CLAYTON, RICHARD E. The use of Consumer Preference Data in Forecasting Sales. (1968) Directed by Dr. Mathilde Hardaway. pp. 70

The problem of this study is to find a more reliable method of forecasting sales than the system presently being used by the Lady Wrangler Division of Blue Bell, Incorporated.

Sales forecasting is perhaps the most difficult problem in the apparel industry today. To a large degree, the success of a business depends upon the skill of management in accurately predicting sales.

This study investigates the use of consumer preference data in forecasting sales. Three sets of data were collected and compared statistically. In addition to the consumer preference data collected from 292 female consumers, a forecast made by Blue Bell management using conventional forecasting methods was used. The final Spring 1968 sales for the styles being forecast constitute the third set of data. Each of these sets of data were reduced to an index of 100 for this study in order to mask the actual sales figures and place all three variables on a common base.

For this study, the line is divided into four construction groups: (1) shorts, (2), slacks, (3), skirts, (4) blouses.

The two forecasts were compared with final sales and coefficeints of correlation were calculated.

In three out of the four construction groups, the conventional estimate correlated more closely with final sales than did the consumer forecast. The correlation between the two estimates was relatively low, except for the shorts group. This is a good indication that different

factors were used in making the two estimates.

The hypothesis is that a combination of these two estimates will result in a more accurate sales forecast than either of the two forecasts taken separately. The multiple correlation technique was used to test this hypothesis. Regression coefficients were calculated for both the conventional sales estimate and the consumer preference estimate. Using these regression coefficients along with a constant term, a regression equation was formulated. This equation measures the joint effect of both the conventional and the consumer estimate on final sales.

All four construction groups had rather low coefficients of determination ranging from .194 for blouses to .523 for shorts. This indicates that the unexplained variance for these four groups ranges from 80.6% to 47.7%, respectively.

The coefficient of multiple correlation was reasonably good for shorts (.724) and slacks (.704) but was poorer for skirts (.552) and blouses (.442). In all four construction groups, the coefficient of multiple correlation was higher than the correlation for either of the two estimates.

This calls for an acceptance of the hypothesis which states: The use of a consumer preference estimate combined with conventional methods of forecasting sales will result in more accurate sales forecasting.

The results of the statistical calculations revealed that more and better components are needed both in the conventional estimate and in the consumer estimate. The lower correlation between the consumer estimate and final sales indicates that particular attention is needed in improving the consumer estimate.

THE USE OF CONSUMER PREFERENCE DATA IN FORECASTING SALES

by

Richard E. Clayton

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Approved by

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APPROVAL SHEET

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CHAPTER I

INTRODUCTION

The forecasting of sales is one of the most difficult problems in industry today. In fact, the success of a business depends to a large extent upon the skill of management in accurately predicting the level of sales. The problem of forecasting sales in the clothing industry takes on an extra dimension of difficulty because a sales estimate must be made on each style being offered for sale long before a sales trend has been established.

Statement of the Problem

The problem of this study is to find a more reliable method of forecasting sales. This study is made with particular reference to Blue Bell, Incorporated, Greensboro, North Carolina.

Importance of the Study

The general feeling in industry today seems to be not whether to forecast, but how to forecast more accurately and economically. Forecasting methods range from simple attempts at keeping well informed to complex systems of analysis and projection. The tools are facts, rumors, conjectures, statistical techniques, and, above all else, intuitive judgment.

Fact and judgment are the two essential ingredients of any forecast, whatever its nature; and all modern-day techniques are designed either to limit the area in which judgment must be exercised, or to improve the quality of judgment by reinforcing it with facts.

Despite all the progress that has been made toward the improvement of the methods and tools of management, including electronic computers, no one has yet found a substitute for sound judgment. No formula has been found that produces consistently accurate sales forecasts.

Production Planning

The importance of the sales forecast as an instrument of management lies in the many uses to which it can be put. One of the most important uses is in the planning and control of production. Production departments have found that a reasonably reliable forecast of sales enables them to stabilize employment and to schedule work to achieve the optimum use of plant and equipment. This is of particular importance in garment manufacturing since there are wide seasonal variations in sales. Here, the process of reducing and increasing the labor force as demand warrants is a costly one. From the point of view of management, this results in decreased efficiency and insecurity on the part of the workers, and necessitates the over development of facilities to meet peak seasonal demands. When this occurs repeatedly, it can result in low morale among the workers and many of them will seek employment elsewhere.

Inventory Control

The sales forecast also helps to control finished product inven-

tory. Many companies that have manufactured for inventory as demand warrants have found that inventory has usually been at its lowest point when demand was at the peak and at its highest point when demand was slack. These companies have often been unable to fill all orders at the peak of demand and have thus lost potential income. At the same time, carrying charges on inventory during slack periods have been excessive. When a real slump has followed a period of heavy demand, it has often left the company with an inflated inventory of finished goods upon which the company has suffered severe losses in price decline, obsolescence, and carrying charges.

The sales forecast can help to even out production throughout cyclical swings as well as in seasonal fluctuations. While inventory would be kept high enough in good times to provide adequate customer service, production would be regulated so as to allow inventory to be at an operating minimum when the slump occurs. From this low point, inventory would gradually be rebuilt in anticipation of the change in the cycle. The system helps to retain valuable trained workers.

Sales Management

The forecast has many uses in the hands of sales management. First, by indicating the probable size of the market for the period ahead, the forecast establishes a target for the sales force. It is common practice to break the forecast down into quotas for products, for geographical territories, and often for individual salesmen. If these quotas are sound and realistic, they inspire salesmen and sales managers to meet them. This is in contrast to the "10% more than last

year" method, which does not take into account possible performance and often discourages salesmen because they see no hope of achievement.

Often the sales quotas based upon the forecast are the foundation of a sales compensation plan. By disregarding the past performance of the salesmen and measuring the true potential of each area, salesmen are given an equitable base upon which to compete for recognition and larger incomes. Potentials, of course, must be adjusted to account for factors beyond the control of salesmen, which may greatly affect their performance.

Some types of sales forecasts serve to indicate whether or not sales territories are properly established. They help to identify territories that are too large to be adequately served by the number of salesmen assigned to them as well as territories that are too sparse to furnish the salesmen sufficient volume to insure a fair return.

Another important use attributed to the sales forecast is in directing sales effort. Forecasts reveal those areas in which the company is doing the best job in relation to competition and also indicate where poor showings are being made. With these facts in hand, sales executives find it possible to intensify effort where necessary.

Advertising

Blue Bell uses sales estimates to determine the size and character of the advertising appropriation. Some companies try to maintain their advertising budgets at a certain percentage of sales of various products.

Financial Management

Finance departments use the sales forecast for estimating cash requirements and for planning long-term and short-term financing. The development of standard costs and the preparation of operating budgets also depend upon assumed levels of production and sales. The finance departments cannot function properly without sales forecasts.

Pricing

Prices are largely dependent upon costs. Costs are influenced by volume. And volume, in turn, is affected by price. If a company wishes to use firm selling prices and at the same time assure itself of a fair margin of profit, it must have some idea of its probable sales volume. Its prices will be based upon the finance department's standard costs, which will have been established upon the basis of an assumed volume of production. The latter assumption, if prices are to be carefully set, must be made on the basis of the sales outlook.

In some lines, moderate price variations have no appreciable effect on volume. Similarly, in some types of manufacturing, moderate changes in the production level have little effect on costs. But, in the case of Blue Bell, volume is very sensitive to price changes, and costs are greatly influenced by volume. In such cases, a sound sales forecast helps in the development of prices that will keep volume high and bring a fair profit.

Plant Facilities

Plant expansion decisions, which usually involve consideration

by production, finance, sales, traffic, personnel, engineering, and other departments, are often quite dependent upon estimates of sales. Before a decision is reached to expand facilities or to replace old facilities with more modern equipment, some knowledge of the future course of the business is essential. Some companies make five-year to ten-year forecasts of sales for making sound expansion decisions.

Purchasing

The purchasing department has found several important uses for sales forecasts. With a foreknowledge of sales and therefore of probable production, the purchasing department is in a better position to maintain adequate stocks of raw materials and supplies to insure uninterrupted production. At the same time, the purchasing department can minimize overstocking with its resultant danger of loss due to declining prices and deterioration or obsolescence. Proper control, made possible by estimates of future demand, keeps warehousing and carrying costs at a minimum.

These applications are of particular importance when raw materials and supply markets are unstable. A long-range forecast of requirements makes it possible for the purchasing department to plan purchases far enough ahead to take advantage of favorable prices with less danger of running short or of overstocking.

In turn, the purchasing department can help the forecaster by keeping him informed of changes in the price and supply situation of major commodities which might affect the company's customer.

Research

Special forecasts of the potential market for new products are of great value in regulating the efforts of corporation and industry research. Before products are subjected to the costly processes of discovery, development, and marketing, estimates of probable sales assist management in deciding what products are most likely to be profitable. This method results in a more efficient operation of the industrial research laboratory.

There are many other uses for sales forecasts. They are used as a guide for top management policy and as a basis for reconciling the view of the sales and production departments on the types and quantities of products to be produced. They are also an aid in estimating earnings and profits and in maintaining a skilled labor force. Their use in setting sales quotas, planning finances, and regulating advertising efforts is widely appreciated.

Purpose of the Study

The purpose of this study is to make comparisons of three different methods of forecasting the actual sales by style of the Lady Wrangler Spring 1968 ladies' sportswear line. For these comparisons, the sportswear line was divided into four construction groups which include shorts, slacks, skirts, and blouses.

The first of these three forecasting methods involves the use of a conventional forecasting method.

