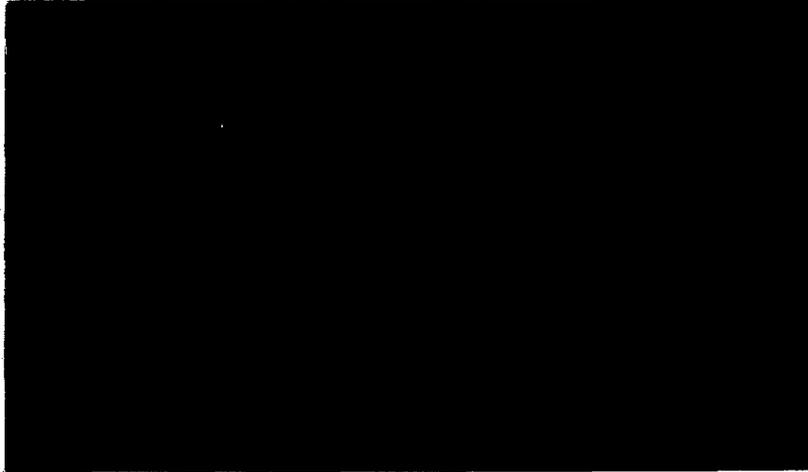


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93591

Shelter Sector Reform Project Newly Independent States of the Former Soviet Union



An ICMA Report

Prepared for the Office of Housing and Urban Programs
Agency for International Development



TRIP REPORT

**Land and Property Tax Assessment:
Seminar on Computer-Assisted Mass Appraisal
and Development of an Action Plan**

November 1996

Prepared for

U.S. Agency for International Development
ENI/EEUD/UDH

By

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ICMA Consultants

INTERNATIONAL CITY/COUNTY MANAGEMENT ASSOCIATION
Shelter Sector Reform Program for
The Newly Independent States of the Former Soviet Union
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ABSTRACT

This report was prepared by Messrs. Richard Almy and Robert Gloudemans, ICMA Consultants in Armenia, under Task Order 88. It contains a summary of their consulting activities in the field of Land and Property Tax Assessment and an overview of a seminar they conducted on Computer-Assisted Mass Appraisal (CAMA).

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1. Overview

1.1 Objectives and Tasks

The following table attempts to match tasks with objectives in the scope of work for Task Order #88:

Scope of Work Task	Understanding and use of market-based methods of property assessment	Training in CAMA and related aspects of property tax administration	Other comments and objectives
(1) Provide general policy advice on improving property tax methods.	There is a match. The STI is specifically interested in help with drafting combined tax law beginning 1/97.	There is a match. Policy recommendations could be part of a training program.	There was little opportunity to do this during this mission. Re passports: getting counterparts to examine the relevance of traditional inventorization, registration, and valuation would be desirable.
(2) Assist in preparation of an organizational plan/action plan for tax assessment.	There is a match.	There is a match. Training likely will be part of an action plan.	This is a large task, which itself needs detailed planning. A planning approach was suggested during a meeting with counterparts.

Scope of Work Task	Understanding and use of market-based methods of property assessment	Training in CAMA and related aspects of property tax administration	Other comments and objectives
(3) Organize/conduct mass appraisal training for trainers.	There is a match.	There is a match. The purpose of the CAMA seminar is to introduce a tool to allow ongoing counterpart use in monitoring, etc., rather than to train trainers per se.	Clarification of several issues is needed, including "training for trainers," valuation in general, and mass appraisal modeling in particular.
(4) Assist in review and modification of normative assessment methods.	There is a match. Need method for matching sales data with assessment records.	There is not a match.	A change would probably occur in 1998, but the consultants could begin now to show this could be done.
(5) Help assess feasibility of introducing mass appraisal methods.	There is a match.	There is not a direct match.	The modeling effort demonstrates that the housing market in Yerevan is behaving rationally.
(6) Provide training opportunities in real estate appraisal.	There is a match. Initial training has been offered, but not to the relevant audience.	There is a match (the CAMA seminar). Additional training is needed.	Consultants need to lay out a training strategy.

1.2 Summary of Accomplishments

ICMA consultants Almy and Gloudemans focused on the Computer-Assisted Mass Appraisal (CAMA) seminar and the organizational plan/action plan. The seminar was highly successful (see Section 3 and Attachment E). An approach to the development of an action plan related to real property assessment was introduced to key counterparts (see section 2 and attachment B). Their opportunities to pursue development of the action plan were slightly diminished, however, because the director of the Cadastre Department of MUD was in Spain during the first week of the mission, and the director of the Property Tax Department of STI was ill during the second.

Gloudemans was introduced to most of the counterparts he will be working with in the future.

2. Action Plan for Land and Property Tax Assessment

With Steve Anlian's assistance, the consultants organized a meeting on November 14 designed to gauge Armenian interest in a memorandum of understanding concerning an action plan for land and property tax assessment. The following organizations were invited: the Ministry of Food and Agriculture (deputy minister and head of Giprozem), the Ministry of Urban Development (MUD) (first deputy minister, head of cadastre department, head of the republican property registration state enterprise, and head of the Yerevan property registration state enterprise), and the State Tax Inspectorate (STI) (head of property tax department). The deputy ministers and the head of the Yerevan enterprise were not able to attend.

Almy and Gloudemans outlined the SAID/ICMA work program and the objectives of the property assessment component. A participatory approach to developing the action plan (which is described in more detail in a memorandum given to the meeting participants—see attachment B) was also described. The consultants believe that: 1) only a jointly developed plan has a real chance of success (in the current environment it is too easy to ignore a plan developed by others); and 2) a structure needs to be established in which the various parties hold each other accountable. Counterpart responses ranged from cautiously to enthusiastically favorable. The next steps from the ICMA side were agreed upon. These include drafting a memorandum of understanding and refining the proposed planning approach.

3. Seminar on Computer-Assisted Mass Appraisal

Almy and Gloudemans conducted a seminar on CAMA November 11-15 (see Attachment E). Ten persons were invited, and six participated throughout. Five regular participants were from the Ministry of Urban Development, including two from the Cadastre Department, two from the Republican property registration state enterprise, and one from the Yerevan property registration state enterprise. We had one regular participant from the State Tax Inspectorate (STI), and

another participated in 50-60 percent of the seminar (he was standing in for the ill head of the property tax department of the STI the other times). Two others participated less.

All of the regular participants demonstrated at least some experience with Windows programs, and they were eager to learn mass valuation concepts and how to use the statistical package, SPSS for Windows. About half participated actively in class discussions. Two of the participants served as mentors for the others. All enthusiastically completed the computer laboratory exercises.

In summary, the seminar exceeded the consultant's expectations. The participants also gave the seminar high marks, based on their evaluations. The following table summarizes their agreement with seven rating questions.

Question	4 - Mostly yes	5 - Definitely yes
1. Did you enjoy the course?	4	3
2. Did you find the course instructive and informative?	3	4
3. Were you able to understand the concepts of market valuation and mass appraisal presented in the course?	2	5
4. Were you able to understand the statistical methods, including multiple regression, used in the course?	5	2
5. Did you find the software (SPSS) effective (powerful and easy to use)?	2	5
6. Did you find the computer laboratory exercises useful and helpful?	2	5
7. Would you be interested in taking a follow-up course on the subjects covered in this course?	2	5

Melikset Karapetyan, ICMA office manager, and Elsa Poghosyan, interpreter, contributed materially to the success of the seminar.

Based on comments in the evaluation forms, all were eager to continue and were optimistic that Armenia could implement a market-value assessment program.

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At the close of the seminar, Almy and Gloude-mans outlined a possible mass valuation pilot study strategy, which would be a component of the action plan discussed below. Each of the organizations represented seemed eager to obtain a copy of SPSS and to continue research on market-based assessments.

4. Future Missions

4.1 General Policy Advice

Subject to the approval of the State Tax Inspectorate, Almy could assist with the development of a draft property tax law adopting market value principles and combining the present Law on Land Tax and Law on Property Tax. The STI plans to begin this work in 1997. Almy already has begun a working outline, which could be finished and sent to Armenia prior to the mission.

4.2 Action Plan

Depending on progress made by counterparts in the interim (i.e., signing a memorandum of understanding, establishing a planning group, and drawing up the terms of reference for the group), a number of activities related to the development of the action plan could be undertaken. Almy visualizes that the general framework for the plan would be developed during a retreat. The objectives of such a retreat would have to be clarified first, at the request of STI. Logistics related to the proposed retreat would have to be attended to, including the identification of a facilitator (possibly Almy, another TDY, Anlian, someone from the American University of Armenia, etc.). The retreat itself could be the centerpiece of a TDY. After a plan has been drafted, implementation activities would begin, and technical assistance may be needed. Progress should be monitored.

4.3 Review and Modification of Normative Assessment Methods

As part of the situation analysis visualized as part of the action planning process, the consultants would like to review the current valuation system in detail. Gloude-mans (or Almy) would meet one-to-one with key technical people in the property registration enterprises and the Tax Inspectorate to learn how property is currently appraised, what data are captured and computerized, and how the data base is structured. A detailed understanding of these matters will be necessary to the development of a strategy for efficiently converting to market-based methods.

4.4 Additional Appraisal Training

Almy and Gloudemans visualize a combination of self-paced independent research activities by the people who participated in the November 1996 CAMA seminar, accompanied by follow-on formal training.

Pilot Research. Related to the former type of activity, the consultants outlined a pilot study during the November seminar (see Attachment C), that they visualized their student group could pursue on its own. Gloudemans would like to work with the group to refine items 1 through 3 in the outline. It may also be possible to formulate a strategy for accomplishing item 4.

Supplemental Computer Laboratory. The consultants have developed a supplemental computer laboratory exercise, that they would like ICMA-Yerevan to give to the students of the November seminar (see Attachment D).

As it is important that the participants in the mass appraisal seminar keep up the skills learned in class, Almy and Gloudemans recommend that ICMA purchase two additional copies of SPSS for distribution. The consultants have also prepared two supplemental, self-study labs, for ICMA to translate into Russian and distribute to the students. Ideally these would be completed in a classroom setting, similar to the seminar, with a discussion of results and answers to the questions posed. If it is not possible for several PCS with SPSS to be assembled in the same place for this purpose, ICMA could organize two meetings to discuss the labs and answers to the questions (one meeting per lab). A discussion leader would lead the group through the questions, review answers, and encourage discussion. The consultants have prepared a "master" lab exercise with correct answers.

Workshop on Use of Multiple Regression Analysis in Mass Valuation. In addition, Gloudemans would like to conduct a 2 ½ day follow-up workshop on use of multiple regression analysis in mass valuation. This important topic was only introduced in the November 1996 seminar on CAMA. As it is the method of choice in the planned conversion to a market-based property tax system, Gloudemans would like to cover it in more detail. Topics would include MRA assumptions and limitations, market stratification, creation of MRA variables, and model testing and refinement.

5. General Observations

The mission took place during a overhaul in the cabinet of the Republic of Armenia. Although distracting to Almy and Gloudemans' counterparts, the reorganization apparently did not directly affect working relationships in the Ministry of Urban Development (MUD) or the State Tax Inspectorate (STI). There also appears to be an ongoing power struggle within the MUD over responsibility for the legal and fiscal cadastre. A number of scenarios have been outlined. The director of the Cadastre Department is seeking to have the Yerevan and Republican property registration organizations report to him. He would also like to establish an autonomous cadastral

organization outside MUD. Alternatively, he would like a semi-autonomous organization along the lines of the STI, which is now under the Ministry of Finance. He also mentioned transferring all registration and property tax administration activities to the marz. The heads of the inventory organizations and the First Deputy Minister of Urban Development appear to want the Cadastre Department to be a staff agency in MUD rather than a line agency. There are valid arguments both for and against either outcome.

To some extent, the pilot property registration project is caught up in this struggle. With the exception of the head of the Cadastre Department, who has some unspoken reservations, most key counterparts are supportive.

It seems unlikely that there will be separate legal and fiscal cadastral agencies. No matter how the power struggle is resolved, a single organization apparently will be responsible for registering rights in real property and for figuring property tax assessments. This will make it more difficult to separate the private-sector interests in security of title (and access to information about title) from the public-sector interest in taxing property.

The cadastral department has a staff of 13 now, which may grow to 20-25 if its organizational status is elevated. It is organized into three divisions: registration, valuation, and recording. The department is organized into three divisions: registration, valuation, and recording. Recording essentially is data maintenance, and includes referencing (measuring) and mapping.

Armenia has budgeted approximately \$1 million in 1997 for registration for property tax purposes. The Armenians also are pursuing funding for related activities from donor agencies, including the World Bank and the Spanish government.

ATTACHMENT A

PERSONS WITH WHOM MEETINGS WERE HELD

Attachment A: Persons with whom meetings were held

Note: Seminar participants are listed separately.

