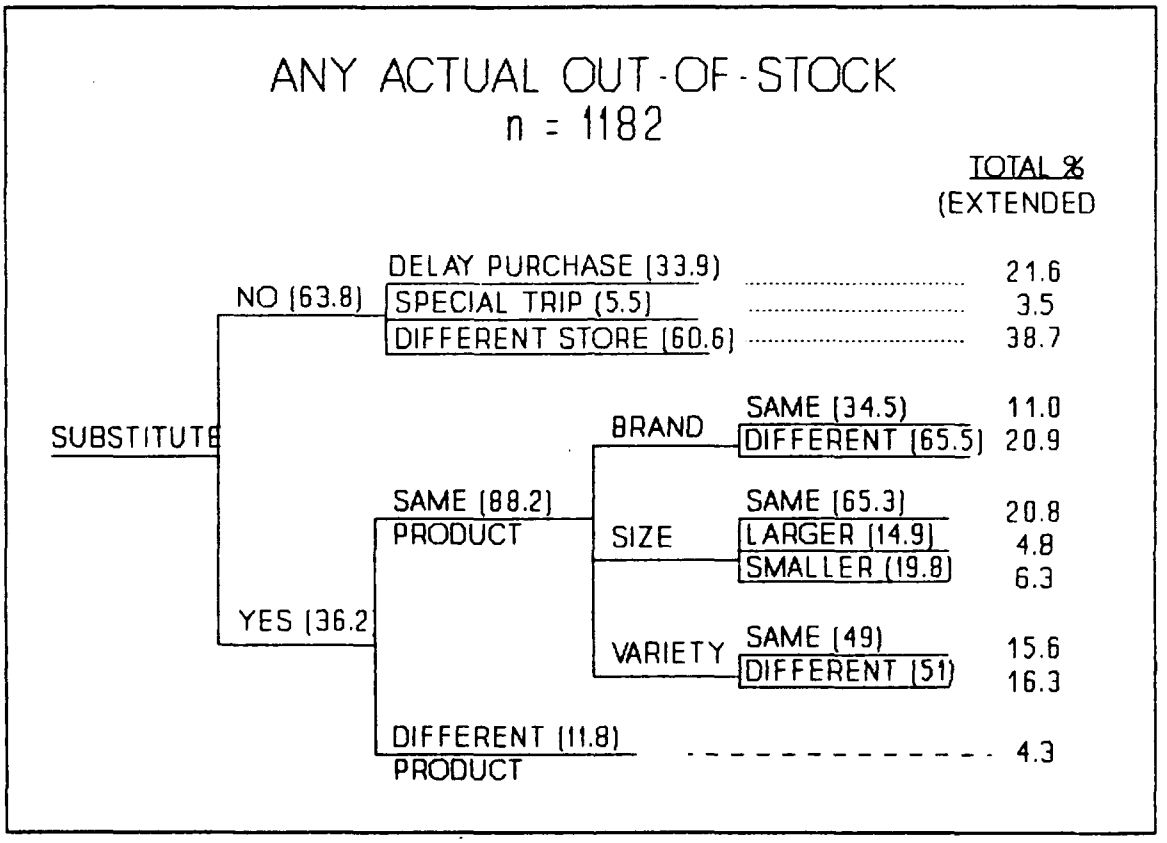


Figure 1. Customer Behavior When Faced with a Stockout (Emmelhainz et al., 1989:15)

Models of Safety Stock

Silver and Peterson present five methods of modeling safety stock determination (Silver and Peterson, 1985:260-267):

1. **Safety Stocks Established Through the Use of a Common Factor.** Two approaches to this method are to use time supplies or safety factors as the common factor. With equal time supplies, the safety stocks of a large group of (if not all) items in an inventory are set equal to the same time

supply. For example, an item would be reordered when its inventory position minus forecasted lead time demand drops to a one month supply or lower. The problem with this approach is that it fails to account for differences in uncertainty of forecasts from item to item.

For equal safety factors safety stock (SS) is defined as the product of two factors:

$$SS = k\,\sigma \qquad (1)$$

where

k = the safety factor
σ = the standard deviation of forecast errors over a period of duration L

A common value of k is used for a broad range of items (Silver and Peterson, 1985:263). This is essentially the method recommended by Bytronic Technologies for the commissary. The Bytronic model uses different common factors depending on the item's variability of demand.

2. Safety Stocks Based on Costing of Shortages. Safety stock level is based on a fixed cost per stockout, a charge per unit short, or a charge per unit short per unit of time. A common implementation of this method is to set safety stocks equal to 3σ (Silver and Peterson, 1985:263)

3. Safety Stocks Based on Service Considerations. Safety stocks are set to deliver a certain customer service level, usually subjectively set by management. This approach recognizes the severe difficulties associated with costing out-of-stocks. The service level is the control parameter

used in establishing safety stock of an item. For example, the objective might be to minimize carrying costs of an item subject to satisfying, routinely from stock, 95 percent of demands. There are a number of different approaches to measuring service level. Descriptions of several of them are contained later in this chapter. (Silver and Peterson, 1985:263-264)

4. Safety Stocks Based on the Effects of Disservice on Future Demand. This approach explicitly makes future demand a function of the service now provided. As Silver and Peterson state, "Although this approach is conceptually appealing, it is very difficult to ascertain the appropriate functional form to use." (Silver and Peterson, 1985:261)

5. Safety Stocks Based on Aggregate Considerations. With this approach safety stocks are established for individual items, using up a set available budget, to provide the best possible aggregate service across a population of items. The objective is to keep the investment in individual safety stocks low while meeting a desired service level. (Silver and Peterson, 1985:264)

In a study by Zinn and Marmorstein, simulation was used to compare two alternative methods of determining safety stock. For the first method, the Demand System, safety stock depends primarily upon the variability of demand. In the second method, the Forecast System, safety stock level is dependent upon the variability of demand forecast errors. Results of the study indicated that the Forecast System

typically required 15 percent less safety stock than the Demand System to provide the same level of customer service. Customer disservice was defined as the percentage of lead times in which a stockout occurred. For individual items the safety stock savings from using the forecast system ranged from near zero to as much as 70 percent. (Zinn and Marmorstein, 1990:95-96)

The study identified the independent variables that have the greatest impact on producing savings by the Forecast System. They are, in order of importance, variability of demand, absolute level of demand, forecast quality, variability of lead time, customer service level, and absolute lead time level. As Zinn and Marmorstein state, "the greater the variability of demand, the greater the opportunity to reduce safety stock by forecasting demand more precisely" (Zinn and Marmorstein, 1990:96, 104-105).

Bytronic Technologies Report to AFCOMS

In a 1987 report, Bytronic Technologies Corporation studied AFCOMS' inventory management practices and made suggestions for improvement. Bytronic recommended establishing safety stocks on the basis of demand and lead time variability through an ABC classification scheme (Bytronic, 1987:78).

An ABC Analysis involves assigning inventory items to categories, usually on the basis of their annual total dollar volume of sales. However, inventory items can be assigned by

a number of different criteria, for example, unit sales, demand variability or item profitability. ABC analysis is based on the Pareto Principle or 80/20 Rule - that 20 percent of a firm's products typically account for 80 percent of its sales. Type A items usually make up the largest portion of the firm's inventory investment (Stock and Lambert, 1987:419-420). Type A items (approximately 20 percent of inventory line items) are the firm's most important items. They require close attention by management and warrant sophisticated inventory control measures. According to Bytronic, "it is not unusual that 20 percent of the SKU's make up 50 percent or more of the total annual carrying charge" (Bytronic, 1987:78). Type B items are somewhat less important than Type A. These items make a lesser contribution to the firm's sales, and require a moderate amount of attention. Type C items do not usually constitute a large portion of the firm's inventory investment. These items generally tend to be slow movers which are easy to manage (Silver and Peterson, 1985:67-69).

ABC classifications set up on bases other than annual dollar volume of sales or inventory investment are sometimes used. Bytronics suggests classifying items on the basis of their demand variability from order cycle to order cycle, or variability in lead time from the vendor. Under Bytronic's classification scheme, a Type A item would exhibit high variability in demand, lead time, or both. (Bytronic, 1987:78)

Before continuing with the specifics of Bytronic's safety stock recommendations, discussion of inventory control

procedures and how commissary stores fit in is warranted.

Inventory Control Procedures

Inventory control procedures can be classified as either proactive or reactive. A forecast of the demand for the upcoming period is used to set inventory levels in a proactive system. The success of a proactive system is dependent on forecast accuracy. According to Bytronic, "Since no forecast, regardless of its complexity, will be consistently accurate, practitioners prefer reactive systems when they have a choice." (Bytronic, 1987:78)

A reactive system responds to recent action in setting inventories at appropriate levels. A reactive system uses a naive forecast under the assumption that the demand to be experienced in the future is approximately equal to the demand of the recent past. (Bytronic, 1987:79)

Silver and Peterson describe four of the most common reactive inventory control systems (summarized in Table 1) that are appropriate for managing inventories with probabilistic demand (Silver and Peterson, 1985:256-260):

1. Order-Point, Order-Quantity (s,Q) System. Under this continuous review system, a fixed quantity Q is ordered whenever the inventory position (stock on-hand and on-order) drops to a fixed reorder point s, or lower. This system is sometimes called the two bin system because one form of implementation is to have two bins for the storage of an item. When the supply in the first bin is exhausted, the second bin

is used and an order is placed. When the order arrives the second bin is refilled, and the remainder is placed in the first bin. There is little chance for error with this simple system. This system may not be effective where the quantity size of individual transactions is large. If the transaction quantity is too large, the replenishment would not raise the inventory position above the reorder point. (Silver and Peterson, 1985:256,259)

2. Order-Point, Order-Up-to-Level (s,S) System. This is also a continuous review system, however the order quantity is variable. Whenever the inventory position drops to the reorder point s, or below, a sufficient quantity is ordered to bring the inventory position up to the order-up-to-level, S. Replenishment, shortage and carrying costs for the best (s,S) systems are no greater than for the best (s,Q) systems. However, finding the best (s,S) pair is extremely difficult. A disadvantage of this system is that, because of the variable order quantity, errors in requisitioning could occur. (Silver and Peterson, 1985:256-257,259)

3. Periodic Review, Order-Up-to-Level (R,S) System. This is a replenishment cycle system and is commonly used, particularly in companies not utilizing computer control. Every R units of time (at each review instant) enough stock is ordered to bring the inventory position up to the order-up-to-level, S. Two advantages of this system are that it allows replenishments of related items to be coordinated, and there is a regular opportunity (every R units of time) to adjust the

Table 1

Inventory Control System Characteristics

System	Characteristics	Advantages/Disadvantages
Order Point, Order Quantity (s,Q)	- Continuous Review - Fixed order quantity, Q - Order placed when inventory position < s	- Simple operation - Not effective when individual transactions are large
Order Point, Order Up-to-Level (s,S)	- Continuous Review - Variable order quantity	- Hard to find best (s,S) pair - Possible requisitioning errors due to variable order quantity
Periodic Review, Order-Up-to-Level (R,S)	- Periodic review - Variable order quantity - Order-Up-to-Level can be adjusted easily - Higher carrying costs than with a continuous review system	- Easy to coordinate replenishment of related items
(R,s,S) System	- Periodic Review version of (s,S) system - Order-Up-to-Level - Order placed only if inventory pos < s	- Generally produces lower costs than the other systems - Hard to find best combination of parameters

order-up-to-level, S. This is a useful property if the demand pattern is changing with time. Carrying costs under this system are higher than with continuous review systems. (Silver and Peterson, 1985:258-259)

4. (R,s,S) System. This system can be thought of as a periodic version of the (s,S) system. Every R units of time inventory position is checked. If it is at or below the reorder point enough stock is ordered to raise it back to the order-up-to-level, S. If the inventory position is above s,

no action is taken until the next review. According to Silver and Peterson, "under quite general assumptions concerning demand pattern and cost factors involved, the best (R,s,S) system produces a lower total of replenishment, carrying, and shortage costs than does any other form of system." A disadvantage of the system is the difficulty in finding the best values for the three control parameters. This system is also more difficult for inventory clerks to understand. (Silver and Peterson, 1985:258,260)

A periodic review inventory system best describes the commissary environment. Orders are placed during the periodic visits by vendor representatives. A continuous review system is not used in the commissary environment because, although the scanning system is able to provide a perpetual inventory count, orders are only placed when vendor representatives call. The commissary is essentially using a Periodic Review, Order-Up-to-Level (R,S) System. There is no need for a reorder point (s), as in the (R,s,S) System, because order costs are insignificant, and reorder point is a function of ordering costs. Small replenishments can be made frequently without significant cost. (Bytronic, 1987:80)

Bytronic suggests the target inventory level (S) for Type A items be computed as follows (Bytronic, 1987:80):

$$S = M(R+L) + B \qquad (2)$$

where

M = historical average daily demand
R = number of days between vendor reviews
L = number of days of lead time

B = Buffer or safety stock

Bytronics recommends subdividing Type A items into two categories: those with high demand variability, and those with high lead time variability. For those items with high demand variability Bytronic recommends safety stock (B_{A1}) be set at 2.25 times standard deviation of demand over review period and lead time (Bytronic, 1985:84). This would be computed:

$$B_{A1} = 2.25\,\sigma_{adj} \tag{3}$$

where σ_{ADJ} is computed by first approximating σ at 1.25 times mean absolute deviation, and then adjusting for length of the review period plus lead time:

$$\sigma_{ADJ} = \sigma\sqrt{R+L} \tag{4}$$

where

σ = Approximated standard deviation of demand over review period and lead time
R = Review Period
L = Lead Time

For items exhibiting high lead time variability Bytronic suggests a safety days buffer (B_{A2}) computed as follows (Bytronic, 1987:85):

$$B_{A2} = M(L_w - L) \tag{5}$$

where

M = Average daily demand
L_w = Reasonable worst case lead time
L = Average (vendor quoted) lead time

For items exhibiting both a high variability of demand and lead time Bytronic recommends use of a hybrid method that provides for both variability of demand and lead times

simultaneously (Bytronic, 1985:86).

Simple 20 and 10 percent buffers based on safety days are suggested for Type B and C items, respectively. This buffer stock is computed as follows (Bytronic, 1987:86):

$$B_B = 0.2M(R+L) \tag{6}$$

$$B_C = 0.1M(R+L) \tag{7}$$

where

M = average daily demand
R = review period
L = lead time

Safety Stock and Customer Service Levels

Another approach to safety stocks is to set them so as to deliver a certain predefined service level. This approach, which is the primary focus of this research, was not considered by Bytronics. Because of the extremely high cost of trying to totally eliminate out-of-stocks, firms usually consider a "reasonable" number of out-of-stocks acceptable. Tersine states, "the policy of never having a stockout is usually uneconomical" (Tersine, 1976:301). As discussed earlier, safety stocks are subject to diminishing marginal returns. Increasingly larger additions to safety stock level result in increasingly smaller benefits in terms of affect on the NIS rate.

An important step in this approach is to establish a service level. There are a number of different measures for service (summarized in Table 2). Tersine describes three

common service measures (Tersine, 1976:301-306):

1. Frequency of Service per Order Interval. This measure indicates the probability of not running out of stock during the order interval. This approach does not consider the magnitude of the shortage, only whether or not a shortage of at least one unit occurred. It is defined as the fraction of order intervals without a depletion of stock. (Tersine, 1976:301-302)

2. Fraction of Units Demanded. This measure is the fraction of units (or dollars) demanded which is immediately filled from stock. Service level fraction is defined as the number of units supplied divided by the number of units demanded. The stockout level fraction is defined as the number of units short divided by the number of units demanded (Tersine, 1976:303-305).

3. Fraction of Operating Days. This is a measure of the length of time the shortage or stockout exists. The service level fraction is defined as the number of operating days without a stockout divided by the total number of operating days. (Tersine, 1976:305)

Summary of Inventory Safety Stock Literature

This literature has clearly documented the severe consequences of excessive not-in-stock conditions, and the importance of maintaining adequate safety stocks in a retail environment. The alternative methods of computing safety stock levels described by Silver and Peterson and Bytronics

Table 2

Calculation of Inventory Service Level Measures
(Tersine, 1976:301-306)

Service Measure	Calculation
Service per Order Interval	$1 - \frac{\text{Number of order intervals with a stockout}}{\text{Total number of order intervals}}$
Fraction of Units Demanded:	
Service Level Fraction	$\frac{\text{Number of units supplied}}{\text{Total number of units demanded}}$
Stockout Level Fraction	$\frac{\text{Number of units short}}{\text{Total number of units demanded}}$
Fraction of Operating Days	$\frac{\text{Number of operating days without a stockout}}{\text{Total number of operating days}}$

provide insight into how the commissary safety stock problem could be approached. Zinn and Marmorstein provided an interesting comparison of demand versus forecast based systems. The background set forth on methods for computing safety stock enhance understanding of the three proposed methods incorporated in this research.

Related Theses

In 1987 Captain Michael B. Stark, then a Graduate Operations Research student at the Air Force Institute of Technology, produced a thesis which compared the effectiveness

of three different inventory control systems in the commissary environment. Using SLAM II models, Stark simulated the system AFCOMS currently uses, the system recommended by Bytronics, and a third system, the Tijms and Groenevelt procedure, which was taken from professional literature. The models basically mimic and track inventory movement and replenishment on an item by item basis. After graduating from AFIT, Captain Stark was assigned to AFCOMS Headquarters, where he has continued to work on the model, and has made significant improvements to his original thesis work. The model used in this research is actually significantly more advanced than the original model described in Stark's thesis (Stark, 1990).

Stark's model can be best explained by describing its four components:

1. Input and Initialization. The model accepts as input each item's Universal Product Code (UPC), unit price, review period in days, lead time in days, average daily demand, and the standard deviation of daily demand. These data are read from an input data file (Stark, 1987:57-58). The model initializes the inventory position values, stock control level, and on-hand inventory to equal average daily demand multiplied by the total number of days of lead time and review period (Stark, 1987:59). Stark estimates the model's transient phase to be 360 days. The transient phase is the time needed for the model to "be 'warmed-up' in order to arrive at a steady state condition" (Stark, 1987:100). All statistical registers are cleared "after 360 days of store

operation in an effort to reduce the bias induced by these initial starting conditions" (Stark, 1987:59). The improved version of the model has a transient phase of approximately 1000 days (Stark, 1990).

2. Daily Transactions. This subroutine "performs the daily sales transactions associated with inventory control" (Stark, 1987:60). A random daily demand is generated for each item. Daily demand generated for each item "fits a Normal distribution with a mean and variance as specified for each UPC during model initialization" (Stark, 1987:60). The model counts the number of demands that are satisfied from stock as sales, and the number of unsatisfied demands (demand that occurs when on-hand stock is at zero) as lost sales (Stark, 1987:59-60).

3. Review Period Calculations. This subroutine calculates an item's stock control level and reorder point at each review period. If an order is necessary, the order quantity needed to raise the inventory position up to the stock control level is calculated. Inventory position is reset to the stock control level when the order is placed. On-hand inventory is increased by the size of the order when the replenishment arrives (at current time plus lead time). (Stark, 1987:60)

4. Model Output. The model produces performance measures for individual items and aggregate measures for the entire group of items (Stark, 1987:61-62). Performance measures are:

a. Average Inventory Position. Average of daily Inventory Position (IP) where IP = (Stock on-hand) + (Stock on order).

b. Average On-Hand Inventory.

c. Average Reorder Quantity.

d. Average Buffer Stock. Average level of inventory on-hand just before a replenishment arrives.

e. Inventory-to-Sales Ratio. Defined as:

$$I:S = \frac{Unit\ Cost \times Average\ Inventory\ Position}{Unit\ Cost \times Number\ of\ Units\ Sold} \qquad (8)$$

f. Stock Turns. Inverse of inventory-to-sales ratio.

g. Not-In-Stock (NIS) Ratio. Ratio of the total number of lost sales over the total number demanded (satisfied and unsatisfied). The model also reports the cumulative number of items sold and sales lost on an individual and aggregate average basis (Stark, 1987:61).

In his discussion of model validity, Stark cites a three-step validation procedure developed by Naylor and Finger (Stark, 1987:89). These three steps are:

1. Build a model that has high face validity. As Stark states, the models in this study:

> tend to be very isomorphic in nature and inherently possess a rather high degree of 'face validity', consequently, instead of some sort of mystical 'black box', in essence, each of the models is nothing more than a sophisticated accounting procedure whose functioning is tedious by routine (Stark, 1987:89).

Stark notes that average inventory position and average

inventory on-hand are positively correlated with the review period, which is an example of consistency of results produced by the model (Stark, 1987:89).

2. Validation of model assumptions. Stark notes that "although a number of simplifying assumptions are made during the model development stage," the data are actual daily demand data collected from the Wright-Patterson AFB store, and "the effects of most of the considerations that were not explicitly incorporated into the model structures are reflected in this data" (Stark, 1987:90).

3. Validating Input-Output Transformations. Two approaches to this aspect of validation are using the model to accurately predict the future, or using the model to predict the past (using historical data). Stark was unable to use either of these approaches. Predicting future performance with the system was not possible because "the time and effort required to actually implement the decisions recommended by the inventory control models of this study simply exceed the scope of the research" (Stark, 1987:90). The second approach, actually predicting the past, was also not possible. One of the models simulates AFCOMS' current inventory control system, however, "interviews with personnel of the Wright-Patterson AFB store reveal that inventory control recommendations by ACOS are routinely overridden" (Stark, 1987:90). Because of this accurate historical data are not available. Historical data for the Bytronic and Tijms systems are not available as neither system has ever been implemented by AFCOMS (Stark,

1987:91).

As previously stated, Captain Stark made significant improvements to the model while working at AFCOMS headquarters. Stark was able to check the face validity and validate the assumptions of the enhanced model, but was again unable to validate using input-output transformations (predictive validity). Face validity and the model's assumptions were checked with AFCOMS experts. Additionally, sensitivity analysis was used in testing face validity. Stark interviewed the management of a number of commissary stores in an attempt to find a store suitable for use in testing input-output transformations. However, the model represents the ideal commissary which follows ACOS and AFCOMS operating procedures without deviation, and Stark was unable to find a real world commissary store which followed the system closely enough to make an input-output validation study viable. (Stark, 1990)

In his recommendations for further study, Stark suggests that if "a sufficiently linear relationship between not-in-stock and coefficient of variability could be established," a response surface could be generated. Stark goes on to say, "this surface could be used to determine required buffer size to obtain a prescribed stockage objective (stated in terms of not-in-stock rate) for a product with a known variability of demand (stated in terms of coefficient of variation)." A more exact match could be made between variability of demand and safety stock as buffer size would be treated as a continuous

variable. (Stark, 1987:123-124)

Summary of Related Thesis

The aspect of Stark's work that is most relevant to this research is his inventory simulation modeling work for the commissary environment. The thorough description of the technical aspects of the model provide an understanding of the model's internal operation and how output data is calculated. An unavoidable weakness in Stark's work is the lack of a predictive validity study of the model. However, strong efforts have been made to ensure high face validity, and AFCOMS has enough confidence in the model to have used it in numerous in-house studies. For this study the model will be accepted as being satisfactorily validated.

III. METHODOLOGY

General

The basic objective of this research was to develop a method of establishing safety stock levels to meet a predetermined customer service level. This method was compared with two alternate methods, as well as the baseline (current) safety stock levels. Using the model developed by Stark, the effectiveness and cost of the commissary's current method was compared with (1) the Targeted Service Level method - which involved setting safety stock to meet AFCOMS' two percent NIS customer service level objective, (2) the Bytronic approach based on an A-B-C classification scheme, and (3) two versions of Stratified Targeted Service Levels - a method combining aspects of the customer service level and Bytronic methods.

Data

HQ AFCOMS provided 60 days of daily demand and price data for 6000 warehoused items at the Randolph AFB commissary. These data were collected through the Automated Commissary Operations System (ACOS). The checkout scanners and certain aspects of the inventory management system are components of ACOS. HQ AFCOMS also provided a data file of inventory characteristics for each warehoused product. This file contained Universal Product Code (UPC), casepack, description, vendor code, review period, lead time, safety days, and store department. (Stark, 1990)

The daily demand figures used in this study were the actual demands for each day of the sixty day collection period. It is important to note this as oftentimes daily demand is actually average daily demand, computed by dividing total weekly or monthly demand by 7 or 30. This normal method of data collection is not preferred as it suppresses the true variance of daily demand. These data were collected in this manner to avoid the distortions created by such averaging.

To operate the model an input file containing the following data fields is required: UPC, review period, price, average daily demand, standard deviation of daily demand, lead time, safety days, factors for lowest and highest reasonable lead time, casepack, department code, and vendor code. In order to create an input file for the model, the average daily demand and standard deviation of daily demand were computed using the daily demand data. These values were combined with data from the item characteristics data file to create an input file the model would accept. Note that the number of safety days of inventory to be maintained was input to the model from the data file; this value was computed for each item.

To account for lead time variability, the model accepts factors for the shortest and longest reasonable lead times the commissary would expect. These factors establish the bounds of a triangular distribution that is used to define lead time. For example, if the short factor is .85, this would indicate that the shortest reasonable lead time the commissary would

expect would be .85 times the vendor quoted lead time. Although lead time variability will affect the Not-In-Stock (NIS) rates the model produces, in this study it was not used as a factor to determine safety stock levels. The primary reason is that data on vendor delivery performance is not available (Kleaver, 1990). Also, management at the Wright-Patterson AFB commissary, who judge their store's operation to be typical of most other commissary stores, do not consider lead time variability to be a significant problem (Kleaver, 1990). At the Wright-Patterson AFB commissary, the store receiving function schedules order arrivals based on receiving capacity and to keep the day to day work load stable. This could result in a delivery delay of several days if a vendor had to wait for a delivery appointment (Kleaver, 1990). Furthermore, management at the Wright-Patterson AFB commissary discourages lead time variability by dealing harshly (i.e. cancelling orders) with vendors who do not deliver on schedule (Kleaver, 1990).

Experimental Design

The methodology for conducting this research was composed of four phases: (1) use the data provided by AFCOMS to build a regression model that relates coefficient of variation (CV) and buffer stock percent (B%) to the not-in-stock (NIS) rate, (2) prepare a sample of items from the AFCOMS data and compute safety stock for each item for each of the four alternative methods, (3) run the simulation model with each of the five

versions of the sample (same items, but different safety day values for the baseline and each of the four alternatives), and (4) analyze and compare performance data for the baseline and four alternative safety stock methods. Safety stock figures were converted to safety days (by dividing safety stock by average daily demand) prior to being input into the model.

As stated in chapter one, the vendor and item manager agree on the order review period, order lead time, and the number of safety days of inventory that must be maintained. These values are the same for all of a vendors' products (Berger, 1990). Current safety stock values were contained in the item characteristics data file provided by AFCOMS. The safety stock levels AFCOMS currently uses constitute the baseline for this study.

Targeted Service Levels (TSL) is the first method of determining safety stock levels. Safety stock is set to deliver a certain level of customer service. Chapter two describes several different measures of defining customer service. For this research the Not-In-Stock (NIS) ratio was used. This measure was selected primarily because it is the service performance measure Stark's model produces, but it is also a highly appropriate measure in this circumstance. A regression model with CV and buffer percent as independent variables, and NIS rate as the response was built. While each item's demand variability cannot be controlled, its level of buffer stock can be. By rearranging the regression equation,

setting the NIS rate equal to the desired customer service level, and making buffer percent the unknown variable, the number of safety days required to meet the desired NIS rate can be determined for any level of demand variability.

