GUIDE

TO

AUTOMATIC COST CALIBRATION

Computer Assisted Mass Appraisal

Massachusetts Department of Revenue - Division of Local Services

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I. INTRODUCTION

The CAMA system has a module in the Market Analysis Menus to run a valuation program called Automatic Cost Calibration.

BEFORE PROCEEDING FURTHER, ANSWER *FOR YOURSELF* THE QUESTIONS --

1. **What Does The Automatic Cost Calibrator Do That My Current Approach To Cost Doesn't? See Below.**
2. **Do I Have An Overall Residential Valuation Problem That Needs Fixing? If The Answer Is 'No', The Automatic Cost Calibrator May Be Overkill. If The Answer Is A Big 'Yes', The Module May Be Invaluable.**

ANSWER TO QUESTION 1

SIMPLE COST is very simple and is not market value**:**

COST ESTIMATE = TOTAL LAND VALUE + TOTAL RCNLD

PROBLEMS:

- **OUT-OF-DATE TABLES**
- **INADEQUATE TIME-ADJUSTMENTS**
- **SUBJECTIVE DEPRECIATION SCHEDULES**
- **NON-TABLED MARKET INFLUENCES**
- **COST IS NOT MARKET VALUE**

Solution(?): Apply market factors to the total or component simple cost values. BUT, what if the market is more complicated than a set of overall factors? What if inflationary or deflationary market forces affect different land and building factors very differently? Which factors and how different?

WHY CONSIDER A MODEL?

ADJUSTMENT FACTORS NOT CALIBRATED SEPARATELY IN OVERALL MARKET CALIBRATION OF SIMPLE COST

LAND

- **Neighborhood**
- **Road Type**
- **Road Condition**
- **Traffic**
- **Water**
- **Sewer**
- **Quality of View**
- **Landscaping**
- **Scenic Influence**
- **Topography**
- **Zone**
- **School District**
- **Inflation/Deflation**

BUILDINGS

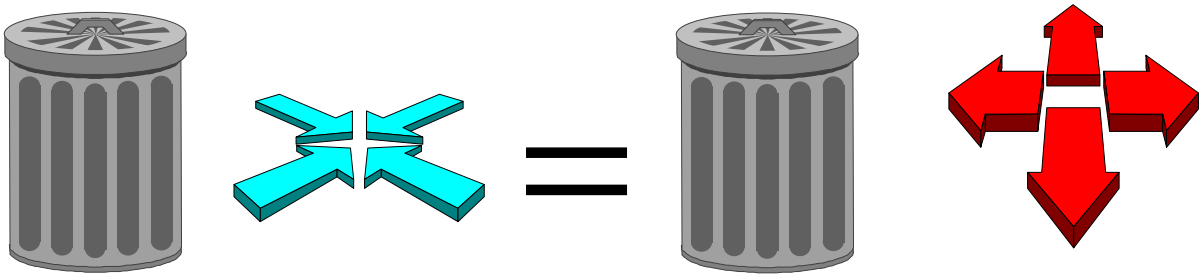
- **Style**
- **Interior Condition**
- **Exterior Condition**
- **Overall Condition**
- **Age**
- **Inflation/Deflation**
- **Seasonality**

If the market does not influence these factors in exactly the same way over time, an overall calibration of land and RCNLD will be off.

Solution: Use regression to calibrate Cost values. Automate the modelling process, so the user does not have to be an expert to get good results. Base the approach on calibrating RCN (as opposed to a pure market model) because factored Replacement Cost New is easier to explain and more easily accepted by taxpayers than market models.

The Automatic Cost Calibrator is a state-of-the-art Expert System that uses artificial intelligence in conjunction with advanced computer-assisted mass appraisal methodology (based on the multiple linear regression technique) to automatically calibrate replacement cost estimates of real property value to current local market conditions. In other words, the program fully uses regression analysis to weigh market factors while basing values on the easily understood concept of Replacement Cost New. This approach may be more explainable to taxpayers than regression models that derive all components of value from market.data. What do "Expert System" and "artificial intelligence" mean? They mean you do not have to be an expert to run the program and get meaningful results.

Can the program set good values despite bad data? **NO. Garbage In = Garbage Out,** or, for the visually oriented:



But, it can help narrow down where data are bad. Examples of bad data that will directly affect values are centered on the sales file:

Do neighborhood boundaries accurately reflect current market realities?
Are buildings styles correct?
Are property grades consistently and accurately applied?
Are use codes correct or does the sales file have some land-only sales coded as 101's?

Can the program accurately value types of properties that have no valid sales? **NO.** Users have to know their sales file, its strengths and weaknesses, and interpret modelling results using their overall knowledge of mass appraisal and of the community.

- The **First** part of this manual will deal with required set-up.
- The **Second** part will deal with running the Automatic Cost Calibration program.
- The **Third** part will deal will interpreting results:
  1. Model not generated -- What to do?
  2. Model generated, but results unacceptable.
  3. Model generated, results acceptable, but how do I explain these results?
- The **Fourth** part will deal with the applying the results to sales and non-sales.

II. SETTING UP AN ACC RUN

To run the Automatic Cost Calibrator (HEREAFTER referred to as the **ACC**):

1. **INSTALLATION:** The program must be properly installed with a REGION-1.DAT file in the *sigma/mstr* directory that correctly lists the community's neighborhood codes.

2.**SALES FILE:** A sales file with three year's valid sales must exist.

3.**COST SALES:** The user will have to run the Cost Valuation program on at least the sales file. The ACC program needs the RCN value of the residence as a starting point.

4. **MARKET INTERFACE:** The user will also need to convert the sales file to a special file understood by the ACC. This is done by running the sales file through "Market Interface", an option in the *MARKET ANALYSIS, RESIDENTIAL MARKET ANALYSIS menu.*

CLEANING UP SALES DATABASE

In order to get the best results using ACC, a user should have the cleanest possible sales file. Verify all sales for validity and field review for data correctness.

GENERATING COST VALUES ON SALES FILE

Next, run Cost Valuation on the Sales File. The Automatic Cost Calibration program will not run unless the Replacement Cost New (RCN) of the residence is calculated. To run cost on the Sales File, a user should refer to their CAMA Valuation Manual.

ANALYZE SALES FILE -- HOW REPRESENTATIVE OF SUBJECT FILE?

Compare data arrays of Sales and Subject files for selected variables. The DOR has IQ procedures that you can customize for your community and produce these data arrays for transfer to a spreadsheet. Which sales should you include or exclude from the Automatic Cost Calibrator? Does your sales file under-represent important areas of your community or important property types? What are your expectations for building a model and will your sales file support those expectations?

SAMPLE DATA ARRAYS --
Is the distribution of building styles in your sales file representative of styles in your community?

ARRAY BY BUILDING STYLE

	INVENTORY FILE					SALES FILE						
	CNT	% OF TOT	AVG ASD VL	MIN ASD VL	MAX ASD VL	CNT	% OF TOT	AVG ASD VL	MIN ASD VL	MAX ASD VL	AVG SALE PR	MIN SALE PR	MAX SALE PR
STYLE AF	1	0.88%	106700	106700	106700	0	0.00%	0	0	0	0	0	0
STYLE BN	1	0.88%	71500	71500	71500	0	0.00%	0	0	0	0	0	0
STYLE CL	27	23.89%	184526	0	466100	18	25.00%	177322	71700	466100	183700	74100	491400
STYLE CM	12	10.62%	80833	63900	103800	9	12.50%	83478	63900	103800	87189	66500	108700
STYLE CP	21	18.58%	142557	66400	266900	12	16.67%	155425	67300	266900	159575	69700	271500
STYLE MM	1	0.88%	164000	164000	164000	0	0.00%	0	0	0	0	0	0
STYLE 0S	17	15.04%	109982	77500	241300	12	16.67%	112933	80700	241300	105517	20000	243800
STYLE RN	19	16.81%	125821	0	268800	11	15.28%	141009	67400	235800	148000	76900	240100
STYLE RR	14	12.39%	228907	127100	292800	10	13.89%	244870	127100	292800	247200	131400	309300
	113					72							

Is the distribution of parcel land size in your sales file representative of land size in your community?

ARRAY BY LAND SIZE

	INVENTORY FILE					SALES FILE					
	CNT	% OF TOT	AVG ASD VL	MIN ASD VL	MAX ASD VL	CNT	% OF TOT	AVG ASD VL	MIN ASD VL	MAX ASD VL	AVG SALE P	MIN SALE P	MAX SALE P
< .25 a	0	0.00%	0	0	0	0	0.00%	0	0	0	0	0	0
.26ac-.50 a	5	4.42%	86260	71200	108300	0	0.00%	0	0	0	0	0	0
.51ac-.75ac	14	12.39%	155643	86600	268800	0	0.00%	0	0	0	0	0	0
.76ac-1 ac	69	61.06%	153078	63900	383500	57	79.17%	157058	63900	383500	160396	20000	387900
1.01ac-2 ac	22	19.47%	155291	0	466100	15	20.83%	147393	67300	466100	148653	69700	491400
2.01ac-5 ac	1	0.88%	164000	164000	164000	0	0.00%	0	0	0	0	0	0
5.01ac-10 a	0	0.00%	0	0	0	0	0.00%	0	0	0	0	0	0
10.01ac-20	1	0.88%	0	0	0	0	0.00%	0	0	0	0	0	0
20.01ac-50	0	0.00%	0	0	0	0	0.00%	0	0	0	0	0	0
> 50 ac	1	0.88%	0	0	0	0	0.00%	0	0	0	0	0	0
	113					72							

RUNNING MARKET INTERFACE

Now, run Market Interface on the Sales file.

PURPOSE

Market Interface creates a file that will work with MOD PRO II, the program that drives Automatic Cost Calibration.

Market Interface takes all of the records (Parcel, Land, Residence, and Detached Structure) and merges them into one record. This makes it easier for the system to compare data that may or may not be in the same record in the Data Management module.

Market interface is done for both:

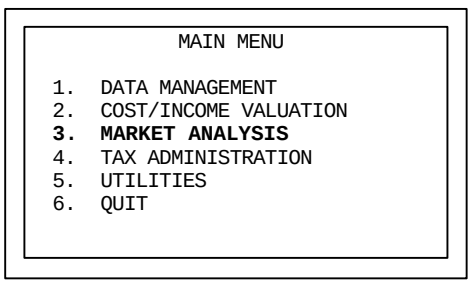
1. Inventory File
2. Sales File

A Market Interface only allows the user the capability of segmenting the data base on the State Use Code and the Neighborhood Code, as well as selecting on SALE-VALID (Y,N) in the Sales File Parcel record. A user can set up IQ PID Files to segment data by any other criteria. This allows the user more flexibility.

RUNNING MARKET INTERFACE

You can run Market Interface on both the Inventory and Sales Files. To begin the process, follow these steps:

At the RPIS MAIN MENU, choose number
3. MARKET ANALYSIS.



At the Market Analysis Menu, choose number
1. Residential Market Analysis

At the Residential Analysis menu, choose either number 1 (Prepare Subjects for Interface) or number 2 (Prepare Sales for Interface).

The first of two Option screens appears:

```
      (TO MOVE AROUND IN THIS SCREEN USE YOUR TAB OR ARROW KEYS)

RUN NUMBER  < 1>                    BASE DATE      <9112> YYMM
MAX PARCELS TO PROCESS <999999>        VALUE DATE      <9301> YYMM
PROCESS MULT BUILDINGS <N> Y/N         APPRAISAL DATE  <9402> YYMM
ERROR PROCESSING FLAG <2>              HISTORY DATE    <1993> YYYY
MARKET REGION <REGION-1>


STATE USE CODE          <101> <  >   <  >   <  >   <  >   <  >   <  >   <  > <  >        <  >
                  <  >   <  >   <  >   <  >   <  >   <  >   <  >   <  >   <  > <  >


SALE PRICE  LOW <    50000>  HIGH  <    4000000>  Whole Dollars , No Decimal

SALE DATE   LOW  <0192>  HIGH <0693>  MMYY Format Only
SALE VALID: <Y>                 < > < > < > < > < > < > < > < > < > < > < > < > < > < > < >
```

RUN NUMBER- Signifies the number of runs (set sales file to 1, subject file to 2)

MAX PARCELS TO PROCESS- Set the maximum number of parcels to be passed to the Market Data file. It can be set anywhere from 1 to 999999. (Generally Ignore it; leave it set to 99999)

PROCESS MULT BUILDINGS - Flags whether or not you want multiple residence parcels (109's) included in this run.