ICMA/SAID

Steven Anlian, Resident Advisor
Melik Karapetyan, Office Manager
Vahan Harutiunian

Ivan Ford, Marston & Marston
Terry Percival, Marston & Marston

Philip Rosenberg, ICMA Advisor

Elsa Poghosyan, Interpreter

MINISTRY OF URBAN DEVELOPMENT

Andranik Andreassian, First Deputy Minister
Manuk Vartanian, Head, Cadastral Department
Arsen Bagratian, Director, Yerevan Inventory Office
Gagik Begjamian, Director, Republican Inventory Office

STATE TAX INSPECTORATE

Samvel Abrahamian, Head, Property Tax Division

MINISTRY OF FOOD AND AGRICULTURE

Sergey Harutiunian, Director, Giprozem

SCIENTIFIC RESEARCH CENTER ON CITY MANAGEMENT SYSTEMS

Artashes Arakelian, Director

ATTACHMENT B
MATERIALS PERTAINING TO THE ACTION PLAN

MEMORANDUM

Via telefax: +374 2 151350

Date: 4 December 1996
To: Steven Anlian
From: Richard Almy
Subject: Memorandum of understanding re organizational plan / action plan for tax assessment

What follows is the beginnings of a memorandum of understanding concerning the proposed action plan for land and property tax assessment. I visualize this MOU as providing the foundation for a joint effort by counterpart organizations to develop and carry out the action plan—provided that influential counterparts endorse the strategy of a jointly developed action plan.

I am uncertain about which organization(s) should sign on behalf of the Republic of Armenia. Candidates include the State Tax Inspectorate, the Cadastre Department, and the inventory bureaus (or their ministries).

I hope the following material will provide the basis for a draft MOU that can be presented to counterparts for signature. I welcome your comments and suggestions. Let me know what you would like for me to do next. (I will be at home on 5 December.)

DRAFT

MEMORANDUM OF UNDERSTANDING

The Republic of Armenia (ROA) has enacted a law on land tax and a law on property tax. The central government intends that the revenues from these taxes be dedicated to the newly created local governments. The government also desires within a few years to introduce a combined property tax law covering land, buildings, and other taxable property. The government also aims to base the tax market values.

The land tax has not yet been introduced into urban areas. Major problems have been encountered in introducing the property tax. Problems that must be solved include the development of a workable administrative framework, securing sufficient resources, and developing the necessary expertise.

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The United States Agency for International Development (USAID) through its contractor, the International City/County Management Association (ICMA), wishes to help the Republic of Armenia overcome the problems that have been encountered so that the full revenue potential of the two taxes can be realized. The USAID also wants to help the ROA achieve its proposed reforms.

The purpose of this memorandum of understanding (MOU) is to establish a framework for developing and carrying out a generally accepted, workable action plan for achieving the property tax system goals.

Scope of Cooperation

1. [Participating ROA organizations] and the ICMA will work together to establish a planning group and its terms of reference. The purpose of the planning group is to provide an effective forum for developing a mutually acceptable action plan, establishing a framework for mutual accountability, and resolving related problems.
2. [Participating ROA organizations] and the ICMA will work together to develop and carry out a mutually acceptable action plan capable of achieving the goals of the project.

Responsibilities of Parties

1. Each participating ROA organization will designate one (or more) representatives to serve on the planning group. Each representative should have sufficient stature in her or his organization to make commitments on behalf of the organization.
2. Each participating ROA organization will assign qualified staff to participate in working groups.
3. The ICMA will provide technical assistance related to the action plan within the limits of available resources.
4. The ICMA will work to coordinate work sponsored by other assistance organizations and to secure necessary additional financial and technical assistance.

Schedule

It is expected that activities covered by this memorandum of understanding will commence in December 1996 and continue through September 1997. Should USAID funding be extended, the term of this agreement may be extended if all parties agree.

[Signatures]

c: Jill Diskan

DRAFT

8 November 1996

Meeting Announcement

To: Samvel Abrahamian
Andranik Andreassian
Misak Azarian
Arsen Bagratian
Gagik Begjanian
Sergey Harutiunian
Manuk Vardanian

From: Steven Anlian

Time and Place: 16:00, Thursday, 14 November 1996 at....

The ICMA work program for technical assistance to the Republic of Armenia includes a sub-project related to improving land and property tax administration. Part of the program is to "help prepare organizational plan/action plan for tax assessment." The purpose of this meeting is to discuss the need for technical assistance related to property taxation and to begin to develop the action plan. The agenda for the meeting includes:

- Introduction—background of the ICMA work plan and purpose of the proposed action plan
- Initial steps
 - Create a planning group
 - Analyze the current situation
 - Set explicit goals and measurable objectives, assign responsibilities, and fix deadlines
- Next steps

c: Richard Almy
Ivan Ford
Robert Gloudemans

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ACTION PLAN FOR LAND AND PROPERTY TAX ASSESSMENT
Initial Steps

Richard Almy and Robert Gloudemans
ICMA Advisors

November 1996

Introduction

This memorandum addresses the third activity in the Market-Based Property Assessment Sub-Project of the ICMA's Work Program for Technical Assistance to the Republic of Armenia (ICMA WPTA.DOC), namely to "help prepare organizational plan/action plan for tax assessment."

The purpose of this proposed action plan is to overcome the difficulties encountered in introducing the property tax and in expanding coverage of the land tax into urban areas. The goals of the plan are (1) to implement the current taxes successfully and (2) to lay the ground work for later reforms, including basing assessments on actual market values. The purpose of this memorandum is to help the Armenian officials responsible for land and property tax administration develop a workable action plan.

The following sections discuss important steps in developing and implementing the action plan.

1. *Create a planning group.*

The current legislative framework and institutional structures make several organizations responsible for parts of the land and property tax system. We recommend that those organizations *actively* participate in developing the action plan. Otherwise they are unlikely to accept responsibility for carrying it out. We recommend participation by the following:

- **Ministry of Urban Development (Cadastre Department, Republican Real Property Registration State Enterprise, and City of Yerevan Real Property Registration State Enterprise).** These organizations should participate because they have responsibilities for registration of property and for valuation for property tax purposes.
- **Ministry of Food and Agriculture (Giprozem).** This organization should participate because it now has responsibilities related to registration and is responsible for valuation of agricultural land.
- **State Tax Inspectorate.** This organization should participate because it has responsibility for maintaining lists of taxable properties/taxpayers and for collecting the land and property taxes.

Other organizations, such as the Ministry of Territorial Affairs, also could participate.

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Ideally, the individuals representing the participating organizations would "champion" necessary changes in legislation, institutional arrangements, and work practices. The representatives should have sufficient stature in their organizations to make policy decisions and commit resources. Each representative on the planning group should be allowed to designate one or more assistants to help carry out assigned activities.

The planning group should devise its working procedures, set its schedules, and so forth.

2. *Decide on a planning approach.*

Because there are multiple independent organizations involved in land and property taxation, we recommend a participatory planning approach, in which each organization has an equal voice in the planning process. The approach should be designed to reach consensus on the best course of action to follow and to create an environment of mutual accountability.

The planning group would develop the overall structure of the plan, and each organization would flesh out its parts.

A planning "retreat" could be used to accomplish the next two objectives (steps 3 and 4). A "retreat" is a one or two day meeting devoted exclusively to shaping the plan. It should be held in a location away from the daily distractions of work. Often an outside "facilitator" is used to guide the meeting. A facilitator can transcend organization structures, has no role in past successes and failures, and has no direct stake in the outcome. The facilitator can ensure that every member of the planning group has an opportunity to participate.

3. *Analyze the current situation.*

Before charting the future course of action, it is useful to analyze the current situation. Situation analysis asks two basic questions: (1) What are the current policies, legal requirements, organizational structures, and operating procedures? (2) What should they be?

Situation analysis examines current strengths (which should be reinforced), weaknesses (which should be eliminated), opportunities (which should be taken advantage of), and threats (which should be avoided). The planning group should summarize its views on strengths, weaknesses, and so on. From this analysis will flow statements of goals and objectives, the development of strategies, the commitment of resources, work assignments, and so on.

Part of situation analysis would be to estimate the work involved in implementing the new property tax system. Attachment 1 contains the information available to us in this area, and the planning group should update this information and provide additional detail by type of land and building use.

4. *Set explicit goals and measurable objectives, assign responsibilities, and fix deadlines.*

The planning group should meet to develop statements of goals and objectives (or actions). A goal is the thing the group wants to accomplish, for example "complete the introduction of the property tax by 1 January 1998" or "convert to market-based assessments by 1999." There can

be more than one goal, but the goals should be realistically attainable. An action is a thing that must be done to accomplish a goal, for example “design and install a computerized fiscal cadastre.” Usually several actions must be finished before a goal can be attained.

The planning group also should agree on responsibilities for actions and decide deadlines.

How are goals and actions decided? One planning technique is to ask each member of the planning group to suggest a goal. After every member has made a suggestion, the group discusses the suggestions and makes a refined list of goals that the whole group agrees upon. For each goal statement, the group follows the same technique to identify actions. A chart like the following could be used to record the group’s decisions for each goal.

Goal 1. (Statement of the goal)			
Action No.	Action Statement	Organization / person responsible	Deadline

The planning group should consider actions in the following areas:

- System design
- Pilot (demonstration) projects
- Data collection and entry
- Mapping
- Market monitoring and valuation modeling
- Model application, review, and field work
- Assessment
- Tax collection
- Documentation of work requirements and procedures
- Organizational structures

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- Resource requirements and mobilization (staffing, computer software and equipment, office facilities, vehicles, and so forth)
- Recruiting and training staff

5. *Monitor progress and refine the plan as necessary.*

The planning group should hold regular meetings to review progress and revise the plan as necessary. Changing a property tax system is complicated, and it will be impossible to plan everything at the beginning. The frequency of the meetings would depend on the pace of activities and the need to coordinate work. Meetings should be at least quarterly, and monthly meetings would be better.

References

Several existing works might prove helpful in developing the plan. In 1995, the State Tax Inspectorate submitted a plan for introducing the property tax. See attachment 2: "Minutes of the Meeting of the Government of the Republic of Armenia, 18 January 1995, No. 6" (ARK055.DOC). This could serve as a model for parts of the action plan. Several of Almy's mission reports address aspects of planning.

ATTACHMENT C
OUTLINE FOR PILOT RESEARCH

Implementation of Market Values in Urban Areas (11/16/96)

1. Define candidate variables
 - a. building characteristics
 - b. site/location/geographic
2. Define pilot area (all or part of Yerevan)
3. Identify sales listings in pilot area
4. Collect data for listed properties in pilot area
 - a. property characteristics
 - b. list prices
 - c. sale price where available (to develop a "discount" factor)

Note: characteristics data would only be collected on properties for which list prices were obtained

5. Analyze pilot data
 - a. Exploratory data analysis
 - b. Multiple regression model (or models)
6. Seminars on results
 - a. Yerevan (2-3 days)

Note: seminar should be conducted by "work group" for their colleagues. Objective is to brief peers and obtain feedback and consensus.

6. Seminars on results
 - b. International

Note: 2-3 of the work group would present an overview of Armenia's program to implement market-value assessment and the results of the pilot study at the 1997 (Toronto) or 1998 (Orlando) IAAO Conference. The objective is to gain exposure, confidence, and feedback and to share ideas and experiences with the international community. The conference paper could be shared with other developing countries.

7. Based on above, determine data to collect for all urban properties and design corresponding data file
8. Collect data for all properties and enter into data file
9. Develop, test, and refine models for other areas
10. Produce new market-based values

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ATTACHMENT D
SUPPLEMENTAL COMPUTER LABORATORY

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General Instructions - Supplemental Labs

The two attached labs are a follow-up to our mass valuation seminar. The first is on data analysis (graphs and statistics). The second is on multiple regression analysis. You can do them separately at different times or together at the same time.

When doing the labs, you are encouraged to compare results, discuss answers, help each other, and try additional analyses. Happy computing!

+!-

Fax any questions to Bob Gloudemans at 602-861-2114.

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Supplemental Lab 1 - Data Analysis

1. Open the data file, C:\ARMENIA\APT.SAV.
2. Run a frequency distribution for LIVAREA, STORIES, and STORY.

Statistics..Summarize..Frequencies...

How many cases (properties) are there? _____

What is the minimum value of LIVAREA? _____

What is the minimum value of STORIES? _____

What is the minimum value of STORY? _____

3. Set a filter to include properties for which LIVAREA > 0, STORIES > 0, and STORY > 0.

Data..Select Cases..If Condition is Satisfied..If...

Note: when finished, the FILTER ON message should appear on the bottom right corner of your screen.

4. Rerun the frequency distribution for LIVAREA, STORIES, and PRICE.

Note: there should be 288 cases.

5. Compute a new variable, PRICEPSM = PRICE/LIVAREA.

TRANSFORM.. COMPUTE. Enter PRICEPSM into the "target" variable and PRICE/LIVAREA as the expression.

6. Run a histogram of PRICEPSM.

What is the average PRICEPSM? _____

When finished, click "Discard",

7. Run box plots of PRICEPSM with ZONE, STORIES, and STORY.

Graphs..Box Plots..Define...

Which STORY level has the highest median price per square meter? _____

Do high STORY levels (8+) command relatively low or high prices? _____

8. Compute average values of PRICEPSM by STORY level.
Statistics..Compare Means..Means...
What is the average value of PRICEPSM for properties on the first floor? _____
What is the average value of PRICEPSM for properties on the third floor? _____
9. Modify your filter to include only properties in zone 2.
Data..Select Cases..If. Add "ZONE = 2" to the expression.
10. Check your work by running a frequency distribution of ZONE.
Note: all properties should be in zone 2.
11. Rerun the box plot of PRICEPSM with STORY.
Graphs..Box Plots..Define...
Is the pattern similar to that for all six zones? _____
12. Run a frequency distribution for STORIES. Which two story heights occur most frequently? _____ and _____
13. SPSS has a procedure for repeating analyses for each value of a variable. This procedure is called SPLIT FILES. We will split the file based on STORIES.
Data..Split File..Repeat Analysis for Each Group. Enter STORIES and click OK.
Note: FILTER ON and SPLIT FILE ON should now both appear in the bottom right hand corner of your screen.
14. To see how SPLIT FILES works, run a frequency distribution of STORY. The output should show separate results for each value of STORIES.
15. Now rerun the box plot of PRICEPSM with STORY. A separate chart is produced for each value of STORIES. View each chart and then discard it.

