AN APPRAISAL OF DR. BROOM'S TOP MANAGEMENT GAME

by

JOHN DAVIDSON GIBBERD

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Department of Faculty of Commerce and Business Administration

The University of British Columbia
Vancouver 8, Canada

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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[1], 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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[1] H.N. Broom, Business Policy and Strategic Action, Text and Cases (Englewood Cliffs: Prentice Hall Inc., 1969) pp 535-583; H.N. Broom, Business Policy and Strategic Action, Teacher's Manual (Englewood Cliffs: Prentice Hall Inc., 1969) pp. 86-188.

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.

1. Greenlaw, Herron Rowdon, Business Simulation in Industrial and University Education, (Englewood Cliffs: Prentice Hall Inc., 1962) Ch. 1.
2. Carson J., "Business Games: A Technique for Teaching Decision Making" Business Games Handbook, Graham, Gray (American Management Association, 1969) pp. 39-46.

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.

3. Andrew Wilson, The Bomb and the Computer, (New York, New York, Delacorte Press, 1968) pp 1-210.
4. Greenlaw, Herron, Rowdon, Business Simulation in Industrial and University Education (Englewood Cliffs: Prentice Hall Inc., 1962) Ch. 1.

5. R. C. Muer, William T. Newell, Harold L. Pazer, Simulation in Business & Economics (Englewood Cliffs: Prentice Hall Inc., 1969) pp. 179-213.

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.

6. R. Matessich, Simulation of the Firm Through A Budget Computer Program (Homewood Illinois: Richard D. Irwin Inc., 1964)

7. George W. Gershefski, The Development and Application of a Corporate Financial Model (Oxford Ohio: The Planning Executive Institute, 1968)

8. George W. Gershefski, Management Science, Vol. 16 No. 6, February 1970, pp 303-312.

9. Rodney H. Brady, "Computers in Top Level Decision Making", Harvard Business Review, Vol. n, July-August, pp. 67-76.

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.

10. J. A. Bell, "A Simulation Model for Business Planning", Operational Research Quarterly, Special Conference Issue, Vol. 20, April 1960, pp. 3-4.

11. Allen A. Zoll, Dynamic Management Education, (Don Mills, Ontario, Addison Wesley Publishing Co., 1969).

12. Martin Shubik, "Gaming: Cost and Facilities", Management Science, Vol. 14, No. 11, July, 1968, pp. 629-660.

13. R. C. Muer, William T. Newell, Harold L. Pazer, Simulation in Business & Economics, (Englewood Cliffs: Prentice Hall Inc., 1969) pp. 170-213.

14. J. R. Greene, Roger L. Sisson, Dynamic Management Decision Games, (New York: John Wiley & Sons Inc., 1959) pp. 2-6.

15. E. M. Babb, L. M. Eisgruder, Management Games for Teaching and Research, (Chicago, Illinois, Educational Methods Inc., 1966).

Educational Value of Games

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

16. E. M. Babb, L. M. Eisgruder, Management Games for Teaching and Research, (Chicago, Illinois, Educational Methods Inc., 1966) pp. 15-113.

17. Larry F. Moore, "Business Games vs. Cases as Tools of Learning", Training and Development Journal, Vol. 21, No. 10, October 1967.

18. Robert G. Grahm, Clifford F. Gray, Business Games Handbook, (American Management Association, 1969) pp. 19-28.

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.

19. Greenlaw, Herron Rowdon, Business Simulation In Industrial and University Education, (Englewood Cliffs: Prentice Hall Inc., 1962) Ch. 6.

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

20. Martin Shubik, "Gaming: Cost and Facilities", Management Science, Vol. 14, No. 11, July, 1968.

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.

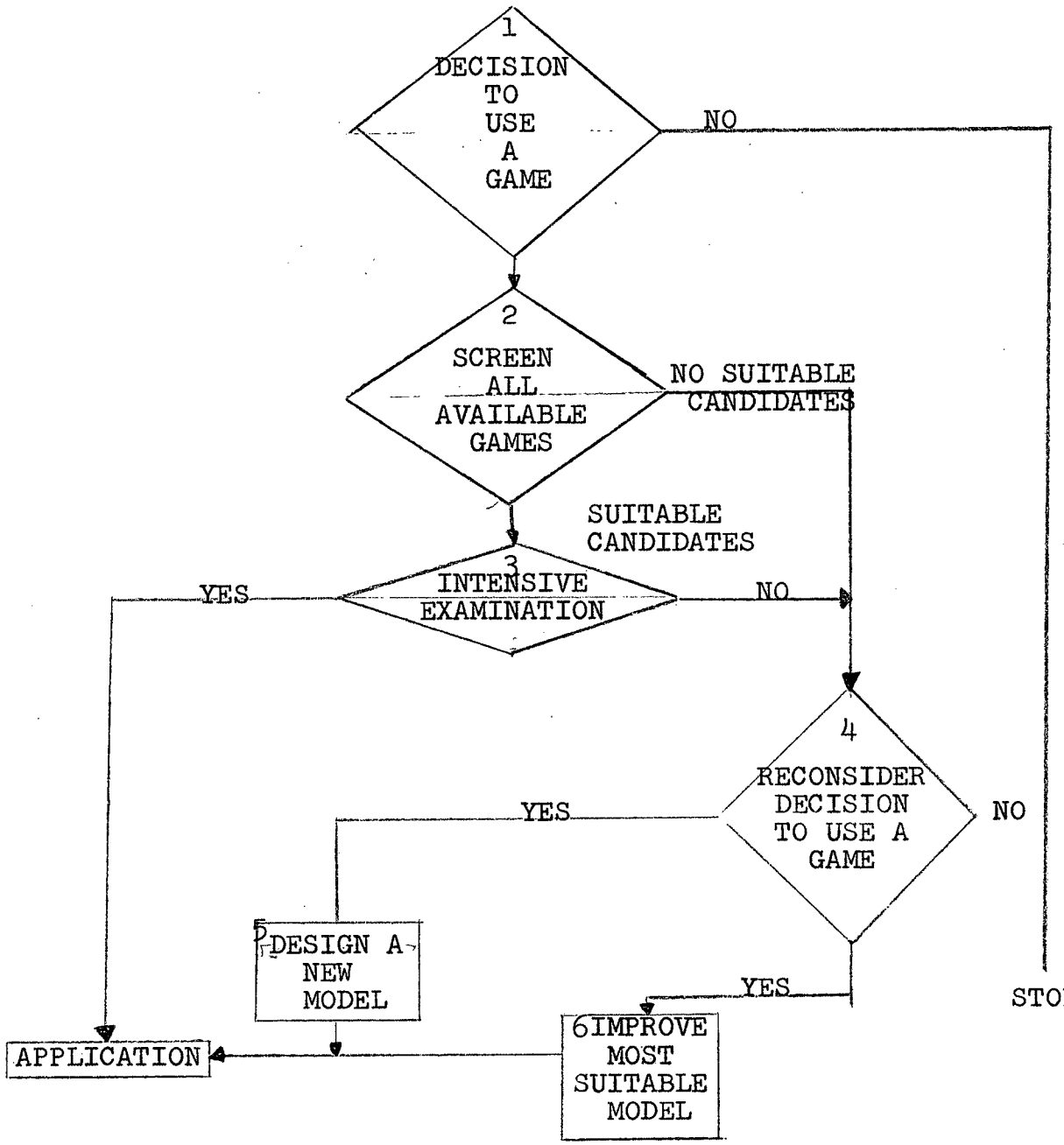
Design Steps

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 colums 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 subdivision of the matrix.

TABLE II

MATRIX TO ANALIZE 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.

TABLE II. A MANAGEMENT GAME MATRIX

INPUT FOR A PERIOD

	OPERATING					CONTROL					TOP				
OUTPUT FOR A PERIOD	E	P	F	L	M	E	P	F	L	M	E	P	F	L	M
OPERATING	E														
	P														
	F														
	L														
	M														
CONTROL	E														
	P														
	F														
	L														
	M														
TOP	E														
	P														
	F														
	L														
	M														

(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 <u>decision input</u> with the corresponding <u>column output decision</u>.

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 Univeristy[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.

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[2] H.N.Broom, Business Policy and Strategic Action, Text and Cases (Englewood Cliffs: Prentice Hall Inc., 1969).

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 out-out. 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-

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3 H.N.Broom, Teacher's Manual: Business Policy and Strategic Action (Englewood Cliffs: Prentice Hall Inc., 1969) Errata.