ERROR PROCESSING FLAG - When the Initialization report is printed:

1- Will print all parcels that were not selected by Market Interface.

2- The report will bypass reporting of non-selected parcels, while reporting parcels that may have had certain records bypassed and have still been passed to Market Data File.

BASE DATE - This should be set to one month before the earliest date of sale you have set for the analysis. (Each model has a base date associated with it. The base date is a reference date used for computing the date of sale, date of appraisal, date of valuation, etc. in months relative to that reference date. For MOD-PRO generated models, the base date must match that specified in the Market Interface Option file which should be set to one month prior to the earliest date of sale.)

VALUE DATE - This is the valuation date (e.g., 9301 is for certification year 1994 format YYMM).

APPRAISAL DATE - This is TODAY'S DATE.

HISTORY DATE - The certification year depreciation year.

MARKET REGION - This refers to an internal file that should list all of your neighborhoods, see your BLA adviser in order to set up that REGION-1.DAT file.

STATE-USE-CD - Filling in state-use-codes limits parcels passed to the Market Data File. If you do not enter a state-use-code, all parcels will be passed to the Market Data File.

The next three lines should only be filled in when working on the Sales file. When running the Inventory file, these lines should contain no information.

SALES PRICE - The LOW box should contain the lowest sales price acceptable for analysis. The HIGH box should contain the highest price acceptable for analysis. (Prices will automatically right justify themselves, when you hit ↵ENTER to leave this screen.)

SALES DATE - These boxes control the range of sale dates you want to consider for analysis. The LOW box should contain the earliest date and the HIGH box, the latest Date.

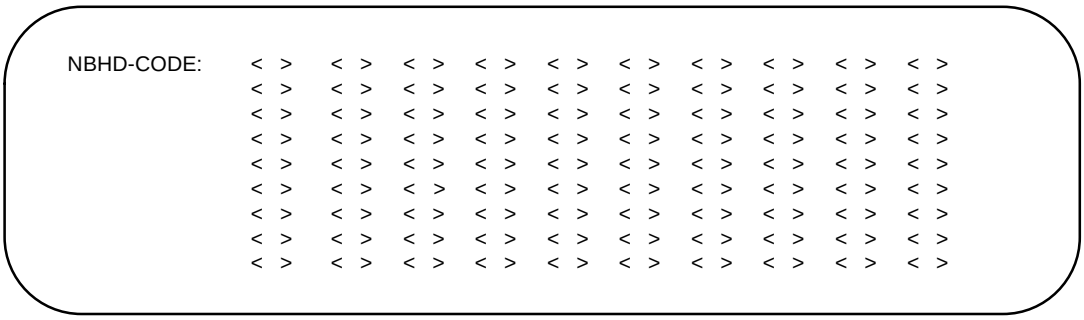
SALE VALID - Only parcels with validity codes entered here will be passed to the Market Data File. If the line is left blank, all sales whether valid or invalid will be passed.

When you have finished with all of your entries on this screen press the ↵ENTER key. You then will get the following question:

ARE ABOVE OPTIONS CORRECT <Y> Y/N

If the options are correct, press ↵ENTER to continue. If you have forgotten something, type a 'N' and press ↵ENTER and finish filling out the options.

Now a second Option Screen will appear:

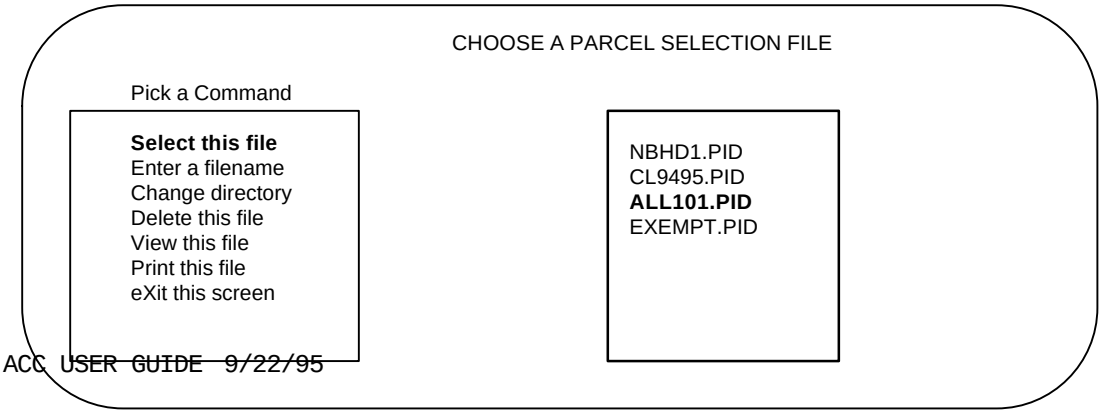


NBHD-CODE -Fill in the neighborhood codes that you want passed to the Market Data file. Only parcels in neighborhoods listed here will be included in the Market Interface file. Press ↵ENTER, and again the question:

ARE THE ABOVE OPTIONS CORRECT <Y> Y/N

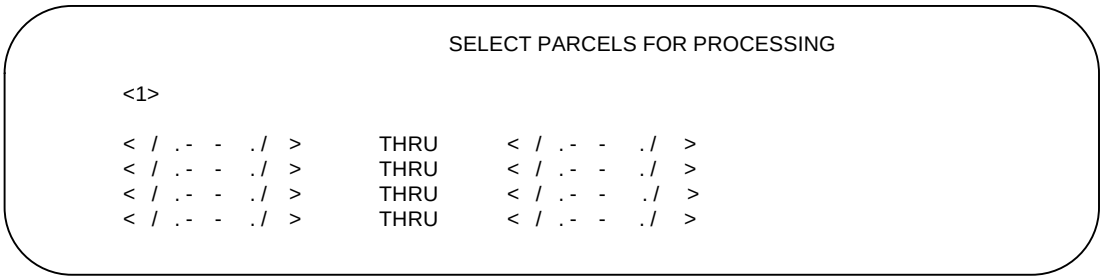
If they are correct, press ↵ENTER. If you forgot a code type 'N' and press ↵ENTER.

The next screen that comes up is the File Selection Screen:



Abort procedure

At this point you can select a pre-selected PID file or you can type 'x' to exit the screen and put in your parcel selection. If you choose to put in your own selections or your PID file is less than 100 parcels, the following screen comes up:



If you chose a pre-selected PID file of less then 100 parcels, a list of parcels on the left hand side of screen will already be in place. If your PID file was larger then 99 parcels the following would have appeared on screen:

The parcel selection file is too big for selbuild
Do you wish to edit it instead (Y/N) ***N***

This does not mean it is too large to work, just too large for the SELECT PARCELS FOR PROCESSING screen. Since it defaults to NO just press ↵ENTER to continue.

If the screen comes up blank, you should now Enter the parcel(s) or Range(s) of parcels you want to pass through interface.

The SAVE THE PARCEL SELECTION FILE screen comes up next, If you used a pre-selected PID file, press 'x' to Exit the Screen. If this is a parcel range you intend to use again and is not an existing PID file choose "*Enter a Filename*". The name will be given the extension .PID by the system so all you need to do is give it an 8 letter or less name. If you choose not to save the parcel selection you entered, just type 'x' to exit the screen.

Next the question comes up:

Will you want the Market Interface (MKTINT.RPT) Report printed (Y/N) ***N***

You should print this report to make sure that the interface went successfully. It tells you how many parcels were processed and how many parcels were passed to the Market Data File.

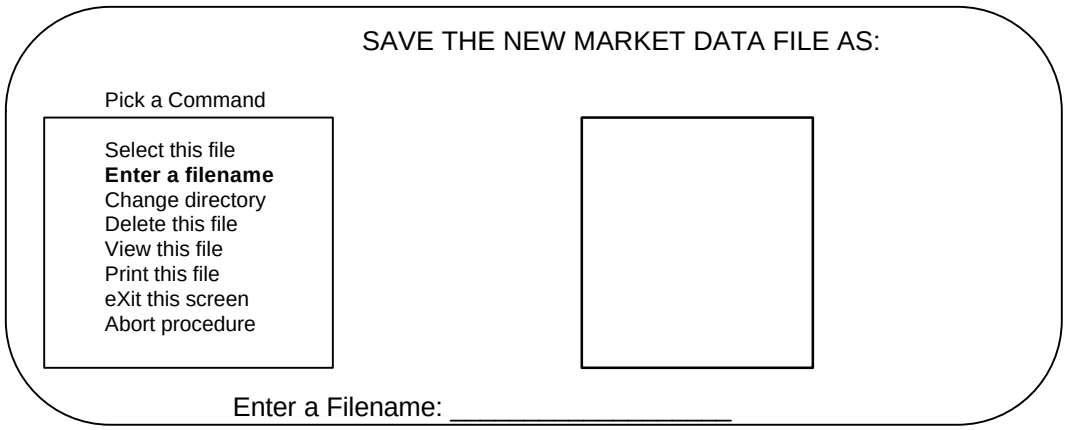
To Print, type 'Y' and press ↵ENTER. To bypass, just press ↵ENTER.

Another Question comes up:

Will you want the Market Library (MKLIB.RPT) Report printed (Y/N) ***N***

Accept the default and press ↵ENTER. ACC does not need this report, since no editing is done to any input files.

Next a screen will display as follows:



Enter any name (no more then eight characters). The System will automatically give it the extension (.SAL or .SUB).

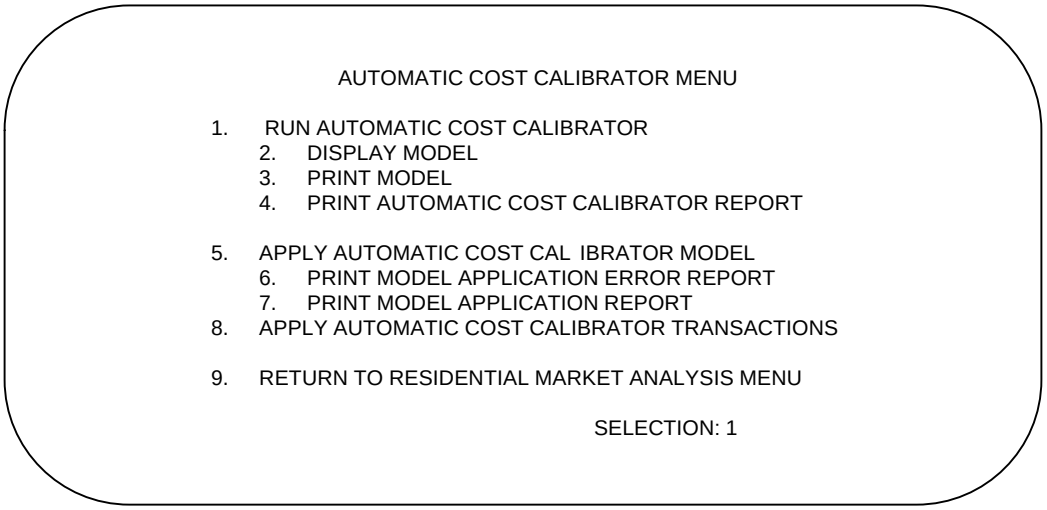
The question will then come up:

*Run Market Interface (Y/N)?**N***

Type 'Y' and press ↵ENTER to run Market Interface.