As a measure of demand variability, Stark uses the Coefficient of Variation (CV), which is computed as follows:

$$CV_{R+L} = \frac{SD(D) \times \sqrt{R+L}}{DMD \times (R+L)} \qquad (9)$$

where

SD(D) = Standard deviation of daily demand
R = Review period
L = Lead time
DMD = Average daily demand

Stark explains that, "the numerator represents the standard deviation of daily demand corrected for the period during which the system is exposed to uncertainty..., while the denominator represents average demand during the review period and lead time" (Stark, 1987:96).

The buffer stock percentage defines safety stock as a percent of the total demand during review period and lead time. It is calculated as follows:

$$B\% = \frac{DMD \times SAFDAY}{(R+L) \times DMD} \qquad (10)$$

where

DMD = Average daily demand
SAFDAY = Safety days
R = Review period (days)
L = Lead time (days)

CV and buffer percent were the only independent variables used in building the regression model. The intent of this

research was to determine the viability of establishing safety stocks to meet a prescribed customer service level based on demand variability. An item's level of demand is also important in setting safety stocks, as a high demand, low variability item will require a higher level of safety stock than a low demand, high variability item. Because buffer stock percent defines buffer stock in terms of cumulative demand during review period and lead time, the demand factor is implicitly included in the model. Consider two items, A and B, both have a review period plus lead time equal to ten days, and a 30 percent buffer stock. Average daily demand is 200 units for A and 20 units for B. These items have the same CV, yet safety stock is 600 units for A, but just 60 units for B.

To obtain the NIS data required to build the regression equation, the simulation model was run using the complete data set provided by AFCOMS. After deleting items with a zero or otherwise invalid average daily demand or standard deviation of daily demand, the data set consisted of 5621 items. The simulation run length was 5000 days. The model was set to begin data collection after 1000 days of operation; this was necessary to avoid capturing data during the simulation's transient period. Table three lists the model parameters used for these runs. To ease the transfer of model output data to SAS and quattro, the model's output subroutine was altered to write the NIS rate, coefficient of variation (CV) and buffer stock percentage for each item to a separate output file.

This placed data for the two independent variables, CV and buffer stock, and the dependent variable, NIS rate, in a single data file. Figure two is an XYZ plot of the actual CV, buffer stock percent and Not-In-Stock rate (model output) data for the baseline sample. This plot demonstrates the expected relationship between these three variables.

Table 3

AFCOMS Inventory Model Parameter Settings

Parameter	Setting
Duration of Model Run	5000 days
Duration of Model Warm-up (transient period)	1000 days
Average Vendor Fill Rate	0.98
Average Inventory Shrinkage due to Loss, Breakage, Theft or Spoilage	0.01
Average Short Shipment Rate	0.02
Average Long Shipment Rate	0.01

Using the data obtained in the above step, the SAS PROC GLM regression function was employed to find the equation that best fits the response surface that relates CV and buffer stock to the NIS rate. The SAS stepwise regression screening procedure was used to test a variety of variable combinations, including interactive and second order terms. The coefficient of determination (R-squared) and the F-Test were the criteria

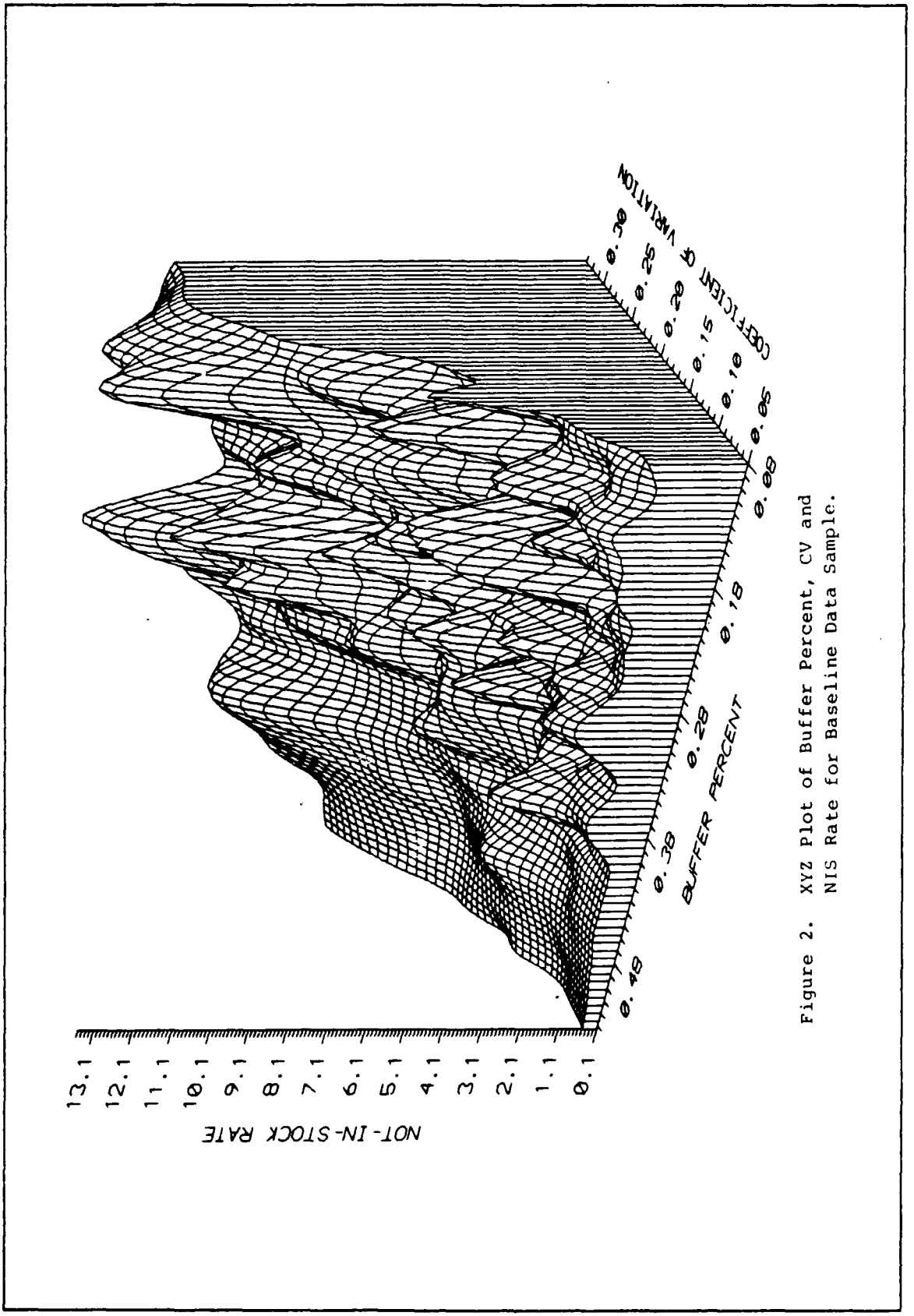


Figure 2. XYZ Plot of Buffer Percent, CV and NIS Rate for Baseline Data Sample.

used to evaluate each model's accuracy of fit (McClave and Benson, 1988:661-666). The model found to best fit the response surface was used to compute the number of safety days of inventory required by each line item to meet the prescribed NIS rate.

The second method for determining safety stock levels was recommended by Bytronic Technologies. As stated in chapter two, Bytronic suggested an A-B-C (20-30-50 percent) approach based on demand and/or lead time variability. After computing CV for each item, the items were rank ordered by CV in descending order. The first 20 percent of the items (those having the highest CV values) were classified as Type A, the next 30 percent were classified as Type B, and the remaining 50 percent were Type C items. (Bytronic, 1987:78-86)

Safety stock levels for Type A items were set at 2.25 times adjusted standard deviation (σ_{ADJ}). Adjusted standard deviation is calculated as follows:

$$\sigma_{ADJ} = \sigma \sqrt{R+L} \qquad (4)$$

where

σ = standard deviation of daily demand
R = Review period
L = Lead time

Simple 20 and 10 percent buffers were used for Type B and C items. These buffer stocks are computed as follows:

$$B_B = 0.2M(R+L) \quad (6)$$

$$B_C = 0.1M(R+L) \quad (7)$$

where

DMD = average daily demand
R = review period
L = lead time

The third method of computing safety stock is the Stratified Service Levels (STSL) model. It is a variation of the Targeted Service Level method. The sample was divided with an ABC classification scheme (20-30-50 percent) based on unit demand. Targeted service levels differed between item classes. NIS target levels were 1 percent for type A items, 2 percent for type B items, and 3 percent for type C items.

The fourth safety stock method was basically the same as the STSL method, except that a separate regression equation was built for each item class. The rationale for this approach was that the predictive accuracy of the regression models of an item class will probably be higher than for a model spanning all items. This and the other safety stock methods are summarized in Table 4.

The advantage of the stratified targeted service levels approach is that it should maintain a higher customer service level for the most important (high demand, type A) items, and a lower level of customer service for less important (low demand, type C) items. This would result in a more efficient allocation of the safety stock inventory investment.

A sample of the 5621 item population was used in

Table 4

Safety Stock Determination Techniques

Method	Characteristics
Baseline	- Current commissary safety stock levels
Targeted Service Level	- Uses regression model that relates NIS Level(dep) to buffer % and CV (indep) - Safety stocks set to deliver a pre-determined customer service level
Bytronic	- A-B-C classification scheme by coefficient of variation - Safety stock of type A items set to 2.25 σ_{LT} - Safety stocks of type B and C items are 20 and 10% buffers, respectively.
Stratified Targeted Service Levels	- A-B-C classification scheme by unit demand - Safety stocks of high demand item set to deliver 1% NIS rate - Type B items set to deliver 2% NIS - Type C items set to deliver 3% NIS
Modified Stratified Targeted Service Levels	- Same as STSL, but separate regression models built for each item class

comparing the performance of the safety stock methods and validating the regression model. A sample was used rather than the entire population because time constraints precluded spending the large amount of time required to make 5000 day simulation runs for all 5621 items. The following formula estimates the sample size necessary to obtain a confidence of

total width W with a confidence of 100(1-σ) percent (McClave and Benson, 1988:255):

$$n = \frac{4(Z_{\frac{\alpha}{2}})^2 \sigma^2}{W^2} \qquad (11)$$

where

$Z_{\alpha/2}$ = Z score for confidence level

σ^2 = standard deviation

W = confidence interval width

Given the standard deviation of NIS rates of 2.0572 (from the 5600 item population), a confidence interval width of 0.2, and a 90 percent confidence level, the necessary sample size is estimated to be 694. Because NIS is not normally distributed, it was decided to increase the sample size to 1100 items in order to ensure accuracy of the inferences about the population. The sample size estimated above was used as a guideline. A sample of 1100 items was randomly selected from the 5621 item population. Safety day values for each of the four safety stock methods were computed for each item. Safety days were rounded to the nearest integer.

After simulation runs were made with the 1100 item samples of the baseline levels, and the four alternative methods, the performance results were compared and analyzed. The appendix contains the safety day values (as well as other key data) assigned to each line item for the baseline and the four alternative safety stock methods. The three primary performance measures this study used (listed in Table 5) were the NIS rate, the I:S ratio, and aggregate investment in

inventory safety stock. The NIS rate was be employed as a measure of customer service. The I:S ratio and aggregate investment in inventory safety stock were used to gauge the cost of maintaining a particular safety stock strategy.

Performance measures for item types were also examined. The Bytronic and STSL methods assign items to a class based on their CV or average daily demand. Safety stock was computed differently for each class. For ease of comparison, the TSL and baseline performance data were also broken into A-B-C (20-30-50%) classes for both a unit demand and CV ranking. Performance statistics were computed for these classes. Examining the performance of item classes is important because it can show that a particular technique may be effective for some classes of items, but ineffective for others.

NIS rates were the measure used in determining how well a particular safety stock strategy met customer service objectives. Mean NIS rate is a key customer service measure. Standard deviation of item NIS rates measures the variability of item NIS rates. A technique which results in a mean NIS near the objective level, but has a wide variation in item NIS rates is not desired. The percentage of items not meeting the two percent NIS rate was also used in measuring customer service.

As stated in chapter one, the AFCOMS objective is to maintain an I:S ratio below 65 percent (Solheim, 1990). The model produces an aggregate I:S ratio just as it does for the NIS rate. The I:S ratios of individual items are not relevant

in this analysis.

Table 5

Performance Measures for Safety Stock Methods

Customer Service Measures
Mean Not-In-Stock Rate
Percent of Items not Meeting NIS Objective
Cost Measures
Aggregate Investment in Inventory Safety Stock
Mean Number of Safety Days
Inventory Position to Sales Ratio

Aggregate investment in inventory safety stock is the primary measure of the cost of implementing a safety stock strategy. This value was computed by summing the dollar value of safety stocks (safety stock quantity times price) for each line item. Inventory investment in safety stock was also computed for item classes. A useful comparison made was cost versus NIS for item classes. This allows for a cost-benefit analysis of safety stock techniques by item class.

Summary

The methodology contained in this chapter essentially involved performing the same series of steps for each of the four safety stock techniques and the baseline. Once safety stock levels were determined for the particular method, the

model was run with an 1100 item sample. A comparison of the results of the runs form the basis for this study's conclusion.

Time constraints preclude the testing of a variety of parameters for each of the safety stock techniques. The intention was to study the viability of establishing safety stock levels to meet prescribed customer service levels. Finding the parameters that optimize safety stock levels (lowest NIS rate for the lowest cost) was not an objective of this research.

IV. Analysis

General

This chapter is divided into seven sections, each of which corresponds to a particular phase of the methodology. The first section describes the building of a multiple regression model to relate the NIS rate to buffer stock percentage and coefficient of variation.

In the next five sections an analysis of the performance of the baseline (current) safety stock level, and each of the four alternative methods of computing safety stock are presented.

The last section compares the performances of each safety stock method, and discusses the strengths and weaknesses of each approach.

Regression Model

In this portion of the research a probabilistic model relating NIS rate to coefficient of variation (CV) and buffer stock percent was developed. The regression model was used in determining safety stock for the Targeted Service Level and Stratified Targeted Service Levels models. The SAS General Linear Models (GLM) and Stepwise screening procedures were the tools used to fit an equation to the response surface. As explained in chapter three, the regression model was limited to CV and buffer stock percent as independent variables. After trying several first and second order, and interactive variable combinations, it appeared that a simple first order

Table 6

ANOVA Table for NIS Prediction Model

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.77076617	0.38538308	1346.31	0.0001
Error	5617	1.6078682	0.00028625		
Corrected Total	5619	2.37863437			

Root MSE	0.01692	R-Square	0.3240
Dep Mean	0.03353	Adj R-Sq	0.3238
C.V.	50.45653		

Parameter Estimates

Variable	DF	Paramter Estimate	Standard Error	T for HO: Parameter=0	Prob > |T|
Intercept	1	0.0024332	0.00073729	33.002	0.0001
Buffer	1	-0.114066	0.00271105	-42.075	0.0001
CV	1	0.247953	0.00537030	46.171	0.0001

model held the most promise. The ANOVA table for this model is shown in Table six. Because the coefficient of determination (r^2) was only 0.324, methods of improving the model's fit were investigated. The residual plot indicated the presence of heteroscedasticity. A frequency histogram of NIS, the response variable (Figure three), shows that it appears to exhibit a Poisson distribution. The SAS Proc Univariate function was used to test NIS for normality with the Kolmogorov-Smirnoff test. This test confirmed that NIS did not fit a normal distribution (D=0.067243 at the <.01

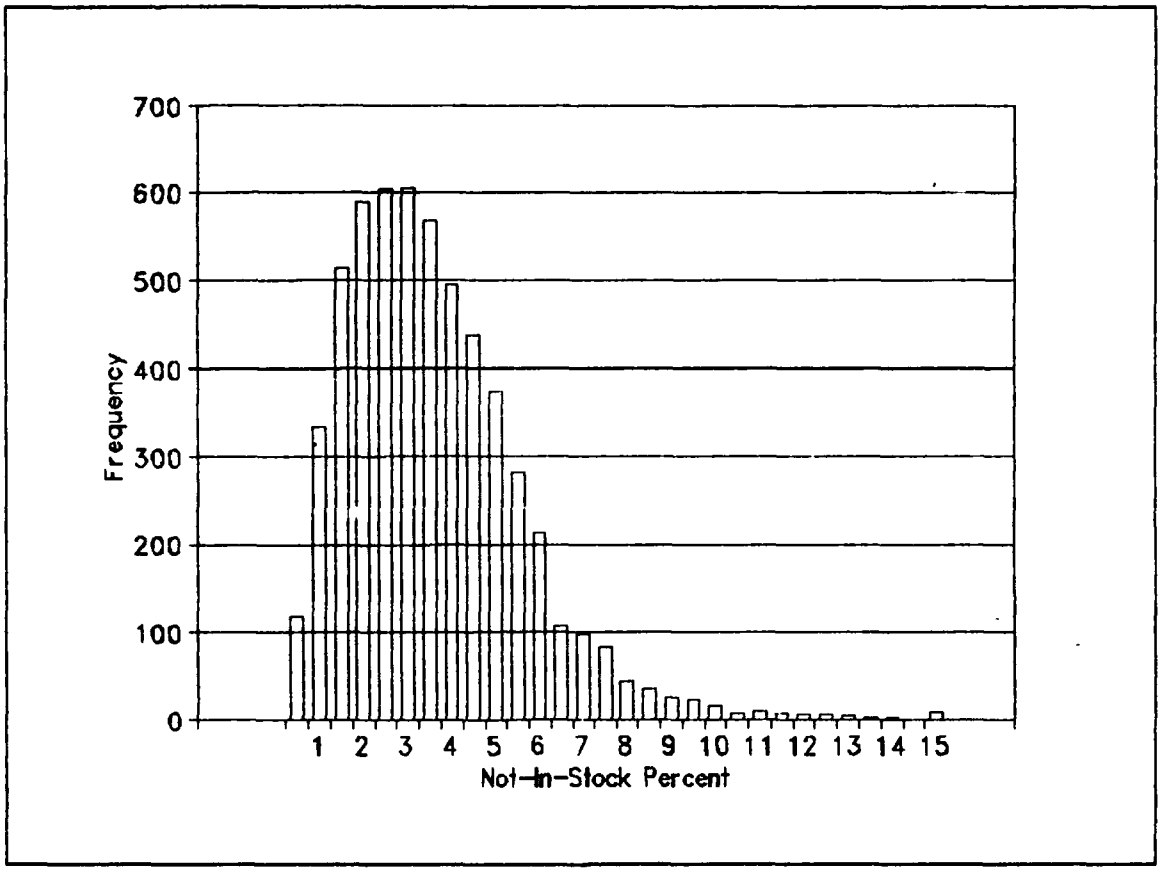


Figure 3. Frequency Histogram of Not-In-Stock Rate

level of significance). According to Neter and Wasserman, "heteroscedasticity is inherent when the response in regression analysis follows a distribution in which the variance is functionally related to the mean" (Neter and Wasserman, 1974:131). This is the case with a Poisson distribution. Neter and Wasserman suggest using a square root transformation to stabilize the variance and improve normality (Neter and Wasserman, 1974:131,507-514). The transformation $Y' = \log(Y)$ was also tried. Neither transformation was effective. The square root transformation produced only slight improvement in the r^2, while the log transformation

actually lowered the r^2. Given the inability to improve the model through transformation, it was decided to proceed using the simple first order model shown in Table six.

Because the predictive accuracy of the population-wide regression model was weak, it was decided to divide the population into an A-B-C classification scheme (20-30-50 percent) by unit demand, and build a separate regression model for each item class. ANOVA tables for each of the models are shown in Tables 7, 8 and 9. Note that the r^2 values for the type A and B models were considerably higher than the r^2 of the initial model. These models were used to predict the required buffer stock percent for the modified STSL method.

Baseline Results

AFCOMS' current safety day levels constituted the baseline for this study. Baseline performance measures are displayed in Table 10 and Figures 4 and 5. The baseline safety stock levels resulted in a mean NIS rate of 3.405 percent with an investment in inventory safety stock of $57,023. NIS rates ranged widely, as indicated by the relatively high NIS standard deviation of 2.023 percent. The inventory position to sales ratio of 59.36 percent was well below AFCOMS' 65 percent ceiling. The two percent objective was not met by 72.8 percent of the baseline items.

It appears that the baseline safety stocks were established primarily on the basis of average daily demand. As shown in Figure 4, demand Type A items account for 47.9

Table 7

ANOVA Table for Type A NIS Prediction Model

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.3052879	0.15264399	512.68	0.0001
Error	1122	0.33405907	0.00029774		
Corrected Total	1124	0.63934705			

Root MSE	0.01725	R-Square	0.4517
Dep Mean	0.03819	Adj R-Sq	0.4498
C.V.	45.17715		

Parameter Estimates

Variable	DF	Paramter Estimate	Standard Error	T for HO: Parameter=0	Prob > |T|
Intercept	1	0.029006	0.00171577	16.910	0.0001
Buffer	1	-0.134025	0.00670566	-19.99	0.0001
CV	1	0.323311	0.01063749	30.39	0.0001

Table 8

ANOVA Table for Type B NIS Prediction Model

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.37787615	0.18893808	715.70	0.0001
Error	1689	0.44588009	0.00026399		
Corrected Total	1691	0.82375624			

Root MSE	0.01624	R-Square	0.4587
Dep Mean	0.03819	Adj R-Sq	0.4544
C.V.	45.40100		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for HO: Parameter=0	Prob > |T|
Intercept	1	0.022836	0.00130853	17.45	0.0001
Buffer	1	-0.133274	0.00448600	-29.71	0.0001
CV	1	0.319461	0.00955000	33.45	0.0001

Table 9

ANOVA Table for Type C NIS Prediction Model

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.28286077	0.14143039	691.88	0.0001
Error	2812	0.57481715	0.00020442		
Corrected Total	2814	0.85767792			

Root MSE	0.01429	R-Square	0.3297
Dep Mean	0.03034	Adj R-Sq	0.3242
C.V.	47.12285		

Parameter Estimates

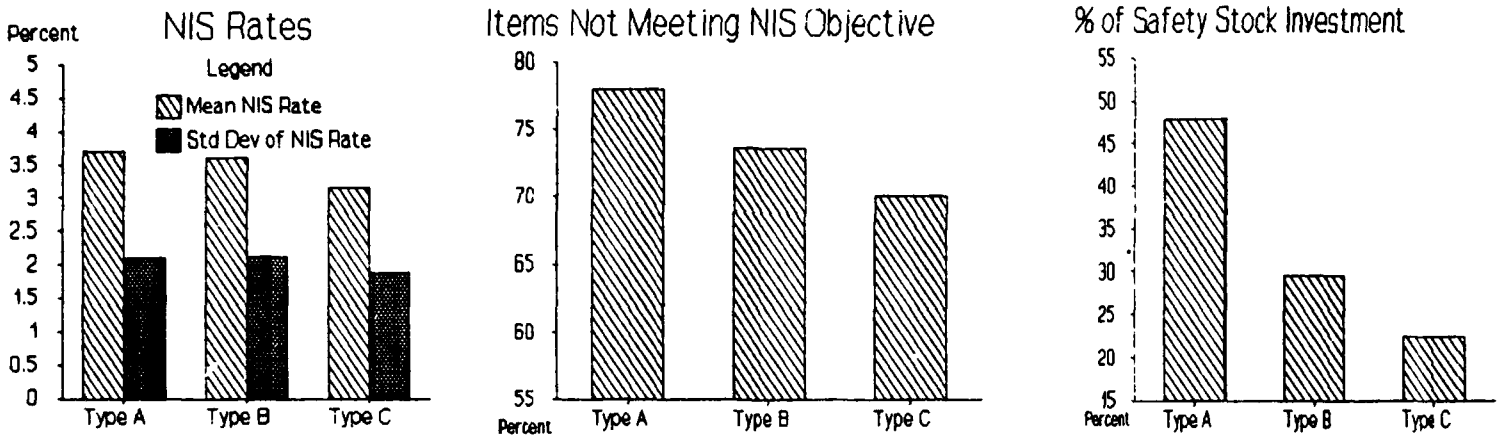
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
Intercept	1	0.020178	0.00091883	21.96	0.0001
Buffer	1	-0.117378	0.00347785	-33.75	0.0001
CV	1	0.240062	0.00740942	32.40	0.0001

Table 10

Baseline Performance Statistics

Mean Not-In-Stock Rate	3.402%
Standard Deviation of NIS Rate	2.023%
Percent of Items Not Meeting 2% NIS Objective	72.8%
Inventory Position to Sales Ratio	.5936
On-Hand Inventory to Sales Ratio	.2736
Mean Number of Safety Days per Item	3.38

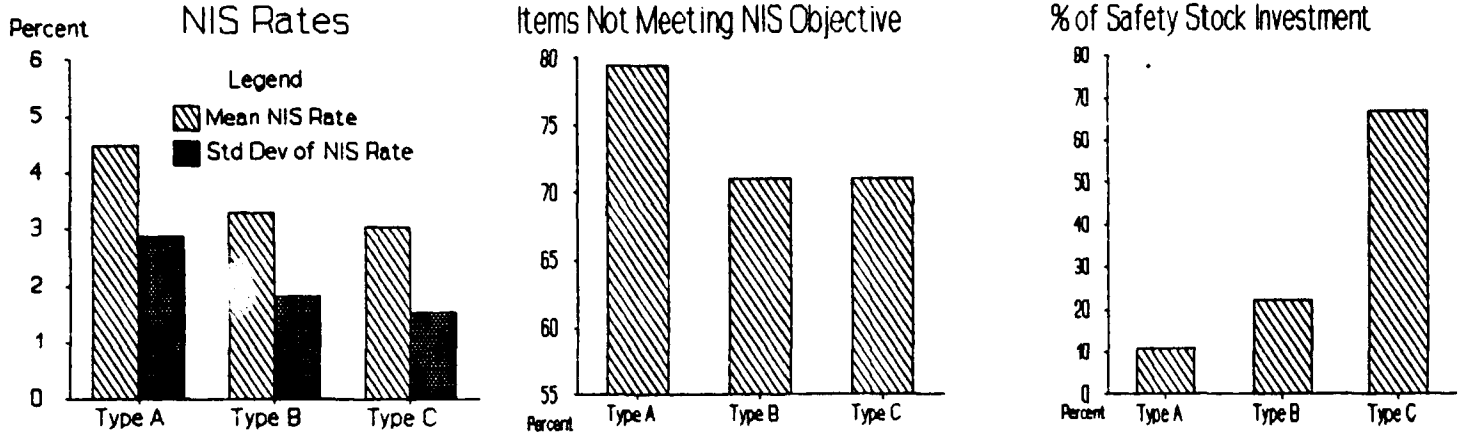
Baseline Performance Measures Breakdown by Unit Demand



Type A 20% Highest Demand
Type B 30% Next Highest Demand
Type C 50% Lowest Demand

Figure 4. Baseline Performance Statistics Broken Down By Item Type

Baseline Performance Measures
Breakdown by Coefficient of Variation



Type A 20% Highest CV
Type B 30% Next Highest CV
Type C 50% Lowest CV

Figure 5. Baseline Performance Statistics Broken Down by Coefficient of Variation.

percent of the investment in safety stock. This group performed poorly, with an NIS rate of 3.71 percent. The demand Type C items, which accounted for 22.38 percent of the total safety stock investment, performed better with an NIS rate of 3.15 percent.