Note: pay particular attention to the charts for 5 and 9 stories, which account for most of the data. Recall that all the properties are in zone 2. Thus the charts isolate the effect of STORY level on price per square meters for properties in the same zone and the same number of stories.

16. Remove SPLIT FILES.

Data..Split File..Analyze all cases..OK.

Note: the SPLIT FILE ON message should disappear.

17. Remove ZONE = 2 from the filter.

Data..Select Cases..IF. Delete ZONE = 2.

18. Check your work by running a frequency distribution of ZONE.

Note: there should be 288 cases.

19. Split the file by ZONE.

Data..Split File..Repeat Analysis for Each Group. Replace STORIES with ZONE and click OK.

Note: SPLIT FILES ON should appear in the bottom right hand corner of the screen.

20. Run scatter plots of PRICE with LIVAREA.

Graphs..Scatter..Define. Enter PRICE as the Y axis and LIVAREA as the X axis.

There should be one chart for each zone. You can page through the charts by clicking the ▲ or ▼ arrows. To view them better or edit them, click EDIT and then FILE..CLOSE when finished. Or simply click Discard when finished viewing a chart.

Do the charts show that PRICE increases with LIVAREA? _____

21. Remove SPLIT FILES.

Data..Split File..Analyze All Cases..OK

Note: the SPLIT FILES message should disappear from the bottom right of the screen. The FILTER ON message should still appear.

22. Save the data file with the filter variable and PRICEPSM.

Window..APT.SAV..File..Save Data.

23. If finished, exit SPSS. Otherwise go to Lab 2.

Supplemental Lab 2 - Regression Analysis

1. If you have not already done so, open the data file, C:\ARMENIA\APT.SAV.
2. Filter the data based on the filter variable you created in the previous lab. Note: if you did not exit SPSS after Lab 1, go directly to step 3.

Data..Select Cases..If Condition Satisfied If. Enter FILTER\$ = 1 and click Continue..OK.

Note: the FILTER ON message should appear at the bottom of your screen.

3. Run a frequency distribution for BALCONY.

Note: there should be 288 cases.

Is BALCONY a "string" or numeric variable? _____

Could it be used in multiple regression analysis? _____

4. Run frequency distributions on PARAD and XOZ.

Are these variables "string" or numeric? _____

Do most properties have a PARAD balcony? _____

Do most properties have an XOZ balcony? _____

5. Run a regression of PRICE on LIVAREA.

Statistics..Regression..Linear. Enter PRICE as the Dependent variable and LIVAREA as the Independent variable.

What is the R-Square? _____

What is the standard error? _____

6. Check to see if your file has the binary variables, ZONE1, ZONE3, and ZONE456, which we created in the seminar (lab E).

If not, recreate the variables following the instructions in lab E and save your work:

Window..APT.SAV..FILE..SAVE DATA

7. To make sure the variables are correct, run a LIST CASES of ZONE, ZONE1, ZONE3, and ZONE456.

Statistics..Summarize..List Cases...

28

Note: for properties in zone 1, ZONE1 should equal 1 and ZONE3 and ZONE456 should equal 0. If ZONE = 2, ZONE1, ZONE3, and ZONE456 should all be 0. If ZONE = 3, ZONE1 should be 0, ZONE3 should be 1, and ZONE456 should be 0. If ZONE = 4, 5, or 6, ZONE1 should be 0, ZONE3 should be 0, and ZONE456 should be 1.

8. Create a binary variable for STORY1 (location on the first floor).

Transform..Compute. Enter STORY1 as the target variable and 0 into the expression. Click OK.

Transform..Compute. Replace 0 with 1 and click If..Include If Case Satisfies Condition. Enter STORY = 1 and click Continue..OK. The screen should display "Change existing variable?" Click OK.

9. Run a crosstabs of STORY1 and STORY.

Statistics..Summarize..Crosstabs. Enter STORY1 as the column variable and STORY as the row variable. Click OK.

Note: STORY1 should equal 1 when STORIES = 1; otherwise it should be 0.

10. On you own, create a similar binary variable for STORY8UP (location on the 8th floor or higher).

11. Rerun the crosstabs, substituting STORY8UP for STORY1.

Note: STORY8UP should equal 0 when STORY is < 8 and 1 when STORY => 8.

How many of the 288 properties are located on the 8th floor or higher? _____

12. Save your data file with the two new variables.

Window..APT.SAV..File..Save Data

13. Add STORY1 and STORY8UP to the regression.

What is the value of R-Square? _____

What is the standard error? _____

14. Now add ZONE1, ZONE3, and ZONE456 to the regression model.

What is R-Square? _____

What is the standard error? _____

15. Recall that most properties have one XOZ balcony. On your own, create a new variable $XOZADJ = XOZ - 1$. Note that $XOZADJ$ will be centered on 1.

16. Run a frequency distribution of $XOZADJ$.

What is the typical value of $XOZADJ$? _____

What is the minimum value? _____ Maximum value? _____

17. Save the data file with the new variable, XOZ .

Window..APT.SAV..File..Save Data.

18. Add $PARAD$ and $XOZADJ$ to the regression model. Review and discuss the coefficients ("B"s). Do they make sense?

What is the value of R-Square? _____

What is the standard error? _____

19. What would be the indicated value of an apartment with 40 square meters on the third floor with one XOZ balcony in zone 2? _____

What would be the value of the same property in zone 1?

What would be the value of the property in zone 1 if were on the first floor? _____

20. With SPSS, you can save the estimated values and many other statistics from the regression model. We will save the predicted values. Return to the regression and click $SAVE..Unstandardized Predicted Values..Continue..OK$.

Note: SPSS runs the regression and saves the predicted values under the name PRE_1 . (If you were to repeat the procedure, the new predicted values would be saved as PRE_2 , and so forth. To stop saving the predicted values, uncheck the Unstandardized Predicted Values box.)

21. Go to the data window (click $Window..APT.SAV$) and view the new variable PRE_1 at the end of the file. Note that PRE_1 was not computed for those cases not included in the regression (due to the filter variable).

22. Run descriptive statistics on $PRICE$ and PRE_1 .

Statistics..Summarize..Descriptives. Enter $PRICE$ and PRE_1 .

Note: the mean of the two variables should be equal.

30

23. On your own, compute a new variable $ERROR = PRICE - PRE_1$.
24. Run a histogram for ERROR.

What is the average error? _____

What is its standard deviation? _____

25. Run a frequency distribution for ERROR, including the following statistics: median, mean, standard deviation, minimum, maximum, quartiles, and 10 percentiles.

Statistics..Summarize..Frequencies..ERROR..Statistics.
Enter the above statistics.

Note: the percentiles are obtained by ckecking "Cut points for 10 equal groups."

What is the 10th percentile? _____

What is the 25th percentile? _____

What is the 75th percentile? _____

What is the 90th percentile? _____

26. Run a scatter plot of ERROR with LIVAREA and fit a reference line at 0.

Graphs..Scatter..Define...

Note: to create the reference line, click EDIT, click the vertical axis, and click Chart..Reference line..Add..OK.

Do ERROR and LIVAREA appear to be related? _____

Note: in analyses of this type, a horizontal pattern showing no relationship between the horizontal variable (LIVAREA) and the vertical variable (PRICE) indicates good equity. An upward or downward trend would indicate that we were valuing large and small homes at different percentage of sale price and that our model was inadequate.

27. Run a box plot of ERROR with ZONE.

Graphs..Box Plots..Define

Do the medians in the box plot appear similar? _____

Note: as with the scatter graphs, a horizontal pattern indicates good uniformity. If some boxes were above or below others, this would indicate that some zones were valued too high and others too low. We could perform similar analyses by STORY, BALCONY, or other variables.

28. On your own, try to improve the regression model by adding new variables. You can use either other existing variables or create new variables using the Transformations panel.

What is your final R-Square? _____

What is the standard error? _____

29. When finished, exit SPSS (there is no need to save any of the files).

Supplemental Lab 1 - Data Analysis

1. Open the data file, C:\ARMENIA\APT.SAV.
2. Run a frequency distribution for LIVAREA, STORIES, and STORY.

Statistics..Summarize..Frequencies...

How many cases (properties) are there? 301

What is the minimum value of LIVAREA? 0

What is the minimum value of STORIES? 0

What is the minimum value of STORY? 0

3. Set a filter to include properties for which LIVAREA > 0, STORIES > 0, and STORY > 0.

Data..Select Cases..If Condition is Satisfied..If...

Note: when finished, the FILTER ON message should appear on the bottom right corner of your screen.

4. Rerun the frequency distribution for LIVAREA, STORIES, and PRICE.

Note: there should be 288 cases.

5. Compute a new variable, PRICEPSM = PRICE/LIVAREA.

TRANSFORM.. COMPUTE. Enter PRICEPSM into the "target" variable and PRICE/LIVAREA as the expression.

6. Run a histogram of PRICEPSM.

What is the average PRICEPSM? 487.8

When finished, click "Discard",

7. Run box plots of PRICEPSM with ZONE, STORIES, and STORY.

Graphs..Box Plots..Define...

Which STORY level has the highest median price per square meter? 3

Do high STORY levels (8+) command relatively low or high prices? low

8. Compute average values of PRICEPSM by STORY level.
Statistics..Compare Means..Means...
What is the average value of PRICEPSM for properties on the first floor? 465
What is the average value of PRICEPSM for properties on the third floor? 563
9. Modify your filter to include only properties in zone 2.
Data..Select Cases..If. Add "ZONE = 2" to the expression.
10. Check your work by running a frequency distribution of ZONE.
Note: all properties should be in zone 2.
11. Rerun the box plot of PRICEPSM with STORY.
Graphs..Box Plots..Define...
Is the pattern similar to that for all six zones? YTS
12. Run a frequency distribution for STORIES. Which two story heights occur most frequently? 5 and 9
13. SPSS has a procedure for repeating analyses for each value of a variable. This procedure is called SPLIT FILES. We will split the file based on STORIES.
Data..Split File..Repeat Analysis for Each Group. Enter STORIES and click OK.
Note: FILTER ON and SPLIT FILE ON should now both appear in the bottom right hand corner of your screen.
14. To see how SPLIT FILES works, run a frequency distribution of STORY. The output should show separate results for each value of STORIES.
15. Now rerun the box plot of PRICEPSM with STORY. A separate chart is produced for each value of STORIES. View each chart and then discard it.
Note: pay particular attention to the charts for 5 and 9 stories, which account for most of the data. Recall that all the properties are in zone 2. Thus the charts isolate the effect of STORY level on price per square meters for properties in the same zone and the same number of stories.

16. Remove SPLIT FILES.
 Data..Split File..Analyze all cases..OK.
 Note: the SPLIT FILE ON message should disappear.
17. Remove ZONE = 2 from the filter.
 Data..Select Cases..IF. Delete ZONE = 2.
18. Check your work by running a frequency distribution of ZONE.
 Note: there should be 288 cases.
19. Split the file by ZONE.
 Data..Split File..Repeat Analysis for Each Group. Replace STORIES with ZONE and click OK.
 Note: SPLIT FILES ON should appear in the bottom right hand corner of the screen.
20. Run scatter plots of PRICE with LIVAREA.
 Graphs..Scatter..Define. Enter PRICE as the Y axis and LIVAREA as the X axis.
 There should be one chart for each zone. You can page through the charts by clicking the ▲ or ▼ arrows. To view them better or edit them, click EDIT and then FILE..CLOSE when finished. Or simply click Discard when finished viewing a chart.
 Do the charts show that PRICE increases with LIVAREA? Yrs
21. Remove SPLIT FILES.
 Data..Split File..Analyze All Cases..OK
 Note: the SPLIT FILES message should disappear from the bottom right of the screen. The FILTER ON message should still appear.
22. Save the data file with the filter variable and PRICEPSM.
 Window..APT.SAV..File..Save Data.
23. If finished, exit SPSS. Otherwise go to Lab 2.

Supplemental Lab 2 - Regression Analysis

1. If you have not already done so, open the data file, C:\ARMENIA\APT.SAV.
2. Filter the data based on the filter variable you created in the previous lab. Note: if you did not exit SPSS after Lab 1, go directly to step 3.

Data..Select Cases..If Condition Satisfied If. Enter FILTER\$ = 1 and click Continue..OK.

Note: the FILTER ON message should appear at the bottom of your screen.

3. Run a frequency distribution for BALCONY.

Note: there should be 288 cases.

Is BALCONY a "string" or numeric variable? String

Could it be used in multiple regression analysis? no

4. Run frequency distributions on PARAD and XOZ.

Are these variables "string" or numeric? numeric

Do most properties have a PARAD balcony? no

Do most properties have an XOZ balcony? yes

5. Run a regression of PRICE on LIVAREA.

Statistics..Regression..Linear. Enter PRICE as the Dependent variable and LIVAREA as the Independent variable.

What is the R-Square? .442

What is the standard error? 8420

6. Check to see if your file has the binary variables, ZONE1, ZONE3, and ZONE456, which we created in the seminar (lab E).

If not, recreate the variables following the instructions in lab E and save your work:

Window..APT.SAV..FILE..SAVE DATA

7. To make sure the variables are correct, run a LIST CASES of ZONE, ZONE1, ZONE3, and ZONE456.

Statistics..Summarize..List Cases...

