AN APPRAISAL OF DR. BROOM'S TOP MANAGEMENT GAME

by

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THE UNIVERSITY OF BRITISH COLUMBIA

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ABSTRACT

The objective of the thesis is to examine Dr. Broom's Top Management Game. The examination covers the realism of model input output relationships, the cost of an application, the design structure utilized and the adequacy of the model presentation.

Before the analysis is undertaken two analytical tools are developed. The first of these is a management game typology which provides a standardized method for describing gaming models. The second tool is a two dimensional matrix which may be employed for design or analytical purposes. The rows of the matrix represent input for the current period and the columns output for the current period. In order to determine the feasibility of converting The Broom Game, to modular design, the structure of a modular game is outline.

Dr. Broom's Game, is an educational model which employs the computer to calculate the results for a period. Though the model is supposedly total enterprise the personnel function is absent. The marketing function of the model performs in a highly unrealistic manner. Also the production function is inadequate in that no attempt is made to break production into its component parts. The cost of an application is approximately two dollars. In the authors opinion it is not feasible to convert the model to modular design. Finally the administrators' presentation was found to be inadequate.
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CHAPTER I

INTRODUCTION

I. Purpose

The objective of my thesis is:

A. To describe H. N. Broom's, The Top Management Game, using analytical methods developed in the thesis;
B. To determine the realism of model input, output relationships;
C. To determine the approximate cost of an application of The Top Management Game;
D. To determine if model design is flexible enough to satisfy more than one class of application objective;
E. To evaluate the presentation of, The Top Management Game, from the viewpoint of the administrator and the participant;
F. And to review the results of the analysis and to recommend improvements where necessary.

II. Importance

The management game is one of many tools which managers may draw upon for help in research, decision making and education. Attention in this study is concentrated on the

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educational use of gaming. After the decision has been made to include a management game in an education program, the next problem is to select a game which matches the objectives of the intended application. Since this selection process is likely to be performed many times, a standard type of analysis would prove useful. One such method of analysis is developed in the evaluation of, The Top Management Game.

III. Outline of Remaining Chapters

Chapter II

The intent of Chapter II is to provide a basis on which to formulate a set of criteria with which it is possible to perform the evaluation. A beginning point in any analysis is a description of the game under study. The classification scheme introduced in the first part of the chapter is an instrument to delineate management games. The stepwise design procedures of the second part of the chapter rely heavily on this typology. Special attention is given to the input, output matrix of design for it will later prove to be a useful descriptive and analytical tool.

Chapter III

The classification scheme set out earlier is enacted at the beginning of the chapter to provide a description of The Top Management Game. Following this the input, output relationships of the model are presented with the aid of the matrix analysis. The remainder of the chapter
discusses the tests to be applied to the model at hand.

Chapter IV

The task of the final chapter is to review the results of the tests, to point out areas of failure and to recommend improvements where necessary. The Chapter closes with comments on the method of analysis employed and on gaming in general.

IV. Limitations

From his involvement with an educational gaming model, the participant is expected to receive certain knowledge about the business system and/or to develop specified managerial skills. Therefore, an evaluation of this type should include a test for measuring the attainment of these objectives. Because of the limited time available, no attempt was made to investigate the effectiveness of The Top Management Game in a formal learning situation. Again because of the time constraint, the method of analysis employed here was not extended to evaluate other educational games, which would have proven the broad applicability of the method.

V. Review of Management Games

The report assumes the reader to have had previous experience in the management game area. For those who desire to review the main aspects of gaming, a brief
outline with suggested references is given below.

**Definition**

Management games are sequential decision making exercises, whose structures are based on either general business and economic principles or on an actual situation and whose participants assume the role of a manager in the simulated system.


**History**

Gaming dates back to 3000 B.C. but it has only been in the past fifteen years that it has gained any prominence in the world of commerce. War games, operations research, role playing and cases are the foundations of management games.


**Trends**

Control System models based on regression analysis and the technique of programmed play are two trends which point towards specific firm management games which will include the total enterprise and the three levels of management.


**Applications**

The possible applications of management games are:

A. as a tool in management education

B. as an aid in the evaluation of policy

C. as an aid in selecting personnel

D. as a device for creation of a data bank
E. as a tool to assist in the development of information systems
F. and as a research tool for exploring managerial behavior in the laboratory.


Educational Value of Games

The argument on the educational value of games revolves around the laws of learning.
Administration

Proper administration of a management game is just as important as selecting a well designed model which matches the objectives of the application. Briefing and critiquing are the two most important elements of proper administration.

Costs of Management Gaming

A game which is properly designed and matches the goals of the intended application may be rejected for use, if its cost is prohibitive. The four main costs of gaming are:

A. Construction
   1. conceptual framework
   2. programming
   3. debugging
   4. documentation
B. Running
   1. calculation
   2. data preparation and storage

C. Administration
   1. facilities
   2. administrative personnel
   3. materials

D. Participants Time Value


Further reference to the topics of the outline are given in the bibliography. The aspects covered above are an integral part of the work of the next and following chapters.
CHAPTER II

CLASSIFICATION AND DESIGN

Taken together the design procedures and typology of this Chapter give the understanding necessary to formulate the measures of assessment. The classification was devised after considering the possible objectives, structures, computational methods and scope of a model.

I CLASSIFICATION

Objective

This mechanism is intended to be an initial screening device and as such it does not constitute an exhaustive appraisal. A more in depth approach follows under the heading of Design.

Typology

In order to avoid repetition an explanation of the breakdown is deferred until the next section.

Table I

A MANAGEMENT GAME

TYPOLOGY

I MODEL OBJECTIVES

A, Applications:

1. education

2. research

3. evaluation
B. Area of Organization Encompassed

1. total enterprise
   a) logistics
   b) finance
   c) marketing
   d) personnel

2. functional area
   a) logistics
   b) finance
   c) marketing
   d) personnel

C. Levels of Management Explicitly Recognized

1. top
2. control
3. operating

D. Basis for Model Relationships

1. general business and economic principles
2. specific organization

II STRUCTURE

A. Competition

1. interactive model
2. non-interactive model

B. Participant Structure

1. team
2. individual
C. Design Flexibility
   1. modular
   2. non-modular

III COMPUTATION OF RESULTS
   A. Hand
   B. Computer

IV SCOPE
   A. Degree of Complexity
      1. basic
         a) required number of decisions limited
         b) amount of output from the model limited
      2. complex
         a) required number of decisions extensive
         b) amount of output from the model extensive
   B. Model Outcomes
      1. deterministic
      2. stochastic
   C. Qualitative Factors
      1. are included within the model
      2. are introduced from outside the model.
      3. are not considered.
   D. Exogenous Factors
      1. are included
      2. are not included
E. Time Considerations

1. length of time covered by a period in the model
2. intended number of periods of play.

II DESIGN

Comment

Stages one and four of Figure I require a cost benefit analysis which is beyond the scope of the paper. The foregoing typology, the design procedures given below and the tests discussed in Chapter III do provide the techniques necessary for stages two, three, five and six.

Design Steps

The period which starts when the need for a new model arises and ends when the model becomes a reality may be divided into four segments which are:

A. Conceptual framework formulated
B. Quantify the relationships and set out the algorithm
C. Debug the model
D. Information

Emphasis here will be upon the first two areas.

A. Conceptual Framework. Definition of the model begins with a statement of goals, as is the correct procedure for the design of any system. From here each step of the framework considers the model in greater detail.
DECISION STAGES IN GAME EMPLOYMENT

FIGURE I
1. Objectives
   a) Is the model for research, educational or evaluation purposes?
   b) Is the model to encompass the total enterprise or just a functional area?
   c) If a functional area, is it logistics, finance, marketing, or personnel?
   d) Does the model include the three levels of management, top, control and operating?
   e) Are model relationships to be based on a real situation or on general business and economic principles?

2. Structure
   a) Are there interactions between the organizations and between the organizations and the economy?
   b) Is the participant structure team or individual? A team structure is usually linked with a total enterprise model and an individual structure is often found with a functional model.
   c) Will modular design be employed and thus increase model flexibility?

3. Computation
   a) Are the model calculations to be done by hand or by a computer?

4. Scope
   a) What input decisions are required and what will be
the model output?

b) Are the outcomes of the model influenced by random elements?

c) Is an attempt made to quantify qualitative factors? Are these qualitative factors built into the model structure or are they introduced as inputs during play?

d) Are exogenous factors which influence the sections of the firm but are not determined by the firms actions, included in the game?

e) What length of time does a period of play represent and what is the intended number of periods of play?

5. Model Input Output Relationships

a) The first step in specifying the input output relationships is to construct a matrix similar to that of Table II. In this matrix rows stand for input for a period and columns represent output for the period.

(1) The first division of rows and columns takes place if the organization structure of the model explicitly recognizes more than one level or management. This division is signified by blue in the Table. In the majority of games the designer ignores interactions between the three levels of management and in such instances there is no sub-division of the matrix.
TABLE II

MATRIX TO ANALYZE INPUT OUTPUT RELATIONSHIPS

A. Levels of Management
   1. top
   2. control
   3. operating

B. Symbols
   M - marketing
   L - logistics
   F - finance
   P - personnel
   E - exogenous
   D - decision inputs
   O - output of previous periods and
       this period which are inputs
       to the model.
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**Table II. A MANAGEMENT GAME MATRIX**

**Input for a Period**

**Output for a Period**
(2) Rows and columns are next subdivided into one or more of the following five areas:

(a) marketing
(b) logistics
(c) finance
(d) personnel
(e) exogenous factors

These functional divisions are indicated by green in the Table. Those areas included in the matrix correspond to the ones recognized in the model. Exogenous factors cover those events or conditions which take place in the game economy and affect the firm but are not influenced by the firm's actions within the model. Examples of these factors are the business index, strikes in the economy, or national disasters.

(3) Under each of the five above classifications the rows are again broken into two groups.

(a) decision inputs for the current period signified by orange in the Table.
(b) model output from previous periods and the current period denoted by yellow in the Table.

Under the heading of Decisions the designer lists all those decisions he desires the participants to make. The output list covers all factors desired as output
and as well should include the input decisions. This latter inclusion is done to facilitate the type of analysis put forth.

(4) Under the column breakdown for the five areas the designer lists the output he wishes from each of the recognized areas. This list corresponds to the row output list. However, these outputs are only for the current period.

(b) The second step of specifying the model input, output relationships involves the following procedures. The designer examines the intersection of each row and column and determines if a proportional, limiting, competitive time or determining relationship exists between the two factors. If one of these relationships exists the designer notes this in the cell. The cell is left blank if no relationship is found to exist. The detailed procedures are:

(1) At the intersection of a row decision input with the corresponding column output decision.

a) These cells are used to specify if there are any limits to be placed on a decision. For example a decision on advertising in each period must not go above or below a specified amount.

b) If there are limits place a capital L in the cell.
(2) At the intersection of a row decision with a column output decision which does not correspond
   a) These cells are used to specify where the effects of two decisions must be proportional.
   b) If a proportional relationship is to exist place a capital P in the cell.

(3) At the intersection of a row decision with a column output which is not a decision input.
   a) These cells are used to specify that a row decision has a determining effect on a column output.
   b) If the decision does have a determining effect place a capital D in the cell.
   c) These cells may also be used to indicate when competition exists between firms in an interactive model. This is noted by a capital C.

(4) At the intersection of a row output of a previous period with the corresponding column output of the current period.
   a) These cells are used to denote time relationships.
   b) If there exists a time relationship place a capital T in the cell.

(5) At the intersection of a row output with a column output which do not correspond.
   a) These cells are used to specify where the effects of two outputs on a column output are proportional.
b) If proportionality is to be maintained place a capital P in the cell.

(6) The intersection of a row output of the previous period that does not correspond to a column output decision.

a) These cells are used to state if the previous output has a determining effect on a current output.

b) If such a relationship exists place a capital D in the cell.

c) These cells may also be used to indicate competition between firms in an interactive model.

This is indicated by a capital C in the cell.

(7) Because some of the current period outputs are determined by other outputs of the current period it is necessary to show this in the matrix. An example of this would be sales revenue which is determined in part by the current period sales orders. There are two ways in which these types of relationships may be indicated, either by adding more rows to the matrix or by considering row output as simultaneously being output of the previous period and output of the present period. I prefer the latter scheme for it reduces the size of the matrix considerably. There should be no difficulty in doing this since these relationships may be denoted with a different color than the others.

(8) After completion of the above procedures the designer places a forty-five degree stroke through
those cells where no relationships are noted.

The conceptual framework after completion provides a foundation on which to build the detailed structure of the model. Each segment of the design procedures put forth here builds on the previous segment. This building block approach will become more apparent in the next design segment.

B. Quantifying The Relationships and Setting Out the Algorithm

Once it has been determined where relationships exist between input and output it is necessary to specify the actual relationships. This is the task of quantifying relationships. Each relationship will have a reference note or notes corresponding to it and the number of the note should be placed in the appropriate cell when the note is complete.

1. Quantifying

The task here is to specify each relationship of the matrix in algebraic terms. The complete set of specifications act as reference notes to the matrix. In order to give a logical sequence to the notes they should be divided into the functional areas recognized in the model. Cross-referencing each note to the matrix as it is completed provides a safeguard that no relationship desired in the model is excluded.
2. Algorithm
   a) The task of the designer at this point is to set the algebraic formulas in a logical order so that the output of the model may be easily computed. The order of the expressions will not differ much from that of the reference notes. As an aid it may prove helpful to flowchart the model.
   b) If the model is intended for the computer the designer must then have the program written.

C. Model Debugging

1. Steps
   a) Play the game with a group that is knowledgable in the subject areas covered by the model.
   b) Evaluate the results against the checks mentioned below.
   c) If evidence of a failure in the model appears, improve it where necessary and test again.

2. Checks
   a) Do the results approximate those of "reality"?
   b) Consider the elasticity of model relationships, do they stifle initiative?
   c) Are all correct actions rewarded?
   d) Are all incorrect actions penalized?
   e) Is it possible to get a return for investing nothing?
D. Information

1. Model Input Output
   a) Input
      (1) It is now the task of the designer to draw up the necessary decision sheets.
   b) Output
      (1) What quantity of information will the participant receive?
      (2) Will any of the feedback be distorted?
      (3) What will be the format of the feedback?

2. Administrators' Information
   a) The administrator requires an accurate description of the game.
   b) This presentation should include:
      (1) Objectives of the model.
      (2) Structure.
      (3) A list of the variables and constants.
      (4) A flowchart of the game.
      (5) Instructions on how to perform the necessary calculations or the steps necessary to set the model up for computer use.
      (6) Scope of the model.
      (7) A copy of game rules.
      (8) A sample of game input, output.
      (9) The data necessary to initialize the game.
      (10) A description of the beginning situation.
3. Participant Information
   a) The value of participating in the exercise.
   b) A sample of the opening output.
   c) A written description of the opening situation.
   d) Rules
      (1) The decisions required
      (2) The number of periods of play and the length of time covered in the model by a period of play.
      (3) Constraints placed on decisions.
      (4) When decisions are required and the length of time given to make the decisions.
   e) A sample decision sheet with instruction on how to enter decisions.
   f) The criteria on which the participants' performance will be evaluated.

The stepwise design procedures have now been completed. The points discussed in the Chapter highlight the decisions necessary to design a model. This Chapter provides the information required to construct the tests to appraise, The Top Management Game.
CHAPTER III

THE TOP MANAGEMENT GAME

DESCRIPTION AND TESTS

The Top Management Game is intended to be a supplemental learning tool to be used in conjunction with the text, Business Policy and Strategic Action, by Dr. Broom of Baylor University.²

I DESCRIPTION

Typology

The results of a comparison of, The Top Management Game with the typology of Chapter II are presented in TABLE III. It may be seen from the presentation that the Game is intended to be an educational tool to teach the participants the basic relationships that affect and take place in a business enterprise. At this stage of the analysis it may be noted that the model already fails in that it is supposedly total enterprise yet the personnel function is absent. As the analysis progresses, one of the objectives is going to be to determine if the model does represent the basic business and economic principles affecting a business organization.

TABLE III
A CLASSIFICATION OF
THE TOP MANAGEMENT GAME

I Objectives
A. Applications
1. educational

B. Area of Organization Encompassed
1. total enterprise
   a) logistics
   b) finance
   c) marketing

C. Levels of Management Recognized
1. only one level - top management

D. Basis for Model Relationships
1. general business and economic principles

II. Structure
A. Competition
1. interactive model with four firms per industry
   with no interactions between industries or an
   industry and the economy

B. Participant Structure
1. team

C. Design
2. non-modular

III Computation of Results
A. Computer
IV Scope

A. Complexity

1. basic. All four firms market the same product within five regions. Regions one, two, three and four are the home territories for firms one, two, three and four respectively and area five is common territory for all firms. A firm marketing its product in an area other than its home territory or the common area is considered to be operating in a foreign market.

a) Each team makes the following decisions each period.

1) price for each area, five decisions
2) marketing spending for each area, five decisions.
3) research and development expenditure
4) bank loans negotiated
5) bonds sold
6) bonds bought back
7) capital stock sold
8) capital stock bought back
9) dividends
10) new plant investment
11) production spending

b) The amount of output each team receives as feedback is limited. Information is not purposely distorted. Appendix IV contains
the sample output for quarter zero.

B. Model Outcome
   1. deterministic

C. Qualitative Factors
   1. are not considered

D. Exogenous Factors
   1. yes - the business index which increases eight to ten points per period to a high of 1.30 and decreases from the norm of 1.00 to a low of .70.

E. Time.
   1. a period in the model covers one quarter of a year
   2. the model is intended to be played for twelve periods.

Matrix and Reference Notes

The design procedures of Chapter II call for the designer to first do the matrix analysis and then the detailed reference notes. This procedure is reversed when analyzing an existing model—first the reference notes, then the matrix. The reference notes for the Broom Game are to be found in Appendix I. The results of the matrix analysis are found in TABLE IV. Notation devised in Chapter II is employed here. The color red denotes those cases where an output for the current period is influenced by another current period output. In doing the analysis I found the matrix helpful but I do believe its greatest benefit lies in the area of design.
The matrix is enclosed in the pocket at the end of the thesis.
II TESTS

Realism of Model Input, Output Relationships

Logistics  The reference notes and the matrix for The Top Management Game bring out the fact that production output for a given firm for any quarter is determined by the inputs of production spending, research and development spending, the business index and plant investment. The objective is to analytically determine the effect of each one of these four inputs on production output. After this is done the results are judged on the basis of how well they represent the general business and economic principles affecting a business organization. If it is found that there are discrepancies in the model in this area suggested improvements are given.

Marketing  It was found that the model output of sales orders per area for the whole industry were determined by each company's input of marketing spending, price, research and development spending and the input of the business index. Area industry sales orders are then divided on a competitive basis. In addition to analyzing the effect of each input on the output it is necessary to investigate the manner in which orders are divided between the firms.

Actual sales per firm per area are determined by an interface between the logistics and marketing functions. The total sales orders for each firm are compared to the sum of inventory on hand and production for the quarter. If
sales orders exceed available units actual sales equal this amount, otherwise actual sales per firm equal demand. A point to investigate here is the manner unfilled orders are treated.

**Finance** The inputs of the financial function are reviewed to discover their effect upon the various outputs. Particular attention is given to the outputs of unit cost, investment in plant, depreciation, methods of finance and income taxes. One point to check for is the time lags involved in new plant investment. Again the results are judged for realism and suggested improvements are recommended where necessary.

The judgements expressed here are my opinion and are based upon the understanding I have of business which stems from texts and lectures on business. Therefore since they are opinions they are open to argument. The defense I offer is that I have tried to apply common sense in making the judgements.

**Costs Incurred**

The costs incurred in gaming were outlined at the end of Chapter I. Design and development costs may be ignored by those who choose to use a game which is already developed. The appropriate cost to consider in this case is the price that must be paid for the model. The, Broom Game, cost two dollars and fifty cents American for a source and
object deck\(^3\). Also there is a cost attached to the pre-application analysis. It is my estimate that an analysis of, The Broom Game, using the methods developed here takes at least sixteen man hours.

The Broom Game, was originally written in FORTRAN II for an I.B.M. 1620 computer\(^4\). Therefore it was necessary to convert the program for use on an I.B.M. 360 Model 67 computer. On this system the program was run under an I.B.M. FORTRAN IV G level compiler. The necessary program changes were:

A. In FORTRAN IV executable statements must not extend beyond the seventy-second column of a card. It was necessary to reduce statement length for, The Broom Game.

B. It was necessary to set up a main program and sub-routines for the program.

C. In setting up the sub-routines it was necessary to rewrite the COMMON blocks.

D. Finally it was necessary to convert the program to the 360/67 key punch code. This was done by a computer supplied program.

In order to determine the approximate cost of an appli-


\(^4\) Ibid, page 117.
cation, *The Broom Game*, will be run a few times. Each run will consist of one industry made up of four firms operating in all five areas.

**Modular Design**

A modular game is one that is constructed from standardized blocks and which is suitable for a wide variety of application objectives. The standardization blocks are called modules. To be modular a game should satisfy these requirements:

A. It is a total enterprise model which is complex in scope.

B. It is a total enterprise model which is basic in scope.

C. It is a functional model which is complex in scope.

D. It is a functional model which is basic in scope.

A game which meets these specifications is illustrated in FIGURE II. The core of this model consists of eight computation blocks which make up ten different games. This model requires twenty-nine modules whereas ten separate games would require forty-six modules. The absolute saving is less than seventeen modules because the same blocks of the separate games would be smaller in size. But the savings are still substantial. It is possible that one model of this type could satisfy the complete demands of a business education program.