The second method of forecasting sales involves the use of an estimate derived from a consumer preference survey.

The third method of forecasting sales is a combination of the conventional sales estimate and the consumer preference estimate.

These two sets of data will be compared individually with the actual final sales on each style. A coefficient of correlation will be calculated for the conventional estimate versus final sales and also for the consumer preference estimate versus final sales. Then, regression coefficients will be calculated for both the conventional sales estimate and the consumer preference estimate. Using these regression coefficients along with a constant term, a regression equation will be formulated which is a combination of the conventional estimate and the consumer preference estimate for a specific style and may be used to predict the actual sales of the style.

This study will show a comparison of the combination forecast with the first two methods and will show which one of the three forecasts more closely predicts the actual sales.

Definition of Terms

1. Sales forecast: A calculation or prediction of the eventual sales of an individual item or group of items as a result of rational study and analysis of available pertinent data.
2. Conventional method: The means of forecasting sales which is presently being done by Blue Bell management.
3. Line: A group of clothing items made up of many different styles, such as blouses, slacks, skirts and jamaica shorts, usually in the same general class of articles.

4. Style: Refers in this study to each individual item of clothing.

5. Consumer preference estimate: A forecast made of the sale of styles in a line made by the use of a consumer preference vote.

6. Confidence level: The interval within which sales can be expected to vary on the basis of a given chance or probability.

7. Correlation: The mathematical relationship between sales and the independent variables used to predict sales.

8. Coefficient of correlation: A measure of the degree of relationship between sales and sales predicting variables. (A coefficient of 1 denotes perfect correlation, and 0 represents the complete absence of any relationship between the variables.)

9. Coefficient of multiple correlation: A measure of the degree of relationship between the combination of the two sales forecasts and final sales.

10. Multiple regression equation: An equation which describes the average relationship between two different sales forecasts and final sales.

11. Coefficient of multiple determination: The proportion of the variance in the dependent variable (sales) explained by the other factors (the two forecasts).

Hypothesis

The use of a consumer preference "vote" combined with conventional methods of forecasting sales will result in a more accurate sales forecast.

Justification for the Study

In the manufacturing of clothing, as well as many other consumer products, the most serious loss in profits comes from inaccurate sales forecasts. The need is great to find better methods of performing this task so that profits may be improved.

Sinclair stated that:

> Forecasting is a rudimentary and essential element of business. Whether based on study, judgment, or hunch, an appraisal of future prospects is inherent in financial planning, appropriating capital, timing purchases, setting production and inventory levels, directing sales, and many other phases of business activity. In fact, the success of a business depends, in large measure, upon the skill of management in foreseeing and preparing for future conditions.[1]

The significance of this study is that it presents a technique whereby the quality of judgment used by the forecaster may be reinforced by the use of consumer preference data on the styles being forecast.

The findings of this study may be of value not only to Blue Bell, Incorporated, but also to many other kinds of businesses that find it necessary to forecast sales.

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[1]National Industrial Conference Board, Report of the Marketing Committee, Forecasting Sales (New York: National Industrial Conference Board, 1964), p.3.

CHAPTER II

REVIEW OF RELATED LITERATURE

After searching in the Walter Clinton Jackson Library, located on The University of North Carolina at Greensboro campus and in the Greensboro City Library for previous research conducted in the field of consumer preference as it relates to forecasting sales, very little research was evident.

With the assistance of the research librarian at the Walter Clinton Jackson Library, the following sources were utilized:

1. Index of Economic Journals
2. Journal of Marketing
3. American Journal of Economics and Sociology
4. Monthly Catalog of U. S. Government Publications
5. Business Periodicals Index
6. Record of Research at The University of North Carolina at Chapel Hill
7. Dissertation Abstracts
8. Business Education Index
9. Journal of Business Education
10. Encyclopedia of Educational Research
11. Harvard Business Review

In addition, letters were written to two experts in the field of sales forecasting and to two of the outstanding companies that have a

reputation for using advanced forecasting techniques. These were:

1. Mr. J. W. Summerour
   Summerour and Associates, Inc.
   Marketing Consultants
   Atlanta, Georgia

2. Mr. Robert Heiland
   Research Director
   Kurt Salmon Associates
   Coopersburg, Pennsylvania

3. Marketing Director
   Corning Glass Center
   Corning, New York

4. E. I. DuPont Company
   Director of Market Research
   Textile Fibers Division
   Wilmington, Delaware

The responses from these four companies were varied. Mr. J. W. Summerour writes that because of a heavy travel schedule, he is unable to help. Mr. Robert Heiland sent a most helpful booklet entitled, Forecasting Apparel Sales. No answer was received from the marketing director of Corning Glass Center. Normally, this type of information is considered confidential, which partially explains the response which was experienced.

The E. I. DuPont Company responded with a copy of an article which appeared in The Daily News Record in New York on November 16, 1967. This article quoted Mr. Daniel M. Thornton as follows:

> Testing consumer acceptance of styles before going into production would enable manufacturers to eliminate losers before presenting a line to retailers.
>
> DuPont has done some consumer preference testing of men's sweaters, suits, sport coats, casual slacks, walking shorts, women's double knit dresses, sweaters, blouses and swimsuits.[1]

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[1] "Pre-Testing Fashion Held Means to Cut Down 'Losers'," Daily News Record New York, November 16, 1967, p. 4.

DuPont will not release any additional details concerning this data and how it was being used.

Information was obtained concerning the forecasting techniques of several companies. None of these companies use consumer preference data as a tool in forecasting sales. Descriptions of their methods are included in this chapter.

Analysis of Previous Research

Many companies have been involved with questioning consumers about their preferences, but in only one instance that was located was there an attempt to use this consumer preference data to forecast sales.

Quenon recognizes that:

> One of the fundamental problems in retail merchandising is that of determining and predicting consumer demand. It would be definitely advantageous to have a method available whereby the sales of merchandise items could be pre-evaluated at the time the selection of the items for the offering is made.[2]

Mr. Quenon then presents for consideration a method of pre-evaluation designed by a National Consumer-Retailer Council Committee composed of consumer experts in the clothing and textile fields and of representatives of the Infants', Children's and Teens' Wear Buyers Association. He proposes that:

> Studies be made of actual goods owned by the consuming public and that within homogenous groups such as children's boxer shorts, age sizes 3 to 6X, which is the example chosen for illustration, the most desirable and the least desirable characteristics be ascertained by an interviewing process. The garment liked best and the garment liked least would then be submitted to expert examination and objectively considered utilizing laboratory tests

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[2] E. L. Quenon, "A Method of Pre-Evaluating Merchandise Offerings," Journal of Marketing, XVI, (Number 2, October, 1951), p. 159.

> so that the construction of each can be analyzed in great detail and the major likes and dislikes of the buying public be synthesized and numerically evaluated.
>
> Once the class characteristics are synthesized and numerically evaluated, a numerical weight can be attached to each garment to indicate its consumer acceptance on the basis of quality. Variations in the offering price of a garment of a given quality rating are considered to have corresponding determinable variations in the resulting sales. It is assumed that customers are able to distinguish between a large number of given price-quality variations so that a constant sales volume can be achieved by a large number of variations in a given price-quality offering.
>
> If this is so, then, given a set quality rating, one can vary the price and determine sales volume of each combination. One can, therefore, not only forecast sales volume at a given quality rating offered at a given price, but can also price at the maximum profit selling price since the volume and total gross profit can be calculated at each price level. The problems of correct pricing and correct sales forecasting are made simpler through the application of this method.[3]

It is not known whether or not Mr. Quenon has tested this theory. He merely sets forth a method which might possibly be of value in forecasting sales.

Types of Forecasting Systems Now Being Used

There is no forecasting system now known which gives uniformly accurate results with infallible precision. One of the most favored means of obtaining sounder forecasts is the concurrent use of several different methods.

The problems of forecasting and the degree of accuracy attainable vary from product to product, from company to company, and from industry to industry. For example, the higher the unit value of a product, the greater the chance of a wide margin of error. The accuracy of the forecast

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[3] Ibid., p. 170.

for large machinery can depend on the capture or loss of a single order; whereas, for a clothing item, many orders would have to be won or lost if sales totals were to be similarly affected.

There are many different types of sales forecasting systems now being used. The most common techniques in current use are: Jury of executive opinion, sales force composite, users' expectations, and time-series analysis.

Jury of Executive Opinion Method

This is one of the oldest and simplest methods of forecasting sales. It involves a process of combining and averaging the views of top executives. This is done to obtain a sounder forecast of sales than could be made by a single estimator.

When operating under this system, a company generally brings together executives from the sales, production, finance, merchandising, and administration divisions so as to achieve a broad coverage of experience and opinion.

In some companies the executives who compose the jury are periodically requested to submit their estimates of future sales. These may then be reviewed by the president, who makes a final estimate on the basis of the opinions expressed, or they may be averaged to arrive at a representative forecast.

The advantages of this method are four: (1) can provide forecasts easily and quickly, (2) may not require the preparation of elaborate statistics, (3) brings a variety of specialized viewpoints together for a pooling of experience and judgment, (4) may be the only feasible means of forecasting, especially in the absence of adequate data.

Among the disadvantages of the jury of executive opinion method, the following five are the most prominent: (1) it is inferior to a more factual basis of forecasting since it is based so heavily on opinion, (2) requires costly executive time, (3) is not necessarily more accurate because opinion is averaged, (4) disperses responsibility for accurate forecasting, (5) presents difficulties in making breakdowns by products, time intervals, or markets for operating purposes.

Companies using this method include Cooper-Bessemer Corporation and Lockheed Aircraft Corporation.[4]

Sales Force Composite Method

The sales force composite method of forecasting is a process of obtaining the views of the salesmen, sales management, or both, as to the future sales outlook.