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,

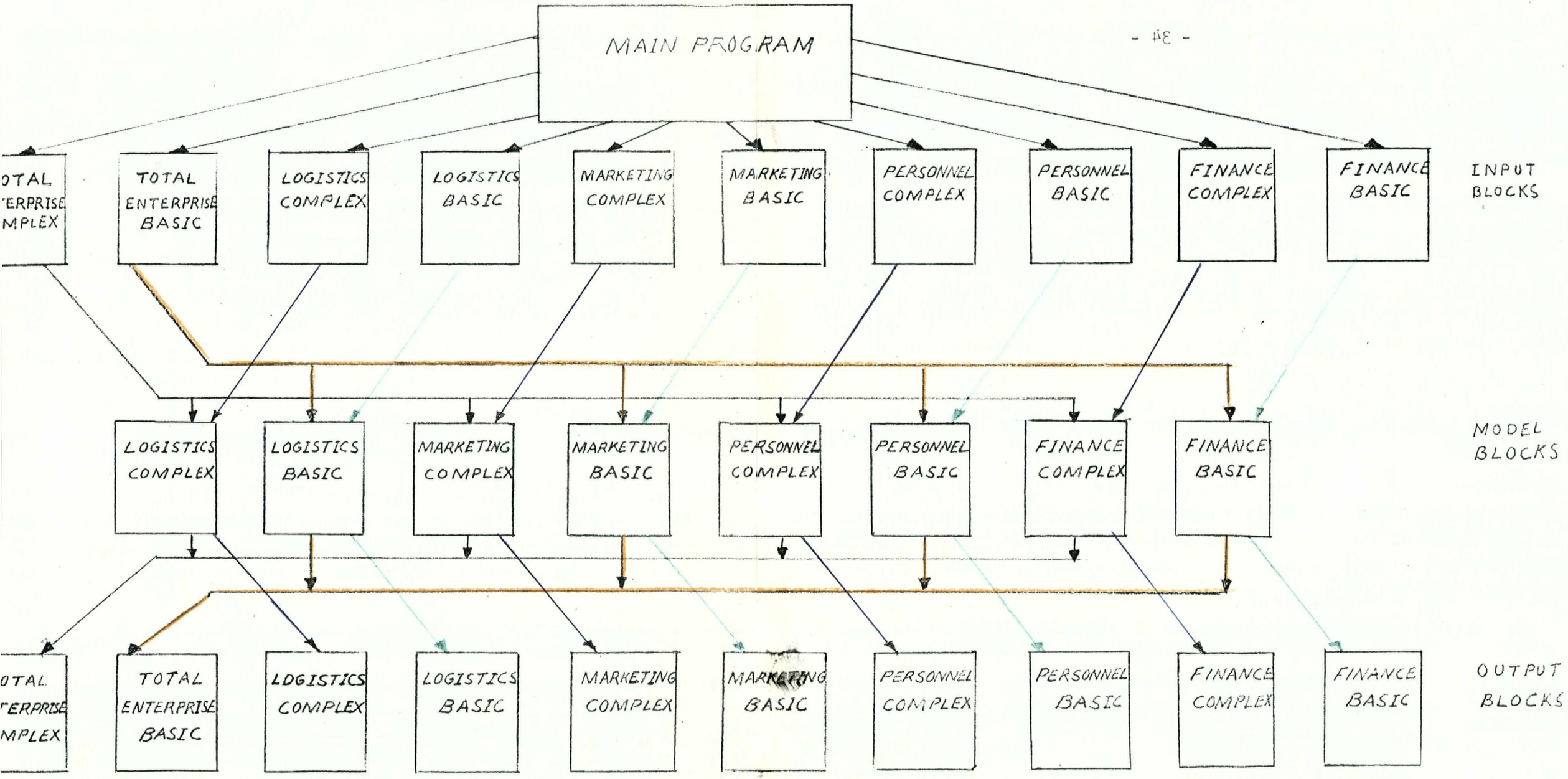

FIGURE II.

A TOTAL ENTEPRISE MODEL, MODULAR DESIGN

that it is not modular. As a result the analysis shifts to determining the feasability 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

$$UPRO(I) = \frac{SPRO(I)}{AN} - \frac{(Z3 - (F \times EE(I) + e(I) \times Z5 - \frac{PVS(I)}{Z2} \times Z7}{Z3 - \frac{(F \times EE(I) + E(I)}{Z4} \times Z6 - Z7}$$

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

and $\frac{PVS(I)}{Z2} = W$

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

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: $SPRO(I) \times \frac{1}{AN} = A$

$$UPRO(I) = A \times \frac{1}{Y \times Z6 - Z7} - \left(\frac{Z5 \times Y}{Y \times Z6 - Z7}\right) - \left(\frac{W \times Z7}{Y \times Z6 - Z7}\right)$$

Also from the Appendix I remember that

$$Y = 1.06 - \left(\frac{.50 \times EE(I) + E(I)}{3600}\right)$$

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

$$\frac{W \times Z7}{Y \times Z6 - Z7} = \frac{\frac{PVS(I)}{60} \times 6}{50 \times Y - 6} = \frac{\frac{1}{10} \times PVS(I)}{50 \times Y - 6}$$

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:

$$T(J,I) \doteq$$

$$AN \times UH \times \left(H1 + \frac{SUMEE}{H2}\right) \times \left(AM1 - \left(\frac{AN \times P(I) \times AM2}{SAJJ(I)}\right)\right) X \left(\frac{R \times AN}{SMIN(I)}\right) +$$

OR

$$AN \times UF \times \left(H1 + \frac{SUMEE}{H2}\right) \times \left(AM1 - \left(\frac{AN \times P(I) \times AM2}{SAJJ(I)}\right)\right) X \left(\frac{R \times AN}{SMIN(I)}\right)$$

OR

$$AN \times U5 \times \left(H1 + \frac{SUMEE}{H2}\right) \times \left(AM1 - \left(\frac{AN \times P(I) \times AM2}{SAJJ(I)}\right)\right) x \left(\frac{R \times AN}{SMIN(I)}\right)$$

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 substractions 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 = Marketing expenditures in area with smaller total of two regions.

The difference between the two AL(I) equals

$$AM1 - \left(\frac{AN \times P(I) \times AM2}{M}\right) - \left(AM1 - (AN \times P(I) \times AM2)\right)$$

$$= \frac{D - M\,(AN \times P(I) \times AM2) + M \times (AN \times P(I) \times AM2)}{M(M - D)}$$

$$= \frac{D \times (AN \times P(I) \times AM2)}{M(M - D)}$$

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 $\frac{(R \times AN)}{SMIN(I)}$. 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 $G = H1 + \frac{SUMEE}{H2}$. 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.

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

(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 anddevelopment do not help in capturing sales also is unrealistic.

I recommend the following changes. Multiply part one of the formula by $\frac{AJJ(I,J)}{SAJJ(I)}$. 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 $\frac{EE(I)}{SUMEE}$ 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. Obsolesence 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 obsolesence, 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 necesary 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 keeping 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.

IV PRESENTATION

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[5], the first format numbered ninety three is incorrect and there are three statements missing. The program should read:

```
WORTH  =  CSTG(I) + SURP(I)
OPEX   =  COSA(I) + SFRGT(I) + E(I) + SUMAG(I) + Z(I) + ALOBD(I)
OPPR   =  SREV(I) - OPEX
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:

```
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.

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[5] H.N.Broom, Teacher's Manual: Business Policy and Strategic Action (Englewood Cliffs: Prentice Hall Inc., 1969) p. 186.

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.

V CONCLUDING COMMENTS

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.

6 R.Graham, C.Gray, Business Games Handbook, (American Management Association, 1969).

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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[1]

AAAA(5)	Amount spent for marketing, by areas, for entire industry (in M dollars).
AINV1(4)	Starting inventory for given firm and quarter (in M units) = AINV2(4) of previous quarter for given firm (per history data)
AINV2(4)	Ending inventory for given firm and quarter (in M units)
AITP (4)	Income tax paid by given firm for given quarter (in M dollars)
AITRA	Income tax ratio (rate paid, applicable to net profit before taxes)
AJ(4,5)	Amount spent for marketing, by areas, in current quarter (by company decision)
AJJ(4,5)	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)

---

[1] H.N.Broom, Teacher's Manual: Business Policy and Strategic Action (Englewood Cliffs: Prentice Hall Inc., 1969), p. 109-115.

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
AM1 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

BPO1(4) Bonds Payable, in M dollars, for given firm at start of given quarter, at par = BPO2(4) of prior quarter (per history data)

BPO2(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

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

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

FRGT(4,5)	Freight cost per area, for given company and quarter, in M dollars
G	Industry cumulative R & D impact ratio (applied to all area total orders)
H1	R & D sales scaling value
H2	R & D sales sensitivity factor
IA	Industry number
IB	Number of companies
IC	Quarter
ID	Number of areas
IIA	Card number for checking during READ IN
IPR	Value to test card order
J	Values to test card order
JINX	Calculation for checking card order
JPR	Values to test card order
KPR	Values for testing industry number
LPR	Values for testing quarter number
M	Company number for printout purposes
N	Number of output history card
NOP	No operation (meaning ignore the first value punched in the given cards, when used)
OOOO(5)	Sume of orders by areas, in M units, for industry, in given quarter
P(5)	Area normalizing factors
PPPW	Basic bond flotation discount rate, any company
PREV	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)

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

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)
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 & 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)

TEXP	Total expenses, in M dollars, for given firm and quarter (used for first computation thereof)
TOT(4)	Total of starting inventory and units produced in current quarter, in M units (second use thereof, for printout purposes)
U5	Area consumer power factor, common territory
UF	Area consumer power factor, foreign territory
UH	Area consumer power factor, home territory
UCOL(4)	Cash collected on accounts receivable, in M dollars, by given company, for given quarter
UCST	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)
UPRO(4)	Actual production in current quarter, by o companies, in M units
UPROL(4)	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
UPROM(4)	Production in M units, given company and quarter, that wouldhave been attained if operations had been at 11/10 of current quarter's actual production level
V(4,5)	Area-order-getting-power factors, by companies
VINV(4)	Value of ending inventory, in M dollars, for given firm and quarter
VINVB(4)	Preceding quarter's ending inventory, given company and quarter, in M dollars
W1	Share-of-market marketing impact sensitivity factor
W2	Share-of-market price sensitivity factor
W3	Share-of-market R & D sensitivity factor
W4	Share-of-market scaling value

WORTH	Sum of capital stock outstanding and surplus, in M dollars
WWWW(5)	Industry total sales in M dollars, by areas, for current quarter
X1(4)	R & D production impact factor (one value per company)
X(4,5)	Share of market ratios, by areas and companies (20 values per industry)
Y(4,5)	Sales orders of given company in given area, in M units, for current quarter
ZZ	Replacement value for UPRO(4) when cost of current capacity output must be ascertained = CAP(4)
Z1	Depreciation rate
Z(4)	Amount of depreciation for given company in current quarter, in M dollars
Z2	M dollar investment required to create 1,000 units of capacity
Z3	R & D production scaling value
Z4	R & D production sensitivity factor
Z5	Unit cost sensitivity factor #1
Z6	Unit cost sensitivity factor #2
Z7	Adjustment factor for company size
Z8	Multiplier of UPRO(4) for output at 9/10 of current actual level
Z9	Multiplier of UPRO(4) for output at 11/10 of current actual level
ZZZ1	Cycle scaling value
ZZZ2	Cycle sensitivity factor

PRODUCTION

1. SPRØ(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

   IF(SPRØ(I) - 4500)3,4,4

3. If production spending is less than $4,500,000 set it equal to this amount

   SPRØ(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.

   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 Research and development scaling factor

   EE(I) = F x EE(I) + E(I)

9. X1(I) I = 1,--,4. Research and development production impact factor.

Z3 = 1.06 Research and development scaling value

Z4 = 3,600 Research and development production sensitivity factor

X1(I) = Z3 - (EE(I)/Z4)

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

PVS(I) = 1,--,4 Dollar value of each plant at the start of the quarter

Z2 = 60 Dollars of plant investment required to create a unit of capacity

CAP(I) = PVS(I)/Z2

11. UPRØ(I) I = 1,--,4. Number of units produced by a firm in a given period.

AN = Business index

Z5 = 3,000 Unit cost sensitivity factor No. 1. This value is incorrect and should read 3.