III. RUNNING AUTOMATIC COST CALIBRATOR

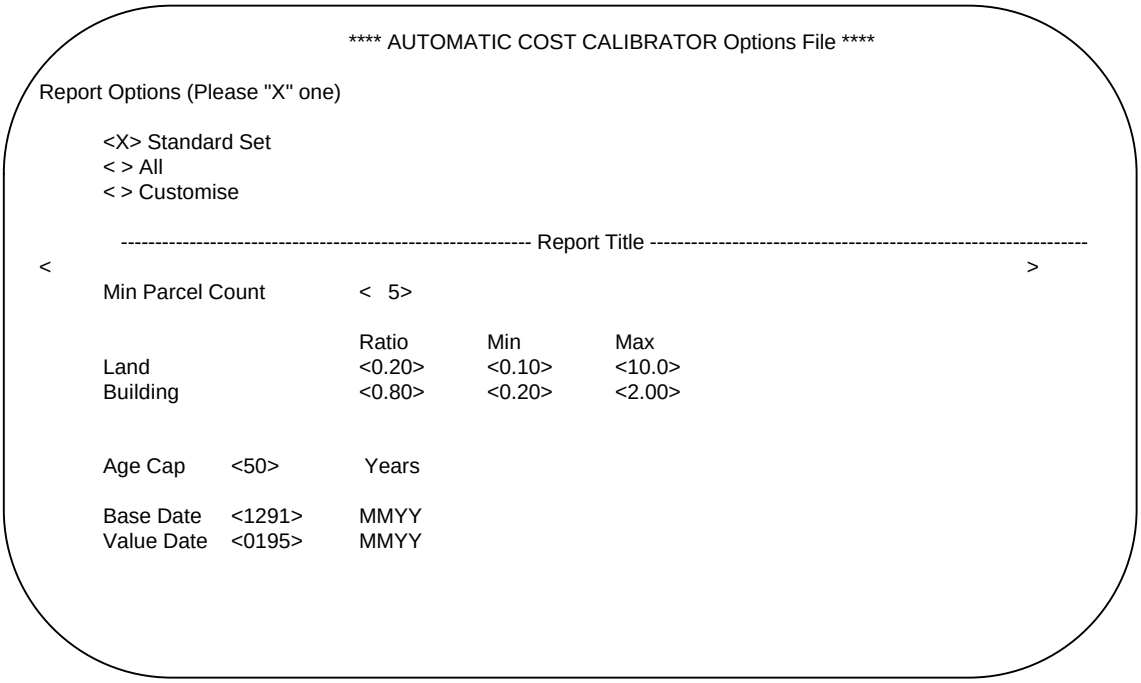
ACC is found on the Residential Market Analysis Menu, select choice 6, the following Menu appears:



To begin the process choose number 1. Run Automatic Cost Calibrator.

EDITING THE COST CALIBRATOR OPTION SCREENS

Next the option screen is displayed.



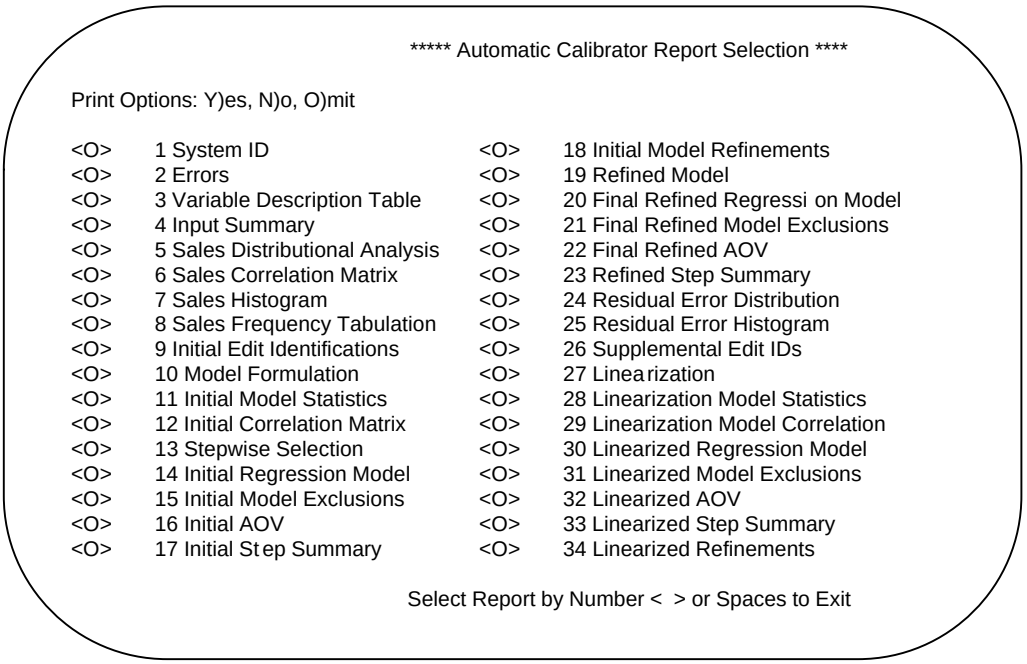
PRINTING OR DISPLAYING COST CALIBRATION MODELS

First, a user selects which reports they want as final output.

1. **STANDARD**: The Final Regression model, Full Ratio Statistics, Final Model Statistics, any Stratified Ratio Summaries and all sales excluded from the analysis will be printed.

2. **ALL**: Details of the cost calibration run. This report could be very large. This option gives you all available reports generated during the run. (Stored in your rpiswork directory as PRINTER.OUT.)

3. **CUSTOMIZE**: This allows the user to pick and choose what they want to see on the cost calibration report. If the user chooses this option, the two screens below appear:

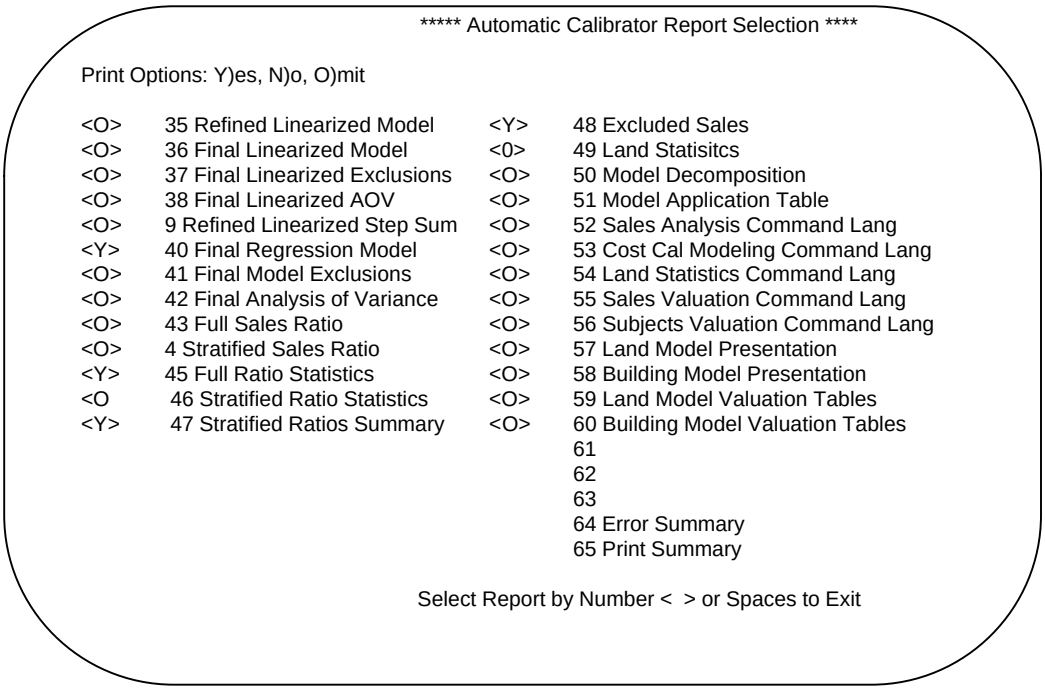


***** Automatic Calibrator Report Selection ****

Print Options: Y)es, N)o, O)mit

<O>	1 System ID	<O>	18 Initial Model Refinements
<O>	2 Errors	<O>	19 Refined Model
<O>	3 Variable Description Table	<O>	20 Final Refined Regressi on Model
<O>	4 Input Summary	<O>	21 Final Refined Model Exclusions
<O>	5 Sales Distributional Analysis	<O>	22 Final Refined AOV
<O>	6 Sales Correlation Matrix	<O>	23 Refined Step Summary
<O>	7 Sales Histogram	<O>	24 Residual Error Distribution
<O>	8 Sales Frequency Tabulation	<O>	25 Residual Error Histogram
<O>	9 Initial Edit Identifications	<O>	26 Supplemental Edit IDs
<O>	10 Model Formulation	<O>	27 Linea rization
<O>	11 Initial Model Statistics	<O>	28 Linearization Model Statistics
<O>	12 Initial Correlation Matrix	<O>	29 Linearization Model Correlation
<O>	13 Stepwise Selection	<O>	30 Linearized Regression Model
<O>	14 Initial Regression Model	<O>	31 Linearized Model Exclusions
<O>	15 Initial Model Exclusions	<O>	32 Linearized AOV
<O>	16 Initial AOV	<O>	33 Linearized Step Summary
<O>	17 Initial St ep Summary	<O>	34 Linearized Refinements

Select Report by Number < > or Spaces to Exit



***** Automatic Calibrator Report Selection ****

Print Options: Y)es, N)o, O)mit

<O>	35 Refined Linearized Model	<Y>	48 Excluded Sales
<O>	36 Final Linearized Model	<0>	49 Land Statisitcs
<O>	37 Final Linearized Exclusions	<O>	50 Model Decomposition
<O>	38 Final Linearized AOV	<O>	51 Model Application Table
<O>	9 Refined Linearized Step Sum	<O>	52 Sales Analysis Command Lang
<Y>	40 Final Regression Model	<O>	53 Cost Cal Modeling Command Lang
<O>	41 Final Model Exclusions	<O>	54 Land Statistics Command Lang
<O>	42 Final Analysis of Variance	<O>	55 Sales Valuation Command Lang
<O>	43 Full Sales Ratio	<O>	56 Subjects Valuation Command Lang
<O>	4 Stratified Sales Ratio	<O>	57 Land Model Presentation
<Y>	45 Full Ratio Statistics	<O>	58 Building Model Presentation
<O	46 Stratified Ratio Statistics	<O>	59 Land Model Valuation Tables
<Y>	47 Stratified Ratios Summary	<O>	60 Building Model Valuation Tables
			61
			62
			63
			64 Error Summary
			65 Print Summary

Select Report by Number < > or Spaces to Exit

To select reports, type the corresponding number and press ↵ENTER. To select, type 'Y'. To omit type, 'O'. Once you have selected the first one, you can now use the up and down arrow keys in that column. When you have made all of your choices in the first column, press ↵ENTER this will first take you to the second column, (If you started in the second column and want to work in the first column, select a number from the first column and press ↵ENTER). After all of your selections in the second column are made press ↵ENTER (first column: press ↵ENTER twice.) To go to the second screen, spacebar out the number and press ↵ENTER. Follow the same procedures outlined above on the second screen.

** A description of Cost Calibration Report Components can be found in Section VIII of this manual, Cost Calibration Reports **

After the report contents are defined, press ↵ENTER. Next give the report a title if desired.

Then you will arrow down to the min parcel count per variable. This allows the user to put in the minimum number of sales the analysis can consider. It is currently set at 5, so this program needs at least five sales to run properly.

Next, arrow down to set the average land to building ratio. For example, if a 40/60 split is desired as an average, the entry would be:

<0.40> Land Ratio
<0.60> Building Ratio

The next two groups set the **Bands of Confidence** you want to see in setting values. The previous group set the average land to building ratios. These two groups set the minimum land to building ratios. The following default settings are:

<0.10> Min Land Ratio
<10.0> Max Land Ratio

<0.20> Min Bldg Ratio
<2.00> Max Land Ratio

The above states that the land ratio can be no less then 10% of the total value and no greater then 10 times the building value. The building ratio can be no less then 20% of the total value and no greater then 2 times the land value. If they fall outside those ranges, AUTOMATIC COST CALIBRATOR will consider them errors, and exclude them from the analysis.

The final option on the screen:

< 35> Age Cap in Years

Allows the user to cap depreciation at a predetermined year. Using the above example, a property that is 45 years old and in average condition would have the same depreciation as a property 35 years old in average condition.