Demand variability does not appear to have been a factor in establishing baseline safety stocks. The CV type A group was allocated only 10.9 percent of the safety stock investment, and fared poorly, having an NIS rate of 4.49 percent. Of the CV Type A items, 79.5 percent had an NIS rate greater than 2 percent. In fact, over one third of this group had NIS rates above 5 percent.

Targeted Service Level Results (TSL)

By making buffer percent the unknown in the NIS regression model and setting NIS rate equal to 2 percent, the following equation was obtained for setting safety stock:

$$B\% = .037978 + 2.173768\,CV \qquad (12)$$

Performance statistics for the TSL method are shown in Table 11 and Figures 6 and 7. This method resulted in an NIS rate of 1.66 percent - the lowest of any of the techniques tested. The extremely low NIS rate was achieved at a significant cost, however. The aggregate inventory safety stock was $82,828 - 45 percent higher than the baseline. The Inventory to Sales ratio of .6563 is still acceptable however. Items with low demand (type C) or high CV (type A) had the lowest NIS rates - 1.24 and 1.47 percent, respectively. A

Table 11

Targeted Service Level Performance Statistics

Mean Not-In-Stock Rate	1.66%
Standard Deviation of NIS Rate	1.145%
Percent of Items Not Meeting 2% NIS Objective	27.8%
Inventory Position to Sales Ratio	.6563
On-Hand Inventory to Sales Ratio	.3363
Mean Number of Safety Days per Item	5.64

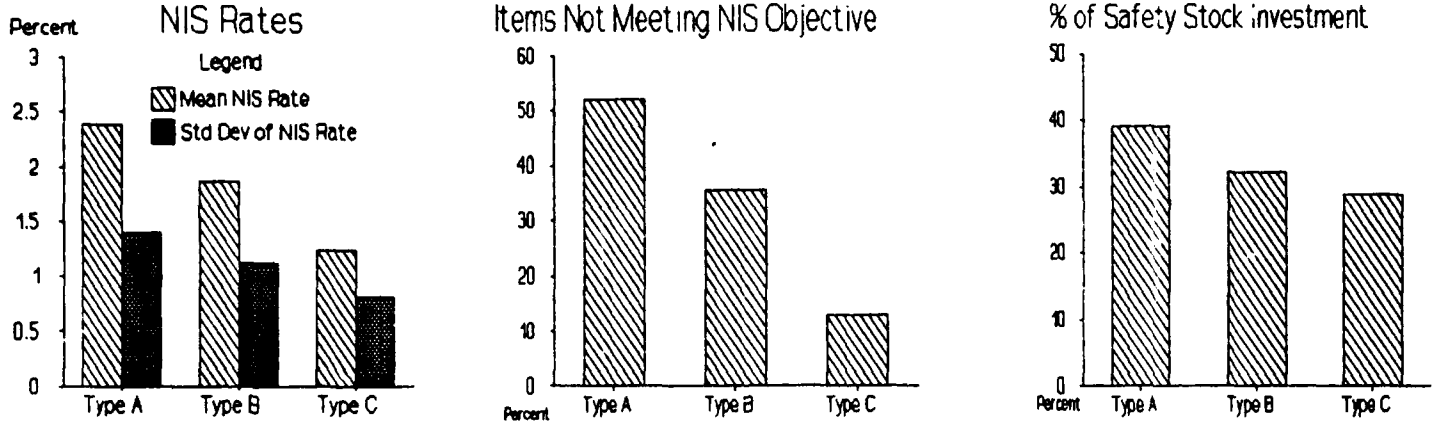
possible explanation for this is that the model weights CV too heavily and demand too lightly. The demand Type A group was the only group with an NIS exceeding two percent, however, at 2.29 percent it was reasonably close to the target.

Overall, this method, set for a two percent NIS target, established safety stock levels that were too high. This method produced average NIS rates below two percent for all item types but the demand type A group. The problem is most evident with the low demand items. The lowest demand items (type C) had a 1.24 percent NIS rate, and only 13 percent of these items had an NIS rate of over two percent. This indicates an inefficient over-allocation of safety stock investment to these items of lower importance.

Stratified Targeted Service Levels (STSL)

For this approach, items were arranged in an A-B-C (20-30-50%) classification scheme by unit demand. Equations

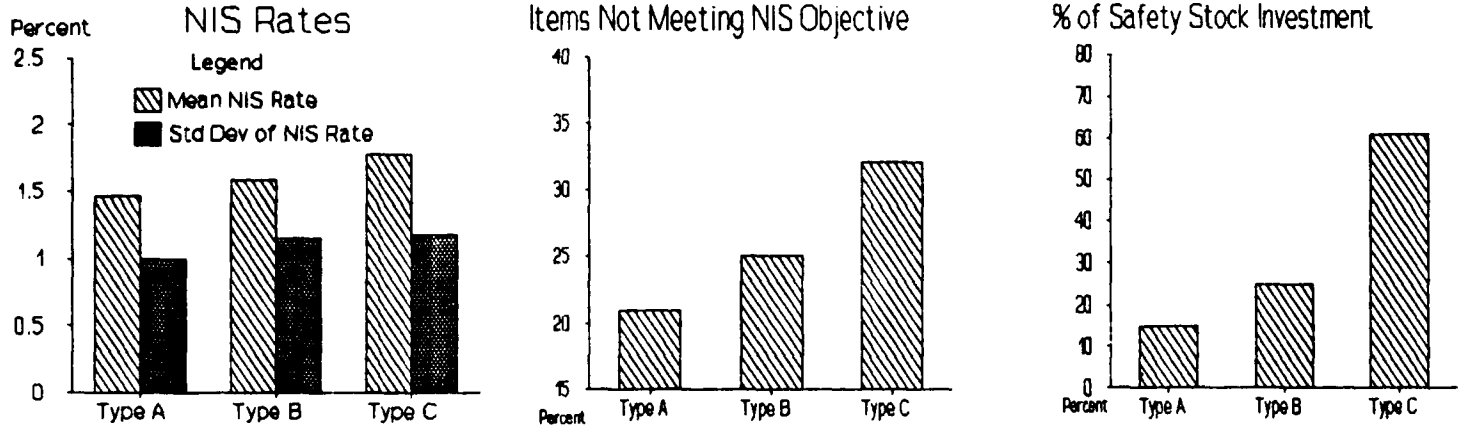
TSL Performance Measures Breakdown by Unit Demand



Type A 20% Highest Demand
Type B 30% Next Highest Demand
Type C 50% Lowest Demand

Figure 6. Targeted Service Level Performance Statistics Broken Down by Item Type

TSL Performance Measures
Breakdown by Coefficient of Variation



Type A 20% Highest CV
Type B 30% Next Highest CV
Type C 50% Lowest CV

Figure 7. Targeted Service Level Performance Statistics Broken Down by Coefficient of Variation.

setting NIS rate to predetermined levels were developed from the NIS regression model. NIS objectives were one percent for Type A, two percent for Type B, and three percent for Type C items. Equations used to compute the buffer stock percent are as follows:

$$B\%_A = 0.125647 + 2.173768\,CV \quad (13)$$

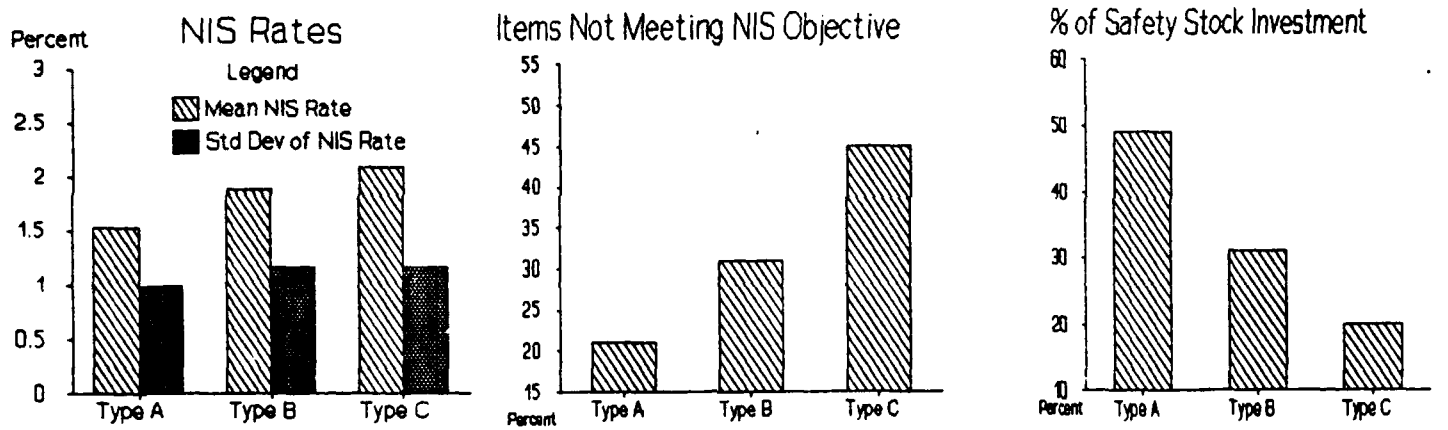
$$B\%_B = 0.037978 + 2.173768\,CV \quad (14)$$

$$B\%_C = -0.049691 + 2.173768\,CV \quad (15)$$

As expected, this method allocated safety stock heavily to high demand items, as high demand items were assigned a higher service level. Of the total $87,000 investment in inventory safety stock, 49.09 percent was devoted to Type A items, as shown in Figure 8. Even with this substantial allocation to high demand items the targeted one percent NIS rate was not achieved. The actual NIS rate for Type A items was 1.52 percent. Type C items had an average NIS rate of 2.08 percent - relatively far below the target of three percent. With this particular parameter set the STSL method achieved an average NIS rate of 1.91 percent with a safety stock investment of $87,000. This parameter set is not viable given that the TSL method achieved a 1.66 percent NIS rate with an $82,828 safety stock investment.

NIS targets for the separate models STSL method were set to 2, 3 and 3.5 percent for type A, B and C items, respectively. NIS targets used for the model run were increased from the first STSL run because the aggregate

STSL Performance Measures Breakdown by Unit Demand



Type A 20% Highest Demand
Type B 30% Next Highest Demand
Type C 50% Lowest Demand

Figure 8. Stratified Targeted Service Levels Performance Statistics Broken Down by Item Type

Table 12

Stratified Targeted Service Level
Performance Statistics

Mean Not-In-Stock Rate	1.915%
Standard Deviation of NIS Rate	1.147%
Percent of Items Not Meeting 2% NIS Objective	36.18%
Inventory Position to Sales Ratio	.6427
On-Hand Inventory to Sales Ratio	.32
Mean Number of Safety Days per Item	5.1

inventory investment required for 1, 2 and 3 percent NIS targets was $89,500. This level was considered too high for this parameter set to be viable. The new NIS targets were increased in order to bring the required inventory investment closer to the baseline figure. The inventory investment requirement for the 2, 3 and 3.5 percent NIS targets was a more reasonable $70,100.

Safety stocks for each item were set using the following equations:

$$B\%_A = .067196874 + 2.41230609\,CV \quad (16)$$

$$B\%_B = .0212860125 + 2.3970299606\,CV \quad (17)$$

$$B\%_C = .00015213649 + 2.0452118\,CV \quad (18)$$

Performance results for the modified STSL method are shown in Table 13 and Figure 9. This modified STSL method resulted in

a mean NIS of 3.07 percent. NIS rates for the item classes were closer to the targeted NIS levels for type A and C items than the single equation STSL method was. The NIS rates for type A and B items were below the target level, indicating safety stocks were again being set too high.

Table 13

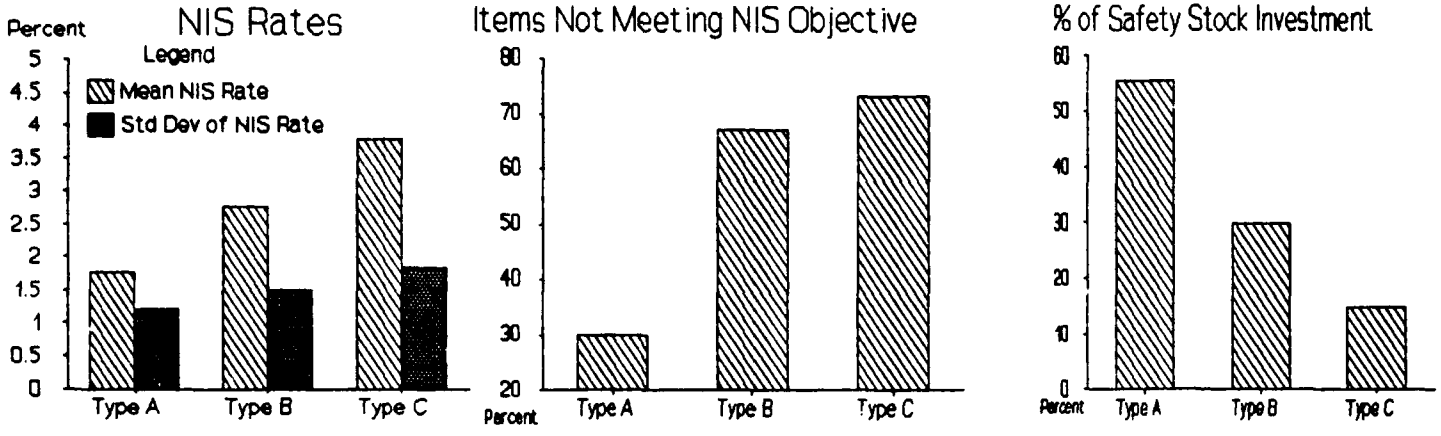
Modified Stratified Targeted Service Levels Performance Statistics

Mean Not-In-Stock Rate	3.07%
Standard Deviation of NIS Rate	1.82%
Percent of Items Not Meeting 2% NIS Objective	54.68%
Inventory Position to Sales Ratio	.60
On-Hand Inventory to Sales Ratio	.27
Mean Number of Safety Days per Item	3.71

Bytronic Method

For this method, items were rank ordered by coefficient of variation, and assigned to an A-B-C (20-30-50%) categorization. Type A items have a safety stock equal to 2.25 times adjusted standard deviation, while type B and C items are assigned 20 and 10 percent buffer stocks, respectively. Performance statistics for the Bytronic method are shown in Table 14 and Figure 10. The Bytronic method produced an NIS rate of 3.93 percent - the highest of the methods tested. However, with an aggregate investment in

Modified STSL Performance Measures Breakdown by Unit Demand



Type A 20% Highest Demand
Type B 30% Next Highest Demand
Type C 50% Lowest Demand

Figure 9. Modified Stratified Targeted Service Levels Performance Statistics Broken Down by Item Type (Separate Models for Each Item Class)

safety stock of $43,429, its cost was by far the lowest. This method performed well with CV type A items. An NIS of 1.79 percent and a comparatively low standard deviation of NIS (1.25) were achieved with an inventory safety stock investment of $11,064. The weakness of the Bytronic method lies with the performance of the type B and C items. Type B items had an average NIS rate of 4.03 percent, while type C items had an average NIS of 4.72 percent. Both B and C items had relatively high standard deviations of NIS of 2.27 and 2.55 percent, respectively.

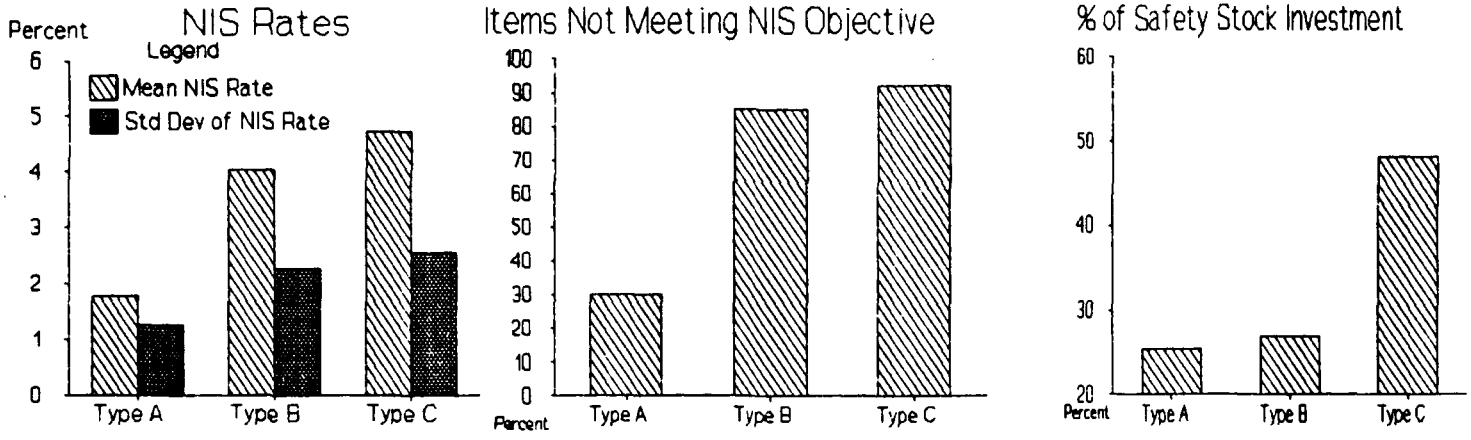
Table 14

Bytronic Method Performance Statistics

Mean Not-In-Stock Rate	3.932%
Standard Deviation of NIS Rate	2.52%
Percent of Items Not Meeting 2% NIS Objective	77.72%
Inventory Position to Sales Ratio	.59
On-Hand Inventory to Sales Ratio	.267
Mean Number of Safety Days per Item	3.13

The Bytronic method shows that a safety stock set on the basis of adjusted standard deviation can be effective. The NIS rate and low standard deviation of NIS for the type A items compares very favorably to the other methods - especially considering the low inventory investment. Based on the performance of the type B and C items it appears that

Bytronic Performance Measures Breakdown by Coefficient of Variation



Type A 20% Highest Demand
Type B 30% Next Highest Demand
Type C 50% Lowest Demand

Figure 10. Bytronic Method Performance Statistics Broken Down by Coefficient of Variation

the buffer percentages recommended for these items are too low to achieve an overall two percent NIS rate.

Comparing the Safety Stock Methods

None of the safety stock methods emerges as being clearly superior to the others. Figure 11 is an XY plot of performance (NIS rate) against cost (safety stock investment). This graph shows that, with the parameters sets tested, the TSL method was superior to the STSL method. TSL achieved an NIS rate of 1.66 percent with an $82,828 inventory investment, while STSL had an NIS rate of 1.91 percent and an inventory investment of $87,000. This graph is also useful because it shows several safety stock options available to AFCOMS management. Having options with different characteristics could be useful to management, as their priorities may change. Financial concerns could constrain management's attempts to reduce NIS rates. For example, budget constraints might force management to accept the lowest cost safety stock method which results in a reasonable NIS rate. This graph also shows management what the marginal cost of improving the NIS rate is.

While none of the methods shows overall superiority, each has its own positive and negative aspects. Some methods produce better results with certain types of items than other methods do. Determining what types of items the safety stock methods are most effective with provides insight that can be invaluable when designing a method to optimize safety stocks.

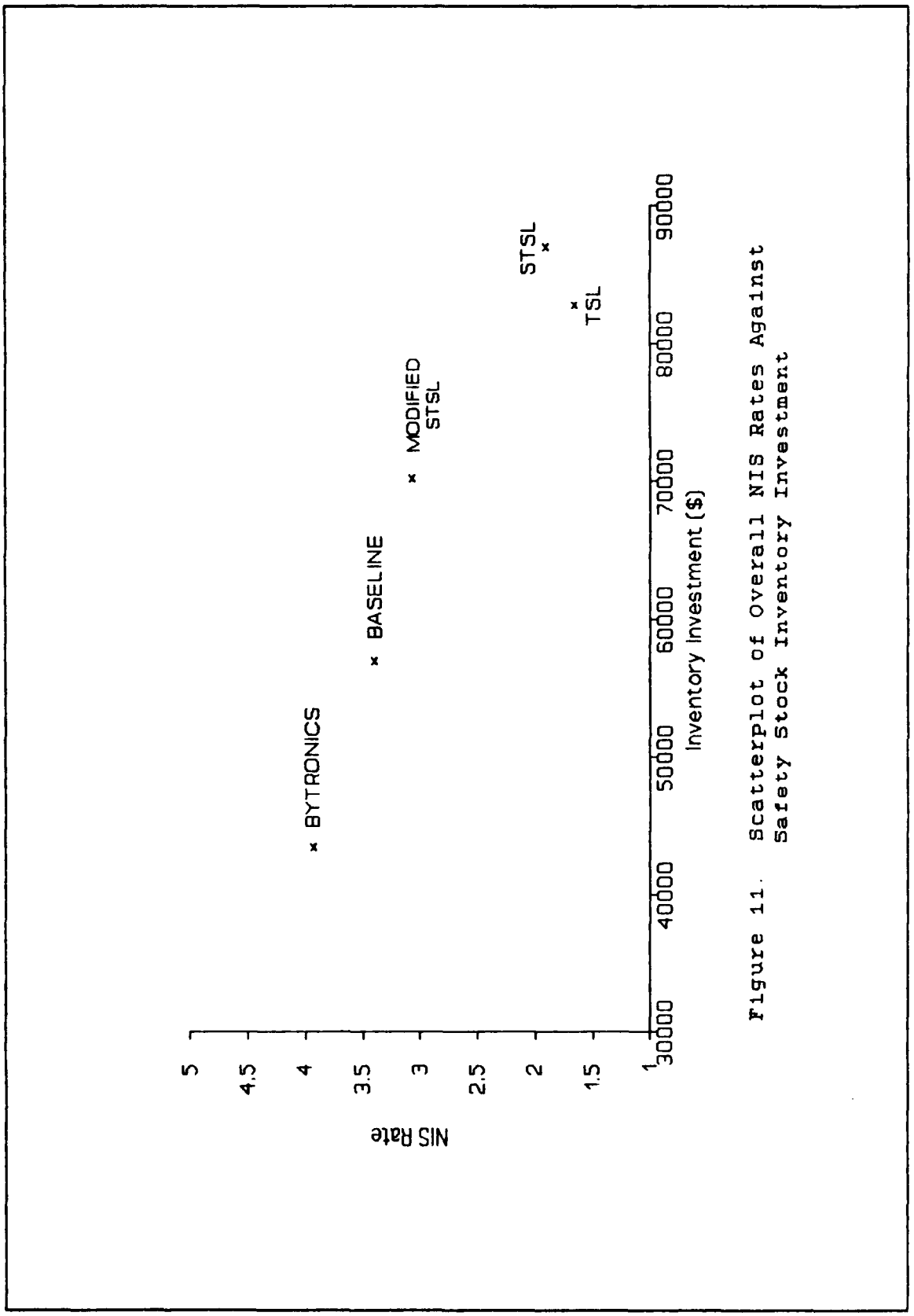


Figure 11. Scatterplot of Overall NIS Rates Against Safety Stock Inventory Investment

Figures 12, 13 and 14 are scatterplots of NIS rates versus inventory safety stock investment for demand type A, B and C items. Note that the Bytronic method is not included as it is based on CV.

For the demand groups, TSL and STSL were the best performing methods. TSL handled the type A items better in terms of cost than STSL. The methods are identical for type B items. The STSL method performed better than TSL with type C items. The regression model over-allocates safety stock to low demand items. The STSL method, set for a 3 percent NIS target for type C items, resulted in a 2.08 percent NIS rate.

Figures 15, 16 and 17 are scatterplots of NIS rate versus inventory safety stock investment for the coefficient of

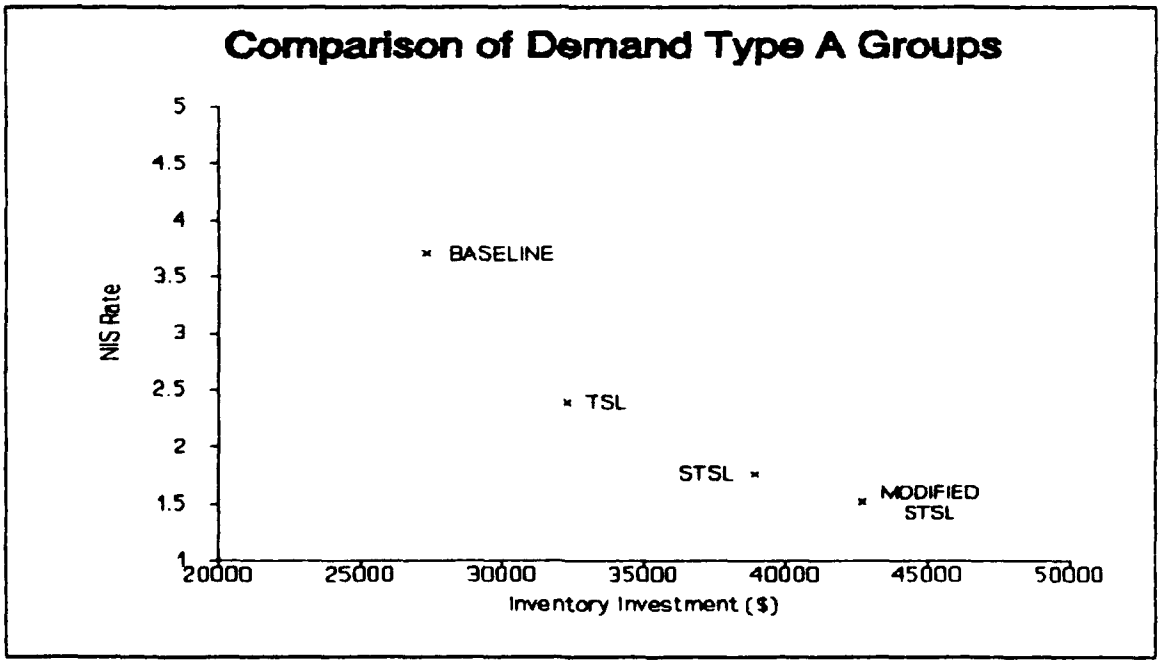


Figure 12. Scatterplot of NIS versus Inventory Safety Stock Investment for Demand Type A Items.