Z6 = 50 Unit cost sensitivity factor No. 2.

Z7 = 6 Adjustment factor for company size.

UPRO(I) = ((SPRO(I)/AN) - (X1(I) * Z5) - CAP(I)* Z7)/

((X1(I)* Z6) - Z7)

UPRO(I) = FLOAT (INT (UPRO(I) + .5))

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

MARKETING

Creation of Demand

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

13. SUMAJ(I) I = 1,--4. Total marketing expenditures in a period for each company.

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

```
IF(SUMAJ(I) - 1800)24,24,15
```

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

```
DIF = SUMAJ(I) - 1800
```

16. AJJ(J,I) J = 1,--,4; I = 1,---,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

```
IF(DIF - AJJ(J,J) 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) - 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.

BALNS = DIF - 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.

IF(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.

AK = 60 Marketing adjustment factor

AJJ(J,I) = AK * (AJJ(J,I) + AJ(J,I))

25. SAJJ(I) I = 1,---,5. The sum of cumulative marketing to date for each area.

SAJJ(I) = SAJJ(I) + AJJ(J,I)

26. AL(I) I = 1,---,5. Industry cumulative marketing impact ratio for each area.

AM1 = 20 Marketing sales scaling factor.

AM2 = 50 Marketing sales sensitivity factor.

P(I) = 1.25 for foreign and home territories

= 2.62 for common territory

These are area normalizing factors

AN = Business index

27. S(J,I) 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* AN)/SMIN(I)
```

29/ EE(I) 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) 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 * UH* G * AL(I) * Q(I)

= AN * U5* G * AL(I) * Q(I)

= AN * UF * G * AL(I) * 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.

```
W2 = 90  Share of market price sensitivity factor
DO 89 I = 1,4
DO 89 J = 1,5
IF(SAVE(I)/S(I,J) - W2) 11,11,89
11 V(I,J) = 0
89 CONTINUE
```

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

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

```
W1 = 10      Share of market marketing impact
               sensitivity factor
W3 = 10000   Share of market research and devel-
               opment sensitivity factor
W4 = 90      Share of market scaling value.
V(I,J) = (AL(J)/ALAVE * W1) *
         (SAVE(J)/S(I,J) - W2) *
         (W4 + G/(AN   W3)
```

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

```
SMV(J) = 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)/SMV(J)
```

41. Y(I,J) I = 1,--,4; J = 1,---,5. The actual sales

orders for each firm per region.

```
      DO 140 I = 1,4
      DO 140 J = 1,5
      Y(I,J) = X(I,J) * T(I,J)
  140 Y(I,J) = FLOAT(INT(Y(I,J) + .5))
```

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

```
      DO 90 I = 1,4
      DO 90 J = 1,5
      90 SUMY(I) = SUMY(I) + Y(I,J)
```

43. Marketing interfaces with production to dete rmine actual sales.

UPRO(I) I = 1,--,4.	Production for a firm for period.
AINV1(I) I = 1,--,4.	The inventory at the begin= ning of a period for each firm.

44. TEST The sum of beginning inventory plus production for the period for a firm.

```
      TEST = AINV1(I) + UPRO(I)
```

45. Determine if a company's sales orders are greater that TEST

```
      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) = ((AINV1(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.

Z1 = .04 Quarterly depreciation rate.

Z(I) = Z1 * 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.

IF(SMSAL(I) - AINV1(I)) 58,57,57

57. VINV(I) = (AINV2(I) x COST(I))

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

58. VINV(I) = VINB(I) * (1.0 - SMSAL(I)/AINV1(I) + UPRO(I) * COST(I)

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

59. UCST Unit cost of ending inventory in dollars and cents. Test to see if ending inventory is greater than period production.

IF(AINV2(I) - UPRO(I)) 60,60,61

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

61. UCST = VINV(I)/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. SREV(I) I = 1,--,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) * SAL(I,J)
```

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

SFRGT(I) I = 1,--,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.

FR1 = 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 * SAL(I,J) Foreign Freight
      GO TO 307
  306 FRGT(I,J) = FR3 * SAL(I,J) Home Freight
      GO TO 307
  310 FRGT(I,J) = FR1 * SAL(I,J) Common Freight
  307 SFRGT(I) = SFRGT(I) + FRGT(I,J)
      210 CONTINUE
      400 CONTINUE
```

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

receivable for the quarter.

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

ALUR = .01 Reduction rate used for calculating loss on bad debts.

ALOBD(I) = ALUR * RRR1(I)

65. Test to see if sales revenue is zero.

IF(SREV(I) 65,65,66

UCOL(I) I = 1,--,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 Business index

ZZZ1 = 1.00 Cycle scaling value

ZZZ2 = 20 Cycle sensitivity factor

$$AZ = ZZZ1 - \frac{AN - ZZZ1}{ZZZ2}$$

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

COL1 = .60 Collection ratio, applicable to sales of the quarter.

COL2 = .98 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.

BPO1(I) I = 1,--,4. M dollars of bonds outstanding at the beginning of the quarter.

```
DO 993 I = 1,4
IF(BOR(I) - BPO1(I))  994,994,995
995 BOR(I) = BPO1(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
700 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. BP02(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.

BPO2(I) = BPO1(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.

```
      DO 791 I = 1,4
      IF(BPS(I)   791,791,708
  708 IF(BPO2(I) - 20000)  791,791,709
  709 BPS(I) = BPS(I) - (BPO2(I) - 20,000)
      IF(BPS(I)) 710,791,791
  710 PRINT 910, I
  910 FORMAT
  791 CONTINUE
```

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.

AZ Adjustment multiplier see note (65)

PPPW = .08 basic bond flotation discount rate any company

BRAT(I) = AZ * PPPW

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,--,4. Interest expense on bonds outstanding for a given company at the end of any quarter.

```
PWWW = .015  quarterly interest rate
BICO(I) = BPO2(I) * PWWW
```

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

```
PSWW = .0175 bank loan discount rate
BLDT(I) = BLN(I) * PSWW
```

84. SPROC(I) I = 1,--,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.

```
SPROC(I) = AN * (CAP(I) * (X1(I) * Z6 - Z7)+
               (x1(I) * Z5 + CAP(I) * Z7)
IF(UPRO(I) - CAP(I))85,930,85
930 SPRO(I) = SPROC(I)
```

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

```
COSA(I) = VINVB(I) + SPRO(I) - VINV(I)
```

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

```
FIN = BFD(I) + BICO(I) + BLDT(I)
```

87. ANPBT(I) I = 1,--,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. CDDD(I) I = 1,--,4. The second part of cash disbursements.

$$CDDD(I) = SPRO(I) + SFRGT(I) + E(I) + SUMAJ(I) + ANPJ(I) + BOR(I) + BFD(I) + FINAN$$

95. CASH2(I) I = 1,--,4. M dollars cash balance at the end of the period.

CASH1(I) I = 1,--,4. M dollars cash balance at the beginning of the period.

$$CASH2(I) = CASH1(I) + CSHR(I) - CDDD(I)$$

96. CSTG(I) I = 1,--,4. Calculation of outstanding capital stock at the end of the quarter.

$$CSTG(I) = CSTO(I) + CSSC(I) - REPST(I)$$

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

```
IF(CASH2(I)) 98,101,101
```

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.

```
IF(AUTH - CSTG(I)) 100,100,99
```

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

```
979 IF(CASH2(I))  980,101,101
980 IF( AUTH - CSTG(I))  100,100,981
981 CSTG(I) = 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

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:

```
UPRO(I) = FLOAT(INT(UPRO(I) + .5))
Y(I,J = FLOAT(INT(Y(I,J) + .5))
```

```
C          DR BROOM S MANAGEMENT DECISION GAME          (A)          PART ONE
      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,ZZZ1,
     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),SPROL(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)
C     READ HISTORY DATA CONSTANTS
      READ(5,1) IB,IC,IA,ID
    1 FORMAT(I2, 3I3)
      READ(5,2)  F, H1, H2, AK, AM1, AM2, AN
      READ(5,2)  P(1), P(2), P(3), P(4), P(5), R, W1, W2
      READ(5,2)  Z1, Z2, Z3, Z4, Z5, Z6, Z7, W3
      READ(5,2)  Z8, Z9, COL1, COL2, COLC, ZZZ1, ZZZ2
      READ(5,2)  PPPW, PWWW, PSWW, FR1, FR2, FR3, AITRA
      READ(5,2)  AUTH, W4, ALUR, UH, UF, U5
    2 FORMAT(7F10.0, F5.0)
      B6 = IB
      D6 = ID
C     READS DATA FROM PAST QUARTER AND CHECKS INPUT ORDER
      DO 10 I = 1, IB
      READ(5,3) 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),BPO1(I),COSTB(I)
      JPR = 1
   21 READ(5,3) IPR,J,IIA,CASH1(I),SURP(I),VINVB(I),
     XCSTO(I),BLRP(I)
   10 CONTINUE
    3 FORMAT(I2, 2I3, 8F8.0)
    4 FORMAT(I2, 2I3, 3F8.0)
      READ(5,3)  NOP,LPR,KPR
   22 DO 30 I = 1, IB
      READ(5,3) IPR,J,IIA,E(I),AJ(I,1),AJ(I,2),AJ(I,3),
     XAJ(I,4),AJ(I,5)
      JPR = 3
   23 READ(5,3) IPR,J,IIA,S(I,1),S(I,2),S(I,3),
     XS(I,4),S(I,5),SPRO(I)
   24 READ(5,3) IPR,J,IIA,BLN(I),BPS(I),CSSC(I),ANPJ(I),
     XBOR(I),REPST(I),DIVS(I)
   30 CONTINUE
      GO TO 100
   25 JINX = 3 * I + JPR + 4
      GO TO 27
   26 JINX = 2 * I + JPR + 12
   27 PRINT 6, JINX
```

