JAMES A. GRAASKAMP COLLECTION OF TEACHING MATERIALS

VII. INDUSTRY EDUCATIONAL COURSES - LONG TERM

A. EDUCARE

4. Listing and Summary Descriptions of Computer Programs Available on EDUCARE

Index

Educare Computer Network (ECN)
Library
July, 1972

| Program Name | |
|---|---|
| | - Real Estate Programs - |
| CIT | Compound Interest Tables provides 6 factors associated with compound interest tables. Output is formated to conform the "Ellwood Tables" book. |
| RATES | Rate of return calculations. Program will provide present value, internal rate of return, and adjusted rate for an arbitrary set of net reciepts and investments. |
| ELLWOOD | Provides analysis "ala Ellwood" text, ed. IV. |
| MKTCOMP | Market Comparison Program will adjust a set of comparables on the basis of a subject property. User provides selection of factors, a comparable file and a subject file. |
| MINIMOD | A basic cash flow analysis model with file input. |
| MEDIT | An edit program for MINIMOD data files. |
| AIP | Analysis of Investment Potential. An advanced cash flow analysis model with data file input. |
| | - General - |
| MAILBOX | A program to provide intercommunication among ECN subscribers. Sender prepares a message in a file. Addressee is notified of message upon signing in. |
| HELP | A program to provide intercommunication to ECN personnel in order to get assistance or answers to questions (self documenting) |
| USERS | Program produces a list of user numbers and user names for ECN subscribers (User numbers are required by MAILBOX). |

| | |
|---|---|
| PCHTAPE | Will punch a file to paper tape in a re-loadable format. Printout will be divided into 8½ x 11" pages. |
| NEWS** | A Listable file (not a program itself) which provides recent news of ECN developments |
| | - Billing Information Programs - (These programs, for the most part, require little or no user input) |
| COST | Will show dollar cost of current terminal session since sign-in. |
| GECOST | Will show total computer charges for last month and current month to date (yesterday). |
| GEBILL | Will provide computer charges by Project ID for last month. |
| LIBBILL | Will provide library usage log by date, time, project ID and will show total usage and royalty charges for last month. |

Educare Computer Network (ECN)
Library
December, 1974

| Program Name | Real Estate Programs - |
|---|---|
| CIT | Compound Interest Tables provides 6 factors associated with compound interest tables. Output is formated to conform the "Ellwood Tables" book. |
| RATES | Rate of return calculations. Program will provide present value, internal rate of return, and adjusted rate for an arbitrary set of net reciepts and investments. |
| ELLWOOD | Provides analysis "ala Ellwood" text, ed. IB. |
| MKTCOMP | Market Comparison Program will adjust a set of comparables on the basis of a subject property. User provides selection of factors, a comparable file and a subject file. |
| MINIMOD | A basic cash flow analysis model with file input. |
| MEDIT | An edit program for MINIMOD data files. |
| AIP | Analysis of Investment Potential. An advanced cash flow analysis model with data file input. |
| AIPEDIT | An edit program for AIP data files. |
| DAP | Design Analysis Program writeup available for $10 from John Nabors, John H. Nabors & Associates, Suite 210, Empire Gardens Building, 1165 Empire Central Place, Dallas, Texas 75247. |
| BFCF | Cash flow program - summary input, one page output. |
| ELWPLOT | Produces the "Ellwood" plot of appr/depr versus time and rate of return. |
| CONVERSE | Conversational input preprocessor for (1) Minimod, (2) Preliminary land development model. |
| LDM1 | Preliminary land development model (accessed thru converse) |
| RENTBUY | Oriented toward brokers, this program will show short and long term advantages of purchase over rental. |
| MAILBOX | A program to provide intercommunication among ECN subscribers. Send prepares a message in a file. Addressee is notified of message upon signing in. |

| | |
|---|---|
| HELP | A program to provide intercommunication to ECN personnel in order to get assistance or answers to questions (self documenting) |
| USERS | Program produces a list of user numbers and user names for ECN subscribers (User numbers are required by MAILBOX). |
| PCHTAPE | Will punch a file to paper tape in a re-loadable format. Printout will be divided into 8 1/2 x 11" pages. |
| NEWS** | A Listable file (not a program itself) which provides recent news of ECN developments |
| | - Billing Information Programs - (These programs, for the most part, require little or no user input) |
| COST | Will show dollar cost of current terminal session since sign-in. |
| GECOST | Will show total computer charges for last month and current month to date (yesterday). |
| GEBILL | Will provide computer charges by Project ID for last month. |
| LIBBILL | Will provide library usage log by date, time, project ID and will show total usage and royalty charges for last month. |
| FILELIST | Will provide a list of files stored, size, date of last access and modif. |

Educare Computer Network (ECN)
Library
May, 1976

| Program Name | - Real Estate Programs - |
|---|---|
| CIT | Compound Interest Tables provides 6 factors associated with compound interest tables. Output is formated to conform the "Ellwood Tables" book. |
| RATES | Rate of return calculations. Program will provide present value, internal rate of return, and adjusted rate for an arbitrary set of net reciepts and investments. |
| ELLWOOD | Provides analysis "ala Ellwood" text, 3rd edition. |
| ELWPLOT | Produces the "Ellwood" plot of appr/depr versus time and rate of return. |
| MKTCOMP | Market Comparison Program will adjust a set of comparables on the basis of a subject property. User provides selection of factors, a comparable file and a subject file. |
| MKTSTAT | A program to reformat existing MKTCOMP comparable files for a statistical (STATSYST***) run. The program is self documenting and initiates the run for deferred or overnite processing. The user must be familiar with statistical terminology to interpret output. |
| MINIMOD | A basic cash flow analysis model with file input. |
| MEDIT | An edit program for MINIMOD data files.* |
| IMV | The IMV program is actually two programs in one. The First program will calculate the market value (market value is unknown) of a project based on either a specific after-tax yield or a specific before tax yield. The Second program is the reverse of the first type in which case the program will calculate both the after tax and before tax yield (rate of return is unknown) for a given project. |
| AIP | Analysis of Investment Potential. An advanced cash flow analysis model with data file input. |
| AIPEDIT | An edit program for AIP data files.* |
| MRCAP | This program is an advanced cash flow analysis model with data file input. Available summer 1976 this program will evaluate an income stream generated by known capital components in a fashion very much like either MINIMOD or AIP. Alternatively the program can first develop the Capital Budget in a fashion similar to IMV and there evaluat the income stream.<br><br>Regardless of which option above is selected the program can also provide individual cash flow statements for as many as 15 unique partnerships.<br><br>A detailed users manual is in production and will be available. |

| | |
|---|---|
| DAP | Design Analysis Program writeup available for $10 from John Nabors, John H. Nabors & Associates, Suite 210, Empire Gardens Building, 1165 Empire Central Place, Dallas, Texas 75247. |
| BFCF | Cash flow program - summary input, one page output. |
| CONVERSE | Conversational input preprocessor for (1) Minimod, (2) Preliminary land development model. |
| LDM1 | Preliminary land development model (accessed thru converse) |
| WRAPMTG | (In development-est. avail. July 76; on-line msg. will notify users) Program to provide calculations for wrap-around mortgage combinations. |
| RENTBUY | Oriented toward brokers, this program will show short and long term advantages of purchase over rental. |
| MAILBOX | A program to provide intercommunication among ECN subscribers. Addressee is notified of message upon signing in. Self documenting.* |
| READTAPE | A procedure to help you enter a tape file, even it contains errors which prevent use of the TAPE command. Self documenting.* |
| HELP | A program to provide intercommunication to ECN personnel in order to get assistance or answers to questions (self documenting)* |
| USERS | Program produces a list of user numbers and user names for ECN subscribers (User numbers are required by MAILBOX). |
| NEWS** | A Listable file (not a program itself) which provides recent news of ECN developments* |

- Billing Information Programs -

(These programs, for the most part, require little or no user input)

| | |
|---|---|
| COST | Will show dollar cost of current terminal session since sign-in. |
| GECOST | Will show total computer charges for last month and current month to date (yesterday). |
| GEBILL | Will provide computer charges by Project ID for last month. |
| LIBBILL | Will provide library usage log by date, time project ID and will show total usage and royalty charges for last month |
| FILELIST | Will provide a list of files stored, size, date of last access and modification. |
| CHGPASS | Program will allow user to change own password. Self documenting.* |

* No library access charge applied at this time.

REGPLOT

The dependent or plotted variable is the resale price expressed as a percentage of original price. The net income pattern is known and entered in the input as one of the independent variables. The cap rate may vary with respect to time. There is no assumption that there will always be the same relationship between net income at time of sale and selling price.

JAYPLOT

The dependent or plotted variable is the resale price and net income level at time of resale expressed as a percentage of the original price and income level. The net income pattern is not entered as a part of the input. It is assumed that the cap rate will be fixed with respect to time. In other words, there will be a constant relationship between net income at time of sale and resale price.

STARTING THE PROGRAM

The user calls up the desired program by typing OLD REGPLOT or OLD JAYPLOT. When the computer says READY, the user starts the program with the command RUN. The computer will type the title, explanation and then ask for the input with a series of questions. The input is entered in the same manner for each program. If the user specifies REGPLOT the computer will ask four questions. If the user specifies JAYPLOT the computer will omit the third question but the other questions will be identical. In order to illustrate the proper format, the sample printout for REGPLOT will serve as a model. The format for JAYPLOT is the same except for the omission of the third question.