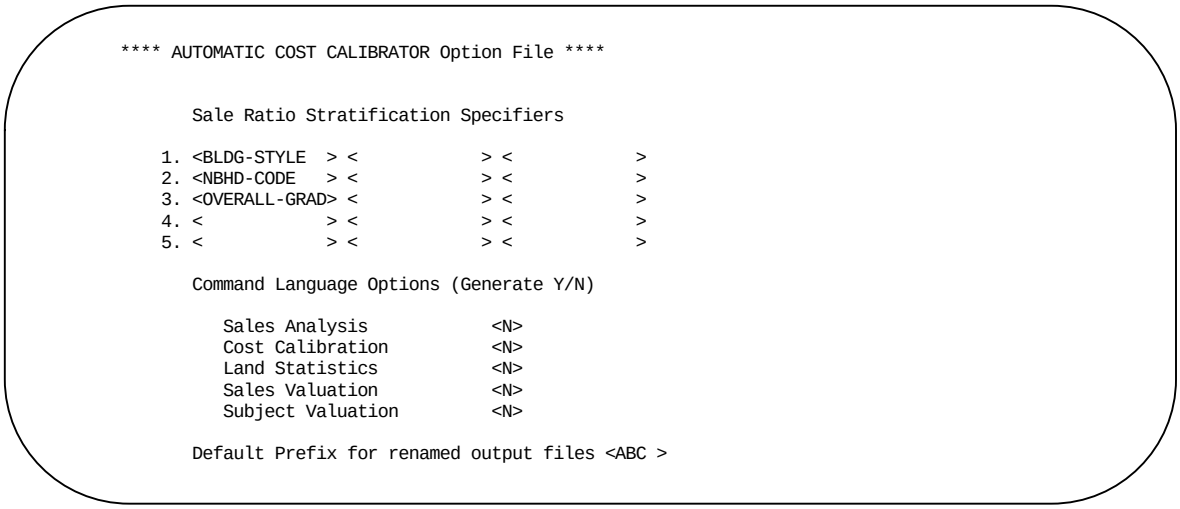
Once you have finished making entries in this area, press ↵ENTER. You will then get the following screen command line:

SCREEN CMD <N> N-NEXT, R-RETURN, P-PREV, D-DONE

If you press ↵ENTER before you have made all of your entries, pressing 'R' returns you to the present screen. If you were on the second option screen and wanted to go back to the first screen, type 'P' to return to that screen. If you have no more changes, type 'D' to go on to next process. At this point select the 'N' and go to the second option screen.

STRATIFIED RATIO STUDIES

At this point the following screen appears:



With the displayed selections, the user would get arrays: the first set up by BUILDING STYLE, the second set up by NEIGHBORHOOD, and the third set up by GRADE.

To further stratify the results, use the second and third columns. If the user wanted to have an array that broke out Building Styles within a Neighborhood, line two would look as follows:

2. <NBHD-CODE > <BLDG-STYLE > < >

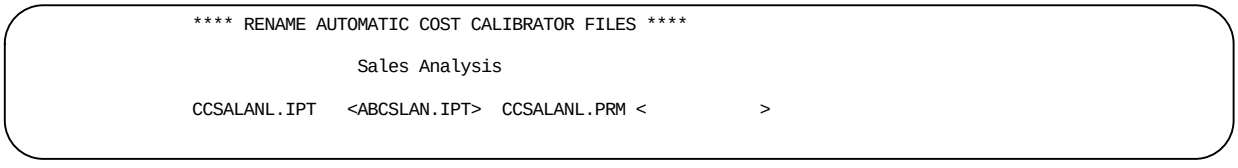
If the user wanted to also break the Style by Grade, line two would look as follows:

2. <NBHD-CODE > <BLDG-STYLE > <OVERALL-GRAD>

NOTE: THE FIELD NAMES THAT ARE USED ARE THE SAME US THEY APPEAR IN THE DATA MANAGEMENT LIBRARY, NOT THE MOD-PRO MARKET FILE LIBRARY.

The next section, Command Language options, is for the advanced user who can edit MOD PRO II command language. It allows the user to print out the command language input files that go into the Cost Calibration process. It is not necessary to print these files so type a 'N' for each component. If desired, a copy of these files can be saved in the rpiswork directory, the user can then type 'Y' for each component and then assign a prefix so that they can be identified in the rpiswork directory.

When the user has completed all the entries, press ↵ENTER. Again the screen command line comes up. To bypass the command language (and all options are chosen) type 'D' and press ↵ENTER. To generate command language files just press ↵ENTER and the following screen comes up:



This shows the system name for the Command Language and if the user has specified a prefix the default name that will appear in their rpiswork directory. Every time the ↵ENTER key is pressed, it will bring up another default name until the screen looks as follows:

```
**** RENAME AUTOMATIC COST CALIBRATOR FILES ****
.
                  Sales Analysis

CCSALANL.IPT   <ABCSLAN.IPT >   CCSALANL.IPT   <ABCSLAN.PRM >

         Cost Calibration Model Generation

CCALMODL.IPT   <ABCCMOD.IPT >   CCALMODL.PRM   <ABCCMOD.PRM >

                  Land Statistics

LANDSTAT.IPT   <ABCLDST.IPT >   LANDSTAT.PRM   <ABCLDST.PRM >

                  Sales Valuation

CCSALVAL.IPT   <ABCSLVL.IPT >   CCSALVAL.PRM   <ABCSLVL.PRM >

                Subjects Valuation

CCSUBVAL.IPT   <ABCSBVL.IPT >   CCSUBVAL.PRM   <ABCSBSL.PRM >


   SCREEN CMD <D> N-NEXT, R-RETURN, P-PREV, D-DONE
```

Press ↵ENTER, since the default is D-DONE.

At this point, the CHOOSE INPUT SALES FILE (default is MARKET.SAL) screen will come up. The user will press the right arrow key and then arrow down and select the Market Data File they created during Market Interface.

Next, the NAME THE NEW MODEL APPLICATION TABLE (default is RESCCAL.MDO), screen comes up. If the user plans on having multiple models, give each their own distinctive name. Choose *Enter a Filename* and give it a eight character name. The system will automatically give it the .MDO extension. If this is the only model being used type 'x' and Exit the Screen.

Next, the SAVE ARCHIVE FILE AS OR TYPE 'delete' TO DELETE: (default: COSTCAL.RPT) screen comes up.

If the user does not want a copy of the report generated by AUTOMATIC COST CALIBRATOR, choose *Enter a Filename* and type 'delete'. To name the report something other then the default, also choose *Enter a Filename*, and give it an eight character or less name. To use the default name, just press 'x' to exit the screen.
Next the following question comes up:

*Run Cost Calibration(Y/N)? **N***

To run the program type 'Y' and press ↵ENTER. To leave the program at this time press ↵ENTER.

The program will run in the background under UNIX system, however it is advised that you run no other Mod-Pro program while the procedure is running.

When the program is done, the user will get one of two possible mail messages.

If it was successful, the message will be:

Cost Calibration Run is Completed. Model generated RESCCAL.MDO

If it was unsuccessful, the message will be:

Cost Calibration run completed. Model could not be generated.

If the latter message appears, rerun ACC if the Standard report or a Customized report options did not include **ERRORS**. The user should select Customized report with **ERRORS** or a complete report (ALL) during the second run. When that run has finished, at the AUTOMATIC COST CALIBRATOR Menu, choose number 4,. PRINT COST CALIBRATOR REPORT. Then refer to the Error Codes, located at the end of this manual, to find out what went wrong and caused the run to fail. See also, Section XI --*If It Doesn't Work: Best Guesses on Common Problems.*

PRINTING OR DISPLAYING THE AUTOMATIC COST CALIBRATOR OUTPUTS

To look at the successful model, the user can either display it or print it. To do so at the AUTOMATIC COST CALIBRATOR Menu, they would choose either number 2, Display Model or number 3, Print Model. On the next page is a sample model:

MODEL APPLICATION TABLE

Model Number	Rec	Mnemonic	Operation Flag	Qualifying Field ID. Rec	Mnemonic	Class	Rate
1				LND	NBHD-CODE	1	46842.3320
1				LND	NBHD-CODE	2	47959.3711
1				LND	NBHD-CODE	3	47959.3711
1				LND	NBHD-CODE	4	47959.3711
1				LND	NBHD-CODE	100	47959.3711
1				LND	NBHD-CODE	200	49418.4531
1				LND	NBHD-CODE	300	47959.3711
1				LND	NBHD-CODE	400	72750.8594
1	LND	SQUARE-FEET					.5730
1				PAR	TRAFFIC	H	-38656.4023
1				PAR	SEWER	SP	-41828.3750
2				LND	NBHD-CODE	1	22967.1523
2				LND	NBHD-CODE	2	21850.1133
2				LND	NBHD-CODE	3	21850.1133
2				LND	NBHD-CODE	4	21850.1133
2				LND	NBHD-CODE	100	21850.1133
2				LND	NBHD-CODE	200	20391.0332
2				LND	NBHD-CODE	300	21850.1133
2				LND	NBHD-CODE	400	-2941.3750
2	RES	RCN					1.6052
2	DET	RCNLD					.0313
2	RES	RCN		RES	BLDG-STYLE	CP	.3663
3							69809.4844
3	LND	SQUARE-FEET					.5730
3	RES	RCN					1.6052
3	DET	RCNLD					.0313
3				PAR	TRAFFIC	H	-38656.4023
3				PAR	SEWER	SP	-41828.3750
3	RES	RCN		RES	BLDG-STYLE	CP	.3663

The model has three parts -- Model 1 comes up with a land value. Model 2 comes up with a building value, and Model 3 is the result of the first two -- it comes up with the total value.

Taking that model if you were to value the following:

Building Style:	Cape Cod
RCN of House:	$76000
RCNLD of Outbldgs	$4500
Traffic	Light
Sewer	Septic
Lot Size (Sq FT)	30000
NBHD CODE	200

LAND VALUE (Model 1)		
NBHD CODE CONSTANT NBHD 200	$49418.4531	
LAND SIZE 30000 X .5730		$17190.0000
TRAFFIC LIGHT		$0.0000
SEWER SEPTIC -		$41828.3750
TOTL LND VAL	$24769.0781	
BUILDING VALUE (Model 2)		
NBHD CODE CONSTANT NBHD 200		$20391.0332
RCN ADJUSTMENT $76000 X 1.6052		$121995.2000
DET RCNLD ADJUSTMENT $4500 X .0313		140.8500
STYLE ADJUSTMENT CAPE COD		
($76000) X .3663		$27838.8000
		$170365.8832
TOTAL VALUE (Model 3)		
CONSTANT		$69809.4863
LAND SIZE 30000 X.5730		$17190.0000
TRAFFIC LIGHT		0.0000
SEWER SEPTIC -		$41828.3750
RCN ADJUSTMENT $76000 X 1.6052		$121995.2000
DET RCNLD ADJUSTMENT $4500 X .0313		140.8500
STYLE ADJUSTMENT CAPE COD		
($76000) X .3663		$27838.8000
		$195200.0000

IV. **APPLYING MODEL(S) FROM ACC**

When you have generated a model, you can then directly apply it to either the DMT Inventory or Sales File. The next section of this manual will deal with two ways to run the application program. The first is the quick way -- using the system default name (RESCCAL.MDO) and hard coded options. The second goes to the the Model Application Menu, using either the RESCCAL.MDO or a model the user has named and employing user set options.

QUICK WAY: APPLYING THE MODEL USING DEFAULT NAME (RESCCAL.MDO)

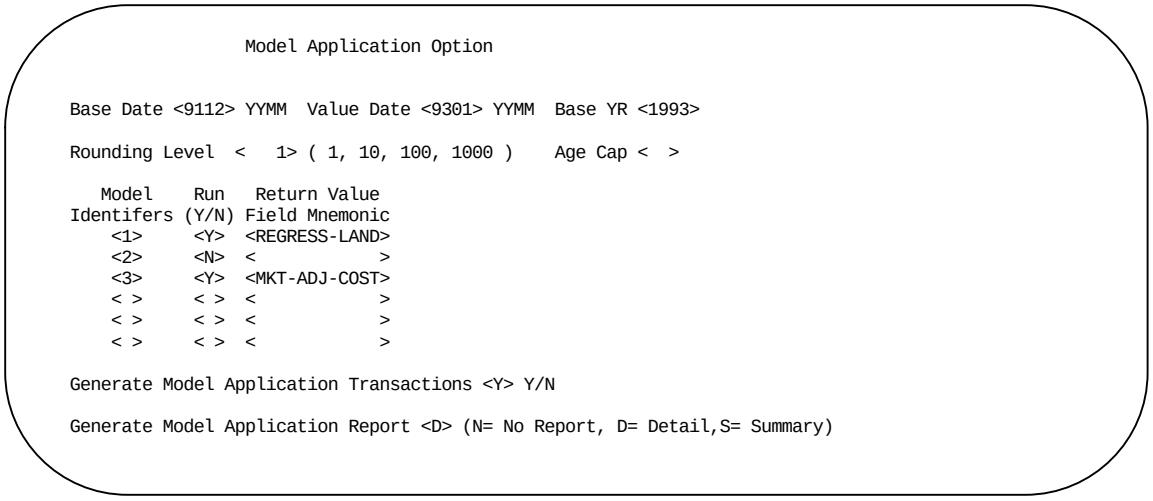
To apply the model choose #5, APPLY AUTOMATIC COST CALIBRATOR MODEL, at the AUTOMATIC COST CALIBRATOR Menu.