The process starts with the collection of each salesman's estimates of probable future sales in his territory. Sometimes these estimates are made privately by the salesman, who uses forms provided for the purpose. In other situations the estimates are made by the salesman with the help of his regional manager.

A more accurate forecast can be obtained if the salesman or sales manager is provided with a history of the past sales. This gives them a base figure to which they can add or from which they can subtract, and has the effect of limiting their judgment to the determination of the change from past performance.

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[4]National Industrial Conference Board, Report of the Business Policy Committee, Forecasting Sales (New York: 1964), pp. 12-19.

As the forecast progresses through the sales force from the salesman to the top sales management group, it is generally subjected to careful scrutiny. The regional managers not only examine the estimates of each salesman but compare the total for their districts against past performance and against their own estimates of future demand. Similarly, divisional managers and national sales managers examine results in the light of their own experience. This process of examination and reconciliation takes place all along the line.

It is also common practice for a head office group, such as the market or economic research department or the treasurer's office, to make an independent estimate of demand. This estimate, often based on information not available to the sales force, sets as a cross-check on the composite. Any major differences call for an investigation of the cause and a correction to achieve the final forecast.

The advantages cited for the sales force composite method are four: (1) uses specialized knowledge of men closest to the market, (2) places responsibility for the forecast in the hands of those who must produce the results, (3) gives sales force greater confidence in quotas developed from forecasts, (4) lends itself to the easy development of product, territory, customer, or salesmen breakdowns.

The most significant disadvantages are four: (1) salesmen are poor estimators, often being either more optimistic or more pessimistic than conditions warrant, (2) if estimates are used as a basis for setting quotas, salesmen are inclined to understate the demand in order to make the goal easier to achieve, (3) salesmen are often unaware of the broad economic patterns shaping future sales and are thus incapable of fore-

casting trends for extended periods, (4) requires an extensive expenditure of time by executives and sales force.

Users of this system include Pennsalt Chemical Corporation and Otis Elevator Corporation.[5]

Users Expectations Method

Some industrial companies, in forecasting sales, ask their customers for information on expected consumption or purchases of their products. This approach is used to best advantage by manufacturers who serve industries comprising a small number of companies. User-expectation surveys are favored when there is very little data on which to base forecasts. Some companies use them to obtain more current and detailed information about industry demand than can be obtained from published sources. They have also been found particularly useful in making short-range forecasts for limited geographical regions.

Potential customers have been surveyed by mail, telephone, and personal interviews. The method used generally depends on the number of companies to be surveyed and the amount of detail being sought.

Whether companies are questioned by mail, telephone, or in person, the general goal is to determine how much of a given product the customer plans to use. From the answers, a forecast of total demand for the product is derived. The company's share is then determined either on the basis of its past share of the market or upon the sales force's estimate of what portion of each customer's total demand the company will satisfy.

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[5] Ibid., pp. 20-29.

The advantages of the users' expectation method are three: (1) bases forecast on information obtained directly from product users, whose buying actions will actually determine sales, (2) gives forecaster a subjective feel of the market and of the thinking behind users' buying intentions, (3) offers a possible way of making a forecast where other methods may be inadequate or impossible to use.

Some of the disadvantages are as follows: (1) difficult to employ in markets where users are numerous or not easily located, (2) depends on the judgment and co-operation of product users, some of whom may be ill-informed or uncooperative, (3) bases forecast on expectations, which are subject to subsequent change, (4) requires considerable expenditure of time and manpower.

This method is preferred by the National Lead Company.[6]

Time-Series Analysis

The use of statistical methods is a popular means of supplementing personal judgment and increasing the accuracy of sales forecasts. Various relationships or movements within a company's or industry's economy can be observed, measured and projections can be made with a reasonable degree of accuracy. Then the forecaster needs only to concern himself with estimating the probability and magnitude of deviations, for the projections will indicate the probable course of sales.

The sales of most companies are affected by long-term growth trends, cyclical business fluctuations, and seasonal variations. If it were not for the irregular or chance variations caused by events such as sudden

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[6] Ibid., pp. 30-32.

changes in business conditions, strikes, material shortages, and competitive activities, the influences of these underlying factors would be more evident.

Time-series analysis is a statistical method of separating and analyzing the past movements and interraction of these three distinct sets of basic forces underlying sales or other economic data. It also serves to expose the irregular forces or chance factors. The method assumes that past sales records contain the principal information needed to produce a basic forecast. Once these forces are understood, data can be modified to allow for expected changes in conditions and projected forward to obtain a forecast of future sales.

Forecasting sales by time-series analysis is usually carried out as follows: First the actual pattern on sales figures over time is broken down into four components - secular trend, cycle, seasonal, and irregular. This gives a picture of what sales volumes would have been during the period being analyzed had each factor been the only one influencing sales. Then, the basic patterns of the trend cycle, and seasonal forces are then projected forward, making allowance for any conditions that might upset the past patterns.

It is hazardous to rigidly project fixed trends on cyclical patterns into the future without any knowledge of the underlying causative factors. Unfortunately, even the most regular cycles vary in duration. In addition, such things as wars, unpredictable psychological factors, strikes, and technological changes disrupt the regularity of cyclical patterns from time to time.

The time-series analysis approach, when used for short-term forecasting, is frequently supplemented by other forecasting techniques and is used as a basis for operational forecasting only in cases where the cyclical patterns are well defined and sales do not fluctuate violently. The study and projection of trends are often most useful in longer-range forecasting.

These are some of the advantages of time-series analysis forecasting: (1) forces the forecaster to consider the underlying trend cycle, and seasonal elements in the sales series, (2) takes into account the particular repetitive or continuing patterns exhibited by the sales in the past, (3) provides a systematic means of making quantitative projections.

Some of the disadvantages are that it: (1) assumes the continuation of historical patterns of change in sales components, without considering outside influences that may affect sales in the forecast period, (2) is often unsatisfactory for short-term forecasting since, for example, the pinpointing of cyclical turning points by mechanical projection is seldom possible, (3) may be difficult to apply in cases where erratic, irregular forces disrupt or hide the regularity of component patterns within a sales series, (4) requires technical skill, experience, and judgment.

The time-series analysis method is used by many companies including Long Island Lighting Company, Eli Lilly Company, and Oakite Products.[7]

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[7] Ibid., pp. 33-37.

Summary

After much searching, it was evident that the use of consumer preference data in predicting sales was rare.

The search through numerous books and research papers revealed no company actually forecasting sales by this method. Letters to marketing consultants and prominent companies brought few results.

The forecasting systems used most often included jury of executive opinion, sales force composite, users' expectations, and time-series analysis.

Many companies use a combination of these along with adaptations of their own since the problems of forecasting and the degree of accuracy attainable vary considerably from product to product.

The next chapter describes the system whereby sales preference data was combined with data derived from conventional estimating methods.

CHAPTER III

DESIGN OF THE STUDY

In this study, three basic sets of information are compared with each other. All three of these are related to an actual group of ladies' sportswear garments which were manufactured for and sold during the Spring 1968 season by The Lady Wrangler Division of Blue Bell, Incorporated, located in Greensboro, North Carolina. This selling season ended the last of March, 1968.

The first set of data is a conventional sales forecast for each of the 234 garments, the number of garments used in the study.

The second group of data is a sales forecast made of the same group of garments by a group of consumers in Atlanta, Georgia, and Chicago, Illinois.

The actual number of dozens sold on each of these styles during the Spring 1968 season by The Lady Wrangler salesmen constitutes the third set of data.

A description follows which shows how these three sets of data were derived.

The Lady Wrangler Conventional Sales Forecast

The first sales forecast for The Lady Wrangler Spring 1968 sportswear line was made on August 8, 1967. This preceded the showing

of the merchandise to The Lady Wrangler sales force by about five weeks. Predicting sales on this line of merchandise is especially challenging because there is very little history on which to base the predictions. The life of each style in this line is one season or less than six months.

Using last season's sales as a guide and considering many factors which will be presented in more detail in subsequent paragraphs, a total dozens figure was established. This figure represents the total expected sales for all the styles in the line combined.

This sales figure is then spread out over each collection in the line. A collection in this instance refers to a group of fabric and color coordinated garments.

Next, a sales figure was estimated for each individual style number and each color within the collection.

In estimating sales, every enterprise was affected by, and must adjust to, three major conditions: (1) national and international economic conditions, (2) the conditions within the industry, (3) conditions within the company itself. With few exceptions, a firm can only control the latter. To do this wisely the sales forecaster must be well-informed on industry and nationwide trends.

The general outlook for improvement or recession in business is a major factor in forecasting sales.

According to Simmons:

> The principal factor in sales variation over the short run is not the ability of the sales organization, or the quality of the company's merchandise, because these change only slowly; but rather the rapid changes in external economic conditions.

> Hence, the job of forecasting is primarily one of forecasting external events and the nature of their influence on the business, rather than one of forecasting what management itself will do.[1]

An analysis of national and international business conditions was provided Blue Bell by a very reputable economist, Lionel D. Edie. For an appraisal of the economic outlook within the apparel industry, Blue Bell leans heavily on reports published by the American Apparel Manufacturers Association.

Both of these sources of economic guidance report regularly on the progress of a group of key economic factors. Information concerning most of these economic factors can be found in the Survey of Current Business published by the Department of Commerce. Others appear also in the Monthly Bulletin of The Federal Reserve Board and in the various publications of other agencies, such as The United States Office of Business Economics, The Bureau of Agricultural Economics, The United States Bureau of Labor Statistics, and The Treasury Department.