```
C       CARD IN WHICH ERROR OCCURS
    6 FORMAT(31HINPUT CARDS IMPROPERLY ORDERED, 2X20HERROR OCCURS IN CAR
     XDI3)
C       PRINT  OUT DATA FOR ADMINISTRATOR
  100   PRINT  41, IA, IC
   41   FORMAT( 10X33HADMINISTRATOR S PRINTOUT PAGE ONE, 5X 8HINDUSTRY,  I
       X4,
       15X7HQUARTERI4///)
        PRINT  42
    42 FORMAT(15X20HBEGINNING 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(4HAREAI3,4F9.0)
        PRINT  45
    45 FORMAT (///)
C
C       TASK 1 RESEARCH AND MARKETING
C        CALCULATES CUMULATIVE R AND D IMPACT IN CURRENT QUARTER BY COMPAN
        SUMEE=0.0
        DO 40 I = 1, IB
C        TEST FOR AMOUNT ON R AND D TO KEEP IT EQUAL OR LESS THAN 1250.
        IF(E(I) - 1250.) 999, 999, 998
   998  E(I) = 1250.
C        TEST REPURCHASED STOCK TO SEE IF EXCEEDS MAXIMUM OF $1000.
   999  IF(REPST(I) - 1000.) 997, 997, 996
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) - BPO1(I)) 994, 994, 995
C        IF REPURCHASED BONDS ARE GREATER THAN OUTSTANDING BONDS,
C             SET REPURCHASED EQUAL TO OUTSTANDING.
   995  BOR(I) = BPO1(I)
C       TEST TO SEE IF BONDS REPURCHASED ARE GREATER THAN MAXIMUM ALLOWED
C           FOR ONE PERIOD ($5000.)
   994  IF(BOR(I) - 5000.) 993, 993, 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.)991, 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,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,
     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),SPROL(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)
C       CALCULATES CUMULATIVE AREA MARKETING M$ SPENT
      DO 60I = 1, ID
      SAJJ(I)= 0.
      DO 60 J= 1, IB
C     TEST TO SEE THAT THE MAXIMUM SPENT ON MARKETING PER COMPANY
C     DOES NOT EXCEED $1800.
      IF(SUMAJ(J) - 1800.) 60, 60, 980
C     IF TOTAL MARKETING EXCEEDS $1800., FIND BY WHAT AMOUNT IT EXCEEDS.
  980 DIF = SUMAJ(J) - 1800.
      IF(DIF - AJJ(J,J)) 960, 960, 950
C     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.
C       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) + AJ(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, ID
      DO 20 I = 1, IB
   20 SAJJ(J) = SAJJ(J) + AJJ(I,J)
C
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)
   80 CONTINUE
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 B
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,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,
     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),SPROL(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  46, SMIN(1), SMIN(2), SMIN(3), SMIN(4), SMIN(5)
   46 FORMAT(4HSMIN5X,5F9.0//)
      PRINT  47, Q(1), Q(2), Q(3), Q(4), Q(5)
   47 FORMAT(2HQ=3X, 5F12.8/)
      PRINT  48, PVS(1), PVS(2), PVS(3), PVS(4)
   48 FORMAT(3HPVS6X4F9.0/)
      PRINT  1
    1 FORMAT(10X6HPART A/)
      PRINT  3
    3 FORMAT(5X14HB = 1, 2, 3, 4, 5X17HD = 1, 2, 3, 4, 5/)
      PRINT  4, F, H1, H2
    4 FORMAT(5X3HF =F4.2, 2X3HH1=F5.2, 2X, 3HH2=F6.0/)
      PRINT  9, AK
    9 FORMAT(5X, 4HAK =, F8.2/)
      PRINT  10, AM1
   10 FORMAT(5X, 5HM1 = F8.2/)
      PRINT  11, AM2
   11 FORMAT(5X, 5HM2 = F8.2/)
      PRINT  12, P(1), P(2), P(3), P(4), P(5)
   12 FORMAT(5X4HP1 =F6.2,2X4HP2 =F6.2, 2X4HP3 =F6.2,2X4HP4 =F6.2, 2X4HP
     X5 =,
     1F6.2//)
      PRINT  13
   13 FORMAT(5X22HU FOR COMPANY AND AREA)
      PRINT  14
   14 FORMAT(7HCOMPANY, 7X1H1, 8X, 1H2, 8X, 1H3, 8X, 1H4)
      M = 1
      PRINT  15, M, UH, UF, UF, UF
   15 FORMAT(4HAREA, I2, 4X, F6.0, 3F9.0)
      M = 2
      PRINT  15, M, UF, UH, UF, UF
      M = 3
      PRINT  15, M, UF, UF, UH, UF
      M = 4
      PRINT  15, M, UF, UF, UF, UH
      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.
     XO//)
      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.
     X2//)
      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, 5X6HPPPW =F6.2, 5X6HPWWW = F6.3//)
      PRINT  26, FR1, FR2, FR3, AITRA
   26 FORMAT(5X5HFR1 =F4.0, 5X5HFR2 =F4.0, 5X5HFR3 =F4.0, 5X7HAITRA =F6.
     X2////)
      PRINT  31
   31 FORMAT(6HPART B//)
      PRINT  32, AN
   32 FORMAT(5X4HAN =F6.2//)
      PRINT  14
      PRINT  33, E(1), E(2), E(3), E(4)
   33 FORMAT(3X4HE = , 4F9.0//)
      PRINT  34, EE(1), EE(2), EE(3), EE(4)
   34 FORMAT( 3X, 5HEE = , 4F9.0//)
      PRINT  35, G
   35 FORMAT(3X4HG = , F12.8//)
      PRINT  14
      PRINT  36, SUMAJ(1), SUMAJ(2) , SUMAJ(3) , SUMAJ(4)
   36 FORMAT (3X7HSUMJD = 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 (3X3HJJD I3,4F9.2)
      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=F11.8,1X4H
     XAL5=,
     1F11.8//)
```

```
      PRINT  14
      DO 110 I = 1,5
  110 PRINT  41, S(1,I), S(2,I), S(3,I), S(4,I)
   41 FORMAT (3X4HSD = 4F9.0)
      PRINT  40
      RETURN
      END
```

IRY REQUIREMENTS 000CAC BYTES

```
      SUBROUTINE C
C       PART TWO OF DIVIDED PROGRAM   DR BROOM S MANAGEMENT GAME     (C)
      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,ZZZ1,
     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),SPROL(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)
      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 / D6
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 V(I,J) = 0.
      GO TO 130
   31 V(I,J) = (AL(J)/ALAVE*W1 ) *(SAVE(J)/S(I,J) -W2) *(W4 + G/(AN * W3
     X))
  130 SMV(J) = SMV(J) + V(I,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) = V(I,J) / SMV(J)
C      COMPANY SALES ORDERS IN AREA
      Y(I,J) = (X(I,J)) * T(I,J)
  140 Y(I,J)=FLOAT(INT(Y(I,J)+.5))
C      DEPRECIATION  M$
      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)
```

```
C       UNIT COST OF PRODUCTION
   32 COST(I) = AN *((X1(I) *(Z6 + Z5/ UPRO(I)))+((CAP(I)-UPRO(I))/UPRO(
     XI)*Z7))
C       TOTAL COST OF PRODUCTION
       SUMY(I) = 0.
       DO 150 J = 1, ID
  150 SUMY(I) = SUMY(I) + Y(I,J)
C       UNIT COST AT ADDED OUTPUT LEVELS
       DO 160 I = 1, IB
       SREV(I) = 0.
       DO 170 J = 1, ID
       TEST = AINV1(I) + UPRO(I)
C       IF TOTAL COMPANY SALES GREATER THAN BEGINNING INVENTORY + PRODUCT
       IF(SUMY(I) - TEST) 53, 53, 34
    53 SAL(I,J) = Y(I,J)
       SMSAL(I) = SUMY(I)
       GO TO 170
    34 SAL(I,J) = ((AINV1(I) + UPRO(I))/ SUMY(I)) * Y(I,J)
       SMSAL(I) = AINV1(I) + UPRO(I)
  170 CONTINUE
C       ENDING INVENTORY (M UNITS)
       TEST = AINV1(I) + UPRO(I)
       IF(SMSAL(I) - TEST) 54, 35,35
    35 AINV2(I) = 0.
       GO TO 160
    54 AINV2(I) = AINV1(I) + UPRO(I) - SMSAL(I)
  160 CONTINUE
C       SALES REVENUE  (M$)
       DO 180 I = 1, IB
       DO 190 J = 1, ID
  190 SREV(I) = SREV(I) + (SAL(I,J) * S(I,J))
C       VALUE OF ENDING INVENTORY
       IF(SMSAL(I) - AINV1(I)) 39, 37, 37
    37 VINV(I) =AINV2(I) * COST(I)
       GO TO 180
    39 VINV(I) = VINVB(I) * (1.0 - SMSAL(I)/AINV1(I)) + UPRO(I) * COST(I)
  180 CONTINUE
       RETURN
       END
```

)RY REQUIREMENTS 0006E6 BYTES

```
      SUBROUTINE D
C  BAYLOR MANAGEMENT GAMES PART (D)
      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,ZZZ1,
     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),SPROL(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)
      DIMENSION TOT(4)
      DIMENSION CY(4)
      PRINT  42, SAVE(1), SAVE(2), SAVE(3), SAVE(4), SAVE(5)
   42 FORMAT(5X10HSAVG       ,5F9.0)
      PRINT  202
  202 FORMAT(79X1H+)
      PRINT  204
  204 FORMAT(20X 35HADMINISTRATOR S PRINTOUT PAGE THREE// )
      PRINT  43
   43 FORMAT(15X 8HT VALUES)
      PRINT  14
   14 FORMAT(7HCOMPANY,11X1H1,11X, 1H2,11X, 1H3,11X, 1H4)
      DO 120 I=1,5
  120 PRINT  44, I, T(1,I), T(2,I), T(3,I), T(4,I)
   44 FORMAT(4HAREAI3,5F12.4)
      PRINT  40
      PRINT  45,ALAVE
   45 FORMAT(5X6HALAVE=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(15X 8HX VALUES)
      PRINT  14
      DO 140 I = 1,5
  140 PRINT  147, I, X(1,I), X(2,I), X(3,I), X(4,I)
      PRINT  40
      PRINT  149
  149 FORMAT(15X 8HY 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(2HZ=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(4HUPRO3X4F9.0/)
      PRINT  54, COST(1), COST(2), COST(3), COST(4)
   54 FORMAT(4HCOST3X4F 9.2/)
      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 (8HINV+UPRO  F8.0,3F9.0/)
      PRINT 57, SUMY(1), SUMY(2), SUMY(3), SUMY(4)
   57 FORMAT (5HSUMY=2X4F9.0/)
      PRINT  58,SMSAL(1), SMSAL(2), SMSAL(3), SMSAL(4)
   58 FORMAT (7HSMSAL = 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 I3, 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, VINVB(1), VINVB(2), VINVB(3), VINVB(4)
   63 FORMAT(5HVINVB2X4F9.0/)
      PRINT  64, VINV(1), VINV(2), VINV(3), VINV(4)
   64 FORMAT(4HVINV3X4F9.0/)
      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