It is obvious from the description of, *The Broom Game*,
that it is not modular. As a result the analysis shifts to determining the feasibility of changing it to a modular model. However, no attempt is made to redesign the model.

Presentation

The Game presentation is first evaluated from the viewpoint of the administrator and then from that of the participant. The list of model information requirements which appears in the Design section of Chapter II is used as a yardstick in the analysis. Finally it was necessary to have a trial run of the model to validate the accuracy of the initializing data.
CHAPTER IV

TEST RESULTS AND CONCLUSION

I  INPUT, OUTPUT RELATIONSHIPS

Logistics

The inputs of production spending, research and development spending, business index and plant investment interact to give production output each period for each firm. The equations used in the analysis are all given in Appendix I.

Substitute equations (8) and (9) into equation (11) to get

\[ UPRO(I) = \frac{SPRO(I)}{AN} - \frac{(Z3 - (F \times EE(I) + e(I)) \times Z5 - \frac{PV\text{S}(I)}{Z2} \times Z7)}{Z3 - \frac{F \times EE(I) + E(I)}{Z4} \times Z6 - Z7} \]

Set: \[ Z3 - \frac{F \times EE(I) + E(I)}{Z4} = Y \]

and \[ \frac{PV\text{S}(I)}{Z2} = W \]

\[ UPRO(I) = \frac{1}{AN} x \frac{SPRO(I)}{Y \times Z6 - Z7} - \frac{(Y \times Z5 + W \times Z7)}{Y \times Z6 - Z7} \]

Business Index  A decrease in the business index increases production by the reciprocal of the change in the index. A decreasing index results in increasing marginal returns in production and an increasing index results in decreasing marginal returns in production. Therefore the model assumes that during a period of growing inflation a firm receives less value per dollar spent on production. This is a
reasonable assumption. In the case of decreasing levels of business activity the model assumes that a firm will receive greater value per dollar spent on production as the rate of deflation increases. This latter assumption is unreasonable in that it implies there is no floor level at which costs will stop decreasing. However, the error is not too serious for the administrator does not allow the index to fall below point seven zero.

**Research and Development**

Set: \[
\text{SPRO}(I) \times \frac{1}{AN} = A \\
\text{UPRO}(I) = A \times \frac{1}{Y \times Z6 - Z7} - \left( \frac{Z5 \times Y}{Y \times Z6 - Z7} \right) - \left( \frac{W \times Z7}{Y \times Z6 - Z7} \right)
\]

Also from the Appendix I remember that

\[
Y = 1.06 - (0.50 \times \text{EE}(I) + \text{E}(I)) \div 3600
\]

Research and development increases production by the increase in the reciprocal of a multiple of Y. Y increases as accumulated spending grows and as a result the reciprocal of a multiple of Y grows. The minimum value of Y is approximately point three six and would be obtained by spending the maximum allowable amount on research and development in each of the twelve periods. Y approaches this minimum impact number at a decreasing rate and each decrease in Y results in marginally greater returns in production. On closer examination of the formula it is evident that this influence is in the thousands of units since production is
stated in thousands of units.

At the same time as the increase takes place a certain proportion of the research and development effect is subtracted from total production. The amount is in the tens of units. The amount subtracted is equal to \[ \frac{3 \times Y}{Y \times 50 - 6} \] and it increases as \( Y \) decreases.

**Plant Investment** A percentage of plant investment is taken away from total production. The results of the reduction is in the thousand unit bracket. The amount equals

\[
\frac{W \times Z7}{Y \times Z6 - Z7} = \frac{PVS(I) \times 6}{50 \times Y - 6} = \frac{1}{10} \times \frac{PVS(I)}{50 \times Y - 6}
\]

As the effect of research and development grows the reduction in production increases. This appears to represent the difficulties encountered in trying to produce at full capacity.

If the production quantity calculated in the above formula is greater than plant capacity, production is set equal to capacity. This may occur if participants have overestimated the per unit cost for the period. A shortcoming in the model is the aggregate approach taken in the production area. No attempt is made to divide production into labor, equipment and raw materials.

**Marketing Function**

The inputs of marketing spending, research and development spending, the business index and price interact to determine product demand in each one of the five areas.
Substitute equations (31), (26) and (2) into equation (32) to get:

\[ T(J,I) = AN \times UH \times (H_1 + \text{SUMEE}) \times (A_{M1} - \frac{AN \times P(I) \times AM2}{SAJJ(I)}) \times \frac{R \times AN}{SMIN(I)} \]

OR

\[ AN \times UF \times (H_1 + \text{SUMEE}) \times (A_{M1} - \frac{AN \times P(I) \times AM2}{SAJJ(I)}) \times \frac{R \times AN}{SMIN(I)} \]

OR

\[ AN \times U5 \times (H_1 + \text{SUMEE}) \times (A_{M1} - \frac{AN \times P(I) \times AM2}{SAJJ(I)}) \times \frac{R \times AN}{SMIN(I)} \]

UH, UF, and U5 are the consumer power factors for the home, foreign and common territories respectively.

**Marketing Spending** The first point to note is what happens when a team's marketing spending exceeds the maximum allowable limit for a period. Accumulated marketing is first reduced in the firm's home territory and if the excess amount exceeds accumulated spending in this area, the cumulative amount for the common region is next decreased. If excess marketing is greater than the sum of accumulated spending in both these markets no further subtractions are done but an error message is printed. As a result of overspending a team suffers a severe penalty, and in my opinion too severe. However no matter how heavy the penalty is the treatment of excess marketing by the model should be complete. I can see no justification to nullifying the marketing influences in the home and common territories and not
touching that of the foreign territories. I do not believe that overspending can completely eradicate the effect of past decisions.

Present and past marketing expenditures are both scaled in the current period. This contrasts the treatment of research and development spending where only past decisions are scaled in the present period. It is my opinion that current marketing will have a greater effect than that assumed in the model. This may be corrected by removing the inner set of brackets in equation (24). To keep the model in balance it may be necessary to increase the value of the scaling factor.

Marketing impact for an area is determined in equation (26). \( AL(I) = \frac{(AN \times P(I) \times AM2)}{SAJJ(I)} \) This is the combined effect of accumulated marketing done by all firms in an area. The maximum possible value of \( AL(I) \) is two point zero which is the given value of \( AM1 \).

What difference will result in product demand between areas because of different amounts of marketing spending in each region?

Set: \( M = SAJJ(I) \) Spending in the region with larger total.

\[ M - D = \frac{\text{Marketing expenditures in area with smaller total of two regions.}}{\text{Marketing expenditures in area with larger total of two regions.}} \]
The difference between the two AL(I) equals
\[ AM1 - \left( \frac{AN \times P(I) \times AM2}{M} \right) - \left( AM1 - \left( \frac{AN \times P(I) \times AM2}{M} \right) \right) \]
\[ = \frac{D - M \left( \frac{AN \times P(I) \times AM2}{M} \right) + M \times \left( \frac{AN \times P(I) \times AM2}{M} \right)}{M(M - D)} \]
\[ = \frac{D \times \left( \frac{AN \times P(I) \times AM2}{M} \right)}{M(M - D)} \]

This gives the difference in AL(I) due to Marketing differences between two areas. The increment will usually be in the thousand unit range.

**Price** Price influence is determined by \( \frac{(R \times AN)}{\text{SMIN}(I)} \). It can be seen that price and demand move inversely. Price may also have the largest influence of the four inputs. The minimum price depends on one firm in the area, which contrasts the other inputs which are either area wide or industry.

**Research and Development** The influence of research and development spending is determined by \( G = H1 + \frac{\text{SUMEE}}{H2} \). The minimum impact of this expenditure is two point zero five which is the given value of \( H1 \). SUMEE is the total scaled expenditures made by all firms in the industry. The influence of this variable varies directly with expenditures.

**Business Index** Sales orders in an area increase as the index increases and decrease with the index also. The economic indicator also has a direct bearing in the price effect and an inverse bearing in the marketing influence.

Total demand in an area is created by the business index, marketing research and development and price. Price
has the greatest influence followed by the business index. The impact of research and development is greater than that of marketing which is questionable.

I disagree with the large advantage given to a firm in its home territory. This preferred position stems from the area consumer power factors. The error would be acceptable if it was not for the way sales orders in an area are divided between firms.

Division of Sales Orders The allocation of demand between firms is dealt with in equation (37) through (41). The first step is to determine if a firm's price for an area is ten per cent greater than the average price for the area. If a price does surpass this limit the firm receives no orders for that region. In my opinion this penalty is unrealistic. If the test is satisfied the following equation calculates the firm's share of market.

\[
V(I,J) = \frac{(AL(J) \times W1)}{(ALAVE)} \times \left( \frac{SAVE(J)}{S(I,J)} - W2 \right) \times \frac{(W4 + G)}{(AN \times W3)}
\]

(1) (2) (3)

Parts one and three will be the same for each firm within an area. Therefore price - part two - does the dividing of orders. Each \(V(I,J)\) for an area is expressed as a per cent of the sum of the four \(V(I,J)\)'s for the area. This percentage is then multiplied against the corresponding \(T(I,J)\) to give the sales orders for that firm for that area.

Thus as a result of the above calculation a firm which does a minimum amount of marketing in its home territory and
keeps research and development spending to a minimum will receive the greatest share of the market as long as it maintains the lowest price in the market. The one qualification on this policy is that total sales orders for the region will be smaller if the firm minimizes marketing. But this policy not only works in the home market it works in all territories. The advantage is greater in the home market because of the large home power consumer factor. In my opinion the model fails here for it seems highly unlikely that a firm's marketing efforts do not help it in obtaining sales orders. The fact that research and development do not help in capturing sales also is unrealistic.

I recommend the following changes. Multiply part one of the formula by \( AJJ(I,J) \). The ratio represents accumulated marketing for a firm in an area over the total accumulated marketing for that market. Use of this modified formula will maintain the advantage for the home firm. Multiply part three by \( EE(I) \) to allow research and development to play its part in the division of orders. The two changes should improve the performance of the model.

Another failure in the model is the treatment of backlogged orders. No attempt is made during a period to shift unfilled orders to a firm able to complete them. Nor is any attempt made to carry unfilled orders forward to the next period. To remedy this error it is necessary to alter the computer program.
The marketing function as is cannot be considered to represent reality. The Game, should not be applied at least until the recommended changes are made to the division of sales orders.

Finance

The inputs and outputs of the finance function are considerable and as a result only the critical ones are reviewed.

Depreciation The model considers depreciation to be a direct loss in available capacity rather than an accounting procedure for the allocation of plant investment to earned revenue over the economic life of the investment. Capacity will be reduced each quarter by wear and tear but this is usually compensated for by maintenance expenditures. Obsolescence is usually compensated for by new plant investment. There is no provision for maintenance spending in the model. Depreciation in the model supposedly covers both the allocation of investment and maintenance. I recommend altering the program to include maintenance spending.

Investment in New Plant As mentioned above new plant investment covers obsolescence, maintenance and expansion. The time lag of one quarter for construction seems too short and should be extended to include at least two quarters. Also the model indicates that the addition of one unit of capacity costs the same as adding two thousand units of capacity. If participants do expand plant they must invest in at least seventeen units of capacity since the decision is expressed in thousands of dollars.
Cost The cost function appears to operate in an appropriate manner. Cost per unit varies directly with the business index. A penalty is incurred for not producing to capacity and unit cost is reduced by research and development efforts. The minimum per unit cost with a given capacity is obtained by producing at that capacity.

Inventory is valued on the FIFO basis and no holding costs are assessed on inventory. Finally no administrative costs are explicitly recognized in the model.

Bonds The players instructions given in the text state: one, that there is a five million dollar limit on bond sales in any one quarter; second, that a penalty is accrued for the forced sale of bonds when forcing a firm to have a positive cash balance; and third, that there is a limit of twenty million on bonds outstanding.

No where in the program is there a test to check on the quarterly limit of bonds sold. I could find no penalty for the forced sale of bonds in the program. Finally it is possible for outstanding bonds to exceed twenty million. The error occurs when trying to establish a positive cash balance for a firm by selling bonds. The computer program catches the mistake but the only result is an error message stating that bonds are oversold. The level of business activity is represented in the bond discount but not in the rate of interest.

Capital Stock The reader should realize that it is illegal for a company in Canada to repurchase its own
capital stock. Game administrators may correct this by not allowing players the option of repurchasing. A more serious error is the absence of stock issuance costs. Stock price always remains at par value and therefore there is no opportunity for the market place to judge the companies performance. However, this is reasonable structure for a basic type game. Finally there is no penalty for the forced sale of stock as stated by the author.

Bank Loans The bank loan operates as a method of short term financing in the absence of accounts payable. The bank loan discount is a constant and does not take into account changes in the business index.

Dividends Dividends in a period are limited to one-half the previous quarters profit of a company. The author states that this is not included in the program but is to be checked by the administrator.

Accounts Receivable Collections on account vary inversely with the business index. There appears to be no difficulties in this area.

Taxes Income taxes are levied at the flat rate of forty-seven per cent. A graduated scale would be more appropriate. Finally there is no provision loss carry forwards.

II COSTS

Costs

The costs of running a program on the 360/67 system differ depending on the method of accessing the computer
the user chooses. This computer operates under the Michigan Terminal System - a time sharing system. Costs will vary depending on the priority level chosen, the number of users on the system and the mode of access.

Turn-around time may be reduced to a few minutes by employing the I.B.M. 2780 Remote Card Reader Printer Terminal located in the Statistical Center at the University of British Columbia.

The Broom Game, is best operated by storing the history and data constants in one file and the object program in another file. Then at the time of a run it would only be necessary to read in the player decisions. The present program requires Input/output changes before the history and data constants for the next quarter may be read into a file while the remaining output is printed.

The Broom Game, was run for one industry of four firms operating in five markets. These runs employed the history data, constants and decisions necessary to obtain Quarter output. Appendix III contains the initializing data. To obtain the results that the author presents I found it necessary to change the value of the constant R from sixty three to sixty five and the value of the constant Z5 from three thousand to three. The Game, was run with the object program in one file and all initializing data in another file and all output was in the form of hard cover.

The approximate cost of a run using the Remote Read Write Terminal was two dollars and fifteen cents. A run
utilizing the Front Desk Reader in the Computer Center and
given and H priority cost one dollar and fifty seven cents.
It must be remembered that these costs are for reading all
input from a file.

The administrator must also consider the cost of keep­
ing the object program on file or magnetic tape. One other
cost is that of key-punching the participant decisions.
From this superficial survey it appears that the costs of
operation are not prohibitive.

III MODULARITY

Modularity

It was stated in Chapter III that the Broom Model was
not modular in design. A decision was made to determine
the feasibility of a change to a modular format. The answer
is no, it is not possible. The effort required to redesign
the model would be better spent on a new game. Why?

The first reason for the no answer is the absence of
the personnel function. A look at production shows that it
is done on an aggregate basis. Labor and raw material
inputs are not considered separately. Such a division of
inputs is a must in a modular game. Also accounts payable
are not considered explicitly in the model. The above
reasons plus the errors found in the model previously are
the basis for the negative answer.
Administrator Information

Computer Program  Though the program has to be converted to the I.B.M. 360/67 there are still absolute errors in the program. On page one hundred and eighty six of the Teacher's Manual, the first format numbered ninety three is incorrect and there are three statements missing. The program should read:

\[
\begin{align*}
\text{WORTH} & = \text{CSTG}(I) + \text{SURP}(I) \\
\text{OPEX} & = \text{COSA}(I) + \text{SFRGT}(I) + E(I) + \text{SUMAD}(I) + Z(I) + ALOBD(I) \\
\text{OPPR} & = \text{SREV}(I) - \text{OPEX}
\end{align*}
\]

92 FORMAT (16TH OPERATING PROGIT 2XF9.0,40X,10H_ _ _ _ _ _ _ _)  
An unnecessary format statement was included in the program on page one hundred and sixty three of the Manual. It is:

\[
\text{4 FORMAT (I2,2I3,3F8.0)}
\]

Listing of Variables and Constants  The author lists variables and constants once grouped under the headings normally found on the income statement and the balance sheet and once alphabetically. It is possible to obtain an understanding of the program from these listings. However I feel that in addition to these listings a presentation of the type found in Appendix I would make the model considerably easier to understand.

--

Initializing Data  The initializing data is given in the grouped listings of variables and constants. It is presented in such a manner that it is necessary to calculate the values of some variables. One can only make the supposition that the author did this to force the administrator to work through the program calculations. As mentioned previously two mistakes were found in the initial data. I believe that more is gained by a complete listing of the opening data.

The three areas discussed above are the main failings of the Administrator's Presentation. The remaining part of the presentation appears to be adequate.

Participants Presentation

The players' presentation is quite adequate. In my opinion the outstanding feature is the attention given to the basis on which a participants' performance is evaluated. The examples given and the techniques of forecasting should be of benefit to the players. One error is the statement that a penalty is assessed on the forced sale of capital stock and bonds. No such penalty was found in the program.
The Top Management Game

It was found that the model was lacking in the marketing and finance functions. The cost of an application is approximately two dollars. In my opinion it would not be beneficial to convert the model to modular design. The Administrator's Presentation was found to be lacking. Those who intend to change the given values of constants should check that the relationships of the model remain in balance after the modification.

Method of Analysis

I found the matrix, reference note type of analysis put forth in the paper to be helpful in analyzing The Broom Game. I believe this analytical device could be improved further summarizing the information given in the matrix. This could be accomplished by adding a table which tells which of the matrix cells contains a relationship. The table could be cross referenced to the matrix by employing the $a_{ij}$ cell numbers. This would aid the reader in understanding the model. I believe the benefits of the proposed analytical method would be greater when designing a game.

Games

The business gaming field is still young. Many models have been developed to fit a variety of situations. A list
of existing models is given in, **Business Games Handbook**.\(^6\)

Not enough effort appears to be put into the creation of games with modular design at this time. The result is that the list of known models will continue to expand rapidly. The goal of designers should now be to develop models with wider applicability.

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BIBLIOGRAPHY


APPENDIX I

Appendix I contains the reference notes which are cross-referenced to the matrix of Chapter III. The notes were constructed from the computer program given in Appendix II. All formulas are written in Fortran II which should facilitate understanding of the model. At the beginning of the Appendix, an alphabetical listing of all variables and constants is given. This listing was taken from the Teacher's Manual.

