CONTINUOUS SYSTEM TECHNIQUES APPLIED TO MACRO ECONOMIC SYSTEM SIMULATION

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Abstract

A macro economic modelling technique is presented in which continuous closed loop cash flow between economic blocks is defined in terms of linear and non-linear transfer functions. The economic system is postulated to be a continuous system from the macro point of view, though solved discretely at the end of each time step. Non-linearities are identified and defined mathematically by logic switches and distribution functions. Cash flow versus time is the principle solution parameter; cash rates and cash levels are readily converted to the real parameters of interest such as the number of jobs created/eliminated, amount of raw material and energy used, number of new cars, aircraft, or homes built, etc.

The effects of government spending on the U.S. aerospace economy is used as an example to illustrate modelling and programming techniques. Six basic FORTRAN subroutines are used for computing cash flow and display of the results. Model results agree with empirical data: between two and three jobs are created in the service and consumer goods sector for every primary and secondary job created in the aerospace sector; 55,000 aerospace workers are unemployed when a billion dollar per year government spending program is terminated; the economy inflates "naturally" at a rate of 5% per year and at a peak rate of 10% per year during massive government spending; the economy is damped fairly quickly - within 3-4 months when government aerospace spending is terminated. The most interesting result of the example program is the "natural" occurrence of inflation, which is due, in this model, to the creation of commercial paper within the corporate banking and accounting system.

Disclaimer

This paper is presented in the interest of demonstrating how techniques used for integrated system analysis may be applied to macro economic simulation. Conclusions made by the author as to the nature of the U.S. economy and Government economic policy are his own and in no way reflect U.S. Government or U.S. Navy thinking.

Introduction

From the macro point of view, discrete variations and non-linear discontinuities in economic systems appear as continuous lumped parameters. This is due in part to the manner in which statistical economic data is collected, but this is due mathematically to the sum of a large number of discrete elements assuming an integral form,

$$\int f(x)\,dx = \lim_{n \to \infty} \sum_{i=1}^{n} f_i(x_i) \qquad (1)$$

in which f(x) is continuous or, in the worst case, piecewise continuous. This implies that the techniques, methodologies, and system analysis methods used in the closed loop simulation of continuous physical systems may be applied to macro economic simulation. The methodologies include numeric integration, signal flow analysis, linear and non-linear transfer functions, and multivariate function analysis.

Modeling

A macro model is defined by naming its constituent components, listing the input/output transfer functions of its components, and identifying real, logical, and information links between components. The choice of model components is often dictated by the sources or forms of data available for initialization of the model. The anatomy of the model is also determined by its intended use, output requirements, and the assumptions which necessarily must be made.

Validation criteria also must be considered when constructing a macro economic model; the model should be configured in such a way that the model can be validated. It is expected that the model will be changed and improved as a result of validation tests.

The development process for a macro economic model is outlined in block diagram form in Figure 1. This is a closed-loop model optimization process which may be summarized as:

1. Definition of the economic system to be modeled.
2. Listing of desired and necessary assumptions to be made about the economic system and about the model.
3. Listing of criteria which must be met for the model to be considered valid.
4. Definition and identification of the data base.
5. Definition of the macro model.
6. Programming of the model.
7. Testing and exercising the model.
8. Evaluation of model results.
9. Redefinition of the model, data base, validation criteria, model assumptions, and economic system.

These are described in more detail in sub-sections below.

1.0 Economic System Definition

The economic system to be modeled must be defined and identified in terms of its primary and secondary macro units. The availability of data heavily influences the identification of macro economic blocks in the simulation model; however, this should not influence the identification of "real-world" economic system blocks for which no data or very obscure statistics exist. The first attempt at a system definition is usually not a problem because the modeler usually has a good idea of what it is he wants to simulate. It may, however, be necessary to redefine the system being simulated as a result of validation testing to postulate artificial economic conditions or to place qualifications on use of the model. This is handled in part by the next subsection.

2.0 Listing of Model Assumptions

Certain assumptions must be made about the economic system and its model in order to model it with Macro units. The most important assumption is that macro models can be used for economic systems and subsystems. This is a testable assumption; the responses and interactions of macro subsystems can be observed and validated. Assumptions about basic model data and transfer functions are not always testable, though these may be adjusted to "tune" the model. The assumptions made in defining the economic system and in constructing a model must be listed so that the modeler and user are not led to make erroneous conclusions or extrapolations from simulation results. The list of assumptions helps to validate the model by delineating regions in which it cannot be expected to be valid.

3.0 Validation Criteria

The validation criteria are used to test the model for validity and to aid in the preliminary construction of a valid model. The criteria will change as the model is debugged and improved. These criteria specify (1) the form the model must have and (2) the tests the model must pass to be acceptable to the modeler and user. The purpose of a validation is not necessarily to demonstrate exact duplication of real world data for all possible economic conditions, but to define sets of economic conditions for which the model gives creditable results, to estimate how much error the model produces in regions outside these

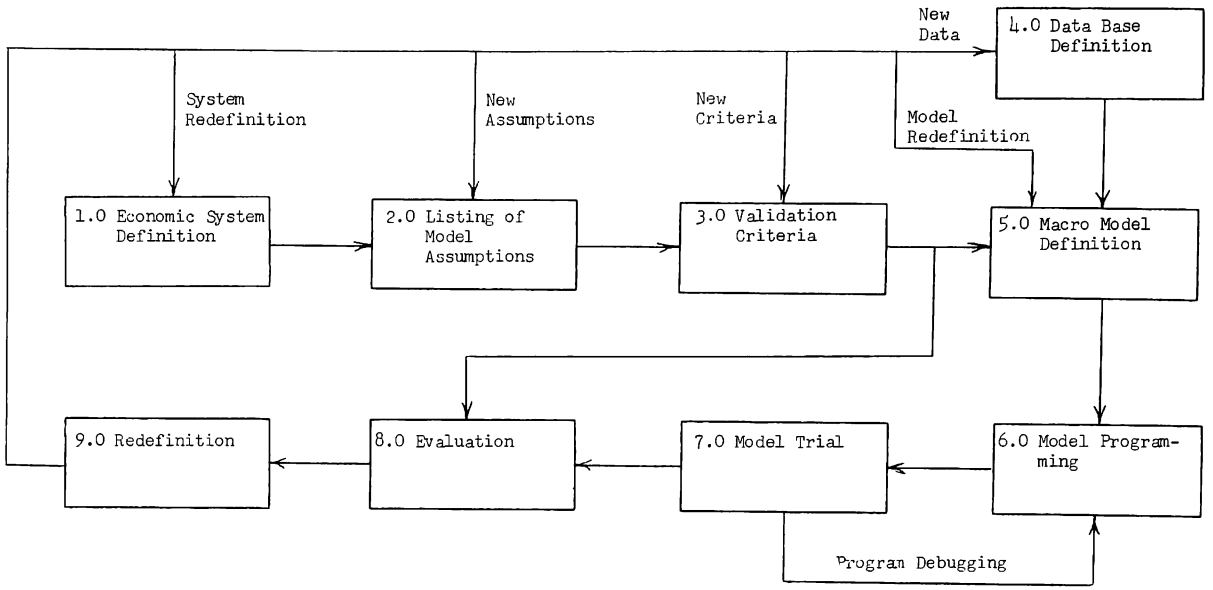

Figure 1. Block Diagram of Model Development/Optimization Process.

conditions, and to define regions where the model is invalid or "hopelessly wrong". Validation criteria should be selected with this in mind.

4.0 Data Base Definition

The definition of a data base for macro economic models is the most difficult task in model development because first, data sources must be searched; then, because data is seldom in the form required for a model, transformations must be done on the available data to put it into forms usuable in the simulations; and, reasonable guesses and assumptions must be made about data which is non-existant; these assumptions will be open to question when the model is exercised. The data base comprises gross statistical data on economic units, transfer functions for macro blocks (multipliers, multivariate functions, statistical tables and distribution functions) and values for initialization of the model. If the model contains adaptive elements (blocks whose structures or transfer functions are changed or logically switched while the model is run), decision tables may also have to be defined.

During modeling and validation testing, it often becomes apparent that the data base is inadequate and will have to be redefined. In fact, the data base is never constant and will change adaptively as the model is exercised at new economic conditions. The bibliography contains a list of statistical sources useful for macro economic data bases.

5.0 Macro Model Definition

The model is determined by the definition of the economic system, requisite assumptions, validation criteria and the data base. A block or signal flow diagram is a common method for documenting and visualizing the model, especially for continuous flow parameters. Macro blocks and external gains or transfer functions between blocks are shown on the block diagram with logic and internal functions listed separately; the external connections, alone, between macro elements tend to create a complex diagram.