ORY REQUIREMENTS 000808 BYTES
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      SUBROUTINE EEEE
C       THIRD PART OF DIVIDED PROGRAM FOR DR. BROOM S MANAGEMENT GAME(E)
      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,ZZZ1,
     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),SPROL(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)
C       LOSS ON BAD DEBTS
      DO 200 I = 1, 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 * RRR1(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
   43 BLN(I) =    2000.
   42 BPO2(I) = BPO1(I) + BPS(I) - BOR(I)
C       TEST TO SEE IF SOLD ANY BONDS THIS QUARTER     IF NOT, SKIP TEST
      IF(BPS(I)) 44, 44, 45
   45 IF(BPO2(I) -  20000.) 44, 44, 46
   46 BPS(I) = BPS(I) -(BPO2(I) -20000.)
      IF(BPS(I)) 47, 44, 44
   47 PRINT  90, I
      BPS(I) = 0.
   90 FORMAT(25HBONDS OVERSOLD IN COMPANY  I4)
   44 CSHR(I) = UCOL(I) + CSSC(I) + BLN(I) + BPS(I)
C       CURRENT QUARTER BOND DISCOUNT RATE
      BRAT(I) = AZ * PPPW
C       DISCOUNT ON BOND SALE
      BFD(I) = BPS(I) * BRAT(I)
C
C       BOND INTEREST COST
      B1CO(I) = BPO2(I) * PWWW
C
C       BANK LOAN DISCOUNT
      BLDT(I) = PSWW * BLN(I)
C       BANK LOAN REPAYMENT
C
      UPROL(I) = Z8 * UPRO(I)
      UPROM(I) = Z9 * UPRO(I)
      SPROL(I)=AN*(UPROL(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))
```

```
      SPROC(I)= AN*(CAP(I)  * (X1(I) *Z6-Z7)+(X1(I)*Z5+CAP(I)*Z7))
      IF(UPRO(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)
  280 WWWW(J) = WWWW(J) + SAL(I,J)
      SUMOO = SUMOO + OOOO(J)
  240 SUMWW = SUMWW + WWWW(J)
      SUMAA = 0.
      DO 250 J = 1, ID
      AAAA(J) = 0.
      DO 260 I = 1,IB
  260 AAAA(J) = AAAA(J) + AJ(I,J)
  250 SUMAA = SUMAA + AAAA(J)
      RETURN
      END

)RY REQUIREMENTS 000554 BYTES
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```
      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
     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,ZZZ1,
     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),SPROL(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  1
    1 FORMAT(25X31HADMINISTRATOR S PRINTOUT PAGE 5  // )
      PRINT  2, RRR1(1), RRR1(2), RRR1(3), RRR1(4)
    2 FORMAT(5X5HRRR1=4F9.0/)
      PRINT  3, ALOBD(1), ALOBD(2), ALOBD(3), ALOBD(4)
    3 FORMAT(5X5HALOBD 4F9.0/)
      PRINT  4, UCOL(1), UCOL(2), UCOL(3), UCOL(4)
    4 FORMAT(5X5HUCOL 4F9.0/)
      PRINT  5, RRR2(1), RRR2(2), RRR2(3), RRR2(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(5X5HBRAT=, 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(Z8)(UPRO)=, F8.0,3F9.0/)
      PRINT  21, UPROM(1), UPROM(2), UPROM(3), UPROM(4)
   21 FORMAT(11H(Z9)(UPRO)=, F8.0,3F9.0/)
      PRINT  22, CAP(1), CAP(2), CAP(3), CAP(4)
   22 FORMAT(5X5HZZ=  4F9.0/)
      PRINT  23, SPROL(1), SPROL(2), SPROL(3), SPROL(4)
   23 FORMAT (12HSPRO(B,C,Z8)  F7.0,3F9.0/)
      PRINT  24, SPROM(1), SPROM(2), SPROM(3), SPROM(4)
   24 FORMAT (12HSPRO(B,C,Z9)  F7.0,3F9.0/)
      PRINT  25, SPROC(1), SPROC(2), SPROC(3), SPROC(4)
   25 FORMAT(  12HSPRO(B,C,ZZ)   F7.0,3F9.0/)
      RETURN
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        END
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ORY REQUIREMENTS 000640 BYTES

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      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,ZZZ1,
     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),SPROL(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,ZZ) 4F 9.4 )
      RETURN
      END
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)RY REQUIREMENTS 0001E8 BYTES
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      SUBROUTINE H
C      FOURTH PART - I - OF DIVIDED BROOM PROGRAM      (H)
      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,ZZZ1,
     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),SPROL(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)
      DO 400 I = 1, IB
      SFRGT(I) = 0.
C      FREIGHT COST  PER AREA FOR GIVEN COMPANY
      DO 210 J = 1, ID
C      DIFFERENT CALCULATIONS OF THE AREA FREIGHT FORMULA
      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)
   47 SFRGT(I) = SFRGT(I) + FRGT(I,J)
  210 CONTINUE
  400 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) + B1CO(I) + BLDT(I)
      ANPBT(I)=SREV(I)-COSA(I)-(SFRGT(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

DRY REQUIREMENTS 0002DA BYTES
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      SUBROUTINE I1
C       MANAGEMENT GAMES  PART I
      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,ZZZ1,
     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),SPROL(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)
C       CASH DISBURSEMENTS
      DO 220 I = 1, IB
C     HAVE TO BREAK DOWN THE DISBURSEMENTS INTO TWO PARTS
      FINAN = B1CO(I) + BLDT(I) + BLRP(I) + AITP(I) + DIVS(I) + REPST(I)
      CDDD(I)=SPRO(I)+SFRGT(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.
      CSSC(I) =  CSSC(I) + 1000.
      CSHR(I) = CSHR(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 = B1CO(I)
      B1CO(I) = BPO2(I) * PWWW
C       SETTING BFOR1 = TO PREVIOUS TAX
      BFOR1 = AITP(I)
C       SUBTRACTING JUST THE ADDITIONAL INTEREST AND DISCOUNT
      ANPBT(I) = ANPBT(I) - (BFD(I) - BEFOR) - (B1CO(I) - PREV)
C       ADD TO CASH DISBURSEMENTS JUST ADDITIONAL INTEREST AND DISCOUNT
      CDDD(I) = CDDD(I) + (BFD(I) - BEFOR) + (B1CO(I) - PREV)
      IF(ANPBT(I))49, 49, 51
   49 AITP(I) = 0.
      ANPAT(I) = ANPBT(I)
      GO TO 100
   51 AITP(I) = AITRA * ANPBT(I)
      ANPAT(I) = ANPBT(I) -  AITP(I)
C     SUBTRACT ADDITIONAL CASH PAID FOR TAXES, INTEREST, AND DISCOUNT
C     AND ADD CASH RECEIVED FROM SALE OF BONDS
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C      CALCULATES AMOUNT TO BE SUBTRACTED FOR INT. AND DISCOUNT
  100 DIFF = (BFD(I) -  BEFOR) + (B1CO(I) - PREV)
      CASH2(I)=CASH2(I)-(AITP(I)-BFOR1)+1000. - DIFF
C      INCREASE CASH RECEIPTS FOR THE BONDS
      CSHR(I) = CSHR(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 0003B2 BYTES
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      SUBROUTINE I2
C     ADDITION TO PART I FOR ADDITIONAL PRINT OUT      (I - 2)
      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,ZZZ1,
     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),SPROL(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  7, CSSC(1), CSSC(2), CSSC(3), CSSC(4)
    7 FORMAT(5X5HCSSC  4F9.0/)
   18 FORMAT(5X5HB1CO=, 4F9.0/)
      PRINT  19, CSHR(1), CSHR(2), CSHR(3), CSHR(4)
   19 FORMAT(5X5HCSHR=, 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(10X11HFRGT VALUES)
      RETURN
       END
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ORY REQUIREMENTS 000364 BYTES

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      SUBROUTINE JJJJ
C      PRINTOUT TO FOLLOW PART FOUR SECOND DIVISION OR 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,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,
     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),SPROL(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  4
    4 FORMAT(7HCOMPANY8X1H1, 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(/8HSFRGT = 4F9.0/)
      PRINT  8, COSA(1), COSA(2), COSA(3), COSA(4)
    8 FORMAT(5X4HCOSA,   F8.0,3F9.0/)
      PRINT  9, ANPBT(1), ANPBT(2), ANPBT(3), ANPBT(4)
    9 FORMAT(5X5HANPBT,  F7.0,3F9.0/)
      PRINT  11, AITP(1), AITP(2), AITP(3), AITP(4)
   11 FORMAT(5X4HAITP,  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(5X4HDIVS,  F8.0,3F9.0/)
      PRINT  14, CASH1(1), CASH1(2), CASH1(3), CASH1(4)
   14 FORMAT(5X5HCASH1,  F7.0,3F9.0/)
      PRINT  15, CDDD(1), CDDD(2), CDDD(3), CDDD(4)
   15 FORMAT(5X4HCDDD,  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, OOOO(1), OOOO(2), OOOO(3), OOOO(4), OOOO(5)
   20 FORMAT(6HORDERS, 3X, 5F9.0/)
       PRINT  21, SUMOO
   21 FORMAT(20X15HSUM OF ORDERS = F12.0/)
      RETURN
      END
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ORY REQUIREMENTS 00056C BYTES