The user will first see the following question:

Process (I)nventory or (S)ales file?

The user would type the letter of the file they wish to value. It is advised that the model be completely tested before valuing the entire file. The user should at least value the sales file or a PID file of the sales in the inventory file, so that they can perform all of the Statistical Tests required for certification.

After answering the previous question, the File Selector Screen appears. The user can arrow right and then select a pre-defined option (*.MOP) file, or they can press 'x' to exit the screen. The following Option screen will then appear:



```
                Model Application Option


Base Date <9112> YYMM  Value Date <9301> YYMM  Base YR <1993>

Rounding Level  <   1> ( 1, 10, 100, 1000 )    Age Cap <  >

   Model    Run   Return Value
Identifers (Y/N) Field Mnemonic
    <1>     <Y>  <REGRESS-LAND>
    <2>     <N>  <             >
    <3>     <Y>  <MKT-ADJ-COST>
    < >     < >  <             >
    < >     < >  <             >
    < >     < >  <             >

Generate Model Application Transactions <Y> Y/N

Generate Model Application Report <D> (N= No Report, D= Detail,S= Summary)
```

BASE DATE- You should enter the same date that was entered in the Market Interface option screen.

VALUE DATE- You should enter the same date that was entered in the Market Interface option screen.

BASE YR- You should enter the same date that was entered under History Date in the Market Interface option screen.

ROUNDING LEVEL- You should enter the level of rounding you want your values to be.

AGE CAP- You should enter the depreciation cap you entered on the Cost Calibration option screen.

MODEL IDENTIFIERS- RUN (Y/N)- RETURN VALUE FIELD MNEMONIC- This section allows you to transfer the value for each of the three models this program generates, to the field you designate here. Model 1 generates the land value, Model 2 generates the building value and model 3 generates the total value.

GENERATE MODEL APPLICATION TRANSACTIONS <Y> Y/N - If you wish to generate the transactions back to the DMT file, type 'Y', if not press the TAB key.

GENERATE MODEL APPLICATION REPORT <N> (N= NO REPORT, D= DETAIL S= SUMMARY)- This procedure can create a report on how the values were determined. A Detail Report is similar to a Cost Report -- it gives complete detail on how the model is applied to the properties you wish to value. A summary report gives you the final values of each model you chose to value in the Model Identifiers section of this screen.

When you have completed all entries on this screen press ↵ENTER. The following question will appear:

ARE THE ABOVE OPTIONS CORRECT?

If they are type 'Y' and press ↵ENTER. If you pressed ↵ENTER before you wanted to, type 'N' and press ↵ENTER, to complete your entries.

Next the SAVE THE OPTION screen comes up. If you want to save the options you just filled out, choose *Enter a Filename*, and type an eight character or less name. The system will automatically give it the (*.MOP) extension, and this choice will appear in the right hand box of the FILE SELECTOR SCREEN the next time you use the application program. If you do not wish to save these options, just type 'x' to continue.

Next, the PARCEL SELECTOR SCREEN comes up. You can, at this point, choose a pre-defined PID file by pressing the right arrow and arrowing down to that file and then pressing ↵ENTER, or you can type 'x' to exit the screen and put in each entry or a range of parcels you wish to value.

Once a parcel selection is entered, the SAVE THE PARCEL SELECTION FILE: screen will come up. If you want to save the parcel selections just entered, choose, *Enter a Filename*, and type in an eight character or less name. The system will automatically add the .PID extension. If you used a pre-defined PID file or do not want to save the parcel selections just type 'x' to Exit the Screen.

Next the question:

Run MODEL APPLICATION TABLE (Y/N)? ***N***

Type 'Y' and press ↵ENTER to run the application program. If the decision is not to run the application program at that time, press ↵ENTER.

ALTERNATIVE WAY: APPLYING MODEL(S) USING USER GENERATED NAMES

If the user has named a model something other then the default, to apply that model, exit the AUTOMATIC COST CALIBRATOR menu and return to the RESIDENTIAL MARKET ANALYSIS MENU.

At this point choose, number 7, MODEL APPLICATION.

To run the model, choose number 1, RUN MODEL APPLICATION TABLE.

The user will then get the following question:

Process (I)nventory or (S)ales file?

Type the first letter of the File for processing and press ↵ENTER.

At this point the CHOOSE A MODEL APPLICATION TABLE (default is MDLAPP.DAT.) screen appears In the right hand box, the RESCCAL.MDO file or the model with the name you chose will appear. Arrow right and select the model you wish to use. (If you want to use the last model you generated, just type 'x' to continue. The last model generated, becomes the MDLAPP.DAT file. If you type 'x' you will then get the SAVE THE MODEL APPLICATION TABLE screen. The user at this point can name the file by selecting, *Enter a Filename*, or just choose to type 'x' to continue.)

Next the FILE SELECTOR screen comes up. The rest of this procedure is the same as outlined in the APPLYING THE MODEL USING THE DEFAULT NAME (RESCCAL.MDO).

V. PRINTING MODEL APPLICATION REPORTS

To print both the MODEL APPLICATION ERROR REPORT, and the MODEL APPLICATION REPORT. The user just has to select the corresponding number in the AUTOMATIC COST CALIBRATOR MENU or the MODEL APPLICATION MENU. The reports will automatically print.

MODEL APPLICATION ERROR REPORT.

This report is similar to a Cost Error report. It will list any parcel that has an error, that has caused the program not to value it. It will show the number of parcels read, the number in error, and thenumber processed.

A sample of this report is as follows:

```
*MODEL*  TOWN OF MOOSEJAW   MODEL APPLICATION ERROR REPORT    01/31/94   PAGE    1

    (ALL PARCELS LISTED BELOW HAVE BEEN SKIPPED BECAUSE OF ERROR)

 500/004.0-0000-0005.0 9209  BLDG-STYLE IN THE RES RECORD IS IN ERROR


              MODEL APPLICATION SUMMARY

              NUMBER OF PARCELS READ                    414
              NUMBER OF PARCELS IN ERROR                1
              NUMBER OF PARCELS PROCESSED     413
```

MODEL APPLICATION REPORT

There are two types of Model Application reports: A **Detailed** report that is the only one available through the AUTOMATIC COST CALIBRATOR MENU and a **Summary** report, which will print if that option is chosen when running the model using the MODEL APPLICATION menu.

The Detailed report is similar to a Cost Report, It shows the breakdown of the model using the first part, Land Value, and Third part, Total Value. If the user chose, under the options, to show model 2, that part will also print. Unlike the Cost Report, where one page will equal one parcel, multiple parcels will be listed on a page.

The Summary report will only list the values specified under the model identifiers section of MODEL APPLICATION OPTION FILE.

A sample of the Detailed Report follows:

```
*MODEL  TOWN OF MOOSEJAW  MODEL APPLICATION COMPUTATION REPORT  01/31/94  PAGE    1

   PARCEL-KEY = 500/001.0-0000-0002.0
            FIELD ID                      QUALIFYING FIELD ID.
   REC  MNEMONIC    VALUE   |OPERATION| MNEMONIC  CLASS   VALUE    RATE |CONTRIBUTN
       LAND-SIZE 19166.00000|    =    |LAND-TYPE    P   = P             |
       TEMP-0    19166.00000|         |                                 |
                            |         |NBHD-CODE    3   = 3   21545.2852|  21545.28
       TEMP-O    19166.00000|         |                           .2502|   4795.33
       TEMP-O    19166.00000|         |NBHD-CODE    3   = 3        .8195|  15706.53
                                          REGRESS-LAND| $42047.14     $42,047
-------------------------------------------------------------------------------
   PARCEL-KEY = 500/001.0-0000-0002.0
            FIELD ID                      QUALIFYING FIELD ID.
   REC  MNEMONIC    VALUE   |OPERATION| MNEMONIC  CLASS   VALUE    RATE |CONTRIBUTN
       LAND SIZE  19166.0000|    =    |LAND-TYPE    P   = P             |
       TEMP-0     19166.0000|         |                                 |
       TEMP-0     19166.0000|         |                           .2502|   4795.33
       TEMP-0     19166.0000|         |NBHD-CODE    3   = 3        .8195|  15706.53
   RES RCN        35827.0000|         |                           .9301|  33322.69
   RES RCN        35827.0000|    *    |                                |
   RES YEAR-BUILT    42.00000|   0    |           -.0030|  -4514.20
                             |         |       41852.7852|  41852.78
                                        MKT-ADJ-COS        91163.13   $91,163
-------------------------------------------------------------------------------
```

Below is a sample of the Summary Report:

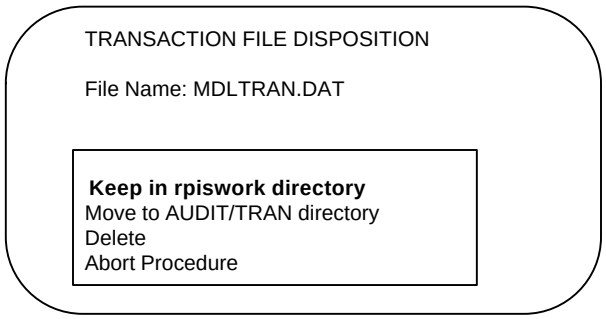
```
*MODEL   TOWN OF MOOSEJAW    MODEL APPLICATION SUMMARY REPORT     01/31/94  PAGE    1

              PARCEL KEY                TRANSACTION           VALUE

          500/001.0-0000-0002.0 9203    REGRESS-LAND         $42,000
                                        MKT-ADJ-COST         $90,900
          500/001.0-0000-0004.0 9211    REGRESS-LAND         $59,800
                                        MKT-ADJ-COST        $112,200
          500/001.0-0000-0006.0 9212    REGRESS-LAND         $46,700
                                        MKT-ADJ-COST        $145,900
```

VI. APPLYING ACC TRANSACTIONS

To transfer the values created by the Cost Calibration Application program back to the database, FOLLOW THESE STEPS:

At the ACC menu, choose number 8. APPLY AUTOMATIC COST CALIBRATOR TRANSACTIONS or at the MODEL APPLICATION menu, choose number 4. APPLY MODEL APPLICATION TRANSACTIONS.

The user will then see a screen similar to the box below:



The user should type a 'd' (this is a system generated transaction file. If it is not deleted, it will take up space in your rpiswork directory. It is strongly recommended that you delete this file.)

At this point the user may now run any valuation testing procedures to find out if the above model meets DOR certification guidelines.

VII. Errors In Calibration Process

A cost calibration run will have errors. Some of the errors are minor and the cost calibration process will correct them. Some of the errors, however, will cause the program to abort without generating a model. On the next few pages are the error codes for cost calibration, what the codes mean, and how they can be fixed.