ALPHABETICAL LISTING OF SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAA(5)</td>
<td>Amount spent for marketing, by areas, for entire industry (in M dollars).</td>
</tr>
<tr>
<td>AINV1(4)</td>
<td>Starting inventory for given firm and quarter (in M units) = AINV2(4) of previous quarter for given firm (per history data)</td>
</tr>
<tr>
<td>AINV2(4)</td>
<td>Ending inventory for given firm and quarter (in M units).</td>
</tr>
<tr>
<td>AITP (4)</td>
<td>Income tax paid by given firm for given quarter (in M dollars)</td>
</tr>
<tr>
<td>AITRA</td>
<td>Income tax ratio (rate paid, applicable to net profit before taxes)</td>
</tr>
<tr>
<td>AJ(4,5)</td>
<td>Amount spent for marketing, by areas, in current quarter (by company decision)</td>
</tr>
<tr>
<td>AJJ(4,5)</td>
<td>Cumulative marketing spending impact amount, in M dollars, by areas, in current quarter (this becomes necessary starting value thereof in the following quarter, read in from the history data)</td>
</tr>
</tbody>
</table>

AK          Marketing adjustment factor
AL(5)       Industry cumulative marketing impact ratio, by areas
ALAVE       Average marketing impact area ratio (all companies)
ALOBD(4)    Loss on bad debts, in M Dollars, for current quarter
ALUR        Quarterly reduction ratio applicable to starting accounts receivable
AML AM      Marketing scaling value
AM2         Marketing sales sensitivity factor
AN          Business cycle index (stated in ratio form)
ANPAT(4)    Net profit after taxes, in M dollars (minus quantity, if a net loss)
ANPBT(4)    Net profit before taxes, in M dollars (minus quantity, if a net loss) -- for given firm and quarter
ANPJ(4)     New investment in plant during given quarter, by given firm, in M dollars
ASSET       Total assets, in M dollars, for given firm and quarter (used for second computation thereof)
AUTH        Total authorized capital stock, in M dollars (same for each company)
AZ          Calculated quantity used for the figuring of UCOL(4) and BRAT(4)
BALNS       Excess of DIF over company spending for marketing in home territory (where DIF is greater than zero), if any (charged, in such case, to common territory spending--a reduction penalty)
B1CO(4)     Bond interest expense, in M dollars, for given company and quarter (paid in cash by its on the last day of the quarter)
B6          Number of companies
BEFOR       Initially calculated value of bond flotation discount = BFD(4) stored pending forced sale upward revision thereof (if firm's planned operations, as such leave a negative value for cash on hand)
BFD(4)  Bond flotation discount, in M dollars, paid by firm on first day of given quarter, upon issue and/or sale of new bonds payable (an expense and a cash disbursement item)

BFOR1  Initially calculated value of AITP(4), stored pending recalculation thereof after forced bond sales for attainment of a positive cash balance

BLDT(4)  Bank loan discount on first day of given quarter, applicable to currently negotiated bank loan, in M dollars, by given firm (a cash disbursement and an expense)

BLN(4)  Face value (in M dollars) of bank loan negotiated by given company on the first day of the given quarter—repayable in full on first day of following quarter (a cash receipt and an account payable item)

BLRP(4)  Amount of bank loan paid off on first day of given quarter, by given firm, in M dollars (at face value of prior quarter's loan)

BOR(4)  Par value of bonds paid off in cash (in M dollars) by given company on the first day of the current quarter—by company decision

BP01(4)  Bonds Payable, in M dollars, for given firm at start of given quarter, at par = BP02(4) of prior quarter (per history data)

BP02(4)  Bonds Payable, in M dollars, for given firm at end of given quarter, at par

BPS(4)  Par value of bonds sold by given firm on the first day of the current quarter, in M dollars, repayable in full 80 quarters later on first day of such quarter (but which can be bought "for the treasury" on the first day of any earlier quarter, in part or in full, at par)

BRAT(4)  Current quarter bond flotation discount rate, any company

CAP(4)  Starting plant capacity to produce, in M units, by companies, for given quarter (applicable as of first day thereof and during the entire quarter)

CASH1(4)  Starting cash, in M dollars, for given firm and quarter
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASH2(4)</td>
<td>Ending cash, in M dollars, for given firm and quarter</td>
</tr>
<tr>
<td>CDDDD(4)</td>
<td>Cash disbursements in M dollars, for given firm and quarter</td>
</tr>
<tr>
<td>CINFL</td>
<td>Net cash inflow, in M dollars, greater than or less than 0 (used for first computation thereof)</td>
</tr>
<tr>
<td>COL1</td>
<td>Collection ratio, for given quarter, applicable to the sales of that quarter</td>
</tr>
<tr>
<td>COL2</td>
<td>Collection ratio, for given quarter, applicable to the starting balance of accounts receivable</td>
</tr>
<tr>
<td>COLC</td>
<td>Correction factor, current collections on receivables, for given quarter</td>
</tr>
<tr>
<td>COSA(4)</td>
<td>Cost of goods sold in current quarter, for given company, in M dollars</td>
</tr>
<tr>
<td>COST(4)</td>
<td>Unit cost of production during given quarter, for given company, in M dollars</td>
</tr>
<tr>
<td>COSTB(4)</td>
<td>Unit cost of beginning inventory, in dollars and cents</td>
</tr>
<tr>
<td>COSTC(4)</td>
<td>Unit cost of production at capacity</td>
</tr>
<tr>
<td>COSTL(4)</td>
<td>Unit cost of production at 90% of current production level</td>
</tr>
<tr>
<td>COSTM(4)</td>
<td>Unit cost of production at 110% of current production level</td>
</tr>
<tr>
<td>CSHIN</td>
<td>Net cash inflow, in M dollars, greater than or less than 0 (used for second computation thereof)</td>
</tr>
<tr>
<td>CSHR(4)</td>
<td>Cash receipts in M dollars, for given firm and quarter</td>
</tr>
<tr>
<td>CSSC(4)</td>
<td>Capital stock sold for cash, at par value, in M dollars, by given firm, on the first day of the given quarter</td>
</tr>
<tr>
<td>CSTG(4)</td>
<td>Capital stock outstanding, at par value, in M dollars, for given firm, on the last day of the given quarter</td>
</tr>
<tr>
<td>CSTO(4)</td>
<td>Capital stock outstanding, at par value, in M dollars, for given firm, on the first day of the given quarter</td>
</tr>
</tbody>
</table>
D6  Number of areas

DIF  Excess of company spending for marketing over the limiting value of 1,800 if any (charged, if less than home territory spending, to the latter—a reduction penalty—and, if greater than home territory spending, such excess is entered as BALNS)

DIFF  Amount of subtraction item for correction of CASH2(4), with 1,000 then added thereto, after forced sale of bonds for restoration of a positive ending cash balance for the given firm

DIVS(4)  Dividends paid, in M dollars, by given company on last day of current quarter (a company decision)

E(4)  Amount spent for R & D in current quarter by given firm, in M dollars (a company decision)

EE(4)  Cumulative R & D spending impact, in M dollars, for given firm and quarter (the prior quarter value is carried over the computer from its history data, for use in computing this value for the current quarter, by firms)

EQUIT  Total equities, in M dollars, for given firm and quarter (used for second computation thereof)

EXEN  Total expenses, in M dollars, for given firm and quarter (used for second computation thereof)

F  R & D adjustment factor

FIN  FINAN

BFD(4) + B1C0(4) + BLDT(4), a first-step computation value necessary because the net profit calculation is too long, otherwise, for one arithmetic statement

FINAN  B1C0(4) + BLDT(4) + BLRP(4) + AITP(4) + DIVS(4) + REPST(4), a first-step computation value similar to FIN (facilitating the computation of cash disbursements)

FR1  Freight cost, in dollars per unit shipped in the common territory

FR2  Freight cost, in dollars per unit shipped in the 3 competing firms' home territory

FR3  Freight cost, in dollars per unit shipped in a firm's home territory
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRGT(4,5)</td>
<td>Freight cost per area, for given company and quarter, in M dollars</td>
</tr>
<tr>
<td>G</td>
<td>Industry cumulative R &amp; D impact ratio (applied to all area total orders)</td>
</tr>
<tr>
<td>H1</td>
<td>R &amp; D sales scaling value</td>
</tr>
<tr>
<td>H2</td>
<td>R &amp; D sales sensitivity factor</td>
</tr>
<tr>
<td>IA</td>
<td>Industry number</td>
</tr>
<tr>
<td>IB</td>
<td>Number of companies</td>
</tr>
<tr>
<td>IC</td>
<td>Quarter</td>
</tr>
<tr>
<td>ID</td>
<td>Number of areas</td>
</tr>
<tr>
<td>IIA</td>
<td>Card number for checking during READ IN</td>
</tr>
<tr>
<td>IPR</td>
<td>Value to test card order</td>
</tr>
<tr>
<td>J</td>
<td>Values to test card order</td>
</tr>
<tr>
<td>JINX</td>
<td>Calculation for checking card order</td>
</tr>
<tr>
<td>JPR</td>
<td>Values to test card order</td>
</tr>
<tr>
<td>KPR</td>
<td>Values for testing industry number</td>
</tr>
<tr>
<td>LPR</td>
<td>Values for testing quarter number</td>
</tr>
<tr>
<td>M</td>
<td>Company number for printout purposes</td>
</tr>
<tr>
<td>N</td>
<td>Number of output history card</td>
</tr>
<tr>
<td>NOP</td>
<td>No operation (meaning ignore the first value punched in the given cards, when used)</td>
</tr>
<tr>
<td>0000(5)</td>
<td>Sum of orders by areas, in M units, for industry, in given quarter</td>
</tr>
<tr>
<td>P(5)</td>
<td>Area normalizing factors</td>
</tr>
<tr>
<td>PPPW</td>
<td>Basic bond flotation discount rate, any company</td>
</tr>
<tr>
<td>PREV</td>
<td>Name given to old value of B1CO during recomputations connected with forced sale of bonds (for restoration of positive ending cash balance when firm's planned operations have yielded a negative ending cash)</td>
</tr>
</tbody>
</table>
PSWW Bank loan discount rate

PVE(4) Ending plant value, in M dollars, for given firm and quarter

PVS(4) Starting plant value, in M dollars, for given firm and quarter

PWWW Interest rate applicable to bonds payable, all companies

Q(5) Industry standard price impact ratio, applicable to all area total orders

R Price sales sensitivity factor

RRR1(4) Starting accounts receivables, in M dollars, for given firm and quarter = RRR2(4) of previous quarter (per history data)

RRR2(4) Ending accounts receivable, in M dollars, for given firm in current quarter

REPST(4) Capital stock purchased at par on open market, in M dollars, by given firm during given quarter

S(4,5) Company prices, by areas

SAJJ(5) Industry area sum of 4 company AJJ values, by areas, in current quarter

SAL(4,5) Company sales, in M units, in given area during current quarter

SAVE(5) Area average price -- all companies

SFRGT(4) Total freight cost, in M dollars, of given company in current quarter

SMIN(5) Minimum price of any company in a given area (i.e., minimum S(4,5) in area)

SMPR(5) Sum of area prices, all firms, for obtaining average price per area

SMSAL(4) Total sales of given company for current quarter (in M units)

SMV(5) Industry sum of area-order-getting-power factors, by companies (i.e., 5 sums of V(4,5) values)

SPRO(4) Production spending by given firm, in M dollars, for current quarter--ACTUAL
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| SPROC(4)  | Amount of production spending, in M dollars, required if a firm were to produce at capacity  
            (note that this would equal SPRO(4) if the firm selects to produce at capacity) |
<p>| SPROL(4)  | Production spending, in M dollars, at 9/10 of actual spending level, for given firm and quarter |
| SPROM(4)  | Production spending, in M dollars, at 11/10 of actual spending level, for given firm and quarter |
| SREV(4)   | Total company sales revenue, in M dollars, for current quarter               |
| SUMAA     | Industry total marketing spending, all areas, in M dollars, for current quarter |
| SUMAJ(4)  | Company total marketing spending, all areas, in M dollars, for current quarter (1 such value per company) |
| SUMAL     | Sum of 5 industry cumulative marketing impact area ratios (1 value for the industry) |
| SUMEE     | Industry sum of four company EE values, in M dollars (cumulative R &amp; D spending impact) |
| SUMOO     | Industry sum of all sales orders, in M units, for current quarter (in all areas and firms) |
| SUMWW     | Industry total sales, all areas and firms, in M dollars, for current quarter |
| SUMY(4)   | Company sales orders in all areas for current quarter (in M units)          |
| SURP(4)   | Ending company surplus (in M dollars)                                       |
| T(4,5)    | Area sales orders, in M units (computed by areas, separately, for all companies) |
| TASS      | Total assets, in M dollars, for given firm and quarter (used for first computation thereof) |
| TEQU      | Total equities, in M dollars, for given firm and quarter (used for first computation thereof) |
| TEST      | Total of starting inventory and units produced in current quarter, in thousands of units (as initially established for use in loop testing) |</p>
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEXP</td>
<td>Total expenses, in M dollars, for given firm and quarter (used for first computation thereof)</td>
</tr>
<tr>
<td>TOT(4)</td>
<td>Total of starting inventory and units produced in current quarter, in M units (second use thereof, for printout purposes)</td>
</tr>
<tr>
<td>U5</td>
<td>Area consumer power factor, common territory</td>
</tr>
<tr>
<td>UF</td>
<td>Area consumer power factor, foreign territory</td>
</tr>
<tr>
<td>UH</td>
<td>Area consumer power factor, home territory</td>
</tr>
<tr>
<td>UCOL(4)</td>
<td>Cash collected on accounts receivable, in M dollars, by given company, for given quarter</td>
</tr>
<tr>
<td>UCST</td>
<td>Unit cost, in dollars and cents, for inventory printout (a weighed average if current quarter sales are less than starting inventory, and equal to unit cost of current production otherwise)</td>
</tr>
<tr>
<td>UPRO(4)</td>
<td>Actual production in current quarter, by o companies, in M units</td>
</tr>
<tr>
<td>UPROL(4)</td>
<td>Production in M units, given company and quarter that would have been attained if operations had been at 9/10 of current quarter's actual production level</td>
</tr>
<tr>
<td>UROM(4)</td>
<td>Production in M units, given company and quarter, that would have been attained if operations had been at 11/10 of current quarter's actual production level</td>
</tr>
<tr>
<td>V(4,5)</td>
<td>Area-order-getting-power factors, by companies</td>
</tr>
<tr>
<td>VINV(4)</td>
<td>Value of ending inventory, in M dollars, for given firm and quarter</td>
</tr>
<tr>
<td>VINV(4)</td>
<td>Value of ending inventory, in M dollars, for given firm and quarter</td>
</tr>
<tr>
<td>W1</td>
<td>Share-of-market marketing impact sensitivity factor</td>
</tr>
<tr>
<td>W2</td>
<td>Share-of-market price sensitivity factor</td>
</tr>
<tr>
<td>W3</td>
<td>Share-of-market R &amp; D sensitivity factor</td>
</tr>
<tr>
<td>W4</td>
<td>Share-of-market scaling value</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>WORTH</td>
<td>Sum of capital stock outstanding and surplus, in M dollars</td>
</tr>
<tr>
<td>WWWWW(5)</td>
<td>Industry total sales in M dollars, by areas, for current quarter</td>
</tr>
<tr>
<td>Xl(4)</td>
<td>R &amp; D production impact factor (one value per company)</td>
</tr>
<tr>
<td>X(4,5)</td>
<td>Share of market ratios, by areas and companies (20 values per industry)</td>
</tr>
<tr>
<td>Y(4,5)</td>
<td>Sales orders of given company in given area, in M units, for current quarter</td>
</tr>
<tr>
<td>ZZ</td>
<td>Replacement value for UPRO(4) when cost of current capacity output must be ascertained = CAP(4)</td>
</tr>
<tr>
<td>Z1</td>
<td>Depreciation rate</td>
</tr>
<tr>
<td>Z(4)</td>
<td>Amount of depreciation for given company in current quarter, in M dollars</td>
</tr>
<tr>
<td>Z2</td>
<td>M dollar investment required to create 1,000 units of capacity</td>
</tr>
<tr>
<td>Z3</td>
<td>R &amp; D production scaling value</td>
</tr>
<tr>
<td>Z4</td>
<td>R &amp; D production sensitivity factor</td>
</tr>
<tr>
<td>Z5</td>
<td>Unit cost sensitivity factor #1</td>
</tr>
<tr>
<td>Z6</td>
<td>Unit cost sensitivity factor #2</td>
</tr>
<tr>
<td>Z7</td>
<td>Adjustment factor for company size</td>
</tr>
<tr>
<td>Z8</td>
<td>Multiplier of UPRO(4) for output at 9/10 of current actual level</td>
</tr>
<tr>
<td>Z9</td>
<td>Multiplier of UPRO(4) for output at 11/10 of current actual level</td>
</tr>
<tr>
<td>ZZZZ1</td>
<td>Cycle scaling value</td>
</tr>
<tr>
<td>ZZZZ2</td>
<td>Cycle sensitivity factor</td>
</tr>
</tbody>
</table>
PRODUCTION

1. SPR\( \phi (I) \) I = 1,--,4. The amount decided upon by each firm to spend on production in each quarter.

2. Test each decision to determine if proposed spending is less than the minimum allowable amount of $4,500,000
   \[ \text{IF} (\text{SPR}\phi (I) - 4500) 3,4,4 \]

3. If production spending is less than $4,500,000 set it equal to this amount
   \[ \text{SPR}\phi (I) = 4500 \]

4. E(I) I = 1,--,4. Research and development expenditures for each firm. A team decision.

5. Test each of the E(I)'s to see if it is greater than the maximum allowable amount of $1,250,000 for a quarter.
   \[ \text{IF} (E(I) - 1250) 7,7,6 \]

6. If the research and development expenditures for any firm for a quarter is greater than the limit set it equal to this amount
   \[ E(I) = 1250 \]

7. EE(I) I = 1,--,4. Accumulated research and development for each firm.

8. Scale the previous EE(I) and then add current E(I).
   This is done for each firm
   \[ F = .50 \quad \text{Research and development scaling factor} \]
   \[ EE(I) = F \times EE(I) + E(I) \]
9. $X_1(I) I = 1,\ldots,4$. Research and development production impact factor.

   $Z_3 = 1.06$ Research and development scaling value
   $Z_4 = 3,600$ Research and development production sensitivity factor
   $X_1(I) = Z_3 - \left(\frac{EE(I)}{Z_4}\right)$

10. $CAP(I) I = 1,\ldots,4$. Unit capacity of each firm's factory for the current quarter.

    $PVS(I) = 1,\ldots,4$ Dollar value of each plant at the start of the quarter
    $Z_2 = 60$ Dollars of plant investment required to create a unit of capacity
    $CAP(I) = \frac{PVS(I)}{Z_2}$

11. $UPR_0(I) I = 1,\ldots,4$. Number of units produced by a firm in a given period.

    $AN = $ Business index
    $Z_5 = 3,000$ Unit cost sensitivity factor No. 1. This value is incorrect and should read 3.
    $Z_6 = 50$ Unit cost sensitivity factor No. 2.
    $Z_7 = 6$ Adjustment factor for company size.

    $UPR_0(I) = \left(\frac{(SPRO(I)/AN) - (X_1(I) * Z_5) - CAP(I)* Z_7)}{(X_1(I)* Z_6) - Z_7}\right)$

    $UPR_0(I) = \text{FLOAT (INT (UPR_0(I) + .5))}$

    The calculated value of $UPR_0(I)$ is tested against capacity. If greater than capacity $UPR_0(I)$ is set equal to capacity.
MARKETING

Creation of Demand

12. \( A(J,I) \) \( J = 1,\ldots,4; \ I = 1,\ldots,5. \) The decision by each firm to spend \( M \) dollars on marketing in the given quarter.

13. \( \text{SUMAJ}(I) \) \( I = 1,\ldots,4. \) Total marketing expenditures in a period for each company.

14. Test each \( \text{SUMAJ}(I) \) to determine if it exceeds the maximum limit of \( 1,800,000. \)

\[
\text{IF} (\text{SUMAJ}(I) - 1800) > 0 \quad 14,24,15
\]

15. If greater than \( 1,800,000 \) determine the size of the excess.

\[
\text{DIF} = \text{SUMAJ}(I) - 1800
\]

16. \( AJJ(J,I) \) \( J = 1,\ldots,4; \ I = 1,\ldots,5. \) Cumulative amounts of marketing from previous periods for each area.

17. Test to see if excess is greater than cumulative marketing in home area for that firm

\[
\text{IF} (\text{DIF} - AJJ(J,J) > 0) \quad 18,18,19
\]

18. If excess is less than home territory cumulative marketing subtract the excess from this total.

\[
AJJ(J,J) = AJJ(J,J) - \text{DIF}
\]

GO TO 24

19. If excess is greater than home territory cumulative marketing set \( AJJ(J,J) = 0. \)
20. Determine how much greater the excess is than home territory cumulative spending,

\[ \text{BALNS} = \text{DIF} - \text{AJJ}(J,J) \]

21. Next subtract BALNS from cumulative marketing of common territory.

22. Determine if BALNS is greater than cumulative marketing of common area.

\[ \text{IF}(\text{AJJ}(J,5)) \]

23. If BALNS is greater than total of common an error message is printed.

24. Add current marketing for each area to the cumulative marketing for that area and then scale the total.

\[ \text{AK} = 60 \quad \text{Marketing adjustment factor} \]

\[ \text{AJJ}(J,I) = \text{AK} \ast (\text{AJJ}(J,I) + \text{AJ}(J,I)) \]

25. \( \text{SAJJ}(I) \ I = 1,\ldots,5 \). The sum of cumulative marketing to date for each area.

\[ \text{SAJJ}(I) = \text{SAJJ}(I) + \text{AJJ}(J,I) \]

26. \( \text{AL}(I) \ I = 1,\ldots,5 \). Industry cumulative marketing impact ratio for each area.

\[ \text{AM1} = 20 \quad \text{Marketing sales scaling factor.} \]

\[ \text{AM2} = 50 \quad \text{Marketing sales sensitivity factor.} \]

\[ \text{P}(I) = 1.25 \text{ for foreign and home territories} \]

\[ = 2.62 \text{ for common territory} \]

These are area normalizing factors

\[ \text{AN} = \text{Business index} \]
27. \(S(J,I) \quad J = 1,--,4; I = 1,--,5.\) Price decision for each area for each firm.

- \(SMIN(I) \)  Minimum price for each area
- \(SMIN(I) = S(1,I)\)
- \(DO\ 80\ I = 1,5\)
- \(DO\ 80\ J = 1,4\)
- \(IF(SMIN(I) - S(J,I)) 80,80,28\)
- \(28SMIN(I) = S(I,J)\)
- \(80CONTINUE\)

28. \(Q(I) = I = 1,--,5.\) Area price standard impact ratio.

- \(R = 63\) Price sales sensitivity factor. The value of \(R\) should be 65.
- \(Q(I) = (R \times AN)/SMIN(I)\)

29. \(EE(I) \quad I = 1,--,4.\) Cumulative research and development expenditures for each firm. Use the same value here for \(EE(I)\) as calculated in note (8).

30. \(SUMEE\) Sum of four \(EE(I)\) values.

- \(DO\ 100\ I = 1,4\)
- \(100\ SUMEZ = EE(I) + SUMEE\)

31. \(G\) Industry research and development impact ratio.

- \(H1 = 2.05\) Research and development sales scaling value.
- \(H2 = 8000\) Research and development sales sensitivity factor.
- \(G = H1 + SUMEE/H2\)

32. \(T(J,I) \quad J = 1,--,4; I = 1,--,5.\) Sales orders for each area. Each firm competes for the orders in an area.
UH = 75  Consumer power factor home area.
U5 = 68  Consumer power factor common area.
UF = 33  Consumer power factor foreign area.

\[ T(J,I) = AN \times UH \times G \times AL(I) \times Q(I) \]
\[ = AN \times U5 \times G \times AL(I) \times Q(I) \]
\[ = AN \times UF \times G \times AL(I) \times Q(I) \]

There are twenty values calculated altogether. The \( T(J,5) \) values for the common area are the same. However in the other four regions this is not the case. The \( T(J,I) \) values for the foreign firms are equal but the value for the home firm is greater. The reason for this difference is the consumer power factor.