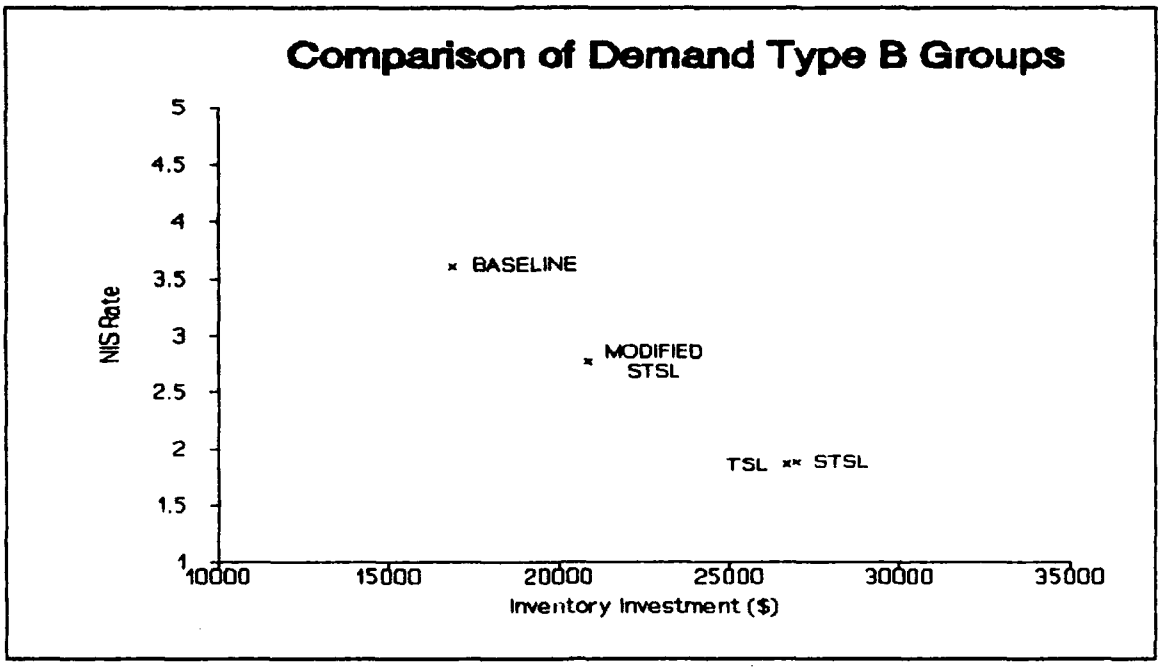


Figure 13. Scatterplot of NIS Rate Versus Inventory Safety Stock Investment for Demand Type B Items.

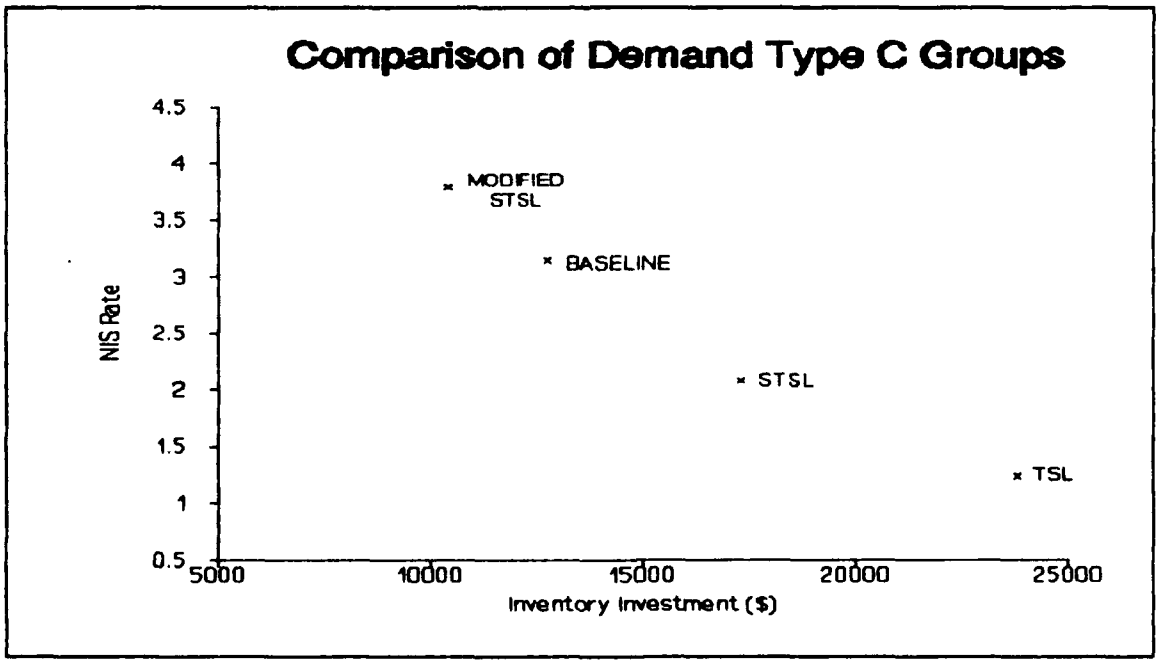


Figure 14. Scatterplot of NIS Rate Versus Inventory Safety Stock Investment for Demand Type C Items.

variation (CV) groups. The baseline, TSL and Bytronic methods are compared in these graphs. For the CV type A group the TSL and Bytronic methods are comparable and perform well. Both result in NIS rates below two percent. The baseline is particularly ineffective for CV type A items, as it has an NIS rate of 4.49 percent. For the CV type B and C groups the TSL method results in NIS rates below two percent. The baseline and Bytronic method perform poorly with the type B and C items.

Summary

This analysis showed that while each safety stock technique proved to be viable, each has its own strengths and

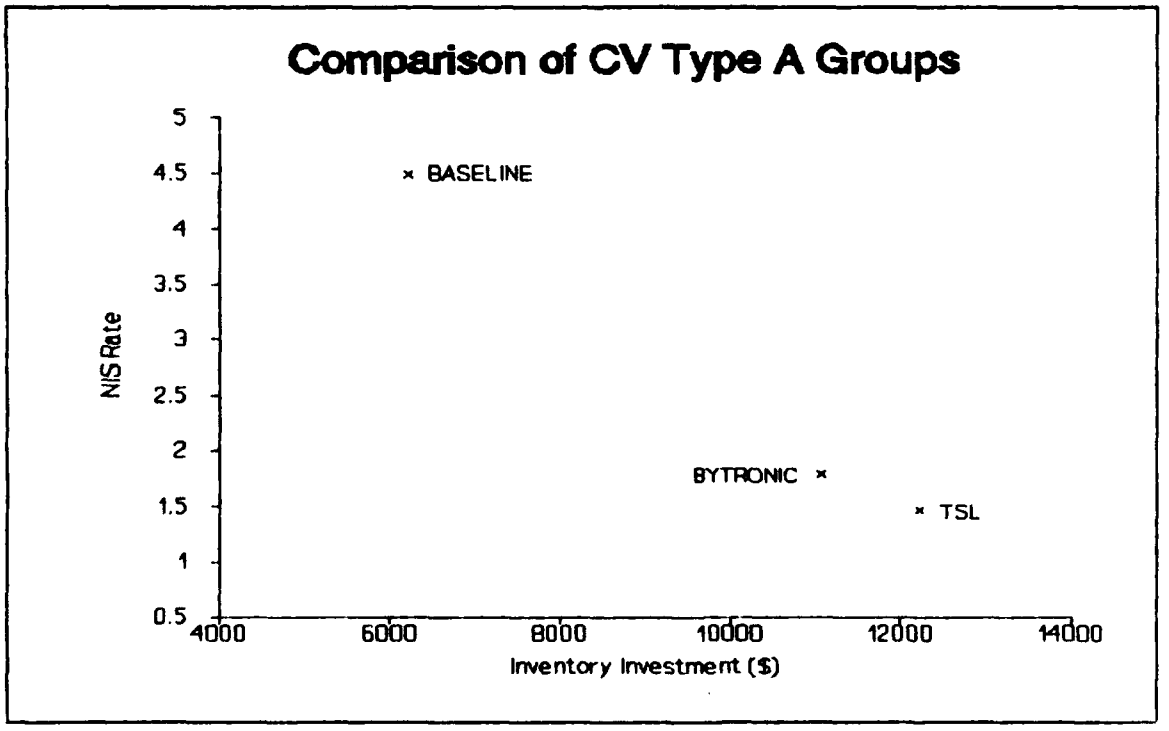


Figure 15. Scatterplot of NIS Rate Versus Inventory Safety Stock Investment for Type A Items.

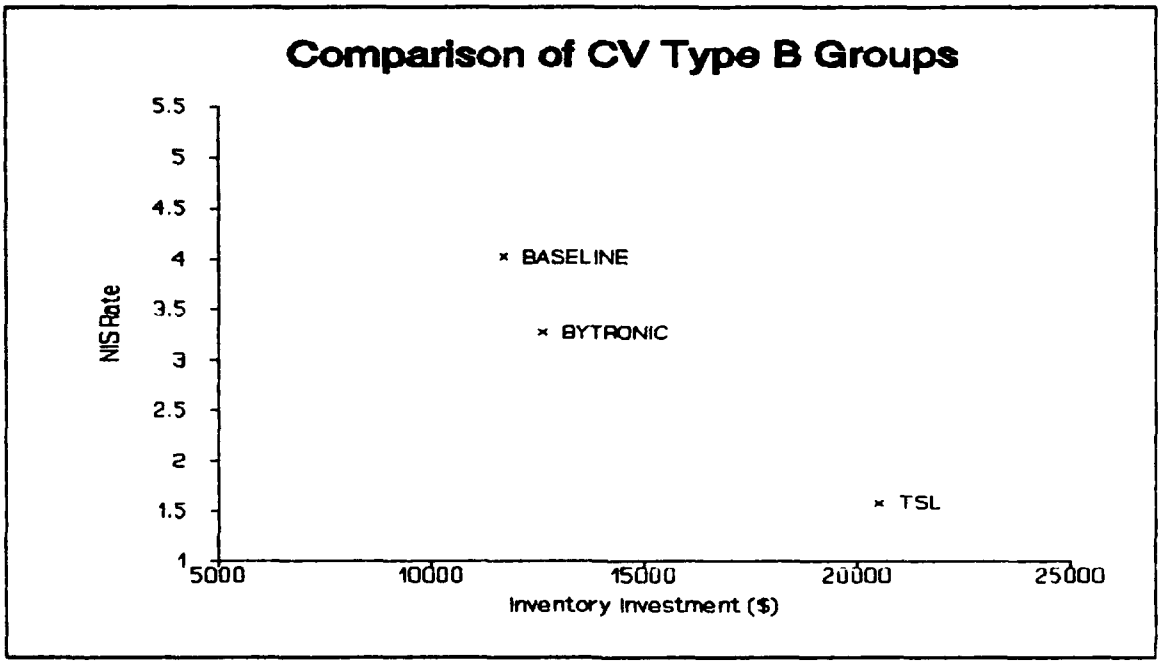


Figure 16. Scatterplot of NIS Rate Versus Inventory Safety Stock Investment for Type B Items.

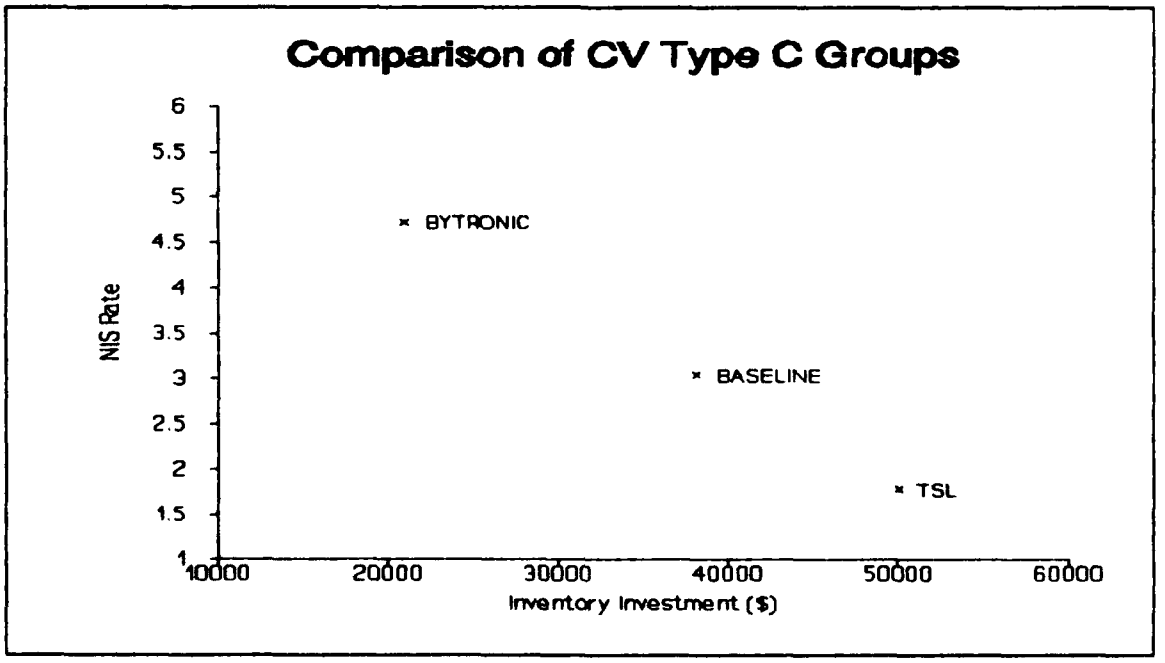


Figure 17. Scatterplot of NIS Rate Versus Inventory Safety Stock Investment for Type C Items.

weaknesses in terms of performance and cost. The service level based techniques perform well, but a stronger NIS prediction model would probably improve their performances. Demand variability is a factor that deserves attention in setting safety stocks. The baseline results show the effects of not considering it.

V. CONCLUSIONS

Overview

The efficient allocation of safety stock inventory is critical to improving AFCOMS' Not-In-Stock (NIS) rate. The current safety stock levels appear to be assigned primarily on the basis of an item's level of demand. The objective of this research was to develop and test a method for setting safety stocks to meet a particular customer service level. Three service level type approaches for setting safety stocks were tested, along with a method recommended by Bytronic Tecnnologies. The answers to the research questions summarize the results of the research.

The final section of this chapter contains suggestions for further research that is related to this study.

Answers to Research Questions

Research Question One

To what extent can an equation be fitted to the response surface that relates a measure of an item's demand variability and desired NIS level to the required number of safety days?

The regression model that was built using the entire population of items did not fit the response surface very well. The coefficient of determination (r^2) of this first order model was .3240. Attempts to improve the r^2 by adding second order and interactive terms were not successful. Because the residual plot of the simple first order model indicated the presence of heteroscedasticity, transformations were also tried. The transformations proved ineffective in

improving the r^2. Despite the low r^2, the overall NIS rate that resulted from the Targeted Service Level (TSL) method was remarkably close to the two percent objective, at 1.66 percent.

Building separate regression models for each of the demand classes resulted in improved accuracy for the type A and B classes. The r^2 for these to classes was improved to .455. There was no improvement for the demand type C class.

The model was purposely limited to coefficient of variation (CV) and buffer stock percent (B%) as the independent variables. Some experimentation indicated that adding additional independent variables (e.g. average daily demand, review period) could have a significant positive effect on the model's predictive ability. It is possible that a more sophisticated technique could be used to find an equation that would better fit this nonlinear surface. However, an overly complex model may be difficult to use in a real world safety stock algorithm.

Research Question Two

To what extent can four alternative methods of computing safety stock be used in the commissary operating environment to produce lower inventory or better in-stock rates?

As stated in chapter four, none of the techniques displayed clear superiority over the others. Only the STSL method had a performance that was clearly inferior. It is important to note that while the STSL method performed poorly with this particular parameter set, the method may work well

with a different parameter set.

This portion of the research showed that while AFCOMS has a two percent NIS rate objective, its current stated safety stock levels are insufficient to meet this goal. Perhaps this is one reason why store management typically increase 50 percent of ACOS suggested orders. AFCOMS' actual NIS rate may be far lower than the level indicated by the baseline results, but the safety stock inventory levels are most likely far higher than the stated levels. The safety stock investment required for the two percent NIS Targeted Service Level (TSL) model was 45 percent higher than the baseline requirement, however, TSL resulted in an NIS rate of 1.66 percent versus 3.4 percent for the baseline. Given the store management's frequent increases to ACOS suggested orders, it is entirely possible that AFCOMS' true safety stock levels are significantly above, perhaps 30 to 50 percent above, the stated levels. If AFCOMS actual safety stock levels are indeed higher than the stated levels, then the true marginal cost of using the TSL technique may be far less than the difference between the baseline and TSL method levels shown in this study. Management's intervention in the ACOS suggested order system conceals the true investment in safety stock and makes accurate comparison difficult. Furthermore, given the adjustments to ACOS suggested orders, the Stark model is unlikely to be an accurate predictor of actual store performance. While the comparisons among the techniques using the model are useful, management cannot be certain what the

true baseline values are. While preventing management from making qualitatively based adjustments to orders would make the model more accurate, such an edict makes no sense by itself. Managements' behavior is consistent with Zinn and Marmorstein's 1990 research that showed forecasting demand leads to more accurate ordering. Unfortunately, such an approach is also likely to increase inventory levels.

It is important to remember Stark's model represents the ideal commissary store that follows AFCOMS official inventory management procedues without deviation. The model reflects inventory ordering policies which are not followed in practice. According to the baseline results, following these policies would produce an NIS significantly above the desired level. Not following these policies appears to produce higher inventory levels with an unknown NIS rate (unknown because ACOS cannot record demands for products that are not-in-stock).

In answer to this research question, any of the techniques examined in this study, with the exception of the STSL method, are viable safety stock techniques for the commissary environment. As stated in chapter one, inventory safety stock levels represent a tradeoff between the customer service level and the inventory carrying cost. The methods examined herein present AFCOMS with several alternatives that have different positive characteristics. The Bytronic method had the highest NIS rate of the methods examined, but requires an investment in safety stock that is 24 percent below the

baseline level. At the other end of the spectrum, the TSL method resulted in an extremely low NIS rate of 1.66 percent, but requires an inventory safety stock investment that is 45 percent above the baseline.

Recommendations for AFCOMS Management

AFCOMS should test one of the service level techniques in a store to determine whether the technique can reduce current actual inventories while producing an acceptable, or improved, level of service. The baseline figures show that the NIS is substantially larger than AFCOMS goal. The baseline results support the 1989 Emmelhainz research that showed an NIS rate greater than two percent.

Recommendations for Further Study

This study examined four alternative methods for computing safety stock, but did not test the same method with different parameter sets. A logical next step for further research would be to find parameter sets that for each method that optimize safety stock levels. The objective of optimization would be to find a parameter set that results in the lowest NIS rate with the least cost. The Stratified Targeted Service Levels method performed poorly with 1, 2 and 3 percent NIS targets for types A, B and C items, respectively. It is possible that the method might perform better with a different parameter set.

Improving the fit of the regression equations that were built to predict the NIS rate would have a positive effect on

the performance of the targeted service level methods. A more sophisticated regression technique is needed to fit an equation to this nonlinear surface. This study limited itself to coefficient of variation (CV) and buffer percent (B%) as the independent variables, however this need not be the case. Building the regression equation with other independent variables, e.g. demand and review period, would definitely result in a model with better predictive accuracy.

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
1	0 17800 24	7	0.56	192.12	73.61	7	48	0.1024	3	4	5	4	1
2	0 24000 1426	7	0.48	138.08	46.40	7	24	0.0898	4	3	4	4	1
3	0 15300 46002	7	0.26	132.69	124.16	3	24	0.2959	3	7	8	8	7
4	0 27000 39005	7	0.26	99.65	39.92	14	72	0.0874	3	5	7	6	2
5	0 43000 95563	7	0.15	96.75	36.60	10	288	0.0918	7	4	6	5	2
6	0 50000 4106	7	0.31	88.22	27.00	4	48	0.0923	3	3	4	3	1
7	0 42200 407	5	0.17	87.64	37.13	2	24	0.1412	3	3	4	4	2
8	0 42200 415	5	0.17	86.10	40.00	2	24	0.1549	3	3	4	4	2
9	0 43000 95531	7	0.15	78.98	34.91	10	288	0.1072	7	5	6	6	2
10	0 50000 22036	7	0.44	72.94	21.49	4	24	0.0888	3	3	4	3	1
11	0 52100 9170	7	0.26	72.94	27.72	5	24	0.1097	3	3	4	4	1
12	0 70690 4	7	1.17	72.86	25.55	3	15	0.1109	3	3	4	3	1
13	0 36000 55860	7	0.56	72.78	44.06	7	30	0.1618	3	5	7	6	3
14	0 24000 1391	7	0.50	71.27	38.64	7	24	0.1449	4	5	6	6	3
15	0 71179 52187	7	0.92	66.24	35.98	3	18	0.1718	3	4	5	5	2
16	0 37000 62792	7	0.69	61.71	21.96	11	36	0.0839	3	4	6	5	2
17	0 54000 18330	7	2.13	60.90	18.94	3	10	0.0983	2	3	3	3	1
18	0 27000 48856	7	1.49	59.47	21.88	14	12	0.0803	3	4	6	5	2
19	0 50000 42984	7	0.25	58.98	33.52	4	24	0.1714	3	5	5	5	2
20	0 12300 15213	15	5.45	57.02	19.83	3	60	0.0843	6	4	5	5	2
21	0 50000 42934	7	0.25	53.60	28.07	4	24	0.1579	3	4	5	5	2
22	0 14900 1270	7	1.02	52.02	44.45	3	24	0.2702	3	6	7	7	6
23	0 50000 35054	7	0.36	51.15	27.68	4	24	0.1632	3	4	5	5	2
24	0 50000 42154	7	0.26	50.63	47.79	4	24	0.2846	3	7	8	8	7
25	0 16000 66610	7	1.96	50.50	12.06	3	12	0.0755	3	2	3	2	1
26	0 30400 1165	7	1.72	50.18	17.77	7	12	0.0946	3	3	5	4	1
27	0 12300 11013	15	8.07	49.73	19.22	3	60	0.0937	6	4	6	5	2
28	0 10900 10	7	0.65	46.22	15.02	14	24	0.0709	3	4	6	5	2
29	0 42200 225	5	0.49	44.92	17.51	2	12	0.1299	3	3	4	3	2
30	0 23100 1017	7	0.34	44.90	15.75	5	24	0.1013	3	3	4	4	1

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
31	0 50000 42704	7	0.43	44.61	30.99	4	24	0.2095	3	5	6	6	5
32	0 12300 16713	15	5.45	43.88	14.73	3	60	0.0814	6	4	5	4	2
33	0 37000 44420	7	0.95	42.49	20.80	11	14	0.1154	3	5	7	6	2
34	0 70470 654	7	0.48	42.06	13.26	3	12	0.0997	3	3	3	3	1
35	0 70662 1002	15	0.18	41.73	20.30	8	24	0.1037	3	6	8	7	2
36	0 24000 1370	7	0.24	41.24	49.48	7	48	0.3207	4	10	12	12	10
37	0 28700 13	7	0.75	40.94	29.12	2	24	0.2371	3	5	6	6	5
38	0 51000 1231	15	0.57	40.55	13.89	9	48	0.0714	3	4	6	6	2
39	0 79100 280	7	0.61	40.31	20.05	7	48	0.1329	3	5	6	5	3
40	0 41522 41500	7	0.37	39.39	16.64	7	24	0.1129	3	4	5	5	1
41	0 64144 4302	7	0.73	39.13	30.87	10	24	0.1913	3	8	9	9	7
42	0 40600 34500	5	1.05	38.64	10.99	1	18	0.1006	3	2	3	2	1
43	0 11100 139	7	1.01	38.57	17.17	5	24	0.1285	3	4	5	5	2
44	0 37000 44014	7	0.95	37.63	12.62	11	14	0.0790	3	4	5	5	2
45	0 51000 1051	15	0.45	36.82	11.92	9	48	0.0675	3	4	6	5	2
46	0 72180 63395	3	1.32	36.51	19.20	1	12	0.1859	1	4	4	4	3
47	0 41565 6	7	1.48	36.04	14.60	10	12	0.0983	3	4	6	5	2
48	0 37000 501	7	0.83	35.41	11.28	11	36	0.0751	3	4	5	4	2
49	0 37000 63527	7	2.14	35.35	12.37	11	10	0.0825	3	4	5	5	2
50	0 38000 69500	7	1.11	35.10	10.27	4	24	0.0882	3	3	3	3	1
51	0 44600 104	7	1.06	34.78	11.53	21	6	0.0627	3	5	7	6	3
52	0 80000 109	7	1.56	34.38	15.76	7	16	0.1225	3	4	5	5	1
53	0 71871 53635	7	1.17	34.16	15.89	5	12	0.1343	3	4	5	5	2
54	0 22000 12502	15	0.96	33.96	10.64	10	30	0.0640	3	4	6	5	2
55	0 24000 2214	7	0.63	33.88	11.19	7	24	0.0883	4	3	4	4	1
56	0 51316 18890	7	0.41	33.80	21.62	3	18	0.2023	3	5	6	6	5
57	0 50000 42884	7	0.24	33.60	15.40	4	24	0.1382	3	4	5	4	2
58	0 54000 41500	7	0.45	33.14	14.74	3	100	0.1407	2	3	4	4	2
59	0 19200 2518	15	1.01	33.08	8.11	14	12	0.0463	3	4	6	5	3
60	0 23100 1058	7	0.43	32.60	20.04	5	24	0.1775	3	5	6	6	5

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
61	0 80000 325	7	1.09	32.36	13.40	7	24	0.1107	3	4	5	5	1
62	0 16000 49980	7	1.36	32.00	16.72	3	12	0.1652	3	4	5	5	2
63	0 23100 1224	7	0.26	31.59	14.19	5	24	0.1297	3	4	5	5	2
64	0 40000 25731	7	1.64	31.49	15.80	15	24	0.1070	3	6	8	7	2
65	0 12100 1035	7	1.54	31.06	14.87	4	16	0.1443	3	4	5	5	2
66	0 11115 62169	5	1.06	30.90	8.91	1	24	0.1019	3	2	3	3	1
67	0 35000 5361	14	0.48	30.20	11.85	14	30	0.0742	3	3	4	4	3
68	0 37000 391	7	1.53	30.20	7.26	11	24	0.0567	3	6	8	7	2
69	0 11111 87406	14	2.69	29.78	13.24	10	9	0.0908	5	6	8	7	2
70	0 23100 1114	7	0.33	29.04	14.75	5	24	0.1466	3	4	5	5	2
71	0 23100 1305	7	0.44	28.71	18.69	5	24	0.1879	3	5	6	6	5
72	0 36000 29600	7	1.37	28.51	14.41	7	24	0.1351	3	5	6	6	3
73	0 51000 1291	15	0.46	27.88	10.11	9	48	0.0756	3	5	7	6	2
74	0 74182 3100	15	0.86	27.70	9.92	15	24	0.0665	7	5	8	7	3
75	0 25700 350	7	1.34	27.27	11.42	7	12	0.1119	3	4	5	5	1
76	0 52000 33905	7	0.82	26.86	12.01	3	12	0.1414	3	3	4	4	2
77	0 40000 1682	7	1.38	26.84	8.85	15	12	0.0703	3	4	4	4	2
78	0 71921 3030	4	2.47	26.84	12.06	2	24	0.1498	2	3	6	5	2
79	0 23100 1033	7	0.33	26.80	17.28	5	24	0.1861	3	5	6	6	5
80	0 54000 58670	7	0.71	26.73	10.46	3	21	0.1237	2	3	4	4	1
81	0 79100 586	7	0.23	26.67	15.56	7	24	0.1559	3	5	7	6	3
82	0 37000 62112	7	1.30	25.94	8.69	11	24	0.0790	3	4	5	5	2
83	0 25000 2513	7	1.22	25.92	9.90	5	24	0.1103	3	3	4	4	1
84	0 37000 60571	7	1.18	25.88	7.81	11	24	0.0711	3	3	5	4	2
85	3 5215 16300	15	1.55	25.86	14.16	12	24	0.1074	3	7	9	8	3
86	0 79100 972	7	0.28	24.78	12.21	7	24	0.1317	3	5	6	5	3
87	0 64144 4730	7	0.72	24.42	13.46	10	12	0.1337	3	6	7	7	3
88	0 35000 70981	30	0.58	24.41	8.40	14	48	0.0650	7	7	10	8	4
89	0 37000 775	7	0.71	24.37	10.48	11	48	0.1014	3	5	6	6	2
90	0 34000 8610	14	0.81	24.27	15.73	12	36	0.1271	3	8	10	10	3