Note: for properties in zone 1, ZONE1 should equal 1 and ZONE3 and ZONE456 should equal 0. If ZONE = 2, ZONE1, ZONE3, and ZONE456 should all be 0. If ZONE = 3, ZONE1 should be 0, ZONE3 should be 1, and ZONE456 should be 0. If ZONE = 4, 5, or 6, ZONE1 should be 0, ZONE3 should be 0, and ZONE456 should be 1.

8. Create a binary variable for STORY1 (location on the first floor).

Transform..Compute. Enter STORY1 as the target variable and 0 into the expression. Click OK.

Transform..Compute. Replace 0 with 1 and click If..Include If Case Satisfies Condition. Enter STORY = 1 and click Continue..OK. The screen should display "Change existing variable?" Click OK.

9. Run a crosstabs of STORY1 and STORY.

Statistics..Summarize..Crosstabs. Enter STORY1 as the column variable and STORY as the row variable. Click OK.

Note: STORY1 should equal 1 when STORIES = 1; otherwise it should be 0.

10. On you own, create a similar binary variable for STORY8UP (location on the 8th floor or higher).
11. Rerun the crosstabs, substituting STORY8UP for STORY1.

Note: STORY8UP should equal 0 when STORY is < 8 and 1 when STORY => 8.

How many of the 288 properties are located on the 8th floor or higher? 33

12. Save your data file with the two new variables.

Window..APT.SAV..File..Save Data

13. Add STORY1 and STORY8UP to the regression.

What is the value of R-Square? .428

What is the standard error? 8219

14. Now add ZONE1, ZONE3, and ZONE456 to the regression model.

What is R-Square? .657

What is the standard error? 6527

15. Recall that most properties have one XOZ balcony. On your own, create a new variable $XOZADJ = XOZ - 1$. Note that $XOZADJ$ will be centered on 1.

16. Run a frequency distribution of $XOZADJ$.

What is the typical value of $XOZADJ$? 0

What is the minimum value? -1 Maximum value? 2

17. Save the data file with the new variable, XOZ .

Window..APT.SAV..File..Save Data.

18. Add $PARAD$ and $XOZADJ$ to the regression model. Review and discuss the coefficients ("B"s). Do they make sense?

What is the value of R-Square? .689

What is the standard error? 639.8

19. What would be the indicated value of an apartment with 40 square meters on the third floor with one XOZ balcony in zone 2? \$20,542

What would be the value of the same property in zone 1?

\$26,780

What would be the value of the property in zone 1 if were on

the first floor? \$25,313

20. With SPSS, you can save the estimated values and many other statistics from the regression model. We will save the predicted values. Return to the regression and click $SAVE..Unstandardized Predicted Values..Continue..OK$.

Note: SPSS runs the regression and saves the predicted values under the name PRE_1 . (If you were to repeat the procedure, the new predicted values would be saved as PRE_2 , and so forth. To stop saving the predicted values, uncheck the Unstandardized Predicted Values box.)

21. Go to the data window (click Window..APT.SAV) and view the new variable PRE_1 at the end of the file. Note that PRE_1 was not computed for those cases not included in the regression (due to the filter variable).

22. Run descriptive statistics on $PRICE$ and PRE_1 .

Statistics..Summarize..Descriptives. Enter $PRICE$ and PRE_1 .

Note: the mean of the two variables should be equal.

30

23. On your own, compute a new variable $ERROR = PRICE - PRE_1$.
24. Run a histogram for ERROR.

What is the average error? 0

What is its standard deviation? 6308

25. Run a frequency distribution for ERROR, including the following statistics: median, mean, standard deviation, minimum, maximum, quartiles, and 10 percentiles.

Statistics..Summarize..Frequencies..ERROR..Statistics.
Enter the above statistics.

Note: the percentiles are obtained by ckecking "Cut points for 10 equal groups."

What is the 10th percentile? -5258

What is the 25th percentile? -3496

What is the 75th percentile? 1691

What is the 90th percentile? 5291

26. Run a scatter plot of ERROR with LIVAREA and fit a reference line at 0.

Graphs..Scatter..Define...

Note: to create the reference line, click EDIT, click the vertical axis, and click Chart..Reference line..Add..OK.

Do ERROR and LIVAREA appear to be related? no

Note: in analyses of this type, a horizontal pattern showing no relationship between the horizontal variable (LIVAREA) and the vertical variable (PRICE) indicates good equity. An upward or downward trend would indicate that we were valuing large and small homes at different percentage of sale price and that our model was inadequate.

27. Run a box plot of ERROR with ZONE.

Graphs..Box Plots..Define

Do the medians in the box plot appear similar? yes

Note: as with the scatter graphs, a horizontal pattern indicates good uniformity. If some boxes were above or below others, this would indicate that some zones were valued too high and others too low. We could perform similar analyses by STORY, BALCONY, or other variables.

28. On your own, try to improve the regression model by adding new variables. You can use either other existing variables or create new variables using the Transformations panel.

What is your final R-Square? _____

What is the standard error? _____

29. When finished, exit SPSS (there is no need to save any of the files).

ATTACHMENT E
MATERIALS FROM THE SEMINAR ON COMPUTER-ASSISTED MASS APPRAISAL

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Attachment E: Materials from the Seminar on Computer-Assisted Mass Appraisal

Seminar schedule and outline, registration list, and overheads in English and Russian.

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SEMINAR ON COMPUTER-ASSISTED MASS APPRAISAL

by

Richard Almy and Robert Gloudemans
ICMA Advisors

Yerevan, Armenia

11-15 November 1996

The seminar will demonstrate computer-assisted mass appraisal concepts. It is designed for officials who have, or will have, technical responsibilities related to the valuation of land and buildings for purposes of taxation. Representatives of the Ministry of Urban Development and the State Tax Inspectorate have been invited to participate. The goal of the seminar is to provide qualified participants with sufficient exposure to mass appraisal methods and statistical software to carry out additional market-monitoring activities and valuation pilot studies, leading ultimately to supplanting the existing land and building tax assessments based on normative values with assessments based on market values.

Schedule

Monday, 11 November 1996

- 10:00 Welcome and Introductions
- 10:30 **Context of Computer-Assisted Mass Appraisal**
- 12:30 Lunch break
- 13:30 **Working with Data**
- 15:00 Review Questions—Working with Data
- 15:30 **Introduction to Statistical Software and SPSS**

Tuesday, 12 November 1996

- 10:00 Laboratory A—Entering and Listing Data
- 12:00 **Descriptive Statistics**
Arrays, Frequency Distributions, and Percentiles
- 12:30 Lunch break

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- 13:30 Measures of Central Tendency and Dispersion
14:30 Study Problem—Calculation of Measures of Central Tendency and Dispersion
15:00 One Variable Graphs and Charts
15:30 Laboratory B—Analyzing Data

Wednesday, 13 November 1996

- 10:00 Review
10:30 Laboratory C—One-Variable Data Analysis, Graphs, and Charts
12:30 Lunch break
13:30 Two and Three Variable Analyses
14:30 Laboratory D—Two-Variable Data Analysis, Graphs, and Charts
16:30 Review Questions—Descriptive Statistics

Thursday, 14 November 1996

- 10:00 Review
10:30 **Correlation and Regression Analysis**
12:30 Lunch break
13:30 Laboratory E—Multiple Regression Analysis
15:30 Review Questions—Correlation and Regression

Friday, 15 November 1996

- 10:00 Review
10:30 **Steps in Setting up a Market Value-Based Property Tax System**
12:00 Seminar Evaluation and Conclusion

AP

11116RAG.SEM

List of Participants
Seminar on COMPUTER-ASSISTED MASS APPRAISAL
by Richard Almy and Robert Gloudemans,
ICMA Advisors
November 11-15, 1996
Yerevan, Armenia

NAME	ORGANIZATION	PHONE	Nov. 11	Nov. 12	Nov. 13	Nov. 14	Nov. 15
1. Haik Gaghatspanian	Cadastral Department	58-33-21	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
2. Benik Martirosyan	Cadastral Department	56-32-05	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
3. Gagik Begjanian	Head of Enterprise, Republican Inventory Agency	57-88-81 57-89-05	_____	_____			
4. R. Yeghiazarian <i>Ruben</i>	Deputy Head, Republican Inventory Agency	57-08-37	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
5. L. Sargsyan <i>Ludmila</i>	Documentalist, Republican Inventory Agency	57-88-81	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
6. Armen Hakopyan	Yerevan Inventory Agency	567909	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
7. Robert Sahakian	Head of Property Taxation Control	53-80-73	_____	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
8. Anna Karapetian	Senior Inspector of Property Taxation Methodology	533582	_____	<i>[Signature]</i>			
9. Sergei Paturian	Head of Information and Tax Calculation Department	538217	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
10. Artak Kirakossian	Senior Inspector of Organization and Regional Control Department	53-86-97	✓	_____			

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Context of Computer-assisted Mass Appraisal

I. Key concepts

- A. Cost, price, and value *slide 5, v = slide 6, MV = slide 7*
- B. Valuation (appraisal) and assessment *slide 12*
- C. *slide 10* Single-property versus mass appraisal *slide 11*
- D. *slide 13* Legal versus fiscal cadastres

II. Mass appraisal in property taxation

- A. Underlying assumptions
 - 1. Common date of valuation
 - 2. The property rights valued are the full set of rights that a private owner may legally possess ("fee simple")
 - 3. The use of the property is assumed to be most economical use or "highest and best use" *slide 15*
- B. Data capture and management *slide 12* *fund*
 - 1. Cadastral maps
 - 2. Land and building registers
 - 3. Taxpayer registers
- C. Market monitoring and preliminary analyses *slide 19*
- D. Mass appraisal model building
- E. Application of mass appraisal models
- F. Quality assurance
- G. Notice, taxpayer information, and appeals

III. System and data linkages

- A. Source data
 - 1. Market evidence (sales data)

2. **Changes in land plots and buildings**
 3. **Owners/taxpayers**
- B. **Tax collection system**
- C. **Geographic information systems**

Price	Цена	Cost	Себестоимость	Value	Стоимость
<ul style="list-style-type: none"> • The money required to obtain a thing 	<ul style="list-style-type: none"> • Деньги необходимые для приобретения вещи 	<ul style="list-style-type: none"> • The money expended in obtaining a thing or attaining an object 	<ul style="list-style-type: none"> • Деньги потраченные на приобретение вещи или сохранение объекта 	<ul style="list-style-type: none"> • The monetary worth of a thing 	<ul style="list-style-type: none"> • Денежная стоимость вещи
<ul style="list-style-type: none"> • Factual in nature 	<ul style="list-style-type: none"> • Фактическая по характеру 	<ul style="list-style-type: none"> • Factual in nature 	<ul style="list-style-type: none"> • Фактическая по характеру 	<ul style="list-style-type: none"> • An opinion • Hypothetical in nature 	<ul style="list-style-type: none"> • Мнение • Гипотетический по характеру

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Types of Value

Типы Стоимости

-
- | | |
|---------------------------|--|
| • Market value | • Рыночная стоимость |
| • Use or investment value | • Инвестиционная стоимость или стоимость использования |
| • Insurance value | • Страховая стоимость |
| • Assessed value | • Оцененная стоимость |

Market Value

Рыночная Стоимость

-
- | | |
|---|--|
| • Cash (equivalent) price | • Стоимость наличными (эквивалентная) |
| • Competitive and open market | • Конкуренстный и открытый рынок |
| • Sufficient exposure to (time on) the market | • Достаточная открытость (достаточное время) рынку |
| • No undue pressure on the buyer or seller | • Отсутствие ненадлежащего давления на покупателя или продавца |
| • Well-informed buyer and seller | • Хорошо информированный продавец и покупатель |

Single property appraisal

Оценка единичного
имущества

Basic Appraisal Methods

Основные Методы
Оценки

- Sales comparison
- Income capitalization
- Cost of construction
- Сравнение продаж
- Капитализация доходов
- Себестоимость строительства

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Single Property Appraisal
Process

Процесс Оценки
Единого Имущества

Define the appraisal
problem

Определить задачу
оценки

Preliminary analysis and
plan: select and collect
data

Предварительный анализ
и план: отбор и сбор
данных

Estimate most economic
use

Расчет наизыгодного
использования

Estimate land (site) value

Расчет стоимости земли
(местности)

Estimate total land and
building value

Расчет полной стоимости
земли и здания

Reconcile value indicators
and reach conclusion
(Reconcile the Differences)

Проверка индикаторов
стоимости и заключение
(Проверка разниц)

Report conclusion
(to the client)

Отчет о заключении
(клиенту)

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Mass Appraisal Process
(Property Tax)

Процесс Массовой
Оценки (Налог на
Имущество)

Data collection

Сбор данных

Preliminary analysis

Предварительный анализ

Valuation model building

Создание модели
оценивания

Model application and
review

Применение и обзор
модели

Documentation and
reporting

Документация и
отчетность



Single property appraisal

Оценка единичного
имущества

Estimate Most Economic
Use

Расчет наименее экономичного
использования

- Land as if vacant and available
- Property as improved (existing or proposed)