DIVISION OF SALES ORDERS

33. SMPR(I)  \( I = 1,5 \). Sum of four prices for each region of the industry.
34. SAVE(I)  \( I = 1,5 \). Average price for each area.
   DO 87 I = 1,5
   87 SAVE = SMPR(I)/4
35. SUMAL  Sum of area marketing impact ratios.
   DO 88 I = 1,5
   88 SUMAL = AL(I) + SUMAL
36. ALAVE  Average of area marketing impact ratios.
   ALAVE = SUMAL/5
37. Determine if a company's price in an area is ten per
cent greater than area average price.

\[ W_2 = 90 \text{ Share of market price sensitivity factor} \]

\[
\text{DO 89 } I = 1,4 \\
\text{DO 89 } J = 1,5 \\
\text{IF}(\text{SAVE}(I)/S(I,J) - W_2) 11,11,89 \\
11 \text{ V}(I,J) = 0 \\
89 \text{ CONTINUE}
\]

\[ V(I,J) \text{ area order getting power factor. It is set equal to} \]
\[ \text{zero if a firm's price is ten per cent or more greater than} \]
\[ \text{the average price for the area.} \]

38. If price was within the given limit \( V(I,J) \) is calculated according to the following equation.

\[ W_1 = 10 \text{ Share of market marketing impact} \]
\[ \text{sensitivity factor} \]
\[ W_3 = 10000 \text{ Share of market research and development sensitivity factor} \]
\[ W_4 = 90 \text{ Share of market scaling value.} \]

\[
V(I,J) = (\text{AL}(J)/\text{ALAVE} * W_1) * \\
(SAVE(J)/S(I,J) - W_2) * \\
(W_4 + G/(AN W_3))
\]

39. \( \text{SMV}(J) \) \( J = 1,---,5 \). Sum of \( V(I,J) \)'s for each area.

\[
\text{SMV}(J) = \text{SMV}(J) + V(I,J)
\]

40. \( X(I,J) \) Express \( V(I,J) \) as a per cent of sum of region \( V(I,J) \)'s.

\[
X(I,J) = V(I,J)/\text{SMV}(J)
\]

41. \( Y(I,J) \) \( I = 1,--,4; J = 1,---,5 \). The actual sales
orders for each firm per region.

\[
\text{DO 140 I} = 1, 4
\]
\[
\text{DO 140 J} = 1, 5
\]
\[
Y(I, J) = X(I, J) \times T(I, J)
\]
\[
140 \ Y(I, J) = \text{FLOAT}(\text{INT}(Y(I, J) + .5))
\]

42. \( \text{SUMY(I)} \ I = 1, --, 4. \) The sum of sales orders for five areas for each firm.

\[
\text{DO 90 I} = 1, 4
\]
\[
\text{DO 90 J} = 1, 5
\]
\[
90 \ \text{SUMY(I)} = \text{SUMY(I)} + Y(I, J)
\]

43. Marketing interfaces with production to determine actual sales.

\[
\text{UPRO(I)} \ I = 1, --, 4. \ \text{Production for a firm for period.}
\]
\[
\text{AINV1(I)} \ I = 1, --, 4. \ \text{The inventory at the beginning of a period for each firm.}
\]

44. \( \text{TEST} \) The sum of beginning inventory plus production for the period for a firm.

\[
\text{TEST} = \text{AINV1(I)} + \text{UPRO(I)}
\]

45. Determine if a company's sales orders are greater than \( \text{TEST} \)

\[
\text{IF (SUMY(I) - TEST)} 46, 46, 47
\]

46. If sales orders are less than or equal to the available units, set actual sales for each area of the firm equal to sales orders for each area of the firm.
SAL(I,J)  Actual sales orders per area per firm 
SAL(I,J) = Y(I,J)
SMSAL(I)  I = 1,--,4. Total actual sales for a firm. In this case SMSAL(I) equal total orders in the firm.

47. If sales orders for the firm exceed available units reduce that firm's orders in each area by the ratio of available units to total required units.

\[
SAL(I,J) = ((AINVI(I) + UPRO(I))/SUMY(I) * Y(I,J))
\]

Total actual sales in this case equal the available units

\[
SMSAL(I) = AINV1 + UPRO(I)
\]

48. AINV2(I)  I = 1,--,4. Ending inventory for period for each firm.

\[
TEST = AINV1(I) + UPRO(I)
\]

Determine if there is an ending inventory by comparing available units to total actual sales.

\[
IF(SMSAL(I) - TEST) 50,49,49
\]

49. If the available units are less than actual sales orders set ending inventory equal to zero.

\[
ZINV2(I) = 0
\]

50. If available units are greater than or equal to actual sales subtract total sales from available units to calculate ending inventory.

\[
AINV2(I) = AINV1(I) + UPRO(I) - SMSAL(I)
\]
FINANCE

51. PVS(I) I = 1,--4. M dollar investment in plant at start of period.

52. Z(I) I = 1,--4. Dollar amount of depreciation for each firm for the period.
   \[ Z(I) = 0.04 \] Quarterly depreciation rate.
   \[ Z(I) = Zl * PVS(I) \]

53. PVE(I) I = 1,--4. M dollar investment in plant at the end of the quarter.
   ANPJ(I) I = 1,--4. Company decision to invest M dollars in new plant.
   \[ PVE(I) = PVS(I) - Z(I) + ANPJ(I) \]

Note: Depreciation and investment do not influence the available capacity this period but rather that of the next quarter.

54. COST(I) I = 1,--4. Unit cost of production for each firm for a given period and is expressed in dollars and cents.
   \[ COST(I) = AN * (((X1(I) * (Z6 + Z5/UPRO(I) + ((CAP(I) - UPRO(I)) / (UPRO(I) * Z7) \]

55. VINVB(I) I = 1,--4. M dollar value of beginning inventory for the period.
   VINV(I) I = 1,--4. M dollar value of ending inventory for the period.
56. Determine if actual sales for the firm are less than beginning inventory.

\[ \text{IF}(\text{SMSAL}(I) - \text{AINV1}(I)) \]

57. \( \text{VINV}(I) = (\text{AINV2}(I) \times \text{COST}(I)) \)

The value of ending inventory if actual sales for the firm are greater than or equal to beginning inventory.

58. \( \text{VINV}(I) = \text{VINB}(I) \times (\text{L0} - \text{SMSAL}(I)/\text{AINV1}(I) + \text{UPRO}(I) \times \text{COST}(I)) \)

Value of ending inventory if period sales are less than the beginning inventory for the firm.

59. \( \text{UCST} \) Unit cost of ending inventory in dollars and cents. Test to see if ending inventory is greater than period production.

\[ \text{IF}(\text{AINV2}(I) - \text{UPRO}(I)) \]

60. \( \text{UCST} = \text{COST}(I) \) Dollar and cents value of unit of ending inventory if ending inventory is less than or equal to the quarter production.

61. \( \text{UCST} = \text{VINV}(I)/\text{AINV2}(I) \) Dollar and cents value of an unit of ending if ending inventory is greater than the quarterly production. This is the weighted average of unit cost of beginning inventory and the unit cost of the quarterly production.

62. \( \text{SREV}(I) \quad I = 1,\ldots,4 \). Sales revenues for each firm for a given period. It is calculated by multiplying the
actual sales of each area by the price set for that area and then adding these products together for each firm.

\[
SREV(I) = SREV(I) + S(I,J) \times SAL(I,J)
\]

63. \(FRGT(I,J)\) \(I = 1,\ldots,4; J = 1,\ldots,5\). Freight cost for each area for each company.

\[SFRGT(I) \quad I = 1,\ldots,4.\] Total quarterly freight cost for each firm.

- \(FR1 = 3\) Freight cost in dollars for each unit shipped to the common region.
- \(FR2 = 2\) Freight cost in dollars for each unit shipped to the foreign territories.
- \(FR3 = 1\) Freight cost in dollars per unit shipped to the home market.

\[
DO \ 400 \ I = 1,4 \\
DO \ 210 \ J = 1,5 \\
IF(J-5), 300,310,310 \\
300 \ IF(I-J) \ 305,306,305 \\
305 \ FRGT(I,J) = FR2 \times SAL(I,J) \ Foreign\ Freight \\
GO \ TO \ 307 \\
306 \ FRGT(I,J) = FR3 \times SAL(I,J) \ Home\ Freight \\
GO \ TO \ 307 \\
310 \ FRGT(I,J) = FR1 \times SAL(I,J) \ Common\ Freight \\
307 \ SFRGT(I) = SFRGT(I) + FRGT(I,J) \\
210 \ CONTINUE \\
400 \ CONTINUE
\]

64. \(ALOBD(I)\) \(I = 1,\ldots,4\). Loss on bad debts in M dollars for the quarter. Calculated on the starting accounts.
receivable for the quarter.

RRR1(I) \( I = 1, \ldots, 4 \). Starting accounts receivable for the quarter in M dollars.

\[
ALUR = .01 \quad \text{Reduction rate used for calculating loss on bad debts.}
\]

\[
ALOBD(I) = ALUR \times RRR1(I)
\]

65. Test to see if sales revenue is zero.

\[
IF(SREV(I) \neq 0, 65, 65, 66)
\]

UCOL(I) \( I = 1, \ldots, 4 \). M dollars collected on accounts receivable for this quarter for each firm. This formula covers the situation where sales revenue equals zero.

\[
UCOL(I) = RRR1(I) - ALOBD(I)
\]

66 a. AZ Is an adjustment multiplier for collections on accounts receivable.

\[
AN \quad \text{Business index}
\]

\[
ZZZ1 = 1.00 \quad \text{Cycle scaling value}
\]

\[
ZZZ2 = 20 \quad \text{Cycle sensitivity factor}
\]

\[
AZ = ZZZ1 - \frac{AN}{ZZZ2}
\]

66b. UCOL(I), \( I = 1, \ldots, 4 \). M dollars collected on receivables this quarter. The formula covers the situation of a positive sales revenue.

\[
COL1 = .60 \quad \text{Collection ratio, applicable to sales of the quarter.}
\]

\[
COL2 = .98 \quad \text{Collection ratio, applicable to starting accounts receivable.}
\]
COLC = 40  Correction factor for collections on receivables.

UCOL(I) = (COL1 * SREV(I)) + (COL2 * RRR1(I) + COLC) * AZ

67. RRR2(I)  I = 1,—,4. Ending accounts receivable for each firm for the period.
    RRR2(I) = RRR1(I) + SREV(I) + ALOBD(I) - UCOL(I)

68. REPST(I)  I = 1,—,4. Decision to repurchase M dollars of a capital stock for a given firm.

69. Test to see if repurchased capital stock exceeds the quarterly limit of $1,000,000.
    IF(REPST(I) - 1000) 997,997,995.
    995 REPST(I) = 1000

70. BOR(I)  I = 1,—,4. The decision to payoff M dollars of bonds this quarter.

71. Test the decision to payoff M dollars of bonds to see if it exceeds outstanding bonds and if it is greater than the period limit of $5,000,000.
    BP01(I)  I = 1,—,4. M dollars of bonds outstanding at the beginning of the quarter.

    DO 993 I = 1,4
    IF(BOR(I) - BP01(I)) 994,994,995
    995 BOR(I) = BP01(I)
    994 IF(BOR(I) - 5000) 993,993,992
    992 BOR(I) = 5000
    993 CONTINUE
72. CSTO(I) I = 1,--,4. M dollars of capital stock outstanding at par value.

73. AUTH $22,000,000 authorized capital stock.

74. Test to determine if outstanding capital stock equals authorized capital stock. If it does set capital stock sold this quarter equal to zero.

CSSC(I) I = 1,--,4. Decision to sell M dollars of capital stock this quarter.

DO 701 I = 1,4
IF (AUTH - CSTO(I)) 700,700,701
800 CSSC(I) = 0
701 CONTINUE

75. BLN(I) I = 1,--,4. Decision to negotiate a bank loan for M dollars this quarter.

76. Test to determine if the negotiated loan is greater than limit of $2,000,000. If it is set the loan equal to the limit.

DO 703 I = 1,4
IF (BLN(I))- 2000 703,704,704
704(BLN(I)) = 2000
703 CONTINUE

77. BPO2(I) I = 1,--,4. Bonds payable in M dollars, for given firm at end of given quarter, at par.

BPS(I) I = 1,--,4. Par value of bonds sold by a firm on the first day of a quarter. Repayable in eighty
quarters but are callable on the first day of any quarter.

\[ BP02(I) = BP01(I) + BPS(I) + BOR(I) \]

78. The next job is to determine if the bonds sold this quarter put the firm beyond its limit of $20,000,000.

\[
\begin{align*}
& \text{DO 791 } I = 1, 4 \\
& \text{IF } (BPS(I) \text{ 791}) \text{, 791, 708} \\
& \text{708 IF } (BP02(I) - 20000) \text{ 791, 791, 709} \\
& \text{709 BPS(I) = BPS(I) - (BP02(I) - 20,000)} \\
& \text{IF } (BPS(I)) \text{ 710, 791, 791} \\
& \text{710 PRINT 910, I} \\
& \text{910 FORMAT} \\
& \text{791 CONTINUE}
\end{align*}
\]

79. CSHR(I) \( I = 1, --, 4 \). Cash receipts in M dollars for a given company

\[ CSHR(I) = UCOL(I) + CSSC(I) + BLN(I) + BPS(I) \]

80. BRAT(I) \( I = 1, --, 4 \). Current quarter bond flotation discount rate any company.

\[ \begin{align*}
& \text{AZ Adjustment multiplier see note (65)} \\
& \text{PPPW = .08 basic bond flotation discount rate any company} \\
& \text{BRAT(I) = AZ * PPPW}
\end{align*} \]

81. BFD(I). \( I = 1, --, 4 \). Discount on bond sale for given company for this quarter.

\[ BFD(I) = BRAT(I) * BPS(I) \]
82. **BICO(I)**  \( I = 1, \ldots, 4 \). Interest expense on bonds outstanding for a given company at the end of any quarter.

\[
\text{PWWW} = .015 \quad \text{quarterly interest rate}
\]

\[
\text{BICO(I)} = \text{BPO2(I)} \times \text{PWWW}
\]

83. **BLDT(I)**  \( I = 1, \ldots, 4 \). Bank loan discount on first day of given quarter applied to the loan for the period.

\[
\text{PSWW} = .0175 \quad \text{bank loan discount rate}
\]

\[
\text{BLDT(I)} = \text{BLN(I)} \times \text{PSWW}
\]

84. **SPROC(I)**  \( I = 1, \ldots, 4 \). Amount of production spending in M dollars, required if a firm were to produce at capacity. **SPROC(I)** equals **SPRO(I)** if the firm does produce at capacity.

\[
\text{SPROC(I)} = \text{AN} \times (\text{CAP(I)} \times (\text{X1(I)} \times \text{Z6} - \text{Z7}) + \\
(\text{X1(I)} \times \text{Z5} + \text{CAP(I)} \times \text{Z7}) - \text{CAP(I)})
\]

\[930 \quad \text{SPRO(I)} = \text{SPROC(I)}\]

85. **COSA(I)**  \( I = 1, \ldots, 4 \). Cost of goods sold for a given firm.

\[
\text{COSA(I)} = \text{VINVB(I)} + \text{SPRO(I)} - \text{VINV(I)}
\]

86. **FIN**. Costs of debt financing for a given quarter and firm. Note this is a first step calculation.

\[
\text{FIN} = \text{BFD(I)} + \text{BICO(I)} + \text{BLDT(I)}
\]

87. **ANPBT(I)**  \( I = 1, \ldots, 4 \). Initial calculation of net profit before taxes. It is necessary to recalculate profit before taxes if the firm has a negative cash balance.
ANPBT(I) = SREV(I) - COSA - SFRGT(I) + E(I) + SUMAJ(I) + ALOBD(I) - FIN

88. For tax purposes determine if a net profit was earned.

    IF ANPBT(I) 89,89,91

89. AITP(I) I = 1,--4. Income taxes on profits for this quarter.

    AITP(I) = 0 If no profit was earned.

90. ANPAT(I) I = 1,--4. Profit after taxes for a given firm for the current period. If no profit was made set profit after taxes to profit before taxes.

    ANPAT(I) = ANPBT(I)

91. If a profit was made calculate income taxes.

    AITRA = .47 is the tax rate.

    AITP(I) = AITRA * ANPBT(I)

92. Calculate profit after tax

    ANPAT(I) = ANPBT(I) - AITP(I)

93. FINAN The first part of the calculation of cash disbursements.

    FINAN = BICO(I) + BLDT(I) + BLRP(I) + AITP(I) +DIVS(I) + REPST(I)

    BLRP(I) I = 1,--4. Entire M dollars of bank loan of previous period paid off on the first day of the current quarter.

    DIVS(I) I = 1,--4. M dollars of dividends paid on the last day of the current quarter.
94. \( \text{CDDD}(I) = 1,\ldots,4 \). The second part of cash disbursements.

\[
\text{CDDD}(I) = \text{SPRO}(I) + \text{SFRGT}(I) + E(I) + \text{SUMAJ}(I) \\
+ \text{ANPJ}(I) + \text{BOR}(I) + \text{BFD}(I) + \text{FINAN}
\]

95. \( \text{CASH2}(I) = 1,\ldots,4 \). M dollars cash balance at the end of the period.

\( \text{CASH1}(I) = 1,\ldots,4 \). M dollars cash balance at the beginning of the period.

\[
\text{CASH2}(I) = \text{CASH1}(I) + \text{CSHR}(I) - \text{CDDD}(I)
\]

96. \( \text{CSTG}(I) = 1,\ldots,4 \). Calculation of outstanding capital stock at the end of the quarter.

\[
\text{CSTG}(I) = \text{CSTO}(I) + \text{CSSC}(I) - \text{REPST}(I)
\]

97. It is necessary to test the ending cash balance to determine if it is negative.

\[
\text{IF}(\text{CASH2}(I))
\]

98. If the ending cash balance is negative, capital stock is sold first and then bonds. Since neither capital stock nor bonds are to be oversold it is necessary to test if they are at the limit.

\[
\text{IF}(\text{AUTH} - \text{CSTG}(I))
\]

99. If the ending cash balance is negative and capital stock is under limit then the following steps are followed.

\[
\text{IF}(\text{CASH2}(I))
\]

\[
\text{IF}(\text{AUTH} - \text{CSTG}(I))
\]

\[
\text{CSTG}(I) = \text{CSTG}(I) + 1000
\]
CSSC(I) = CSSC(I) + 1000
CASH2(I) = CASH2(I) + 1000
GO TO 979

100. The following steps cover the forced sale of bonds.

IF BP02(I) - 20000 982,101,101

982 BP02(I) = BP02(I) + 1000
BPS(I) = BPS(I) + 1000
BEFOR = BFD(I)
AZ = ZZZ1 - (AN - ZZZ1)/ZZZ2
BRAT = AZ * PPPW
BFD(I) = BPS(I) * BRAT
PREV = BICO(I)
BICO(I) = BP02(I) * PWWW
BFOR1 = AITP(I)
ANPBT(I) = ANPBT(I) - (BFD(I) - BEFOR) -
(BICO(I) - PREV)
CDDD(I) = CDDD(I) + (BFD(I) - BEFOR) + (BICO(I) - PREV)

IF (ANPBT(I)) 983,983,984

983 AITP(I) = 0
ANPAT(I) = ANPBT(I)
GO TO 986

984 AITP(I) = AITRA * ANPBT(I)
ANPAT(I) = ANPBT(I) - AITP(I)

986 DIFF = BFD(I) - BEFOR + (BICO(I) - PREV)
CASH2(I) = CASH2(I) - (AITP(I) - BEFOR) + 1000 - DIFF
CSHR(I) = CSHR(I) + 1000

IF CASH2(I) 100,101,101

101. CSTO(I) = CSTG(I)
    SURP(I) = SURP(I) + ANPAT(I) - DIVS(I)
    The opening surplus and capital stock balances, are calculated for the next quarter.