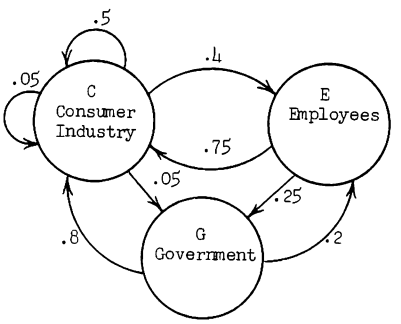

Figure 2. Example of a Simple Three Element Macro Model.

The format of a diagram is shown in Figure 2 for a simple macro model of a three-macro block economy which consists of a consumer industry sector C, employee sector E and government sector G. Arrows between the blocks denote linear transfer functions (constant multipliers) which indicate what percentage of a block's input is passed to another block. For example, all employees in block E transfer an average of 25% of their salaries to the government in income taxes; the remaining 75% is all spent in the consumer industry. The government spends 80% of its cash income in the consumer industry sector and 20% on paying its employees. The consumer macro model is more complex: the consumer industry is permitted (assumed) to make a 10% profit on its gross; half of this is turned over to the government as income tax, the other half is returned to the consumer industry block as reinvestment; the consumer industry is assumed to spend 50% of its gross on other consumer purchases within itself and the remaining 40% is paid to its employees. The equations for this simple model are therefore,

$$C(t_1) = .55\ C(t_o) + .75\ E(t_o) + .8\ G(t_o) \quad (2)$$

$$G(t_1) = .05\ C(t_o) + .25\ E(t_o) \quad (3)$$

$$E(t_1) = .4\ C(t_o) + .2\ G(t_o) \quad (4)$$

$$t_1 = t_o + \Delta t \quad (5)$$

where,

t_o is the initial time,

Δt is the time interval or time-step at which the model is recomputed

and t_1 is the new time at the end of the time interval.

Equations 2-5 are initialized with data for $C(t_o)$, $E(t_o)$, $G(t_o)$, t_o, and Δt, and are then recomputed once for each pass or time interval.

6.0 Model Programming

Models are usually programmed sequentially, with one block computed at a time, until all blocks are computed, then time is stepped and the blocks are recomputed. The programming task is simplified if subroutines are constructed for computing blocks which have similar structures. The size of the time-step depends upon the rate at which cash or goods are transferred and accounted in the system. It may be desirable to have blocks computed at different rates and time-steps to allow for realistic economic transfer rates.

Routines for sampling, printing, and plotting data are necessary for output display. Examples of output routines and block subroutines are given in the example program.

7.0 Model Trial

Testing and exercising the model initially locates bugs and instabilities; as the model is exercised over extended conditions its validity may be tested to extend its credibility. The test, evaluation, and validation of a model is a continuing process which is expected to be repeated with the application of new sets of conditions as the model is used.

Models may be validated in two ways: (1) test at one given set of economic conditions, or (2) test at sets of economic conditions which bracket the region within which the model will be exercised. The second method appears to be more desirable from a users point of view, however, it entails considerably more work than a single test and in some cases there is only enough validation data for one economic condition, and the first method is forced. Use of the single test method implies that reasonable extrapolations will be made from the test set of conditions to sets at which the model is exercised. Due to the non-linear nature of economic systems the validation conditions for the first method should be chosen fairly close to the expected exercising conditions.

8.0 Evaluation

In evaluation, results of model runs are compared with the validation criteria. The overall response of the model is also noted and new validation criteria developed to evaluate unreasonable responses. The evaluation determines the credibility of the model and delineates its valid response regions. Output data is analyzed and interpreted.

As a result of evaluation, the model, validation criteria, assumptions, and system definition may have to be redefined; this is discussed in the next sub-section.

The purpose of a validation should not be to prove that a model exactly simulates the response of an economic system, but should be to define the regions in which the model may be exercised and with what degree of credibility; a validation should also delineate the regions in which a model is invalid so that a user is appropriately warned.

9.0 Redefinition

During evaluation it often is realized that the wrong data has been used in the simulation model and that more data or new data must be obtained. Better methods of modeling occur to the modeler during evaluation and the model is then redefined.

New and better validation criteria also occur to the modeler during the evaluation phase and these will have to be redefined. Basic assumptions made about the model and the economic system may have to be adjusted and finally the economic system itself may have to be redefined. The process shown in Figure 1 is a closed loop process which, with recursive repetition, can result in convergence of the model to an optimal form. For complex models each trip around the development loop is expensive and the number of optimizations and redefinitions may have to be limited by time or money to one or two; the resulting model may then be adequate but sub-optimal.

Example Program: The Effects of Government Spending Upon the Aerospace Economy

Secondary effects on the U.S. economy due to multi-billion dollar government spending is a popular subject for speculation among politicians, economists, and the public in general. If the government spends three billion dollars, on say, a space shuttle program, the effect on the economy is expected to be multiplied as the prime contractors pay money to their employees and secondary corporations who in turn pass money on to others. Any government spending program will certainly cost the government less than the initial appropriation because of the cash return in income taxes from the principal recipients, but exactly what the over-all return will be is difficult to predict from current data on the U.S. economy. This is due to the intermixing of extraneous economic effects, that is, effects which are exogenous but undefined for our problem. In a simulation model we can segregate these effects and examine only those sectors of the economy in which we are interested: in this case, the aerospace sectors. Programming the model on a computer, we can perform ambitious economic and social experiments in time spans of a few seconds and make predictions of economic effects or, at least, trends.

The purpose of the example economic simulation model is to answer the following questions:

1. What are the secondary economic effects of government spending in aerospace programs?
2. How many jobs are created when the government initiates a multibillion dollar spending program?
3. What is the over-all return to the U.S. treasury in income taxes?
4. What are the inflationary effects of government spending?
5. Is there a spending strategy whereby the government can maximize economic benefits to the taxpayer while minimizing deficit spending?
6. What are the long-term effects of regulatory mechanisms such as increasing/decreasing the income tax rate?

Model

A cash flow model was chosen for the simulation because cash and account levels are easy to calculate, the mechanics of cash flow are easy to visualize, and cash flow is readily convertible into equivalent parameters, such as number of jobs, number of cars produced, kilowatt hours of electricity, tons of raw material, etc. The model is MACRO; that is, all aerospace corporations are grouped

into one block, all subcontractors are in another block, all consumer companies are in another block, etc. The cash flow model is constructed by diagraming the proportion of total cash input that each block receives from other blocks in the model. The blocks in the current model are:

1. Aerospace companies
2. Subcontractors
3. Raw material and power companies
4. Electronics and machinery companies
5. Consumer companies
6. Banks
7. Savings and Loan accounts
8. U.S. Treasury
9. Aerospace employees
10. Subcontractor employees
11. Resource and power company employees
12. Electronics and machinery employees
13. Consumer company employees
14. Banking employees

The blocks are linked by transfer functions which may be (1) constant coefficients, (2) functional coefficients of a number of variables, (3) decision functions which contain networks of tests to be done before the transfer function is specified. The model blocks and linear coefficient links are shown in Figure 3. The source or input to the model is cash flow from the U.S. Treasury into the aerospace industry at a rate of $1 billion per year for three years. At the end of three years all aerospace contracts are terminated, the cash input is cut off, and the economic effects are observed. The model output consists of cash levels of the total input to each block. These are sufficient to provide monitoring of all block outputs via the transfer functions and the construction of accounts of particular interest, such as the total number of jobs generated. Not shown in Figure 3 is the accounting system which monitors the model output, and the bank account system, which computes savings and loan accounts and determines whether corporate profits are to be used to repay loans or be reinvested in the corporate blocks.

Accounting

The major computing task of an economic model is not concerned with the mechanics of the model (system cash flow in this model), but with accounting - sampling input and output parameters of the model blocks, computing cumulative totals, converting cash to equivalent parameters, and then displaying these accounts in tabular or graphical form. Solution of the model is basically an accounting task in which each block in Figure 3 is solved sequentially. When all accounts have been computed for one month, time is stepped by another month and the accounts are recomputed. The program uses one subroutine for each type of accounting done. The subroutines used are:

1. A corporate subroutine
2. An employee subroutine
3. A bank account (savings account) subroutine
4. A corporate loan subroutine
5. A list (table-generating) subroutine
6. A plot (printer-plot) subroutine

A subroutine is called for each block in Figure 3, except the U.S. Treasury block, which is computed in the main program. Subroutine arguments include input expressions, identifiers, plot symbols, and scale factors. The main program and its subroutines are shown in Figures 4-10 and described in sub-sections below.