INPUT

The user is required to specify the scale dimensions, the overall rate, the interest rate on the mortgage loan, the annual constant on the mortgage loan, the loan to value ratio, the rate of change in net income, and 5 equity yield rates to be analyzed. All input is entered by the user in response to 4 questions. Note that the accompanying sample REGPLOT printout shows 4 questions under "INPUT", namely

SCALE?
R,I,F,M?
ANNUAL RATE OF GROWTH (OR LOSS) IN NET INCOME?
EQUITY YIELD RATES B,C,D,E,F?

EDUCATE
NO. 3

# INTRODUCTORY ELLWOOD CASE #2

The Old Dog Appraisal Company has been asked to provide a value based on the income approach, specifically using the Ellwood approach, complete with an Ellwood graph of alternative yeilds and a proof, to support a real estate tax appeal. Analysis of the property has provided the following elements of information:

- Net operating income is $100,000 per year before deduction of real estate taxes
- Leases in the neighborhood center roll over every five years with an expected net increase of 15%
- The real estate tax mill rate is .03 and the equlization rate is .67 so that taxes are effectively .02 of value
- The investor wants a five year projection
- Market indicates investors expect 13% equity return

| | 1st Mortgage | 2nd Mortgage |
|---|---|---|
| Interest Rate | .105 | .12 |
| Term | 30 | |
| Debt Service Constant | | .143 |
| M (Mortgage Ratio) | .75 | |
| M$ (Mortgage Amount) | | 120,000 |
| Payment Periods/Year | 4 | 12 |

Instructions:

Step 1 - With your teminal team, log-on by dialing the telephone and establishing contact with the computer.

Step 2 - When the computer indicates ready, call for old Ellwood and follow the drill exactly as found on the opposite page. As the terminal asks questions, make all the entries indicated on the example in hand.

Step 3 - When you have completed the entire run, read back through the program to see if you can crack the code or cryptic notations:

a. For example: What is the purpose of entering a question mark (?)?
b. What is "mode"?
c. Did you enter any percentages as 9 instead of .09? Did it work? Why?
d. Does typing 0 (zero) mean the same thing as entering nothing?
e. How do you indicate the number of mortgages to the program?
f. How do you specify a mortgage as a % of valuation vs. a particular dollar amount?

Step 4 - When the first team member has finished the initial run, type HELLO. This will maintain telephone contact but will require the next team member to log-in and repeat the exercise with some variation of his own choosing. All exercises on the example run should be done at least once by various members on the team so that each has the practice of logging-in and directing a form of output.

```
U#=UCE97035,                                  (Terminal inputs are underlined)
PASSWORD
[redacted]
ID:JAG
EDUCARE COMPUTER NETWORK 09/30/80 17:16CDT


USED      1.23 UNITS
SPEED 30
READY
OLD E=LWOOD
WHAT?
OLD ELLWOOD

READY
RUN -10


ELLWOOD      17:18CDT     09/30/80

REVISED 6/17/75
```

---

```
 1 EQ YLD? ?
EQUITY YIELD RATE DESIRED
 1 EQ YLD? .13
 2 PROJ PD? 5
MORTGAGE 1 DATA
 4 MTG INTR? .105
 5 MTG PD? 30
 7 PMT PDS/YR? 4
 10 M? ?
MORTGAGE AMT AS A % OF VALUE, IF UNKNOWN PRESS RETURN
 10 M? .75
MORTGAGE 2 DATA
 14 MTG INTR? .12
 15 MTG PD?
 16 MTG CON? .143
 17 PMT PDS/YR? 12
 20 M?
 21 M$? 120000
MORTGAGE 3 DATA
 24 MTG INTR?
 52 %DEPR(-APPR)? -.15
 55 INC? 100000
 53 % INCR INCOME? 0
 58 EF.R.E.TX.R.? .02
 .0249901 = MTG 1 C
 .0111554 = MTG 2 C
 .1100936 = BASIC RATE
 .1069464 = OVERALL RATE
   935048 = VALUATION
MODE? P
```

You may enter a "?" to get a more complete description of any of these questions.

indicates that only "return" was entered

```
 MORTGAGE1  75%  701286 AT .1099   77074
 MORTGAGE2  13%  120000 AT .1430   17160
    EQUITY  12%  113762 AT *-.1137 -12935
                       R.E.TAXES   18700
          TOTAL  935048           100000 INCOME

 935048 ORIGINAL PRICE
-140257 LESS -15.% DEPRECIATION
-------
1075305 PROPERTY REVERSION, DEFERRED 5 YEARS
         701286 MORTGAGE 1
 679040   22246 LESS 5 YEAR AMORTIZATION; (3.17211E-2)
         120000 MORTGAGE 2
 101216   18784 LESS 5 YEAR AMORTIZATION; (0.156534)
-------
 295049 EQUITY REVERSION, DEFERRED 5 YEARS

PRESENT VALUE OF EQUITY INCOME AND REVERSION AT 13.%

 -45498 INCOME, -12935.8 X 3.51723
 160140 REVERSION, 295049. X 0.54276
-------
 114642 TOTAL
```

```
MODE? T
IS INCOME CONSTANT? YES
ENTER OVERALL RATE FOR ANAL.? .138396
ENTER 1 TO 4 PROJ. PDS? 2,5,8,10
ENTER 1 TO 6 EQ. YLDS? 8,10,13,15,18,21
```

```
YIELD ANALYSIS WITH
CONSTANT INCOME,   .1383960 = R
    YRS        2       5       8      10
YIELD
   .0800  -.0802  -.2153  -.3896  -.5331
   .1000  -.0716  -.2026  -.3789  -.5292
   .1300  -.0592  -.1834  -.3612  -.5207
   .1500  -.0514  -.1705  -.3481  -.5127
   .1800  -.0401  -.1509  -.3259  -.4962
   .2100  -.0294  -.1310  -.3001  -.4728
```

```
MODE? T
IS INCOME CONSTANT? NO
ENTER OVERALL RATE FOR ANAL.? .138396
ENTER 1 TO 4 PROJ. PDS? 2,5,8,10,15
ENTER 1 TO 6 EQ. YLDS? 8,10,13,15,18,21
```

YIELD ANALYSIS WITH
VARIABLE INCOME, .1383960 = R

| YRS | 2 | 5 | 8 | 10 | 15 |
|---|---|---|---|---|---|
| YIELD | | | | | |
| .0800 | -.0663 | -.1499 | -.2321 | -.2885 | -.4437 |
| .1000 | -.0591 | -.1405 | -.2240 | -.2832 | -.4543 |
| .1300 | -.0489 | -.1266 | -.2112 | -.2744 | -.4715 |
| .1500 | -.0424 | -.1173 | -.2021 | -.2676 | -.4830 |
| .1800 | -.0331 | -.1034 | -.1873 | -.2555 | -.4987 |
| .2100 | -.0243 | -.0893 | -.1709 | -.2404 | -.5094 |

```
MODE? C
#,NEWVAL? 53,.025
#,NEWVAL?
 .0249901 = MTG 1 C
 .0111554 = MTG 2 C
 .1100936 = BASIC RATE
 .1060150 = OVERALL RATE
   943263 = VALUATION
MODE? O

USED     6.80 UNITS
RUN COST

COST        17:23CDT    09/30/80

ACCRUED CHARGES SINCE SIGNIN
$  1.41 COMPUTER
   1.52 CONNECT
   0.42 CHARACTERS
$  3.35 TOTAL
EFFICIENCY =  28.0

USED      .47 UNITS
BYE
00008.87  CRU    0000.12  TCH    0003.25  KC

OFF AT 17:23CDT 09/30/80
```

Class Exercise #1 - Rates Problem 2/74

Good Deal Development Company has an opportunity to purchase land for a shopping center, sell off two 20-acre pads to major department stores, and then develop the remaining sandwich land as a total regional shopping center. Folowing the development phase which is done partly on its own money and partly on construction loan, it will be able to refinance the whole deal on the strength of its net income from leases. GD Developers will sell the project when it reaches peak value 7 1/2 years after it initially exercised the option.

While most of the action will occur through a specially created joint venture entity, the schedule of net outlays and receipts to the parent corporation (after all financing and income taxes have been paid) has been estimated for two alternative plans: one will sell the pads to the major department stores; the other plan would build and lease the facilities to the two department stores. As a result of previous Good Deals the company has made, their cost of capital is 20%.

OUTLAYS

| Date | Case #1 | | Case #2 |
|---|---|---|---|
| 1/1/71 | -5,000 | Option and Land Search | - 5,000 |
| 6/1/71 | - 15,000 | Engineering Studies | - 15,000 |
| 9/1/71 | - 600,000 | Closing - 120 acres | - 600,000 |
| 9/1/72 | - 300,000 | Working drawings, fees, etc. | - 400,000 |
| 1/1/73 | - 100,000 | Lease Commissions | - 200,000 |

RECEIPTS

| Date | Case #1 | | Case #2 |
|---|---|---|---|
| 4/30/72 | 200,000 | Sell 2-20 acre department store | 0 |
| 6/30/73 | 40,000 | Monthly for 5 years | 65,000 |
| 8/30/73 | 400,000 | Net balance on refinancing | 0 |
| 6/30/78 | 400,000 | Sale | 800,000 |

Which of the two plans offers the best of internal rate of return, compounding monthly? annually?

Which alternative is the better investment when recognizing cost of capital at 20%? 40%?