Num	UPC CODE		Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
91	0 11115	29024	7	1.86	24.00	10.83	7	12	0.1206	3	4	5	5	1
92	0 13700	8850	7	1.23	23.58	9.55	7	12	0.1082	3	4	5	5	1
93	0 70074	40414	30	1.35	23.38	14.89	6	24	0.1424	3	10	13	12	4
94	0 34700	57410	15	0.35	23.16	8.71	7	24	0.0821	3	5	6	6	2
95	0 51000	371	15	0.32	23.14	11.56	9	24	0.1042	3	6	8	7	2
96	0 11111	42304	14	5.14	23.02	13.95	10	4	0.1237	5	7	9	9	2
97	0 13800	10317	7	1.18	22.70	8.81	4	12	0.1170	3	3	4	4	1
98	0 35000	43300	14	1.00	22.59	9.02	14	12	0.0755	3	6	8	7	3
99	0 37000	90200	7	13.08	22.57	11.96	11	1	0.1249	3	6	7	7	2
100	0 11210	1	14	0.55	22.39	7.21	14	24	0.0609	3	5	7	6	3
101	0 50000	42464	7	0.26	22.26	16.95	4	24	0.2296	3	6	7	7	6
102	0 23100	1107	7	0.25	22.24	9.11	5	24	0.1182	3	4	5	4	1
103	0 79100	516	7	0.26	22.20	14.16	7	24	0.1705	3	6	7	7	3
104	0 41000	610	15	1.32	22.18	7.50	13	12	0.0651	3	5	7	6	3
105	0 43000	469	7	1.18	22.16	19.05	5	12	0.2482	3	7	8	8	7
106	0 13120	672	7	0.39	22.14	10.02	5	24	0.1306	3	4	5	5	2
107	0 30000	9020	7	0.38	21.93	22.76	3	48	0.3282	3	8	8	9	7
108	0 24000	1922	7	0.67	21.71	7.34	7	24	0.0904	4	3	3	3	1
109	0 72180	63754	3	1.85	21.71	7.18	1	12	0.1169	1	2	5	4	1
110	0 37000	91240	7	6.19	21.69	8.04	11	4	0.0874	3	4	6	5	2
111	0 25700	399	7	1.08	21.47	6.75	7	12	0.0840	3	3	4	4	1
112	0 17000	440	7	0.64	21.29	8.60	12	48	0.0927	3	5	6	6	2
113	0 16000	50940	7	0.99	21.25	11.68	3	12	0.1738	3	6	5	5	2
114	0 11111	56006	14	1.87	21.25	9.31	10	9	0.0894	5	4	8	7	4
115	0 39000	7668	7	1.83	21.18	8.05	4	24	0.1146	3	3	4	4	1
116	0 36000	26300	7	0.75	20.80	7.67	7	36	0.0986	3	4	5	4	1
117	0 73369	5010	7	0.61	20.73	10.64	2	12	0.1711	3	4	4	4	2
118	0 24000	1092	7	1.13	20.67	6.89	7	24	0.0891	4	3	4	4	1
119	0 50000	35104	7	0.33	20.65	16.02	4	24	0.2339	3	6	7	7	6
120	0 43000	95033	7	1.99	20.63	8.16	10	24	0.0959	7	4	6	5	2

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121	0 38900 473	7	0.85	20.41	6.94	2	24	0.1133	3	3	3	3	1
122	0 19800 191	15	0.70	20.33	9.89	15	12	0.0903	3	7	9	8	3
123	0 51000 1641	15	0.43	20.04	8.81	9	24	0.0917	3	5	7	7	2
124	0 15300 2038	7	0.81	19.94	7.41	3	12	0.1175	3	3	4	4	1
125	0 36632 109	7	0.51	19.71	12.64	4	12	0.1934	3	5	6	6	5
126	0 24000 198	7	0.45	19.67	7.58	7	24	0.1030	4	4	4	3	1
127	0 70690 50031	7	1.49	19.67	6.30	5	6	0.0925	3	3	5	4	1
128	0 16500 98021	14	0.76	19.54	8.76	13	24	0.0863	3	6	8	7	3
129	0 41333 22401	15	0.68	19.49	7.40	14	48	0.0718	3	5	8	7	3
130	0 50000 32054	7	0.44	19.47	11.15	4	24	0.1727	3	5	6	5	4
131	0 73201 2608	7	0.15	19.37	12.44	2	24	0.2141	3	5	5	5	4
132	0 70222 2918	15	0.56	19.35	7.84	8	24	0.0864	3	5	7	6	2
133	0 43000 11260	7	1.83	19.33	8.65	10	12	0.1085	7	5	6	6	2
134	0 17000 163	7	0.81	19.30	14.95	12	12	0.1777	3	8	10	9	8
135	0 13800 16636	7	1.42	19.27	10.23	4	12	0.1601	3	4	5	5	2
136	0 34000 13100	14	1.77	19.26	6.59	12	24	0.0671	3	5	7	6	3
137	0 70077 1048	7	0.75	19.24	8.60	1	12	0.1580	3	3	4	4	2
138	0 34000 56002	14	0.68	19.18	7.12	12	24	0.0728	3	6	7	6	2
139	0 51000 2421	15	0.37	19.18	9.07	9	24	0.0986	3	5	8	7	3
140	0 52000 1172	7	0.35	19.02	8.29	3	24	0.1378	3	3	4	4	2
141	0 43000 95458	7	0.49	18.98	8.52	10	24	0.1089	7	5	6	6	2
142	0 43000 96670	7	1.56	18.77	6.71	5	8	0.1032	3	3	4	4	1
143	0 51000 305	15	1.08	18.69	10.03	9	8	0.1119	3	6	8	8	2
144	0 13800 16610	7	2.39	18.65	6.71	4	12	0.1085	3	3	4	4	1
145	0 51000 2512	15	0.46	18.64	9.32	9	24	0.1043	3	6	8	7	2
146	0 30000 1020	7	1.39	18.63	6.28	3	24	0.1066	3	3	4	3	1
147	0 37000 36030	7	2.94	18.60	15.34	11	8	0.1944	3	8	10	10	8
148	0 52100 3780	7	0.28	18.59	7.22	5	24	0.1121	3	3	4	4	1
149	0 37000 863	7	1.83	18.57	7.07	11	15	0.0897	3	4	6	5	2
150	0 42200 457	5	0.17	18.51	13.88	2	24	0.2500	3	5	6	6	5

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151	0 54600 233	7	1.49	18.36	6.11	7	12	0.0889	3	3	4	4	1
152	0 12300 12013	15	8.07	18.27	7.40	3	60	0.0982	6	4	6	5	2
153	0 15300 43023	7	0.78	18.24	8.35	3	24	0.1448	3	4	4	4	2
154	0 16000 40610	7	0.89	18.21	5.83	3	12	0.1012	3	3	3	3	1
155	0 73369 6012	7	1.29	18.17	14.34	2	12	0.2631	3	5	6	6	5
156	0 43300 6538	7	8.36	17.96	7.37	5	60	0.1185	3	4	5	4	1
157	0 79100 22	7	0.22	17.90	8.42	7	24	0.1257	3	4	6	5	1
158	0 19800 159	15	1.10	17.82	6.61	15	12	0.0689	3	5	8	7	3
159	0 36632 101	7	0.51	17.68	7.84	4	12	0.1337	3	4	5	4	2
160	0 54600 720	7	1.79	17.51	8.48	7	9	0.1294	3	4	6	5	3
161	0 24000 1880	7	0.67	17.49	8.97	7	24	0.1371	4	5	6	6	3
162	0 43300 2088	7	8.36	17.47	9.40	5	60	0.1553	3	5	6	5	2
163	0 64144 4702	7	0.65	17.37	6.82	10	12	0.0952	3	4	6	5	1
164	0 71068 11010	7	2.49	17.37	6.24	3	12	0.1136	3	3	4	3	2
165	0 24000 1022	7	1.11	17.20	6.13	7	24	0.0953	4	3	5	4	1
166	0 43000 95351	7	1.68	17.04	7.10	10	12	0.1011	7	4	6	5	2
167	0 36632 114	7	0.51	16.96	6.89	4	12	0.1225	3	3	7	7	1
168	0 23100 1601	7	0.47	16.96	12.63	5	24	0.2150	3	6	4	4	6
169	0 13800 16642	7	1.92	16.88	9.61	4	12	0.1717	3	6	6	7	2
170	0 42200 463	5	0.17	16.88	13.82	2	24	0.2729	3	5	5	5	6
171	0 44300 71536	7	0.51	16.86	5.80	7	12	0.0919	3	3	5	4	1
172	0 11217 20725	7	0.89	16.80	6.17	3	12	0.1161	3	3	4	3	1
173	0 16000 30230	7	0.34	16.69	10.43	3	24	0.1976	3	5	6	5	4
174	0 12546 61368	14	0.88	16.67	7.04	14	30	0.0798	3	6	8	7	3
175	0 37000 407	7	1.93	16.65	5.40	11	12	0.0764	3	4	5	5	1
176	0 24000 1943	7	1.06	16.65	7.41	7	12	0.1189	4	4	5	5	2
177	0 37000 93927	7	2.52	16.50	3.42	11	9	0.0489	3	3	4	3	2
178	0 43000 70155	7	3.14	16.50	7.16	10	12	0.1052	7	5	6	5	2
179	0 71503 544	15	0.44	16.41	5.62	10	24	0.0699	3	5	7	6	2
180	0 17000 269	7	0.81	16.41	6.82	12	12	0.0953	3	5	6	6	2

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181	0 45300	18461	7	0.91	16.35	7.69	3	12	0.1487	3	4	4	4	2
182	0 27000	41120	7	0.98	16.25	7.76	14	12	0.1042	3	6	7	7	2
183	0 47400	33	30	2.33	16.24	6.76	14	72	0.0787	3	8	12	10	4
184	0 24000	1456	7	0.48	16.21	7.60	7	24	0.1253	4	4	6	5	1
185	0 17000	855	7	0.49	16.18	3.91	12	12	0.0554	3	3	5	4	7
186	0 19000	1142	7	1.44	16.18	13.28	7	24	0.2194	3	7	8	8	2
187	0 34000	44804	14	1.72	16.02	5.24	12	24	0.0641	3	5	7	6	3
188	0 43000	93977	7	1.89	15.94	5.65	10	12	0.0860	7	4	5	5	2
189	0 37600	45523	7	0.97	15.94	5.49	10	24	0.0835	3	4	5	5	2
190	0 73202	64676	7	0.37	15.85	9.04	1	24	0.2016	3	4	5	4	4
191	0 24000	1269	7	0.55	15.81	8.19	7	24	0.1384	4	5	6	6	3
192	0 11111	47008	14	2.76	15.78	5.78	10	8	0.0748	5	5	3	3	2
193	0 15900	43074	7	1.31	15.78	4.96	1	12	0.1111	3	2	7	6	1
194	0 37000	353	7	2.57	15.76	8.15	11	12	0.1219	3	5	7	7	2
195	3 258	10931	14	2.96	15.75	5.41	21	12	0.0581	5	6	9	7	4
196	0 27000	38007	7	0.54	15.65	7.06	14	24	0.0984	3	5	7	6	2
197	0 34700	6510	15	0.43	15.63	6.76	7	24	0.0944	3	5	7	6	2
198	0 18700	25	7	0.89	15.57	6.62	3	12	0.1345	3	3	4	4	2
199	0 54100	60	15	1.31	15.55	9.04	7	12	0.1269	7	7	8	8	2
200	0 28200	10400	15	8.36	15.37	9.05	6	60	0.1317	3	6	8	8	4
201	0 16000	67970	7	2.62	15.32	5.12	3	12	0.1057	3	3	4	3	1
202	0 12587	55	15	2.36	15.27	5.10	15	12	0.0620	3	5	8	6	3
203	0 38100	130	7	0.92	15.20	7.24	7	12	0.1273	3	4	6	5	2
204	0 41165	41620	15	0.94	15.20	5.63	7	12	0.0808	3	4	6	6	3
205	0 46500	624	14	0.75	15.00	5.50	14	12	0.0693	3	3	4	4	3
206	0 13700	1401	7	2.85	15.00	4.33	7	12	0.0771	3	5	8	7	1
207	0 51000	2951	15	0.35	14.91	6.86	9	24	0.0959	3	6	8	7	2
208	0 51000	572	15	0.65	14.82	6.73	9	24	0.0947	3	2	8	7	1
209	0 46000	81201	7	1.08	14.82	4.22	4	12	0.0859	3	6	3	3	2
210	0 70470	252	7	1.16	14.79	5.96	3	6	0.1274	3	3	4	4	2

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211	0 52000 3962	7	3.30	14.77	6.09	3	12	0.1304	3	3	4	4	2
212	0 43000 95281	7	1.99	14.76	7.97	10	12	0.1310	7	5	7	7	3
213	0 70222 2655	15	0.54	14.69	10.74	8	24	0.1559	3	6	10	10	2
214	0 46900 123	12	0.39	14.69	6.52	10	24	0.0906	3	8	8	7	4
215	0 44700 9205	7	1.51	14.67	5.54	5	12	0.1090	3	3	4	4	1
216	0 17000 765	7	1.65	14.56	5.06	12	12	0.0797	3	4	6	5	2
217	0 11113 41101	15	0.79	14.50	5.25	12	24	0.0710	3	5	7	6	3
218	0 17000 932	7	0.64	14.47	8.60	12	48	0.1363	3	6	8	8	4
219	0 73202 64662	7	0.37	14.42	9.23	1	24	0.2263	3	4	5	5	4
220	0 43000 28532	7	1.03	14.37	6.24	10	12	0.1053	7	5	6	5	2
221	0 38100 309	7	0.24	14.35	10.88	7	24	0.2026	3	7	7	6	6
222	0 51000 2527	15	0.72	14.26	8.19	9	24	0.1198	3	7	7	5	2
223	0 11111 61324	14	0.52	14.25	7.87	10	48	0.1127	5	7	7	5	2
224	0 23100 1006	7	0.62	14.24	10.50	5	24	0.2129	3	6	6	5	6
225	0 48001 26520	15	1.14	14.07	4.73	15	12	0.0624	3	5	5	3	3
226	0 41500 1310	7	0.64	14.06	10.59	6	12	0.2089	3	6	6	6	6
227	0 25000 2560	7	0.89	14.04	8.07	5	24	0.1659	3	5	5	4	2
228	0 52000 33939	7	1.83	14.00	5.73	3	6	0.1294	3	5	5	3	2
229	0 28000 502	15	0.46	14.00	6.62	15	24	0.0878	7	7	7	5	3
230	0 72179 212	15	0.66	14.00	4.87	14	12	0.0657	7	3	3	3	3
231	3 450 46850	14	3.59	13.96	5.31	7	72	0.0830	3	4	4	3	2
232	0 43000 189	7	0.52	13.96	6.18	5	24	0.1278	3	5	5	3	2
233	0 41322 22450	7	2.20	13.90	6.75	4	12	0.1464	3	4	4	3	2
234	0 43000 274	7	0.92	13.88	5.68	5	24	0.1181	3	4	4	3	1
235	0 51000 1477	15	0.57	13.82	5.99	9	24	0.0904	3	5	5	4	2
236	0 70470 312	7	0.48	13.80	5.50	3	12	0.1260	3	3	3	2	1
237	0 43000 20140	7	0.39	13.70	4.79	10	24	0.0848	7	4	4	3	2
238	0 72180 63300	3	1.87	13.69	6.20	1	12	0.1601	1	3	3	3	2
239	0 54100 73713	15	0.95	13.67	6.14	7	24	0.0980	7	5	5	4	2
240	0 44300 10625	7	0.45	13.59	6.35	14	24	0.1020	3	5	5	4	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
241	0 70074 42110	30	1.44	13.58	12.27	6	24	0.2020	3	13	13	11	7
242	0 25000 611	7	0.87	13.45	6.87	5	24	0.1475	3	4	4	4	2
243	0 76186 2	7	0.33	13.43	10.82	2	24	0.2686	3	6	6	5	5
244	0 73369 5015	7	0.62	13.41	4.63	2	12	0.1151	3	3	3	2	1
245	0 43300 4678	7	8.36	13.37	7.14	5	60	0.1542	3	4	4	4	2
246	0 37600 26580	7	1.50	13.35	9.42	10	12	0.1711	3	7	7	6	3
247	0 10900 565	7	1.87	13.20	4.80	14	12	0.0794	3	4	4	3	2
248	0 41500 300	7	0.69	13.18	5.72	6	12	0.1204	3	4	4	3	1
249	0 52000 1551	7	0.39	13.12	6.25	3	24	0.1506	3	4	4	3	2
250	0 51700 34587	7	1.80	13.05	5.06	4	12	0.1169	3	3	3	3	1
251	0 70077 1276	7	1.46	13.05	6.19	1	12	0.1677	3	3	3	2	2
252	0 91494 265	30	2.69	12.90	6.09	7	12	0.1030	7	8	8	5	4
253	0 70470 103	7	0.48	12.84	6.03	3	12	0.1485	3	4	4	3	2
254	0 43000 337	7	1.39	12.80	5.71	5	12	0.1288	3	4	4	3	2
255	0 12547 63987	14	2.32	12.73	6.03	14	12	0.0895	3	7	7	5	3
256	0 71100 443	7	0.60	12.71	5.91	21	24	0.0879	3	6	6	4	3
257	0 23100 1078	7	0.62	12.63	7.81	5	24	0.1785	3	5	5	4	5
258	0 13120 1036	7	1.29	12.61	4.86	5	12	0.1113	3	3	3	3	1
259	0 72392 94224	15	1.16	12.58	4.82	6	12	0.0857	3	4	4	3	2
260	0 37000 31652	7	1.43	12.51	5.92	11	16	0.1115	3	5	5	4	2
261	0 12300 13013	15	8.07	12.49	5.80	3	60	0.1126	6	5	5	4	2
262	0 54600 14	7	0.69	12.45	5.57	7	12	0.1196	3	4	4	3	1
263	0 19200 6800	15	1.93	12.39	5.32	14	12	0.0811	3	6	6	4	3
264	3 5212 58300	15	0.61	12.35	16.64	12	48	0.2642	3	16	16	15	15
265	0 42200 328	5	0.69	12.34	8.85	2	8	0.2391	3	5	5	5	5
266	0 54000 70000	7	1.19	12.31	4.78	3	12	0.1228	2	3	3	2	1
267	0 17000 700	7	1.75	12.30	5.38	12	18	0.1003	3	5	5	4	2
268	0 43000 20004	7	0.34	12.27	4.83	10	24	0.0955	7	8	4	3	4
269	0 47400 11249	30	4.29	12.27	5.02	14	72	0.0773	3	4	8	4	2
270	0 70470 305	7	0.48	12.24	5.31	3	12	0.1372	3	7	3	3	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
271	0 51000 1141	15	0.46	12.24	6.92	9	24	0.1179	3	3	7	5	2
272	0 48001 27072	15	3.79	12.22	6.86	15	8	0.1042	3	8	8	6	3
273	0 51000 2323	15	0.73	12.21	9.28	9	24	0.1585	3	9	9	8	5
274	0 44800 103	7	1.50	12.18	3.87	7	12	0.0849	3	3	3	2	1
275	0 37000 41040	7	0.59	12.16	5.77	11	12	0.1118	3	5	5	4	2
276	0 70330 81048	14	0.98	12.11	5.04	10	72	0.0850	3	5	5	4	2
277	0 10900 28	7	2.19	12.06	4.35	14	12	0.0787	3	4	4	3	2
278	0 19000 490	7	0.89	12.04	5.01	7	30	0.1112	3	6	6	4	1
279	0 11113 20202	15	0.86	12.04	5.42	12	24	0.0883	3	4	4	3	3
280	0 43000 20166	7	0.62	12.03	6.41	10	12	0.1292	7	5	5	4	3
281	0 50000 20074	7	0.79	12.00	4.91	4	12	0.1234	3	4	3	3	1
282	0 24000 1319	7	0.57	12.00	5.34	7	24	0.1189	4	3	4	3	1
283	0 43000 10713	7	1.15	11.94	4.41	10	12	0.0896	7	4	4	3	3
284	0 35000 50600	14	1.48	11.94	7.24	14	24	0.1146	3	8	8	6	2
285	0 27400 10315	5	0.76	11.92	4.37	1	18	0.1296	3	3	3	2	2
286	0 52100 9650	7	0.28	11.85	6.52	5	24	0.1588	3	5	5	4	2
287	0 47600 377	7	0.67	11.84	6.40	5	24	0.1560	3	5	5	4	2
288	0 70560 85615	7	0.89	11.81	4.01	1	12	0.1200	3	2	2	2	1
289	0 17800 19266	7	1.82	11.80	4.67	7	12	0.1058	3	4	4	3	1
290	0 17800 14407	7	2.35	11.77	4.36	7	12	0.0990	3	4	4	3	1
291	0 44600 628	7	1.52	11.70	5.10	21	12	0.0824	3	6	6	4	3
292	0 28200 10760	15	8.36	11.69	6.24	6	60	0.1194	3	6	6	5	2
293	0 53100 32210	15	1.10	11.65	4.43	14	24	0.0719	3	5	5	3	3
294	0 52100 12590	7	0.66	11.63	5.17	5	12	0.1283	3	4	4	3	2
295	0 44400 15200	7	2.85	11.60	4.95	2	12	0.1422	3	3	3	3	2
296	0 70230 71	7	0.85	11.59	5.82	7	12	0.1342	3	5	5	4	3
297	0 37000 35680	7	2.96	11.57	5.22	11	6	0.1063	3	6	6	4	2
298	0 70222 2819	15	0.43	11.57	7.86	8	24	0.1448	3	5	8	6	4
299	0 77623 57	10	1.59	11.57	5.79	13	12	0.1119	3	8	5	4	2
300	0 41196 89012	7	1.82	11.47	5.62	4	24	0.1477	3	4	4	3	2

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301	0 25800 2011	7	1.35	11.39	4.78	5	12	0.1211	3	4	4	3	1
302	0 45300 55	7	2.97	11.33	4.90	14	12	0.0944	3	5	3	3	2
303	0 51700 36848	7	1.45	11.33	4.52	4	12	0.1203	3	3	5	4	1
304	0 43000 66	7	1.49	11.31	5.28	10	12	0.1132	7	5	5	4	2
305	0 43000 804	7	1.57	11.29	4.58	5	12	0.1171	3	4	4	3	1
306	0 37000 312	7	1.63	11.25	4.81	11	24	0.1008	3	5	5	3	2
307	0 35000 14402	14	1.54	11.18	5.36	14	18	0.0906	3	7	7	5	3
308	0 46000 3161	7	0.72	11.04	9.03	4	12	0.2466	3	6	6	6	6
309	0 27000 42239	7	0.94	11.00	4.70	14	12	0.0932	3	5	5	4	2
310	0 51000 6017	15	0.39	10.94	5.38	9	24	0.1025	3	6	6	4	2
311	0 22600 73042	15	1.63	10.86	4.72	13	24	0.0836	3	6	5	4	3
312	0 40000 1623	7	1.46	10.86	4.79	15	24	0.0940	3	5	6	4	2
313	0 52100 9880	7	0.24	10.84	6.19	5	24	0.1648	3	5	5	4	2
314	0 41000 875	15	1.77	10.83	4.86	13	12	0.0864	3	3	3	3	3
315	0 70052 112	7	1.69	10.83	4.85	2	12	0.1493	3	6	6	4	2
316	0 24000 1399	7	0.58	10.80	5.29	7	24	0.1309	4	5	5	4	3
317	0 11217 46010	7	1.49	10.78	4.13	3	12	0.1212	3	3	3	2	3
318	0 48001 7104	15	0.54	10.78	4.52	15	24	0.0779	3	6	6	4	1
319	0 71100 577	7	1.90	10.77	6.43	21	12	0.1128	3	8	8	6	3
320	0 15300 2087	7	0.66	10.76	5.16	3	12	0.1516	3	4	4	3	7
321	0 13800 10393	7	1.55	10.76	9.87	4	12	0.2766	3	7	7	7	2
322	0 70470 613	7	0.47	10.74	7.01	3	12	0.2064	3	5	5	4	5
323	0 37000 622	7	1.82	10.69	4.49	11	12	0.0990	3	6	6	4	2
324	0 41333 11601	15	1.01	10.69	4.61	14	48	0.0815	3	5	5	3	3
325	0 34500 15130	7	1.43	10.67	4.65	2	36	0.1453	2	3	3	3	2
326	0 70470 602	7	0.48	10.65	5.83	3	12	0.1731	3	4	4	4	4
327	0 45300 29425	7	0.91	10.63	5.58	3	12	0.1660	3	4	4	3	2
328	0 26600 70851	7	1.71	10.61	3.87	6	12	0.1012	3	3	3	2	1
329	0 72180 62603	3	1.35	10.59	5.07	1	12	0.1693	1	3	5	3	2
330	0 28200 11110	15	8.36	10.59	4.39	6	60	0.0927	3	5	3	3	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
331	0 44600 2339	7	7.17	10.58	8.88	21	4	0.1586	3	11	11	9	6
332	0 23100 7103	7	2.25	10.52	5.22	5	12	0.1432	3	4	4	3	2
333	0 35000 59600	14	1.47	10.51	5.01	14	24	0.0901	3	7	7	5	3
334	0 41000 2280	15	0.86	10.50	5.26	13	12	0.0964	3	7	7	5	3
335	0 16000 65960	7	1.98	10.49	4.70	3	12	0.1417	3	3	3	3	2
336	0 34000 21800	14	1.08	10.45	5.06	12	24	0.0950	3	9	9	8	3
337	0 24000 225	7	0.89	10.45	10.38	7	12	0.2655	4	6	6	5	8
338	0 34000 106	14	1.20	10.44	8.99	12	12	0.1689	3	11	11	9	5
339	0 26100 427	7	8.36	10.38	6.34	3	60	0.1931	3	5	5	4	4
340	0 27000 38807	7	0.35	10.37	7.91	14	48	0.1665	3	8	8	7	4
341	0 13700 462	7	2.62	10.33	3.92	7	12	0.1014	3	4	4	3	1
342	0 19200 6428	15	1.76	10.32	4.90	14	12	0.0897	3	7	7	5	3
343	0 43000 70590	7	2.09	10.27	5.16	10	24	0.1219	7	7	5	4	4
344	0 37000 41140	7	0.64	10.27	6.64	11	12	0.1524	3	5	7	6	2
345	0 12100 1092	7	2.73	10.24	5.21	4	12	0.1534	3	5	5	4	2
346	0 24000 11552	7	1.41	10.24	6.79	7	12	0.1772	4	6	6	5	6
347	0 54700 35	15	1.33	10.24	4.55	7	12	0.0970	7	4	4	3	2
348	0 21500 22600	15	0.45	10.22	5.43	15	24	0.0987	3	7	7	5	3
349	0 41419 6174	7	1.03	10.14	5.04	15	18	0.1060	3	6	3	2	2
350	0 30000 6780	7	2.03	10.14	3.59	3	12	0.1120	3	3	6	4	1
351	0 70662 3001	15	0.44	10.12	5.39	8	12	0.1136	3	6	6	5	2
352	0 19000 88291	7	1.22	10.11	4.21	7	30	0.1113	3	4	4	3	1
353	3 5213 19900	15	0.79	10.09	6.31	12	12	0.1226	3	8	8	6	3
354	0 17800 40426	7	2.98	10.08	4.00	7	10	0.1061	3	4	4	3	1
355	0 17000 292	7	0.69	10.07	6.62	12	12	0.1508	3	7	7	6	4
356	0 17800 46048	7	1.07	10.06	5.12	7	12	0.1360	3	5	5	4	3
357	0 52100 7103	7	1.28	10.04	4.60	5	12	0.1323	3	4	4	3	1
358	0 16000 48600	7	1.66	10.04	3.44	3	12	0.1083	3	3	3	2	2
359	0 43000 167	7	2.13	10.03	4.39	5	12	0.1263	3	4	4	3	1
360	0 36200 302	15	1.17	10.02	6.97	8	12	0.1483	3	8	8	7	4