One of the most important economic factors which was watched carefully was the gross national product. Closely allied to this factor were national income, disposable personal income, and consumer expenditures.

To keep a check on the level of production, reports on industrial production and farm production were consulted.

It is important to be aware also of the inventory levels of manufacturers, retailers, and wholesalers.

Another important factor was department store sales and wholesale and retail prices.

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[1] Harry Simmons, New Techniques in Marketing Management (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1958), p. 106.

The other area which was watched closely was money and credit. The money supply, level of bank loans, amount of United States Savings Bonds sold, and the amount of personal savings all provide helpful insights into the nation's economy.

The Blue Bell sales forecasters generally looked at the above factors with regularity. When this was done, there gradually develops in the forecaster's mind a general awareness of the business situation as a whole. The forecasters usually read regularly the business pages of a first-class newspaper, such as The New York Times.

Some forecasters also read a general business publication, such as Business Week. It is also helpful to read The Wall Street Journal, Barron's, and Dun's Review. From this reading, a good idea can be gained of the strength of demand, the level of confidence, the price situation, and the relationship of supply to demand.

In using this type information, a forecaster does not attempt to work with anything complicated, mechanical, or mathematical. He simply absorbs the important information, allows it to take root in his mind, and then draws from it whatever net picture his best judgment produces.

In doing this, he should observe some basic rules as stated by MacGowan:

> Demand is the great determinant of business activity. Without the demand there is no business. The primary effort of the sales forecaster should be to see whether the demand is backed up by adequate buying power. Without the buying power, it cannot be made effective.
>
> The next thing is to see whether business and consumer confidence is adequate to cause purchasers to want to use their power to buy. He should ask himself whether prices are or are not so high as to discourage buying. Finally, he should ask himself

> whether the goods are available to meet the demand. Sometimes this factor can be of considerable importance. Let me repeat these five factors: Demand, Buying Power, Confidence, Prices, Supply.[2]

Thus, the Blue Bell sales forecaster is able to know in a general way what lies ahead in the way of production, sales, prices, and employment for the economy as a whole, and for various parts of it in which he might be especially interested. He is now in a good position to go on to make a rather specific forecast for his own company against a background of sensible general economic information.

Conditions within the Apparel Industry

Circumstances of an industry-wide nature may affect the Lady Wrangler estimate. The most important of these circumstances are new developments, improvements in machinery, and competition.

New Developments

Known developments of new products or styles by other companies may render certain Lady Wrangler styles obsolete. New developments within Lady Wrangler may create obsolescence among competitors.

Improvements in Machinery

An appraisal is necessary of the relative extent to which Lady Wrangler and its competitors have installed improved machinery having a low operating cost.

Competition

An appraisal must be made of the increase or decline in importance of prominent competitors and of the prospective strength of new

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[2] T. G. MacGowan, "Forecasting Sales," The Harvard Business Review, (November, 1949), 111-112.

competitors. It must be established what competitive position in a specific market Lady Wrangler occupies.

Conditions with Lady Wrangler

National and local economic conditions have now been considered and conditions in the apparel industry have been appraised. Attention must be turned now to conditions within Blue Bell, and particularly the Lady Wrangler Division. The following are the most important factors which were considered:

Plant Productive Capacity

It must be determined in advance of making the sales forecast what the productive capacity of the plant is. Under ideal conditions, the estimate or forecast will be sufficiently large to run the plant at full capacity. If the forecast is too small to run the plant full time, plans must be made concerning what is to be done with the surplus of machines and labor. If the forecast is larger than can be produced by the plant, then it must be determined how this additional production can be supplied. If the labor supply is inadequate and plant production cannot be increased in other ways, the forecast must be reduced to match the plant's productive capacity.

Elements that Make Up the Sales Organization

Since the sales department plays such a vital role in industry, the forecaster must have an intimate knowledge of the make up of the sales organization. He must be aware of any changes in the number of salesmen, changes in sales assignments, revisions to the incentive plans, etc. All changes of this type can materially affect sales patterns.

Advertising and Promotion Plans

This is another area of company operations which the forecaster must be very familiar with. The size of advertising and promotion expenditures usually is based on the volume sold by the merchandise being advertised. Any appreciable change in the size of this advertising budget could effect sales considerably. Also, it is important that a forecaster be aware of new means or new techniques of advertising and promotion. This, too, could influence the rate of sales.

Changes in Pricing Policies

Plans may be formulated by management to lower or raise the entire price structure, or the prices of individual lines. The influence that a decision of this type can have on sales is enormous.

Reaction of Sales Management and Key Customers

Before the initial forecast is made, new styles and colors are shown to sales management and sometimes to key customers. Their reaction to these styles and colors is noted, and this plays a part in the size of the forecast for individual garments in the line.

Degree of Confidence in Colors, Fabrics, and Garment Construction

Apparel manufacturers are, to a great extent, dependent on fabric mills for the designing and producing of desirable, fashionable fabrics. In some cases, large apparel manufacturers, such as Blue Bell, do exert an influence on the styling and coloring of new fabrics.

However, there are occasions when some of the offerings made by fabric mills do not appear desirable to the management of the apparel

manufacturers, but because the cloth might have been sold widely to competitors, it becomes necessary to buy the fabric for use in the line. In such a case, the size of the forecast for garments using this fabric is likely to be relatively low. A good example of this type of cloth is a loosely woven basket weave.

A similar problem may develop in the area of fabric colorations. A color which is produced by the mills about every four years, but which never sells in volume is purple. Color stylists from the mills offer this color in all shades from the most delicate violet to a dark plum. However, experience covering many years indicates that consumers will not buy any shade of purple in volume. It sometimes becomes a good idea to include this color in a line for various reasons, but lack of confidence in purple definitely affects the size of the forecast.

The degree of confidence a sales forecaster has in a garment construction obviously would affect the size of the estimate. Many times, a construction style will become popular in the market even though it is apparent that the make of the garment is not practical. A prime example of this in women's sportswear is the "hip-hugger" style in pants, shorts, and skirts. This style, which fits low on the hips, swept through ladies' fashion circles during 1966 and it appeared there would be a heavy demand for this style. Unfortunately, the consumer did not approve of this construction. As a result, many apparel manufacturers were inflicted with huge losses because of excessive estimates of garments with this construction. The forecaster must continually be on the lookout for questionable constructions such as this and set his forecast accordingly.

The Lady Wrangler sales forecaster draws on many sources of information to finally arrive at a specific number of dozens he thinks each garment will sell during the course of the season, such as the historical sales, national and international economic conditions, apparel industry conditions, and conditions within the company itself.

The technique for forecasting sales described above was used to arrive at an actual estimate for the Lady Wrangler Spring 1968 sportswear line. These data are used in an important way in the study. However, the actual dozens are expressed as an index of 100 for this report.

The Consumer Preference Survey Sales Forecast

Consumer preference data on the Spring 1968 Lady Wrangler sportswear line were obtained from 170 teenagers and young married housewives in Atlanta, Georgia, on September 21, 1967. The same type data were also obtained from a group of 122 women of the same age range in Chicago, Illinois, on September 28, 1967.

To select the 292 women who were used in the Consumer Research Surveys in Atlanta and Chicago, a systematic, restricted sampling design was employed. The Phyllis Vail Market Research Company of Atlanta and the Bee Angel Research Company in Chicago assisted in selecting the respondents.

Their instructions were to locate between 250 and 300 teenagers and young married housewives between the ages of 16 and 40. They were to be ladies living in a middle to upper-middle class neighborhood. These ladies would represent a typical customer for Lady Wrangler sportswear. They were selected from the membership of several organizations,

including high school sororities, modeling schools, church groups, and the Jaycettes.

All interested members of these organizations were screened for the required qualifications. Those selected were asked to meet at a specified location at a certain time to answer a questionnaire regarding each of the sportswear styles.

The 234 garments to be examined were placed on hangers and hung on racks. These racks were lined up in rows in a large room. Each participant went about the room and examined each garment individually and then "voted" in one of three ways. For each style, the women indicated if they (1) liked it enough to buy it at the price, (2) disliked it, or (3) were undecided. Only "would buy" votes were counted. The only information the ladies were given about the garments other than that shown on the various tickets and labels was the retail selling price. The tickets and labels indicated fiber content and washing instructions.

The entire Lady Wrangler line is divided into four major construction groupings; (1) shorts, (2) slacks, (3) skirts, (4) blouses. All the "would buy" votes were tallied for each style and color within each construction group and all correlations and comparisons were made within the construction group.

The consumer forecast was a percentage of the "would buy" votes each style receives from the 292 consumers, with a total of 100 for each of the four construction groups.

Actual Dozens Sold Data

The actual dozens sold are reported weekly as the orders are

mailed in by the Lady Wrangler salesmen. The dozens used in this study were the actual final sales for the season for each style. The selling season began about the second week in September, 1967, and ended about the last week of March, 1968. The Lady Wrangler salesmen were presented with a new Fall 1968 line of sportswear the first week of March, 1968. Their selling time since the first week of March, and including the time of this writing (April, 1968),is being used primarily for the selling of this fall merchandise. Reorders for spring 1968 merchandise were fairly good in March but have virtually stopped. Prices are reduced on many styles now. Many other styles are withdrawn from sale because of broken stock, and the entire line will be prepacked and reduced in price in early May. The sales dozens represented in this study were sales at list price and do not include closeouts and irregulars.

These figures also are grouped by the four main construction categories: (1) shorts, (2) slacks, (3) skirts, (4) blouses. The actual dozens were reduced to equal 100, and each style represents a percentage of 100.

Method of Analysis

With all three sets of data available for statistical analysis and study, they were converted to an index of 100. This procedure was necessary in order to disquise the actual sales data. The writer was assured that the conversion of all three variables to a common base would not distort the statistical results.