Main Program

The main program, Figure 4, is run four times - once for each of three sets of 11 parameters which are listed as the program is run and once again to plot 47 parameters. This is done to minimize the amount of storage required. Data for these parameters could have been stored during one pass and then output at the end of a run in the form of lists and plots; the number of data points accumulated would then be equal to the number of parameters separately listed and plotted multiplied by the number of time frames. List headings, plot titles, and plot symbols are read as data by the main program. Accounts are initialized by the main program and subroutines are called to compute corporate blocks, employee blocks, private bank accounts, corporate loan accounts, list output parameters, and make printer plots. These subroutines are described below.

Corporate Block Subroutine

The subroutine for computing corporate blocks, SUBROUTINE CORP, is shown in Figure 5. This subroutine computes total block cash gross, taxable income, and profit, and stores these in FORTRAN identifiers used in the subroutine arguments. Also computed in the corporate block subroutine are maximum gross corporate profits and the printer plot symbol positions for corporate gross and profit. Arguments used in calls to the CORP subroutine are:

TOTIN - FORTRAN identifier where total gross input to a corporate block is stored.
TAXINC - A FORTRAN identifier where taxable corporate income is stored.
TAXIN - A FORTRAN expression for gross income whose profits are taxable.
CNONTX - A FORTRAN expression for cash inputs to the corporate block which are non-taxable.
PROFIT - A FORTRAN identifier where corporate profits are stored.
CMAX - A FORTRAN identifier where maximum gross block cash input is stored.
PMAX - A FORTRAN identifier where maximum profit value is stored.
NCORP - An integer number which identifies a plot array element for the corporate block gross input. The plot array is L.
NPROF - An integer number which identifies a plot array element for corporate block profit. The plot array is L. The plot symbols for L(NCORP) and L(NPROF) are stored respectively in LS(NCORP) and LS(NPROF).

Employee Subroutine

SUBROUTINE EMPL, the employee subroutine shown in Figure 6, computes the income of the employees of a corporate block and stores it in the FORTRAN identifier used in the subroutine argument. The peak income is also computed and the position of a plot symbol for the employee block is computed. Arguments used in the EMPL subroutine are:

EMP - FORTRAN identifier for corporate employee block.
TAXIN - FORTRAN expression for employee block income.
EMAX - FORTRAN identifier for storage of peak income value.
NPLOT - Number to denote an integer array element where the plot symbol position for gross block input is stored. This array is L. The corresponding plot symbol is stored in the array LS. L and LS are both in dimensioned COMMON.

Bank Account Subroutine

This subroutine, Figure 7, computes the value of employee bank accounts and the banks' own accounts. Interest is credited to accounts monthly. Total bank account level, account totals for two employee groups, the level of banks' own accounts and maximum levels of account totals, accounts of the two employee groups, and banks' own accounts are computed. Arguments used in a call to SUBROUTINE BANKAC are:

ACIN - FORTRAN identifier where total net value of all bank accounts is stored.

AEMP - FORTRAN expression for monthly deposits of first employee group.

BEMP - FORTRAN expression for monthly deposits of second employee group.

AEAC - FORTRAN identifier where account level of first employee group's accounts is stored.

BEAC - FORTRAN identifier where account level of second employee group's accounts is stored.

BAC - A FORTRAN identifier where account level of banks' own accounts is stored.

BP - FORTRAN identifier where bank profits are stored. Bank profits are computed in SUBROUTINE CORPAC.

AIM - FORTRAN identifier where the maximum net total of all bank accounts is stored.

BAM - FORTRAN identifier where the maximum value of employee group and banks' own accounts is stored.

N1,N2,N3,N4,N5,N6 - Integer numbers which identify plot array elements for bank account values. The plot array is L. Plot symbols are stored in a corresponding array LS.

Corporate Account Subroutine

This subroutine, SUBROUTINE CORPAC, Figure 8, computes corporate loan balances and adjusted profits for each corporate block. It also computes bank profits, scales loan balances for plotting, and computes plot symbol positions. Arguments used in SUBROUTINE CORPAC are:

BIN - FORTRAN expression for total cash input to banks and available for corporate loans.

BP - FORTRAN identifier where bank profits are stored.

CL,DL,EL - FORTRAN identifier where monthly amounts loaned to three respective corporate blocks C, D, and E are stored.

CLT,DLT,ELT - FORTRAN identifier where loan balances, for corporate blocks C, D, and E are stored.

CP,DP,EP - FORTRAN identifier where corporate profits adjusted for loan payments are stored.

BINMX - FORTRAN identifier where maximum monthly amount available for corporate loans is stored.

ALM - FORTRAN identifier where maximum monthly amount loaned to a corporate block is stored.

ALTM - FORTRAN identifier where maximum corporate loan balance is stored.

PM - FORTRAN identifier where maximum corporate profit is stored.

BPM - FORTRAN identifier where maximum monthly bank profit is stored.

N1,N2,N3,...,N11 - Integer numbers which denote an array element in the plot position array L. The corresponding plot symbols are stored in array elements LS(N1), LS(N2), LS(N3), ..., LS(N11).

Listing Subroutine

SUBROUTINE LIST, Figure 9, prints one line of text containing the month number and parameter values of 11 FORTRAN variables used in the subroutine arguments. This subroutine is called once for each pass through the computation sequence in the main program. When called, its arguments may be variables or FORTRAN expressions. The use of expressions in the argument list permits the output and display of parameters which are not otherwise computed in the program. Headings and titles for the listing are created by the main program.

Printer Plot Subroutine

This subroutine, shown in Figure 10, generates plots of 47 variables on a line printer. The number of variables plotted is only limited by the number of FORTRAN symbols available. The column position of each plot symbol is computed either in the main program or in one of the block subroutines and stored in the array L. The plot symbol is stored in a corresponding element of the array LS. Plot headings are generated by the main program.

Model Results

The output of a model run is shown in Figures 11-14. One billion dollars per year is input to primary aerospace corporations for three years at a rate of $83-1/3 million per month. At the end of 36 months, government aerospace spending is terminated and the effects on the economy noted. The list in Figure 11 shows the job market breakdown and the monthly cash flow to banks from employees. The employees of prime aerospace corporations and their subcontractors feel the effect of spending termination immediately: at the end of four months, everyone is unemployed. The consumer industry feels the effect at the same time and 30% of the new jobs created in the consumer sector are eliminated. The damping rate is not as great as in the aerospace sector because the consumer sector is able to maintain itself and the employment level steady states out to 5,550 permanent new jobs created and self-maintained in the consumer, raw materials, and machinery industries as a result of the government spending program. At the peak employment period 281,900 jobs were generated; 55,000 of these were in aerospace, 145,000 were in the consumer industry and the remainder were in the raw materials, electronics, machinery, and banking industries which support both aerospace and one another. The model predicts an average of 2.6 jobs created in the consumer sector for every aerospace job. Employees of the consumer industry are therefore the real beneficiaries of government aerospace spending; this is reflected in the net bank savings and income tax figures for this employee group. After the cash input to aerospace corporations is terminated, cash continues to circulate within the consumer, raw materials, and electronics and machinery industries which operate at a lower cash flow rate and finally achieve a steady state where the economy is self-maintained. Despite the fact that all corporate profits are used first to repay loans, and second to reinvest in the industry, the corporate loan balances for the consumer, raw material, and electronics-machinery industries increase throughout the period the model is run. As a result these industries show no net after-tax profits. The income tax tabulations show that the U.S. Treasury receives 2.23 times as much income from individuals as from corporations, even though corporations pay at a 50% income tax rate. (This agrees well with U.S. Budget figures for the 1960's. The individual/corporate ratio for 1970-1972 was about 3; this is probably because corporations have declared lower profits for the recessionary period.) The figures for net cumulative income tax return to the U.S. Treasury show that the government receives all the money back that it originally spends along with an additional $.7 billion; this money is not free; it has been obtained at the expense of borrowing the original $3 billion and inflating this amount by $.7 billion. The average inflation rate for the first 36 month period is 5% per year, but has reached a peak rate of 10% at the end of 36 months. The average inflation rate over a 5 year period is 4.8%. The only inflation source in this model is within the banking model which recirculates money deposited in accounts to the consumer, raw material, and electronics and machinery industries in the form of loans. A 4% interest on accounts is credited to the accounts and paid in paper money backed by commercial bonds; 25% of this interest is paid to the Treasury as individual income tax. The banks realize a 2% paper profit on money loaned (this is the difference between the prime rate and the deposit dividend rate); half of this is paid to the U.S. Treasury as corporate income tax and the other half is loaned out and recirculated in the model. The rapid recirculation of deposit and loan money results in the creation of additional jobs and higher cash flow in the consumer, raw

material, and electronics and machinery blocks. Inflation results because paper money is created in the banking system. Attempts were made to control or decrease the inflation rate by adjusting the individual and corporate tax rate upward. Increasing the average individual income tax rate to 50% results in an average inflation rate of 2% over the first three years. Increasing the corporate income tax rate to 70% results in an average inflation rate of 8% over the first three years. One interpretation of this high figure is that corporations pass higher costs on to the consumer. In this model, the higher inflation rate, as measured by the Treasury return, occurs because money is returned to the Treasury sooner; corporations maintain their 10% profit margin which would result in higher costs being passed on; employees receive the same proportions of corporation gross cash inflow and therefore banks deposit and loan the same amount of money, but corporations are unable to pay off their loans as rapidly as with a lower tax rate. Increasing the individual income tax rate does lower the inflation rate but does not control it. In this model, the source of inflation is in the banking system. To control inflation, the banking model must be adjusted. This is the topic of a separate study.