## Class Exercise #2 - Rates Problem

The S-M Development Company can purchase forty acres which can be subdivided into eighty fully improved single-family lots. These lots will sell for $6000 each net of all sales and administrative costs. Two different financing plans are available. One will provide a $200,000 blanket loan at 8% add-on interest to be advanced when development construction is complete. The other alternative financing plan will provide $240,000 for both the purchase price of the land and construction of improvements at 10% add on per annum. Both loans have installments each six months geared to lot sales closings. Opportunity cost of equity money is 12%.

Under financing option #1, the schedule of outlays and receipts is as follows:

Outlays

| | | |
|---|---|---|
| 1-30-67 | $1,000 | Option on 40 acres |
| 5-1-67 | $5,000 | Preliminary engineering and legal expense |
| 6-3-67 | $80,000 | Closing land purchase |
| 5-31-68 | $160,000 | All development costs |
| 8-1-68 | $35,000 | Loan payment, 1st of 8 payments to be made each 6 months |

Receipts

| | | |
|---|---|---|
| 6-15-68 | $200,000 | Blanket loan proceeds |
| 7-31-68 | $60,000 | Net cash receipts on lot closing, each 6 months for 4 years |

Under financing option #2, the schedule of outlays and receipts for the equity investor is as follows:

Outlays

| | | |
|---|---|---|
| 1-3-67 | $1,000 | Option on 40 acres |
| 5-1-67 | $5,000 | Preliminary engineering and legal expense |
| 8-1-68 | $42,000 | Loan payment, 1st of 8 payments to be made each 6 months on $240,000 credit line for land and construction |

Receipts

| | | |
|---|---|---|
| 7-31-68 | $60,000 | Net cash receipts on lot closing, each 6 months for 6 years |

EDUCARE p.o. box 631 / madison, wisconsin 53701

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AIP PROGAM


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EDUCARE p.o. box 631 / madison, wisconsin 53701

# INCOME PROPERTY ANALYSIS

EDUCARE has made available a versatile computer program which can be used to provide a thorough and accurate financial analysis of any income producing property.

This program is useful to:

- Appraisers
- Real Estate Brokers
- Real Estate Developers
- Estate Planners
- Property Managers
- Financial Advisors
- Mortgage Companies
- Savings & Loans Companies
- Banks
- Investors
- Accounting Firms
- Market Research Firms

The EDUCARE AIP Income Property Analysis program has easy-to-use options which allow the customer to select the information that he needs for a specific purpose. These options are:

1) CASH FLOW ANALYSIS
Projections of fixed or variable incomes, expenses, cash flows and returns on equity.

2) LOAN SUMMARY
Annual loan status analysis. Provides Beginning Balance, Principal and Interest amounts paid and annual payment amounts for various loan types. Allows you to begin the Loan Summary at any time in the loan life.

3) DEPRECIATION SUMMARY
Annual depreciation analysis. Provides the Straight Line Depreciation amount, accelerated depreciation amount and the excess depreciation amount for each depreciable item for each year.

4) LOAN AMORTIZATION SCHEDULE
Amortization schedules. Provides Loan Balance, Principal and Interest payments for any payment frequency that you desire. Any type of loan may be amortized, including FHA insured, interest-only, etc.

5) CASH FLOW AND FINANCIAL ANALYSIS
Provides an abbreviated version of option 1 and also provides an annual equity position and tax analysis. The tax analysis assumes a sale at the end of each year and computes the tax on capital gains and ordinary income.

The EDUCARE AIP Income Property Analysis offers the following advantages:

* The printout is easily readable and designed for customer or management presentations without having to retype in a more convenient format.

* The 1969 Tax Reform Act changes are accurately computed. The program does not average or take other shortcuts which can result in sizeable inaccuracies in the tax computations.

* The customer has a choice as to the type of information he receives. You pay only for what you need.

* The printout generally follows NIREB Form B for the presentation of information.

* The Users Manual is designed for the customer's convenience. It does not assume that you are already a time-sharing specialist.

* Custom modifications can be made easily and inexpensively.

# M K T C O M P

Market Comparison Program
September 1972

## INTRODUCTION

The market comparison approach to real estate evaluation permits the appraiser to combine his insight, experience, and judgment with a semi-automatic, mathematical technique in order to arrive at market value from a set of comparable sales. The purpose of MKTCOMP is to implement this mathematical procedure without placing any constraints upon the manner in which the appraiser wishes to express his judgment.

There are five functional steps to processing a market comparison appraisal of a single subject or of several subject properties in a batch. The user must begin by preparing three separate data files. First, the user would create a comparable sale file as the data set from which the market comparison value of a subject property is to be determined and this file becomes a permanent resource with appropriate updating. It is designed to adapt to the factor file which allows the user to express the basis or items on which a subset of comparables are selected and adjusted for comparison. Third, there is a subject file which provides for the identification and description of one or more subject property. The fourth step in the process is specification of decision Rule 5 by which a subset of comparables will be selected from all the properties in the comparable file. Finally, the user can control the output of MKTCOMP by selecting eight different "report" components. These five elements of the system are described below with examples and demonstrations of flexibility and options for the user.

## THE FACTOR FILE

It is best to begin design of your MKTCOMP system by defining a factor file, this establishes items for which you will wish to collect information to be included in the comparable file. The comparable file describes each property sale according to attributes which might play a part in the appraisers adjustments. The factor file has the following structure, in this case named FAC1FAM (abbreviation for "factors for one family residences; you may use up to 8 characters to name files of factors for different types of buildings, different towns, etc.

```
FAC1FAM                    02/15                20:15CST

100 PRICE, 0, 1
110 SALE DATE, 2, .04
120 LOCATION, 1, 500
130 ADJ. AGE,2, -.02
140 CONST QUAL, 2, .05
150 CURB APPL, 2, .05
160 LOT SQFT, 3, 11
170 BLDG SQFT, 1, 11
180 #PD STALLS, 1, 1200
190 MISC., 1, 1
200 PR/LSQFT, 5, 0
```

There is a numbered line for each factor or item on which adjustments for comparison may be made. Price is always in the first line and the user may list up to 25 different factors. (e.g. increasing the line number by 10 to a maximum of 340 as the highest line number).

Each of these lines contains 3 entries - (1) the name of the factor, (2) a type code, and (3) the rate at which adjustments for comparison are to be made.

PRICE is always the first factor (line 100 and its type code is unique and always in "0". The third entry for the price line is always "1". (Remember this file is structuring information about a comparable sale and about adjustments to be made when compared to a subject property. There will be another file which gives the actual price, sales date, and other information about each comparable).

Factor Name

The factor name may have as many letters and spaces as you wish not to exceed 10 spaces and must be followed by a comma. Since these names can be included in the report output they should be self evident or written out in full. The order of these factors will determine the order of data items which describe an actual comparable sale property so the user should follow a logical sequence which is useful and convenient when coding information. For example, following sales date, there might be 3 components to a location, such as the postal zone number, a neighborhood code number related to the users map of his market area, and a street number with a numeric code for each street in the neighborhood or community. Each of these would require one line and a factor name.

Type Code

A type code follows the name of each factor and there are presently 5 code types.

Type Code 1 designates factors for which the adjustment to be made is specified in number of dollars. (In the example above each additional parking stall in a garage is assumed to be worth an additional $1200 and each additional square foot of building is assumed to be worth $11)

Type Code 2 designates factors which compare on a proportion or percentage of the sales price. (In the example adjusted age provide for an adjustment for the difference between the age of a comparable and a subject property is associated with a 2% decline in price, thus a -.02). Similarly each increment in a construction quality code number describing a comparable would be associated with a 3% adjustment in price. The construction quality code number assigned to each comparable by the user is optional and subjective.

Type Code 3 adjustments to be made using data associated with each comparable. In order to provide this capability an additional variable or factor must be added to the comparable file. The third entry in the factor is then the number of the position of the variable which contains the variable to be used at the rate of adjustment. In the example, variable 11 indicated that either the $ amount in the

comparable file in position 11 will be used if given or the adjustment will be used from line 200 as the price per square foot of lot.

Type Code 4 operates in the same way as #3 with the exception being that the adjustment is made on the basis of percentage of price as in a Type Code 2.

Type Code 5 is the coding required for an entry such as line 200 which is referred to by a Code 3 or Code 4 factor. The Type Code 5 designates factors which do not play a role in the adjustment process unless referred to by another factor with a type code of 3 or 5. A factor line with a Type Code 5 must also contain a third entry to conform to the format of 3 entries per line - specifically an "0" as in line 200 above.

Not all factors must be used for any particular set of comparables as there is a great variety of selection rules with which the basic data bank and adjustment factor file can be focused selectively for a particular subject property or group of properties and these will be discussed under SELECTION RULES. A worksheet is provided for developing a factor file prior to data entry on the terminal.