102. DIV(I) I = 1,--4. Dividends paid by a firm. They are limited to one half the profits of the previous quarter. This is not checked by the computer but is instead the job of the administrator.
Appendix II contains the computer program for The Top Management Game. The listing that appears here is operative for the I.B.M. 360/67 computer. The program contains the changes presented in Chapter III. In addition to these changes two statements were added to the program. Because the majority of totals contained in the output are stated in thousands it was necessary to round off sales orders and production. The two statements are:

\[
\text{UPRO}(I) = \text{FLOAT} \left( \text{INT} \left( \text{UPRO}(I) + .5 \right) \right)
\]

\[
\text{Y}(I,J) = \text{FLOAT} \left( \text{INT} \left( \text{Y}(I,J) + .5 \right) \right)
\]
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, CSE10, EE(4), F, FR1, FR2, FR3, HI, H2, IA, IB, IC, ID, P(5), PPPW, PSWH, PW2W, R, SURP(4), UH, UF, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZZZ1,
3ZEM, Q(5), SAJJ(5), G, BOR(4), BPOI(45), BPS(4), RRR1(4), AINV1(4),
4PVS(4), AJ(4,5), ANPJ(4), BLPN(4), CASHI(4), E(4), S(4,5), SPROC(4),
5SUMAJ(4), SMIN(5), FILL(59), SPROC(5), T(4,5), AL(5), COSTB(4),
COMMON CSSC(4), DIVS(4), REPS(4),
COMMON VINVB(4), X(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), CLAP(4), COST(4), SAL(4), SREV(4), SUMY(4), UP(4), Z(4), ZZZZ2,
B6 = IB
D6 = ID
READ DATA FROM PAST QUARTER AND CHECKS INPUT ORDER
DO 10 I = 1, IB
READ(5,1) IPR, J, IIA, AJJ(I,1), AJJ(I,2), AJJ(I,3),
XAJJ(I,4), AJJ(I,5)
JPR = 0.
18 READ(5,3) IPR, J, IIA, PVS(I), AINV1(I), RRR1(I),
XEE(I), BPOI(I), COSTB(I)
JPR = 1
21 READ(5,3) IPR, J, IIA, CASHI(I), SURP(I), VINVB(I),
XST0(I), BLRP(I)
CONTINUE
22 DO 30 I = 1, IB
READ(5,3) IPR, J, IIA, E(I), AJI(1), AJI(2), AJI(3),
XAJI(4), AJI(5)
JPR = 3
23 READ(5,3) IPR, J, IIA, S(I,1), S(I,2), S(I,3),
XSI(I,4), SSI(I,5), SPROC(I)
24 READ(5,3) IPR, J, IIA, BLPN(1), BPS(I),CSSC(I), ANPJ(1),
XBOR(I), REPS(I), DIVS(I)
CONTINUE
GO TO 100
25 Jinx = 3 * I + JPR + 4
GO TO 27
26 Jinx = 2 * I + JPR + 12
27 PRINT 6, Jinx
COMPILER MAIN 04-21-70 10:20:14 PAGE 0002

C CARD IN WHICH ERROR OCCURS
6 FORMAT(31HINPUT CARDS IMPROPERLY ORDERED, 2X20HERROR OCCURS IN CARD XDI3)
C PRINT OUT DATA FOR ADMINISTRATOR
100 PRINT 41, IA, IC
41 FORMAT(10X33HADMINISTRATOR S PRINTOUT PAGE ONE, 5X8HINDUSTRY, 1X4,
1X5HQUARTER(4///))
PRINT 42
42 FORMAT(15X20HBEUGI.NING AJJ VALUES)
PRINT 43
43 FORMAT(7HCOMPANY8X1H1,8X1H2,8X1H3,8X1H4)
DO 110 I=1,5
110 PRINT 44, I, AJJ(1, I), AJJ(2, I), AJJ(3, I), AJJ(4, I)
44 FORMAT(4H AREAI3,4F9.0)
PRINT 45
45 FORMAT(/)
C C TASK 1 RESEARCH AND MARKETING
  C CALCULATES CUMULATIVE R AND D IMPACT IN CURRENT QUARTER BY COMPANY
  C SUMEE=0.0
  DO 40 I=1, IB
  C TEST FOR AMOUNT ON R AND D TO KEEP IT EQUAL OR LESS THAN 1250.
  998 E(I) = 1250.
  999 IF(EE(I) - 1250.) > 998, 999, 998
  C TEST REPURCHASED STOCK TO SEE IF EXCEEDS MAXIMUM OF $1000.
  999 IF(REPST(I) - 1000.) > 999, 999, 999
  C TESTS TO SEE IF BONDS REPURCHASED ARE LESS THAN BONDS OUTSTANDING
  C AT FIRST OF THIS PERIOD.
  996 REPST(I) = 1000.
  997 IF(BOR(I) - BP01(I)) > 997, 997, 996
  C IF REPURCHASED BONDS ARE GREATER THAN OUTSTANDING BONDS,
  C SET REPURCHASED EQUAL TO OUTSTANDING.
  995 BOR(I) = BP01(I)
  C TEST TO SEE IF BONDS REPURCHASED ARE GREATER THAN MAXIMUM ALLOWED
  C FOR ONE PERIOD ($5000.)
  994 IF(BOR(I) - 5000.) > 994, 994, 992
  C IF GREATER THAN $5000., REDUCE TO $5000.
  992 BOR(I) = 5000.
  C TEST TO SEE IF AMOUNT SPENT ON PRODUCTION IS LESS THAN $4500.
  C FORCE COMPANY TO SPEND AT LEAST $4500. ON PRODUCTION
  993 IF(SPRO(I) - 4500.) > 993, 990, 990
  991 SPRO(I) = 4500.
  990 SUMAJ(I) = 0.
  EE(I) = F * EE(I) + E(I)
  C CUMULATIVE R AND D TOTAL
  40 SUMEE = SUMEE + EE(I)
  C CUMULATIVE INDUSTRY R AND D IMPACT RATIO
  G = H1 + SUMEE/ H2
  DO 50 J = 1, IB
  DO 50 I = 1, ID
  C ADDS ALL 5 AREA DECISIONS TOGETHER FOR EACH COMPANY GIVING 4 SUMS
  50 SUMAJ(J) = SUMAJ(J) + AJ(J, I)
      CALL A
      CALL B
CALL C
CALL D
CALL EEEE
CALL FFFF
CALL GGGG
CALL H
CALL I1
CALL I2
CALL JJJJ
CALL K
CALL L
CALL M
CALL N
STOP
END

Y REQUIREMENTS 000AA6 BYTES
SUBROUTINE A

C DR BROOM'S MANAGEMENT DECISION GAME (A) PART TWO

COMMON AITRA, AJJ(4, 5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, CO
1LC, CSTD(4), EET(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
2WW, R, SURP(4), UH, UF, USW, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZ1,
3ZZZ2, Q(5), SAJJ(5), G, BOR(4), BP01(45), BPS(4), RRR1(4), AINV1(4),
4PV5(4), AJ(4, 5), ANPJ(4), BLN(4), CASH1(4), E(4), S(4, 5), SPRO(4)
5, SUMAJ(4), SMIN(5), FILL(59), SMPR(5), T(4, 5), AL(5), COSTB(4)
COMMON CSSCC(4), DIVS(4), REPST(4)
COMMON VINVB(4), X1(4), X(4, 5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
1AP(4), COST(4), SAL(4, 5), SREV(4), SUMY(4), UPRO(4), Y(4, 5), Z(4), SAVE(5)
2, 2SMSAL(4), SMV(5), V(4, 5), BP02(4), RRR2(4), UPROL(4), UPROM(4), ALOBD(4)
3, B1CO(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROC(4), AAAA(5), 0000(5), SUMOO, WWWW(5), CSHR(4), BR
5AT(4), SUMMA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4, 5)
COMMON SFRGT(4), ANPBT(4), AITP(4)
COMMON CSSCC(4), DIVS(4), REPST(4)
COMMON VINV(4), X1(4), X(4, 5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4),
1AP(4), COST(4), SAL(4, 5), SREV(4), SUMY(4), UPRO(4), Y(4, 5), Z(4), SAVE(5)
2, 2SMSAL(4), SMV(5), V(4, 5), BP02(4), RRR2(4), UPROL(4), UPROM(4), ALOBD(4)
3, B1CO(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROC(4), AAAA(5), 0000(5), SUMOO, WWWW(5), CSHR(4), BR
5AT(4), SUMMA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4, 5)
COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

C CALCULATES CUMULATIVE AREA MARKETING $ SPENT
DO 60 1 = 1, ID
   SAJJ(I) = 0.
DO 60 J = 1, IB
   TEST TO SEE THAT THE MAXIMUM SPENT ON MARKETING PER COMPANY
C DOES NOT EXCEED $1800.
   IF(SUMAJ(J) - 1800.) 60, 60, 980
   IF TOTAL MARKETING EXCEEDS $1800., FIND BY WHAT AMOUNT IT EXCEEDS.
   980 DIF = SUMAJ(J) - 1800.
   IF(DIF - AJJ(J, J)) 960, 960, 950
   IF TOTAL MARKETING DIFFERENCE EXCEEDS $1800.
   C REDUCE THE HOME TERRITORY MARKETING BY THE EXCESS
960 AJJ(J, J) = AJJ(J, J) - DIF
   GO TO 60
C IF EXCESS SPENT ON MARKETING IS GREATER THAN AMOUNT SPENT IN HOME
C TERRITORY, REDUCE AMOUNT SPENT IN COMMON TERRITORY AFTER TESTING T
C TO BE SURE THIS REMAINING BALANCE DOES NOT EXCEED COMMON TERRITORY
950 BALNS = DIF - AJJ(J, J)
930 AJJ(J, 5) = AJJ(J, 5) - BALNS
AJJ(J, J) = 0.
   TEST TO SEE IF THE AMOUNT BY WHICH IT EXCEEDS IS MORE THAN
C MARKETING SPENT IN THE HOME TERRITORY
   IF(AJJ(J, 5)) 940, 60, 60
940 PRINT 920
920 FORMAT(40HEXCESS MARKETING GREATER THAN BOTH HOME ,
111H AND COMMON)
   60 AJJ(J, I) = AK * (AJJ(J, I) + AJJ(J, I))
C TAKES EACH MARKETING BY CO BY AREA ADDS PREVIOUS CO AREA SUM
C AND MULTIPLIES TOTAL BY MARKETING ADJUSTMENT FACTOR
C FOR SAJJ NEED 5 VALUES FOR AREAS
   DO 20 J = 1, IB
   DO 20 I = 1, IB
20 SAJJ(J) = SAJJ(J) + AJJ(I, J)
C CALCULATES INDUSTRY CUMULATIVE MARKETING IMPACT RATIO
   DO 70 I = 1, ID
   SMIN(I) = S(1, I)
70 AL(I) = AM1 - ((AN * P(I) * AM2) / SAJJ(I))
C FIND MINIMUM PRICE FOR EACH AREA
DO 80 I = 1, ID
DO 80 J = 1, IB
IF(SMIN(I) - S(J,I)) 80, 80, 28
28 SMIN(I) = S(J,I)

C CALCULATES INDUSTRY STANDARD PRICE IMPACT RATIO
DO 90 I = 1, ID
90 Q(I) = (R * AN) / SMIN(I)

C CALCULATES AREA TOTAL ORDERS
DO 300 I = 1, ID
DO 300 J = 1, IB
IF(I-5) 31, 32, 31
31 IF(J - I) 33, 34, 33
34 T(J,I) = AN * UH * G * AL(I) * Q(I)
GO TO 300
32 T(J,5) = AN * U5 * G * AL(I) * Q(I)
GO TO 300
33 T(J,I) = AN * UF * G * AL(I) * Q(I)
300 SMPR(I) = 0.
RETURN
END

Y REQUIREMENTS 000580 BYTES
SUBROUTINE C
PRINTOUT FOR THE ADMINISTRATOR AS A FOLLOW UP TO PART ONE (B)
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, CO
1LC, CST0(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PWW, PSWW, PW
2WW, R, SURP(4), UH, UF, US, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZZ1,
3ZZZ2, Q(5), SAJJ(5), G, B0R(4), BP01(45), BPS(4), RRR1(4), AINV1(4),
4PSVS(4), AJ(4,5), ANPJ(4), BLPN(4), CASHI(4), E(4), S(4,5), SPROM(4)
5, SUMAJ(4), SMNT(5), FILL(59), SMPT(5), T(4,5), AL(5), COSTB(4)
COMMON CSSC(4), DIVS(4), REPT(4)
COMMON VINVB(4), XI(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPR0(4), Y(4,5), Z(4,5), SAVE(5)
2, SMSAL(4), SMV(5), V(4,5), BP02(4), RRR2(4), UPR0(4), UPROM(4), ALOBD(4)
3, B1CD(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPRL(4), SUMWW, SPROC(4), AAAA(5), 0000(5), SUMOO, WWWW(5), C3HR(4), BR
5AT(4), SUMMA, UCOLI(4), CASH2(4), ANPAT(4), CODD(4), COSA(4), FRGT(4,5)
COMMON SFRGT(4), ANPB0(4), AITP(4), CSTG(4)
PRINT 46, SM1N(1), SM1N(2), SM1N(3), SM1N(4), SM1N(5)
46 FORMAT(4HSM1N5X, 5F9.0//)
PRINT 47, Q(1), Q(2), Q(3), Q(4), Q(5)
47 FORMAT(2HQ=3X, 5F12.8/)  
PRINT 48, PVSI(1), PVSI(2), PVSI(3), PVSI(4)
48 FORMAT(3HPVSI6X4F9.0//)
PRINT 49, AK
49 FORMAT(5X, 4HAK =, F8.2/)  
PRINT 50, AM1
50 FORMAT(5X, 5HM1 = F8.2/)  
PRINT 51, AM2
51 FORMAT(5X, 5HM2 = F8.2/)  
PRINT 52, P(1), P(2), P(3), P(4), P(5)
52 FORMAT(5X4HP1 =F6.2, 2X4HP2 =F6.2, 2X4HP3 =F6.2, 2X4HP4 =F6.2, 2X4HP5 =,  
IF6.2//)
PRINT 53
13 FORMAT(5X22HU FOR COMPANY AND AREA)
PRINT 14
14 FORMAT(7HC0MPANY, 7X1H1, 8X, 1H2, 8X, 1H3, 8X, 1H4)
15 FORMAT(4HAREA, 12, 4X, F6.0, 3F9.0)
PRINT 15, M, UH, UF, UF, UF
15 FORMAT(4HAREA, 12, 4X, F6.0, 3F9.0)
M = 2
PRINT 15, M, UH, UF, UH, UF
15 FORMAT(4HAREA, 12, 4X, F6.0, 3F9.0)
M = 3
PRINT 15, M, UH, UF, UH, UF
15 FORMAT(4HAREA, 12, 4X, F6.0, 3F9.0)
M = 4
PRINT 15, M, UH, UF, UH, UF
15 FORMAT(4HAREA, 12, 4X, F6.0, 3F9.0)
M = 5
PRINT 15, M, U5, U5, U5, U5
PRINT 200
200 FORMAT(/)
B6 = IB
D6 = ID
PRINT 201, B6, D6, R, W1
201 FORMAT(5X5X5HB6 = F6.0, 5X4HD6 = F6.0, 5X4HR = F6.0, 5X4HW1 = F8.2)
PRINT 17, W2
17 FORMAT(5X5HW2 = F8.2)
PRINT 18, W3
18 FORMAT(5X5HW3 = F8.0)
PRINT 19, W4
19 FORMAT(5X5HW4 = F8.2)
PRINT 202
202 FORMAT(79X1H+)
PRINT 203
203 FORMAT(20X33HADMINISTRATOR S PRINTOUT PAGE TWO///)
PRINT 20, Z1, Z2, Z3, Z4, Z5
20 FORMAT(5X3HZ1 = F6.2, 2X3HZ2 = F6.0, 2X3HZ3 = F6.2, 2X3HZ4 = F7.0, 2X3HZ5 = F7.0)
PRINT 21, Z6, Z7, Z8, Z9
21 FORMAT(5X3HZ6 = F6.0, 2X3HZ7 = F6.0, 2X3HZ8 = F6.2, 2X3HZ9 = F6.2)
PRINT 22, ALUR, COL1, COL2, COLC
22 FORMAT(5X6HALUR = F6.2, 2X6HCOL1 = F6.2, 2X6HCOL2 = F6.2, 2X6HCOLC = F6.2)
PRINT 23, ZZZ1, ZZZ2
23 FORMAT(5X6HZZZ1 = F4.0, 5X6HZZZ2 = F6.0)
24 FORMAT(5X4HAUTH3X4F9.0)
PRINT 24, AUTH, AUTH, AUTH, AUTH
PRINT 25, PSWW, PPPW, PWWW
25 FORMAT(5X6HPSWW = F8.4, 5X6HPPPP = F6.2, 5X6HPWWW = F6.3)
PRINT 26, FR1, FR2, FR3, AITRA
26 FORMAT(5X5HFR1 = F4.0, 5X5HFR2 = F4.0, 5X5HFR3 = F4.0, 5X7HAITRA = F6.0)
PRINT 31
31 FORMAT(6HPART B///)
PRINT 32, AN
32 FORMAT(5X4HAN = F6.2)
PRINT 33, E(1), E(2), E(3), E(4)
33 FORMAT(3X4HE = , F4.0)
PRINT 34, EE(1), EE(2), EE(3), EE(4)
34 FORMAT(3X4HEE = , F4.9)
PRINT 35, G
35 FORMAT(3X4HG = , F12.8)
PRINT 36, SUMAJ(1), SUMAJ(2), SUMAJ(3), SUMAJ(4)
36 FORMAT(3X7HSUMJ = F6.0, 3F9.0)
PRINT 14
DO 100 I = 1, 5
100 PRINT 38, I, AJJ(1,I), AJJ(2,I), AJJ(3,I), AJJ(4,I)
38 FORMAT(3X3HJJ J13, 4F9.2)
PRINT 40
40 FORMAT(/)
PRINT 39, AL(1), AL(2), AL(3), AL(4), AL(5)
39 FORMAT(4HAL1 = F11.8, 1X, 4HAL2 = F11.8, 1X4HAL3 = F11.8, 1X4HAL4 = F11.8, 1X4HAL5 = , 1F11.8/)
PRINT  14
DO 110 I = 1, 5
110 PRINT  41, S(I, 1), S(I, 2), S(I, 3), S(I, 4)
41 FORMAT (3X4HSD = 4F9.0)
PRINT  40
RETURN
END
SUBROUTINE C

PART TWO OF DIVIDED PROGRAM OR BROOM S MANAGEMENT GAME (C)

5, SUMAJ(4), SMIN(5), FILL(59), SMPR(5), T(4,5), AL(5), COSTB(4)

COMMON CSSC(4), DIVS(4), REPST(4)

COMMON VINVB(4), XI(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C

1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)
2, SMSAL(4), SMV(5), V(4,5), BP02(4), RRR2(4), UPR0L(4), UPR0M(4), ALOBD(4)
3, BICO(4), BFO(4), BLDT(4), COSTL(4), COSTM(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROC(4), AAAA(5), 0000(5), SUMDO, WWW(5), CSHR(4), BR
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4,5)

COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

DO 110 I = 1, ID
SMV(I) = 0.
DO 110 J = 1, IB
110 SMPR(I) = SMPR(I) + S(J,I)
SUMAL = 0.
DO 120 I = 1, ID
SAVE(I) = SMPR(I) / B6
120 SUMAL = SUMAL + AL(I)
C PAGE 10

ALAVE = SUMAL / 06
C AREA ORDER GETTING POWER BY COMPANIES
DO 130 I = 1, IB
DO 130 J = 1, ID
IF (SAVE(J) / S(I,J) - W2) 29, 29, 31
29 VI(J) = 0.
GO TO 130
31 VI(J) = (AL(J) / ALAVE*W1) *(SAVE(J) / S(I,J) - W2) *(W4 + G/(AN * W3)
X(J))

130 SMV(J) = SMV(J) + VI(J)
C AVERAGE MARKET IMPACT AREA RATIO
C COMPANY SHARE OF MARKET RATIOS BY COMPANIES
DO 140 I = 1, IB
DO 140 J = 1, ID
X(I,J) = VI(J) / SMV(J)
C COMPANY SALES :ORDERS IN AREA
Y(I,J) = (XI(J)) * T(I,J)
140 Y(I,J) = FLOAT(INT(Y(I,J)) + .5))
C DEPRECIATION $\$
DO 150 I = 1, IB
Z(I) = Z1 * PVS(I)
PVE(I) = (PVS(I) - Z(I)) + ANPJ(I)
CAP(I) = PVS(I) / Z2
X1(I) = Z3 - (EE(I) / Z4)
UPRO(I) = (SPRO(I) / AN - X1(I) * Z5 - CAP(I) * Z7) / (X1(I) * Z6 - X Z7)
UPRO(I) = FLOAT(INT(UPRO(I) + .5))
C TEST UNIT PRODUCTION AGAINST CAPACITY
IF (UPRO(I) - CAP(I)) 32, 32, 33
33 UPRO(I) = CAP(I)
UNIT COST OF PRODUCTION

\[ \text{COST}(I) = AN \times (\text{XI}(I) \times (Z6 + Z5/UPRO(I))) + \{(\text{CAP}(I) - UPRO(I))/UPRO(I) \times \text{XI}(I) \times Z7\} \]

TOTAL COST OF PRODUCTION

\[ \text{SUMY}(I) = 0. \]
\[ \text{DO 150 J = 1, ID} \]
\[ \text{SUMY}(I) = \text{SUMY}(I) + Y(I,J) \]

UNIT COST AT ADDED OUTPUT LEVELS

\[ \text{DO 160 I = If IB} \]
\[ \text{SREV}(I) = 0. \]
\[ \text{DO 170 J = 1, ID} \]
\[ \text{TEST} = \text{AINV1}(I) + \text{UPRO}(I) \]
\[ \text{IF SUMY}(I) - \text{TEST} < 53, 53, 34 \]
\[ \text{53 SAL}(I,J) = Y(I,J) \]
\[ \text{SMSAL}(I) = \text{SUMY}(I) \]
\[ \text{GO TO 170} \]
\[ \text{34 SAL}(I,J) = ((\text{AINV1}(I) + \text{UPRO}(I))/\text{SUMY}(I)) \times Y(I,J) \]
\[ \text{SMSAL}(I) = \text{AINV1}(I) + \text{UPRO}(I) \]
\[ \text{170 CONTINUE} \]