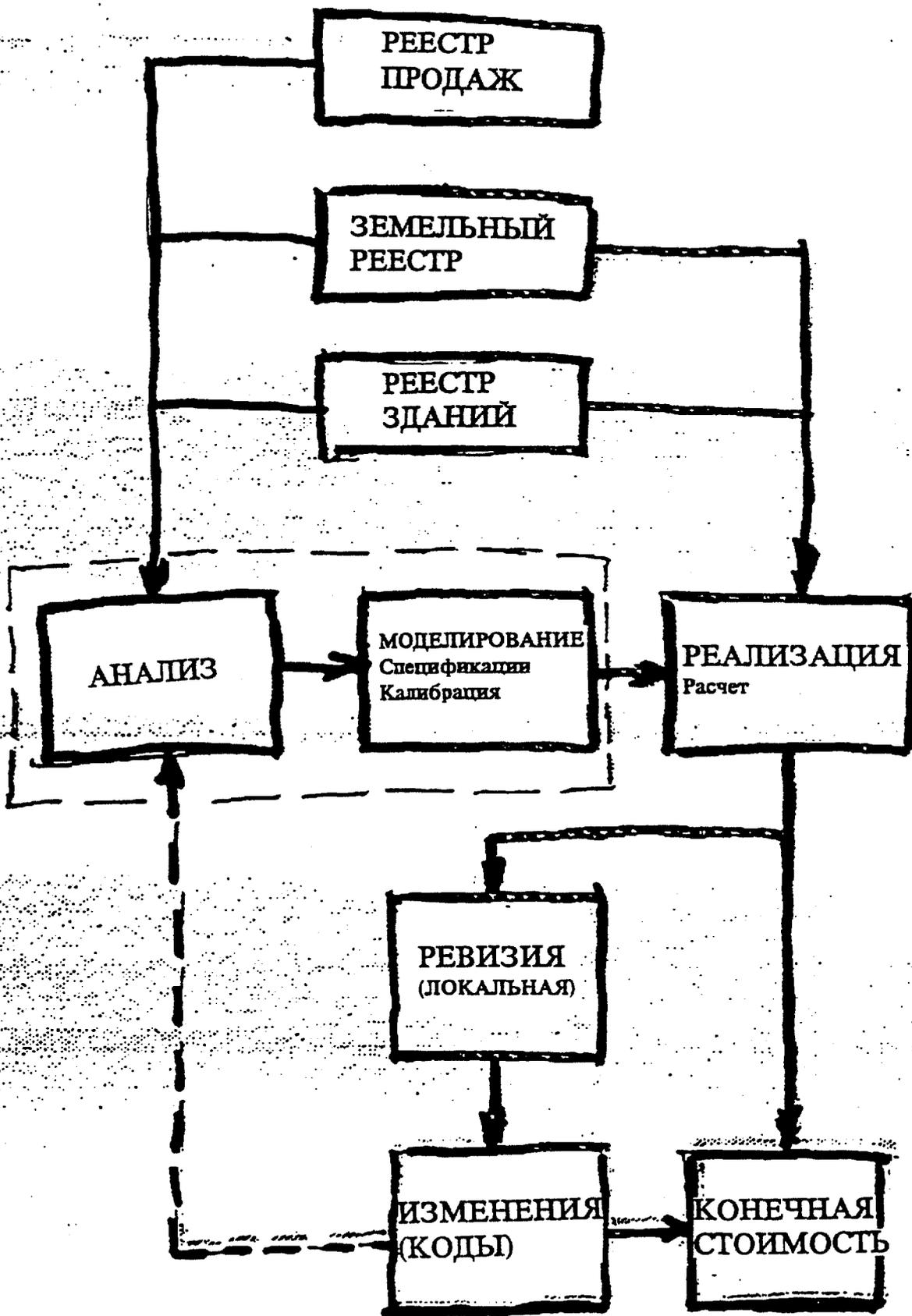
- Земли в качестве свободной и доступной
- Имущества в качестве благоустроенного (реально или предположительно)

Система учетных кадастров

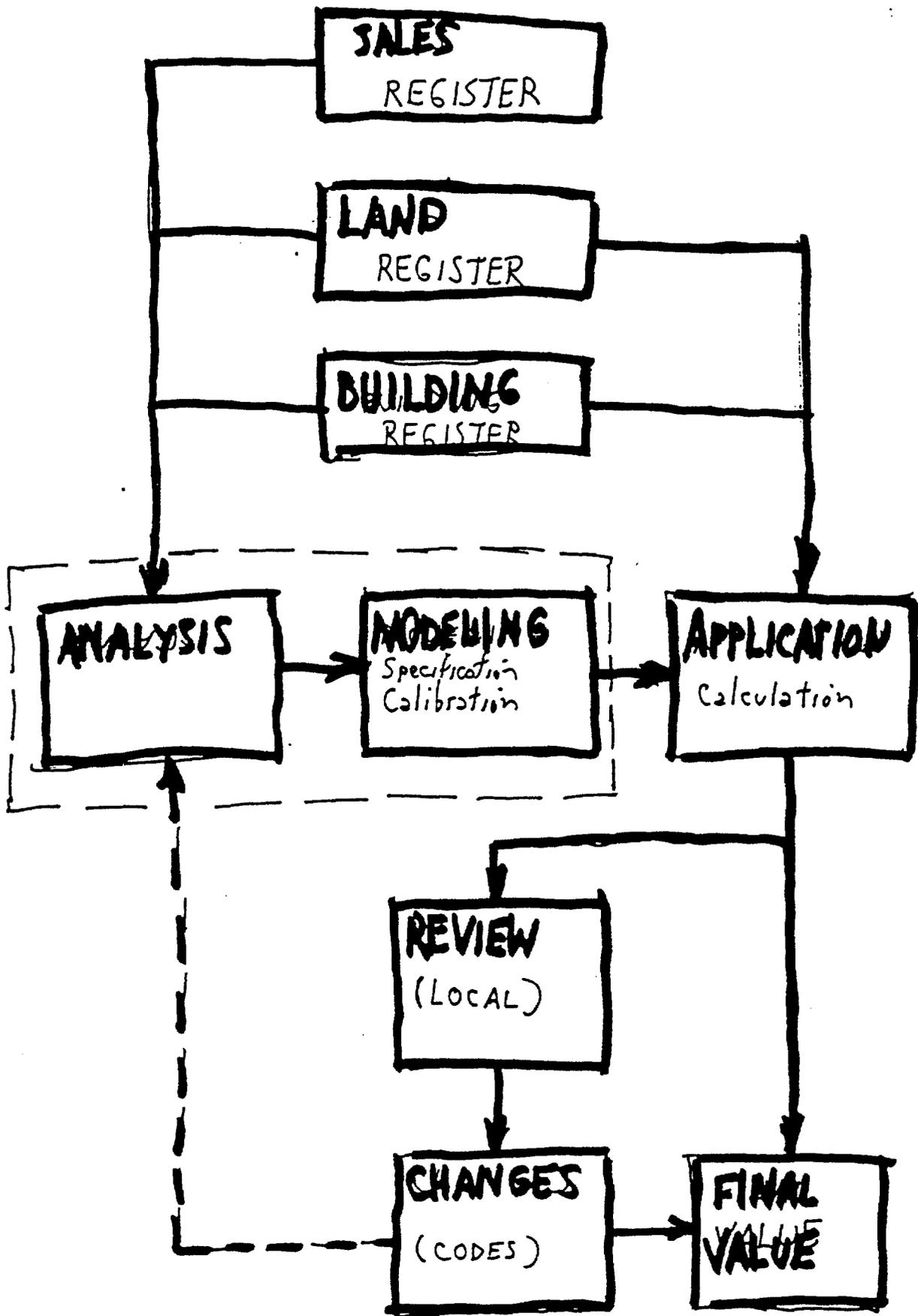
- Административные установки
- Списки налогоплательщиков
- Имущественные реестры
- Карты кадастров
- Система нумерации кадастров
- Картотека данных параметров рынка (цены на продажу, арендная плата и т.д.)

Cadastral System

- Administrative arrangements
- Taxpayer register
- Property register
- Cadastral maps
- Cadastral numbering system
- Market data files (sales prices, rents, etc.)



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Система оценки стоимости

- Административные установки
- Оценка рынка и предварительный анализ
- Моделирование оценки стоимости
- Расчеты стоимостей
- Пересмотр стоимостей
- Апелляции

Valuation System

- Administrative arrangements
- Market monitoring and preliminary analyses
- Valuation modeling
- Calculation of values
- Review of values
- Appeals

Working with Data

- I. Importance of Accurate Data
 - A. Sales data
 - B. Property characteristics data

- II. Evaluating Existing Data
 - A. Completeness -- are the necessary data available?
 - B. Accuracy -- are the data reliable?

- III. Data Important in Mass Appraisal
 - A. Land characteristics
 - 1. Lot size
 - 2. Site characteristics
 - B. Main structure
 - 1. Living area
 - 2. Construction quality
 - 3. Effective age or condition
 - 4. Design and amenities
 - C. Secondary structures (e.g., garage or outbuilding)
 - D. Location
 - 1. Economic area or zone
 - 2. Neighborhood

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Working with Data

IV. Types of Data

A. Quantitative (continuous)

1. Can take on a continuum of values
2. Usually based on counting or measuring
3. Examples: living area, number of rooms, age

B. Qualitative (Categorical) -- values are predefined

1. Discrete -- more than two choices

Examples: construction quality, design, roof type

2. Binary -- only two choices (yes/no)

Examples: remodeled, furnished, basement storage (PODVAL)

C. Numeric vs. Alphanumeric Data

- A. Only numeric data can be used in modeling

- B. For modeling, alphanumeric data must be converted to numeric

V. Editing Data

- A. Purpose -- to reduce data errors

- B. Types of data edits

1. Range edits

-- ensure that all quantitative data are reasonable (e.g., sale prices > 0)

-- ensure that all qualitative data are valid (e.g., furnished is 0 or 1)

2. Consistency edits -- ensure that data are consistent (e.g., total area => living area)

VI. "Outliers"

1. Unusual data
2. Should be checked for accuracy
3. May need to be deleted (not used in modeling)

Review Questions - Working with Data

1. List several data items important in the valuation of residential properties.

2. Building area is an example of which of the following:
 - a. continuous variable
 - b. qualitative variable
 - c. discrete variable
 - d. binary variable

3. Exterior wall type is an example of which of the following
 - a. quantitative variable
 - b. discrete variable
 - c. continuous variable
 - d. binary variable

4. Ensuring that number of rooms is greater than zero is an example of a _____ edit.

5. Ensuring that first floor area is no greater than total living area is an example of a _____ edit.

6. Categorize the following data items as continuous (C), discrete (D), or binary (B)
 - a. _____ building design
 - b. _____ living area
 - c. _____ neighborhood code
 - d. _____ covered parking (yes/no)
 - e. _____ construction quality

BB

Review Questions - Working with Data (Continued)

7. Unusual data items that may need to be deleted prior to valuation analysis are known as
 - a. Continuous data
 - b. Discrete data
 - c. Alphanumeric data
 - d. Outliers

8. All data used in modeling must be
 - a. Alphanumeric
 - b. Numeric
 - c. Continuous
 - d. Outliers

Introduction to Statistical Software and SPSS

I. Introduction to Statistical Software

A. Capabilities

1. Descriptive statistics
2. Multiple regression
3. Other statistics
 - a. Parametric (assumes normal distributions)
 - b. Nonparametric (no assumptions about data distributions)
4. Graphical analysis

B. Limitations

1. Data bases are not "dynamic" (variables can not be linked like in spreadsheets)
2. Requires knowledgeable user
3. Requires good judgment

C. Operating modes

1. Interactive
 - a. DOS - select from menus
 - b. Windows - point with mouse and click
2. Batch (command mode) -- involves writing programs

D. Some leading software packages

1. SPSS (Statistical Package for the Social Sciences)
2. NCSS (Number Cruncher Statistical System)
3. SAS (Statistical Analysis System)

Introduction to Statistical Software and SPSS

II. Overview of SPSS

- A. What is SPSS
 - 1. Widely used in education and social sciences
 - 2. Interfaces: interactive and batch
- B. Main menu and submenus
- C. "Window" or file types
 - 1. Data window (contains the data file)
 - 2. Output window (contains results)
 - 3. Chart windows (chart files)
 - 4. Syntax windows (program files)

III. Working with Files, Printing, and Help

- A. Entering and saving data
 - 1. Data types
 - a. alphanumeric ("string") -- can contain letters and numbers
 - b. Numeric -- contains only numbers
 - 2. Variable and value labels
- B. Importing and exporting data
 - 1. Can "import" spreadsheet (WK1) and dBase (dbf) files
 - 3. Can "export" data to other software
- C. Printing
 - 1. Printer setup
 - 2. Printing charts
- D. Utilities and Help

Introduction to Statistical Software and SPSS

IV. Manipulating Data

- A. Sorting (SORT CASES)
- B. Selecting data (SELECT CASES)

V. Transforming Variables

- A. Computing new variables (COMPUTE)
- B. Recoding variables (RECODE)

VI. Producing Basic Statistics

- A. Means and standard deviations (DESCRIPTIVES)
- B. Frequency distributions (FREQUENCIES)
- C. Data lists (LIST CASES)

Lab A - Entering and Listing Data

1. Open a new data file

File..New..Data

2. Enter the following data:

PARCEL	GRADE	YRBLT	LIVAREA	NBHD	ROOMS	PRICE
1	4	1976	46	103	3	50,000
2	3	1984	58	101	4	65,000
3	3	1965	40	101	3	47,500
4	2	1947	63	102	5	80,000
5	3	1980	52	103	3	70,000
6	4	1989	34	101	2	32,000
7	2	1953	39	102	2	39,500
8	3	1977	55	103	4	60,990
9	2	1982	36	102	3	35,000
10	3	1988	50	101	4	55,250

3. Assign the above variable labels to the variables.

Double click on a column label and enter the variable name.