THE COMPARABLE FILE

The comparable file is the data bank which gives sales prices and property attributes for each transaction validated by the user as a market sale. This file contains nine ficticious comparables and each contains data items which correspond in sequence with those described in the factor file. A sample file called COMPIFAM - East Madison is illustrated below:

```
COMPIFAM                02/15                20:15CST
100 111 1ST ST
110 31000, 71.00,3, 5, 5, 3, 11160, 1500, 2, 0, .40
120 222 2ND ST
130 24000, 71.25, 3, 8, 1, 4, 15000, 1150, 0, 0, .40
140 333 3RD ST
150 26000, 71.75,4, 6, 3, 2, 10060, 1200, 1, 0, .60
160 444 4TH ST
170 35000, 72.00, 5, 3, 4, 3, 8800, 1800, 2, -750, .50
180 555 5TH ST
190 29000, 71.50, 3, 8, 3, 3, 17640, 1300, 1, 0, .55
200 666 6TH ST
210 26000, 71.00, 2, 5, 3, 2, 14380, 1300, 1, 0, .50
220 777 7TH ST
230 23000, 69.50, 4, 5, 2, 2, 14480, 110, 0, 0, .50
240 888 8TH ST
250 32000, 70.75, 2, 2, 4, 4, 10340, 1600, 0, 0, .40
260 999 9TH ST
270 26000, 71.75, 4, 6, 2, 3, 20820, 1300, 1, 0, .60
```

**Identifier Line**
The first line of entry for each comparable must be an identifier. This can be any series of alphabetic and numeric characters and the address and street name is only a suggestion (since the comma character is used as punctuation, a comma is not permitted as part of the identifier unless the entire identifier is also enclosed in quotation marks, the upper case of the digit 2 on the basic teletype.

**Factor Quantities**
The second line of entry for each comparable will be the numeric variables which describe the transaction and property.

(1) The first of these numeric variables must be price; subsequent variables provide values or quantities for the factors named in the factor file. Qualitative items such as curb appeal or location or construction quality might be coded 1 - 3 or 1 - 5 on criteria selected by the user.

(2) In the sample shown above the second factor is the sale data measured in years with months as decimals. The quantity 61.75 is associated with September of 1971.

(3) In the sample shown above the fourth comparable shows -750 as the entry for miscellaneous (MISC). This deduction of $750 (relating to a Type Code 1, a $1 adjustment x 750) from this property was one determined by the user as being associated with some condition relative to the comparable sales price (such as terms or non-market bargaining power) not specifically described in the factor file. It might have been a wet basement discovered after the sale as chronic to 444 Fourth Street, which shows the flexibility of data management sensitive to the experience of the appraiser using MKTCOMP.

(4) It is not necessary that the identifier and numeric data appear on separate lines. They may appear on one line provided that the identifier is followed by a comma. The user will probably find that it is far easier to check the validity of his data after it is prepared if some relatively uniform format is followed for the entire comparable file. Any departure from the required sequence of values, in this case one identifier followed by eleven numeric entries, will produce file reading problems.

(5) A worksheet is provided for developing a comparable file prior to data entry at the terminal.

**THE SUBJECT FILE**

The subject file provides a description of the property or multiple properties to be appraised.

```
SUBJ                    02/15                20:17CST

100 1234 E. MAIN ST
110 00000, 72.50, 4, 6, 3, 4, 10000, 1350, 1, 0, 55
```

The format of this file example above is identical to the format of the comparable file. It must contain an identifier, a price entry of "zero", and sufficient additional variables to complete the list specifiec in the factor file. In this case eleven numeric entries appear in the line following the identifier and even though the price is not known, the entry must NOT be omitted, thus the "000".

Multiple subjects may be processed by including them in sequence in the same subject file. They must each conform to the required format and each will be processed in turn using the market comparison program.

Sample output is shown on the following pages. In running the program the user is required to enter the names for the factor, comparable, and subject files.

REPORT SECTION CHOICES

The user may control execution of the program by entering the report "sections" desired as part of the output. In addition to the list of eight report sections, if no report sections are selected a brief adjustment summary will be shown using ALL comparables in the comparable file. Report sections also identify optional commands to create a selective subset of comparables from the total comparable file. When operating the model the computer will ask for the report section selected as follows and the user can supply a number or ask for a listing of options:

```
SPECIFY REPORT SECTIONS SELECTED (0 FOR LIST)
? 0
LIST OF REPORT SECTIONS
1-LIST OF FACTORS READ
2-LIST OF COMPS READ (NAMES ONLY)
  (USE 1, 2 AND 5 TO LOCATE FILE READ PROBLEMS)
3-ADJUSTMENTS MADE FOR COMPS
4-ADJUST. SUMMARY (ALWAYS PRINTED)
5-LIST OF VALUES READ FOR EACH COMP
6-ENTER SELECTION RULES
7-READ NEXT SUBJ
8-READ ALL SUBJ
9-CHANGE FACTOR ENTRY
```

1 - A list of the factors by name only

2 - a list of the comparable identifiers

3 - a detailed presentation of the adjustments made for each comparable

4 - a summary report showing the average and standard deviation of the price before and after adjustment together with the averages and standard deviations of the adjustments made for each of the factors.

5 - a list of each of the numeric items read from the comparable file. This list will be printed following the associated comparable identifier. (This output may be very lengthy for larg COMP files).

6 - an optional selection operation with which to refine and reduce the number of comparables to focus on the problem. These rules are discussed in the following sections.

7 - a command to the system to move on to the next property listed on the subject file when multiple properties are being appraised. With this option it will be possible to change the selection rules for each subject property to be appraised in contrast to:

8 - a command to proceed with the market comparison valuation of all the remaining properties in the subject file according to the selection rules finally established for the first subject property, thus permitting batch processing of a group of properties on a consistent set of rules for the selection of comparables as might be desirable for tax assessment valuation.

9 - a command to allow the user to change the type or rate of factors currently being used.

The way in which the market comparison program operates depends upon the sequence of report section selections and selection rules and this relationship is shown in the flow chart at the end of this description.

SELECTION RULES

The market comparison approach is really the application of set theory and the total comparable file is the total set. The appraiser searches the file to create progressively smaller subsets that are more and more comparable to the subject property by creating smaller and smaller divisions with selection rules to define a subset. For example, in appraisal practice the appraiser typically defines the neighborhood in which he is seeking comparable sales, perhaps certain streets, then a structure type such as one story ranch, than a price range, then a number of rooms, a lot size, etc. If he creates too many specifications none of the sales data may qualify or only one which may not represent competitive market choices consistent with the spirit of the principle of substitution. In that case he removes one or more requirements until he has five or more sales and then begins a process of adjusting prices for the differences between the features of the subject property and those of the remaining comparables. This is the process provided for by the selection rules feature of MKTCOMP. The user may create a subset of comparables by screening and searching the comparable file with a sequence of up to 10 selection rules. This search and adjustment process may be applied repeatedly by reviewing the adjustment summary and deciding if one has too many or too few comparables or when one has reduced the standard of the average to an acceptable level. Selection rules may be added, deleted, or changed by control from the terminal.

The format for entering selection rules is as follows:

(RULE#),(TYPE),(FACTOR),(VAL1),(VAL2), ETC.

The rule number must be a number between 1 and 10. If a previous selection rule is to be changed that change is made by starting a new line and reentering another rule with the same rule number.

The rule type is either 0, 1 or 2. Rule type 0 is used to eliminate a previously entered rule. A Type 1 rule specifies a range within which comparable quantities would qualify for selection. A Type 2 selection rule provides for specific values which must match entries in the comparable file.

The factor to be entered is the name of the factor in the factor file. For a Type 1 selection rule, two values follow the factor name which are the lower and upper limit for selection. Only comparables which have factor values falling within this range will be used in the adjustment process. For Type 2 selection rules at least one of the values following the factor name must match the factor value or the comparable to be selected. Terminate entries by pressing "Return".

## FACTOR CHANGES

The user may change the current factors by entering:

(FACTOR),(TYPE),(RATE)

The factor name must match a previous factor, the new type and rate will apply for subsequent adjustments. (Note that any factor may be "eliminated" by changing it to Type 5). The original named factor file is unchanged. Terminate entries by pressing "Return".

## A SAMPLE RUN

The process of using the files above and controlling the program using report sections and selection rules is best illustrated by the following facsimile terminal output based on some simple data files.

Market Comparison Program
-Enhancements-
April 1973

## HIGHLIGHTS OF CHANGES

A number of important changes have been made to the Market Comparison Program MKTCOMP. These changes are in the nature of extensions and do not effect the previous operation of the program in any way. The most significant new feature is that the program will select from a large set of comparables, a "best set" based on an index of comparability calculated within the program. This feature of the program isn't intended to replace a careful selection of comparables and doesn't eliminate the need for entering selection rules so that a proper subset of the comparable file is assessed by the program. It does provide the user with the capability of locating from among a larger set of selected comparables, those which require the least adjustment in order to come up with an adjusted price. This method is particularly useful in dealing with data bases which contain many comparables.

The program has also been extended to allow the user to specify a T-ratio limit other than 2 which has been the only value permitted to date. This will allow the users to calculate an average of only those comparables which fall into a very narrow range. Two additional alternatives are provided for the presentation of individual comparables after selection. In addition to providing a list of comparables which shows each individual adjustment to that comparable in reaching the average, an option is offered whereby only the comparable identifier, the original price, and the adjusted price are printed. A further abbreviation is offered whereby only the identifiers are printed. The program also has been expended to provide an optional 1 line printout indicating the cost of the calculations made since the start of the program. Some of the new features provided, specifically those associated with calculating a "best set" of comparables involved slightly more costly computer operations than in the past.

## DESCRIPTION OF NEW PROGRAM FUNCTIONS

The control of the program was previously exercised through the entry of numeric "report sections" since that title is somewhat misleading the term "report section" has in all cases been changed to "program function". This more clearly identifies the nature of the entry to be made by the user. The list below is a complete list of program functions available within the extended MKTCOMP program. New options 10-14 are further described below.