ENDING INVENTORY (M UNITS)

\[ \text{TEST} = \text{AINV1}(I) + \text{UPRO}(I) \]
\[ \text{IF SMSAL}(I) - \text{TEST} < 54, 35, 35 \]
\[ \text{35 AINV2}(I) = 0. \]
\[ \text{GO TO 160} \]
\[ \text{54 AINV2}(I) = \text{AINV1}(I) + \text{UPRO}(I) - \text{SMSAL}(I) \]
\[ \text{160 CONTINUE} \]

SALES REVENUE (M$)

\[ \text{DO 180 I = 1, ID} \]
\[ \text{DO 190 J = 1, ID} \]
\[ \text{SREV}(I) = \text{SREV}(I) + (\text{SAL}(I,J) \times S(I,J)) \]

VALUE OF ENDING INVENTORY

\[ \text{IF SMSAL}(I) - \text{AINV1}(I)) < 39, 37, 37 \]
\[ \text{37 VINV}(I) = \text{AINV2}(I) \times \text{COST}(I) \]
\[ \text{GO TO 180} \]
\[ \text{39 VINV}(I) = \text{VINVB}(I) \times (1.0 - \text{SMSAL}(I)/\text{AINV1}(I)) + \text{UPRO}(I) \times \text{COST}(I) \]
\[ \text{180 CONTINUE} \]
\[ \text{RETURN} \]

END
SUBROUTINE D

COMMON AITRA, AJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, CSTQ(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSW, PWW, PW


5, SUMAJ(4), SMIN(5), FILL(59), SMPLR(5), T(4,5), AL(5), COST(5)

COMMON CSSC(4), DIVS(4), REPST(4)

COMMON VINVB(4), X(1,4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C

IAP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)

2, SMSAL(4), SMV(5), V(4,5), BPOII(4), RRR2(4), UPR(4), UPR(4), ALOB(4)

3, BICO(4), BFO(4), BLDT(4), COST(4), COST(4), SRO(4), SRO(4), SRO(4)

, SPRO(4), SUMWW, SRO(4), AAAA(5), OOOO(5), SUMOO, WWW(5), CSRH(4), B

5, SAT(4), SUMAA, UCOL(4), CASH2(4), ANPBT(4), CDD(4), COSA(4), FRGT(4,5)

COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

DIMENSION TOT(4)
DIMENSION CY(4)

PRINT 42, SAVE(1), SAVE(2), SAVE(3), SAVE(4), SAVE(5)

42 FORMAT(5X10HS AVG, 5F9.0)
PRINT 202

202 FORMAT(79X1H+)

PRINT 204

204 FORMAT(20X35HADMINISTRATOR S PRINTOUT PAGE THREE// )
PRINT 43

43 FORMAT(15X8HT VALUES)
PRINT 14

14 FORMAT(7HC0MPANY, 11X1H1, 11X, 1H2, 11X, 1H3, 11X, 1H4)

DO 120 I = 1, 5

120 PRINT 44, I, T(I,1), T(I,2), T(I,3), T(I,4)

44 FORMAT(4HAREA13, 5F12.4)
PRINT 40

PRINT 45, ALAVE

45 FORMAT(5X6H ALAVE=F12.8/)

PRINT 146

146 FORMAT(15X8HV VALUES)
PRINT 14

DO 130 I = 1, 5

130 PRINT 147, I, V(1, I), V(2, I), V(3, I), V(4, I)

147 FORMAT(4HAREAI3, 4F12.8)

PRINT 40

40 FORMAT(/)
PRINT 148

148 FORMAT(15X8X VALUES)
PRINT 14

DO 140 I = 1, 5

140 PRINT 147, I, X(I,1), X(I,2), X(I,3), X(I,4)

PRINT 40

PRINT 149

149 FORMAT(15X8HY VALUES)

DO 333 J = 1, 4

IF(J = 4) 10, 11, 11

10 PRINT 335, J
GO TO 13

335 FORMAT(/9HCOMPANY, I4)
11 PRINT 29
PRINT 12
12 FORMAT(20X 35HADMINISTRATOR S PRINTOUT PAGE FOUR //)
PRINT 335, J

13 DO 333 I = 1, 5
333 PRINT 147, I, Y(J, I)
PRINT 40
PRINT 49, CAP(1), CAP(2), CAP(3), CAP(4)
49 FORMAT(3HCAP 4X, 4F9.0/)
PRINT 50, Z(1), Z(2), Z(3), Z(4)
50 FORMAT(2HZA=5X, 4F9.0/)
PRINT 51, PVE(1), PVE(2), PVE(3), PVE(4)
51 FORMAT(4HPVE=3X 4F9.0/)
PRINT 52, X1(1), X1(2), X1(3), X1(4)
52 FORMAT(4HX1 = 4F12.8/)
PRINT 53, UPRO(1), UPRO(2), UPRO(3), UPRO(4)

53 FORMAT(4HUMPRO3X4F9.0/)
PRINT 54, COST(1), COST(2), COST(3), COST(4)
54 FORMAT(4HCOST3X4F9.0/)
PRINT 55, AINV1(1), AINV1(2), AINV1(3), AINV1(4)
55 FORMAT(5HAINV 2X4F9.0/)
DO 160 I=1,4

160 TOT(I)= AINV1(I)+UPRO(I)
PRINT 56, TOT(1), TOT(2), TOT(3), TOT(4)
56 FORMAT(8HAINV+UPRO F8.0,3F9.0/)
PRINT 57, SUMY(1), SUMY(2), SUMY(3), SUMY(4)
57 FORMAT(5HSMY=2X4F9.0/)
PRINT 58, SMSAL(1), SMSAL(2), SMSAL(3), SMSAL(4)

58 FORMAT(7HSMAL = 4F9.0/)
PRINT 59
59 FORMAT(15X10HSAL VALUES)
PRINT 14
DO 170 I = 1,5
170 PRINT 60, I, SAL(1, I), SAL(2, I), SAL(3, I), SAL(4, I)

60 FORMAT(4HAREA 13, 4F12.0)
PRINT 40
PRINT 61, AINV2(1), AINV2(2), AINV2(3), AINV2(4)
61 FORMAT(5HAINV23X4F9.0/)
PRINT 62, SREV(1), SREV(2), SREV(3), SREV(4)
62 FORMAT(4HSREV 4X4F9.0/)
PRINT 63, VINV(1), VINV(2), VINV(3), VINV(4)
63 FORMAT(5HVINV2X4F9.0/)
PRINT 64, VINV(1), VINV(2), VINV(3), VINV(4)
64 FORMAT(5HVINV3X4F9.0/)
PRINT 65, SURP(1), SURP(2), SURP(3), SURP(4)
65 FORMAT(9HBEG. SURP F7.0,3F9.0/)

PRINT 29
29 FORMAT(79X1H+)
RETURN
END

TRY REQUIREMENTS 000008 BYTES
SUBROUTINE EEEE
C
THIRD PART OF DIVIDED PROGRAM FOR DR. BROOM'S MANAGEMENT GAME (E)

COMMON A1TRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLP(4), COL1, COL2, CO
ILC, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PWW, PW
2WW, R, SURP(4), UH, UF, US, W1, W2, W4, WZ, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZ1,
3ZZZ2, O(5), SAJJ(5), G, BOR(4), BPO1(45), BPS(4), RRR1(4), AINV1(4),
4PV(4), AJ(4,5), ANPJ(4), BLN(4), CASH1(4), E(4), S(4, 5), SPRO(4)
5, SUMAJ(4), SMIN(5), FILL(59), SMPr(5), T(4, 5), AL(5), COSTB(4)
COMMON CSSC(4), DIVS(4), REPST(4)
COMMON VINVB(4), X1(4), X(4, 5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
1AP(4), COST(4), SAL(4, 5), SREV(41), SUMY(4), UPRO(4), Y(4, 5), Z(4), SAVE(5)
2, SMSAL(4), SMV(5), V(4, 5), BPO2(4), RRR2(4), UPROL(4), UPR0M(4), ALOBD(4)
3, BICO(4), BFD(I), BLDT(I), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROC(4), AAAA(5), O000(5), SUMOO, WWWW(5), CSRH(4), BR
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4, 5)
COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)
C
LOSS ON BAD DEBTS
DO 200 I = I, IB
ALOBD(I) = RRR1(I) * ALUR
AZ = ZZZ1 - (AN - ZZZ1) / ZZZ2
IF (SREV(I)) 1, 1, 2
1 UCOL(I) = RRR1(I) - ALOBD(I)
GO TO 3
2 UCOL(I) = (COL1 * SREV(I)) + (COL2 * RRR(I) + COLC) * AZ
3 RRR2(I) = RRR1(I) + SREV(I) - ALOBD(I) - UCOL(I)
IF (AUTH - CSTO(I)) 55, 55, 41
55 CSSC(I) = 0.
41 IF (BLN(I) = 2000.) 42, 43, 43
42 BLN(I) = 2000.
43 BP02(I) = BP01(I) + BPS(I) - BOR(I)
C TEST TO SEE IF SOLD ANY BONDS THIS QUARTER IF NOT, SKIP TEST
44 IF (BP02(I) = 20000.) 44, 44, 45
45 IF (BP02(I) = 20000.) 44, 44, 46
46 BP02(I) = BP02(I) - 20000.
I$FORMAT(25HBONDS OVERSOLD IN COMPANY 14)
$44 CSHR(1) = UCOL(1) + CSSC(1) + BLN(1) + BPS(1)
C CURRENT QUARTER BOND DISCOUNT RATE
BRAT(1) = AZ * PPPW
C DISCOUNT ON BOND SALE
BFD(I) = BPS(I) * BRAT(I)
C
BOND INTEREST COST
BICO(I) = BP02(I) * PWWW
C
BANK LOAN DISCOUNT
BLDT(I) = PWW * BLN(I)
C BANK LOAN REPAYMENT
C
UPROL(I) = Z8 * UPRO(I)
UPROM(I) = Z9 * UPRO(I)
SPROM(I) = AN*UPROM(I)*(X1(I)*Z6-Z7)+(X1(I)*Z5+CAP(I)*Z7)
SPROM(I) = AN*UPROM(I)*(X1(I)*Z6-Z7)+(X1(I)*Z5+CAP(I)*Z7)
C

SPROC(I) = AN*(CAP(I) * (X1(I) + Z6-Z7)+(X1(I)*Z5+CAP(I)*Z7))

IF(UPROL(I) - CAP(I)) 49, 48, 49

48 SPRO(I) = SPROC(I)

49 COSTL(I) = SPROL(I) / UPROL(I)

COSTM(I) = SPROM(I) / UPROM(I)

COSTC(I) = SPROC(I) / CAP(I)

200 CONTINUE

SUMWW = 0.
SUMOO = 0.

DO 240 J = 1, ID

OOOO(J) = 0.
WWWW(J) = 0.

DO 280 I = 1, IB

OOOO(J) = OOOO(J) + Y(I,J)

WWW(J) = WWW(J) + SAL(I,J)

SUMOO = SUMOO + OOOO(J)

240 SUMWW = SUMWW + WWW(J)

250 SUMAA = SUMWW + WWW(J)

SUMAA = 0.

DO 250 J = 1, ID

AAAA(J) = 0.

DO 260 I = 1, IB

AAAA(J) = AAAA(J) + AJ(I,J)

260 AAAA(J) = AAAA(J) + AJ(I,J)

250 SUMAA = SUMAA + AAAA(J)

RETURN

END
SUBROUTINE FFFF
C ADMINISTRATOR S PRINTOUT TO BE PRINTED AFTER PART THREE  (F)
COMMON AITRA,AJJ(4,5),AK,ALUR,AM1,AM2,AN,AUTH,BLRP(4),COL1,COL2,CO
1L,CSTO(4),EE(4),F,FR1,FR2,FR3,H1,H2,IA,IB,IC,ID,P(5),PPP,PWW,PWW
2W,R,SURF(4),UH,UF,UX,W2,W3,W4,Z1,Z2,Z3,Z4,Z5,Z6,Z7,Z8,Z9,ZZ1
3ZZZ2,Q(5),SAJJ(5),G,BOR(4),BPO(4),BPS(4),RRR(4),AINV(4),
4PVS(4),AJ(4,5),ANP(4),BLN(4),CASHI(4,E(4),S(4,5),SPRO(4)
5,SUMAJ(4),SMIN(5),FILL(59),SMPR(5),T(4,5),AL(5),COSTB(4)
COMMON CSSC(4),DIVS(4),REPST(4)
COMMON VINVB(4),X(4,5),ALAVE,B6,B6,AINV2(4),PVE(4),VINV(4),C
IAP(4),COST(4),SAL(4,5),SREVI(4),SUMY(4),UPRO(4),Y(4,5),Z(4),SAVE(5)
2,SMAS(4),SMV(4,5),BPO2(4),RRR(4),UPROL(4),UPROM(4),ALOB(4)
3,BICO(4),BFDI(4),BLDT(4),COSTL(4),COSTM(4),COSTC(4),SROL(4),SPRO(4)
4,SPROL(4),SUMWW,SPROC(4),AAA(4),0000(5),SUM00,WWW(4),CSHR(4),BR
5AT(4),SUMM,AUCOL(4),CASH2(4),ANPAT(4),CDDD(4),COSA(4),FRGT(4,5)
COMMON SFRGT(4),ANPBT(4),AIP(4),TSTG(4)

PRINT 1
1 FORMAT(25X31HADMINISTRATOR S PRINTOUT PAGE 5 //)
PRINT 2, RRR(1), RRR(2), RRR(3), RRR(4)
2 FORMAT(5X5HRRR1=4F9.0/) 
PRINT 3, ALOBD(1), ALOBD(2), ALOBD(3), ALOBD(4)
3 FORMAT(5X5HALOBP 4F9.0/) 
PRINT 4, UCOL(1), UCOL(2), UCOL(3), UCOL(4)
4 FORMAT(5X5HUCOL 4F9.0/) 
PRINT 5, RRR(1), RRR(2), RRR(3), RRR(4)
5 FORMAT(5X5HRRR2 4F9.0/) 
PRINT 6, CSTO(1), CSTO(2), CSTO(3), CSTO(4)
6 FORMAT(5X5HCSTO 4F9.0/) 
PRINT 8, REPST(1), REPST(2), REPST(3), REPST(4)
8 FORMAT(5X5HREPST, 4F9.0/) 
PRINT 9, BLN(1), BLN(2), BLN(3), BLN(4)
9 FORMAT(5X5HBLN 4F9.0/) 
PRINT 10, BLDT(1), BLDT(2), BLDT(3), BLDT(4)
10 FORMAT(5X5HBLDT=4F9.0/) 
PRINT 11, BLRP(1), BLRP(2), BLRP(3), BLRP(4)
11 FORMAT(5X5HBLRP=4F9.0/) 
PRINT 13, BRAT(1), BRAT(2), BRAT(3), BRAT(4)
13 FORMAT(5X5HBRA2T=, 4F12.8/) 
PRINT 15, BOR(1), BOR(2), BOR(3), BOR(4)
15 FORMAT (5X5HBOR= 4F9.0/) 
PRINT 16, BPO1(1), BPO1(2), BPO1(3), BPO1(4)
16 FORMAT(5X5HBPO1=4F9.0/) 
PRINT 20, UPROL(1), UPROL(2), UPROL(3), UPROL(4)
20 FORMAT(11H(28)UPROL=, F8.0,3F9.0/) 
PRINT 21, UPRON(1), UPRON(2), UPRON(3), UPRON(4)
21 FORMAT(11H(29)UPRON=, F8.0,3F9.0/) 
PRINT 22, CAP(1), CAP(2), CAP(3), CAP(4)
22 FORMAT(5X5HCA1= 4F9.0/) 
PRINT 23, SPROL(1), SPROL(2), SPROL(3), SPROL(4)
23 FORMAT(12HSRO(1B,C,Z8) F7.0,3F9.0/) 
PRINT 24, SPRO(1), SPRO(2), SPRO(3), SPRO(4)
24 FORMAT(12HSRO(1B,C,Z9) F7.0,3F9.0/) 
PRINT 25, SPROC(1), SPROC(2), SPROC(3), SPROC(4)
25 FORMAT(12HSRO(1B,C,Z9) F7.0,3F9.0/) 
RETURN
END

DRY REQUIREMENTS 000640 BYTES
SUBROUTINE GGGG
C
ADMINISTRATOR'S PRINTOUT TO BE PRINTED AFTER PART THREE TWO (XG)
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, CO
1LC, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
2WW, R, SURP(4), UH, UF, U5, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZ1
3ZZZ2, Q(5), SAJJ(5), G, BOR(4), BPO1(45), BPS(4), RRR1(4), AINV1(4),
4PVS(4), AJ(4,5), ANPJ(4), BLN(4), CASH1(4), E(4), S(4,5), SPRO(4)
5, SUMAJ(4), SMIN(5), Fill(59), SMPR(5), T(4,5), AL(5), COSTB(4)
COMMON CSSC(4), DIVS(4), REPST(4)
COMMON VINVB(4), X1(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)
2, SMSAL(4), SMV(5), V(4,5), BPO2(4), RRR2(4), UPROL(4), UPROM(4), ALOBD(4)
3, B1CO(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SROL(4), SUMWW, SPROC(4), AAAA(5), OOOO(5), SUMOO, WWWW(5), CSHR(4), BR
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4,5)
COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

PRINT 26, COSTL(1), COSTL(2), COSTL(3), COSTL(4)
26 FORMAT( 12HCOST(B,C,Z8) 4F 9.4/)
PRINT 27, COSTM(1), COSTM(2), COSTM(3), COSTM(4)
27 FORMAT( 12HCOST(B,C,Z9) 4F 9.4/)
PRINT 28, COSTC(1), COSTC(2), COSTC(3), COSTC(4)
28 FORMAT( 12HCOST(B,C,Z2) 4F 9.4 )

RETURN
END

DRI REQUIREMENTS 0001E8 BYTES
SUBROUTINE H
C
FOURTH PART - I - OF DIVIDED BROOM PROGRAM (H).
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLP(4), COL1, COL2, COUIC, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
4PVSI(4), AJJ(4, 5), ANP(4), BLN(4), CASH1(4), E(4), S(4,5), SPRO(4)
5, SUMAJ(4), SMIN(5), FILL(59), SMPR(5), T(4,5), AL(5), COSTB(4)
COMMON CSSC(4), DVS(4), REPST(4)
COMMON VINVB(4), X1(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4),
1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)
2, SMSAL(4), MV(5), V(4,5), BPO2(4), RRR2(4), UPROL(4), UPROM(4), ALOBD(4)
3, BICO(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROC(4), AAAA(5), 0000(5), SUM00, WWW(5), CSHR(4), BR
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPAT(4), CDDD(4), COSA(4), FRGT(4,5)
COMMON SRGT(4), ANPBT(4), AITP(4), CSTG(4)
DO 400 I = 1, IB
SRGT(I) = 0.
C
DIFFERENT CALCULATIONS OF THE AREA FREIGHT FORMULA
DO 210 J = 1, ID
C
IF(J - 5) 44, 48, 48
44 IF(I - J) 45, 46, 45
45 FRGT(I,J) = FR2 * SAL(I,J)
GO TO 47
46 FRGT(I,J) = FR3 * SAL(I,J)
GO TO 47
48 FRGT(I,J) = FR1 * SAL(I,J)
GO TO 47
47 SRGT(I) = SRGT(I) + FRGT(I,J)
210 CONTINUE
C
NET PROFIT OR LOSS SECTION
DO 220 I = 1, IB
C
COST OF GOODS SOLD
COSA(I) = VINVB(I) + SPRO(I) - VINV(I)
C
HAVE TO DIVIDE THE NET PROFIT CALCULATION INTO TWO PARTS TOO LONG
C
FINANCIAL PART
FIN = BFD(I) + BICO(I) + BLDT(I)
ANPBT(I) = SREV(I) - COSA(I) - (SRGT(I) + E(I) + SUMAJ(I) + Z(I) + ALOBD(I)) - X FIN
IF (ANPBT(I)) 49, 49, 51
49 AITP(I) = 0.
ANPAT(I) = ANPBT(I)
GO TO 220
51 AITP(I) = AITRA * ANPBT(I)
ANPAT(I) = ANPBT(I) - AITP(I)
220 CONTINUE
RETURN
END

DOSY REQUIREMENTS 0002DA BYTES
SUBROUTINE II
MANAGEMENT GAMES PART I
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, EE1, EE2, EE3, EE4, EE5, FR1, FR2, FR3, FR4, FR5, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
COMMON AITR1, AITR2, AITR3, AITR4, AITR5, AITR6, AITR7, AITR8, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, EE1, EE2, EE3, EE4, EE5, FR1, FR2, FR3, FR4, FR5, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
COMMON AITR1, AITR2, AITR3, AITR4, AITR5, AITR6, AITR7, AITR8, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, EE1, EE2, EE3, EE4, EE5, FR1, FR2, FR3, FR4, FR5, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
COMMON AITR1, AITR2, AITR3, AITR4, AITR5, AITR6, AITR7, AITR8, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, EE1, EE2, EE3, EE4, EE5, FR1, FR2, FR3, FR4, FR5, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW