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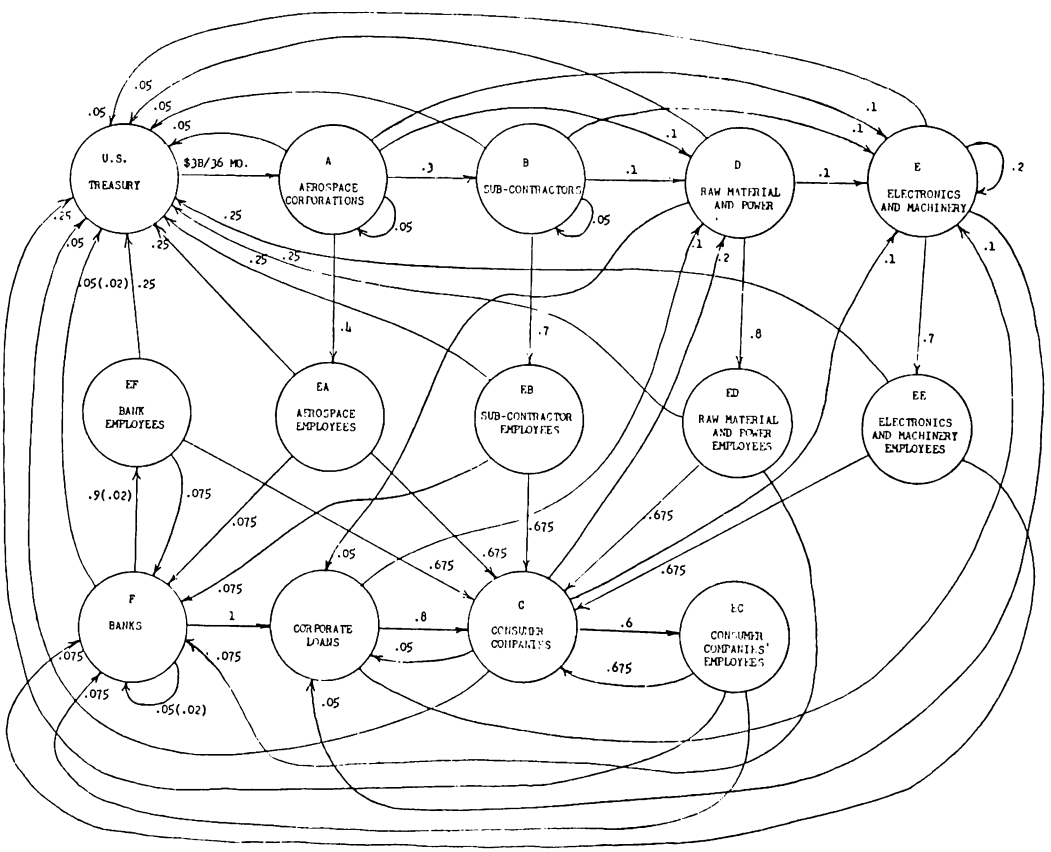


U.S. AEROSPACE ECONOMY

FIGURE 3. EXAMPLE MODEL.

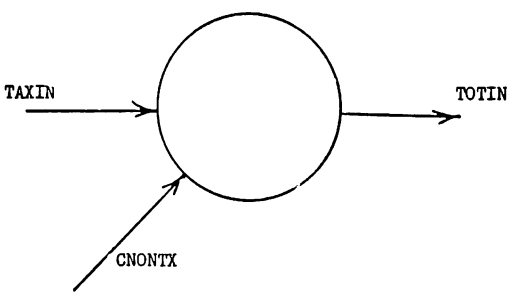
```
      MAINPROGRAM ECOPUF
      INTEGER HEADN
      DIMENSION HEADN(3,33),LISTP(16)
      COMMON M,L(47),LS(47)
      PM=1000.
      DO 250 IC=1,4
      IF(IC-3)10,10,20
   10 READ (5,1000)((HEADN(I,J),J=1,33),I=1,3)
      WRITE(6,1010)((HEADN(I,J),J=1,33),I=1,3)
      WRITE(6,1002)
      GO TO 40
   20 READ(5,1020)LS
      DO 30 I=1,40
      READ(5,1030)LISTP
   30 WRITE(6,1030)LISTP
      WRITE(6,1040)
   40 M=0
C ZERO ACCOUNTS
      A=0.$B=0.$AP=0.$ABP=0.$CL=0.$CLT=0.$CP=0.$DLT=0.$DP=0.$E=0.$DL=0.
      EA=0.$EB=0.$EC=0.$ED=0.$EE=0.$EF=0.$DPF=0.$EL=0.$EP=0.$ELT=0.$BP=0
      UST=0.
      BAC=0.
      AEAC=0.
      BEAC=0.
      CLT=0.
      DLT=0.
      ELT=0.
      AIN=1.0E09/12.E00
   50 M=M+1
      IF(M.GT.36)AIN=0.
      CALL CORP(A,AT,AIN,     .05*A,AP,AMX,PMX,7,12)
      CALL CORP(B,BT,.3*A,.05*B,ABP,AMX,PMX,8,13)
      CALL CORP(C,CT,.675*(EA+EB+EC+ED+EE+EF),CL+CP+.005*CLT,CP,AMX,PMX,
     $9,45)
      CALL CORP(D,DT,.1*(A+B)+.2*C,.005*DLT,DP,AMX,PMX,10,45)
      CALL CORP(E,ET,.1*(A+B+C+D)+.2*E+DL+DPF,EL+EP+.005*ELT,EP,AMX,PMX,
     $11,45)
C EMPLOYEES
      CALL EMPL(EA,.4*A,EMX,1)
      CALL EMPL(EB,.7*B,EMX,2)
      CALL EMPL(EC,.7*C,EMX,3)
      CALL EMPL(ED,.8*D,EMX,4)
      CALL EMPL(EE,.7*E,EMX,5)
      CALL EMPL(EF,.9*BP,EMX,45)
C NUMBER OF JOBS
      AN=EA/1000.
      BN=EB/1000.
      CN=EC/1000.
      DN=ED/1000.
      EN=EE/1000.
      FN=EF/1000.
      TN=AN+BN+CN+DN+EN+FN
      ET=EA+EB+EC+ED+EE+EF
      EMX=AMAX1(EMX,ET)
      L(6)=1.+124.*ET/EMX
C BANK ACCOUNTS, LOANS, AND CORPORATE BALANCES
      CALL BANKAC(ACIN,.075*(EA+EB),.075*(EC+ED+EE+EF),AEAC,BEAC,BAC,
     $BP,AIM,BAM,19,17,18,20,21,39)
      CALL CORPAC(ACIN        ,BP,CL,DL,EL,CLT,DLT,ELT,CP,DP ,EP,BINMX,
     $ALM,ALTM,PM,BPM,45,45,22,23,24,38,25,26,14,15,16)
      DPF=DP
C INCOME TAXES
      TAXIND=.25*(EA+EB+EC+ED+EE+EF)+.01*(AEAC+BEAC)/12.
      CORPTX=.05*(AT+BT+CT+DT+ET+.02*ACIN-.005*(CLT+DLT+ELT))
      USIN=TAXIND+CORPTX
      UST=UST+USIN
      TRMX=AMAX1(TRMX,UST)
      TMAX=AMAX1(TMAX,TAXIND,CORPTX)
      L(27)=1.+124.*TAXIND/TMAX
      L(28)=1.+124.*CORPTX/TMAX
      L(29)=1.+124.*UST/TRMX
```

FIGURE 4. MAIN PROGRAM. (CONTINUED ON NEXT PAGE.)

```
      GO TO (100,110,120,130),IC
  100 CALL LIST(AN,BN,CN,DN,EN,FN,TN,.075*(EA+EB),.075*EC,.075*ED,.075*E
     $E)
      GO TO 200
  110 CALL LIST(A,B,C,D,E,CL,DL,EL,CLT,DLT,ELT)
      GO TO 200
  120 CALL LIST(AP,BP,CP,DP,EP,BP,.25*(EA+EB),.25*(EC+ED+EE+EF),TAXIND,
     *UST,UST)
      GO TO 200
  130 CALL PLOT
  200 IF(M-96)50,250,250
  250 CONTINUE
 1000 FORMAT(18A4/15A4)
 1002 FORMAT(1H0)
 1010 FORMAT(33A4)
 1020 FORMAT(47A1)
 1030 FORMAT(16A5)
 1040 FORMAT(1H0,5HMONTH,10(1H.),26(1H.))
      STOP
```

FIGURE 4. MAIN PROGRAM. (CONTINUED FROM PREVIOUS PAGE.)