LIST OF PROGRAM FUNCTIONS

1-LIST OF FACTORS READ
2-LIST OF COMPS READ (NAMES ONLY)
(USE 1,2 & 5 TO LOCATE FILE READ PROBLEMS)
3-ADJUSTMENTS MADE FOR COMPS
4-ADJUSTMENT SUMMARY
5-LIST OF VALUES READ FOR EACH COMP
6-ENTER SELECTION RULES
7-READ NEXT SUBJ
8-READ ALL SUBJ
9-CHANGE FACTORS
10-ABBREVIATED ADJUST. BY COMP.(IF 3 ALSO SELECTED)
11-LIST SELECTED COMP ID'S
12-ENTER NEW T-RATIO LIMIT
13-ENTER MAX NUM OF COMPS
14-PRINT COST INFO

## 10-ABBREVIATED ADJUSTMENTS BY COMPARABLE

If function 3 is selected a complete list of all adjustments for each selected comparable is presented. In order to eliminate the printout of the individual adjustments and thereby reduce the volume of output fucntion 10 can be selected in addition to function 3 and the printout of adjustments by comparable will be abbreviated to include only the comparable identifier, the original price, the adjusted price, the T-ratio and the comparability index (explained below).

## 11-SELECTED COMP ID'S

If program function 11 is specified, the list of all selected comparable identifiers will be printed.

## 12-ENTER NEW T-RATIO LIMIT

If program function 12 is selected the user will be asked to enter a new limit for the T-ratio. Unless this program function is used 2 will be used as the T-ratio limit. After the selection of comparables, an average adjusted price is calculated together with the standard deviation of the prices about that average. The adjusted prices are then re-examined and each of them which is more than 2 standard deviations away from the previous average is eliminated. This limit of 2 can now be changed to some other value at the user's option. All adjusted prices which exceed the limit are then again averaged and this second average is then printed in the adjustment summary.

## 13-ENTER MAXIMUM NUMBER OF COMPARABLES

This program function provides for the automatic selection of comparables based on a comparability index. The user is asked to enter the maximum number of comparables that he wishes to examine. This can be any value smaller than the number of comparables in the set but greater than 2. If for example the user should enter the number 6 then, if after the selection rules were applied, there remained more than 6 comparables only the best 6 of the remaining selected comparables would be used in the remainder of the calculation. This program function of course depends quite heavly on the definition of "best" or the index of comparability. The underlying assumption that has been made is that the "quality" of a comparable is based, in large measure, on the amount of adjustment necessary to change the original price to an adjusted price. Those comparables which require extensive adjustment are, by implication "poorer" comparables, than those which require fewer dollar adjustments in comparison with a subject property. The index of comparability calculated is portional to the amount of adjustment necessary and those comparables with the smallest index of comparability are considered "best". Specifically, the index of comparability is closely associated with the standard deviation of the adjustments and is the square root of the average of the squares of each of the adjustments made to a particular comparable. The more adjustments that are necessary and in particular the larger these adjustments the larger the index and the less likely that that particular comparable will be selected as one of the best. The comparability index is defined below in algebraic terms.

## 14-PRINT COST INFO

Program function 14, when selected, will cause a single line print-out prior to the adjustment summary which indicates the dollar value of computer usage since the beginning of the MKTCOMP program.

## AN EXAMPLE

The operation of the MKTCOMP program can best be described and understood by the use of an example. A sample run using factor, comparable and subject files defined in the former write up is shown on the following pages.

```
OLD MKTCOMP

READY
RUN


MKTCOMP      11:12CDT     05/28/

SPECIFY  FACTOR,COMPERABLE,SUBJECT  FILENAMES
? FAC2,COMP2,SUBJ2
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 0
LIST OF PROGRAM FUNCTIONS
1-LIST OF FACTORS READ
2-LIST OF COMPS READ (NAMES ONLY)
  (USE 1,2 & 5 TO LOCATE FILE READ PROBLEMS)
3-ADJUSTMENTS MADE FOR COMPS
4-ADJUSTMENT SUMMARY
5-LIST OF VALUES READ FOR EACH COMP
6-ENTER SELECTION RULES
7-READ NEXT SUBJ
8-READ ALL SUBJ
9-CHANGE FACTORS
10-ABBREVIATED ADJUST. BY COMP.(IF 3 ALSO SELECTED)
11-LIST SELECTED COMP ID'S
12-ENTER NEW T-RATIO LIMIT
13-ENTER MAX NUM OF COMPS
14-PRINT COST INFO
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
?
```

*On-line demo files are requested*

```
ADJUSTMENT SUMMARY
                          STD     SUBJECT.
  FACTOR        AVE       DEV   P101
     PRICE    38526     16213          .00
ADJUSTED
     PRICE    25716      6624   99 COMPARABLES
     PRICE    24693      4932   94 COMPARABLES BETWEEN 14030.9 AND 36549.2

SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 14,6,4


SELECTION RULES
NEW RULES,  FORMAT:
(RULE#),(TYPE),(FACTOR),(VAL1),(VAL2), ETC
? 1,2,NBR,3
? 2,1,PRICE,20000,30000
?
```

*3 Bedroom properties between $20,000 and $30,000 are selected*

```
ADJUSTMENT SUMMARY
                          STD     SUBJECT
  FACTOR        AVE       DEV   P101
     PRICE    23674      2603          .00
              ADJUSTMENTS
      SQFT    -2475      3008     1490.00
      GNDA      575       559     1240.00
      QUAL     -708      1144        2.00
      VIEW      400      1264         .00
       RAV     -225       711         .00
ADJUSTED
     PRICE    21240      2666   10 COMPARABLES
     PRICE    21872      1875   9 COMPARABLES BETWEEN 19803 AND 24975
```

*Result of cost (14) request*

```
 3.10783 UNITS   $ 1.02558
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 14,13,3,4
ENTER MAX # OF COMPS? 5
 10 COMPS SELECTED BY RULES
'BEST' 5 USED
```

*Program function 13 allows the limit of 5 comps to be entered. Message indicates further selection*

```
ADJUSTMENTS BY COMPARABLE
  COMP ID:       P24      P93      P66      P97      P89
     PRICE     20935    23150    23307    21565    25351
      SQFT      -330      880     1870     -330    -2860
      GNDA      1053      944     -648      864      216
      QUAL         0        0        0    -2156        0
      VIEW         0        0        0        0        0
       RAV         0        0        0        0        0
ADJUSTED
     PRICE     21658    24975    24529    19942    22707
   T RATIO      -.53     1.07      .85    -1.36     -.03
   C INDEX       450      527      807      957     1170
```

*Comps printed in order of C-index. Best 5 of 10 selected by rules are printed*

```
ADJUSTMENT SUMMARY
                          STD     SUBJECT
  FACTOR        AVE       DEV   P101
     PRICE    22861      1722          .00
              ADJUSTMENTS
      SQFT     -154      1771     1490.00
      GNDA      486       713     1240.00
      QUAL     -431       964        2.00
      VIEW        0         0         .00
       RAV        0         0         .00
ADJUSTED
     PRICE    22762      2073   5 COMPARABLES
     PRICE    22762      2073   5 COMPARABLES BETWEEN 19942.5 AND 24975
```

```
 3.82823 UNITS  $ 1.26332
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 14,6,3


SELECTION RULES
1, 2, NBR, 3
2, 1, PRICE, 20000, 30000
NEW RULES,  FORMAT:
(RULE#),(TYPE),(FACTOR),(VAL1),(VAL2), ETC
? 1,0
? 2,1,PRICE,15000,30000
?
 32 COMPS SELECTED BY RULES
'BEST' 5 USED
```

*Selection bedrooms (rule 1) eliminated and price range is increased*

```
ADJUSTMENTS BY COMPARABLE
  COMP ID:      P06      P24      P93      P80      P08
     PRICE    23818    20935    23150    21228    19470
      SQFT      220     -330      880     -220     -880
      GNDA      378     1053      944     1701     1512
      QUAL        0        0        0        0        0
      VIEW        0        0        0        0        0
       RAV        0        0        0        0        0
ADJUSTED
     PRICE    24416    21658    24975    22709    20102
   T RATIO      .82     -.56     1.10     -.03    -1.34
   C INDEX      178      450      527      700      714
```

*Note that P06 is now the 'best' of the 32 originally selected. Also note the similarity of characteristics of P06 and subject; this is indicated by the small adjustments made*

```
ADJUSTMENT SUMMARY
                        STD     SUBJECT
  FACTOR       AVE      DEV   P101
     PRICE    21720     1758          .00
ADJUSTED
     PRICE    22772     1995   5 COMPARABLES
     PRICE    22772     1995   5 COMPARABLES BETWEEN 20102 AND 24975


 4.89381 UNITS  $ 1.61496
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 14,6,3
```

```
SELECTION RULES
2, 1, PRICE, 15000, 30000
NEW RULES,  FORMAT:
(RULE#),(TYPE),(FACTOR),(VAL1),(VAL2), ETC
? 2,0
?
 99 COMPS SELECTED BY RULES
'BEST' 5 USED
```

All selection rules now eliminated

Since the same set of comps remain 'best' output was terminated with break key

```
ADJUSTMENTS BY COMPARABLE
  COMP ID:      P06      P24      P93      P80      P08
     PRICE    23818    20935    23150    21228    19470
      SQFT      220     -330       8SPECIFY PROGRAM FUNCTIONS SELECTED (O F
R LIST)
                                    0
? STOP
PROGRAM HALTED
```