Num	UPC CODE		Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
361	0 16500	98762	14	0.99	10.00	9.95	13	12	0.1915	3	12	12	11	12
362	0 53200	7215	7	0.36	9.98	4.63	7	24	0.1240	3	4	4	3	3
363	0 19000	173	7	0.88	9.98	5.17	7	80	0.1385	3	5	5	4	1
364	0 51100	7921	15	1.33	9.96	6.82	7	12	0.1494	3	8	8	6	5
365	0 72596	31103	7	0.61	9.96	7.33	3	12	0.2327	3	5	5	5	4
366	0 11000	83080	7	4.12	9.88	5.19	7	60	0.1404	3	5	5	4	3
367	0 23700	5108	7	2.39	9.87	6.03	4	8	0.1842	3	5	5	4	5
368	0 25800	1941	7	2.09	9.86	4.51	5	12	0.1320	3	4	4	3	2
369	0 50000	324	7	0.23	9.84	7.26	4	24	0.2225	3	6	6	5	6
370	0 12587	120	15	3.54	9.78	3.71	15	12	0.0704	3	6	6	3	3
371	0 52100	5990	7	0.92	9.70	4.44	5	6	0.1321	3	4	4	3	2
372	0 30000	3900	7	0.50	9.67	6.16	3	12	0.2014	3	4	4	3	5
373	0 12800	18317	7	0.88	9.67	4.73	3	48	0.1547	3	5	5	4	2
374	0 46500	2252	14	1.66	9.65	3.03	14	12	0.0593	3	5	5	2	3
375	0 12547	382	14	0.79	9.58	4.47	14	36	0.0882	3	6	6	4	3
376	0 11217	15120	7	1.02	9.48	4.20	3	12	0.1401	3	3	3	3	2
377	0 12587	57034	15	1.30	9.47	4.26	15	12	0.0835	3	6	6	4	3
378	0 40000	5760	7	1.39	9.43	4.51	15	24	0.1020	3	4	6	4	2
379	0 37600	6951	7	1.11	9.43	3.95	10	12	0.1016	3	6	4	3	2
380	0 41000	1053	15	1.62	9.42	4.92	13	12	0.1005	3	7	7	5	3
381	0 73010	6	15	3.78	9.42	2.78	14	36	0.0558	3	4	4	2	3
382	0 19800	126	15	1.29	9.41	3.80	15	12	0.0750	3	6	6	4	3
383	0 70077	1016	7	1.03	9.38	6.46	1	12	0.2435	3	5	5	4	4
384	0 70662	3008	15	0.44	9.37	4.90	8	12	0.1115	3	6	6	5	2
385	0 13120	336	7	1.09	9.35	4.32	5	12	0.1334	3	4	4	3	2
386	0 70077	4020	7	1.63	9.31	3.18	1	12	0.1208	3	2	2	2	1
387	0 87682	11503	5	0.55	9.29	3.82	2	20	0.1371	2	3	3	2	2
388	0 41000	3500	15	0.48	9.25	4.91	13	48	0.1022	3	7	7	5	3
389	0 53100	51550	15	1.19	9.22	4.01	14	12	0.0822	3	6	6	4	3
390	0 15300	43053	7	0.76	9.18	4.43	3	12	0.1526	3	6	6	4	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
391	0 41000 2246	15	0.75	9.18	3.87	13	12	0.0811	3	4	4	3	3
392	0 43000 20145	7	0.75	9.16	4.73	10	24	0.1252	7	5	5	4	2
393	0 12547 279	14	1.13	9.14	4.93	14	36	0.1019	3	7	7	6	3
394	0 24200 11600	7	0.24	9.14	5.74	12	24	0.1441	3	7	7	5	4
395	0 11113 74242	15	0.51	9.12	4.71	12	24	0.1013	3	7	7	5	3
396	0 72400 722	7	1.09	9.06	4.71	4	12	0.1567	3	7	4	4	2
397	0 48001 27040	15	1.64	9.06	3.84	15	12	0.0787	3	6	6	4	3
398	0 51000 5547	15	0.69	9.06	5.40	9	24	0.1243	3	4	7	6	2
399	0 46500 2032	14	1.44	9.04	3.33	14	12	0.0696	3	6	4	3	3
400	0 17800 41962	7	9.65	9.04	3.72	7	1	0.1100	3	4	6	5	4
401	0 24200 3801	7	1.80	9.04	5.04	12	8	0.1279	3	5	5	3	1
402	0 25500 80260	7	2.35	9.02	4.82	11	12	0.1260	3	6	6	4	2
403	0 16000 44820	7	1.62	9.00	3.74	3	12	0.1314	3	3	3	3	2
404	0 24000 1488	7	0.30	8.96	5.27	7	12	0.1572	4	3	5	5	1
405	0 33700 47511	7	0.19	8.96	5.39	3	24	0.1902	3	5	5	5	4
406	0 51000 5080	7	1.57	8.96	3.01	2	18	0.1120	3	5	3	2	5
407	0 12100 9251	7	0.89	8.96	5.77	4	20	0.1942	3	5	5	4	3
408	0 78300 8686	15	3.24	8.90	3.19	20	48	0.0615	3	6	6	3	3
409	0 54100 72820	15	0.45	8.88	6.06	7	24	0.1489	7	8	8	6	4
410	0 35000 11100	14	0.24	8.86	6.23	14	48	0.1329	3	9	9	7	6
411	0 22600 19032	15	1.59	8.85	4.21	13	24	0.0916	3	3	6	4	2
412	0 18195 70200	7	0.97	8.85	4.04	2	12	0.1522	3	6	3	3	3
413	0 18300 41731	7	1.39	8.83	3.07	7	12	0.0929	3	3	3	2	1
414	0 12547 700	14	0.96	8.82	7.10	14	72	0.1521	3	5	10	9	2
415	0 44300 10670	7	1.16	8.82	3.58	14	12	0.0886	3	10	5	3	6
416	0 34000 29305	14	1.32	8.80	4.70	12	24	0.1047	3	7	7	5	3
417	0 37000 97520	7	1.93	8.79	5.76	11	15	0.1545	3	7	7	6	4
418	0 44400 10270	7	3.38	8.76	4.59	2	12	0.1747	3	4	6	4	4
419	0 11113 83216	15	0.49	8.76	4.20	12	72	0.0940	3	6	4	3	3
420	0 17800 49948	7	1.05	8.75	3.81	7	12	0.1164	3	4	4	3	1

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
421	0 50000 20404	7	2.19	8.74	4.33	4	12	0.1494	3	4	4	3	2
422	0 24000 1185	7	0.73	8.73	4.68	7	24	0.1433	4	5	5	4	3
423	0 16000 44030	7	1.31	8.70	4.01	3	12	0.1458	3	4	4	3	2
424	0 43000 115	7	1.79	8.69	3.39	5	12	0.1126	3	3	3	3	1
425	0 64144 4317	7	1.81	8.65	3.98	10	12	0.1116	3	5	5	4	2
426	0 43000 12950	7	1.82	8.63	3.92	10	12	0.1102	7	5	5	4	2
427	0 36632 412	7	1.58	8.60	3.42	4	4	0.1199	3	3	3	3	1
428	3 5212 91000	15	1.47	8.57	4.40	12	36	0.1007	3	4	4	3	3
429	0 27700 5366	7	1.25	8.57	4.03	4	12	0.1418	3	7	7	5	2
430	0 30000 9230	7	2.92	8.55	3.23	3	8	0.1195	3	3	3	2	1
431	0 70002 5025	8	1.39	8.53	3.63	8	12	0.1099	8	4	4	3	2
432	0 37000 224	7	1.84	8.52	3.31	11	12	0.0916	3	4	4	3	2
433	0 23400 108	7	1.45	8.49	4.40	12	12	0.1189	3	6	6	4	2
434	0 24000 713	7	1.29	8.47	4.02	7	12	0.1268	4	4	4	4	1
435	0 43000 73120	7	3.20	8.45	3.88	10	12	0.1114	7	5	5	4	2
436	0 16000 68640	7	2.31	8.43	3.76	3	12	0.1410	3	3	7	5	2
437	0 46500 1589	14	3.87	8.43	4.13	14	12	0.0926	3	7	3	3	3
438	0 36200 1251	15	2.39	8.40	3.44	8	6	0.0873	3	5	5	4	3
439	0 12546 71164	14	0.94	8.40	3.78	14	24	0.0850	3	6	6	4	2
440	0 25000 2543	7	1.21	8.40	4.73	5	24	0.1626	3	5	6	4	2
441	0 18400 1202	15	4.59	8.40	3.35	13	8	0.0768	3	6	5	3	3
442	3 5732 88010	15	3.40	8.39	3.94	18	144	0.0830	5	7	7	5	3
443	0 32100 2631	7	1.69	8.37	3.92	4	12	0.1412	3	4	4	3	2
444	0 54100 73130	15	2.57	8.36	3.66	7	12	0.0955	7	5	5	4	2
445	0 51000 682	15	0.65	8.31	3.23	9	24	0.0810	3	5	5	3	2
446	0 13800 16601	7	1.79	8.30	4.36	4	12	0.1584	3	6	4	4	2
447	0 47600 60	15	1.29	8.30	4.34	7	12	0.1141	7	4	6	5	2
448	0 25000 672	7	0.89	8.29	3.99	7	9	0.1286	3	4	4	4	3
449	0 13700 20915	7	2.42	8.24	4.02	7	12	0.1304	3	4	6	5	3
450	0 51000 544	15	0.73	8.24	4.34	9	24	0.1098	3	6	4	4	2

Num	UPC CODE		Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
451	0 28000	34510	7	1.96	8.09	3.78	18	12	0.0934	3	6	6	4	3
452	0 16000	41880	7	0.71	8.04	4.06	3	12	0.1597	3	4	4	3	2
453	0 70560	90063	7	0.77	8.03	2.87	1	12	0.1264	3	3	3	2	1
454	0 25000	1482	30	4.98	8.00	6.87	7	8	0.1874	7	12	13	11	12
455	0 40000	35532	7	1.54	8.00	8.98	15	24	0.2393	3	13	12	11	7
456	0 54100	470	15	1.16	7.94	2.96	7	12	0.0814	7	5	5	3	2
457	0 49800	1505	7	0.97	7.92	3.46	4	12	0.1317	3	4	4	3	2
458	0 37000	66251	7	2.76	7.90	3.59	11	12	0.1071	3	7	5	4	3
459	0 40000	1601	7	1.42	7.90	3.78	15	24	0.1020	3	5	7	6	2
460	0 11111	62109	14	2.71	7.90	4.81	10	8	0.1243	5	5	5	4	2
461	0 24000	88	7	1.48	7.90	3.87	7	8	0.1309	4	6	6	4	2
462	0 37600	16672	7	2.14	7.88	4.60	10	12	0.1416	3	7	7	6	3
463	0 43000	20651	7	0.42	7.88	5.22	10	24	0.1607	7	6	6	5	3
464	0 64144	4381	7	0.71	7.85	3.82	10	24	0.1180	3	5	5	4	2
465	0 19800	3408	15	1.16	7.82	3.71	15	12	0.0881	3	7	7	5	3
466	0 30000	7840	7	1.77	7.78	3.61	3	12	0.1467	3	4	4	3	2
467	0 43000	20471	7	0.65	7.77	3.41	10	24	0.1064	7	6	6	4	2
468	0 37000	71460	7	2.27	7.77	4.08	11	12	0.1238	3	5	5	3	2
469	0 70560	92326	7	0.77	7.74	5.01	1	12	0.2289	3	4	4	4	4
470	0 41000	286	15	1.55	7.73	3.35	13	24	0.0834	3	6	6	4	3
471	0 51974	10000	7	1.46	7.62	3.98	5	12	0.1508	3	4	4	4	2
472	0 35000	56685	14	0.92	7.59	4.10	14	24	0.1021	3	5	7	5	2
473	0 41000	572	15	1.32	7.59	4.96	13	6	0.1258	3	8	8	7	3
474	0 43000	20054	7	0.67	7.59	3.55	10	24	0.1134	7	7	5	4	3
475	0 17000	1678	7	0.79	7.57	4.11	12	24	0.1246	3	6	3	3	2
476	0 34500	42688	7	2.08	7.57	3.64	2	12	0.1603	2	3	6	5	2
477	0 36000	52480	7	9.24	7.56	3.86	7	4	0.1365	3	5	5	4	3
478	0 36000	15251	7	2.78	7.49	2.82	7	12	0.1006	3	3	4	3	2
479	0 41757	66890	7	3.32	7.49	3.15	2	6	0.1402	3	4	3	3	1
480	0 41800	15100	7	1.30	7.48	3.83	5	12	0.1478	3	5	5	5	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
481	0 52100 4360	7	0.28	7.48	4.86	5	24	0.1876	3	4	4	4	5
482	0 52100 9030	7	0.28	7.47	3.91	5	24	0.1511	3	4	4	4	2
483	0 24000 1828	7	0.94	7.46	3.64	7	24	0.1304	4	5	5	4	3
484	0 37000 42000	7	1.38	7.45	3.88	11	12	0.1228	3	5	5	4	2
485	0 33700 47152	14	0.75	7.45	3.42	6	12	0.1026	3	5	5	4	2
486	0 41000 2252	15	0.72	7.43	3.84	13	12	0.0995	3	5	5	5	3
487	0 47600 8281	7	0.25	7.43	4.82	5	18	0.1873	3	7	7	5	5
488	0 23700 662	7	2.30	7.42	3.89	4	8	0.1581	3	4	4	4	2
489	0 30000 16905	7	0.99	7.41	3.04	3	12	0.1297	3	3	3	3	2
490	0 20100 17	15	0.51	7.38	3.95	7	24	0.1168	3	6	6	5	2
491	0 37100 510	7	1.38	7.37	3.52	7	12	0.1276	3	4	4	4	3
492	0 37000 71109	7	1.82	7.31	3.18	11	12	0.1025	3	5	5	3	2
493	0 71503 597	15	0.71	7.27	4.84	10	24	0.1359	3	8	8	7	5
494	0 43000 10440	7	2.02	7.26	5.74	10	14	0.1918	7	6	8	7	2
495	0 27200 1115	15	8.36	7.26	3.90	6	60	0.1201	3	8	6	5	7
496	0 41620 1136	7	1.59	7.24	4.39	2	12	0.2021	2	4	4	4	4
497	0 35000 42100	14	2.78	7.23	3.94	14	9	0.1030	3	7	7	5	3
498	0 72973 10118	7	0.60	7.20	4.16	3	24	0.1827	3	4	5	4	3
499	0 35000 46800	14	2.12	7.20	2.99	14	9	0.0785	3	6	4	4	4
500	0 36200 443	15	1.63	7.20	3.03	8	12	0.0897	3	5	6	4	2
501	0 20500 90008	15	0.76	7.19	4.75	9	24	0.1378	3	8	8	6	5
502	0 51000 556	15	1.20	7.12	3.15	9	24	0.0923	3	5	6	4	2
503	0 46500 1671	14	2.45	7.12	2.96	14	12	0.0786	3	6	5	4	3
504	0 43000 97911	7	0.51	7.11	4.90	10	24	0.1671	7	7	7	6	3
505	0 30000 5650	7	0.90	7.10	4.12	2	12	0.1934	3	4	4	4	4
506	0 46500 1351	14	2.90	7.06	2.76	14	12	0.0739	3	6	6	3	3
507	0 74300 933	15	0.78	7.05	3.22	15	12	0.0848	3	6	6	4	3
508	0 44400 15600	7	2.04	7.04	3.00	2	12	0.1420	3	3	3	3	2
509	3 450 49960	14	5.17	7.02	3.82	7	48	0.1187	3	6	6	5	2
510	0 43000 20554	7	0.49	7.00	3.51	10	24	0.1216	7	5	5	4	3

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511	0 37000 439	7	0.84	7.00	3.60	11	12	0.1212	3	5	5	4	2
512	0 24000 30062	7	0.49	7.00	4.00	7	8	0.1527	4	5	5	4	2
513	0 17800 10362	7	2.36	6.98	4.38	7	12	0.1677	3	6	6	5	3
514	0 37000 30400	7	0.78	6.94	3.51	11	12	0.1192	3	5	5	4	2
515	0 77520 0	7	0.89	6.93	5.26	3	12	0.2400	3	6	6	5	5
516	3 380 65212	15	3.36	6.92	3.85	13	12	0.1071	3	4	4	4	3
517	0 26100 167	7	8.07	6.92	4.05	3	60	0.1851	3	7	7	5	4
518	0 16500 2025	15	2.40	6.88	3.58	14	12	0.0983	3	7	7	5	3
519	0 30854 45233	7	0.48	6.84	4.11	3	12	0.1900	3	5	5	4	4
520	0 27000 39120	7	0.60	6.82	3.27	14	24	0.1046	3	6	6	4	2
521	0 27000 48864	7	1.43	6.76	3.98	14	12	0.1285	3	7	7	5	4
522	0 54800 1009	15	2.32	6.74	4.24	16	12	0.1149	3	7	5	4	3
523	0 19200 4033	15	1.45	6.74	3.34	14	9	0.0937	3	9	9	7	3
524	0 13700 25431	7	1.28	6.74	3.29	7	12	0.1305	3	5	7	5	3
525	0 79639 9950	7	1.59	6.66	3.88	7	24	0.1557	3	5	5	4	3
526	0 73369 7005	7	1.37	6.62	2.81	2	12	0.1415	3	3	3	3	2
527	0 50000 10232	7	6.82	6.62	2.81	4	6	0.1280	3	3	3	3	2
528	0 33700 60	7	0.87	6.59	3.98	3	12	0.1910	3	5	5	4	4
529	0 30000 5910	7	1.30	6.58	3.90	2	12	0.1976	3	4	4	4	4
530	0 43000 94778	7	1.17	6.57	3.81	10	4	0.1406	7	6	6	6	3
531	0 71179 58358	7	1.35	6.57	5.50	3	12	0.2647	3	6	6	5	6
532	0 21200 18503	15	1.82	6.53	2.95	12	36	0.0886	3	6	6	4	3
533	3 710 84013	14	2.62	6.49	3.51	14	24	0.1022	3	7	7	5	3
534	0 74880 7013	7	0.31	6.48	3.64	2	24	0.1872	3	4	4	4	4
535	0 38900 818	7	1.25	6.47	3.98	2	12	0.2050	3	4	4	4	4
536	0 79400 72300	12	1.05	6.43	3.44	14	12	0.1011	3	4	4	3	3
537	0 60569 713	7	2.35	6.43	3.25	4	12	0.1524	3	7	7	5	2
538	0 17800 47720	7	1.28	6.37	3.54	7	12	0.1485	3	5	5	4	3
539	0 30000 3160	7	0.68	6.32	3.25	3	24	0.1626	3	4	4	3	2
540	0 19800 3541	15	0.68	6.30	2.99	15	12	0.0881	3	7	7	5	3

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541	0	47400 26522	30	2.91	6.29	2.90	14	12	0.0871	3	5	4	3	4
542	3	650 11612	15	1.40	6.29	2.75	13	24	0.0841	3	4	6	4	3
543	0	17800 44697	7	8.54	6.29	3.39	7	1	0.1440	3	6	8	5	3
544	0	25000 415	7	1.59	6.29	2.99	6	6	0.1318	3	8	5	4	3
545	0	28700 32	7	1.68	6.26	6.41	7	6	0.2737	3	9	9	8	9
546	0	51000 6236	15	0.65	6.24	3.69	9	24	0.1233	3	8	7	6	3
547	0	17800 62022	7	1.72	6.24	2.96	7	12	0.1268	3	4	4	4	1
548	0	41390 2	15	0.90	6.24	3.50	15	12	0.1042	3	7	8	6	2
549	0	70077 1080	7	0.89	6.22	2.58	1	12	0.1467	3	7	3	2	4
550	0	74601 375	7	0.49	6.22	3.34	2	24	0.1790	3	4	4	2	4
551	0	51316 18940	7	0.35	6.22	6.20	3	18	0.3152	3	3	6	5	2
552	0	16000 42550	7	1.29	6.22	2.98	3	12	0.1515	3	5	9	7	2
553	0	37000 42415	7	1.43	6.22	3.10	11	12	0.1175	3	4	4	3	2
554	3	80 45204	7	2.00	6.22	4.76	15	6	0.1632	10	9	2	1	7
555	3	870 30501	15	2.18	6.19	4.70	10	6	0.1550	7	9	7	5	5
556	3	1490 9325	30	2.12	6.16	3.01	7	12	0.1066	7	8	6	3	4
557	0	36600 81331	15	0.52	6.16	3.82	14	144	0.1172	3	8	5	1	3
558	0	25800 1964	7	1.85	6.14	3.32	5	12	0.1561	3	5	3	2	2
559	0	46000 82161	7	0.78	6.12	3.36	4	12	0.1655	3	4	3	2	2
560	0	27200 1192	15	5.45	6.11	4.16	6	60	0.1522	3	7	6	4	4
561	0	19100 351	15	0.69	6.06	3.23	16	18	0.0973	3	7	5	2	3
562	0	34000 37104	14	1.42	6.04	3.19	12	24	0.1036	3	7	4	2	3
563	0	36000 1400	7	2.78	6.04	3.34	7	12	0.1478	3	5	5	2	3
564	0	37000 41081	7	2.38	6.02	5.56	11	8	0.2177	3	9	8	6	9
565	0	70074 40119	30	1.32	6.00	4.85	6	12	0.1807	3	4	9	5	4
566	0	39000 8507	7	1.30	6.00	3.30	4	12	0.1658	3	6	3	2	3
567	0	26600 70251	7	1.02	6.00	3.02	6	12	0.1396	3	12	4	3	7
568	0	37000 65784	7	8.75	6.00	3.42	11	6	0.1344	3	4	3	2	2
569	0	13700 237	7	1.82	5.98	2.97	7	12	0.1327	3	4	3	2	4
570	0	37000 34190	7	1.73	5.98	2.28	11	12	0.0899	3	5	3	1	2

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571	0 16000 41740	7	0.74	5.98	3.29	3	12	0.1740	3	4	3	2	3
572	0 70153 29001	7	1.47	5.96	2.95	2	12	0.1650	3	7	3	2	3
573	0 19800 295	15	1.69	5.96	2.79	15	12	0.0869	3	4	4	3	4
574	0 25500 80	7	4.73	5.96	3.29	11	12	0.1301	3	6	4	1	2
575	0 30854 45120	7	1.69	5.94	2.61	3	6	0.1389	3	3	3	2	4
576	0 30000 1380	7	1.91	5.94	3.26	3	12	0.1736	3	4	3	2	2
577	0 47400 62421	30	2.32	5.92	2.64	14	12	0.0843	3	8	3	2	4
578	0 87684 982	7	2.08	5.92	3.40	3	4	0.1816	3	4	4	0	4
579	0 15300 1068	7	0.61	5.88	3.42	3	12	0.1839	3	4	4	2	4
580	0 17800 51596	7	1.05	5.87	3.25	7	12	0.1480	3	5	4	2	3
581	0 27000 38508	7	0.74	5.86	3.10	14	12	0.1154	3	6	4	2	2
582	0 28200 10601	15	8.36	5.86	3.21	6	60	0.1225	3	6	4	2	2
583	0 36632 201	7	0.92	5.84	5.78	4	6	0.2984	3	8	7	5	7
584	0 13120 192	7	0.72	5.82	2.81	5	12	0.1394	3	4	3	2	3
585	0 25700 103	7	2.07	5.82	3.02	7	12	0.1387	3	5	4	2	2
586	0 25800 46	7	1.69	5.80	2.50	5	12	0.1244	3	4	3	2	1
587	0 22200 309	15	1.19	5.78	3.10	18	12	0.0948	3	8	5	2	3
588	0 48001 5515	15	2.12	5.76	3.08	15	12	0.0993	3	7	5	2	2
589	0 44300 72374	7	2.46	5.76	3.16	7	12	0.1466	3	5	4	2	3
590	0 47600 80501	7	0.34	5.76	3.40	5	24	0.1704	3	5	4	3	3
591	0 41000 650	15	1.31	5.71	3.87	13	6	0.1304	3	9	6	4	5
592	0 79400 74070	12	1.02	5.70	3.74	14	12	0.1240	3	9	5	3	3
593	0 79400 74640	12	1.01	5.70	3.23	14	12	0.1071	3	8	6	4	3
594	0 30000 4880	7	0.86	5.68	3.13	2	24	0.1837	3	4	3	2	1
595	0 52100 15920	7	1.09	5.68	2.30	5	12	0.1169	3	4	2	1	4
596	0 52000 1041	7	0.49	5.67	3.59	3	24	0.2002	3	5	4	3	5
597	0 71503 500	15	0.59	5.66	3.43	10	36	0.1237	3	7	5	3	2
598	0 37000 83	7	2.54	5.63	2.78	11	12	0.1164	3	5	4	2	2
599	0 37600 23688	7	0.65	5.62	3.10	10	24	0.1338	3	6	4	3	3
600	0 24000 1699	7	1.47	5.61	2.62	7	12	0.1248	4	4	3	2	1