In the next chapter, each of the four construction groups was analyzed separately. Coefficients of correlation were calculated between the conventional estimate and the final sales, between the conven-

tional estimate and the consumer estimate, and between the consumer estimate and final sales.

In order to measure the joint effect of the two separate forecasts on final sales, regression coefficients were calculated and a multiple regression equation was formulated. These test the hypothesis that a proper combination of the two forecasts was a more reliable forecast than either of the two taken separately. The coefficient of multiple correlation was also calculated in order to indicate the degree of reliability of the regression equations.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

For purposes of analysis, the Spring 1968 Lady Wrangler sportswear line was divided into four construction groups: (1) shorts, (2) skirts, (3) slacks, (4) blouses.

Within each construction group, three sets of data were compiled. The first set of data, signified as X_1, was the Blue Bell conventional forecast for each style and color. The second set of data, called X_2, was the forecast for each of the same styles and colors derived from the consumer preference survey. The third and final set of data within each construction group, called Y, is the actual final sales for each style and color. Each of the four construction groups mentioned above was analyzed as a separate entity because of the unique differences in the styling characteristics of each and because of the different consumer uses for each of the four groups.

The statistical calculations for this study were done with the aid of an electronic computer.

Tables presenting each set of data, together with the basic statistical computation of the mean, standard deviation, and the range may be found in Appendix D.

It should be noted that because of Blue Bell company policy, the actual sales and the estimates have been disguised by converting each to a percentage of 100.

Shorts

The coefficient of correlation between the conventional estimate and final sales is .649. This indicates a relative measure of the relationship between two variables, the conventional estimate and final sales. (This relationship could vary from zero, no correlation, to plus or minus 1, perfect correlation.) The number of styles involved is 63.

The correlation between the consumer estimate and final sales is .557. The correlation between the consumer estimate and the conventional estimate is .412. This signifies that some of the same factors involved in making the conventional estimates were also present in the consumer estimates. The standard error of estimate for the conventional forecast and final sales was .906 and for the consumer estimate and final sales it was .830. These measures show the standard deviation of the variable Y, final sales, from its computed values based on the respective estimates.

The data for shorts indicate that the consumer estimate has a lower standard error, and that after the regression line is fitted to the data, the unexplained variance in Y will be smaller for the consumer estimate than for the conventional estimate.

In order to measure the joint relationship of the two independent variables, the conventional estimate and the consumer estimate, on the dependent variable, final sales, the multiple correlation technique was used.

A multiple correlation (R) of .724 was obtained for the shorts group. The coefficient of multiple determination (R^2) was .523 with a probability of less than .0001 that the results were by chance.

These findings are set forth in Table 1.

TABLE I

INTER-CORRELATION TABLE FOR SHORTS

	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Mult. Correlation	Standard Error
Conventional Estimate (X_1)	1.000			.888	.906
Consumer Estimate (X_2)	.412	1.000		.480	.830
Final Sales (Y)	.649	.557	1.000		
Coefficient of Determination (R^2)				.523	
Coefficient of Mult. Correlation (Ry. X_1X_2)				.724	
Coefficient b_1					.172
Coefficient b_2					.135

A multiple regression equation was formulated which represents the simultaneous influence of the two forecasts upon final sales.

The equation for shorts was as follows:

$$Y = b_o + b_1X_1 + b_2X_2$$

or

$$Y = -1.298 + .888(X_1) + .480(X_2)$$

In this equation, Y is the computed value of the dependent variable, final sales. The terms X_1 and X_2 represent the two independent variables, the conventional estimate and the consumer estimate. The terms b_1 and b_2 are the regression coefficients. Each measures the change in Y per unit change in that particular independent variable.

As the coefficient of multiple determination accounts for only about 52% of the variance in the dependent variable, leaving 48% of the variance unaccounted for, the use of the resulting equation is doubtful.

However, the probability of less than .0001 indicates effectively a zero chance of getting the results that were obtained by chance.

It was concluded that for the shorts construction group, the regression equation has some degree of value. Its use in predicting sales would result in more reliable figures than would either of the two estimates described. However, as the coefficient of multiple determination (R^2) shows, the formula does not account for enough of the variance (only 52%). There is a need for more or better components to make this regression equation more reliable. It is apparent that both the forecasts need strengthening, but the consumer estimate is the weaker of the two estimates.

Slacks

The conventional estimate for 53 styles of slacks has a .621 correlation with the final sales for these slacks. While this correlation is not very high, it is considerably higher than that between the consumer estimate and final sales, which is .394. Another interesting correlation was the one between the conventional estimate and the consumer estimate. It is interesting to note that the inter-correlation between the two estimates is very low, only .104. The indication here is that very few of the same factors were involved in these two estimates. Table 2 presents pertinent statistical data.

TABLE 2

INTER-CORRELATION TABLE FOR SLACKS

	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Mult. Correlation	Standard Error
Conventional Estimate (X_1)	1.000			.970	1.046
Consumer Estimate (X_2)	.104	1.000		.565	.830
Final Sales (Y)	.621	.394	1.000		
Coefficient of Determination (R^2)				.495	
Coefficient of Mult. Correlation (Ry. X_1X_2)				.704	
Coefficient b_1					.167
Coefficient b_2					.171

The standard error for the conventional estimate was 1.046, while it was .830 for the consumer estimate. Just as in the case of the shorts group, the standard error and the correlation is lower in the consumer estimate than it is for the conventional estimate.

The coefficient of multiple correlation for slacks was found to be .704, while the coefficient of multiple determination was .495. The explanation here is that only 49.5% of the variance in sales is accounted for by the regression equation. The probability was less than .0001 for the data on slacks.

The multiple regression equation for slacks was:

$$Y = -1.883 + .970(X_1) + .565(X_2)$$

While the equation for slacks was not quite as reliable as the one

derived for shorts, it still would result in a better estimate than either the conventional or the consumer estimate considered separately.

Skirts

The conventional and consumer forecasts for 34 skirt styles correlate rather poorly with final sales as shown in Table 3.

TABLE 3

INTER-CORRELATION TABLE FOR SKIRTS

	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Mult. Correlation	Standard Error
Conventional Estimate (X_1)	1.000			.830	2.134
Consumer Estimate (X_2)	- .090	1.000		.816	2.076
Final Sales (Y)	.476	.235	1.000		
Coefficient of Determination (R^2)				.304	
Coefficient of Mult. Correlation (Ry. X_1X_2)				.552	
Coefficient b_1					.249
Coefficient b_2					.438

The correlation between the conventional estimate and sales was fairly low at .476. However, the correlation between the consumer estimate and final sales, .235, has little significance. It is noteworthy that the correlation between the two estimates of -.090 points out that both estimates were done independently of each other.

The standard error for skirts was the highest of all four groups, with a 2.154 for the conventional estimate and 2.076 for the consumer estimate.

The coefficient of multiple determination for this group was .304, with a multiple correlation of .552. Of the three groups, this was the poorest correlation obtained. The probability of .004 reveals that the results obtained were not by accident.

The multiple regression equation is:

$$Y = -2.722 + .830(X_1) + .816(X_2)$$

Since only 30.4% of the variance is accounted for, the equation is of very little use.

One other observation was that even though the coefficient of multiple correlation was a very low .552, it still was higher than the correlation for either the conventional estimate (.476) or the consumer estimate (.235).

Blouses

The blouse category was the largest of the four groups, with 84 styles involved. It was the only category in which the correlation of the consumer estimate, .369, was higher than the correlation of the conventional estimate, .267. Both of these correlations were quite low, particularly that of the conventional estimate. The correlation between the two estimates was .072. Since they were uncorrelated, they can both be of some help in the regression equation. Table 4 summarizes these data.

TABLE 4

INTER-CORRELATION TABLE FOR BLOUSES

	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Mult. Correlation	Standard Error
Conventional Estimate (X_1)	1.000			.406	.914
Consumer Estimate (X_2)	.072	1.000		.258	.857
Final Sales (Y)	.267	.369	1.000		
Coefficient of Determination (R^2)				.194	
Coefficient of Mult. Correlation (Ry. X_1X_2)				.442	
Coefficient b_1					.168
Coefficient b_2					.734

The standard error for the conventional estimate was .914, while it was calculated at .857 for the consumer estimate.

In measuring the combined effect of the two independent variables on final sales, it was determined that the coefficient of multiple correlation for blouses was .442, the lowest of the four groups. The coefficient of determination was .194 and the probability was .0002.

Regression coefficients were derived, and the regression equation was:

$$Y = -.334 + .406(X_1) + .258(X_2)$$

This equation does not adequately represent blouse sales for reasons stated above. Therefore, it is not a useful equation. With a coefficient of determination of .194, there remains unaccounted for 80.6% of the variance.

This calls for a higher refinement of both forecasts in order to make the regression equation more reliable.

It has been revealed in three out of four groups that the coefficient of correlation (r) of the conventional estimate exceeds that of the consumer estimate. When the coefficient of multiple correlation is used, it was observed that the yield was sufficiently high in the shorts and slacks groups to support the use of the regression equation. In the blouse and skirt groups the coefficient of multiple correlation was not high enough to support the use of the regression equation. Table 5 shows a correlation summary between the four construction groups.