Entering 'STOP' will terminate program.

```
OLD STATSYST***

READY
CREATE RFILE,,

READY
RUN
```

THE FOLLOWING IS AN EXAMPLE OF THE USE OF MULTIPLE REGRESSION TO CREATE A REASONABLE FACTOR FILE

A file must be created, or available for use by STATSYST

```
STATSYST     14:46CDT     05/28/

VERSION 19 FEB 73-LIST STATINFO*** FOR UPDATES

ENTER NAME OF RESTART FILE?RFILE
```

Comperable file is read into STATSYST. Note that prop ID must be included

```
READY
?READ(PROPID,PRICE,NBR,SQFT,GNDA,QUAL,VIEW,RAV)FROM COMP2 BY CASE
```

All data is now saved (in RFILE) for later restart using RESTORE command if necessary

```
READY
?DUMP
```

Dependent followed by 6 indep. var. named

```
READY
?RUN MUL-CORRELATION(PRICE,NBR,SQFT,GNDA,QUAL,VIEW,RAV)6,3,0,0,1

VERSION 31 JAN 72 STEPWISE REGRESSION
```

PROBLEM: 1

| VARIABLE | MEAN | STD. DEVIATION |
|---|---|---|
| NBR | 3.474747E+00 | 1.380206E+00 |
| SQFT | 2.019394E+03 | 4.910398E+02 |
| GNDA | 1.529596E+03 | 6.997374E+02 |
| QUAL | 3.131313E+00 | 8.648046E-01 |
| VIEW | 1.414141E-01 | 4.950799E-01 |
| RAV | 1.919192E-01 | 4.443929E-01 |
| PRICE | 3.852605E+04 | 1.621317E+04 |

CORRELATION MATRIX:

VARIABLE:

| | | | | | |
|---|---|---|---|---|---|
| NBR | 1.0000000 | 0.3116391 | -0.1669475 | 0.0754724 | -0.0245871 |
| | 0.0828466 | 0.2920372 | | | |
| SQFT | 0.3116391 | 1.0000000 | 0.4997514 | 0.4231032 | 0.1951162 |
| | 0.2871876 | 0.8059244 | | | |
| GNDA | -0.1669475 | 0.4997514 | 1.0000000 | 0.3386867 | 0.1250571 |
| | 0.1908067 | 0.5855536 | | | |
| QUAL | 0.0754724 | 0.4231032 | 0.3386867 | 1.0000000 | 0.3375153 |
| | 0.4116821 | 0.6113030 | | | |
| VIEW | -0.0245871 | 0.1951162 | 0.1250571 | 0.3375153 | 1.0000000 |
| | 0.2464234 | 0.4516027 | | | |
| RAV | 0.0828466 | 0.2871876 | 0.1909067 | 0.4116821 | 0.2464234 |
| | 1.0000000 | 0.4957996 | | | |
| PRICE | 0.2920372 | 0.8059244 | 0.5855536 | 0.6113030 | 0.4516027 |
| | 0.4957996 | 1.0000000 | | | |

| | | | | |
|---|---|---|---|---|
| STEP 1 | VARIABLE SQFT | ENTERED : | R= | 8.059243E-01 |
| STEP 2 | VARIABLE VIEW | ENTERED : | R= | 8.599926E-01 |
| STEP 3 | VARIABLE QUAL | ENTERED : | R= | 8.880696E-01 |
| STEP 4 | VARIABLE GNDA | ENTERED : | R= | 9.038585E-01 |
| STEP 5 | VARIABLE RAV | ENTERED : | R= | 9.180547E-01 |
| STEP 6 | VARIABLE NBR | ENTERED : | R= | 9.307895E-01 |

| VARIABLE | COEFFICIENT | STD. ERROR | PARTIAL F |
|---|---|---|---|
| NBR | 2.071123E+03 | 5.144213E+02 | 1.620966E+01 |
| SQFT | 1.483982E+01 | 1.721933E+00 | 7.427194E+01 |
| GNDA | 6.300684E+00 | 1.122140E+00 | 3.152692E+01 |
| QUAL | 3.080995E+03 | 8.714780E+02 | 1.249882E+01 |
| VIEW | 7.721535E+03 | 1.343618E+03 | 3.302596E+01 |
| RAV | 6.364493E+03 | 1.551798E+03 | 1.682121E+01 |
| CONSTANT | -2.023648E+04 | 6.117028E+03 | (RESIDUAL) |

86.64 % VARIATION EXPLAINED: 6 STEPS

*Coefficients or Rates to be used in factor file*

*Note that E+03 means move dec. pt. 3 places right*

```
NEW FAC2RGR

READY
TAPE
READY


100 PRICE,0,1
110 NBR,1,2071
120 SQFT,1,14.84
130 GNDA, 1, 6.3
140 QUAL, 1, 3081
150 VIEW, 1, 7725
160 RAV, 1, 6364
SAVE

READY
OLD MKTCOMP

READY
RUN


MKTCOMP      15:03CDT     05/28/

SPECIFY FACTOR,COMPERABLE,SUBJECT  FILENAMES
? FAC2RGR,COMP2,SUBJ2
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? 14,13,3,4
ENTER MAX # OF COMPS? 5
 99 COMPS SELECTED BY RULES
'BEST' 5 USED
```

*Factor file named FAC2RGR previously punched on tape uses regression co-efficients and used in place of FAC2 below*

*Note some similarity of comps in 'best' 5*

```
ADJUSTMENTS BY COMPARABLE
  COMP ID:      P06     P24     P93     P66     P59
     PRICE    23818   20935   23150   23307   19645
       NBR    -2071       0       0       0       0
      SQFT      296    -445    1187    2522    2226
      GNDA      882    2457    2205   -1512    2142
      QUAL        0       0       0       0       0
      VIEW        0       0       0       0       0
       RAV        0       0       0       0       0
ADJUSTED
     PRICE    22925   22946   26542   24317   24013
   T RATIO     -.83    -.81    1.62     .11    -.09
   C INDEX      926    1019    1022    1200    1261
```

```
ADJUSTMENT SUMMARY
                          STD     SUBJECT
  FACTOR       AVE        DEV   P101
     PRICE    22171      1793          .00
              ADJUSTMENTS
       NBR     -414       926         3.00
      SQFT     1157      1256      1490.00
      GNDA     1234      1652      1240.00
      QUAL        0         0         2.00
      VIEW        0         0          .00
       RAV        0         0          .00
ADJUSTED
     PRICE    24149      1476   5 COMPARABLES
     PRICE    24149      1476   5 COMPARABLES BETWEEN 22925.8 AND 26542.2
```

*Note slightly higher indicated value and lower STD DEV from prev run*

```
 4.55992 UNITS  $ 1.50477
SPECIFY PROGRAM FUNCTIONS SELECTED (0 FOR LIST)
? STOP
PROGRAM HALTED

USED    4.59 UNITS
OLD COST

READY
RUN


COST        15:06CDT    05/28/


ACCRUED CHARGES SINCE SIGNIN
$  1.61 COMPUTER
$  0.59 CONNECT
$  0.45 CHARACTERS
$  2.65 TOTAL( 93.24)

USED     .10 UNITS
BYE
0004.90  CRU    0000.09  TCH    0001.96  KC

OFF AT 15:07CDT 05/28/
```

*Cost of last MKTCOMP run only*

DESIGN ANALYSIS PROGRAM

# NEWSLETTER

February, 1975

Several program modifications have been made recently to the Design Analysis Program "DAP." These modifications will not effect the operation of the program as described in the USER MANUAL.

## New Cash Flow Data File Entries

260 _____ Number of Units in Project (1-9999)
270 _____ Number of Land Lease Expenses (0-5)
(271) _____,_____,_____,_____,_____
Land Lease Expenses (0, $, or $ per unit)
(280) _____ Land Cost Variable (omit, 0 or $)

In effect all of the above entries are optional--you may enter a value as instructed or leave entirely out of the data file and allow the default options to apply.

Default Values if 260-280 are not used:
260 1
270 0
(280) (Same value entered on line 250)

## Analysis on a Per Unit Basis

The entry of any value greater than 1 on line 260 will result in the nomenclature of the Cash Flow Analysis to be presented in dollars per unit and in some cases, in total dollars for the project.

When the number of units is equal to 1, all instructions in the USER MANUAL apply. When the number of units is greater than 1, the following variables will be input on an annual $/unit basis:

Line 201 Rental Rates**
Line 204 Annual Parking Income
Line 205 Other Income
Line 207 Operating Expenses**
Line 270 Land Lease Expenses

**Note that the entries for rental income and operating expenses can be $/unit/year if more than $50 is entered or $/sq ft/year if $50 or less is entered.

On the Pro Forma Cash Flow Table, the rental rates, expense rates, and land lease rates are output on a per unit basis along with the resulting Annual Cash Flows. On the Sensitivity Table, the appropriate sensitivity variables are shown in dollars per unit. On the Cash Flow Pro Forma Using Parameter Norms table, the values are all output on a Project basis and on a Per Unit basis.

## Land Lease Expense

Up to five land lease values can be input to the cash flow portion of the program. If the land is to be purchased, no land lease entries will be entered. Lines 270 and 271 are used to enter the lease amounts in annual dollars for the building or per unit if line 260 is greater than 1. The land lease is the seventh type of parameter (variable) that can be output using lines 215-224.