4. Enter the following variable labels for GRADE: 2 = Fair, 3 = Average, 4 = Good.

5. Save the data file under the name, LAB-A.SAV.

6. Sort the data by PRICE.

Data..Sort Cases and choose PRICE.

7. List the following for each parcel: PARCEL, GRADE, PRICE.

Statistics..Summarize..List Cases

8. Select parcels for which GRADE = 3

Data..Select Cases..If Condition is Satisfied..If and enter GRADE = 3. Then click Continue..OK.

Note that the other property grades are "filtered" but not deleted from the active data file. (Note the "Filter On" message on the lower right hand corner of your screen.)

Lab A (Continued)

9. Again list the following for each parcel: PARCEL, GRADE, PRICE. Verify that all the listed properties are Grade 3. How many properties are on your list? _____

10. Retrieve the full full with all 10 cases.

Data..Select Cases..All Cases..Continue..OK.

Note: the "filter on" message should no longer appear on the lower right hand corner of your screen.

11. Sort the properties by grade and price.

Data..Sort Cases and choose GRADE and then PRICE.

12. On your own, list GRADE, ROOMS, NBHD, and PRICE.

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Descriptive Statistics

I. Arrays

- A. List of data in order of magnitude
- B. Good for small data sets

II. Frequency distributions

- A. Show the number (or percentage) of cases for each data value
- B. Can be used for all data types (alphanumeric and numeric)
- C. Particularly good for qualitative data

III. Percentiles

- A. Divide a data set into desired percentages, e.g., fourths (quartiles) or tenths (deciles)
- B. Only applies to numeric data

IV. Measures of central tendency

- A. Median -- middle value

Note: if the number of data items is even, the median is the midpoint between the two middle values.

- B. Mean -- average value of the items
 - 1. Computed by summing the values and dividing by sample size
 - 2. More affected by extreme values than the median
- C. Mode -- most frequently occurring value

Descriptive Statistics

V. Measures of dispersion

- A. Range -- difference between the minimum and maximum values
- B. Interquartile range -- third quartile less the first quartile
- C. Average absolute deviation -- average sign-ignored deviation from the median

1. Ave Abs Dev =
$$\frac{\Sigma [\text{ABS}(X_i - \text{MEDIAN})]}{n}$$

where ABS = absolute value

2. Nonparametric measure of dispersion
- D. Variance -- sum of the squared deviations from the mean divided by n-1

1. Variance =
$$\frac{\Sigma (X_i - \text{Mean})^2}{n-1}$$

2. Parametric measure of dispersion
3. Used in further statistical analysis and to compute the standard deviation
- E. Standard deviation -- square root of the variance
 1. Std Dev = SQRT (Variance)
 2. When data are normally distributed:
 - Approximately 68% will lie within \pm one standard deviation of the mean
 - Approximately 95% will lie within \pm two standard deviations of the mean
 - Approximately 99% will lie within \pm three standard deviations of the mean

**EXAMPLE OF ARRAY
ASKING PRICES - ZONE 5**

5200
5500
6300
7000
7500
8000
8000
8000
8000
8000
9500
10000
10000
11000
11000
12000
12500
13000
24000

Number of cases read: 19

Number of cases listed: 19

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STEPS IN CALCULATING THE STANDARD DEVIATION

1. Subtract mean from each value
2. Square all deviations from mean
3. Sum squared deviations
4. Divide by $n - 1$ ($n =$ sample size)

Note: result is termed "variance"

5. Take square root of variance

Result is the "standard deviation"

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EXAMPLE OF FREQUENCY DISTRIBUTION

ROOMS

Value	Frequency	Percent	Valid Percent	Cum Percent
1	80	26.6	26.6	26.6
2	112	37.2	37.2	63.8
3	92	30.6	30.6	94.4
4	16	5.3	5.3	99.7
5	1	.3	.3	100.0
<hr/>				
Total	301	100.0	100.0	

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EXAMPLE OF PERCENTILES:

16 SALES PRICES

NUMBER	PRICE
1	4,000
2	5,000
3	10,500
4	16,000
5	18,000
6	20,000
7	22,500
8	24,000
9	25,000
10	27,000
11	27,000
12	30,000
13	35,000
14	39,900
15	45,000
16	52,000

FIRST QUARTILE = 17,000

SECOND QUARTILE (MEDIAN) = 24,500

THIRD QUARTILE = 32,500

INTERQUARTILE RANGE = 32,500 - 17,000 = 15,500

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EXAMPLE OF MEASURES OF CENTRAL TENDENCY:

BATHROOM DATA FOR EIGHT RESIDENCES

RAW DATA			SORTED DATA	
PARCEL	BATHS		PARCEL	BATHS
1	2		2	1
2	1		6	1
3	2		7	1
4	3		1	2
5	2		3	2
6	1		5	2
7	1		8	2
8	2		4	3

				14

MEDIAN = 2

MEAN = 14 / 8 = 1.75

MODE = 2

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EXAMPLE OF MEASURES OF DISPERSION:

BATHROOM DATA FOR EIGHT RESIDENCES

PARCEL	BATHS	MEAN	DIFF.	DIFF. SQUARED
1	2	- 1.75	= 0.25	0.0625
2	1	- 1.75	= -0.75	0.5625
3	2	- 1.75	= 0.25	0.0625
4	3	- 1.75	= 1.25	1.5625
5	2	- 1.75	= 0.25	0.0625
6	1	- 1.75	= -0.75	0.5625
7	1	- 1.75	= -0.75	0.5625
8	2	- 1.75	= -0.25	0.0625

				3.5000

RANGE = 3 - 1 = 2

VARIANCE = 3.50 / 7 = .50

STANDARD DEVIATION = SQRT(.50) = .707

Study Problem
Calculation of Measures of Central Tendency and Dispersion

Consider the following data on building ages:

Property	Age
1	25
2	18
3	7
4	40
5	32
6	12
7	22
8	28

1. Construct an array of the data
2. What is the median and mean age?
3. What is the range?
4. What is the variance and standard deviation?

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Study Problem
Calculation of Measures of Central Tendency and Dispersion

Solution:

1.

Property	Age	Age Arrayed
1	25	7
2	18	12
3	7	18
4	40	22
5	32	25
6	12	28
7	22	32
8	28	40
		<hr style="width: 50px; margin: 0 auto;"/> 184

2. Median = $(22 + 25) \div 2 = 23.5$

Mean = $184 \div 8 = 23$

3. Range = $40 - 7 = 33$

4. Variance and standard deviation:

Age	Mean Age	Difference	Difference Squared
25	-	23 = 2	4
18	-	23 = -5	25
7	-	23 = -16	256
40	-	23 = 17	289
32	-	23 = 9	81
12	-	23 = -11	121
22	-	23 = -1	1
28	-	23 = 5	25
			<hr style="width: 50px; margin: 0 auto;"/> 802

Variance = $802 \div 7 = 114.57$

Standard deviation = $\text{SQRT}(114.57) = 10.7$

MA

One Variable Graphs and Charts

I. Bar Chart (Graphs..Bar)

- use to show the distribution of a qualitative variable
- heights of the bars represent the number of cases (properties)

II. Pie Chart (Graphs..Pie)

- shows the distribution of a qualitative variable
- alternative to a bar chart
- pie slices represent the percentage of cases

III. Histogram (Graphs..Histogram)

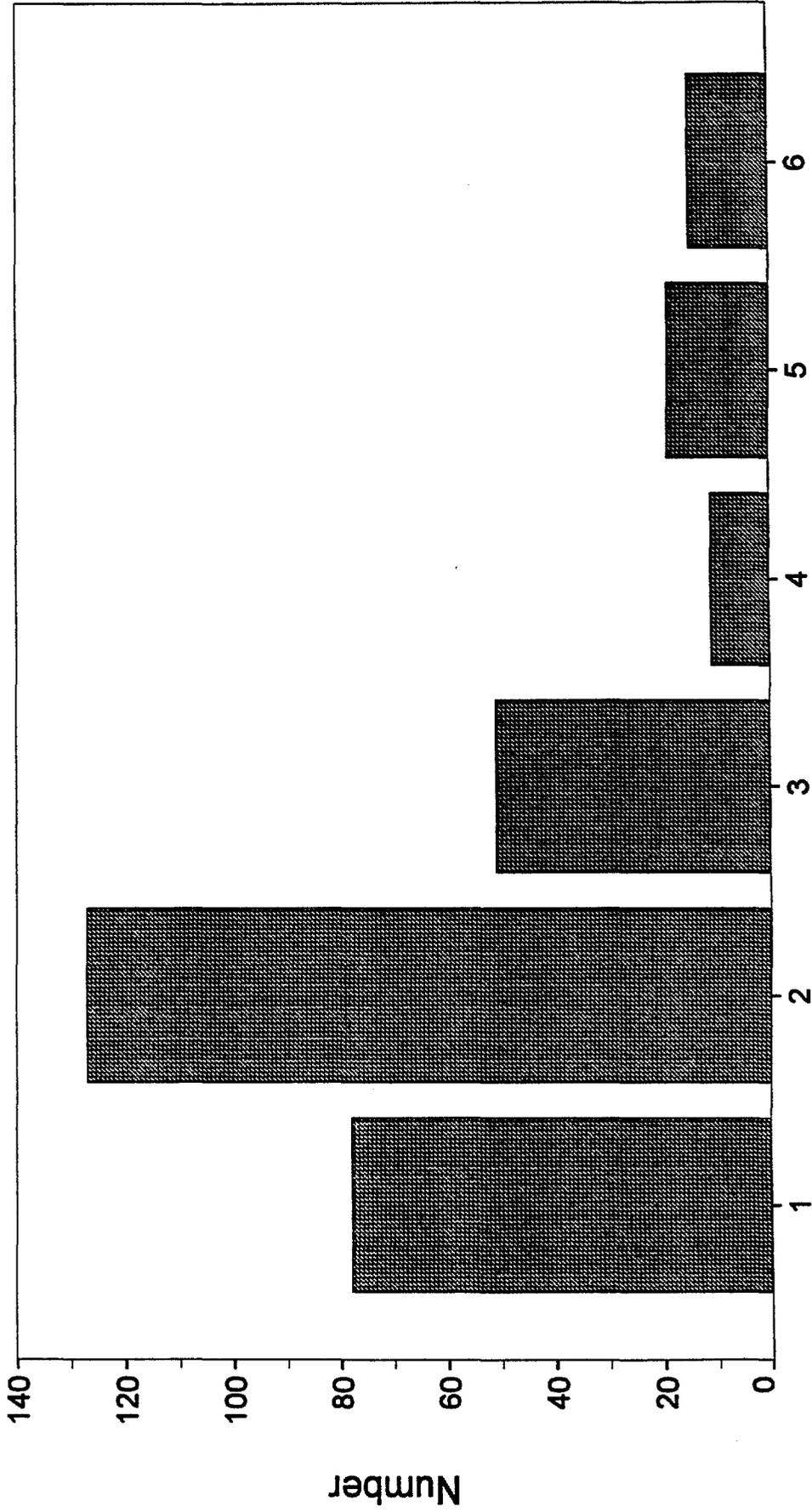
- use to show the distribution of a continuous variable
- software will determine break points
- useful for visualizing the data, including outliers

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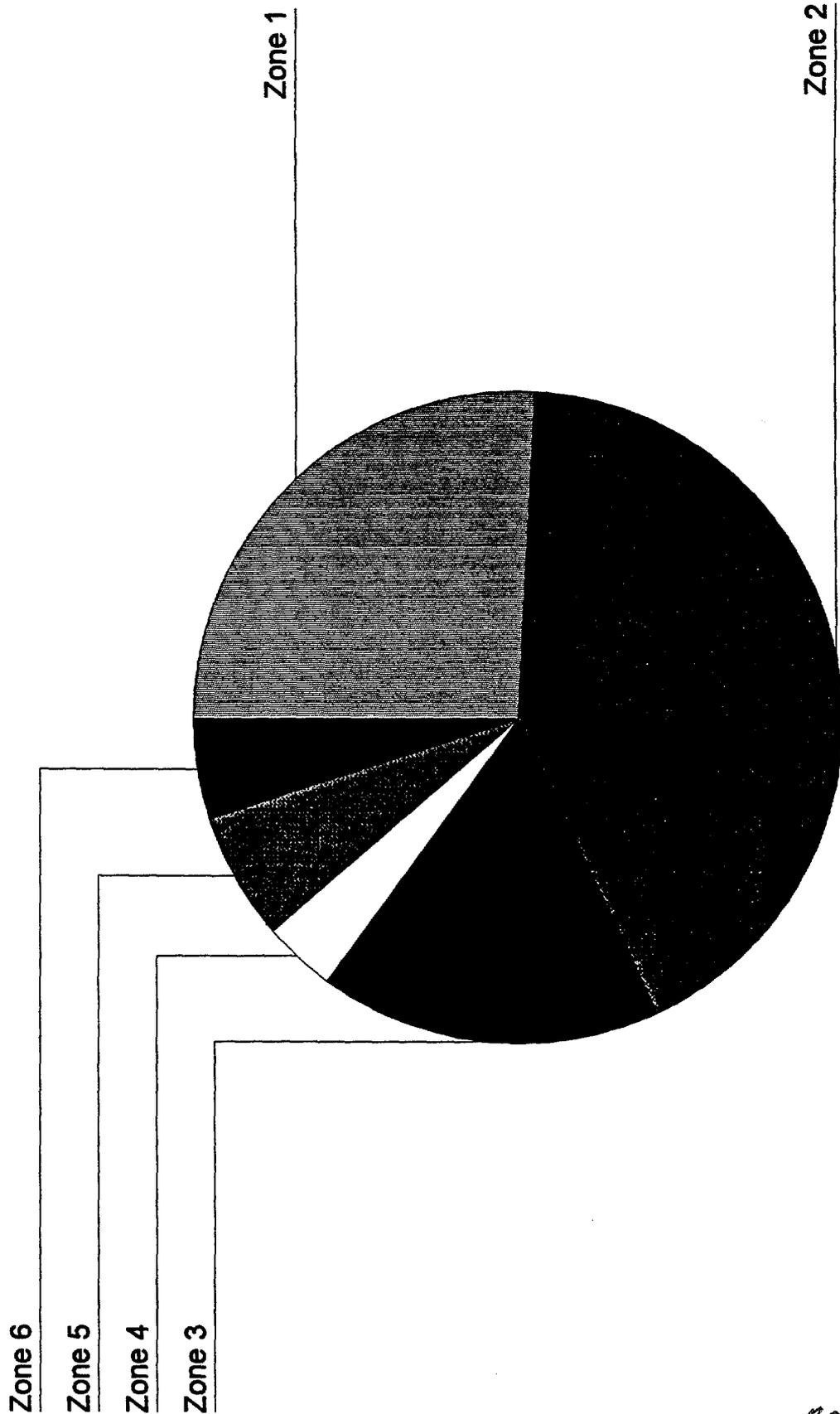
BAR
EXAMPLE OF BOX PLOT