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      SUBROUTINE K
C       CONTINUED PRINTOUT TO FOLLOW FIRST PART FOUR II PRINTOUT (K)
      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,ZZZ1,
     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),SPROL(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  22
   22 FORMAT(10X, 14HSALES BY AREAS)
      PRINT  39
      PRINT  23, WWWW(1), WWWW(2), WWWW(3), WWWW(4), WWWW(5)
   23 FORMAT(5HSALES, 5X, 5F9.0/)
      PRINT  24, SUMWW
   24 FORMAT(20X15HSUM OF SALES = F11.0/)
      PRINT  25
   25 FORMAT(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
   28 FORMAT(7HCOMPANY2X13HTOTAL EXPENSE2X11HCASH INFLOW,
     12X11HTOT. ASSETS2X10HTOT.EQUITY, 2X, 9HSPRO USED)
      DO 30 I = 1, 4
      FIN = BFD(I) + B1CO(I) + BLDT(I)
      TEXP = COSA(I) + SFRGT(I) + E(I) + SUMAJ(I) + Z(I) + ALOBD(I)+FIN
      CINFL = CSHR(I) - CDDD(I)
      TASS = CASH2(I) + RRR2(I) + VINV(I) + PVE(I)
      TEQU = BLN(I) + BPO2(I) + CSTG(I) + SURP(I)
      PRINT  29, I, TEXP, CINFL, TASS, TEQU, SPRO(I)
   29 FORMAT(3XI3, 3X5F12.0 )
   30 CONTINUE
      PRINT  66
   66 FORMAT(79X1H+)
      PRINT 901
  901 FORMAT( 41HEND ADMINISTRATOR S PART ONE  PRESS START)
      RETURN
      END

10RY REQUIREMENTS 000478 BYTES
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      SUBROUTINE L
C     I-FIFTH PART OF DIVIDED PROGRAM FOR DR BROOMS MANAGEMENT GAME  (L)
      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,ZZZ1,
     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),SPROL(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)
C      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 (8HCOMPANY I2,15X6X8HINDUSTRYI3,15X7HQUARTERI3,///)
      PRINT  67
   67 FORMAT(14HSALES ANALYSIS 34X24H(TOTALS ARE APPROXIMATE)/)
      PRINT  68
   68 FORMAT(22X1H1,9X1H2,9X1H3,9X1H4,9X1H57X5HTOTAL/)
      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)+SAL(I,2) + SAL(I,3) + SAL(I,4) + SAL(I,5)
      PRINT 71,SAL(I,1),SAL(I,2), SAL(I,3), SAL(I,4), SAL(I,5), SMSAL(I)
   71 FORMAT(15HSALES (UNITS)    F9.0,5F10.0)
      PRINT  72, AJ(I,1), AJ(I,2), AJ(I,3), AJ(I,4), AJ(I,5), SUMAJ(I)
   72 FORMAT(15HMARKETING       F9.0, 5F10.0/)
      PRINT  73, SREV(I)
   73 FORMAT(27HTOTAL 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(23HINDUSTRY SALES ANALYSIS, 10X17HBUSINESS INDEX = F6.2/)
      PRINT  69, OOOO(1), OOOO(2), OOOO(3), OOOO(4), OOOO(5), SUMOO
      PRINT  71, WWWW(1),  WWWW(2), WWWW(3), WWWW(4), WWWW(5), SUMWW
C     CALCULATES TOTAL MARKETING BY AREAS AND GRAND TOTAL
      PRINT  72, AAAA(1), AAAA(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(J,1),S(J,2),S(J,3),S(J,4),S(J,5)
```

```
     62 FORMAT(12HPRICES, FIRMI3, F9.0, 4F10.0)
        PRINT  2
        PRINT  101, IC
    101 FORMAT(48HPRODUCTION, CAPACITY, AND INVENTORY, ANALYSIS    ,
       16HPERIODI3)
        PRINT  102
    102 FORMAT(17X9H9/10 CUR.4X7HCURRENT 4X10H11/10 CUR.4X10HPLANT CAP.3X,
       19HEND. INV./)
        PRINT  103, UPROL(I), UPRO(I), UPROM(I), 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), COST(I), COSTM(I), COSTC(I), UCST
    104 FORMAT(12HUNIT COST($) 5XF9.2, F11.2, 2F14.2, F12.2)
        PRINT  105, SPROL(I), SPRO(I), SPROM(I), SPROC(I),VINV(I)
    105 FORMAT(14HTOTAL COST(M$) 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,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,ZZZ1,
     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),SPROL(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)
      DO 100 I=1,IB
      PRINT  65
   65 FORMAT('1',14X,'BAYLOR TOP MNGT. GAME, PG.-2')
      PRINT  2
      PRINT  66, I, IA, IC
   66 FORMAT (8HCOMPANY I2,15X6X8HINDUSTRYI3,15X7HQUARTERI3,///)
      PRINT  75
   75 FORMAT(15HPROFIT AND LOSS,15X9HCASH FLOW15X13HBALANCE SHEET/)
      PRINT  2
    2 FORMAT(///)
      PRINT  76, SREV(I), CASH1(I), CASH2(I)
   76 FORMAT(18HSALES INCOME      , F9.0, 3X14HBEG.CASH BAL. , F9.0, 1X,
     14HCASH8X,F10.0)
      PRINT  77, COSA(I), RRR2(I)
   77 FORMAT(15HCOST OF GDS SLD, 3XF9.0, 3X14H                , 10X,
     18HA/C REC. 4XF10.0)
      PRINT  78, VINV(I)
   78 FORMAT(18X9H          , 27X9HINVENTORY3XF10.0)
      PRINT  79, CSHR(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 (30X10HDISBRSMNTS4XF9.0,1X10HTOT.ASSETS2XF10.0)
      PRINT  82
   82  FORMAT(18X9H'''''''''',12X12H''''''''''''', 10X12H'''''''''''''/)
      CSHIN = CSHR(I) - CDDD(I)
      PRINT  83, SFRGT(I), CSHIN
   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), BPO2(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 (54X10HCAP.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.  1X,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
C       PART SIX OF TOP MANAGEMENT PROGRAM BY DR. BROOM                (N)
      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,ZZZ1,
     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),SPROL(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)
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(I2,3I3, 66X, I3)
      N = N + 1
      PRINT 13, F, H1, H2, AK, AM1, AM2, N
   13 FORMAT (6F10.2,17X I3)
      N = N + 1
      PRINT  2, P(1), P(2), P(3), P(4), P(5), R, W1 , W2 , N
    2 FORMAT(7F10.2, F5.2, I5)
      N = N + 1
      PRINT 15, Z1, Z2, Z3, Z4, Z5, Z6, Z7, W3 , N
   15 FORMAT(6F10.2,F8.2,F8.0,I4)
      N = N + 1
      PRINT  3, Z8, Z9, COL1, COL2, COLC, ZZZ1, ZZZ2, N
    3 FORMAT(7F10.2, 7X, I3)
      N = N + 1
      PRINT 16, PPPW, PWWW, PSWW, FR1, FR2, FR3, AITRA , N
   16 FORMAT(3F10.4, 4F10.2, 5X  ,I5)
      N = N + 1
      PRINT  4, AUTH, W4, ALUR, UH, UF, U5 , N
    4 FORMAT(6F10.2, 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(I2, 2I3, 5F8.0, 29X, I3)
      N = N + 1
      J=1
      PRINT 6,I,J,IA,PVE(I),AINV2(I),RRR2(I),EE(I),BPO2(I), COST(I),N
    6 FORMAT(I2, 2I3, 6F8.0, 21X, I3)
      N = N + 1
      J=2
  310 PRINT  5,I,J, IA,CASH2(I), SURP(I), VINV(I), CSTO(I), BLRP(I) , N
      N = N + 1
```