## Land Cost Variable

A value may be entered on line 280 to display the effect on cash flow of a given decrease in the cost of the land for the building. Generally this value is 10% to 20% of the estimated land cost. If no value is entered, the value on line 250 is used.

## Sample Output

In order to illustrate the per unit output, the following data lines were added to the data file CASHX that was used in the USER MANUAL as an example:

```
260  100
270  0
```

The resulting Sensitivity Table and Cash Flow Pro Forma for the 150,000 square foot building are attached

## Newsletters

Keep these Newsletters in the front of your USER MANUAL for handy reference of updates and helpful hints.

PROGRAM SUMMARY
DESIGN ANALYSIS PROGRAM

The Design Analysis Program is basically a method of determining a number of possible annual cash flows from a proposed income property based upon up to five different values of six different cash flow parameters:

1 = Rental Rates e.g. $6.50/sq ft/yr
2 = Vacancy Rates e.g. 10% of potential rental revenue
3 = Expense Rates e.g. $2.50/sq ft/yr
4 = Financing Conditions e.g. 9½% 30 yrs paid monthly
5 = Building Efficiency e.g. 85% of gross space
6 = Loan Ratios e.g. 90% of construction and land costs.

The basic format used is that of a planning format of an annual cash flow proforma: Rental Revenue adjusted for a Vacancy Allowance less Operating Expenses and Debt Service, yielding Annual Cash Flow.

This basic format reflects a single set of conditions that result in a single cash flow quantity. Actual practice reveals that parameter 1, 2, and 3 will constantly vary between years and within the year. Parameters 4 and 6 will be negotiated prior to construction by the developer, while parameter 5 will be established in the design phase and adjusted somewhat with the initial leasing strategy.

During the planning phase of an income property, best estimates of the values of these six parameters are utilized to prepare a cash flow pro forma. The DESIGN ANALYSIS PROGRAM allows the financial analyst to vary each parameter throughout a range of values to study the effect upon the pro forma annual cash flow. With five different values for six parameters, there are exactly 361 different annual cash flows.

The program allows the analyst to produce a 5 by 5 table of annual cash flows by varying one or two of the parameters over a range of values while using a primary or basic value for each of the other parameters. In addition, the breakeven rental rates or the rates of return on initial equity are given for the corresponding cash flows.

The total cost of construction and land can be input to the program or can be calculated through the use of the Construction Cost Estimate subprogram. The total cost of the structure can be computed from per square foot costs, component structure costs, professional fees, and land costs. Interim interest costs for land and construction are both computed.

# FORWARD

The MRCAP program is an advanced cash flow program designed to provide for the simulation of a wide array of investment strategies associated with real estate ownership. The program can simulate ownership strategies for individuals, corporations or partnerships (both general and limited), for any holding period up to 25 years.

The program allows for the identification of fifteen capital assets financed with up to eight mortgages and distributed to a maximum of fifteen partnerships. The program also provides for modification of any or all of the input data and for the development of a sensitivity table to assist in strategy analysis.

The major objective of the MRCAP program is to develop a Pro-Forma Cash Flow Statement based on user supplied information. The program allows for two distinctly different approaches in the establishment of the Pro-Forma Statement.

The first approach is called the "FRONT DOOR" approach and represents the Capital Allocation form of real estate valuation. In this form the user supplies detailed information concerning income, expenses and capital costs. The program then develops the income statement and provides a ratio analysis which identifies the value of these elements to the investor or investors.

The second approach is called the "BACK DOOR" approach and represents the Revenue Justified (RJV) form of real estate valuation. In this form the user may supply market information (in the form of percentages) for all data categories except Gross Income and Before Tax Return. With this information the program will solve for the justified capital allocation costs and then proceed with the development of the Pro-Forma income statement.

# ACKNOWLEDGEMENTS

The author wishes to express his sincere appreciation to the many individuals who have contributed to this program. Specifically, thanks are due to Professor James A. Graaskamp and H. Robert Knitter, of the University of Wisconsin School of Business, whose thorough review and constructive criticism of the computational logic of the program aided greatly in its overall success; to the Real Estate students who for the last three years have been supplying every test in the book to force the logic to fail.

And finally, special recognition is due to the author's wife, Linda, and daughter, Michele, who endured untold amounts of neglect while this program was in preparation.

Michael L. Robbins
1978

5707.01

SELECTED PORTIONS OF

# USER'S GUIDE

# Statistical Analysis System

## STATSYSTEM

December 1971



GENERAL ELECTRIC

INFORMATION SERVICES MARKETING DEPARTMENT

## PREFACE

■ This user's guide presents a system and a series of related programs which perform a wide range of statistical analyses. These programs are a part of an ever-expanding library of time-sharing programs for use by subscribers to the time-sharing service.

■ Users need not be programmers. However, familiarity with the system is required. The MARK II Command System reference manual, publication number 711223, provides such information and should be used in conjunction with this user's guide.

■ Listings of programs and routines available in the library are published in the Program Library Indexes for MARK I and MARK II, publication numbers 800000 and 900000, respectively. The terms under which library programs are made available to subscribers may vary between programs or they may vary with a given program from time to time. General Electric reserves the right to change these terms at its discretion. Any questions regarding use of the library programs should be directed to the General Electric representative.

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■ Statistical computations have evolved through three generations. In the first generation numerous individual batch programs were developed. Each program required a unique input format which entailed considerable data preparation. As a result it was very difficult to run a number of analyses on the same set of data.

Statistical packages of batch programs, such as the BMD series, formed the second generation. These packages provided a large selection of analyses on a common set of data. Data transformation and selection capabilities were provided as additional, powerful data analyses tools. However, use of these packages required some knowledge of statistical analysis, programming, and a separate setup for each analysis.

The third generation of statistical computations was coincident with the advent of the time-shared computer. Various individual statistical programs were developed. Because of the ease of access and the employment of conversational time-shared programs their use far outstripped that of their batch counterparts. However, the old problem of the first generation returned. Each program had its own data input format, requiring considerable data preparation once again.

■ STATSYSTEM represents the beginning of the fourth generation. Its design allows data to be stored in various input files and to be entered only once; the user is permitted to perform a large variety of statistical analyses on the data. Flexible transformation and selection capabilities permit easy data manipulation to be performed on line, conversationally. STATSYSTEM is intended to be simple and easy to use, but is also powerful and flexible enough to meet the requirements of demanding users.

7

# USER MANUAL

FOR THE

# HOTEL-MOTEL CASH FLOW PROGRAM

DEVELOPED BY

JOHN H. NABORS, JR.

COPY _____

#7

# PREFACE

The program "HOTEL" is one of a series of cash flow programs that was developed to assist the developer or the owners of a hotel in developing estimates of the cash flow from a hotel or motel.

The program is being developed on a continuous basis. The User Manual will be revised in the near future to reflect the final program format. User privileges are available for those EDUCARE members that have requested a USER MANUAL for the DESIGN ANALYSIS PROGRAM. Other users will be accepted upon application to the author.

A MAIL-IN Service is available from the author to users without time-sharing capabilities.

Telephones

| | |
|---|---|
| Business Hours | (214) 634-9283 |
| Residence | (214) 259-5888 |


UNTIL NOTIFIED OTHERWISE, "HOTEL" will not work in conjunction with the program "DAP". Thus, the data file for the program "HOTEL" must contain a 0 on line 100.

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# PROGRAM DESCRIPTION

## CASH FLOW SCHEDULE

The cash flow portion of the Hotel/Motel program provides the analyst with a flexible and simple means to prepare a cash flow analysis on any size hotel. Since most hotel operations can be broken down into five or six departments, the program allows up to six revenue and expense categories which can be used as departments.

Some of the features for the Cash Flow Schedule portion of the program are listed below:

* Up to six income and expense categories (departments) can be used, two of which can be titled by the analyst.

* Up to seven overhead expense categories can be used, two of which can be titled by the analyst.

* Taxes & Insurance and Rental Income can be displayed before or after HOUSE PROFIT.

* Up to three loans can be placed on the property.

* Up to eight occupancy levels can be investigated in a single analysis at any given average room rates.

* Revenue, expense and overhead ratios are presented for any one occupancy level.

* Revenues can be entered as percentages of ROOMS income or in annual dollars.

* Expenses can be entered as percentages of the corresponding income category or in annual dollars.

* Overhead expenses can be entered as percentages of total income category or in annual dollars.

* Any category that is not necessary may be deleted by the entry of 0 data on the input sheet.

* Computer costs for eight occupancy levels should amount to less than $10.

* The Output is ready for reproduction and distribution.

The program can be used for financial planning for a proposed hotel or motel or for an operating hotel.

## SENSITIVITY TABLE

The Sensitivity Table produces an unique planning tool for the hotel/motel analyst. The Cash Flow Schedule presents the revenue and expense data in a manner related to different occupancy levels. In addition, revenue and expense ratios are presented for each category. The Sensitivity Table allows the analyst to increase or decrease these ratios and to investigate their effect on House Profit.

All revenue will be converted to percentages of ROOM REVENUE. Likewise, all expense categories will be converted to percentages of their revenue and all overhead categories will be converted to percentages of the TOTAL SALES. The sensitivity of the annual house profit to changes in various percentages can then be investigated. Note that all the ratios are based upon only one column of output, which is the first column in the sample analysis.