C CASH DISBURSEMENTS
DO 220 I = 1, IB
C HAVE TO BREAK DOWN THE DISBURSEMENTS INTO TWO PARTS
FINAN = BICO(I) + BLDT(I) + BLRP(I) + AITP(I) + DIVS(I) + REPST(I)
CDDD(I) = SPRO(I) + SFRTG(I) + E(I) + SUMAJ(I) + ANPJ(I) + BOR(I) + BFD(I) + FINAN
BLRP(I) = BLN(I)
C ENDING CASH BALANCE
CASH2(I) = CASH1(I) + CSHR(I) - CDDD(I)
CSTG(I) = CSTO(I) + CSSC(I) - REPST(I)
65 IF(CASH2(I)) = 63, 64, 64
63 IF(AUTH - CSTG(I)) = 67, 67, 69
69 CSTG(I) = CSTG(I) + 1000.
C CSSC(I) = CSSC(I) + 1000.
CASHR(I) = CASHR(I) + 1000.
CASH2(I) = CASH2(I) + 1000.
GO TO 65
67 IF(BPO2(I) = 20000.) = 68, 64, 64
68 BPO2(I) = BPO2(I) + 1000.
BPS(I) = BPS(I) + 1000.
BEFOR = BFD(I)
AZ = ZZZ1 - (AN - ZZZ1) / ZZZ2
BRAT(I) = AZ * PPPW
BFD(I) = BPS(I) * BRAT(I)
PREV = BICO(I)
BICO(I) = BPO2(I) * PPPW
C SETTING BFOR1 = TO PREVIOUS TAX
BEFOR = BFD(I)
C SUBTRACTING JUST THE ADDITIONAL INTEREST AND DISCOUNT
ANPBT(I) = ANPBT(I) - (BFD(I) - BEFOR) - (BICO(I) - PREV)
C ADD TO CASH DISBURSEMENTS JUST ADDITIONAL INTEREST AND DISCOUNT
CDDD(I) = CDDD(I) + (BFD(I) - BEFOR) + (BICO(I) - PREV)
IF(ANPBT(I)) = 49, 49, 51
49 ANPBT(I) = ANPBT(I)
GO TO 100
51 ANPBT(I) = AITRA * ANPBT(I)
ANPBT(I) = ANPBT(I) - AITP(I)
C subtract additional cash paid for taxes, interest, and discount
C and add cash received from sale of bonds
C Calculates amount to be subtracted for int. and discount
100 DIFF = (BFD(I) - BEFORE) + (BICO(I) - PREV)
CASH2(I) = CASH2(I) - (AITP(I) - BFOR1) + 1000. - DIFF
C Increase cash receipts for the bonds
CASHR(I) = CASHR(I) + 1000.
C Test for negative cash
IF (CASH2(I)) 67, 64, 64
C End of quarter capital stock outstanding
64 CSTO(I) = CSTG(I)
56 SURP(I) = SURP(I) + ANPAT(I) - DIVS(I)
C End of computation
220 CONTINUE
RETURN
END

ORY REQUIREMENTS 000382 BYTES
SUBROUTINE I2

ADDITION TO PART I FOR ADDITIONAL PRINT OUT

COMMON AITRA, AJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, COL4, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PWW


4PV(4), AJ(4,5), ANPJ(4), BLN(4), CASH(4), E(4), S(4,5), SPRO(4)

5, SUMAJ(4), SMN(5), FILL(5), SM(5), T(4,5), AL(5), COSTB(4)

COMMON CSSC(4), DIVS(4), REPSTS(4)

COMMON VINVB(4), X(4,5), ALAVE, B6, D6, AINV2(4), PV(4), VINV(4), C

1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)

2, SM(5), V(4,5), BPO2(4), RRR2(4), UPRO(4), UPROM(4), ALOBD(4)

3, B1CO(4), BFD(4), BLDT(4), COST(4), COSTM(4), COSTC(4), SRD(4), SPROM(4)

4, SPRO(4), SUMS, SPROC(4), AAAA(5), U0000(5), SUMO0, WWW(5), CSHR(4), BR

5AT(4), SUMAA, UCOL(4), CASH2(4), ANP(4), CDDD(4), COSA(4), FRG(4,5)

COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

PRINT 7, CSSC(1), CSSC(2), CSSC(3), CSSC(4)

7 FORMAT(5X5HCSSC, 4F9.0/)

18 FORMAT(5X5H1CO=, 4F9.0/)

PRINT 19, CSSH(1), CSSH(2), CSSH(3), CSSH(4)

19 FORMAT(5X5HCSSH=, 4F9.0/)

PRINT 12, BPS(1), BPS(2), BPS(3), BPS(4)

12 FORMAT(5X5HBPS=, 4F9.0/)

PRINT 14, BFD(1), BFD(2), BFD(3), BFD(4)

14 FORMAT(5X5HBFD= 4F9.0/)

PRINT 18, B1CO(1), B1CO(2), B1CO(3), B1CO(4)

PRINT 29

29 FORMAT(79X1H+)

C ADMINISTRATOR PRINTOUT PAGE SIX

PRINT 1

1 FORMAT(20X31HADMINISTRATOR S PRINTOUT PAGE 6 / )

PRINT 17, BPO2(1), BPO2(2), BPO2(3), BPO2(4)

17 FORMAT(5X5HBPO2=4F9.0/)

PRINT 2, CSTG(1), CSTG(2), CSTG(3), CSTG(4)

2 FORMAT(5X5HCSTG= 4F9.0/)

PRINT 3

3 FORMAT(10X11HFRGRT VALUES)

RETURN

END

ORY REQUIREMENTS 000364 BYTES
SUBROUTINE JJJJ
PRINTOUT TO FOLLOW PART FOUR SECOND DIVISION DR BROOM PROGRAM «J

COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, CC

1LC, CSTO(4), EE(4), F, FR1, FR2, FR3, HI, H2, IA, IB, IC, ID, P(5), PPPW, PSW, Ph

2WW, R, SURP(4), UH, UF, U5, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZZ1,

3ZZZ2, Q(5), SAJJ(5), G, BOR(4), BP01(45), BPS(4), RRR1(4), AINV1(4),

4PV5(4), AJ(4,5), ANPJ(4), BLN(4), CASH1(4), E(4), S(4,5), SPRO(4)

5, SUMAJ(4), SMIN(5), FILL(59), SMPR(5), T(4,5), AL(5), COSTB(4)

COMMON CSSC(4), DIVS(4), REPLS(4)

COMMON VINV(4), X(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4),

1AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), Y(4,5), Z(4), SAVE(5)

2, SML1(4), SMV(5), V(4,5), BP02(4), RRR2(4), UPRO(4), UPROM(4), ALOBD(4)

3, BICO(4), BDO(4), BLD0(4), COST(4), COCT(4), SROM(4), SPROM(4)

4, SPRO(4), SUMWW, SPROC(4), AAAA(5), O0000(5), SUM00, WWW(5), CSHR(4), BR

5AT(4), SUMAA, UC0L(4), CASH2(4), ANPAT(4), CDD1(4), COSA(4), FRGT(4,5)

COMMON SFRGT(4), ANPB1(4), AITP(4), CSTD(4)

PRINT 4

4 FORMAT (7HC0MPANY8X1HI, 8X1H2, 8X1H3, 8X1H4)

DO 10 I = 1, 5

10 PRINT 5, I, FRGT(1, I), FRGT(2, I), FRGT(3, I), FRGT(4, I)

5 FORMAT (1X4HAREAI3,4F9.0)

PRINT 7, SFRGT(1), SFRGT(2), SFRGT(3), SFRGT(4)

7 FORMAT (8HFRGT = 4F9.0/)

8 FORMAT (5X4HCSA, F8.0,3F9.0/)

PRINT 9, ANPB1(1), ANPB1(2), ANPB1(3), ANPB1(4)

9 FORMAT (5X5HANPB1, F7.0,3F9.0/)

PRINT 1, AITP(1), AITP(2), AITP(3), AITP(4)

11 FORMAT (5X4HAI5P, F8.0,3F9.0/)

PRINT 12, ANPAT(1), ANPAT(2), ANPAT(3), ANPAT(4)

12 FORMAT (5X5HANPAT, F7.0,3F9.0/)

PRINT 13, DIVS(1), DIVS(2), DIVS(3), DIVS(4)

13 FORMAT (5X4HIIVS, F8.0,3F9.0/)

PRINT 14, CASH1(1), CASH1(2), CASH1(3), CASH1(4)

14 FORMAT (5X5HCASH1, F7.0,3F9.0/)

PRINT 15, CDD1(1), CDD1(2), CDD1(3), CDD1(4)

15 FORMAT (5X4HCDDO, F8.0,3F9.0/)

PRINT 16, CASH2(1), CASH2(2), CASH2(3), CASH2(4)

16 FORMAT (5X5HCASH2, F7.0,3F9.0/)

PRINT 17, SURP(1), SURP(2), SURP(3), SURP(4)

17 FORMAT (8HEND, SURP, 4F9.0/)

PRINT 18

18 FORMAT (10X15HORDERS BY AREAS)

PRINT 19

19 FORMAT (5X4HAREA8X1H1, 8X1H2, 8X1H3, 8X1H4, 8X1H5)

PRINT 20, 0000(1), 0000(2), 0000(3), 0000(4), 0000(5)

20 FORMAT (6HORDERS, 3X, 5F9.0/)

PRINT 21, SUM00

21 FORMAT (20X15HSUM OF ORDERS = F12.0/)

RETURN

END

DRY REQUIREMENTS 00056C BYTES
SUBROUTINE K

CONTINUED PRINTOUT TO FOLLOW FIRST PART FOUR II PRINTOUT (K)

COMMON ATRA, AJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, CO1Lc, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PWW, PW

COMMON CSSC(4), DIVS(4), REPST(4)

COMMON VINVB(4), XI(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPBT(4), CODDD(4), COSA(4), FRGT(4,5)

COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)

PRINT 22

22 FORMAT(10X, 14HSALES BY AREAS)
PRINT 39
PRINT 23, WWW(1), WWW(2), WWW(3), WWW(4), WWW(5)

23 FORMAT(5XSALES, 5X, 5F9.0)
PRINT 24, SUMWW

24 FORMAT(20X15HSUM OF SALES = F11.0/)
PRINT 25
PRINT 10X, 18HMARKETING BY AREAS)
PRINT 39

39 FORMAT(5X4HAREA8X1H1, 8X1H2, 8X1H3, 8X1H4, 8X1H5)
PRINT 26, AAAA(1), AAAA(2), AAAA(3), AAAA(4), AAAA(5)

26 FORMAT(11HMARKETING 5F9.0/)
PRINT 27, SUMAA

27 FORMAT(20X18HSUM OF MARKETING = F9.0/)
PRINT 28
PRINT 28 FORMAT(7HCOMPANY2X13HTOTAL EXPENSE2X11HCASH INFLOW, 12X11HTOT. ASSETS2X10HTOT.EQUITY, 2X, 9HSPRO USED)

DO 30 I = 1, 4
FIN = BFD(I) + BICO(I) + BLDT(I)
TEXP = COSA(I) + SFRGT(I) + E(I) + SUMAJ(I) + Z(I) + ALOBD(I) + FIN
CINFL = CSHRI(I) - CODDD(I)
TASS = CASH2(I) + RRR2(I) + VINV(I) + PVE(I)
TEQU = BLN(I) + BP02(I) + CSTG(I) + SURP(I)

PRINT 29, I, TEXP, CINFL, TASS, TEQU, SPRO(I)

29 CONTINUE

30 PRINT 66

66 FORMAT(79X1H+)
PRINT 901

901 FORMAT(41HEND ADMINISTRATOR S PART ONE PRESS START:
RETURN
END

ORY REQUIREMENTS 000478 BYTES
SUBROUTINE L
I-FIFTH PART OF DIVIDED PROGRAM FOR CR BROOMS MANAGEMENT GAME (L)
COMMON AITRA, AJ(4,5), AK, ALUR, AMI, AM2, AN, AUTH, BLRP(4), COLI, COL2, CO
ILC, CSTO(4), EE(4), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, P(5), PPPW, PSWW, PW
2WW, R, SURP(4), UH, UF, U5, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZZ1,
ZZZ2, Z(5), SAJ(5), G, BOR(5), B(m1(45), BPS(4), RRR(4), ANI1(4),
4PV(4), AJ(4,5), ANP(4), BLN(4), CASI(4), E(4), S(4,5), SPRO(4)
5, SUMAJ(4), SMNI(5), FILL(5), SMPr(5), T(4,5), AL(5), COST(4)
COMMON CSSC(4), DIVS(4), REPST(4)
COMMON VINV(4), X(4), X(4,5), ALAVE, B6, D6, AINV(2), PVE(4), VIN(4, C
1AP(4), COST(4), SAL(4,5), SREI(4), SUMY(4), UPR(4), Y(4,5), Z(4), SAVE(5)
2, SMSAL(4), SMV(4,5), Y(4,5), BPS(4), RRR(4), UPR(4), UPR(4), ALOBD(4)
3, BICO(4), BFD(4), BLOT(4), COSTL(4), COSTM(4), COSTC(4), SRO(4), SPRO(4)
4, SROL(4), SUMWW, SPROC(4), AAA(5), OOOO(5), SUMOO, WWWW(5), CSH(4), BR
5AT(4), SUMMA, UC01(4), CASH2(4), ANP(4), COD(4), COS(4), FRGT(4,5)
COMMON SFRG(4), ANPBT(4), A1TP(4), CSTG(4)
PRINTOUTS OF STATEMENTS - COMPANY DATA ONLY FOR SALES ANALYSIS
C SHOULD NOT THIS BE OUTER LOOP SO HAVE 4 SEPARATE OUTPUTS
DO 230 IPR = 1, IB
I = IPR
PRINT 65
65 FORMAT(*1,14X,'BAYLOR TOP MNGT. GAME')
PRINT 2
2 FORMAT(/)
PRINT 66, I, IA, IC
66 FORMAT(18HCOMPANY I2,15X6X8HINDUSTRYI3,15X7HQUARTERI3,///)
PRINT 67
67 FORMAT(14HSALES ANALYSIS 34X24H(TOTALS ARE APPROXIMATE)///)
PRINT 68
68 FORMAT(22X1I1,9X1H2,9X1H3,9X1H4,9X1H5X5HTOTAL/) PRINT 69, Y(I,1), Y(I,2), Y(I,3), Y(I,4), Y(I,5), SUMY(I)
69 FORMAT(15HORDERS (UNITS) F9.0, 5F10.0)
SMSAL(I) = SAL(I,1) + SAIL(1,2) + SAL(I,3) + SAIL(1,4) + SAIL(1,5)
PRINT 71, SAL(I,1), SAL(I,2), SAIL(1,3), SAIL(1,4), SAIL(1,5), SMSAL(I)
71 FORMAT(15HSALES (UNITS) F9.0, 5F10.0)
72 FORMAT(15HMARKETING F9.0, 5F10.0/) PRINT 73, SREV(I)
73 FORMAT(17HTOTAL REVENUE FROM SALES = ,35X,F12.0///)
C PRINT OUT SALES ANALYSIS BY 5 AREAS AND IN TOTAL
C (DATA FOR ALL 4 COMPANIES)
C CALCULATES SUM OF ORDERS FOR EACH AREA WITH 4 COMPANIES IN EACH
C TOTAL INCLUDES ALL ORDERS IN ALL AREAS
PRINT 74, AN
PRINT 68
74 FORMAT(23HSALES ANALYSIS, 10X17HBUSINESS INDEX = F6.2/) PRINT 69, OOOO(1), OOOO(12), OOOO(13), OOOO(4), OOOO(5), SUMO
PRINT 71, WWWW(1), WWWW(2), WWWW(3), WWWW(4), WWWW(5), SUMWW
C CALCULATES TOTAL MARKETING BY AREAS AND GRAND TOTAL
PRINT 72, AAA(1), AAA(2), AAAA(3), AAAA(4), AAAA(5), SUMAA
PRINT 2
PRINT 10
10 FORMAT (23HINDUSTRY PRICE ANALYSIS/) DO 260 J = 1, IB
260 PRINT 62, J, S(I,J,1), S(I,J,2), S(I,J,3), S(I,J,4), S(I,J,5)
62 FORMAT (12HPRICES, FIRM13, F9.0, 4F10.0)
PRINT 2
PRINT 101, IC
101 FORMAT (48HPRODUCTION, CAPACITY, AND INVENTORY, ANALYSIS ,
16HPERIOD(13))
PRINT 102
102 FORMAT (17X9H9/10 CUR.4X7HCURRENT 4X10H11/10 CUR.4X10HPLANT CAP. 3X,
19HEND. INV. /)
PRINT 103, UPRO(I), UPRO(I), UPRO(M), CAP(I), AINV2(I)
103 FORMAT (17HQUANTITY(M UNITS)F9.0, F11.0, F14.0, F14.0, F12.0)
IF (AINV2(I)) 202, 202, 200
200 IF (AINV2(I) - UPRO(I)) 203, 203, 201
201 UCST = VINV(I) / AINV2(I)
GO TO 204
202 UCST = 0.0
GO TO 204
203 UCST = COST(I)
204 PRINT 104, COSTL(I), COSTM(I), COSTC(I), UCST
104 FORMAT (12HUNIT COST($) 5XF9.2, F11.2, 2F14.2, F12.2)
PRINT 105, SPRO(I), SPRO(I), SPROM(I), SPROC(I), VINV(I)
105 FORMAT (14HTOTAL COST($) 3XF9.0, F11.0, 2F14.0, F12.0)
PRINT 61
61 FORMAT (79X1H+)
230 CONTINUE
RETURN
END

ORY REQUIREMENTS 000950 BYTES
SUBROUTINE M
C II- FIFTH PART OF DIVIDED PROGRAM FOR DR BROOMS MANAGEMENT GAME(M)
COMMON AITRA, AJJ([4,5], AK, ALUR, AM1, AM2, AN, AUTH, BLP(4), COL1, COL2, CO
ILL, CSTO([4], EE([4]), F, FR1, FR2, FR3, H1, H2, IA, IB, IC, ID, IP([5]), PPPW, PSW, PW
2WN, R, SURP([4], UH, UF, US, W1, W2, W3, W4, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, ZZZ1,
3ZZ2, Q([5], SAJJ([5]), G, BQR([4], BP01([4], BPS([4], RRI([4], AINV1([4],
4PVS([4], AJJ([5], ANPJ([4], BLN([4), CASH1([4], E([4], S([4, SPRO([4]
5), SUMAJ([4], SMIN([5], FILL([5], SM(, T([4, 5], AL([5), COSTB([4]
COMMON CSSC([4], DIVS, REPST([4]
COMMON VINVB([4], X1([4, X([4, 5], ALAVE, B6, D6, AINV2([4], PVE([4), VINV([4],
1AP([4], COST([4], SAL([4, 5], SREV([4), SUMY([4], UPRO([4], Y([4, 5], Z([4, SAVE([5]
2, SMAL([4], SMV([5], V([4, 5], BP02([4], RRR2([4], UPRO([4], UPROM([4], ALOBD([4]
3, BICO([4], BFD([4], BLDT([4], COST([4], COST([4], SROL([4], SPRO([4]
4, SPRO([4], SUMW, SPROC([4], AAAA([5], 00000([5], SUM00, WWW([5], CSRH([4], BR
5AT([4], SUMAA, UCOL([4), CASH2([4], ANPAT([4], CDDD([4), COSA([4], FRGT([4, 5]
COMMON SFRGT([4), ANPBT([4), AITP([4), CSTG([4]
DO 100 I=1, IB
65 FORMAT ('1', 14X, 'BAYLOR TOP MNGT. GAME, PG.-2')
PRINT 2
66 FORMAT (18HC0MPANY 12, 15X6X8HINDUSTRYI3, 15X7HQUARTERI3,///)
PRINT 75
75 FORMAT ('15HPROFIT AND LOSS, 15X9HCASH FLOW15X13HBALANCE SHEET/')
PRINT 2
76 FORMAT (18HSALES INCOME , F9.0, 3X14HBEG.CASH BAL., F9.0, 1X,
14HCASH8X, F10.0)
PRINT 77, COSA(1), RRR2(1)
77 FORMAT ('15HCOST OF GDS SLD, 3XF9.0, 3X14H , 10X,
18HAC REC. 4XF10.0)
PRINT 78, VINV(I)
78 FORMAT (18X9H , 27X9HINVENTORY3XF10.0)
PRINT 79, CSRH(I), PVE(I)
79 FORMAT ('30X8HRECEIPTS 6XF9.0, 1X12HPLANT INVST.F10.0)
ASSET = CASH2(I) + RRR2(I) + VINV(I) + PVE(I)
PRINT 81, CDDD(I), ASSET
81 FORMAT ('30X10HDISBSRMSNTS4XF9.0, 1X10HTOT.ASSETS2XF10.0)
PRINT 82
82 FORMAT (18X9H*********, 12X12H*********, 10X12H*********)/
CASHIN = CSRH(I) - CDDD(I)
PRINT 83, SFGRGT([I], CASHIN
83 FORMAT ('7HFREIGHT, 11XF9.0, 3X10HNET INFLOW, 4XF9.0)
PRINT 84, E(I), BLN([I)
84 FORMAT ('7HR AND D, 11XF9.0, 3X, 12H(OR OUTFLOW) 2X9H*********1X,
110HBANK LOANS3XF9.0)
PRINT 85, SUMAJ(I), BP02(I)
85 FORMAT ('9HMARKETING 9X, F9.0, 27X, 12HBONDS PAYBL.1XF9.0)
PRINT 86, Z(I), CASH2(I)
86 FORMAT ('12HDEPRECIATION6X, F9.0, 3X, 13HEND.CASH BAL.,
11XF9.0, 13X10H*********)
PRINT 87, ALOBD(I)
87 FORMAT ('14HBAD DEBTS LOSS4XF9.0, 16X11H*********)
PRINT 88, CSTG(I)
88 FORMAT (54X1OHCAP.STOCK 3XF9.0)
PRINT 89, SURP(I)
89 FORMAT(17X10H**********27X,7HSURPLUS6XF9.0)
PRINT 91