TABLE 5

CORRELATION SUMMARY BETWEEN CONSTRUCTION GROUPS

	Shorts	Slacks	Skirts	Blouses
Number of Styles	63	53	34	84
Conventional Estimate (X_1) vs. Final Sales (Y)	.649	.621	.476	.267
Consumer Estimate (X_2) vs. Final Sales (Y)	.557	.394	.235	.369
Conventional Estimate (X_1) vs. Consumer Estimate (X_2)	.412	.104	-.090	.072
Coefficient of Determination (R^2)	.523	.495	.304	.194
Coefficient of Multiple Correlation (Ry. X_1X_2)	.724	.704	.552	.442

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The problem of this study was to find a more reliable method of forecasting sales than the system presently being used by the Lady Wrangler Division of Blue Bell, Incorporated.

Sales forecasting is perhaps the most difficult problem in the apparel industry today. To a large degree, the success of a business depends upon the skill of management in accurately predicting sales.

This study investigates the use of consumer preference data in forecasting sales. Three sets of data were collected and compared statistically. In addition to the consumer preference data collected from 292 female consumers, a forecast made by Blue Bell management using conventional forecasting methods was used. Also, the final sales for the styles being forecast were listed. All these data were reduced to an index of 100 for this study.

The two forecasts were compared with final sales, and coefficients of correlation were calculated. Also, the mean, the standard deviation, and a standard error of estimate were calculated for the conventional estimate and the consumer estimate.

The hypothesis was that a combination of these two estimates will result in a more accurate sales forecast than either the conventional or the consumer preference estimate. The multiple correlation technique was used to test this hypothesis.

The results of this study call for an acceptance of the hypothesis. Regression coefficients were calculated for both the conventional sales estimate and the consumer preference estimate. Using these regression coefficients with a constant term, a regression equation was formulated to measure the joint effect of both the conventional and the consumer estimate on final sales.

Significant relationships between the two independent variables and the dependent variable final sales were found. For this study, the line was divided into four construction groups; (1) shorts, (2) slacks, (3) skirts, (4) blouses.

In three out of the four construction groups, the conventional estimate correlated more closely with final sales than did the consumer forecast.

The correlation between the two estimates was relatively low, except for the shorts group. This was a good indication that different factors were used in making the two estimates.

All four construction groups had a rather low coefficient of determination, ranging from .194 for blouses to .523 for shorts. This indicates that the unexplained variance for these four groups was between 80.6% and 47.7%.

The coefficient of multiple correlation was reasonably good for shorts (.724) and slacks (.704), but was poorer for skirts (.552) and blouses (.442).

In all four construction groups, the coefficient of multiple correlation was higher than the correlation for either of the two estimates.

Conclusions

The fact that in three of four construction groups, the conventional estimate correlated more closely with sales than did the consumer estimate has some significance. The conventional estimate was made by Blue Bell management, based on years of experience. It made use of historical sales, plant production, and other tools of sales forecasting not available to the consumer preference group. In the shorts group, the correlation was .649 for the conventional estimate and .557 for the consumer estimate. In the slacks group, the correlations were .621 and .394. The skirt group showed a correlation between the conventional estimate and final sales of .476, and a correlation of .235 between the consumer estimate and final sales. The only group in which the consumer estimate is higher is the blouse group. Here the consumer estimate was .369 and the conventional estimate was .267.

The correlations between the two different estimates was low in each group. This indicates that different factors were used in making the estimate and that both estimates can be of some value in the regression equation.

The coefficient of determination for all four groups was rather low. The lowest of all was the blouse category where only 19.4% of the variance in final sales was explained. The explained variance for skirts is 30.4%; for slacks, 49.5%; and for shorts, 52.3%. The conclusion is that more and better terms are needed both in the conventional and in the consumer estimate. The lower correlation between consumer forecasts and final sales reveals that the consumer forecast needs the most attention.

In all four groups, the multiple correlation was slightly higher than was the correlation for either of the two estimates separately. This suggests that a combination of the two estimates is a more reliable forecast than either of the estimates taken separately. This calls for an acceptance of the hypothesis that a combination of the conventional estimate and the consumer estimate gives a more reliable estimate than either of the two estimates considered separately.

A more important use of this study is that it may serve to open an awareness among the management of Blue Bell, Incorporated as to the potential importance of the consumer in forecasting sales.

This study indicates a need for further refinement in the collection and use of the consumer data.

It should also be stated that since the statistical calculations were made by an electronic computer, they are deemed to be accurate. However, all the refined interpretations of this data have not been explored.

Recommendations for Further Research

The results of this study indicate a need for more and/or better terms, particularly in the area of consumer preference data. By fortifying this portion of the regression equation, final sales may be forecast in a more reliable way. The conventional method of estimating sales is left unchanged for the experiment to be described here. A system which might be called a sales ranking method is used to furnish the data formerly supplied by the consumer preference survey.

Early in the season, three groups of people are called upon to establish a selling rank (the style they think will sell best is #1, next best is #2, etc.). This is done for each style in the line by construction group. The construction groups are shorts, slacks, skirts, and blouses.

Several persons chosen from the Blue Bell merchandising department, sales managers, and a large group of consumers are used to rank all the styles within each construction group. Once the rank is established for each style number, quantities are applied by use of a historical sales curve. This curve is constructed from historical sales for the past several seasons for each construction group. This curve tells us that the #1 short in the past has accounted for a certain percent of the total short sales.

The Blue Bell Merchandising Department provides a total estimate for the construction group using conventional sales forecasting methods. This total estimate multiplied by the percentage discussed above will result in a sales estimate by style number and color.

For example, suppose that according to the historical sales curve; the number one short represented 30 percent of all shorts sold, the number two short represented 25 percent of all shorts sold, the number three short represented 20 percent of all shorts sold, etc.

If the conventional estimate for all Spring '68 shorts is, for instance, 1000 dozen, then the estimate for these shorts is easily calculated by multiplying 1000 dozen times each percentage.

This produces a sales ranking estimate which is called X_2.

The statistical treatment is the same as explained in this study when X_2 signified a consumer preference estimate.

However, the reliability of this information should be greatly improved for several reasons. The opinions of the consumers may be fortified by the opinions of Blue Bell personnel acquainted with market problems and the line of clothes involved. Sales managers who have a first-hand knowledge of what the customer wants and what is happening in the market place, give of their experience in the ranking process. Then, by the use of historical curves for each construction group, a sound quantification may be made.

This very process is now being carried on with the Lady Wrangler Fall 1968 sportswear line.

There are many other areas of research also open in sales forecasting. Many of these areas involve the electronic computer. Systems could be designed whereby a wide variety of constant and variable data could be fed into the computer. This data might be national economic forecasts bearing on apparel markets, apparel industry economic forecasts by garment types, target turnover rates, standard manufacturing capacities and limits of all types, and detailed costs. This type information could be of invaluable help in making a better conventional estimate.

Some visionaries predict a very exciting possibility which is certainly worthy of research:

> Computers operated by key retailers are connected to computers operated by apparel manufacturers and by textile mill suppliers to feed back to both terminals the impact of consumer demand at the moment of sale. Small retailers are connected by long-lines data transmission systems.

> Based upon these highly sensitive data, both supplier computers automatically adjust all manufacturing and delivery plans to optimize ability to meet customer needs and desires, as well as the requirements of profit. Constrictive conditions which arise are solved by reference to joint decision rules which are controlled by management executives at both supply terminals.[1]

No one knows what the future holds for sales forecasting but it is important that industry gets started at once on the road to more scientific sales forecasting.

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[1]American Apparel Manufacturers Association, Report of the Marketing Committee, Forecasting Apparel Sales (Washington, D. C.: American Apparel Manufacturers Association, 1968), p. 35.

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APPENDIX A

FORMS USED FOR GATHERING DATA

GENERAL INSTRUCTIONS FOR CLOTHING SURVEY

First, scan through the questionnaire to see what it's all about.

Use the three marks below to express your personal opinion of each item.

✓ Those items you would consider buying

0 Those you aren't sure about buying.

X Those you would not buy.

Each clothing item is numbered, and a matching number and space appears on each page where you can mark your decision.

Don't hesitate too long over any one decision.

Work independently - your own opinion is important.

Your answers are confidential, and your signature is not requested.

Start anywhere - but make sure you are rating the garments identified by the matching numbers on this form.

When you have finished, please check all pages to see if you have expressed your opinion one way or another in all the places provided for answers.

SPORTSWEAR

Please use ✓, O, or an X to indicate how you personally would feel about buying each garment. Consider price and everything else you normally consider.

Start anywhere - but make sure you are rating the garments identified by the matching numbers on this form.

✓ Those you would consider buying.
O Those you aren't sure about buying.
X Those you would not buy.

1 ____	19 ____	37 ____	55 ____	73 ____
2 ____	20 ____	38 ____	56 ____	74 ____
3 ____	21 ____	39 ____	57 ____	75 ____
4 ____	22 ____	40 ____	58 ____	76 ____
5 ____	23 ____	41 ____	59 ____	77 ____
6 ____	24 ____	42 ____	60 ____	78 ____
7 ____	25 ____	43 ____	61 ____	79 ____
8 ____	26 ____	44 ____	62 ____	80 ____
9 ____	27 ____	45 ____	63 ____	81 ____
10 ____	28 ____	46 ____	64 ____	82 ____
11 ____	29 ____	47 ____	65 ____	83 ____
12 ____	30 ____	48 ____	66 ____	84 ____
13 ____	31 ____	49 ____	67 ____	85 ____
14 ____	32 ____	50 ____	68 ____	86 ____
15 ____	33 ____	51 ____	69 ____	87 ____
16 ____	34 ____	52 ____	70 ____	88 ____
17 ____	35 ____	53 ____	71 ____	89 ____
18 ____	36 ____	54 ____	72 ____	90 ____

December 21, 1967

Mr. Robert Heiland
Research Director
Kurt Salmon Associates
Route #1
Coopersburg, Pennsylvania 18036

Dear Mr. Heiland:

Mr. Ed Lucas of Blue Bell, Inc., in Greensboro told me that you were gathering data from many companies concerning how they forecast sales.