Three types of effects on house profit and cash flow are displayed. The simplest effect to use is shown as the Y-EFFECT which is the increase in annual house profit from a discrete increase of one percentage point in a revenue category without an increase in its expense category. Also illustrated is the effect of the decrease of one percentage point for each expense category and for any overhead item. This Y-EFFECT is useful when the analyst is determining what the effect will be of an increase in revenue from one department without a corresponding increase in overhead or departmental expense.

The Z-EFFECT is the dollar effect on annual house profit resulting from an increase in room rate, occupancy rate or any revenue category with a corresponding increase in the respective expense category. This Z-EFFECT is useful when, for example, the analyst assumes that once a property has reached an equilibrium, that an increase in room rate will not effect other revenue categories.

The X-EFFECT takes into effect the entire relationship of the revenue categories to room revenue--an increase in room rate increases room revenue and all other revenue categories by their respective ratios displayed on the cash flow schedule. Then, each expense category is effected through its respective ratio with each revenue category and each overhead category is effected through its respective ratio with total revenue. The end result is the effect on house profit if the average room rate is increased (or decreased) by $1.00 or if the occupancy percentage had been increased (or decreased)by one percent.

Further explanation is made on the following pages. See Page 20.

# ON-LINE SURVEY CALCULATIONS USING COGO$$

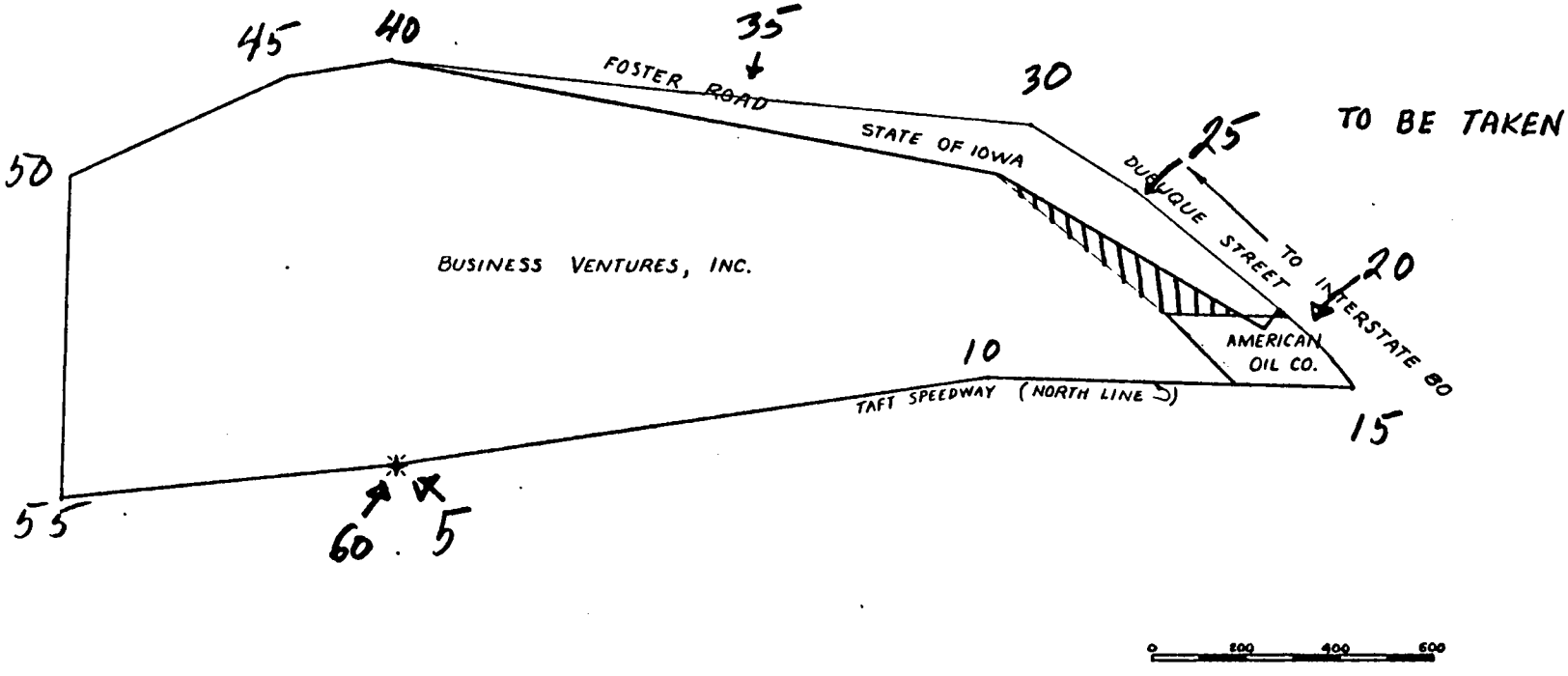
PROBLEM PROPOSED AND DATA
SUPPLIED BY ROY R. FISHER JR.

## EDUCARE COMPUTER NETWORK

THE CO-ORDINATE GEOMETRY PROGRAM
IS A PRODUCT OF G.E. TIMESHARING
AND IS AVAILABLE TO ALL SUBSCRIBERS

# ENGLERT TRACT

NORTH DUBUQUE
IOWA CITY, IOWA 52240




ROY R. FISHER, INC.
DAVENPORT, IOWA 52803

SEPTEMBER 1971

# A Message Exchange Program

Program Name: MAILBOX

The "Mailbox" program was written to facilitate exchange of messages between users on the same user catalog of the G. E. Timesharing system. The Mailbox program itself provides procedure which allows the user to check the status of messages which concern him. It further will provide a mechanism through which he may notify another user that he has created a message for his attention. In order to communicate with another user the person entering the message must merely provide the subscriber suffix (last 2 digits of user number) under which the addressee will normally log on, his name and the name of the file which contains the message. The actual message is created as a normal file; the only restriction on that file is that the sixth character of the file name must be an asterisk (this notation will make the file accessable to all users within the same catalog).

Upon running the Mailbox program the user will be required to provide a name. This should normally be his last name but must correspond exactly with the name to which a message was posted. He will then be required to respond to the following inquiries:

MSG CHECK? The user is required to provide a yes/no response; he may enter a Y or YES as the affirmative response, any other entry will be interpreted to be equivalent to No. An affirmative response will provide a check of all messages which concern the name entered previously and the user number currently active. Three types of messages may be printed in response to the Yes entry.

1) A LIST message followed by the identification of the file to be listed. This is a notification that the message has been posted to his name and the user should list the file specified.

2) A PENDING messing followed by file identification. This is a notification that a message that he has previously filed to another user still remains pending. That user has not yet received notification of the message still filed.

3) A PURGE message followed by file identification. This is a notification that a previously pending file was received by the addressee and that a previously pending file was received by the addressee and that the user who sent the file now purge that message. The file identification is followed by a notification of the date and time that the addressee recieved notification.

LOG MSG? An affirmative answer (of the same format as above) will allow the current user (as identified by the currently active user number and the previously entered user name) to file a message for the attention of another user. The filename to be communicated, the addressee's user number and name will be entered as below.

USER ##? The addressee's user number (last two digits) must be entered here.

TO NAME? The name of the addressee must be entered here. It normally should be entered as his last name only. The entry may contain no commas.

FILENAME? The name of the file which contains the actual message must be entered here. The sixth character of the file name must be an asterisk; if it is not the user will be so notified and the entry re-requested.

QUIT If the entry is affirmative the program will terminate properly filing the information previously entered or received. This is the only valid exit from the program which will provide for automatic updating of the internal files. If a negative entry is made here the program will return to the request for name and proceed similarly. This return to the beginning provides for the capability of checking for messages filed under alternate spellings of the name of the intended recipient.

# USER'S GUIDE FOR GRAPHIC ANALYSIS PROGRAMS

## PURPOSE AND ORIGIN OF PROGRAMS

These programs compute and print Ellwood-type graphs using a standard teletype terminal. The printouts are designed for display as finished graphs with titles, explanatory remarks, and scales. Input is typed in by the user and becomes a part of the final display. See sample printouts on following pages. See also the graphs on pages 88 and 96 of Ellwood, Part I. Observe that the first sample printout and the graph on page 88 of the Ellwood text were constructed according to the same input and that the second sample printout corresponds to the graph on page 96. The only difference is that the graphs illustrated in the Ellwood text show the plotted curves running from left to right with respect to time, whereas the following printouts show curves running from top to bottom with respect to time. In other words if the sample computer graphs are turned 90 degrees, they are near facsimiles of the graphs in the Ellwood text. The mathematical derivations and the purposes of the graphs are explained in detail in the Ellwood text on pages 85-96.

The programs were developed by Charles B. Akerson, MAI, CRE. Both programs are an adaptation of PLOTTO, a standard GE time sharing program used for plotting one to six functions of X simultaneously. Given the required input, the computer performs all of the necessary calculations and causes the teletypewriter to produce the finished graph.

## CHOICE OF PROGRAM

The user has a choice of two programs, namely the REGPLOT program or the JAYPLOT program. REGPLOT presumes that income will be received exactly as specified in the input, whereas JAYPLOT presumes that income will vary in direct proportion to the resale price. In other words, REGPLOT is a regular plot of resale prices which correspond to selected equity yield rates and JAYPLOT uses the J FACTOR premise to plot the changes in both income and price which correspond to selected equity yield rates.

It is important to recognize the difference between the programs. See Ellwood text for further explanation of the J FACTOR premise. REGPLOT and JAYPLOT are separate programs. The two programs produce graphs which are somewhat similar in appearance but which have separate and distinct meanings.