91 FORMAT(40X,27X10H**************)
WORTH = CSTG(I) + SURP(I)
OPEX=COSA(I)+SFRGT(I)+E(I)+SUMAJ(I)+Z(I)+ALOBD(I)
OPPR=SREV(I)-OPEX
PRINT 92,OPPR
92 FORMAT(16HOPERATING PROFIT2XF9.0, 40X, 10H**********)
EQUIT = WORTH + BLN(I) + BPO2(I)
PRINT 94, BFD(I), EQUIT
94 FORMAT(17HBOND FLOT DISC. IX,F9.0,27X10HTOT.EQUITY3XF9.0)
PRINT 95, BICO(I)
95 FORMAT(13HBOND INTEREST5XF9.0)
PRINT 96, BLDT(I)
96 FORMAT(18HBANK LOAN DISCOUNT, F9.0)
PRINT 97
97 FORMAT(18X10H--------)
FIN = BFD(I) + BICO(I) + BLDT(I)
PRINT 97
EXEN= COSA(I)+SFRGT(I)+E(I)+SUMAJ(I)+Z(I)+ALOBD(I)+FIN
PRINT 98, EXEN
98 FORMAT(14HTOT. OPER. EXP,4XF9.0)
PRINT 107, ANPBT(I)
107 FORMAT(18HNET PROF. BEFR. TAX F9.0)
PRINT 93, AITP(I)
93 FORMAT (12HINCOME TAXES6XF9.0)
PRINT 99, ANPAT(I)
99 FORMAT(17HNET PROF.AFTR. TAX1XF9.0)
PRINT 91
PRINT 1
1 FORMAT (40X39X1H+)
100 CONTINUE
RETURN
END

ORY REQUIREMENTS 000934 BYTES
SUBROUTINE N

```
COMMON AITRA, AJJ(4,5), AK, ALUR, AM1, AM2, AN, AUTH, BLRP(4), COL1, COL2, COL3, CST0(4), EE(4), F, FR1, FR2, FR3, H1, H2, [A, B, C, D, E, F, P(5), PPPW, PWW, PW
COMMON CSSC(4), DIVS(4), REPST(4)
COMMON VINVB(4), X1(4), X(4,5), ALAVE, B6, D6, AINV2(4), PVE(4), VINV(4), C
AP(4), COST(4), SAL(4,5), SREV(4), SUMY(4), UPRO(4), V(4,5), Z(4), SAVE(5)
B, SMSAL(4), SMV(5), V(4,5), BPG2(4), RR2(4), UPRM(4), ALOBD(4)
3, BICO(4), BFD(4), BLDT(4), COSTL(4), COSTM(4), COSTC(4), SROL(4), SPROM(4)
4, SPROL(4), SUMWW, SPROL(4), AAAA(5), DDDD(5), SUMO0, WWW(5), CSHT(4), BR
5AT(4), SUMAA, UCOL(4), CASH2(4), ANPBT(4), ODDD(4), COSA(4), FRGT(4,5)
COMMON SFRGT(4), ANPBT(4), AITP(4), CSTG(4)
```

C CONSTANTS AND HISTORY DATA FOR NEXT QUARTER

```
PRINT 106
106 FORMAT(* 1',40X, 'CONSTANTS & HISTORY NEXT QTR', )
N = 1
IC1 = IC + 1
PRINT 1, IB, IC1, IA, ID, N
1 FORMAT(12,3I3, 66X, I3)
N = N + 1
PRINT 13, F, H1, H2, AK, AM1, AM2, N
13 FORMAT (6FIO.2, 17X I3)
N = N + 1
PRINT 2, P(1), P(2), P(3), P(4), P(5), R, W1, W2, N
2 FORMAT(7FIO.2, F5.2, 15)
N = N + 1
PRINT 15, Z1, Z2, Z3, Z4, Z5, Z6, Z7, W3, N
15 FORMAT(6FI0.2, F8.2, F8.0, I4)
N = N + 1
PRINT 3, Z8, Z9, COL1, COL2, COL3, ZZZ1, ZZZ2, N
3 FORMAT(7FI0.2, 7X, I3)
N = N + 1
PRINT 16, PPPW, PWWW, PWW, FR1, FR2, FR3, AITRA, N
16 FORMAT(3FI0.4, 4FIO.2, 5X, I5)
N = N + 1
PRINT 4, AUTH, W4, ALUR, UH, UF, US, N
4 FORMAT(6FI0.2, 17X, I3)
DO 310 I=1, IB
J=0
N = N + 1
PRINT 5, I, J, IA, AJJ(I,1), AJJ(I,2), AJJ(I,3), AJJ(I,4), AJJ(I,5), XN
5 FORMAT([2, 213, 5F8.0, 29X, I3]
N = N + 1
J=1
PRINT 6, I, J, IA, PVE(I), AINV2(I), RR2(I), EE(I), BPO2(I), COST(I), N
6 FORMAT([2, 213, 6FI0.2, 21X, I3)
N = N + 1
J=2
310 PRINT 5, I, J, IA, CASH2(I), SURP(I), VINV(I), CSTO(I), BLRP(4), N
N = N + 1
```
PRINT 14, IC1, IA, N
14 FORMAT (2H 0213, 69X13)
258 PRINT 259
259 FORMAT (32H DON'T STOP NOW, IM JUST BEGINNING /)
PRINT 269
269 FORMAT (1H REACHED END OF PROG, NO STOP? SEE STOP 999*)
RETURN
END

ORY REQUIREMENTS 000684 BYTES
APPENDIX III

The data given in the Appendix covers the constants, history and decisions necessary to calculate Quarter zero output.

**CONSTANTS**

<table>
<thead>
<tr>
<th>IB</th>
<th>IC</th>
<th>IA</th>
<th>ID</th>
<th>F</th>
<th>R</th>
<th>Z6</th>
<th>Z7</th>
<th>Z8</th>
<th>PSWW</th>
<th>FR1</th>
<th>FR2</th>
<th>FR3</th>
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<tr>
<td>4</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>.50</td>
<td>65</td>
<td>50</td>
<td>6</td>
<td>.90</td>
<td>.0175</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<table>
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<tr>
<th>P(2)</th>
<th>P(3)</th>
<th>P(4)</th>
<th>P(5)</th>
<th>R</th>
<th>W1</th>
<th>W3</th>
<th>FR1</th>
<th>FR2</th>
<th>FR3</th>
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<tr>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>2.62</td>
<td>1</td>
<td>10</td>
<td>10000</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<table>
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<tr>
<th>Z9</th>
<th>AITRA</th>
<th>AUTH</th>
<th>W4</th>
<th>COL1</th>
<th>COL2</th>
<th>COLC</th>
<th>ZZZ1</th>
<th>ZZZ2</th>
<th>PPPW</th>
<th>UH</th>
<th>UF</th>
<th>U5</th>
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</thead>
<tbody>
<tr>
<td>1.10</td>
<td>.47</td>
<td>22000</td>
<td>.90</td>
<td>.60</td>
<td>.98</td>
<td>40</td>
<td>1.00</td>
<td>20</td>
<td>.08</td>
<td>75</td>
<td>33</td>
<td>68</td>
</tr>
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</table>

<table>
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<tr>
<th>P(1)</th>
<th>Z5</th>
<th>PWWW</th>
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<tbody>
<tr>
<td>1.25</td>
<td>3</td>
<td>.015</td>
<td></td>
</tr>
</tbody>
</table>
HISTORY

The history is the same for each firm

\[
\begin{align*}
AJJ(I,J) &= 200 & AJJ(I,J) &= 200 & EE(I) &= 280 & SURP(I) &= 10206 \\
AJJ(I,J) &= 40 & PVS(I) &= 15600 & BP01(I) &= 0 & VINVB(I) &= 1295 \\
AJJ(I,J) &= 40 & AINV1(I) &= 55 & COSTB(I) &= 0 & CST0(I) &= 17000 \\
AJJ(I,J) &= 40 & RRR1(I) &= 7000 & CASH1(I) &= 3311 & BLRP(I) &= 0
\end{align*}
\]

DECISIONS

The decisions are the same for each firm in Quarter zero.

\[
\begin{align*}
E(I) &= 60 & AJ(I,J) &= 270 & S(I,J) &= 60 & ANPJ(I) &= 624 \\
AJ(I,J) &= 290 & S(I,J) &= 60 & SPRO(I) &= 12480 & BOR(I) &= 0 \\
AJ(I,J) &= 80 & S(I,J) &= 60 & BLN(I) &= 0 & REPST(I) &= 0 \\
AJ(I,J) &= 880 & S(I,J) &= 60 & BPS(I) &= 0 & DIVS(I) &= 0 \\
AJ(I,J) &= 80 & S(I,J) &= 60 & CSSC(I) &= 0
\end{align*}
\]
APPENDIX IV

The Appendix contains the Quarter zero output for both the administrator and participants. The last page of output covers the history and constants required for period one.
EXECUTION TERMINATED

RUN GIB2 5=GIB3
EXECUTION BEGINS
ADMINISTRATOR'S PRINTOUT PAGE ONE
INDUSTRY 1 QUARTER 0

BEGINNING AJJ VALUES

<table>
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<tr>
<th>COMPANY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>AREA 1</td>
<td>200.</td>
<td>40.</td>
<td>40.</td>
<td>40.</td>
</tr>
<tr>
<td>AREA 2</td>
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<td>200.</td>
<td>40.</td>
<td>40.</td>
</tr>
<tr>
<td>AREA 3</td>
<td>40.</td>
<td>40.</td>
<td>200.</td>
<td>40.</td>
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<tr>
<td>AREA 4</td>
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<td>40.</td>
<td>40.</td>
<td>200.</td>
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</table>

$\theta$ = 60. 60. 60. 60. 60.

$\gamma$ = 1.08333302 1.08333302 1.08333302 1.08333302 1.08333302

$\psi$ = 15600. 15600. 15600. 15600.

PART A

$B$ = 1, 2, 3, 4  $D$ = 1, 2, 3, 4, 5

$F = 0.50$  $H_1 = 2.05$  $H_2 = 8000.$

$AK = 0.60$

$M_1 = 2.00$

$M_2 = 50.00$

$P_1 = 1.25$  $P_2 = 1.25$  $P_3 = 1.25$  $P_4 = 1.25$  $P_5 = 2.62$

$U$ FOR COMPANY AND AREA

<table>
<thead>
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<th>COMPANY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
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<tr>
<td>AREA 1</td>
<td>75.</td>
<td>33.</td>
<td>33.</td>
<td>33.</td>
</tr>
<tr>
<td>AREA 2</td>
<td>33.</td>
<td>75.</td>
<td>33.</td>
<td>33.</td>
</tr>
<tr>
<td>AREA 3</td>
<td>33.</td>
<td>33.</td>
<td>75.</td>
<td>33.</td>
</tr>
<tr>
<td>AREA 4</td>
<td>33.</td>
<td>33.</td>
<td>33.</td>
<td>75.</td>
</tr>
<tr>
<td>AREA 5</td>
<td>68.</td>
<td>68.</td>
<td>68.</td>
<td>68.</td>
</tr>
</tbody>
</table>

$B_6 = 4.$  $D_6 = 5.$  $R = 65.$  $W_1 = 10.00$

$W_2 = 0.90$

$W_3 = 10000.$

$W_4 = 0.90$
<table>
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<th></th>
<th>Z1 = 0.04</th>
<th>Z2 = 60.</th>
<th>Z3 = 1.08</th>
<th>Z4 = 3600.</th>
<th>Z5 = 3.</th>
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<td>Z6 = 50.</td>
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<td>Z8 = 0.90</td>
<td>Z9 = 1.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALUR = 0.01</td>
<td>COL1 = 0.60</td>
<td>COL2 = 0.98</td>
<td>COLC = 40.00</td>
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<tr>
<td></td>
<td>ZZ1 = 1.</td>
<td>ZZ2 = 20.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>AUTH = 22000.</td>
<td>22000.</td>
<td>22000.</td>
<td>22000.</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>PPPW = 0.08</td>
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### Y VALUES

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| AREA 2 | 36.00000000 |
| AREA 3 | 36.00000000 |
| AREA 4 | 36.00000000 |
| AREA 5 | 75.00000000 |

#### COMPANY 2

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| AREA 4 | 36.00000000 |
| AREA 5 | 75.00000000 |

#### COMPANY 3

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| AREA 2 | 36.00000000 |
| AREA 3 | 82.00000000 |
| AREA 4 | 36.00000000 |
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ADMINISTRATOR'S PRINTOUT PAGE 5

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**ADMINISTRATOR S PRINTOUT PAGE 6**

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ANPBT 1607. 1607. 1607. 1607.
ANPAT 852. 852. 852. 852.
DIVS 0. 0. 0. 0.
CASH1 3311. 3311. 3311. 3311.
CDDD 15242. 15242. 15242. 15242.
CASH2 4509. 4509. 4509. 4509.
NO.SURP 11058. 11058. 11058. 11058.

ORDERS BY AREAS
AREA 1 2 3 4 5
ORDERS 190. 190. 190. 190. 300.
SUM OF ORDERS = 1060.

SALES BY AREAS
AREA 1 2 3 4 5
SALES 190. 190. 190. 190. 300.
SUM OF SALES = 1060.

MARKETING BY AREAS
AREA 1 2 3 4 5
MARKETING 530. 530. 530. 530. 1080.
SUM OF MARKETING = 3200.

COMPANY TOTAL EXPENSE CASH INFLOW TOT. ASSETS TOT.EQUITY SPRD USED
1 14293. 1198. 28058. 28058. 12480.
2 14293. 1198. 28058. 28058. 12480.
3 14293. 1198. 28058. 28058. 12480.
4 14293. 1198. 28058. 28058. 12480.

END ADMINISTRATOR S PART ONE PRESS START
### Company 1 | Industry 1 | Quarter 0

#### Sales Analysis

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<td>36.</td>
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Total Revenue from Sales = 15900.

#### Industry Sales Analysis

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Business Index = 1.00

#### Industry Price Analysis

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| Prices, Firm 2 | 60.   | 60.   | 60.   | 60.   | 60.   |
| Prices, Firm 3 | 60.   | 60.   | 60.   | 60.   | 60.   |
| Prices, Firm 4 | 60.   | 60.   | 60.   | 60.   | 60.   |

#### Production, Capacity, and Inventory Analysis, Period 0

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## SALES ANALYSIS

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**TOTAL REVENUE FROM SALES =** 15900.

## INDUSTRY SALES ANALYSIS

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<td>190.</td>
<td>190.</td>
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**BUSINESS INDEX = 1.00**

## INDUSTRY PRICE ANALYSIS

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## PRODUCTION, CAPACITY, AND INVENTORY, ANALYSIS PERIOD 0

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<th>11/10 CUR.</th>
<th>PLANT CAP.</th>
<th>END. INV.</th>
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<td>264.</td>
<td>260.</td>
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<tr>
<td>52.69</td>
<td>51.96</td>
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<tr>
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<td>13381.</td>
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### Sales Analysis

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<th>Total</th>
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<tr>
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<td>36.</td>
<td>82.</td>
<td>36.</td>
<td>75.</td>
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<td>Sales (Units)</td>
<td>36.</td>
<td>36.</td>
<td>82.</td>
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<td>75.</td>
<td>265.</td>
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<tr>
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<td>80.</td>
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<td>290.</td>
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<td>270.</td>
<td>800.</td>
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Total revenue from sales = 15900.

### Industry Sales Analysis

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<tr>
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<td>3200.</td>
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Business Index = 1.00

### INDUSTRY PRICE ANALYSIS

| PRICES, FIRM 1 | 60. | 60. | 60. | 60. | 60. |
| PRICES, FIRM 2 | 60. | 60. | 60. | 60. | 60. |
| PRICES, FIRM 3 | 60. | 60. | 60. | 60. | 60. |
| PRICES, FIRM 4 | 60. | 60. | 60. | 60. | 60. |

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<td>12480.</td>
<td>13562.</td>
<td>13381.</td>
<td>1559.</td>
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</tbody>
</table>
COMPANY 1  INDUSTRY 1  QUARTER 0

PROFIT AND LOSS  CASH FLOW  BALANCE SHEET

ALES INCOME  15900.  BEG. CASH BAL.  3311.  CASH  4509.
OST OF GDS SLD  12216.  A/C REC.  6390.

RECEIPTS  16440.  PLANT INVST.  15600.
DISBRSMTS  15242.  TOT. ASSETS  28058.

REIGHT  523.  NET INFLOW  1198.
AND O  60.  (OR OUTFLOW)  BANK LOANS  0.
MARKETING  800.
DEPRECIATION  624.
BAD DEBTS LOSS  70.

NET PROF. BEFR. TAX  1607.
INCOME TAXES  755.
NET PROF. AFTR. TAX  852.

TORG TOT. OPER. EXP  14293.

CAP. STOCK  17000.
SURPLUS  11058.
TOT. EQUITY  28058.
### COMPANY 2  INDUSTRY 1  QUARTER 0

#### PROFIT AND LOSS

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<tr>
<td>Cost of Goods Sold</td>
<td>12216.</td>
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<tr>
<td><strong>Total Revenue</strong></td>
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<td>Reights</td>
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<td>Marketing</td>
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<tr>
<td>Depreciation</td>
<td>624.</td>
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<tr>
<td>Bad Debts Loss</td>
<td>70.</td>
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<tr>
<td><strong>Operating Profit</strong></td>
<td>1607.</td>
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<tr>
<td>Bond Flop Disc</td>
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</tr>
<tr>
<td>Bond Interest</td>
<td>0.</td>
</tr>
<tr>
<td>Bank Loan Discount</td>
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</tr>
<tr>
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<tr>
<td>Net Prof. Befr. Tax</td>
<td>1607.</td>
</tr>
<tr>
<td>Income Taxes</td>
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<tr>
<td>Net Prof. Aftr. Tax</td>
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#### CASH FLOW

<table>
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</tr>
<tr>
<td>Receipts</td>
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<tr>
<td>Disbrsmts</td>
<td>15242.</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
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<td>Net Inflow (or Outflow)</td>
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<td>Bonds Paybl.</td>
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<td>Depreciation</td>
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<td>End. Cash Bal.</td>
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<tr>
<td>Freight</td>
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<td>And D</td>
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### Company 3  
#### Industry 1  
#### Quarter 0

#### Profit and Loss

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<tr>
<td>Operating Profit</td>
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<td>Bond Flot Disc</td>
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#### Cash Flow

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<td>Disbursements</td>
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#### Balance Sheet

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</tr>
<tr>
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<tr>
<td>Plant Invst.</td>
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<tr>
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**Total Cash Flow:** 18553.  
**Total Equity:** 28058.
**COMPANY 4**

**INDUSTRY 1**

**QUARTER 0**

### PROFIT AND LOSS

<table>
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<td>AND D (OR OUTFLOW)</td>
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<td><strong>END.CASH BAL.</strong></td>
<td><strong>4509</strong></td>
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<tr>
<td><strong>CASH</strong></td>
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<tr>
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<td><strong>28058</strong></td>
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### BALANCE SHEET

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<tr>
<th>Item</th>
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<td>CASH</td>
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<td>1559</td>
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<td>RECEIPTS</td>
<td>16440</td>
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<td>PLANT INVEST.</td>
<td>15600</td>
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<td>RECEIPTS</td>
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<td>DISBRSMNTS</td>
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<tr>
<td>NET INFLOW</td>
<td>1198</td>
</tr>
<tr>
<td>AND D (OR OUTFLOW)</td>
<td>****</td>
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<tr>
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<td><strong>NET PROF. BEFR.TAX</strong></td>
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<tr>
<td><strong>INCOME TAXES</strong></td>
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<tr>
<td><strong>NET PROF.AFTR.TAX</strong></td>
<td><strong>852</strong></td>
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<td><strong>CAP.STOCK</strong></td>
<td>17000</td>
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<tr>
<td><strong>SURPLUS</strong></td>
<td>11058</td>
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<td><strong>TOT. EQUITY</strong></td>
<td><strong>28058</strong></td>
</tr>
<tr>
<td>****</td>
<td></td>
</tr>
</tbody>
</table>
ONT STOP NOW, I'M JUST BEGINNING

REACHED END OF PROG, NO STOP? SEE STOP 999

STOP  0
EXECUTION TERMINATED

SIG