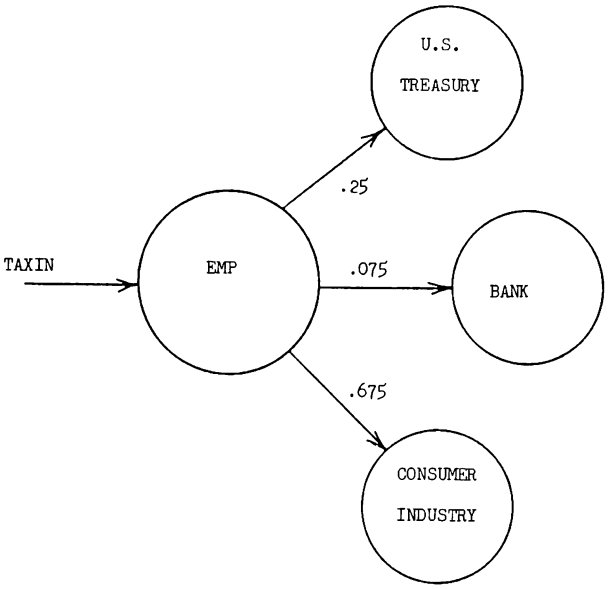
```
      SUBROUTINE CORP(TOTIN,TAXINC,TAXIN,CNONTX,PROFIT,CMAX,PMAX,NCORP,
     $NPROF)
      COMMON M,L(47),LS(47)
      TAXINC=TAXIN
      TOTIN=TAXIN+CNONTX/.9
      PROFIT=.05*TAXIN
      CMAX=AMAX1(CMAX,TOTIN)
      PMAX=AMAX1(PMAX,PROFIT)
      L(NCORP)=1.+124.*TOTIN/CMAX
      L(NPROF)=1.+124.*PROFIT/PMAX
      RETURN
```



CORPORATE SUBROUTINE AND MODEL

FIGURE 5

```
SUBROUTINE EMPL(EMP,TAXIN,EMAX,NPLOT)
COMMON M,L(47),LS(47)
EMP=TAXIN
EMAX=AMAX1(EMAX,TAXIN)
L(NPLOT)=1.+124.*TAXIN/EMAX
RETURN
```



EMPLOYEE SUBROUTINE AND MODEL

FIGURE 6.

```
 SUBROUTINE BANKAC(ACIN,AEMP,BEMP,AEAC,BEAC,BAC,BP,AIM,BAM,N1,N2,N3
$,N4,N5,N6)
 COMMON M,L(47),LS(47)
 ACIN=AEMP+BEMP+.05*BP
 AEAC=AEAC+.03*AEAC/12.+AEMP
 BEAC=BEAC+.03*BEAC/12.+BEMP
 BAC=BAC+.05*BP
 AIM=AMAX1(AIM,ACIN)
 BAM=AMAX1(BAM,AEAC,BEAC,BAC)
 L(N1)=1.+124.*ACIN/AIM
 L(N2)=1.+124.*AEMP/AIM
 L(N3)=1.+124.*BEMP/AIM
 L(N4)=1.+124.*AEAC/BAM
 L(N5)=1.+124.*BEAC/BAM
 L(N6)=1.+124.*BAC/BAM
 RETURN
```

BANK ACCOUNT SUBROUTINE

FIGURE 7.

```
      SUBROUTINE CORPAC(BIN,BP,CL,DL,EL,CLT,DLT,ELT,CP,DP,EP,BINMX,ALM,
     $ALTM,PM,BPM,N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11)
      COMMON M,L(47),LS(47)
      CL=.7*BIN
      DL=.15*BIN
      EL=.15*BIN
      CLT=1.005*CLT+CL-CP
      DLT=1.005*DLT+DL-DP
      ELT=1.005*ELT+EL-EP
      IF(CLT)10,20,20
10    CP=-CLT
      CLT=0.
      GO TO 30
20    CP=0.
30    IF(DLT)40,50,50
40    DP=-DLT
      DLT=0.
      GO TO 60
50    DP=0.
60    IF(ELT)70,80,80
70    EP=-ELT
      ELT=0.
      GO TO 90
80    EP=0.
90    CONTINUE
      BP=.02*BIN/12.
      BINMX=AMAX1(BINMX,BIN)
      ALM=AMAX1(ALM,AL,BL,CL,DL,EL)
      ALTM=AMAX1(ALTM,CLT,DLT,ELT)
      BPM=AMAX1(BPM,BP)
      PM=AMAX1(PM,CP,DP,EP)
      L(N1)=1.+124.*BIN/BINMX
      L(N2)=1.+124.*BP/BPM
      L(N3)=1.+124.*CL/ALM
      L(N4)=1.+124.*DL/ALM
      L(N5)=1.+124.*EL/ALM
      L(N6)=1.+124.*CLT/ALTM
      L(N7)=1.+124.*DLT/ALTM
      L(N8)=1.+124.*ELT/ALTM
      L(N9)=1.+124.*CP/PM
      L(N10)=1.+124.*DP/PM
      L(N11)=1.+124.*EP/PM
      RETURN
      END
```

FIGURE 8. CORPORATE ACCOUNT SUBROUTINE.

```
      SUBROUTINE LIST(C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12)
      COMMON M,L(47),LS(47)
      WRITE(6,10)M,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12
10    FORMAT(I6,4X,11F11.0)
      RETURN
```

FIGURE 9. LISTING SUBROUTINE.

```
      SUBROUTINE PLOT
      COMMON M,L(47),LS(47)
      DIMENSION LINE(126)
      DO 10 N=2,125
10    LINE(N)=1H
      LINE(1)=1H.
      LINE(126)=1H.
      DO 20 N=1,47
20    LINE(L(N))=LS(N)
      WRITE(6,30)M,LINE
30    FORMAT(1X,I3,2X,100A1,26A1)
      RETURN
```

FIGURE 10. PRINTER PLOT SUBROUTINE.