I am writing a thesis on Sales Forecasting in order to earn a Master's Degree in Education. It would be extremely helpful if you could send to me any information you might have on this subject.

One part of my thesis will deal with what techniques various companies use to forecast sales. Also, I will delve into the part that consumer preference might play in this process.

Thank you very much for your help.

Yours very truly,

BLUE BELL, INC.

Dick Clayton

REC/ya

2704 Tillbrook Place
Greensboro, North Carolina
December 27, 1967

Mr. J. W. Summerour
Summerour and Associates
C & S National Bank Building
Suite 711
Athens, Georgia

Dear Mr. Summerour:

Mr. Con Malmgren, the Knit Goods Manager of Blue Bell, Inc. in Greensboro, has recommended you as one of the leading authorities in sales forecasting techniques.

I am working toward a Master's Degree in Business at the University of North Carolina and have chosen sales forecasting as my thesis topic.

It will be necessary for me to outline in this paper some of the various techniques of forecasting now being used, particularly in the apparel field. I'm vitally interested in any system which uses information gathered from consumers as a means of predicting sales.

Any information which you could supply me would be much appreciated.

I would be happy to send to you a copy of my thesis when it is finished if you would be interested in seeing it.

Yours very truly,

Richard Clayton

RC/sm

cc: Mr. Con Malmgren

2704 Tillbrook Place
Greensboro, North Carolina
December 28, 1967

Marketing Director
Corning Glass Center
Corning, New York

Dear Sir:

The National Industrial Conference Board in New York published a report entitled, "Use of Motivation Research in Marketing."

In this report written by Dr. Lawrence Lockley, there is a paragraph which I will quote:

> "Marketing research men have developed an extensive kit of research techniques, some of which are disarmingly simple while others are quite sophisticated. Some of these techniques are intended merely to determine how people will react to a given set of circumstances. An example of the latter type of research is that carried on at the Corning Glass Center, where visitors are asked to vote their preference for various shapes, designs, or colors of consumer glassware products. The results have been found to be startingly accurate when the products have later been put on the market."

I am a graduate student at the University of North Carolina writing a thesis on Sales Forecasting by use of consumer preference. The experience you have had in this area as described above could be of tremendous help to me. Will you please send to me all the information you can about how you conduct the survey and then exactly how you use the votes to predict the sales for each item.

I am attempting to collect information on this subject from many sources. If you could help me, I would be happy to send you a copy of my thesis when it is finished.

Thank you very much for your help.

Sincerely,

Richard E. Clayton

REC/sm

APPENDIX B

TECHNICAL NOTES ON STATISTICAL METHODS

Statistical Methods

The statistics for this study were calculated by use of an electronic computer. This could be done by hand calculations with the use of the following formulae.

Least Squares Formula for Determining the Line of Best Fit

$$\Sigma Y = Na + b\Sigma X_1$$

$$\Sigma X_1 Y = a\Sigma X_1 + b\Sigma X_1^2$$

Y = Final Sales

X_1 = Conventional estimate

X_2 = Consumer estimate

N = Number of styles

Solve the above equation simultaneously for a and b. After this is done, the terms a and b may be used to solve this equation using final sales and the conventional estimate:

$$Y = a + bX_1$$

To solve the equation using final sales and the consumer estimate, the following equation is used:

$$Y = a + bX_2$$

Standard Error of Estimate Formula (from raw scores)

$$SX_1^2 = \frac{\Sigma X_1^2 - (\Sigma X_1)(a) - (\Sigma X_1 X_2)(b)}{N}$$

Standard Deviation

$$\sigma X_1^2 = \frac{\Sigma X_1^2}{N} - \frac{(\Sigma X_1)^2}{N}$$

Coefficient of Correlation

$$SX_1^2 = \frac{\Sigma X_1^2 - a\Sigma X_1 - b\Sigma X_1 X_2}{N}$$

$$\sigma X_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N}$$

$$r = \sqrt{1 - \frac{SX_1^2}{\sigma X_1^2}}$$

In this equation:

SX_1^2 = Standard error of estimate

σX_1^2 = Standard deviation

Multiple Regression Equation

$$Y = b_o + b_1X_1 + b_2X_2$$

Y = Final Sales

b_o = Constant term

b_1 = Regression coefficient for conventional estimate

X_1 = Conventional estimate

b_2 = Regression coefficient for consumer estimate

X_2 = Consumer estimate

$$b_o = Y - b_1X_1 - b_2X_2$$

Formulae for Calculating Regression Coefficients

The following three normal equations are solved:

$$\Sigma Y = na + b_1\Sigma X_1 + b_2\Sigma X_2$$

$$\Sigma X_1Y = a\Sigma X_1 + b_1\Sigma X_1^2 + b_2\Sigma X_1X_2$$

$$\Sigma X_2Y = a\Sigma X_2 + b_1\Sigma X_1X_2 + b_2\Sigma X_2^2$$

$$x_1 = X_1 - \bar{X}_1$$

$$x_2 = X_2 - \bar{X}_2$$

$$Y = Y - \bar{Y}$$

When the second and third normal equations above are expressed in small x's, the terms ΣX_1, and ΣX_2 equal zero, and the equations become:

$$\Sigma x_1 y = b_1 \Sigma x^2_1 + b_2 \Sigma x_1 x_2$$

$$\Sigma x_2 y = b_1 \Sigma x_1 x_2 + b_2 \Sigma x_2^2$$

These equations are solved simultaneously to find b_1 and b_2.

Coefficient of Determination

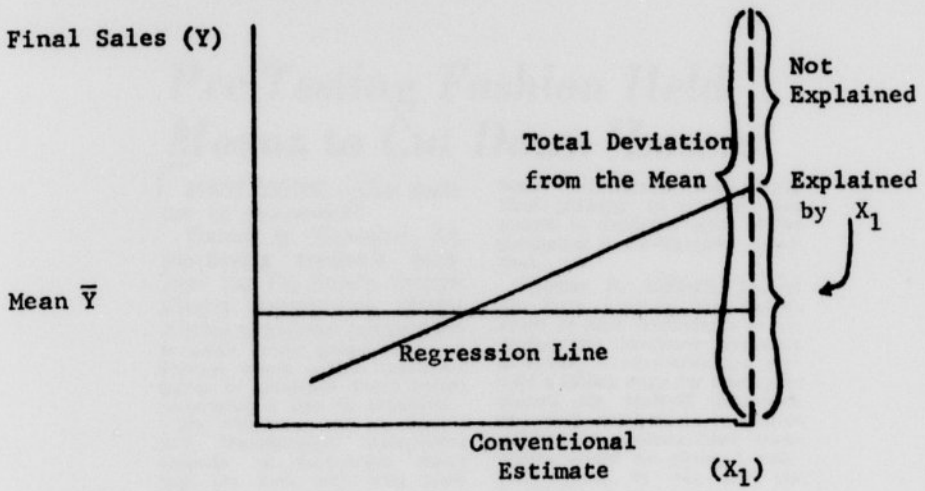
$$r^2 = 1 - \frac{S^2_{YX}}{S^2_Y}$$

In this equation:

S^2_{YX} = Unexplained variance

S^2_Y = Total variance

Graphic Presentation of Regression Line



The coefficient of correlation (r) is a relative measure of the relationship between two variables. It varies from zero (no correlation) to ± 1 (perfect correlation).

The correlation coefficient may also be defined as a measure of the extent to which the independent variable (X_1) accounts for the variability in the dependent variable (Y).

The standard error of estimate (S^2YX) measures the deviations of the points about the line. It represents the unexplained variance in Y that remains after the regression line has been fitted to the data.

By explaining the explained variance as a ratio of the total variance of Y, the square of the correlation coefficient is obtained, and is called the coefficient of determination.

APPENDIX C

COPY OF NEWSPAPER ARTICLE

Pre-Testing Fashion Held Means to Cut Down 'Losers'

NEW YORK.—Can fashion be pre-tested?

Daniel M. Thornton, 3d, marketing research manager for Du Pont's Textile Fibers department, thinks testing consumer acceptance of styles before going into production would enable manufacturers to eliminate losers before presenting a line to retailers.

Mr. Thornton told an American Management Association seminar on man-made fibers that Du Pont had done some consumer preference testing of men's sweaters, suits, sport coats, casual slacks, walking shorts, women's double knit dresses, sweaters, blouses and swimsuits.

The technique was also applied to fabrics to predict sales of men's suits.

Mr. Thornton also said it would be beneficial to develop automated feedback systems, so that manufacturers could use data on retail sales, collected weekly or even daily, to determine production.

He suggested improvements in this aspect of manufacturer-retailer relationships would come in the years ahead.

Mr. Thornton touched on consumer acceptance of fiber brand names, as did other speakers at the session.

Vincent Waterman, director of merchandising research for B. Altman & Co., said a change was taking place in some retail advertising where fabric, fiber and manufacturer brands were being used. Mr. Waterman felt the consumer had to be educated to seek fiber indentification.

He said he didn't agree with some in retailing that the store's name was more important than the fiber mark. More retail advertising is giving fabric and fiber information, he explained.

Mr. Waterman suggested that faster communications from fiber producer to retailer were needed to eliminate some of the guesswork in merchandise selection.

Thomas H. McNeill, Jr., of Du Pont, outlined the importance of fiber trademarks in affording the consumer assurance of quality. Trademarks also provide a selling edge for fiber producers, Mr. McNeill explained. He said marketing structures existing in various fiber companies would be changed radically, were it not for the trademark system.