CODED ERROR MESSAGES

ERROR CODE	ERROR SUBCODE	ERROR (* REPRESENTS A SERIOUS ERROR)	CORRECTIVE ACTION
501*	LINE NO.	LINE IN THE INPUT VARIABLE DESCRIPTIONS DOES NOT START WITH 5001 OR IS OUT OF SEQUENCE.	CORRECT THE VARIABLE DESCRIPTION TABLE
502*		NO VARIABLES DEFINED IN VARDSC.TBL	CORRECT THE VARIABLE DESCRIPTION TABLE
503*	LINE NO.	LINE IN THE INPUT CLASSIFICATION TBL DOES NOT START WITH 5002 OR IS OUT OF SEQUENCE.	CORRECT THE VARIABLE DESCRIPTION TABLE
601*		CONVERGENCE FAILURE	SEGMENT THE MARKET
701*		TOO MANY CONTINUOUS VARIABLES IN SALES ANALYSIS	REDUCE THE NUMBER OF BASIC LAND OR BUILDING DESIGNATORS IN THE INPUT VARIABLE DESCRIPTION TABLE
702*		TOO MANY CLASSIFICATION VARIABLES IN SALES ANALYSIS	REDUCE THE NUMBER OF LAND OR BUILDING ADJUSTMENTS IN VARDSC.TBL
703*		NO CONTINUOUS VARIABLES IN VARDSC.TBL	CORRECT THE VARDSC.TBL
704		NO CLASSIFICATION VARIABLES IN VARDSC.TBL	CORRECT THE VARDSC.TBL
705*	VAR.INDEX	INVALID VARIABLE INDEX FOR A CONT. VAR.	CORRECT THE VARDSC.TBL
706	VAR.INDEX	MISSING CONTINUOUS VARIABLE	
707*		NO PARCELS FOR CONTINUOUS NUMERIC VAR.	
708*	VAR.INDEX	TOO MANY CLASSIFICATIONS IN SALES ANAL.	
709*	VAR.INDEX	UNABLE TO FIND CLASSIFICATION VARIABLE IN THE VARDSC.TBL	CALL 1-800-521-5536
801*		MISSING THE FILE LABEL (RECORD 8001) IN MARKET DATA FILE	FIX MARKET INTERFACE
802*		MISSING THE PARCEL RECORD LAYOUT (REC 8002) IN THE MAR. DATA FILE	FIX MARKET INTERFACE
803* (808*)		MISSING THE VARIABLE TYPES AND NAME LOCATIONS (RECORD 8003) IN MAR. DATA FL.	FIX MARKET INTERFACE
804* (809*)		MISSING THE VARIABLE AND LEVEL NAMES (RECORD 8004) IN MAR. DATA FILE	FIX MARKET INTERFACE
805* (810*)		MISSING THE APPRAISAL DESIGNATORS (RECORD 8005) IN MAR. DATA FILE	FIX MARKET INTERFACE
806*		MISSING PARCEL RECORDS (RECORD 8006) IN THE MARKET DATA FILE	FIX MARKET INTERFACE
807		MISSING THE FILE TERMINATOR (RECORD 9999) IN MARKET DATA FILE	NONE
811*		UNIDENTIFIABLE RECORD OR PARCELS OUT OF SEQUENCE IN MARKET DATA FILE	FIX MARKET INTERFACE
812*	NO.OF VARS	TOO MANY VARIABLES IN PARCEL RECORD	FIX MARKET INTERFACE
813*	NO.OF VARS	TOO FEW ENTRIES IN THE VARIABLE TYPES, NAMES LOCATIONS AND CODING CONSTANT TBL	FIX MARKET INTERFACE
814*	NO.OF VARS	TOO MANY ENTRIES IN THE VARIABLE TYPES, NAMES LOCATIONS AND CODING CONSTANT TBL	FIX MARKET INTERFACE
815*	NO.OF ENTS	TO FEW ENTRIES IN THE VARIABLE AND LEVEL NAMES TABLE	FIX MARKET INTERFACE
816*	NO.OF ENTS	TO0 MANY ENTRIES IN THE VARIABLE AND LEVEL NAMES TABLE	FIX MARKET INTERFACE
901	VAR.INDEX	MISSING NUMERIC VARIABLE	NONE
902	VAR.INDEX	EDIT FAILURE	NONE
1001*	LINE NO.	TOO MANY GLOBAL ADJ IN THE VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1002*	LINE NO.	GLOBAL ADJ. IS NOT CLASSIFICATION VAR.	FIX THE MODEL DEFINITION IN VARDSC.TBL
1003*	LINE NO.	TOO MANY LAND ADJ IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1004*	LINE NO.	LAND ADJ. IS NOT CLASSIFICATION VARIABLE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1005*	LINE NO.	TOO MANY BLDG ADJ IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1006*	LINE NO.	BLDG ADJ IS NOT A CLASSIFICATION VARIABLE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1007*	LINE NO.	TOO MANY BASIC LND VAL DETERMINANTS IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
ERROR CODE	ERROR SUBCODE	ERROR (* REPRESENTS A SERIOUS ERROR)	CORRECTIVE ACTION
1008*	LINE NO.	BASIC LND VAL DETERMINANTS IS NOT A CONTINUOUS VARIABLE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1009*	LINE NO.	MULTIPLE LND VAL SURROGATES IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1010*	LINE NO.	LND VAL SURROGATE IS NOT CONTINUOUS VAR.	FIX THE MODEL DEFINITION IN VARDSC.TBL
1011*	LINE NO.	MULTIPLE MAIN STRUCT. RCNS IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1012*	LINE NO.	MAIN STRUCT. RCN IS NOT A CONTINUOUS VAR.	FIX THE MODEL DEFINITION IN VARDSC.TBL
1013*	LINE NO.	MULTIPLE DET STRUCT RCNLDS IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1014*	LINE NO.	DET STRUCT RCNLD IS NOT CONTINUOUS VAR.	FIX THE MODEL DEFINITION IN VARDSC.TBL
1015*	LINE NO.	MULTIPLE REL. DATE OF SALE IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1016*	LINE NO.	RELATIVE DATE OF SALE IS NOT REL. DATE	FIX THE MODEL DEFINITION IN VARDSC.TBL

1017*	LINE NO.	MULTIPLE YEARS BUILT IN VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1018*	LINE NO.	YEAR BUILT IS NOT CONTINUOUS VARIABLE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1019*	LINE NO.	MULTIPLE SALE PRICES IN THE VARDSC.TBL	FIX THE MODEL DEFINITION IN VARDSC.TBL
1020*	LINE NO.	SALE PRICE IS NOT CONTINUOUS VARIABLE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1021*		MISSING SALE PRICE	FIX THE MODEL DEFINITION IN VARDSC.TBL
1022*		NO LND SURROGATE OR BASIC LND VAL DET.	FIX THE MODEL DEFINITION IN VARDSC.TBL
1023*		NO LAND SURROGATE TO BE ADJUSTED	FIX THE MODEL DEFINITION IN VARDSC.TBL
1024*		NO LAND SURROGATE TO BE ADJUSTED	FIX THE MODEL DEFINITION IN VARDSC.TBL
1025		NO LAND TERMS	NONE
1026		NO LAND OR GLOBAL ADJUSTMENTS	NONE
1027*		NO MAIN STRUCTURE RCN	FIX THE MODEL DEFINITION IN VARDSC.TBL
1028*		NO MAIN STRUCTURE RCN TO BE ADJUSTED	FIX THE MODEL DEFINITION IN VARDSC.TBL
1029		NO BLDG(RCN) OR GLOBAL ADJUSTMENTS	NONE
1030		NO DATE OF SALE(FOR IN/DEFLATION AND SEASONALITY ADJ.)	NONE
1031		No Year Built (for an age adjustment)	none
1032*		No Detached Structure RCNLD	Fix the model definition in VARDSC.TBL
1033*	NO.of TERMS	Too many terms in the model formulation	Fix the model definition in VARDSC.TBL
1101* (1104*)	Var.INDEX	Too many names	Reduce num of non-essential variables passed by Market Interface
1102	VAR.INDEX	Transgeneration is a Temp. Variable	none
1103*	VAR.INDEX	Too many transgenerated variables	Reduce the number of non-essential variables passed by Market Interface
1105	VAR.INDEX	Missing variable	none
1106*		No parcels for regression analysis	either correct sales data for missing variable, or remove problem variable from the VARDSC.TBL
1107	VAR. NO	Zero determinant	Increase Num of Sales (if possible)
1108*	VAR. NO	Singularity	Increase Num of Sales (if possible)
1301*		Non-refinable model (non-correctable negative surrogate)	Call 617-626-2350
1302*		Non-refinable model (interaction does not involve surrogate)	Call 617-626-2350
1401*	VAR.INDEX	Classification Variable not found in the VARDSC.TBL	Call 617-626-2350
1402*	VAR.INDEX	Linearization Table full (too many ordinal classification variables)	Change the least significant variable(s)
1403*	VAR.INDEX	Tabulations of a classification var. not found	Call 617-626-2350
1404*	CLASS.NO.	Classification Binary not in the model	Call 617-626-2350
1405*	LIN.TBL.NO.	Sequence of ordinal variable not ascertainable	Call 617-626-2350
1406	VAR.INDEX	Linearized interaction is a temp. var.	none
1407*	VAR.INDEX	Too many variables	Reduce num. of non-essential variables passed by Market Interface
1408*	VAR.INDEX	Too many names	Reduce num. of non-essential variables passed by Market Interface
1409*	VAR.INDEX	Class. Var. not found in VARDSC.TBL	Call 617-626-2350
1501		No Neighborhoods or too many NBHDs	Make sure the NBHD Var. is defined to be Class. Var. in Market Interface
1502*	MODEL TERM	Var. in model not located in VARDSC.TBL	Call 617-626-2350
1503*		No parcels for the land statistics	Either correct the sales data for the missing variable, or remove the problem variable from the VARDSC.TBL
Errors 1601-1604			Call 617-626-2350

VIII. COST CALIBRATION REPORTS

1. SYSTEM ID - These are the two splash pages that comes out on most Mod Pro II reports.
2. ERRORS - By choos ing this component, the report would list all errors, that occurred during the Cost Calibration run.
3. VARIABLE DESCRIPTION TABLE - This shows the users the input file used to run Cost Calibration. For the advanced user, they can edit this file to fine tune Cost Calibration Models.
4. INPUT SUMMARY - A brief description of the raw data format. For most users, there is no reason to print this.
5. **SALES DISTRIBUTIONAL ANALYSIS**- This is a one page summary, that gives the minimum, maximum, range, mean, variance, Standard Deviation, Standard Error, Coefficient of Variation and parcel count, for the nine main data fields needed to run Cost Calibration.
6. SALES CORRELATION MATRIX - This is a simple matrix measuring collinearity, which means, how closely related each variable is to another. For the average user, this matrix will have no value.
7. SALES HISTOGRAM - This is nine pages of histograms showing the number of occurrences for the 9 main datafields needed to run Cost Calibration.
8. **SALES FREQUENCY TABULATIONS**- This five page section, gives you the the number of times each edit appears for all classified Data Fields in the Variable Description Table.
9. EDIT IDENTIFICATION - These are the initial edits developed by AUTOMATIC COST CALIBRATOR using histograms to display raw data and excludes outliers, it recognizes patterns.
10. MODEL FORMULATION - The first run using all of the initial variables, including binaries. the report will display whether the variable is usable or not, and why.
11. INITIAL MODEL STATISTICS - This display includes all variables included in the modeling run. The report displays basic statistics for each candidate elements in the model.
12. INITIAL CORRELATION MATRIX - As of now, this is not available.
13. STEPWISE SELECTION - This very lengthy component, shows every step the cost calibration process has taken. Only an advanced user would find this useful.
14. INITIAL REGRESSION MODEL - This component displays the model achieved after the first pass through the data.
15. INITIAL MODEL EXCLUSIONS - This shows the list of all candidate variables that for some reason or another were not used by the AUTOMATIC COST CALIBRATOR.
16. INITIAL AOV - This component displays the statistical goodness of fit for the initial pass at the model.
17. INITIAL STEP SUMMARY - This component displays the order in which variables were added and subtracted in the model building process.
18. INITIAL MODELS REFINEMENTS - This component shows steps taken to refine data elements that the Automatic Cost Calibrator have determined an illogical result.
19. REFINED REGRESSION MODEL(S) - The regression model after each refinement.
20. FINAL REFINED REGRESSION MODEL- The regression model when no more refinements are needed.
21. FINAL REFINED MODEL EXCLUSIONS - This component shows all of the candidate variables excluded from the final refined model.
22. FINAL REFINED AOV - The statistical goodness of the refined regression model.
23. REFINED STEP SUMMARY - Same as number 17.
24. RESIDUAL ERROR DISTRIBUTION - This component shows the distributional statistics on the actual dollar miss of the actual sales price against the model estimate.
25. RESIDUAL ERROR HISTOGRAMS - Histograms of the above component.
26. SUPPLEMENTAL EDIT IDs - This component shows the final list of edits that if a property fails will cause an error.
27. LINEARIZATION - The Cost Calibrator will analyze the classification of ordinal variable to come up with a multipli cative dollar amount for a specific variable. An example would be Overall Condition.
28. LINEARIZATION MODEL STATISTICS - Same as number 11.
29. LINEARIZATION MODEL CORRELATION - As of now not available.