PROPERTIES FOR SALE BY ZONE



ZONE

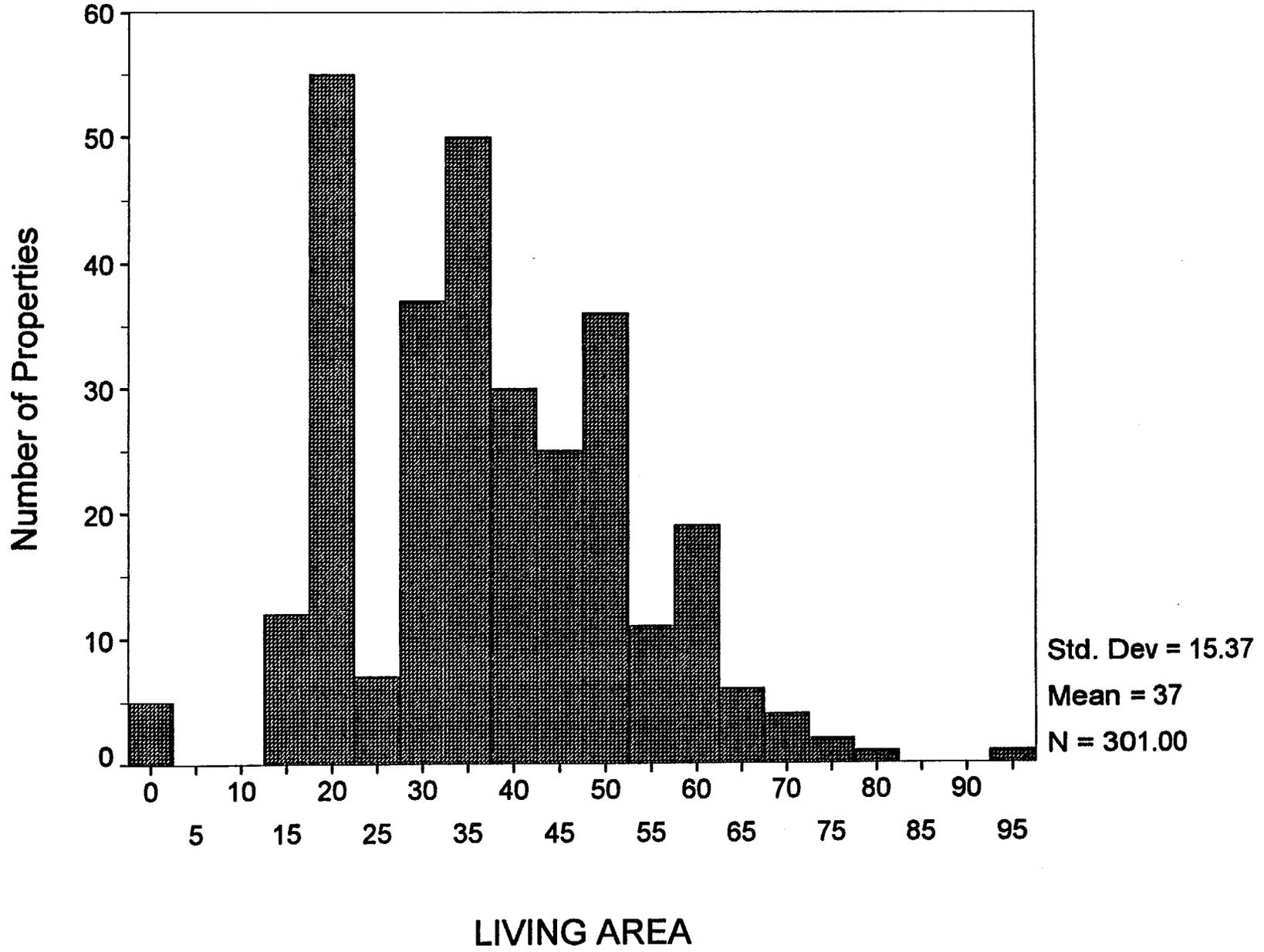
EXAMPLE OF PIE PLOT PROPERTIES FOR SALE BY ZONE



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EXAMPLE OF HISTOGRAM



Lab B - Analyzing Data

1. Retrieve the data file, LAB-A.SAV.

File..Open..Data..LAB-A.SAV.

2. Run a frequency distribution on NBHD.

Statistics..Summarize..Frequencies..NBHD

How many neighborhoods are there? _____

3. Run a frequency distribution on GRADE with a bar chart.

Statistics..Summarize..Frequencies..GRADE..Charts..Bar Chart

Which grade is most common (the mode)? _____

4. Find the median and mean living area and sale price.

Statistics..Summarize..Frequencies. Choose Statistics, and check Median and Mean

	Median	Mean
LIVAREA	_____	_____
PRICE	_____	_____

5. Run descriptives on YRBLT and ROOMS. What are their means and standard deviations?

Statistics..Summarize..Descriptives..YRBLT ROOMS

	Mean	Std Dev
YRBLT	_____	_____
ROOMS	_____	_____

6. Assuming that YRBLT is normally distributed, about two-thirds of homes will have been built between:

Lower Limit: 19 _____

Upper Limit: 19 _____

7. Run a pie chart of ROOMS

Graphs..Pie Chart..ROOMS

What is the mode of ROOMS? _____

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Lab C - One-Variable Data Analysis, Graphs, and Charts

1. Open the file, APT.SAV
2. Run a frequency distribution of STORIES.
Statistics..Summarize..Frequencies. Enter STORIES and click OK.
Which number of stories occurs most frequently? _____
3. Run a frequency distribution of BALCONY. What balcony type is most common? _____
4. On your own, find how many of the apartments have a garage?

5. How many have basement storage (PODVAL)? _____
How many are furnished? _____
6. Produce a bar chart of ROOMS.
Graphs..Bar..Define. Enter ROOMS into the Category Axis and click OK.
Which room count occurs most frequently? _____
7. Discard the chart, return to the main menu, and produce a pie chart of ROOMS.
Graphs..Pie..Define. Enter ROOMS into "Define Slices by" and click OK.
8. Discard the chart, return to the main menu, and produce a histogram of PRICE with a superimposed normal curve.
Graphs..Histogram. Click PRICE and "Display Normal Curve."
Is the distribution approximately normal? _____
9. Repeat the analysis for LIVAREA.
Is the variable normally distributed? _____

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10. Edit the histogram.

☛ Click Edit.

Add and center the title: "HISTOGRAM OF LIVING AREA."

☛ Click on Chart..Title and type in the title. Click OK.

Improve the horizontal axis labels.

☛ Double click on the horizontal axis and change the label to "Living Area (Square Meters)". Center the label.

Make any other changes you feel would improve the appearance of the chart.

☛ To edit a chart element, double click on it or select it from the chart menu.

11. What is the average sale price? _____

Statistics..Summarize..Descriptives..PRICE.

12. Find the 25th and 75th percentiles of PRICE.

Statistics..Summarize..Frequencies. Enter PRICE and then click Statistics..Quartiles.

25th percentile (first quartile) = _____

75th percentile (third quartile) = _____

13. On your own, run additional analyses of interest.

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Two and Three Variable Analyses

- I. Crosstabs (Statistics..Summarize..Crosstabs)
 - use to compare two qualitative variables

- II. Scatter plot (Graphs..Scatter)
 - shows the relationship between two continuous variables, e.g., sale price and living area
 - put the "dependent" variable on the vertical axis
 - put the "independent" variable on the horizontal axis

- III. Breakdowns (Statistics..Compare Means..Means)
 - show the mean of a quantitative by values of a qualitative variable

- IV. Box plots (Graphs..Boxplot)
 - show the distribution of a quantitative variable versus a qualitative variable
 - boxes represent 50% of data
 - hash marks represent at least 90% of data
 - circles represent "outliers" and asterisks represent "extremes" (at least three box lengths from median)

- V. Line charts (Graphs..Line)
 - use to plot statistics for one variable (e.g., mean sale price) versus another variable (e.g., zone)
 - helps to analyze underlying trends (forest versus trees)

- VI. 3-D charts (Graphs..Scatter..3-D)
 - use to compare three continuous variables
 - the "X" and "Y" coordinates can be geographic coordinates

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EXAMPLE OF CROSS-TABULATION

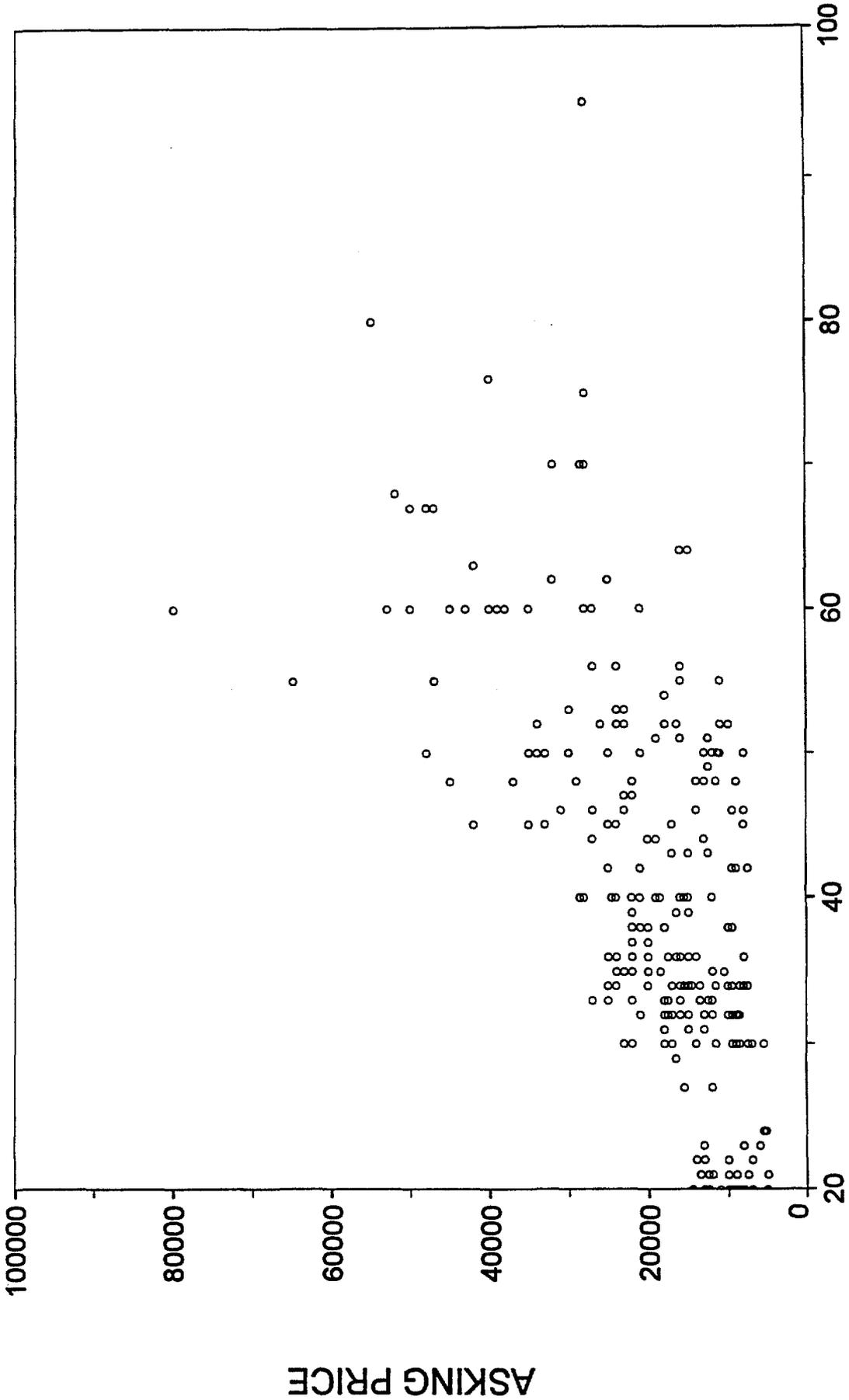
ZONE by ROOMS

ZONE	Count	ROOMS					Row Total
		1	2	3	4	5	
1	23	27	26	2		78 25.9	
2	31	51	35	9	1	127 42.2	
3	17	23	9	2		51 16.9	
4	3	5	2	1		11 3.7	
5	3	3	12	1		19 6.3	
6	3	3	8	1		15 5.0	
Column Total	80 26.6	112 37.2	92 30.6	16 5.3	1 .3	301 100.0	