Num	UPC CODE		Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
601	0 41294	40174	15	2.21	5.60	2.77	10	12	0.1010	3	12	11	9	2
602	0 43000	94767	7	0.70	5.60	7.14	10	9	0.3092	7	6	4	2	12
603	0 43000	95356	7	1.68	5.59	2.61	10	12	0.1132	7	5	3	2	2
604	0 37000	413	7	3.89	5.54	2.82	11	8	0.1200	3	5	4	2	2
605	0 54600	121	7	1.94	5.52	3.48	7	12	0.1685	3	6	4	3	3
606	0 70195	36002	15	11.40	5.50	6.36	10	10	0.2360	3	13	11	9	13
607	0 75700	4502	7	1.40	5.48	3.10	2	12	0.1886	2	4	3	2	4
608	0 47800	29	7	0.91	5.47	3.21	4	24	0.1769	3	5	4	3	4
609	0 37000	91740	7	6.19	5.47	3.01	11	4	0.1297	3	6	4	3	4
610	0 70860	30480	7	1.09	5.46	3.69	3	12	0.2137	3	7	5	2	5
611	0 28000	33190	7	2.91	5.46	2.90	18	12	0.1062	3	5	4	0	4
612	0 47400	11746	30	6.13	5.46	2.28	14	72	0.0789	3	8	4	3	3
613	0 77700	55023	7	0.90	5.45	2.72	5	12	0.1441	3	4	3	2	2
614	3 810	1824	15	3.23	5.44	2.54	10	72	0.0953	3	6	3	2	2
615	3 450	40542	14	3.18	5.44	2.42	7	36	0.0971	3	5	4	2	2
616	0 41294	45660	15	3.58	5.44	2.49	10	12	0.0934	3	6	4	2	2
617	0 43000	25953	7	1.41	5.43	3.22	10	12	0.1438	7	6	4	2	3
618	0 26600	73531	7	1.44	5.42	3.34	6	12	0.1709	3	5	4	3	3
619	0 37000	942	7	4.05	5.41	4.14	11	9	0.1804	3	6	6	4	6
620	0 50000	77302	7	0.74	5.41	4.47	4	12	0.2491	3	8	5	4	7
621	0 73410	29078	7	0.69	5.39	2.42	2	12	0.1497	3	3	2	2	2
622	0 51000	997	15	0.58	5.38	3.50	9	24	0.1357	3	8	6	3	5
623	0 25000	1126	7	0.71	5.33	3.23	7	12	0.1620	3	5	6	4	3
624	3 5213	88400	15	1.19	5.33	3.70	12	12	0.1361	3	9	4	3	5
625	0 41390	1200	15	0.71	5.32	3.05	8	12	0.1222	3	7	5	3	2
626	0 25800	1971	7	2.19	5.29	3.38	5	12	0.1844	3	5	4	3	5
627	0 13120	806	7	1.39	5.27	2.98	5	12	0.1632	3	5	4	2	5
628	0 28000	13840	7	1.47	5.27	3.37	18	24	0.1279	3	8	6	3	2
629	0 73010	76004	15	2.22	5.26	3.31	14	12	0.1189	3	5	4	2	3
630	0 17800	43520	7	4.11	5.26	2.75	7	5	0.1397	3	8	6	3	3

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
631	0 16000 41280	7	0.99	5.24	2.92	3	12	0.1762	3	5	3	2	4
632	0 46500 195	14	1.55	5.24	2.44	14	12	0.0880	3	4	4	2	3
633	0 43000 79830	7	4.19	5.24	2.50	10	12	0.1157	7	6	3	2	2
634	0 28000 31140	7	3.14	5.22	2.79	18	12	0.1069	3	4	5	2	4
635	0 24515 86435	7	3.59	5.22	2.74	2	12	0.1750	3	7	3	2	3
636	0 51000 1207	15	0.57	5.20	3.22	9	24	0.1291	3	7	6	4	5
637	3 5212 17100	15	2.33	5.20	3.48	12	48	0.1312	3	8	5	3	5
638	0 18300 42119	7	0.99	5.17	2.66	7	12	0.1375	3	5	3	2	3
639	0 19200 2201	15	1.93	5.16	3.19	14	12	0.1168	3	8	6	3	3
640	0 38900 102	7	0.85	5.15	2.65	2	24	0.1715	3	4	3	2	2
641	0 11217 68080	7	1.66	5.14	3.25	3	12	0.1999	3	5	4	3	3
642	0 77100 9	7	1.29	5.14	2.70	6	12	0.1457	3	5	4	1	3
643	3 5730 82020	15	3.88	5.14	2.36	18	12	0.0812	5	7	3	2	4
644	0 41800 43	14	1.08	5.13	2.09	7	12	0.0889	3	5	4	3	2
645	0 52100 5430	7	0.71	5.13	2.97	5	12	0.1671	3	5	3	1	?
646	0 71100 663	7	0.51	5.11	2.90	21	24	0.1073	3	8	5	3	3
647	0 50000 58032	7	1.67	5.10	2.79	4	12	0.1649	3	4	3	2	8
648	0 9800 947	14	0.79	5.10	4.12	7	18	0.1763	2	9	7	5	2
649	0 53100 271	15	1.21	5.09	3.40	14	12	0.1262	3	9	6	4	3
650	0 54800 5004	15	1.00	5.08	2.78	16	12	0.0999	3	8	5	2	3
651	0 13800 16620	7	1.99	5.06	2.30	4	12	0.1371	3	4	3	2	2
652	0 41000 2267	15	0.70	5.02	2.92	13	12	0.1119	3	6	4	2	3
653	0 36200 150	15	0.99	5.02	2.62	8	12	0.1113	3	8	5	3	2
654	0 17800 42929	7	8.69	5.00	4.24	7	1	0.2266	3	7	6	5	7
655	0 41000 695	15	0.83	4.98	2.82	13	12	0.1090	3	7	5	3	2
656	0 72545 6256	7	5.16	4.98	2.58	5	6	0.1496	3	4	3	2	3
657	0 73369 8015	7	1.63	4.97	2.77	2	12	0.1858	3	4	3	2	4
658	0 46500 343	14	1.23	4.96	3.47	14	12	0.1322	3	9	7	4	6
659	0 11111 2335	14	0.74	4.92	2.84	10	18	0.1178	5	7	5	3	2
660	0 51600 201	15	1.71	4.90	2.43	18	12	0.0877	3	7	5	2	3

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
661	0 47600 458	15	0.56	4.88	6.67	7	24	0.2983	7	14	13	10	14
662	0 12800 54	7	2.05	4.87	2.70	3	12	0.1753	3	4	3	2	4
663	0 22200 331	15	1.53	4.84	2.50	18	24	0.0913	3	8	5	2	3
664	0 30000 6370	7	1.07	4.82	2.51	3	12	0.1647	3	4	3	2	2
665	0 36200 8813	15	0.58	4.81	3.82	8	24	0.1693	3	9	7	5	4
666	0 51000 2577	15	0.45	4.80	3.46	9	24	0.1503	3	8	6	4	5
667	0 47600 8126	7	0.25	4.79	4.19	5	24	0.2525	3	7	6	5	7
668	0 22600 1642	15	1.47	4.78	3.78	13	24	0.1522	3	10	8	5	5
669	0 47000 1310	14	1.41	4.77	2.74	12	24	0.1127	3	7	5	3	5
670	0 50000 30302	7	3.50	4.77	3.44	4	6	0.2174	3	6	5	4	3
671	0 70002 5325	8	1.17	4.73	2.03	8	12	0.1108	8	4	3	1	2
672	0 37100 385	7	1.47	4.73	1.88	7	8	0.1062	3	4	3	2	1
673	0 34500 19500	7	0.99	4.72	2.34	2	24	0.1653	2	4	3	2	2
674	0 17000 955	7	0.51	4.71	3.39	12	24	0.1651	3	8	6	4	4
675	0 22032 16002	15	0.96	4.69	2.67	7	12	0.1242	7	6	3	2	2
676	0 51316 18670	7	2.92	4.69	2.18	3	8	0.1470	3	4	5	3	2
677	0 41196 1072	7	1.03	4.67	2.76	4	12	0.1782	3	5	4	3	4
678	0 71100 534	7	0.65	4.64	2.85	21	24	0.1161	3	6	3	2	3
679	0 71503 576	15	0.71	4.64	2.21	10	24	0.0972	3	8	4	2	2
680	0 73369 8007	7	1.52	4.64	2.46	2	12	0.1767	3	4	6	3	4
681	0 21200 1082	15	1.47	4.59	3.05	12	12	0.1303	3	8	6	4	5
682	0 51000 3087	15	0.92	4.58	2.76	9	24	0.1257	3	7	5	3	3
683	0 25000 679	7	2.63	4.58	2.47	7	3	0.1441	3	5	4	2	2
684	0 71503 523	15	0.32	4.57	2.84	10	36	0.1269	3	8	5	3	2
685	0 70074 40707	30	6.24	4.55	3.11	6	4	0.1528	3	6	6	3	4
686	0 78300 8005	15	2.08	4.55	2.63	20	12	0.0991	3	10	5	3	3
687	0 43000 20437	7	0.44	4.55	2.94	10	24	0.1567	7	9	7	4	3
688	0 37000 70245	7	2.55	4.54	2.02	11	12	0.1049	3	4	3	2	3
689	0 28000 24320	7	1.41	4.54	2.26	18	12	0.0996	3	5	3	1	1
690	0 36000 2400	7	2.78	4.54	1.89	7	12	0.1113	3	6	4	2	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
691	0 25000 449	7	1.65	4.52	2.36	7	3	0.1395	3	5	4	2	3
692	0 71503 528	15	0.32	4.51	4.13	10	36	0.1869	3	11	9	6	10
693	3 881 17547	15	4.24	4.50	2.25	10	72	0.1021	3	6	4	2	2
694	0 41196 1105	7	1.05	4.49	2.58	4	12	0.1733	3	5	4	3	4
695	0 43000 97936	7	0.54	4.47	3.34	10	24	0.1812	7	7	6	4	7
696	0 44400 16750	7	1.80	4.46	2.55	2	12	0.1906	3	4	3	2	4
697	0 35000 37300	14	3.51	4.44	3.72	14	8	0.1583	3	11	5	2	6
698	0 79400 52	12	1.80	4.44	2.31	14	12	0.0983	3	7	8	6	3
699	0 12044 12490	14	1.62	4.42	2.43	21	24	0.0929	7	8	5	2	8
700	0 64144 10740	7	0.68	4.42	3.80	10	12	0.2085	3	8	7	5	4
701	0 15300 43087	7	0.96	4.41	2.84	3	12	0.2036	3	5	4	3	5
702	0 24000 1291	7	1.26	4.40	2.89	7	8	0.1755	4	6	5	3	6
703	0 70120 11324	7	1.14	4.39	2.64	3	24	0.1902	3	5	4	3	4
704	0 15300 43092	7	0.97	4.38	2.15	3	12	0.1552	3	4	3	2	2
705	0 16000 43300	7	0.94	4.36	3.83	3	12	0.2778	3	6	6	4	6
706	0 16000 43040	7	0.95	4.35	2.30	3	12	0.1672	3	4	3	2	2
707	0 52100 5160	7	0.56	4.34	2.14	5	12	0.1423	3	4	3	2	2
708	0 44300 71960	7	1.49	4.33	2.29	7	12	0.1413	3	5	4	2	3
709	0 41522 5409	7	0.66	4.33	2.31	7	12	0.1426	3	5	4	2	3
710	0 36200 580	15	1.12	4.32	2.44	8	12	0.1204	3	7	5	3	2
711	0 13000 50670	7	0.42	4.31	3.79	2	24	0.2931	3	6	5	4	6
712	0 54800 7505	15	1.49	4.29	2.00	16	12	0.0851	3	4	3	2	4
713	0 87682 11581	5	0.55	4.29	2.42	2	20	0.1880	2	7	3	2	3
714	0 13000 50420	7	1.04	4.29	2.22	2	12	0.1725	3	4	3	2	2
715	0 13800 16656	7	2.99	4.29	2.36	4	12	0.1659	3	4	4	1	3
716	3 9980 41315	15	3.36	4.27	2.73	13	36	0.1230	3	8	4	3	5
717	0 70730 1000	30	0.92	4.27	2.64	21	12	0.1045	3	5	6	3	3
718	0 34500 44166	7	1.15	4.27	2.76	2	12	0.2155	2	12	7	3	4
719	0 26600 70258	7	0.96	4.25	2.30	6	12	0.1501	3	5	4	2	3
720	0 48001 70305	7	0.59	4.23	3.10	2	12	0.2443	3	7	3	2	2

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721	0 53000 321	7	6.99	4.23	2.47	2	6	0.1946	3	7	5	3	5
722	3 230 82512	15	2.99	4.23	2.52	10	24	0.1216	7	5	5	3	4
723	0 37323 13318	15	1.05	4.23	2.56	6	12	0.1353	3	4	4	3	4
724	0 37600 21629	7	0.71	4.21	3.13	10	24	0.1803	3	7	6	4	7
725	0 37000 74002	7	5.64	4.20	2.32	11	12	0.1302	3	6	5	3	4
726	0 77700 4	7	1.80	4.20	2.91	5	6	0.2000	3	6	4	3	5
727	0 24000 36139	7	0.67	4.19	2.54	7	12	0.1620	4	5	4	3	5
728	0 34000 14600	14	1.50	4.19	3.12	12	12	0.1460	3	9	7	4	3
729	0 33600 61	7	0.81	4.18	2.29	6	12	0.1519	3	6	4	2	3
730	0 40000 5932	7	2.10	4.18	2.24	15	24	0.1143	3	5	4	2	2
731	0 43000 23076	7	2.74	4.17	1.94	10	8	0.1128	7	5	3	2	5
732	0 43000 430	7	1.04	4.17	2.61	5	12	0.1807	3	5	4	3	2
733	0 19800 136	15	1.31	4.16	2.44	15	12	0.1089	3	4	5	3	4
734	0 51316 17175	7	5.21	4.16	2.27	3	5	0.1726	3	8	3	2	3
735	0 28000 21480	7	1.68	4.15	2.22	18	12	0.1070	3	7	5	2	3
736	0 19800 3702	15	1.25	4.15	1.96	15	12	0.0877	3	7	4	2	3
737	0 41100 19109	15	1.86	4.13	2.28	14	72	0.1043	3	7	5	2	4
738	0 27000 44025	7	1.30	4.13	2.78	14	12	0.1469	3	8	6	4	3
739	0 41210 80287	7	0.39	4.12	3.35	5	24	0.2347	3	7	3	2	6
740	0 43000 28585	7	1.35	4.12	1.90	10	12	0.1118	7	5	6	4	2
741	0 43000 10	7	2.53	4.10	2.45	10	12	0.1449	7	6	5	3	3
742	0 70011 78604	7	0.89	4.09	2.34	12	24	0.1313	3	6	4	3	4
743	0 54100 1160	15	0.91	4.08	2.18	7	12	0.1166	7	6	4	2	2
744	0 47600 8177	7	0.49	4.07	2.35	5	12	0.1667	3	8	4	2	5
745	0 47000 4045	14	0.90	4.07	2.96	12	24	0.1426	3	7	5	2	2
746	3 5730 20045	15	4.43	4.07	2.21	18	72	0.0960	5	5	5	4	6
747	0 24000 30023	7	0.61	4.07	2.95	7	8	0.1937	4	6	7	4	3
748	3 650 15812	15	3.27	4.07	2.08	13	24	0.0984	3	9	4	3	3
749	0 32100 4572	7	1.48	4.06	2.12	4	9	0.1574	3	4	3	2	4
750	0 25500 80108	7	8.21	4.06	2.22	11	8	0.1289	3	6	4	2	2

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751	0 51000	1876	15	0.43	4.05	2.51	9	24	0.1292	3	7	6	5	5
752	0 33900	36	7	0.80	4.05	3.34	7	12	0.2204	3	7	5	3	7
753	0 36200	8957	15	0.59	4.03	2.90	8	24	0.1534	3	9	6	4	3
754	0 79400	45000	12	1.58	4.03	2.71	14	12	0.1271	3	8	6	4	4
755	0 46500	1626	14	2.26	4.02	2.20	14	12	0.1034	3	7	5	2	3
756	0 30000	4790	7	2.05	4.00	1.41	2	12	0.1175	3	6	7	4	1
757	0 46500	602	14	0.87	4.00	2.76	14	12	0.1304	3	10	4	2	6
758	0 54100	1540	15	1.38	4.00	2.09	7	12	0.1140	7	9	2	1	6
759	0 48001	17495	15	1.24	4.00	3.09	15	12	0.1435	3	3	8	5	2
760	0 47400	67081	30	2.20	3.98	2.53	14	12	0.1201	3	11	7	3	4
761	0 29100	4144	14	1.39	3.95	2.37	21	12	0.1014	7	9	6	3	4
762	0 72973	10113	7	0.54	3.94	2.05	3	24	0.1645	3	4	3	2	2
763	0 17800	1009	7	4.03	3.93	2.10	7	24	0.1428	3	5	4	3	3
764	0 54000	67120	7	2.95	3.93	2.56	3	12	0.2060	2	5	4	2	5
765	0 74182	26050	15	0.96	3.92	2.21	15	12	0.1047	7	8	5	3	4
766	0 27000	60712	7	1.09	3.92	2.43	14	12	0.1353	3	7	5	3	3
767	0 41000	966	15	1.54	3.91	2.09	13	12	0.1029	3	7	5	2	3
768	0 16000	41410	7	1.02	3.89	2.79	3	12	0.2268	3	5	4	3	5
769	3 410	81200	30	1.45	3.88	2.79	12	72	0.1410	3	12	8	4	4
770	0 70222	2230	15	0.67	3.88	2.61	8	24	0.1434	3	8	6	4	4
771	0 41322	22540	7	3.14	3.83	2.49	4	12	0.1960	3	5	4	3	5
772	0 41570	383	15	1.24	3.80	2.38	20	12	0.1074	3	9	5	2	6
773	0 74262	207	15	1.99	3.80	2.02	15	12	0.0987	3	7	6	3	3
774	3 10158	5306	15	1.96	3.80	2.68	14	36	0.1333	3	9	7	4	3
775	0 46000	84071	7	0.96	3.78	2.07	4	12	0.1651	3	8	3	2	3
776	0 34000	590	14	1.51	3.78	2.31	12	24	0.1198	3	4	5	3	2
777	0 22200	208	15	1.38	3.77	1.97	18	24	0.0924	3	8	5	2	3
778	0 11000	12608	7	8.36	3.75	2.31	7	30	0.1646	3	6	4	3	3
779	0 79400	45300	12	1.58	3.73	1.93	14	12	0.0978	3	7	3	2	3
780	0 70560	84276	7	0.53	3.73	1.93	1	24	0.1829	3	3	5	2	3

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
781	0 30000 4090	7	0.79	3.72	2.57	3	24	0.2185	3	5	4	3	5
782	0 11127 123	21	1.93	3.71	3.07	21	12	0.1399	3	15	8	5	5
783	0 28000 21760	7	1.60	3.71	3.01	18	12	0.1623	3	10	10	6	5
784	0 41100 8645	15	3.62	3.69	2.18	14	12	0.1116	3	8	5	3	3
785	0 35742 15183	7	2.25	3.68	2.21	2	12	0.2002	3	4	3	3	4
786	0 78300 6306	15	1.53	3.67	2.22	20	72	0.1037	3	5	6	3	4
787	0 30000 7470	7	1.70	3.67	2.65	3	12	0.2283	3	6	5	3	5
788	0 37000 70428	7	2.29	3.67	2.17	11	12	0.1394	3	5	4	3	3
789	0 78001 7	7	2.54	3.67	2.27	3	4	0.1956	3	9	4	3	4
790	0 50000 51052	7	1.49	3.66	2.12	4	8	0.1746	3	5	4	3	4
791	0 52100 4200	7	0.74	3.65	1.80	5	6	0.1424	3	4	3	2	2
792	0 41757 108	7	1.41	3.64	1.83	2	12	0.1676	3	4	3	2	2
793	0 41000 1461	15	0.77	3.61	2.08	13	12	0.1109	3	8	5	3	3
794	0 64144 4117	7	2.04	3.60	2.02	10	12	0.1361	3	6	4	3	3
795	0 13800 12105	7	2.58	3.60	2.28	4	8	0.1910	3	5	4	3	5
796	0 47600 8106	7	0.34	3.59	2.10	5	24	0.1689	3	5	4	3	2
797	3 724 60063	14	3.92	3.58	2.31	14	12	0.1219	3	8	6	3	3
798	0 13800 10032	7	2.09	3.57	2.03	4	12	0.1714	3	5	4	2	2
799	0 74262 512	15	1.75	3.56	1.88	15	12	0.0981	3	4	3	2	3
800	0 41460 33227	7	0.74	3.56	2.03	2	12	0.1901	3	7	5	2	4
801	0 51000 4253	7	1.57	3.55	2.25	2	12	0.2113	3	7	4	3	3
802	0 43000 28603	7	1.14	3.55	2.37	10	12	0.1619	7	4	5	3	4
803	0 74300 62	15	3.16	3.54	2.24	15	36	0.1175	3	9	6	3	3
804	0 48400 31	7	0.78	3.53	1.47	3	12	0.1317	3	8	6	4	2
805	0 70011 72643	7	1.30	3.53	2.62	12	24	0.1703	3	3	2	1	4
806	0 43000 77175	7	6.21	3.52	2.20	10	12	0.1516	7	4	3	2	3
807	0 27700 5022	7	2.43	3.52	1.87	4	6	0.1602	3	6	5	3	2
808	0 54100 72128	15	3.24	3.51	2.41	7	12	0.1498	7	8	6	4	3
809	0 41570 6800	15	3.82	3.51	1.93	20	12	0.0943	3	8	5	2	4
810	0 73776 11111	7	4.98	3.48	1.78	4	6	0.1542	3	4	3	2	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
811	0 71030 25438	7	3.65	3.47	2.05	2	8	0.1969	3	4	3	2	4
812	0 13800 15176	7	2.22	3.46	2.33	4	12	0.2030	3	5	4	3	5
813	0 12587 268	15	1.69	3.43	1.94	15	12	0.1050	3	8	5	3	3
814	0 34500 42583	7	1.25	3.42	2.47	2	12	0.2407	2	8	4	2	7
815	0 70011 84156	7	0.89	3.42	2.61	12	24	0.1751	3	5	4	3	5
816	0 54100 310	15	1.43	3.42	1.80	7	12	0.1149	7	6	6	4	2
817	0 41210 80975	7	0.98	3.40	2.24	5	12	0.1902	3	5	4	2	5
818	0 50000 54082	7	2.59	3.40	1.94	4	8	0.1720	3	5	4	3	2
819	0 43000 21100	7	0.57	3.39	2.45	10	24	0.1753	7	7	6	4	7
820	0 19100 608	15	2.79	3.38	2.27	16	24	0.1226	3	9	7	4	3
821	0 25800 1997	7	1.29	3.37	2.18	5	12	0.1867	3	5	4	3	5
822	0 16000 43600	7	0.92	3.36	2.45	3	12	0.2306	3	5	5	3	5
823	0 18400 635	15	1.55	3.35	2.66	13	12	0.1528	3	5	4	3	5
824	0 30000 5130	7	1.62	3.35	2.13	3	12	0.2011	3	10	8	5	5
825	0 43000 22110	7	1.48	3.34	2.40	10	8	0.1743	7	7	6	4	7
826	0 52100 2380	7	0.55	3.33	2.23	5	12	0.1933	3	5	4	3	5
827	0 16000 18980	7	0.57	3.32	1.96	3	12	0.1867	3	4	4	3	4
828	0 17800 17213	7	2.09	3.31	1.82	7	12	0.1470	3	10	3	2	6
829	0 41460 41173	7	0.59	3.31	1.96	2	12	0.1974	3	5	4	2	3
830	0 46500 1923	14	1.43	3.31	2.50	14	12	0.1427	3	4	7	5	4
831	0 40000 5151	7	0.83	3.28	2.20	15	24	0.1430	3	9	6	3	4
832	0 22400 19070	15	0.89	3.28	1.88	21	12	0.0969	3	8	6	4	4
833	0 71503 934	15	1.69	3.27	1.50	10	24	0.0936	3	6	4	2	2
834	0 41000 214	15	1.23	3.26	1.87	13	12	0.1104	3	8	5	3	3
835	0 22400 383	15	2.03	3.24	2.12	21	12	0.1106	3	10	7	4	4
836	0 19800 3667	15	0.78	3.24	2.23	15	12	0.1278	3	9	7	3	6
837	0 53000 650	7	3.45	3.22	2.07	2	6	0.2143	3	5	4	3	4
838	0 70011 84020	7	0.89	3.21	1.96	12	24	0.1401	3	7	5	3	6
839	0 70002 5915	8	0.99	3.21	2.22	8	12	0.1786	8	6	5	4	4
840	0 46000 85131	7	0.88	3.20	2.17	4	12	0.2045	3	8	6	3	5

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
841	0 12546 71836	14	0.80	3.20	2.06	14	24	0.1217	3	5	4	3	3
842	0 13700 1216	7	1.12	3.19	1.81	7	12	0.1516	3	6	4	3	2
843	0 71503 926	15	2.37	3.19	1.60	10	12	0.1024	3	5	4	2	3
844	0 33600 10	7	0.91	3.18	1.70	6	12	0.1483	3	5	4	2	3
845	0 74601 1587	7	0.99	3.17	1.79	2	24	0.1882	3	4	3	2	4
846	0 41620 1415	7	2.97	3.17	1.99	2	12	0.2093	2	4	4	3	4
847	0 22400 65000	15	1.12	3.15	1.78	21	12	0.0955	3	9	6	2	4
848	0 51000 2757	15	0.69	3.14	2.11	9	24	0.1401	3	9	6	4	4
849	0 22400 11007	15	1.74	3.14	1.82	21	12	0.0980	3	8	6	3	3
850	0 75609 457	15	4.07	3.14	1.87	16	12	0.1087	3	8	6	3	5
851	0 43000 10338	7	0.78	3.11	1.79	10	9	0.1396	7	8	7	5	6
852	0 52100 1582	7	0.59	3.11	2.22	5	12	0.2061	3	6	4	3	3
853	0 37000 40020	7	4.95	3.11	2.52	11	6	0.1910	3	6	5	4	8
854	0 54800 2409	15	1.18	3.10	2.14	16	12	0.1260	3	9	6	3	3
855	0 45893 54500	15	1.92	3.10	1.97	15	24	0.1180	3	9	7	4	3
856	0 22400 21003	15	1.67	3.09	1.59	21	12	0.0870	3	8	4	3	4
857	0 70077 2048	7	0.50	3.09	2.35	1	24	0.2689	3	5	5	2	5
858	0 35742 14002	7	1.34	3.08	1.84	2	12	0.1991	3	4	4	3	4
859	0 32100 2503	7	1.97	3.08	1.88	4	9	0.1840	3	5	3	3	5
860	0 11113 53435	15	1.87	3.07	1.88	15	24	0.1137	3	8	5	3	3
861	0 54800 5302	15	0.89	3.07	1.78	16	12	0.1059	3	8	6	3	3
862	0 16000 10410	7	2.52	3.06	1.64	3	5	0.1695	3	4	3	2	2
863	0 16000 45890	7	0.97	3.05	1.85	3	12	0.1918	3	5	4	3	4
864	0 16000 50230	7	2.00	3.04	1.83	3	12	0.1904	3	5	4	3	4
865	0 44300 73157	7	3.75	3.00	2.44	7	12	0.2174	3	7	6	4	7
866	0 64144 51050	7	0.62	3.00	2.13	10	12	0.1722	3	7	6	4	7
867	3 850 8001	15	2.45	2.95	1.95	15	36	0.1227	3	9	6	4	3
868	0 53100 54000	15	1.05	2.93	1.83	14	12	0.1180	3	6	6	3	5
869	0 70120 14098	7	4.57	2.93	2.34	3	8	0.2526	3	4	5	2	4
870	0 27443 36327	7	1.23	2.93	1.69	3	12	0.1824	3	5	5	4	6