30. LINEARIZED REGRESSION MODEL - The regression initial regression model after linearization.
31. LINEARIZED MODEL EXCLUSIONS - Same as number 15.
32. LINEARIZED AOV - Displays the Statistical goodness of fit after linearization of the model.
33. LINEARIZED STEP SUMMARY - Same as number 17.
34. LINEARIZED REFINEMENTS - Same as number 18.
35. REFINED LINEARIZED MODEL - Same as number 19.
36. FINAL LINEARIZED MODEL - Same as number 20.
37. FINAL LINEARIZED EXCLUSIONS - Same as number 21.
38. FINAL LINEARIZED AOV - Same as number 22.
39. REFINED LINEARIZED STEP SUMMARY - Same as number 17.
40. **FINAL REGRESSION MODEL** - This is the final model that the AUTOMATIC COST CALIBRATOR run produced.
41. **FINAL MODEL EXCLUSIONS** - The final list of candidate variables excluded from the model.
42. **FINAL ANALYSIS OF VARIANCE** - The final Statistical goodness of the model.
43. **FULL SALES RATIOS** - This gives the assessment/sales ratio of all sales not excluded during the ACC run.
44. **STRATIFIED SALES RATIOS** - Same as # 43 but for each array designated by user in setting up Cost Calibrator run.
45. **FULL RATIO STATISTICS** - This gives the Final Statistics by quartiles and overall, this component includes overall median and Coefficient of Dispersion (COD).
46. **STRATIFIED RATIO STATISTICS** - Same as # 45 but for each array designated by user in setting Cost Calibration run.

*** Note: Number 44 and 46 actually give the same information as #'s 43 and 45. To get best breakdown of how each individual edit in the data fields designated, # 47 is best selection.

47. **STRATIFIED RATIOS SUMMARY** - This component gives a breakdown of each edit of the datafield designated for stratification. For example if Building Style was chosen. It would give the number of times each style occurred, the median ratio for each style, and the COD for each style.
48. EXCLUDED SALES - This gives a final list of all sales excluded in the Cost Calibration run.
49. LAND STATISTICS - Distributional Statistics based entirely on land influences.
50. MODEL DECOMPOSITION - This component breaks out the average land to total amounts by neighborhood. It also shows the building constant by neighborhood.
51. MODEL APPLICATION TABLE - This is the model showing how the datafields will be adjusted for.
52. SALES ANALYSIS COMMAND LANGUAGE -
53. COST CAL MODELING COMMAND LANGUAGE
54. LAND STATISTICS COMMAND LANGUAGE
55. SALES VALUATION COMMAND LANGUAGE
56. SUBJECTS VALUATION COMMAND LANGUAGE
57. LAND MODEL PRESENTATION
58. BUILDING MODEL PRESENTATION
59. LAND MODEL VALUATION TABLES
60. BUILDING MODEL VALUATION TABLES

61-63. Spares

64. **ERROR SUMMARY** - This component will tell how many errors were encountered during the Cost Calibration run.
65. PRINT SUMMARY - Shows number of records, not parcels, printed for each requested rep ort.

IX. STATISTICAL CONCEPTS USED IN INTERPRETING AUTOMATIC COST CALIBRATOR RESULTS -- Summarized For The Statistically Challenged

[SOME OF THE REPORTS IN WHICH TERMS ARE USED NOTED IN BRACKETS]

AGGREGATE RATIO: The sum of all of the assessments divided by the sum of all of the sales prices. The Aggregate Ratio and the Median Ratio should be tightly clustered around 1.0000 in a successful ACC model. Compare with mean ratios to show progressivity or regressivity.
[SALE RATIO STATISTICS REPORT]

COEFFICIENT OF DETERMINATION: Same as **R^2**

R^2 : (pronounced R squared) Measures the percentage of the variation in sales prices explained by the regression model. What we're looking for is perfection, i.e. 100% --- which never happens. An R^2 of .88 or .93 is BEAUTIFUL! An R^2 of .67 or .70 is UGLY! This number measures how well the strength of association between descriptors of a property can predict sale price. It measures how close **all** property descriptors, in total, can predict market value.
[ANALYSIS OF VARIANCE][STEP SUMMARY REPORT]

COEFFICIENT OF DISPERSION (COD): For assessors, the key measure of assessment/sale ratio variation, i.e. uniformity. It measures the average pecentage by which individual ratios vary from the median ratio. The lower the number, the better. "A low COD indicates that appraisals within the area or class of property are uniform; a high COD indicates that properties are being appraised at inconsistent percentages of market value."
[SALE RATIO STATISTICS REPORT]

COEFFICIENT OF VARIATION: Like the Standard Deviation (see below) except that the COV is a percentage of the mean ratio rather than a raw decimal or ratio. It needs a normal, bell-shaped distribution of data to be meaningful. ***FORGET IT***
[DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

DEGREES OF FREEDOM: This just means the freedom to vary. How many instances are there? All that is done is to count up all of the parcels (when doing ACC) and then minus 1. We take one away because in averaging the mean, or any other computation, you will up one degree of freedom. ***FORGET IT***

DETERMINANT: A factor that causes a change in price or market desirability. For example, "Location" is one determinant for a piece of property. ***FORGET IT***
[ANALYSIS OF VARIANCE][STEP SUMMARY REPORT]

F RATIO: One of the **tests of significance,** in other words, is it good? Does it mean something? When measuring something against the **F** test, what is being measured is "homogeneity of variance" a rather complicated name for, "how important is the variability of a descriptor variable"? For example: say we have OVERALL-GRADE as a **descriptor** variable, now we need to check to "see" if that variable (descriptor) was important enough to help predict the market value of property. This is the statistic that we will use in most of the regression analysis. It is used for large quantities of sales (over 100 or so). It is an easy statistic to use. For our purposes, if the **F** is 4 or larger then the descriptor variable it is defining is good. How good? Check how high **F** goes. If the **F** is less than 4 the variable will be kicked out of the model.
[REGRESSION MODEL REPORT] [ANALYSIS OF VARIANCE][STEP SUMMARY REPORT]

INDEX OF INEQUALITY: ***FORGET IT***

LINEARIZATION: A phase of of the modelling process in which appropriate classification variables are automatically transformed into continuous variables measured on a cardinal scale. For example,

CONDITION might range from 'EXCELLENT' to 'POOR'. The word 'EXCELLENT' means nothing to a mathematical equation. A number that calculates "percent good", however, can fit right into an equation. Linearization would transform 'EXCELLENT' to 1.00, etc. and make sure that each CONDITION step was proportionately correct.

LINEAR MODEL: This is a model that has a dependent variable (usually price) that is trying to be explained by other descriptor variables, and the results have a straight line or "linear" result to them.
[ANALYSIS OF VARIANCE]

MAXIMUM : The biggest, e.g. highest sale price.
[SALE RATIO STATISTICS REPORT] [DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

MEAN: The arithmetical average, which can be dramatically affected by extreme data at either end of the spectrum, e.g. a $2,000,000 sale in a small town full of properties typically valued at $100,000.
[SALE RATIO STATISTICS REPORT] [DISTRIBUTIONAL ANALYSIS SUMMARY REPORT] [ANALYSIS OF VARIANCE]

MEAN SQUARE: Another name for "variance", not used much anymore. Nowadays, those statistical hot shots that impress us the most use the STANDARD DEVIATION.
[ANALYSIS OF VARIANCE][STEP SUMMARY REPORT] ***FORGET IT***

MEDIAN: The "middle" of an array of numbers, be they sale prices, scores or what have you. It is a count of how many and then ranked in order (high to low), the center is found. Equal amounts are on each side of the "median". For our purposes, median is usually more reliable than mean.

MINIMUM : Littlest or smallest of the group, e.g. the lowest sale price.
[SALE RATIO STATISTICS REPORT] [DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

MNEMONIC: Pronounced NEE-MONIC. What a variable name is called. Mnemonic is a name for an "English" sounding name, as opposed to a number. For example: UPPER-STORY-LIVING-AREA is easier to remember than X253. **UPPER-STORY-LIVING-AREA** is the **MNEMONIC** for variable X253.
[MODEL APPLICATION TABLE]

MULTIPLE CORRELATION: See R^2 -- same idea.
[ANALYSIS OF VARIANCE]

PARTIAL SQUARED CORRELATION: ***FORGET IT***
[REGRESSION MODEL REPORT]

PERCENTAGE RESIDUAL ERROR: The difference between an observed value (sales price) and the predicted value (market value) expressed as a percentage. Big numbers here are not a good sign. Leads up to a COD calculation.
[SALE RATIO STATISTICS REPORT]

PRICE RELATED DIFFERENTIAL: Differentials of less than 1.0 are indicators of assessment progressivity (high value properties are over-appraised), those greater than 1.0 are indicators of assessment regressivity(high value properties are under-appraised). A word of warning, because of the bias built into in the measure, anything in the range of 0.95 to 1.10 is considered inconclusive of any trend, up or down.
[SALE RATIO STATISTICS REPORT]

RANGE: The highest score (or sale price) minus the lowest score (or sale price) plus 1.
[DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

REGRESSION COEFFICIENT : A term of the resulting regression model that reflects a particular descriptor's contribution to the overall predicted value of the property, e.g. the Regression Coefficient for neighborhood 103 is 1.45168. Multiply that coefficient by the square feet of land and you have, in dollars, the locational value of neighborhood 103 in the overall regression-predicted value of the property.
[REGRESSION MODEL REPORT]

RESIDUAL ERROR: The difference between the observed value (sale price) and the predicted value (assessment).
[SALE RATIO STATISTICS REPORT] [ANALYSIS OF VARIANCE]

STANDARD DEVIATION : The primary measure of dispersion in can, given normal, bell-shaped distributions of data, be a powerful measure of appraisal uniformity.
[SALE RATIO STATISTICS REPORT][DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

STANDARD ERROR OF THE ESTIMATE: Or SEE for short. In regression, you will never have predicted values identical to the sale prices, unless somebody has really cheated. What we have left over is a statistic called the "standard error of the estimate". The closer we get to predicting the sale price, the smaller this value will be. The range of this can be from zero (hardly likely) up to 1 standard deviation. Suffice to say, we're looking for a relatively small number here.