MONTH	* JOB MARKET BREAKDOWN *							MONTHLY CASH FLOW TO BANKS			
	MAIN AEROSPACE	SUB-CONTRACTORS	CONSUMER INDUSTRY	MAT. RES. AND POWER	ELECTRONICS AND MACHINERY	BANKING	TOTAL	AEROSPACE EMPLOYEES	CONSUMER IND. EMPL.	RAW MAT. AND POWER EMPL	ELECTR. AND MACH. EMPL
1	33333.	17500.	0	8667.	8342.	0	67842.	3812498.	0	650000.	625625.
2	35185.	19444.	34939.	17224.	15890.	8.	122590.	4097222.	2612944.	1291764.	1191725.
3	35288.	19606.	62960.	23691.	21723.	14.	163282.	4117092.	4721972.	1776860.	1629216.
4	35294.	19618.	83866.	28474.	26079.	18.	193350.	4118418.	6289964.	2135568.	1955914.
5	35294.	19619.	99319.	32008.	29306.	22.	215569.	4118502.	7448952.	2400622.	2197974.
6	35294.	19619.	110744.	34622.	31694.	24.	231998.	4118510.	8305816.	2596624.	2377066.
7	35294.	19619.	119197.	36556.	33461.	26.	244154.	4118510.	8939776.	2741680.	2509602.
8	35294.	19619.	125457.	37989.	34770.	27.	253157.	4118510.	9409288.	2849154.	2607770.
9	35294.	19619.	130099.	39052.	35741.	28.	259834.	4118510.	9757410.	2928898.	2680582.
10	35294.	19619.	133547.	39842.	36462.	29.	264795.	4118510.	10016056.	2988174.	2734678.
11	35294.	19619.	136114.	40431.	36999.	30.	268489.	4118510.	10208592.	3032352.	2774962.
12	35294.	19619.	138032.	40872.	37401.	30.	271248.	4118510.	10352392.	3065390.	2805062.
13	35294.	19619.	139470.	41203.	37702.	31.	273318.	4118510.	10460216.	3090214.	2827646.
14	35294.	19619.	140554.	41453.	37929.	31.	274880.	4118510.	10541520.	3108972.	2844684.
15	35294.	19619.	141377.	41643.	38102.	31.	276066.	4118510.	10603256.	3123262.	2857634.
16	35294.	19619.	142007.	41790.	38234.	31.	276976.	4118510.	10650552.	3134250.	2867570.
17	35294.	19619.	142496.	41904.	38337.	31.	277682.	4118510.	10687216.	3142812.	2875282.
18	35294.	19619.	142880.	41994.	38418.	31.	278238.	4118510.	10716040.	3149580.	2881354.
19	35294.	19619.	143188.	42067.	38483.	31.	278683.	4118510.	10739080.	3155030.	2886218.
20	35294.	19619.	143438.	42127.	38536.	31.	279046.	4118510.	10757864.	3159506.	2890190.
21	35294.	19619.	143647.	42177.	38580.	31.	279349.	4118510.	10773520.	3163270.	2893514.
22	35294.	19619.	143825.	42220.	38618.	31.	279608.	4118510.	10786888.	3166512.	2896354.
23	35294.	19619.	143981.	42258.	38651.	31.	279835.	4118510.	10798560.	3169366.	2898844.
24	35294.	19619.	144120.	42293.	38681.	31.	280039.	4118510.	10809000.	3171940.	2901078.
25	35294.	19619.	144247.	42324.	38708.	32.	280224.	4118510.	10818536.	3174306.	2903118.
26	35294.	19619.	144366.	42354.	38734.	32.	280398.	4118510.	10827416.	3176526.	2905026.
27	35294.	19619.	144478.	42382.	38758.	32.	280562.	4118510.	10835816.	3178638.	2906836.
28	35294.	19619.	144585.	42409.	38781.	32.	280720.	4118510.	10843880.	3180674.	2908570.
29	35294.	19619.	144689.	42435.	38803.	32.	280873.	4118510.	10851764.	3182656.	2910256.
30	35294.	19619.	144791.	42461.	38825.	32.	281023.	4118510.	10859368.	3184598.	2911910.
31	35294.	19619.	144892.	42487.	38847.	32.	281171.	4118510.	10866912.	3186518.	2913540.
32	35294.	19619.	144992.	42512.	38869.	32.	281318.	4118510.	10874392.	3188428.	2915152.
33	35294.	19619.	145091.	42538.	38890.	32.	281464.	4118510.	10881616.	3190320.	2916758.
34	35294.	19619.	145190.	42563.	38912.	32.	281609.	4118510.	10889240.	3192216.	2918362.
35	35294.	19619.	145289.	42588.	38933.	32.	281755.	4118510.	10896648.	3194106.	2919964.
36	35294.	19619.	145387.	42613.	38954.	32.	281900.	4118510.	10904064.	3196002.	2921568.
37	1961.	2119.	145486.	33972.	30634.	32.	214204.	3960012.	10911480.	2547900.	2297548.
38	109.	175.	110746.	25441.	23107.	24.	159602.	21290.	8305976.	1908038.	1733057.
39	6.	13.	82726.	18998.	17296.	18.	119056.	1421.	6204416.	1424852.	1297183.
40	0.	1.	61919.	14241.	12961.	13.	89136.	92.	4643932.	1068065.	972106.
41	0.	0.	46566.	10733.	9756.	10.	67065.	6.	3492404.	804938.	731678.
42	0.	0.	35242.	8145.	7390.	8.	50785.	0.	2643136.	610875.	554226.
43	0.	0.	26891.	6237.	5644.	6.	38778.	0.	2016824.	467762.	423335.
44	0.	0.	20733.	4830.	4358.	4.	29925.	0.	1554963.	362245.	326818.
45	0.	0.	16193.	3793.	3409.	3.	23399.	0.	1214434.	284471.	255672.
46	0.	0.	12848.	3029.	2710.	3.	18590.	0.	963668.	227171.	203249.
47	0.	0.	10384.	2466.	2195.	2.	15048.	0.	778835.	184980.	164643.
48	0.	0.	8571.	2053.	1816.	2.	12442.	0.	642850.	153940.	136233.
49	0.	0.	7238.	1748.	1538.	1.	10526.	0.	542870.	131128.	115349.
50	0.	0.	6259.	1525.	1334.	1.	9119.	0.	469462.	114389.	100018.

FIGURE 11. LISTING OF JOB MARKET AND CASH FLOW TO BANKS.

MONTH	* MONTHLY CASH FLOW TO CORPORATIONS *					MONTHLY CORPORATE LOANS *			CORPORATE LOAN BALANCE		
	AEROSPACE	SUB-CONTRACTORS	CONSUMER INDUSTRY	NAT. RES. AND POWER	ELECTRONICS AND MACHINERY	CONSUMER CORPS.	RAW MAT. AND POWER	ELECTRONICS AND MACHINERY	CONSUMER CORPS.	RAW MAT. AND POWER	ELECTRONICS AND MACHINE
1	83333312.	24999984.	4087068.	11650752.	12773496.	3777762.	809520.	809520.	3589666.	226983.	174329.
2	87962944.	27777776.	52788448.	22133040.	23330880.	6595768.	1413379.	1413379.	7774836.	534908.	467057.
3	88220160.	28009264.	92170496.	30060016.	31498576.	8690616.	1862275.	1862275.	12264400.	897006.	835389.
4	88234432.	28026384.	121453760.	35921824.	37599456.	10238520.	2193968.	2193968.	16977776.	1299618.	1257252.
5	88235200.	28027584.	143099264.	40253376.	42120160.	11382400.	2439086.	2439086.	21663632.	1732894.	1718852.
6	88235264.	28027664.	159103104.	43456544.	45465024.	12228248.	2620338.	2620338.	26884496.	2189550.	2210514.
7	88235264.	28027664.	170944512.	45827360.	47940640.	12854128.	2754456.	2754456.	32012640.	2664196.	2725180.
8	88235264.	28027664.	179714432.	47584000.	49774400.	13317712.	2853796.	2853796.	37227712.	3152856.	3257666.
9	88235264.	28027664.	186218368.	48887488.	51134560.	13661552.	2927476.	2927476.	42514720.	3652596.	3804154.
10	88235264.	28027664.	191050112.	49856608.	52145248.	13917040.	2982222.	2982222.	47862624.	4161268.	4361832.
11	88235264.	28027664.	194648064.	50579040.	52898080.	14107304.	3022994.	3022994.	53263236.	4677272.	4928624.
12	88235264.	28027664.	197335552.	51119392.	53460672.	14249488.	3053462.	3053462.	58710880.	5199452.	5503012.
13	88235264.	28027664.	199351680.	51525536.	53882944.	14356192.	3076326.	3076326.	64200932.	5726944.	6083872.
14	88235264.	28027664.	200872448.	51832608.	54201664.	14436704.	3093580.	3093580.	69730496.	6259120.	6670384.
15	88235264.	28027664.	202027648.	52066624.	54444032.	14497912.	3106696.	3106696.	75297088.	6795520.	7261948.
16	88235264.	28027664.	202913536.	52246784.	54630048.	14544888.	3116762.	3116762.	80899200.	7335812.	7858132.
17	88235264.	28027664.	203600640.	52387200.	54774592.	14581352.	3124576.	3124576.	86535552.	7879752.	8459608.
18	88235264.	28027664.	204141440.	52498368.	54888544.	14610080.	3130732.	3130732.	92205440.	8427160.	9063152.
19	88235264.	28027664.	204574208.	52587968.	54979904.	14633120.	3135670.	3135670.	97908224.	8977912.	9671592.
20	88235264.	28027664.	204927616.	52661728.	55054752.	14651968.	3139708.	3139708.	103643520.	9531920.	10283816.
21	88235264.	28027664.	205222528.	52723776.	55117280.	14667704.	3143080.	3143080.	109411136.	10089120.	10899744.
22	88235264.	28027664.	205474560.	52777280.	55170880.	14681192.	3145970.	3145970.	115210944.	10649472.	11519304.
23	88235264.	28027664.	205694976.	52824480.	55217920.	14692992.	3148500.	3148500.	121042880.	11212960.	12142488.
24	88235264.	28027664.	205892480.	52867104.	55260160.	14703600.	3150772.	3150772.	126907008.	11779560.	12769256.
25	88235264.	28027664.	206073216.	52906400.	55298912.	14713320.	3152856.	3152856.	132803328.	12349264.	13399608.
26	88235264.	28027664.	206241664.	52943264.	55335072.	14722392.	3154800.	3154800.	138731904.	12922072.	14033536.
27	88235264.	28027664.	206401408.	52978368.	55369408.	14730984.	3156640.	3156640.	144692864.	13497992.	14671048.
28	88235264.	28027664.	206554624.	53012224.	55402400.	14739272.	3158416.	3158416.	150686464.	14077032.	15312160.
29	88235264.	28027664.	206703360.	53045184.	55434496.	14747304.	3160138.	3160138.	156712704.	14659200.	15956864.
30	88235264.	28027664.	206849152.	53077600.	55465920.	14755176.	3161824.	3161824.	162771840.	15244512.	16605176.
31	88235264.	28027664.	206992640.	53109536.	55496896.	14762936.	3163488.	3163488.	168863872.	15832984.	17257120.
32	88235264.	28027664.	207134976.	53141280.	55527648.	14770624.	3165134.	3165134.	174989184.	16424616.	17912704.
33	88235264.	28027664.	207276288.	53172800.	55558176.	14778272.	3166774.	3166774.	181147776.	17019440.	18571952.
34	88235264.	28027664.	207417344.	53204352.	55588736.	14785896.	3168408.	3168408.	187339904.	17617472.	19234880.
35	88235264.	28027664.	207558272.	53235872.	55619232.	14793528.	3170042.	3170042.	193565696.	18218720.	19901504.
36	88235264.	28027664.	207699456.	53267424.	55649696.	14801168.	3171678.	3171678.	199825280.	18823184.	20571840.
37	4901960.	3027682.	207840896.	42465728.	43763616.	11247136.	2410100.	2410100.	202557312.	19209328.	21078544.
38	272331.	249904.	158212352.	31801424.	33011440.	8380236.	1795765.	1795765.	204720896.	19516400.	21468880.
39	15123.	18422.	118182528.	23748304.	24709056.	6251324.	1339569.	1339569.	206609024.	19771552.	21786064.
40	841.	1276.	88459072.	17801872.	18517136.	4680340.	1002930.	1002930.	208304128.	19988736.	22052528.
41	47.	85.	66526784.	13416424.	13937576.	3521476.	754602.	754602.	209858688.	20178032.	22282368.
42	3.	5.	50349728.	10182056.	10557536.	2666678.	571431.	571431.	211311104.	20346848.	22485440.
43	0.	0.	38419040.	7796848.	8064376.	2036256.	436341.	436341.	212689920.	20500736.	22668976.
44	0.	0.	29621696.	6038232.	6225072.	1571406.	336730.	336730.	214015872.	20643760.	22838288.
45	0.	0.	23136608.	4742012.	4870812.	1228744.	263302.	263302.	215304704.	20778912.	22997280.
46	0.	0.	18357872.	3787014.	3872272.	976252.	209197.	209197.	216567808.	20908432.	23148880.
47	0.	0.	14838392.	3083838.	3136032.	790304.	169351.	169351.	217813376.	21033936.	23295168.
48	0.	0.	12248216.	2566500.	2595794.	653465.	140028.	140028.	219047936.	21156656.	23437776.
49	0.	0.	10343864.	2196310.	2198002.	552866.	118471.	118471.	220275968.	21277472.	23577808.
50	0.	0.	8945640.	1907336.	1905993.	479014.	102646.	102646.	221501056.	21397040.	23716160.