```
      PRINT  14,IC1, IA,N
   14 FORMAT (2H 02I3,69XI3)
  258 PRINT 259
  259 FORMAT (32HDONT STOP NOW, IM JUST BEGINNING /)
      PRINT 269
  269 FORMAT(' REACHED END OF PROG, NO STOP? SEE STOP 999')
      RETURN
      END
```

IORY REQUIREMENTS 0006B4 BYTES

APPENDIX III

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

CONSTANTS

IB = 4	P(2) = 1.25	Z6 = 50	PSWW = .0175
IC = 0	P(3) = 1.25	Z7 = 6	FR1 = 3
IA = 1	P(4) = 1.25	W3 = 10000	FR2 = 2
ID = 5	P(5) = 2.62	Z8 = .90	FR3 = 1
F = .50	R = 65	Z9 = 1.10	AITRA = .47
H1 = 2.05	W1 = 10	COL1 = .60	AUTH = 22000
H2 = 8000	W2 = .90	COL2 = .98	W4 = .90
AK = .60	Z1 = .04	COLC = 40	ALUR = .01
AM1 = 2	Z2 = 60	ZZZ1 = 1.00	UH = 75
AM2 = 50	Z3 = 1.0846	ZZZ2 = 20	UF = 33
AN = 1.0	Z4 = 3600	PPPW = .08	U5 = 68
P(1)= 1.25	Z5 = 3	PWWW = .015	

HISTORY

The history is the same for each firm

AJJ(I,J) = 200	AJJ(I,J) = 200	EE(I) = 280	SURP(I) = 10206
AJJ(I,J) = 40	PVS(I) = 15600	BPO1(I) = 0	VINVB(I) = 1295
AJJ(I,J) = 40	AINV1(I) = 55	COSTB(I) = 0	CSTO(I) = 17000
AJJ(I,J) = 40	RRR1(I) = 7000	CASH1(I) = 3311	BLRP(I) = 0

DECISIONS

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

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	

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.

:XECUTION TERMINATED

:RUN GIB2 5=GIB3
:XECUTION BEGINS
ADMINISTRATOR S PRINTOUT PAGE ONE INDUSTRY 1 QUARTER 0

BEGINNING AJJ VALUES

:OMPANY	1	2	3	4
\REA 1	200.	40.	40.	40.
\REA 2	40.	200.	40.	40.
\REA 3	40.	40.	200.	40.
\REA 4	40.	40.	40.	200.
\REA 5	200.	200.	200.	200.

;MIN 60. 60. 60. 60. 60.

)= 1.08333302 1.08333302 1.08333302 1.08333302 1.08333302

'VS 15600. 15600. 15600. 15600.

PART A

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

F =0.50 H1= 2.05 H2= 8000.

AK = 0.60

M1 = 2.00

M2 = 50.00

P1 = 1.25 P2 = 1.25 P3 = 1.25 P4 = 1.25 P5 = 2.62

U FOR COMPANY AND AREA

COMPANY	1	2	3	4
AREA 1	75.	33.	33.	33.
AREA 2	33.	75.	33.	33.
AREA 3	33.	33.	75.	33.
AREA 4	33.	33.	33.	75.
AREA 5	68.	68.	68.	68.

B6 = 4. D6 = 5. R = 65. W1 = 10.00

W2 = 0.90

W3 = 10000.

W4 = 0.90

ADMINISTRATOR S PRINTOUT PAGE TWO

Z1= 0.04 Z2= 60. Z3= 1.08 Z4= 3600. Z5= 3.

Z6= 50. Z7= 6. Z8= 0.90 Z9= 1.10

ALUR = 0.01 COL1 = 0.60 COL2 = 0.98 COLC = 40.00

ZZZ1 = 1. ZZZ2 = 20.

AUTH 22000. 22000. 22000. 22000.

PSWW = 0.0175 PPPW = 0.08 PWWW = 0.015

FR1 = 3. FR2 = 2. FR3 = 1. AITRA = 0.47

RT B

AN = 1.00

)MPANY	1	2	3	4
E =	60.	60.	60.	60.
EE =	200.	200.	200.	200.

G = 2.14999866

)MPANY	1	2	3	4
SUMJD =	800.	800.	800.	800.

)MPANY	1	2	3	4
JJD 1	294.00	72.00	72.00	72.00
JJD 2	72.00	294.00	72.00	72.00
JJD 3	72.00	72.00	294.00	72.00
JJD 4	72.00	72.00	72.00	294.00
JJD 5	282.00	282.00	282.00	282.00

.1= 1.87744999 AL2= 1.87744999 AL3= 1.87744999 AL4= 1.87744999 AL5= 1.8838644

)MPANY	1	2	3	4
SD =	60.	60.	60.	60.
SD =	60.	60.	60.	60.
SD =	60.	60.	60.	60.
SD =	60.	60.	60.	60.
SD =	60.	60.	60.	60.

SAVG	60.	60.	60.	60.	60.

ADMINISTRATOR S PRINTOUT PAGE THREE

T VALUES

COMPANY		1	2	3	4
AREA	1	327.9666	144.3053	144.3053	144.3053
AREA	2	144.3053	327.9666	144.3053	144.3053
AREA	3	144.3053	144.3053	327.9666	144.3053
AREA	4	144.3053	144.3053	144.3053	327.9666
AREA	5	298.3721	298.3721	298.3721	298.3721

ALAVE= 1.87873268

V VALUES

COMPANY		1	2	3	4
AREA	1	0.89960039	0.89960039	0.89960039	0.89960039
AREA	2	0.89960039	0.89960039	0.89960039	0.89960039
AREA	3	0.89960039	0.89960039	0.89960039	0.89960039
AREA	4	0.89960039	0.89960039	0.89960039	0.89960039
AREA	5	0.90267372	0.90267372	0.90267372	0.90267372

X VALUES

COMPANY		1	2	3	4
AREA	1	0.25000006	0.25000006	0.25000006	0.25000006
AREA	2	0.25000006	0.25000006	0.25000006	0.25000006
AREA	3	0.25000006	0.25000006	0.25000006	0.25000006
AREA	4	0.25000006	0.25000006	0.25000006	0.25000006
AREA	5	0.25000000	0.25000000	0.25000000	0.25000000

Y VALUES

COMPANY		1
AREA	1	82.00000000
AREA	2	36.00000000
AREA	3	36.00000000
AREA	4	36.00000000
AREA	5	75.00000000

COMPANY		2
AREA	1	36.00000000
AREA	2	82.00000000
AREA	3	36.00000000
AREA	4	36.00000000
AREA	5	75.00000000

COMPANY		3
AREA	1	36.00000000
AREA	2	36.00000000
AREA	3	82.00000000
AREA	4	36.00000000
AREA	5	75.00000000

OMPANY	4			
REA	1	36.00000000		
REA	2	36.00000000		
REA	3	36.00000000		
REA	4	82.00000000		
REA	5	75.00000000		

AP	260.	260.	260.	260.
=	624.	624.	624.	624.
VE=	15600.	15600.	15600.	15600.
(1 =	1.02904320	1.02904320	1.02904320	1.02904320
JPRO	240.	240.	240.	240.
OST	51.96	51.96	51.96	51.96
AINV	55.	55.	55.	55.
INV+UPRO	295.	295.	295.	295.
SUMY=	265.	265.	265.	265.
SMSAL =	265.	265.	265.	265.

SAL VALUES

COMPANY	1	2	3	4
AREA 1	82.	36.	36.	36.
AREA 2	36.	82.	36.	36.
AREA 3	36.	36.	82.	36.
AREA 4	36.	36.	36.	82.
AREA 5	75.	75.	75.	75.

AINV2	30.	30.	30.	30.
SREV	15900.	15900.	15900.	15900.
VINVB	1295.	1295.	1295.	1295.
VINV	1559.	1559.	1559.	1559.
BEG. SURP	10206.	10206.	10206.	10206.

RRR1=	7000.	7000.	7000.	7000.
ALOBD	70.	70.	70.	70.
UCOL	16440.	16440.	16440.	16440.

RRR2	6390.	6390.	6390.	6390.
CSTO	17000.	17000.	17000.	17000.
REPST	0.	0.	0.	0.
BLN	0.	0.	0.	0.
BLDT=	0.	0.	0.	0.
BLRP=	0.	0.	0.	0.
BRAT=	0.07999998	0.07999998	0.07999998	0.07999998
BOR=	0.	0.	0.	0.
BPO1=	0.	0.	0.	0.
(Z8)(UPRO)=	216.	216.	216.	216.
(Z9)(UPRO)=	264.	264.	264.	264.
ZZ=	260.	260.	260.	260.
SPRO(B,C,Z8)	11381.	11381.	11381.	11381.
SPRO(B,C,Z9)	13562.	13562.	13562.	13562.
SPRO(B,C,ZZ)	13381.	13381.	13381.	13381.
COST(B,C,Z8)	52.6886	52.6886	52.6886	52.6886
COST(B,C,Z9)	51.3729	51.3729	51.3729	51.3729
COST(B,C,ZZ)	51.4640	51.4640	51.4640	51.4640
CSSC	0.	0.	0.	0.
CSHR=	16440.	16440.	16440.	16440.
BPS=	0.	0.	0.	0.
BFD=	0.	0.	0.	0.
BICO=	0.	0.	0.	0.

BPO2=	0.	0.	0.	0.
CSTG=	17000.	17000.	17000.	17000.

FRGT VALUES

COMPANY	1	2	3	4
AREA 1	82.	72.	72.	72.
AREA 2	72.	82.	72.	72.
AREA 3	72.	72.	82.	72.
AREA 4	72.	72.	72.	82.
AREA 5	225.	225.	225.	225.

FRGT =	523.	523.	523.	523.
COSA	12216.	12216.	12216.	12216.
ANPBT	1607.	1607.	1607.	1607.
AITP	755.	755.	755.	755.
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.
END.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	SPRO 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

BAYLOR TOP MNGT. GAME

OMPANY 1 INDUSTRY 1 QUARTER 0

ALES ANALYSIS (TOTALS ARE APPROXIMATE)

	1	2	3	4	5	TOTAL
IRDERS (UNITS)	82.	36.	36.	36.	75.	265.
;ALES (UNITS)	82.	36.	36.	36.	75.	265.
IARKETING	290.	80.	80.	80.	270.	800.

'OTAL REVENUE FROM SALES = 15900.

INDUSTRY SALES ANALYSIS BUSINESS INDEX = 1.00

	1	2	3	4	5	TOTAL
)RDERS (UNITS)	190.	190.	190.	190.	300.	1060.
;ALES (UNITS)	190.	190.	190.	190.	300.	1060.
IARKETING	530.	530.	530.	530.	1080.	3200.

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.

PRODUCTION, CAPACITY, AND INVENTORY, ANALYSIS PERIOD 0

	9/10 CUR.	CURRENT	11/10 CUR.	PLANT CAP.	END. INV.
QUANTITY(M UNITS)	216.	240.	264.	260.	30.
JNIT COST($)	52.69	51.96	51.37	51.46	51.96
TOTAL COST(M$)	11381.	12480.	13562.	13381.	1559.

BAYLOR TOP MNGT. GAME

OMPANY 2 INDUSTRY 1 QUARTER 0

ALES ANALYSIS (TOTALS ARE APPROXIMATE)

	1	2	3	4	5	TOTAL
RDERS (UNITS)	36.	82.	36.	36.	75.	265.
ALES (UNITS)	36.	82.	36.	36.	75.	265.
ARKETING	80.	290.	80.	80.	270.	800.

OTAL REVENUE FROM SALES = 15900.

NDUSTRY SALES ANALYSIS BUSINESS INDEX = 1.00

	1	2	3	4	5	TOTAL
RDERS (UNITS)	190.	190.	190.	190.	300.	1060.
ALES (UNITS)	190.	190.	190.	190.	300.	1060.
ARKETING	530.	530.	530.	530.	1080.	3200.

NDUSTRY PRICE ANALYSIS

RICES, FIRM 1	60.	60.	60.	60.	60.
RICES, FIRM 2	60.	60.	60.	60.	60.
RICES, FIRM 3	60.	60.	60.	60.	60.
RICES, FIRM 4	60.	60.	60.	60.	60.

RODUCTION, CAPACITY, AND INVENTORY, ANALYSIS PERIOD 0

	9/10 CUR.	CURRENT	11/10 CUR.	PLANT CAP.	END. INV.
UANTITY(M UNITS)	216.	240.	264.	260.	30.
NIT COST($)	52.69	51.96	51.37	51.46	51.96
OTAL COST(M$)	11381.	12480.	13562.	13381.	1559.

BAYLOR TOP MNGT. GAME

OMPANY 3 INDUSTRY 1 QUARTER 0

SALES ANALYSIS (TOTALS ARE APPROXIMATE)

	1	2	3	4	5	TOTAL
ORDERS (UNITS)	36.	36.	82.	36.	75.	265.
SALES (UNITS)	36.	36.	82.	36.	75.	265.
MARKETING	80.	80.	290.	80.	270.	800.

TOTAL REVENUE FROM SALES = 15900.

INDUSTRY SALES ANALYSIS BUSINESS INDEX = 1.00

	1	2	3	4	5	TOTAL
ORDERS (UNITS)	190.	190.	190.	190.	300.	1060.
SALES (UNITS)	190.	190.	190.	190.	300.	1060.
MARKETING	530.	530.	530.	530.	1080.	3200.

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.

PRODUCTION, CAPACITY, AND INVENTORY, ANALYSIS PERIOD 0

	9/10 CUR.	CURRENT	11/10 CUR.	PLANT CAP.	END. INV.
QUANTITY(M UNITS)	216.	240.	264.	260.	30.
UNIT COST($)	52.69	51.96	51.37	51.46	51.96
TOTAL COST(M$)	11381.	12480.	13562.	13381.	1559.

BAYLOR TOP MNGT. GAME

OMPANY 4 INDUSTRY 1 QUARTER 0

SALES ANALYSIS (TOTALS ARE APPROXIMATE)

	1	2	3	4	5	TOTAL
RDERS (UNITS)	36.	36.	36.	82.	75.	265.
ALES (UNITS)	36.	36.	36.	82.	75.	265.
ARKETING	80.	80.	80.	290.	270.	800.

OTAL REVENUE FROM SALES = 15900.

NDUSTRY SALES ANALYSIS BUSINESS INDEX = 1.00

	1	2	3	4	5	TOTAL
RDERS (UNITS)	190.	190.	190.	190.	300.	1060.
ALES (UNITS)	190.	190.	190.	190.	300.	1060.
ARKETING	530.	530.	530.	530.	1080.	3200.

NDUSTRY PRICE ANALYSIS

RICES, FIRM 1	60.	60.	60.	60.	60.
RICES, FIRM 2	60.	60.	60.	60.	60.
RICES, FIRM 3	60.	60.	60.	60.	60.
RICES, FIRM 4	60.	60.	60.	60.	60.

RODUCTION, CAPACITY, AND INVENTORY, ANALYSIS PERIOD 0

	9/10 CUR.	CURRENT	11/10 CUR.	PLANT CAP.	END. INV.
UANTITY(M UNITS)	216.	240.	264.	260.	30.
NIT COST($)	52.69	51.96	51.37	51.46	51.96
OTAL COST(M$)	11381.	12480.	13562.	13381.	1559.

OMPANY 1 INDUSTRY 1 QUARTER 0

ROFIT AND LOSS

ALES INCOME	15900.
OST OF GDS SLD	12216.
REIGHT	523.
AND D	60.
ARKETING	800.
EPRECIATION	624.
AD DEBTS LOSS	70.
PERATING PROFIT	1607.
OND FLOT DISC.	0.
OND INTEREST	0.
ANK LOAN DISCOUNT	0.
OT. OPER. EXP	14293.
ET PROF. BEFR.TAX	1607.
NCOME TAXES	755.
ET PROF.AFTR.TAX	852.

CASH FLOW

BEG.CASH BAL.	3311.
RECEIPTS	16440.
DISBRSMNTS	15242.
NET INFLOW (OR OUTFLOW)	1198.
END.CASH BAL.	4509.

BALANCE SHEET

CASH	4509.
A/C REC.	6390.
INVENTORY	1559.
PLANT INVST.	15600.
TOT.ASSETS	28058.
BANK LOANS	0.
BONDS PAYBL.	0.
CAP.STOCK	17000.
SURPLUS	11058.
TOT.EQUITY	28058.

COMPANY 2 INDUSTRY 1 QUARTER 0

PROFIT AND LOSS

SALES INCOME	15900.
COST OF GDS SLD	12216.
FREIGHT	523.
R AND D	60.
MARKETING	800.
DEPRECIATION	624.
BAD DEBTS LOSS	70.
OPERATING PROFIT	1607.
BOND FLOT DISC.	0.
BOND INTEREST	0.
BANK LOAN DISCOUNT	0.
TOT. OPER. EXP	14293.
NET PROF. BEFR.TAX	1607.
INCOME TAXES	755.
NET PROF.AFTR.TAX	852.

CASH FLOW

BEG.CASH BAL.	3311.
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BALANCE SHEET

CASH	4509.
A/C REC.	6390.
INVENTORY	1559.
PLANT INVST.	15600.
TOT.ASSETS	28058.
BANK LOANS	0.
BONDS PAYBL.	0.
CAP.STOCK	17000.
SURPLUS	11058.
TOT.EQUITY	28058.

COMPANY 3 INDUSTRY 1 QUARTER 0

PROFIT AND LOSS

SALES INCOME	15900.
COST OF GDS SLD	12216.
FREIGHT	523.
R AND D	60.
MARKETING	800.
DEPRECIATION	624.
BAD DEBTS LOSS	70.
OPERATING PROFIT	1607.
BOND FLOT DISC.	0.
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BALANCE SHEET

CASH	4509.
A/C REC.	6390.
INVENTORY	1559.
PLANT INVST.	15600.
TOT.ASSETS	28058.
BANK LOANS	0.
BONDS PAYBL.	0.
CAP.STOCK	17000.
SURPLUS	11058.
TOT.EQUITY	28058.

COMPANY 4 INDUSTRY 1 QUARTER 0

PROFIT AND LOSS

SALES INCOME	15900.
COST OF GDS SLD	12216.
FREIGHT	523.
R AND D	60.
MARKETING	800.
DEPRECIATION	624.
BAD DEBTS LOSS	70.
OPERATING PROFIT	1607.
BOND FLOT DISC.	0.
BOND INTEREST	0.
BANK LOAN DISCOUNT	0.
TOT. OPER. EXP	14293.
NET PROF. BEFR.TAX	1607.
INCOME TAXES	755.
NET PROF.AFTR.TAX	852.

CASH FLOW

BEG.CASH BAL.	3311.
RECEIPTS	16440.
DISBRSMNTS	15242.
NET INFLOW (OR OUTFLOW)	1198.
END.CASH BAL.	4509.

BALANCE SHEET

CASH	4509.
A/C REC.	6390.
INVENTORY	1559.
PLANT INVST.	15600.
TOT.ASSETS	28058.
BANK LOANS	0.
BONDS PAYBL.	0.
CAP.STOCK	17000.
SURPLUS	11058.
TOT.EQUITY	28058.

CONSTANTS &HISTORY NEXT QTR