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871	0 46500 553	14	0.91	2.93	1.55	14	12	0.1000	3	8	4	3	3
872	0 44400 14170	7	3.05	2.93	2.06	2	12	0.2344	3	7	3	2	3
873	0 70011 60502	7	1.50	2.92	1.73	12	24	0.1359	3	6	5	3	4
874	0 37000 814	7	8.27	2.90	1.83	11	4	0.1487	3	7	5	3	4
875	0 34000 7120	14	2.12	2.89	1.95	12	24	0.1323	3	8	6	4	5
876	0 43300 1908	7	5.45	2.88	1.90	5	60	0.1904	3	5	6	2	5
877	3 745 57405	30	1.66	2.88	1.66	15	36	0.1070	3	10	4	3	5
878	0 53100 23100	15	1.18	2.87	1.73	14	12	0.1139	3	8	6	3	3
879	3 5212 75000	15	0.64	2.86	1.60	12	72	0.1097	3	7	5	3	3
880	0 25800 2051	7	1.20	2.85	1.61	5	12	0.1631	3	5	4	2	2
881	0 47400 65111	30	1.05	2.84	1.49	14	12	0.0991	3	6	5	2	2
882	0 27000 65083	7	2.39	2.84	1.58	14	8	0.1214	3	9	4	3	4
883	3 430 7424	15	2.89	2.83	1.96	15	36	0.1286	3	9	7	4	6
884	0 70011 74335	7	0.89	2.82	1.72	12	24	0.1399	3	7	5	3	5
885	0 54000 9100	7	1.34	2.82	1.89	3	24	0.2119	2	5	4	3	4
886	0 71503 944	15	1.21	2.81	1.70	10	36	0.1235	3	6	5	3	4
887	0 37000 42125	7	1.21	2.81	1.69	11	12	0.1418	3	7	3	2	2
888	0 72973 10212	7	0.94	2.81	1.45	3	12	0.1632	3	4	5	3	2
889	0 41322 37781	7	1.49	2.80	1.69	4	12	0.1820	3	5	4	3	5
890	0 70011 84011	7	0.89	2.79	2.23	12	24	0.1834	3	8	7	5	8
891	0 71117 208	7	1.13	2.78	1.78	3	6	0.2025	3	5	4	3	5
892	0 26600 11126	7	0.68	2.78	1.62	6	24	0.1616	3	5	4	3	3
893	3 680 21054	30	2.34	2.77	1.73	20	12	0.1071	3	11	7	3	5
894	0 36200 1030	15	1.36	2.76	1.54	8	24	0.1190	3	9	5	3	4
895	0 36435 90722	30	2.52	2.76	1.60	7	12	0.1265	7	7	6	3	2
896	0 11152 28659	15	0.31	2.75	1.51	8	24	0.1171	3	6	5	2	2
897	0 28000 30360	7	3.12	2.74	1.24	18	12	0.0905	3	6	4	1	3
898	0 70011 84002	7	0.89	2.71	1.90	12	24	0.1608	3	9	6	4	3
899	0 89165 90530	15	2.79	2.71	1.81	15	12	0.1240	3	7	6	4	4
900	0 79400 45050	12	1.58	2.69	1.41	14	12	0.0991	3	7	5	2	3

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901	0 71503 860	15	0.63	2.67	1.67	10	18	0.1277	3	9	7	4	2
902	0 76660 816	15	1.87	2.67	1.83	16	24	0.1251	3	5	5	3	5
903	0 41800 22700	14	2.33	2.67	1.21	7	6	0.0989	3	8	3	2	3
904	0 73100 149	7	9.95	2.66	1.77	7	18	0.1778	7	6	5	3	6
905	0 22300 1	15	0.81	2.65	1.64	7	12	0.1350	7	7	5	3	3
906	0 46500 1900	14	1.19	2.65	1.61	14	12	0.1148	3	8	6	3	4
907	0 70074 80365	30	2.72	2.64	2.34	6	8	0.1982	3	13	10	6	4
908	0 41147 423	7	1.16	2.64	1.74	2	12	0.2197	3	5	4	3	7
909	0 14400 81200	30	4.35	2.62	1.71	7	6	0.1424	7	10	7	3	4
910	0 70560 91279	7	1.45	2.61	1.55	1	12	0.2100	3	4	4	3	4
911	0 41679 1013	7	0.88	2.61	1.62	2	12	0.2069	3	4	3	2	4
912	0 46000 9003	7	1.37	2.60	1.97	4	12	0.2285	3	4	4	3	6
913	0 73410 29062	7	1.13	2.60	1.63	2	12	0.2090	3	6	5	4	4
914	0 76100 56100	14	2.06	2.59	1.31	21	12	0.0855	7	8	5	1	4
915	0 11124 11016	30	2.50	2.59	1.32	21	12	0.0861	7	10	5	2	5
916	0 16500 4806	15	2.39	2.57	1.58	14	48	0.1162	3	9	7	5	3
917	0 11152 259	15	1.19	2.57	1.98	8	24	0.1643	3	8	6	3	4
918	0 72840 7	7	1.99	2.56	1.52	2	12	0.1979	3	4	3	3	4
919	0 59290 57437	30	1.24	2.55	1.75	7	12	0.1498	7	10	7	4	4
920	0 22400 9	15	1.14	2.54	1.70	21	12	0.1131	3	10	7	4	4
921	0 30000 1800	7	1.96	2.52	1.32	3	12	0.1656	3	4	3	2	2
922	0 52100 7084	7	0.56	2.50	1.98	5	6	0.2286	3	6	5	4	5
923	0 30000 5260	7	1.55	2.50	1.87	3	12	0.2365	3	6	5	4	6
924	0 52100 2140	7	1.23	2.49	1.32	5	12	0.1530	3	4	3	2	2
925	0 34500 54255	15	2.08	2.48	1.30	5	12	0.1203	3	6	4	2	2
926	0 41000 1486	15	0.73	2.45	1.78	13	12	0.1398	3	9	5	3	5
927	0 54100 790	15	0.69	2.45	1.37	7	12	0.1220	7	6	7	4	2
928	0 41322 16500	7	8.50	2.44	1.80	4	12	0.2224	3	6	5	4	6
929	0 74300 607	15	3.70	2.43	2.03	15	36	0.1551	3	11	8	6	6
930	0 41167 30015	30	2.63	2.41	1.64	14	12	0.1286	3	11	8	4	4

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931	0 24515 88211	7	4.13	2.40	1.56	2	12	0.2167	3	7	5	2	4
932	0 41000 365	15	0.81	2.40	1.32	13	12	0.1058	3	5	4	3	3
933	0 37000 42210	7	1.58	2.39	1.36	11	12	0.1341	3	6	4	3	4
934	0 74020 30100	7	6.47	2.36	1.28	2	4	0.1808	3	4	3	2	4
935	0 53100 886	15	1.89	2.33	1.33	14	24	0.1079	3	8	5	3	3
936	0 52100 110	7	0.97	2.32	1.72	5	6	0.2140	3	6	5	4	6
937	0 28000 8150	7	1.09	2.31	1.41	18	12	0.1221	3	8	5	3	3
938	0 31600 12011	7	1.10	2.29	1.57	14	12	0.1496	3	8	6	4	5
939	0 71503 964	15	2.30	2.29	1.59	10	24	0.1417	3	8	6	4	4
940	0 41000 238	15	1.33	2.28	1.19	13	12	0.1004	3	7	5	2	3
941	0 16000 46430	7	1.19	2.27	1.21	3	12	0.1686	3	4	7	4	3
942	0 41000 1430	15	0.74	2.27	1.67	13	12	0.1416	3	7	3	2	2
943	0 79400 70000	12	1.18	2.27	1.26	14	12	0.1049	3	9	5	2	5
944	3 850 90103	15	3.25	2.26	1.31	15	36	0.1076	3	7	5	3	2
945	0 71503 914	15	2.29	2.26	1.35	10	12	0.1219	3	9	4	3	3
946	0 52100 5710	7	0.73	2.26	1.36	5	12	0.1737	3	5	5	3	3
947	0 41345 31712	30	1.39	2.26	1.46	4	8	0.1523	3	8	6	3	5
948	0 52100 1790	7	1.20	2.25	1.20	5	12	0.1540	3	4	3	2	2
949	0 21200 254	15	0.60	2.24	1.37	12	12	0.1199	3	7	5	3	2
950	0 70734 5243	15	1.38	2.24	1.26	8	12	0.1199	3	8	5	3	3
951	0 16000 45660	7	1.29	2.23	1.44	3	12	0.2042	3	5	4	3	5
952	0 70011 60101	7	1.50	2.22	1.22	12	24	0.1261	3	4	4	3	2
953	0 34500 43157	7	2.19	2.22	1.35	2	12	0.2027	2	6	4	3	2
954	0 30000 1980	7	1.93	2.22	1.17	3	12	0.1667	3	4	3	2	4
955	0 52100 354	7	0.89	2.21	1.21	5	3	0.1581	3	5	4	3	2
956	0 77715 23210	7	1.86	2.21	1.45	2	12	0.2187	3	5	4	2	4
957	0 73410 29181	7	1.18	2.20	1.41	2	12	0.2136	3	5	4	3	4
958	0 41100 5413	15	2.23	2.19	1.17	14	36	0.1010	3	4	3	2	3
959	0 41147 863	7	1.16	2.19	1.14	2	12	0.1735	3	7	4	3	4
960	0 70120 14029	7	1.96	2.19	1.29	3	8	0.1863	3	4	5	2	4

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961	0 24000 1054	7	1.85	2.18	0.87	7	12	0.1067	4	5	3	1	3
962	0 52100 5300	7	0.92	2.18	1.43	5	12	0.1894	3	4	4	3	5
963	0 74182 26831	15	1.02	2.18	1.47	15	12	0.1252	7	9	6	4	1
964	0 15700 7277	7	1.32	2.15	1.33	14	12	0.1350	3	7	5	3	4
965	0 71503 563	15	1.09	2.14	1.27	10	12	0.1211	3	7	5	3	4
966	0 52100 5360	7	0.70	2.14	1.76	5	12	0.2374	3	7	6	3	6
967	0 70011 84295	7	0.89	2.14	1.46	12	24	0.1565	3	7	6	4	2
968	0 47400 24404	30	3.47	2.14	1.28	14	12	0.1130	3	10	6	4	4
969	0 52100 5220	7	0.75	2.12	1.10	5	12	0.1498	3	4	3	2	2
970	0 35742 24301	7	1.19	2.11	0.89	2	12	0.1406	3	9	6	2	2
971	0 77715 11810	7	1.44	2.11	1.22	2	12	0.1927	3	3	3	2	4
972	0 14400 61000	30	4.20	2.11	1.21	7	1	0.1251	7	4	2	1	4
973	0 34500 46571	7	5.33	2.10	1.21	2	8	0.1921	2	9	3	2	3
974	3 850 30702	15	2.99	2.10	1.40	15	36	0.1238	3	4	6	4	4
975	0 25400 8253	7	1.65	2.09	1.25	2	12	0.1994	3	4	3	3	4
976	0 78300 8058	15	2.08	2.08	1.53	20	12	0.1262	3	6	5	4	3
977	0 16000 46080	7	0.97	2.08	1.59	3	12	0.2417	3	9	7	5	8
978	0 70011 73802	7	1.78	2.08	1.76	12	24	0.1941	3	11	8	4	5
979	0 71079 5220	14	1.12	2.07	1.42	4	12	0.1617	3	7	5	4	4
980	0 48001 70203	7	0.95	2.06	1.37	2	12	0.2217	3	5	4	3	4
981	0 77715 20110	7	1.05	2.06	1.32	2	12	0.2136	3	5	4	3	4
982	0 30400 75390	7	7.30	2.05	1.70	3	4	0.2622	3	6	5	4	6
983	0 42700 12101	15	0.63	2.04	1.37	15	36	0.1247	7	9	6	4	3
984	0 70011 78610	7	0.89	2.03	1.38	12	24	0.1560	3	8	5	2	3
985	0 16500 8509	15	3.55	2.03	1.21	14	12	0.1126	3	7	5	4	4
986	0 16500 7735	15	4.87	2.03	1.06	14	12	0.0987	3	7	5	3	3
987	0 52100 6070	7	0.71	2.00	1.07	5	6	0.1544	3	4	8	5	3
988	0 70074 60237	30	3.15	2.00	1.41	6	6	0.1576	3	9	3	2	4
989	0 71610 51043	15	4.48	2.00	1.55	15	30	0.1439	3	11	3	2	8
990	0 41000 459	15	0.73	2.00	1.02	13	12	0.0982	3	4	4	2	6

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
991	0 52100 6270	7	0.69	2.00	2.16	5	6	0.3118	3	7	7	4	2
992	0 52100 7850	7	0.78	2.00	1.07	5	12	0.1544	3	10	8	6	2
993	3 5211 98700	30	2.39	1.97	1.03	7	12	0.1141	7	11	3	2	4
994	0 40500 2355	15	3.63	1.97	1.48	23	12	0.1235	3	8	5	2	4
995	0 43000 3	7	2.57	1.97	0.91	10	12	0.1120	7	5	8	5	2
996	0 71503 983	15	2.65	1.95	1.15	10	24	0.1204	3	7	5	3	2
997	0 70540 1	7	0.74	1.94	1.32	2	12	0.2268	3	5	4	3	5
998	0 73510 192	7	0.97	1.93	1.05	2	18	0.1813	3	4	3	2	4
999	0 56762 14124	7	3.34	1.92	1.32	2	12	0.2292	3	5	4	3	5
1000	0 50000 12102	7	1.36	1.91	1.11	4	12	0.1752	3	5	4	3	4
1001	0 43646 20128	7	1.34	1.90	1.01	2	12	0.1772	3	4	3	2	4
1002	0 71503 920	15	1.49	1.89	1.04	10	12	0.1123	3	7	5	2	2
1003	0 21500 64	15	0.84	1.88	1.20	15	12	0.1185	3	7	6	5	3
1004	0 71737 40300	7	9.90	1.88	1.69	3	12	0.2843	3	9	6	3	6
1005	0 70235 11150	7	4.47	1.87	1.01	3	1	0.1708	3	4	3	2	3
1006	0 21500 4050	15	2.23	1.87	0.69	15	12	0.0685	3	5	3	0	2
1007	0 52100 4840	7	0.58	1.86	1.09	3	6	0.1853	3	4	4	3	5
1008	0 52100 284	7	0.94	1.86	1.08	5	3	0.1676	3	5	4	3	2
1009	0 52100 6140	7	0.96	1.86	1.13	5	6	0.1754	3	5	4	3	4
1010	0 52100 7132	7	0.98	1.85	1.10	5	12	0.1716	3	5	4	3	2
1011	0 41679 1705	7	0.87	1.84	0.94	2	12	0.1703	3	4	4	2	2
1012	0 43000 17	7	2.41	1.84	0.90	10	12	0.1186	7	5	3	2	2
1013	3 722 90003	14	2.29	1.83	1.28	14	12	0.1322	3	8	7	4	3
1014	0 28000 23200	7	0.89	1.83	1.15	18	24	0.1257	3	6	4	2	2
1015	0 41800 21	14	1.27	1.83	0.95	7	12	0.1133	3	9	6	3	6
1016	3 5210 6300	15	2.54	1.82	1.17	12	24	0.1261	3	8	6	3	3
1017	0 71503 975	15	1.66	1.81	0.92	10	24	0.1038	3	6	4	2	2
1018	0 86144 21256	30	0.89	1.80	1.79	7	12	0.2170	7	5	3	2	2
1019	0 21634 40101	15	1.88	1.80	0.82	7	12	0.0994	7	15	11	8	7
1020	0 52100 1600	7	1.04	1.80	0.99	5	12	0.1588	3	5	4	2	2

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
1021	0 43000 10100	7	2.80	1.79	1.03	10	12	0.1396	7	11	4	2	2
1022	0 11127 65	21	1.92	1.79	1.09	21	12	0.1029	3	6	7	2	3
1023	0 51000 3915	15	0.71	1.79	0.83	9	12	0.0967	3	6	4	2	2
1024	0 40000 26621	7	1.40	1.79	0.96	15	12	0.1143	3	6	4	3	5
1025	0 31700 91008	7	5.00	1.77	1.15	3	1	0.2055	3	7	4	2	4
1026	0 30000 9520	7	10.39	1.77	1.00	3	2	0.1787	3	5	4	3	5
1027	0 71610 75714	15	8.99	1.77	0.86	15	12	0.0902	3	4	3	2	3
1028	0 44300 74159	7	2.93	1.76	1.02	7	12	0.1549	3	5	4	3	3
1029	0 74601 1087	7	8.99	1.75	0.87	2	1	0.1657	3	4	3	2	2
1030	0 52100 345	7	1.05	1.74	1.19	5	3	0.1974	3	6	5	3	5
1031	0 37000 65891	7	29.11	1.73	0.91	11	2	0.1240	3	6	4	2	2
1032	0 44900 5720	14	2.03	1.72	1.23	7	12	0.1561	3	8	6	4	4
1033	0 78017 111	7	1.76	1.71	1.36	7	24	0.2126	7	7	6	4	2
1034	0 50000 12932	7	1.48	1.71	0.86	4	12	0.1516	3	6	3	3	2
1035	0 71503 904	15	3.34	1.71	0.90	10	12	0.1074	3	4	4	3	2
1036	0 12044 32110	14	1.75	1.71	0.94	21	24	0.0929	7	8	5	2	4
1037	0 71503 949	15	1.03	1.71	0.99	10	24	0.1182	3	7	5	3	7
1038	0 35106 707	15	9.27	1.71	0.98	3	12	0.1390	7	4	4	2	4
1039	0 70278 10	7	1.17	1.71	1.08	1	12	0.2233	3	7	3	2	3
1040	0 52100 5590	7	1.15	1.70	1.10	5	12	0.1868	3	5	4	3	5
1041	0 52594 9	7	2.49	1.69	1.07	4	8	0.1909	3	6	5	3	5
1042	0 52800 48803	14	3.92	1.69	0.79	14	12	0.0883	3	5	4	2	3
1043	0 22700 62448	15	4.03	1.69	0.97	17	12	0.1031	3	8	4	3	3
1044	0 22600 94750	15	1.69	1.68	0.94	13	108	0.1077	3	7	5	3	3
1045	0 52100 373	7	0.80	1.66	0.94	5	3	0.1635	3	5	4	2	2
1046	0 71117 251	7	0.67	1.63	0.66	2	12	0.1350	3	3	5	4	2
1047	0 52100 7067	7	0.56	1.63	1.31	5	6	0.2320	3	7	2	1	6
1048	0 70106 56208	7	1.09	1.61	0.69	2	12	0.1429	3	3	2	1	2
1049	0 17003 10075	7	1.85	1.60	1.00	2	12	0.2083	3	4	4	3	4
1050	0 47600 1008	7	1.99	1.59	0.70	5	12	0.1271	3	4	3	2	1

Num	UPC CODE	Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
1051	0 39000 4512	7	0.99	1.59	0.87	4	24	0.1650	3	7	3	2	1
1052	0 21634 80101	15	1.72	1.59	0.71	7	12	0.0974	7	6	5	3	3
1053	0 52100 330	7	0.99	1.59	0.78	5	3	0.1416	3	3	3	2	4
1054	0 52100 4607	7	0.24	1.59	0.63	3	12	0.1253	3	8	3	2	2
1055	0 37000 70635	7	1.39	1.59	0.91	11	12	0.1349	3	4	2	1	2
1056	0 46500 2612	14	2.22	1.59	0.87	14	12	0.1034	3	5	4	3	2
1057	0 71610 50015	15	8.02	1.59	0.91	15	12	0.1063	3	4	5	2	3
1058	0 18400 119	15	5.99	1.57	0.59	13	8	0.0723	3	5	3	1	3
1059	0 76452 40040	7	5.89	1.56	0.73	3	1	0.1480	3	9	3	2	4
1060	3 54 23419	15	4.24	1.56	0.96	21	12	0.1040	3	4	6	3	2
1061	0 52100 580	7	2.09	1.55	0.78	5	12	0.1453	3	4	3	2	2
1062	0 52100 4760	7	0.45	1.54	0.97	3	6	0.1992	3	5	4	3	4
1063	3 10119 4202	15	4.08	1.52	0.91	20	24	0.1027	3	7	5	3	3
1064	0 37000 69702	7	4.49	1.52	0.98	11	6	0.1520	3	9	6	3	4
1065	0 47600 2317	7	0.93	1.51	0.66	5	12	0.1262	3	4	3	2	1
1066	0 73510 249	7	1.05	1.50	0.71	2	18	0.1578	3	8	3	2	4
1067	3 2340 10100	30	2.81	1.50	0.97	7	12	0.1411	7	6	7	3	4
1068	0 37000 64651	7	9.16	1.50	0.83	11	4	0.1304	3	10	4	3	2
1069	0 12044 37010	14	2.18	1.50	0.76	21	12	0.0856	7	3	5	2	4
1070	0 70860 1370	7	1.26	1.48	1.29	3	12	0.2756	3	6	5	4	6
1071	0 47600 2333	7	1.14	1.46	0.59	5	12	0.1167	3	3	2	1	1
1072	0 80863 2013	5	1.20	1.45	0.60	2	12	0.1379	2	3	2	1	2
1073	0 30900 91123	7	3.69	1.44	0.58	3	6	0.1274	2	5	4	2	5
1074	0 47600 16054	7	1.70	1.44	0.87	5	12	0.1744	3	3	2	1	2
1075	0 70011 84139	7	0.89	1.44	0.78	12	24	0.1243	3	6	4	3	2
1076	0 71610 75776	15	8.43	1.43	0.51	15	12	0.0662	3	5	3	0	3
1077	0 52100 44	7	0.46	1.40	0.55	3	6	0.1242	3	3	2	1	1
1078	0 36000 19760	7	12.35	1.38	0.51	7	3	0.0988	3	4	2	1	1
1079	3 318 67718	15	3.94	1.37	0.56	14	12	0.0772	3	6	3	1	3
1080	3 10119 706	15	1.93	1.35	0.61	20	24	0.0775	3	7	4	1	2

Num	UPC CODE		Rev Per	Price	Mean Dmd	Standard Dev	Lead Time	Case Pack	CV	Baseline Saf Days	TSL Saf Days	STSL Saf Days	Mod STSL Saf Days	Bytronic Saf Days
1081	0	53964 1411	7	2.79	1.35	0.59	3	12	0.1382	3	3	3	2	3
1082	0	47997 12335	7	2.00	1.31	0.48	2	24	0.1221	3	3	2	1	1
1083	0	21634 10101	15	1.53	1.30	0.57	7	12	0.0957	7	5	3	1	2
1084	0	47600 2122	7	0.91	1.29	0.61	5	12	0.1365	3	4	3	2	2
1085	0	41322 37612	7	2.33	1.27	0.60	4	12	0.1424	3	4	3	2	2
1086	0	52100 7096	7	0.88	1.26	0.56	5	6	0.1283	3	4	3	2	2
1087	3	55 51619	15	3.89	1.25	0.46	21	12	0.0622	3	6	3	0	4
1088	0	76660 986	15	4.05	1.22	0.44	14	12	0.0682	7	5	3	0	3
1089	0	52100 4640	7	0.45	1.18	0.40	3	6	0.1072	3	3	2	1	1
1090	0	52100 15646	7	0.40	1.17	0.38	3	6	0.1027	3	3	2	1	2
1091	0	71503 826	15	0.82	1.17	0.49	10	36	0.0855	3	5	3	1	1
1092	3	450 19404	14	3.09	1.15	0.38	7	24	0.0721	3	4	2	0	2
1093	3	430 53608	15	5.52	1.15	0.37	15	12	0.0597	3	5	2	0	3
1094	0	25900 20170	15	4.32	1.14	0.36	15	1	0.0586	7	5	2	0	3
1095	0	52100 15651	7	0.40	1.13	0.34	3	6	0.0951	3	2	2	1	1
1096	0	52100 298	7	1.32	1.11	0.32	5	3	0.0832	3	3	2	1	1
1097	3	7667 38222	15	2.77	1.11	0.33	14	12	0.0562	3	4	2	0	3
1098	0	74472 59400	7	1.88	1.11	0.32	2	12	0.0961	3	2	1	1	1
1099	3	312 23022	15	6.61	1.10	0.30	14	12	0.0515	3	4	2	0	3
1100	0	77715 3005	7	5.08	1.08	0.28	2	12	0.0864	3	2	1	0	

Bibliography

"Air Force Commissary Service," Air Force Magazine, 71: 152-153 (May 1988).

Armstrong, David J. "Sharpening Inventory Management," Harvard Business Review, 63: 42-58 (November-December 1985).

Aucamp, Donald C. "An Evaluation of Safety Stock," Production & Inventory Management, 27: 126-132 (Second Quarter 1986).

Berger, Christoph, Chief, Systems and Procedures Division, Directorate of Operations. Telephone Interview. HQ Air Force Commissary Service, Kelly AFB TX, 14 August 1990.

Bytronics Technologies Corporation. Final Report on Analysis of the Automated Commissary Operations System, Report to Headquarters Air Force Commissary Service. Lancaster OH, 16 February 1987.

Emmelhainz, Larry W. et al. "Retail Product Stockouts: Now What?" Council of Logistics Management Annual Conference Proceedings. 77-85. St. Louis MO:CLM, October 1989.

Johnson, Donald E., Commissary Store Manager. Personal Interviews. Wright-Patterson AFB OH, 19 January through 31 January 1990.

Kleaver, Otis, Commissary Assistant Store Manager. Personal Interview. Wright-Patterson AFB OH, 13 April 1990.

McClave, James T. and P. G. Benson. Statistics for Business and Economics. San Francisco: Dellen Publishing Company, 1988.

Millar, J.L. "Inventory Control in the Supermarket Industry," The Accountant's Magazine: 109-112 (March 1980).

Neter, John and Wasserman, W. Applied Linear Statistical Models. Homewood IL: Richard D. Irwin, Inc., 1974.

Sargent, Robert G. "An Overview of Verification and Validation of Simulation Models," Proceedings of the 1987 Winter Simulation Conference. 33-39. 1987.

Solheim, Major Mark, Commissary Officer. Personal Interviews. Wright-Patterson AFB OH, 19 January through 13 April 1990.

Stark, Captain Michael B., A Comparison of the Performance of Three Inventory Control Strategies in the Commissary Store Environment. MS thesis, AFIT/GOR/ENS/87D-20. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, December 1987 (AD-A189461).

---, Analyst. Personal interview. HQ AFCOMS, Kelley AFB TX, 15-16 February 1990.

Stock, James R., and D.M. Lambert. Strategic Logistics Management (Second Edition). Homewood IL: Richard D. Irwin, Inc., 1987.

Tersine, Richard J. Materials Management and Inventory Systems. New York: American Elsevier Publishing Company, 1976.

Zinn, Walter, and H. Marmorstein. "Comparing Two Alternative Methods of Determining Safety Stock Levels: The Demand and the Forecast Systems," Journal of Business Logistics, 11: 95-110 (Summer 1990).

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13. ABSTRACT (Maximum 200 words)

> This study examined alternative methods of computing safety stock in the commissary operating environment. Safety stock calculation methods designed to deliver a predetermined level of customer service were the primary area of concentration. AFCOMS provided the data for this research, which was from the Randolph AFB commissary store. Current safety stock levels constituted the baseline for this study. Another method, recommended by Bytronic Technologies Corporation, was also tested. A regression model was built to relate customer service level (Not-In-Stock Rate (NIS)) to measures of buffer stock and demand variability. A SLAM II simulation model of a commissary store inventory system was used to test the performance of each technique. It was determined that none of the methods was clearly superior to the others. Baseline safety stock levels are set too low to attain AFCOMS' goal of a two percent NIS rate. The targeted service level methods over-allocated safety stock to all but the high demand items. NIS rates of other than high demand items were consistently below the target level. The Bytronic method performed well with high variability items, but was ineffective with other items.

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