FIGURE 12. LISTING OF CASH FLOW TO CORPORATIONS AND CORPORATE LOANS.

MONTH	MONTHLY CORPORATE PROFITS CONTRACTORS	SUB-CONTRACTORS	CONSUMER CORPS.	RAW MATERIAL AND POWER	ELECTRONICS AND MACHINERY	BANK PROFITS	* INCOME TAX BREAKDOWN MONTHLY AEROSP.EMPL	MONTHLY NON-AEROS. EMPL	MONTHLY INDIVIDUAL	MONTHLY CORPORATE	NET CUMULATIVE
1	4166666.	1249999.	0	0	0	8995.	12708328.	5281660.	17994496.	9789872.	27784368.
2	4166666.	1319444.	0	0	0	15704.	13657408.	17750064.	31419456.	15310112.	74514368.
3	4166666.	1323303.	0	0	0	20692.	13723640.	27658064.	41404448.	19518128.	135436928.
4	4166666.	1323516.	0	0	0	24378.	13728064.	35023680.	48786720.	22632672.	206856320.
5	4166666.	1323528.	0	0	0	27101.	13728344.	40469792.	54246752.	24933568.	286036736.
6	4166666.	1323529.	0	0	0	29115.	13728368.	44496992.	58288640.	26634032.	370959360.
7	4166666.	1323529.	0	0	0	30605.	13728368.	47477024.	61284160.	27891488.	460134912.
8	4166666.	1323529.	0	0	0	31709.	13728368.	49684352.	63507552.	28822080.	552464384.
9	4166666.	1323529.	0	0	0	32528.	13728368.	51321504.	65161152.	29511424.	647137280.
10	4166666.	1323529.	0	0	0	33136.	13728368.	52537920.	66394432.	30022784.	743554560.
11	4166666.	1323529.	0	0	0	33589.	13728368.	53443904.	67317568.	30402848.	841275392.
12	4166666.	1323529.	0	0	0	33927.	13728368.	54120896.	68011840.	30686016.	939973632.
13	4166666.	1323529.	0	0	0	34181.	13728368.	54628896.	68537344.	30897664.	1039408640.
14	4166666.	1323529.	0	0	0	34373.	13728368.	55012224.	68938304.	31056576.	1139403776.
15	4166666.	1323529.	0	0	0	34519.	13728368.	55303680.	69247552.	31176576.	1239828480.
16	4166666.	1323529.	0	0	0	34631.	13728368.	55527296.	69489024.	31267904.	1340584960.
17	4166666.	1323529.	0	0	0	34718.	13728368.	55700896.	69680576.	31338016.	1441603584.
18	4166666.	1323529.	0	0	0	34786.	13728368.	55837728.	69835392.	31392576.	1542832128.
19	4166666.	1323529.	0	0	0	34841.	13728368.	55947392.	69963136.	31435632.	1644230656.
20	4166666.	1323529.	0	0	0	34886.	13728368.	56037120.	70070976.	31470192.	1745772544.
21	4166666.	1323529.	0	0	0	34923.	13728368.	56112064.	70164224.	31498528.	1847435264.
22	4166666.	1323529.	0	0	0	34955.	13728368.	56176288.	70246656.	31522288.	1949203456.
23	4166666.	1323529.	0	0	0	34983.	13728368.	56232512.	70321280.	31542688.	2051066880.
24	4166666.	1323529.	0	0	0	35009.	13728368.	56283008.	70390208.	31560608.	2153017344.
25	4166666.	1323529.	0	0	0	35032.	13728368.	56329280.	70454912.	31576704.	2255048704.
26	4166666.	1323529.	0	0	0	35053.	13728368.	56372480.	70516672.	31591504.	2357157888.
27	4166666.	1323529.	0	0	0	35074.	13728368.	56413408.	70576192.	31605360.	2459338752.
28	4166666.	1323529.	0	0	0	35094.	13728368.	56452832.	70634176.	31618496.	2561591296.
29	4166666.	1323529.	0	0	0	35113.	13728368.	56491072.	70691136.	31631168.	2663913472.
30	4166666.	1323529.	0	0	0	35131.	13728368.	56528544.	70747328.	31643424.	2766305280.
31	4166666.	1323529.	0	0	0	35150.	13728368.	56565504.	70803072.	31655504.	2868764672.
32	4166666.	1323529.	0	0	0	35168.	13728368.	56602112.	70858560.	31667440.	2971291648.
33	4166666.	1323529.	0	0	0	35186.	13728368.	56638496.	70913920.	31679216.	3073884160.
34	4166666.	1323529.	0	0	0	35205.	13728368.	56674816.	70969152.	31690960.	3176544256.
35	4166666.	1323529.	0	0	0	35223.	13728368.	56711168.	71024512.	31702656.	3279271936.
36	4166666.	1323529.	0	0	0	35241.	13728368.	56747520.	71079936.	31714384.	3382067200.
37	0	73529.	0	0	0	26779.	1020040.	52531872.	54170848.	22371584.	3458611200.
38	0	4085.	0	0	0	19953.	70966.	39830464.	40531872.	16749160.	3515891712.
39	0	227.	0	0	0	14884.	4737.	29760176.	30404400.	12468792.	3558764544.
40	0	13.	0	0	0	11144.	307.	22284560.	22931536.	9303960.	3591000064.
41	0	1.	0	0	0	8384.	20.	16767056.	17419552.	6969096.	3615389696.
42	0	0.	0	0	0	6349.	1.	12697072.	13354352.	5246744.	3633991680.
43	0	0.	0	0	0	4848.	0.	9695400.	10356744.	3976320.	3648325632.
44	0	0.	0	0	0	3741.	0.	7482080.	8146948.	3039384.	3659511808.
45	0	0.	0	0	0	2926.	0.	5850540.	6518532.	2348542.	3668379648.
46	0	0.	0	0	0	2324.	0.	4648336.	5319160.	1839308.	3675537408.
47	0	0.	0	0	0	1882.	0.	3762970.	4436412.	1464097.	3681437696.
48	0	0.	0	0	0	1556.	0.	3111426.	3787330.	1187792.	3686412288.
49	0	0.	0	0	0	1316.	0.	2632438.	3310690.	984477.	3690708992.
50	0	0.	0	0	0	1141.	0.	2280798.	2961316.	835026.	3694505984.