"It is difficult to envision a fiber producer spending millions of dollars on advertising, promotion and other elements of marketing services in support of a commodity, particularly when commodity selling generally means one-price, low-price selling."

Mr. McNeill said he doubted the fiber producer would be concerned with fabric development; yarn, fabric and apparel styling; training of retail sales personnel, or development of marketing concepts at the retail level, were it not for his desire and need to maintain product identification.

(Copy of article appearing in The Daily News Record, New York, on November 16, 1967.)

APPENDIX D

PRESENTATION OF BASIC DATA

PRESENTATION OF BASIC DATA

TABLE 6

BASIC DATA ON SHORTS

Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)
1	2.0	1.8	4.1	33	.8	.9	2.2
2	1.5	1.8	3.9	34	1.4	.9	2.0
3	1.7	1.7	3.7	35	2.8	.9	1.8
4	2.9	1.3	3.8	36	1.7	.9	1.6
5	1.5	1.8	3.6	37	3.0	1.3	1.4
6	1.0	1.8	2.9	38	2.5	1.3	1.3
7	1.0	1.1	3.7	39	.5	.9	2.6
8	.9	1.0	3.1	40	.4	.9	2.1
9	1.0	1.1	2.9	41	.4	.9	2.5
10	.2	1.3	2.2	42	.4	.8	2.2
11	.3	1.3	2.2	43	.4	.9	2.5
12	.4	1.4	1.9	44	2.8	1.8	5.8
13	.3	1.3	1.8	45	2.1	1.8	5.4
14	1.6	2.4	3.2	46	1.2	1.1	4.0
15	1.8	2.4	3.3	47	.8	1.1	4.2
16	1.7	2.6	2.5	48	.7	1.0	3.9
17	1.6	1.4	2.3	49	6.0	4.4	6.1
18	3.4	2.2	4.5	50	5.7	3.4	5.7
19	3.8	2.3	3.5	51	2.0	3.3	4.5
20	2.8	1.5	3.2	52	.2	1.3	2.7
21	2.7	1.3	3.2	53	.3	1.3	3.2
22	1.8	1.4	4.1	54	.2	1.3	2.9
23	1.8	1.3	4.3	55	.3	1.3	2.8
24	1.8	1.3	3.9	56	1.5	1.8	4.9
25	2.7	2.0	4.4	57	2.2	1.3	5.1
26	1.6	2.1	3.3	58	1.8	1.3	5.0
27	1.8	2.1	3.5	59	2.3	2.2	4.1
28	.6	1.8	1.8	60	2.3	2.2	3.6
29	.8	1.8	1.3	61	1.0	1.7	2.3
30	.5	1.5	1.3	62	.8	1.8	2.5
31	1.4	.9	2.3	63	1.4	2.2	2.0
32	1.2	.8	2.2				
Total					100.0	100.0	100.0
Mean					1.587	1.587	3.187
Std. Deviation					1.182	.674	1.189
Range					.2 to 6.0	.8 to 4.4	1.3 to 6.1

PRESENTATION OF BASIC DATA

TABLE 7

BASIC DATA ON SLACKS

Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)
1	1.6	1.7	4.8	28	2.3	.7	4.4
2	2.3	1.7	4.3	29	2.2	2.5	4.4
3	1.0	1.7	4.3	30	2.2	2.5	4.1
4	1.1	1.2	4.1	31	.6	1.6	2.0
5	2.5	1.2	4.7	32	.7	1.5	2.0
6	2.2	1.3	4.0	33	.5	1.6	2.0
7	1.2	1.2	3.2	34	2.8	1.6	4.3
8	1.1	1.3	3.0	35	2.6	1.6	3.7
9	5.8	3.9	4.5	36	1.6	1.0	3.1
10	5.8	2.8	4.0	37	1.8	1.0	3.0
11	1.6	2.8	2.7	38	2.5	2.4	4.9
12	.4	1.6	3.3	39	2.1	2.3	4.1
13	.4	1.6	2.5	40	1.2	2.4	4.0
14	.3	1.6	2.5	41	2.3	2.4	3.6
15	.4	1.5	2.3	42	5.1	3.8	2.8
16	1.5	3.2	3.6	43	4.2	3.8	2.8
17	1.3	3.1	3.6	44	4.6	2.5	2.6
18	2.4	2.1	4.3	45	2.7	2.5	2.6
19	1.4	2.1	3.6	46	1.2	1.9	3.3
20	1.3	2.1	3.0	47	1.2	1.9	3.3
21	2.0	1.2	4.1	48	1.1	1.9	3.0
22	1.9	1.3	3.5	49	1.6	1.9	3.1
23	1.4	1.3	3.3	50	.5	.8	3.1
24	3.5	2.8	4.0	51	.5	.8	2.6
25	2.5	2.5	3.4	52	.3	.8	2.6
26	1.5	1.9	3.0	53	.3	.8	2.5
27	2.9	.8	4.5				
Total					100.0	100.0	100.0
Mean					1.887	1.887	3.434
Std. Deviation					1.322	.799	.780
Range					.3 to 5.8	.7 to 3.9	2.0 to 4.9

PRESENTATION OF BASIC DATA

TABLE 8

BASIC DATA ON SKIRTS

Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)
1	2.4	6.3	3.8	18	2.6	2.1	4.2
2	2.3	6.3	3.5	19	2.0	2.1	3.6
3	.6	.4	4.5	20	1.5	2.1	3.1
4	.6	.4	4.4	21	1.9	3.1	3.0
5	.6	.3	4.2	22	1.2	3.2	2.6
6	8.3	3.4	5.1	23	1.3	3.1	2.9
7	5.0	3.5	3.9	24	1.3	3.2	2.6
8	5.0	3.5	3.6	25	2.3	3.4	5.3
9	8.8	4.2	4.7	26	2.7	3.5	5.3
10	8.8	3.1	4.4	27	2.7	3.5	5.2
11	3.3	3.1	3.2	28	1.9	4.2	4.7
12	1.4	1.5	5.1	29	2.8	4.2	4.4
13	1.4	1.5	4.7	30	7.3	4.9	3.8
14	1.2	1.5	4.2	31	7.2	4.9	3.7
15	1.2	1.5	4.0	32	2.4	2.8	3.2
16	1.2	1.5	3.1	33	2.4	2.8	2.8
17	3.2	2.1	4.7	34	1.2	2.8	2.8
Total					100.0	100.0	100.0
Mean					2.941	2.941	3.950
Std. Deviation					2.412	1.457	.828
Range					.6 to 8.8	.3 to 6.3	2.6 to 5.3

PRESENTATION OF BASIC DATA

TABLE 9

BASIC DATA ON BLOUSES

Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)	Style No.	Conv. Est. (X_1)	Cons. Est. (X_2)	Final Sales (Y)
1	.8	1.4	4.5	43	2.3	.6	4.8
2	1.2	1.4	4.3	44	.7	.7	4.8
3	.8	1.4	4.3	45	1.6	.7	4.4
4	.9	1.4	4.2	46	1.5	.8	4.0
5.	.6	1.0	5.4	47	3.0	1.5	6.3
6	1.4	.9	5.4	48	2.7	1.1	6.3
7.	.4	.8	5.1	49	1.7	1.1	6.2
8	.4	.8	4.6	50	1.2	.7	4.7
9	2.4	1.6	5.3	51	.5	.8	4.5
10	1.7	1.3	5.1	52	1.1	.7	4.4
11	2.3	1.3	5.0	53	1.1	.7	4.4
12	.8	.9	4.7	54	.8	1.4	6.1
13	.8	1.0	4.4	55	1.0	1.4	5.7
14	.6	1.0	4.1	56	.7	1.4	5.7
15	2.6	1.4	5.1	57	1.2	1.4	5.0
16	1.6	1.5	4.1	58	1.2	1.5	4.9
17	1.4	1.4	3.6	59	1.0	1.4	4.5
18	.1	1.1	3.0	60	3.1	1.4	4.4
19	.1	1.1	3.0	61	3.6	1.5	4.0
20	.1	1.0	2.5	62	3.6	1.4	4.3
21	.1	1.1	2.5	63	2.1	1.4	5.1
22	.7	.9	4.6	64	1.2	1.5	3.9
23	.8	1.0	4.4	65	1.1	1.4	3.6
24	1.4	.6	3.1	66	.9	1.0	5.4
25	1.2	.6	2.9	67	1.0	.9	5.4
26	.6	.6	2.8	68	.2	1.2	5.5
27	.5	1.0	2.9	69	.3	1.2	5.3
28	.6	1.0	2.6	70	.6	1.4	5.0
29	.5	.9	2.5	71	.9	1.5	4.5
30	.2	.8	2.0	72	.6	1.1	2.4
31	.2	.8	1.9	73	.7	1.1	2.4
32	.3	.8	1.7	74	.7	1.1	2.4
33	.4	.5	1.4	75	.4	1.0	2.1
34	.4	1.4	1.7	76	4.4	1.0	4.6
35	.3	1.3	1.7	77	2.5	.9	4.6
36	.3	1.3	1.6	78	1.2	2.2	3.6
37	.3	1.3	1.5	79	1.0	2.6	3.2
38	1.2	4.3	5.2	80	2.3	1.2	3.5
39	.9	1.0	4.5	81	2.5	1.1	3.2
40	1.5	.8	5.5	82	4.1	3.7	3.1
41	1.4	.8	5.3	83	.5	1.5	2.2
42	1.5	.8	5.1	84	.9	1.0	3.1
Total					100.0	100.0	100.0
Mean					1.196	4.031	1.190
Std. Deviation					.562	1.285	.943
Range					.5 to 4.3	1.4 to 6.3	.1 to 4.4