STANDARDIZED REGRESSION COEFFICIENT: ***FORGET IT***
[REGRESSION MODEL REPORT]

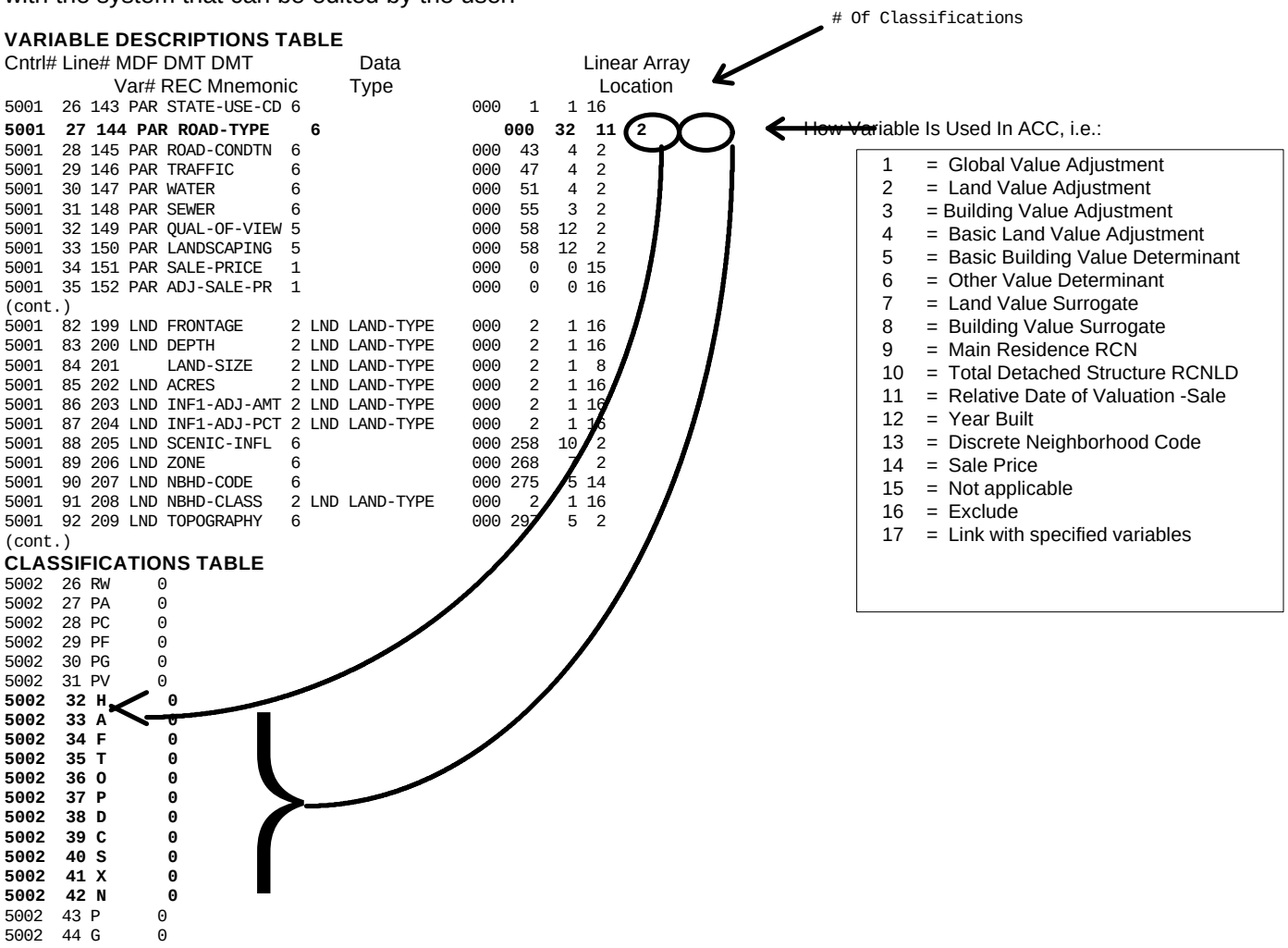
SUM OF THE SQUARES: The value obtained by adding all of the squares of the deviations from the mean value. Usually it is the sum of the squares of the deviation of an individual value (i.e.Joe's lot size) from the mean value (average neighborhood lot size) of that variable . Looking for a relatively low value here.
FORGET IT
[ANALYSIS OF VARIANCE]

T TEST: Or called T ratio. Used when the number of cases are low. This case can be effected by extremes in the data. A table is used to look up these values, i.e. ***FORGET IT***.
[REGRESSION MODEL REPORT]

VARIANCE: The average squared error of the regression model. ***FORGET IT***.
[DISTRIBUTIONAL ANALYSIS SUMMARY REPORT]

X. Variable Description and Classifications Tables- - Simplified for Advanced Users

The Variable Descriptions Table functions both as a data library (mapping very variable on the Market Data File to its location in the source data base) and as a variable usage guide (describing the general use of each variable in the overall ACC valuation process). This required table is a text file with a standard form provided with the system that can be edited by the user.



VARIABLE DESCRIPTIONS TABLE

Cntrl#	Line#	MDF	DMT Var#	DMT REC	Mnemonic		Data Type		Linear Array Location			
5001	26	143	PAR		STATE-USE-CD	6			000	1	1	16
5001	**27**	**144**	**PAR**		**ROAD-TYPE**	**6**			**000**	**32**	**11**	**2**
5001	28	145	PAR		ROAD-CONDTN	6			000	43	4	2
5001	29	146	PAR		TRAFFIC	6			000	47	4	2
5001	30	147	PAR		WATER	6			000	51	4	2
5001	31	148	PAR		SEWER	6			000	55	3	2
5001	32	149	PAR		QUAL-OF-VIEW	5			000	58	12	2
5001	33	150	PAR		LANDSCAPING	5			000	58	12	2
5001	34	151	PAR		SALE-PRICE	1			000	0	0	15
5001	35	152	PAR		ADJ-SALE-PR	1			000	0	0	16
(cont.)												
5001	82	199	LND		FRONTAGE	2	LND	LAND-TYPE	000	2	1	16
5001	83	200	LND		DEPTH	2	LND	LAND-TYPE	000	2	1	16
5001	84	201			LAND-SIZE	2	LND	LAND-TYPE	000	2	1	8
5001	85	202	LND		ACRES	2	LND	LAND-TYPE	000	2	1	16
5001	86	203	LND		INF1-ADJ-AMT	2	LND	LAND-TYPE	000	2	1	16
5001	87	204	LND		INF1-ADJ-PCT	2	LND	LAND-TYPE	000	2	1	16
5001	88	205	LND		SCENIC-INFL	6			000	258	10	2
5001	89	206	LND		ZONE	6			000	268	7	2
5001	90	207	LND		NBHD-CODE	6			000	275	5	14
5001	91	208	LND		NBHD-CLASS	2	LND	LAND-TYPE	000	2	1	16
5001	92	209	LND		TOPOGRAPHY	6			000	297	5	2
(cont.)												

CLASSIFICATIONS TABLE

5002	26	RW	0
5002	27	PA	0
5002	28	PC	0
5002	29	PF	0
5002	30	PG	0
5002	31	PV	0
5002	**32**	**H**	**0**
5002	**33**	**A**	**0**
5002	**34**	**F**	**0**
5002	**35**	**T**	**0**
5002	**36**	**O**	**0**
5002	**37**	**P**	**0**
5002	**38**	**D**	**0**
5002	**39**	**C**	**0**
5002	**40**	**S**	**0**
5002	**41**	**X**	**0**
5002	**42**	**N**	**0**
5002	43	P	0
5002	44	G	0

How could you edit this file? The simplest (and safest) example is excluding a variable. If you wanted to exclude ROAD-TYPE from the model, you would simply change the '2' in the far right column to a '16'. Alternatively, you might want to add classifications (additional codes) to a variable. This is more involved since your will have to change the # of classifications in the Variable Descriptions Table (circled 11 in the example above), add the variable in the correct position in the Classifications Table, and then, unfortunately, renumber all the sequential line numbers that are now incorrect. Obviously, as with all text files, positioning of columns must be maintained. Copy the file to a safe place and a new name before editing.

XI. If it Doesn't Work - Best Guesses on Common Problems

COMMON PROBLEM 1: You get the following result

```
COST CALIBRATION IS DONE.  Model could not be generated.
Time of completion 4/18/95,  1:49:45 pm

Background messages:
***Condition ERROR raised
***Unhandled condition SIGFPE at PC=0002B000
```

Answer: You are getting a floating point error message indicating that either you don't have a math coprocessor or you are using the 80486 version on a 80386 or vice versa. Both versions are on your system, and your DOR advisor can help you copy the right version of *resccal.** tp *resccal.exe* in your */usr/sigma/mkt/exec* (UNIX) or *\SIGMA\MKT\EXEC* (DOS) directories.

COMMON PROBLEM 2: You get the following result

```
COST CALIBRATION IS DONE.  Model could not be generated.
Time of completion 4/18/95,  1:49:45 pm
```

Answer: ACC gave up, at some point, in trying to develop a model. Look at the last entries in the ERROR REPORT, report # 2 in the ACC report listing. If you did not select ERROR REPORT as custom output, re-run ACC to select and print this report. Depending on the nature of the fatal error, you can try re-running Market Interface with a different data set (more, less, or different parcels), targetting a troublesome variable in the Variable Descriptions Table, look for significant data quality problems in your sales file, or give up because you just don't have enough good sales to generate a statistically valid model.

"Singularity" will be a common term in fatal error reports. Singularity in this case means that two variables are measuring essentially the same thing, i.e. multi-collinearity. For example, SIZE and ROOMS both measure living area, and one or both may behave unpredictably if forced into the same model. How do you deal with singularity? Expand the number of sales, if possible, or track down the offending variables and eliminate one (see excluding variables in the section on the Variable Description Table).

COMMON PROBLEM 3:

The model looks good, but the applied values are, in general, dramatically different than existing values. On closer inspection, the applied values don't seem to correspond to the model.

Answer: Is the BASE DATE in the Model Application Options file the same as that used in the Market Interface run? If not, you are going to get nonsensical results.

COMMON PROBLEM 4:

Stupid reasons: "Model could not be generated" could result from something stupid like picking the wrong Market Interface file. Don't assume failure is caused by an intimidating, highly technical defect that you do not have the statistical background to uncover. Start your analysis by eliminating the possibility of silly mistakes, and then progressively move to the problems you can't possibly understand. In the process, you will learn a little more about the incomprehensible each time.

XII.”I’ve got a model. I’ve got ACC values. So what? What do I do now?”

The COD is good. The stratified ratio stats look good. Do I have useable, defensible values? Assuming that you have initially tested the representativeness of the sales file to your subjects file, apply the model to your sales file and analyze the results. How? As one approach, run an IQ REPORT in a a spreadsheet format that calculates an assessment/sale ratio for both ACC and traditional cost values, the ACC percent residual error, displays key variables like neighorhood code, building style and overall grade, and is sorted by the percent residual error. Among the parcels with exceptionally large residual errors (at both ends of the spectrum) do you see any patterns? Check your photographs of the properties. Get in your car and field review them. More often than not, you will find significant data errors among these properties: wrong style, wrong grade, wrong condition, etc. Land only sales coded as 101’s? These will pop up as pct residual errors in the 2.00 range. When were your neighborhood boundaries defined and by whom? Do they adequately reflect today’s market and your judgement? Are values in a discrete section of one neighborhood coming in consistently too low or too high? Are there alternative ways of stratifying the sales ratios that would pinpoint problems? Did the model bring in a variable that helps result in a model with acceptable stats but is inherently indefensible in your town, e.g. when TRAFFIC = ‘LIGHT’ value decreases by $20,000. Has the model picked up TRAFFIC instead of a more significant and explainable variable, such as light traffic streets predominate in an area of town with a bad elementary school or contaminated ground water? In short, the first few model runs can be the just the beginning of analyzing sales and subjects, existing and proposed values. The wealth of statistics that the ACC will automatically produce can, in knowledgeable hands, provide valuable clues to where values can be improved.

The built-in flexibility of the CAMA system in allowing you to set up “what if” dummy communities combined with batch processing and PID file generation means you can try out different schemes, run these separately through Market Interface, and try ACC modeling on the new data without ever altering your community’s actual data until you are absolutely sure you want to.

In our testing of the ACC on actual communities’ data, the ACC has consistently outperformed traditional cost even with significant amounts of bad data. There have been logical, correctable, reasons for large residual errors. Some properties types or locations cannot be accommodated by the ACC models, if too few or no sales exist.

XIII. The Top Ten ACC Reports and What You Should Pay Attention To

In Descending Order of Relevance, i.e. What will you look at first ?

(These are merely suggestions - you may have other preferences.)

1. **ERROR SUMMARY (#2): What went wrong? If nothing fatal, this drops to 10.**
2. **FULL STRATIFIED RATIO STATISTICS (#45): Did you get a model with decent results?**
3. **STRATIFIED RATIO STATISTICS (#46): Let's analyze the results of #45 a little closer.**
4. **STRATIFIED RATIOS SUMMARY (#47): Overview of stratified results**
5. **FINAL REGRESSION MODEL (#40): OK, let's look at the actual model.**
6. **FINAL HISTOGRAMS OF RESIDUAL ERRORS (#25): How nice is the curve?**
7. **FINAL ANALYSIS OF VARIANCE (#42):**
8. **FINAL MODEL EXCLUSIONS (#41):**
9. **MODEL DECOMPOSITION REPORT (#50): How do land & building break out by NBHD?**
10. **MODEL APPLICATION REPORT (from menu): How is the model applied to each parcel?**