FIGURE 13. LISTING OF CORPORATE PROFITS AND INCOME TAX BREAKDOWN.

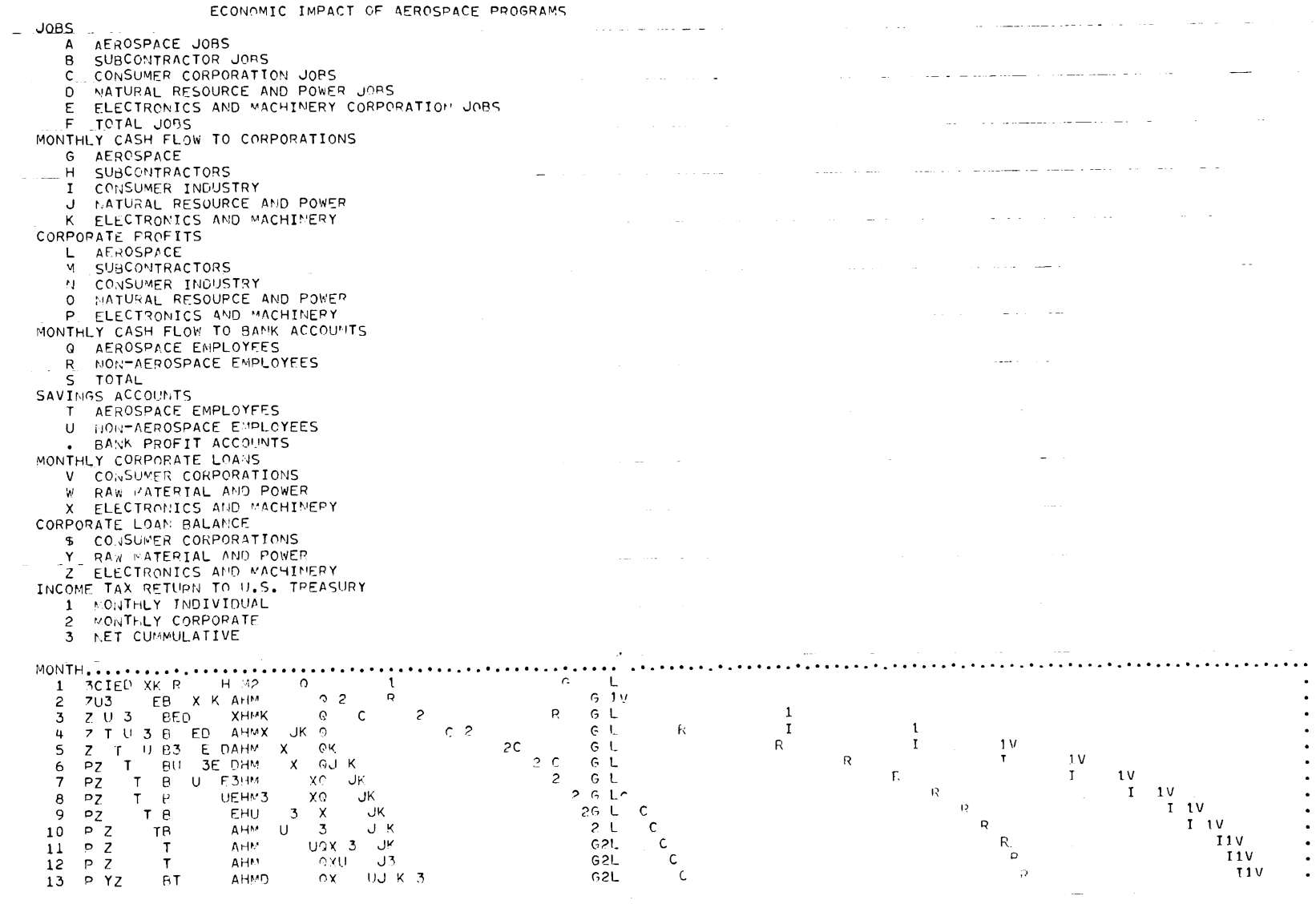


FIGURE 14. PRINTER PLOT. (CONTINUED ON NEXT PAGE).

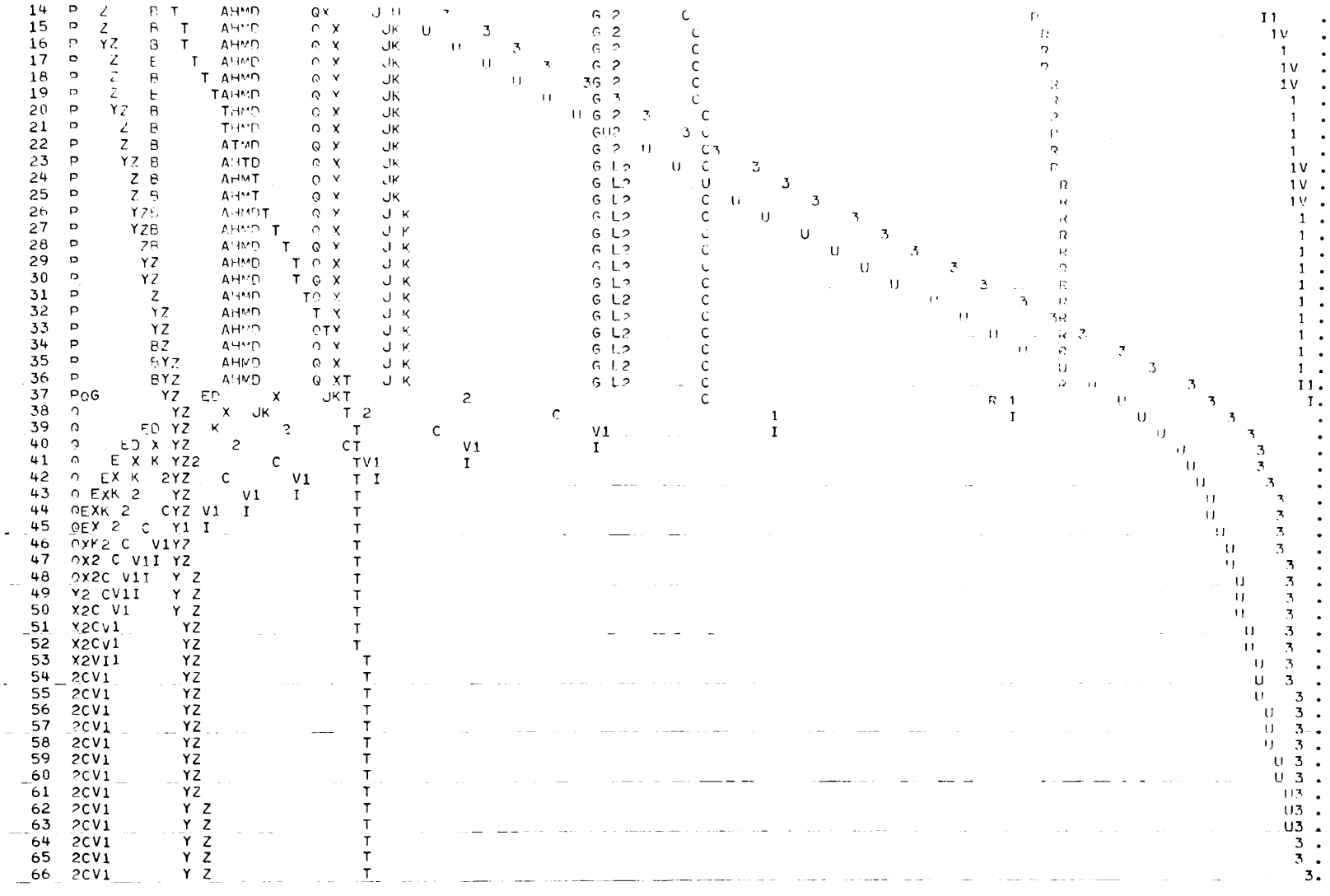


FIGURE 14. PRINTER PLOT. (CONTINUED FROM PREVIOUS PAGE).