```
 1  1  5
    0.50        2.05     8000.00        0.60        2.00       50.00
    1.25        1.25        1.25        1.25        2.62       65.00      10.00 0.90
    0.04       60.00        1.08     3600.00        3.00       50.00      6.00  10000.
    0.90        1.10        0.60        0.98       40.00        1.00      20.00
  0.0800      0.0150      0.0175        3.00        2.00        1.00       0.47
22000.00        0.90        0.01       75.00       33.00       68.00
  0  1     294.          72.         72.         72.        282.
  1  1   15600.          30.       6390.        200.          0.        52.
  2  1    4509.       11058.       1559.      17000.          0.
  0  1      72.         294.         72.         72.        282.
  1  1   15600.          30.       6390.        200.          0.        52.
  2  1    4509.       11058.       1559.      17000.          0.
  0  1      72.          72.        294.         72.        282.
  1  1   15600.          30.       6390.        200.          0.        52.
  2  1    4509.       11058.       1559.      17000.          0.
  0  1      72.          72.         72.        294.        282.
  1  1   15600.          30.       6390.        200.          0.        52.
  2  1    4509.       11058.       1559.      17000.          0.
  1  1
ONT STOP NOW, IM JUST BEGINNING

REACHED END OF PROG, NO STOP? SEE STOP 999

STOP      0
XECUTION TERMINATED
```

SIG

TABLE IV
MATRIX ANALYSIS
OUTPUT CURRENT QUARTER

MARKETING | **LOGISTICS** | **FINANCE** | Ex.

DECISIONS

- PRICE AREA ONE
- PRICE AREA TWO
- PRICE AREA THREE
- PRICE AREA FOUR
- PRICE AREA FIVE
- MARKETING AREA ONE
- MARKETING AREA TWO
- MARKETING AREA THREE
- MARKETING AREA FOUR
- MARKETING AREA FIVE
- RESEARCH AND DEVELOPMENT
- SALES ORDERS AREA ONE
- SALES ORDERS AREA TWO
- SALES ORDERS AREA THREE
- SALES ORDERS AREA FOUR
- SALES ORDERS AREA FIVE

MARKETING OUTPUT

- ACTUAL SALES AREA ONE
- ACTUAL SALES AREA TWO
- ACTUAL SALES AREA THREE
- ACTUAL SALES AREA FOUR
- ACTUAL SALES AREA FIVE

LOGISTICS DECISIONS

- PRODUCTION SPENDING
- RESEARCH AND DEVELOPMENT

LOGISTICS OUTPUT

- PRODUCTION SPENDING
- RESEARCH AND DEVELOPMENT
- ACTUAL PRODUCTION
- INVENTORY

FINANCE DECISIONS

- PLANT INVESTMENT
- DIVIDENDS
- BONDS SOLD
- BONDS BOUGHT BACK
- CAPITAL STOCK SOLD
- CAPITAL STOCK REPURCHASED
- LOANS TAKEN
- PLANT INVESTMENT
- DEPRECIATION
- UNIT COST
- INVENTORY VALUE
- SALES REVENUE AREA ONE
- SALES REVENUE AREA TWO
- SALES REVENUE AREA THREE
- SALES REVENUE AREA FOUR
- SALES REVENUE AREA FIVE
- FREIGHT EXPENSE HOME MARKET
- FREIGHT EXPENSE COMMON MARKET
- FREIGHT EXPENSE FOREIGN MARKETS
- ACCOUNTS RECEIVABLE
- LOSS ON BAD DEBTS
- BONDS BOUGHT BACK
- BONDS SOLD
- CAPITAL STOCK SOLD
- CAPITAL STOCK REPURCHASED
- LOANS PAID
- LOANS TAKEN
- LOAN DISCOUNT
- BOND DISCOUNT
- BOND INTEREST
- COST OF GOODS SOLD
- OPERATING INCOME
- INCOME BEFORE TAXES
- INCOME TAXES
- INCOME AFTER TAXES
- RETAINED EARNINGS
- DIVIDENDS
- CASH BALANCE

FINANCE OUTPUT

- BUSINESS INDEX

EXOGENOUS FACTORS

- OUTPUT: BUSINESS INDEX