JP

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EXAMPLE OF SCATTER PLOT



LIVING AREA

EXAMPLE OF "BREAKDOWN" ANALYSIS:

AVERAGE STORIES BY ZONE

- - Description of Subpopulations - -

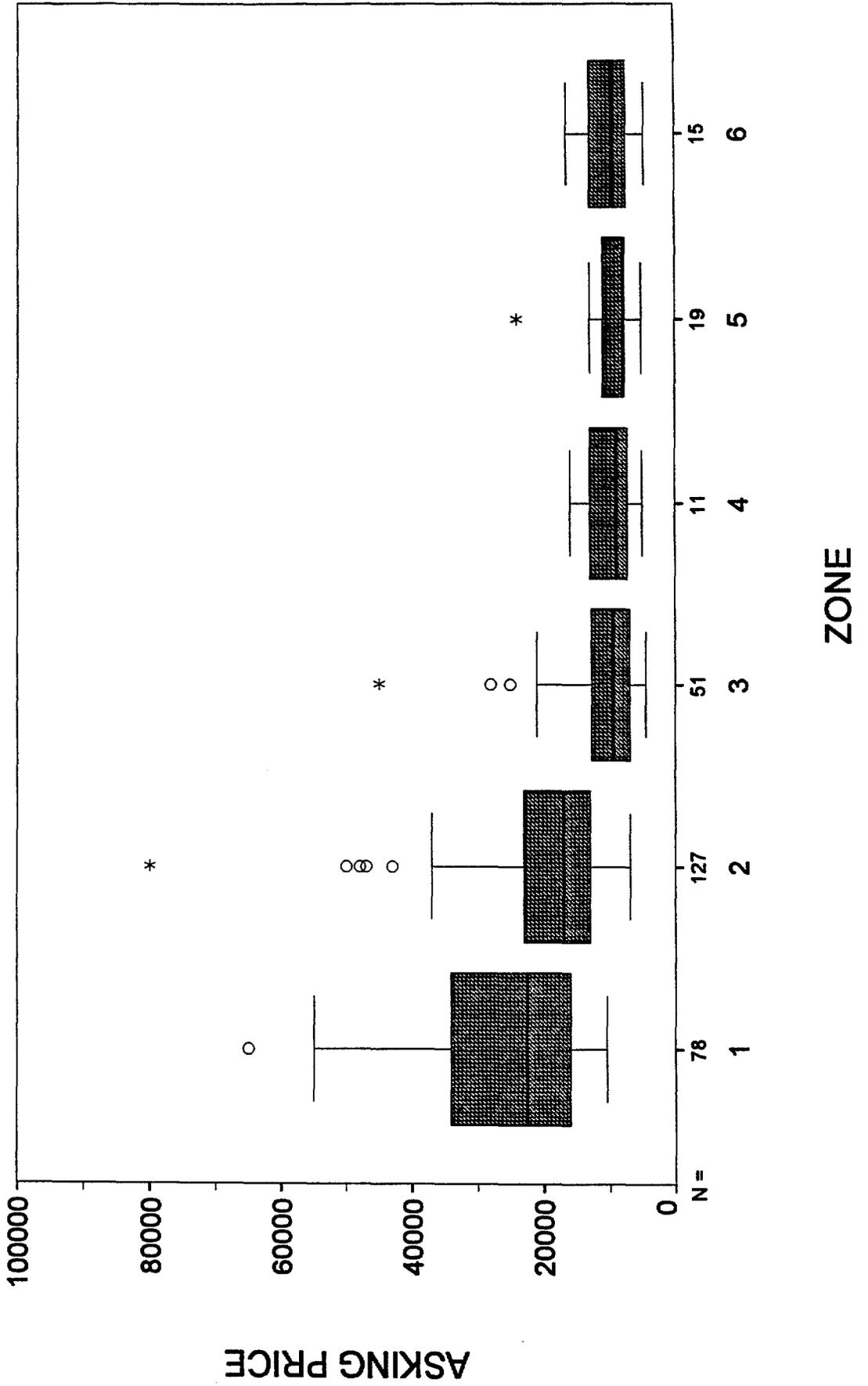
Summaries of STORIES
By levels of ZONE

Variable	Value	Label	Mean	Std Dev	Cases
For Entire Population			7.1329	3.4509	301
ZONE	1		6.4231	3.2092	78
ZONE	2		6.9921	3.3106	127
ZONE	3		6.2353	3.1022	51
ZONE	4		7.7273	4.5186	11
ZONE	5		11.4211	3.3717	19
ZONE	6		9.2000	.7746	15

Total Cases = 301

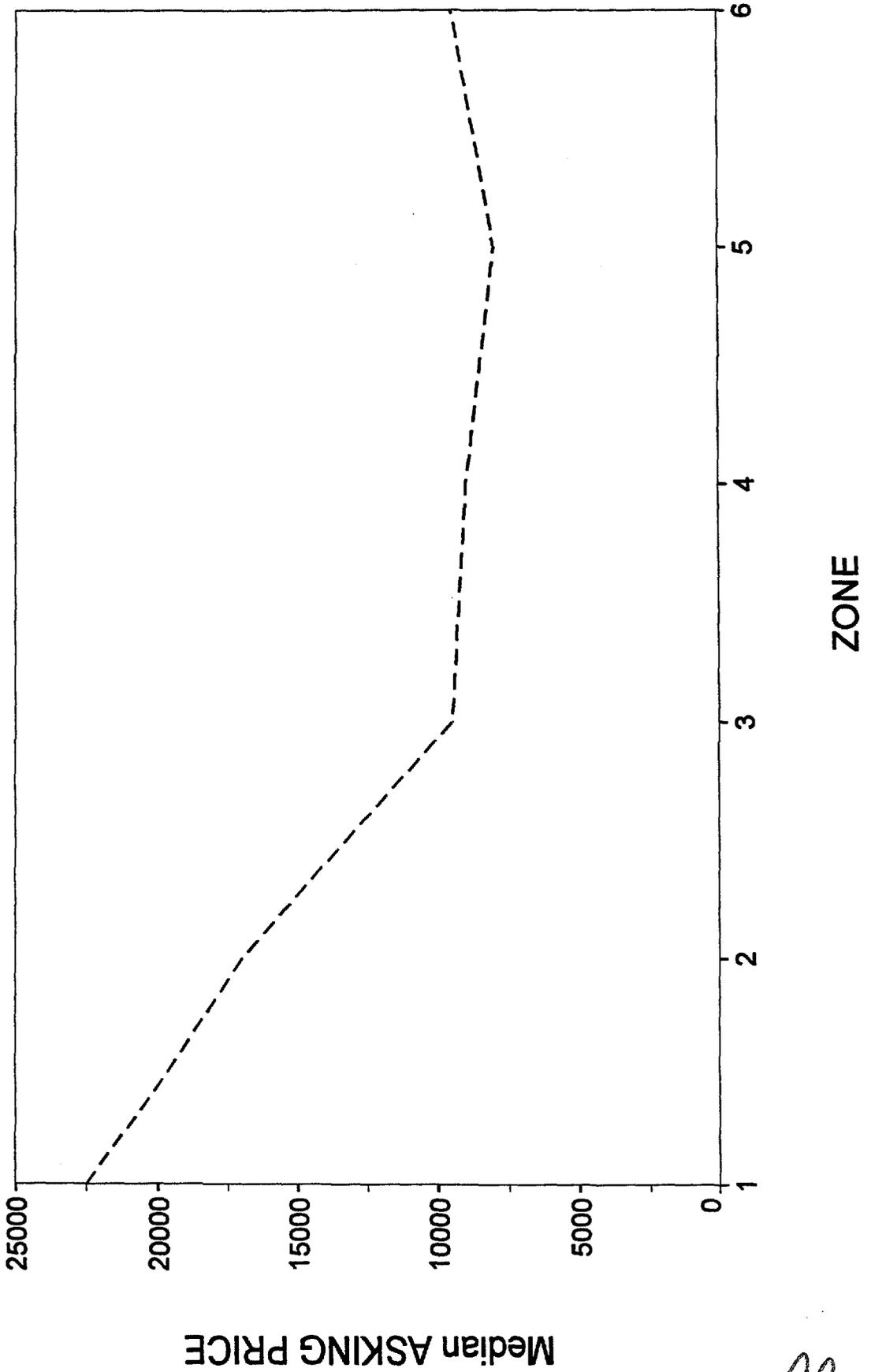
18

EXAMPLE OF BOX PLOT ASKING PRICES BY ZONE



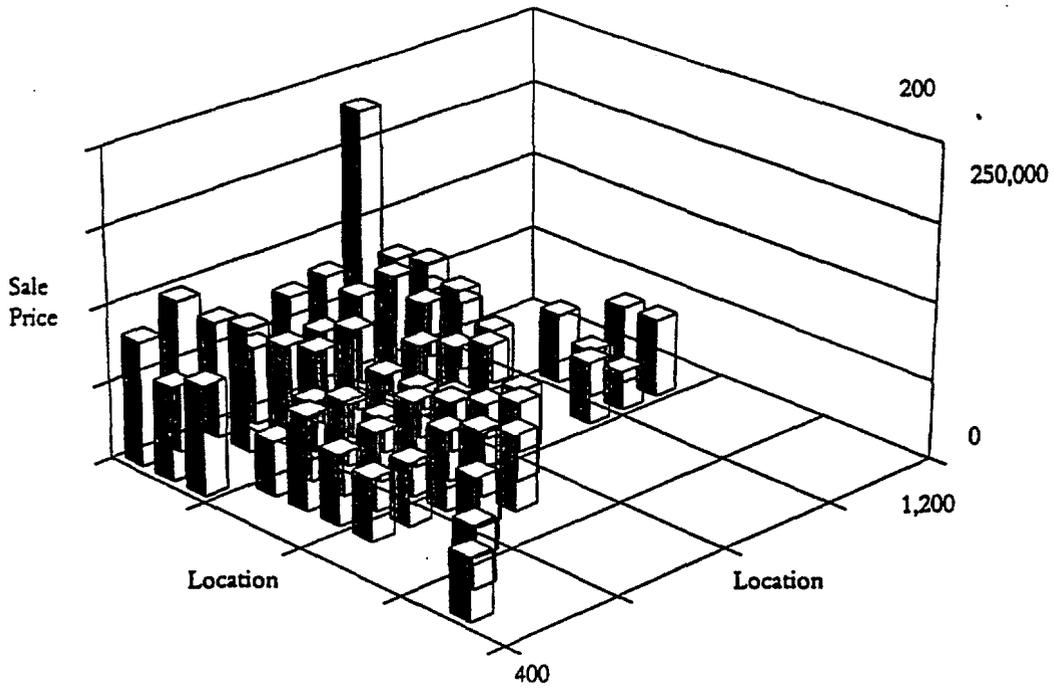
EXAMPLE OF LINE CHART

MEDIAN ASKING PRICES BY ZONE



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Example of 3-D Chart
Sale Price vs X-Y Location Coordinates



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Review Questions: Descriptive Statistics

1. An array is most appropriate for a
 - a. Small sample of a qualitative variable
 - b. Small sample of a quantitative variable
 - c. Large sample of a qualitative variable
 - d. Large sample of a quantitative variable
2. The _____ contains the middle 50 percent of a data distribution.
3. The middle value in an array is the _____
4. Compute the mean of the following room counts: 5, 7, 7, 4, 6, 7. _____
5. What is the mode of the above data? _____
6. What is the range? _____
7. What is the standard deviation? _____
8. Which of the following is used to list the number of cases for each value of a discrete variable?
 - a. Mean
 - b. Scatter plot
 - c. Histogram
 - d. Frequency distribution
9. Which of the following are most similar (can be used to show the same thing)?
 - a. Bar chart and pie chart
 - b. Array and line chart
 - c. Mean and standard deviation
 - d. Frequency distribution and scatter plot
10. Sale price and living area could best be graphically compared by a
 - a. Histogram
 - b. Frequency distribution
 - c. Box plot
 - d. Scatter plot
11. Which of the following would be used to show the number of homes by construction grade and neighborhood?
 - a. Box plot
 - b. Crosstabulation
 - c. Standard deviation
 - d. Scatter plot

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12. The shaded boxed area in a box plot represents _____ percent of the data.
13. Assume that the mean sale price is \$30,000 and the standard deviation is \$8,000.

Provided the data are normally distributed, approximately two-thirds of sales prices will fall between \$ _____ and \$ _____.

14. Approximately 95 percent will fall between \$ _____ and \$ _____.

af

Review Questions: Descriptive Statistics

Solutions:

1. (b) small sample of a quantitative variable
2. inter-quartile range
3. median
4. mean = $(5+7+7+4+6+7) = 36 \div 6 = 6$
5. mode = 7
6. range = $7 - 4 = 3$

7.	Rooms	Mean	Difference	Difference Squared		
	5	-	6	=	-1	1
	7	-	6	=	1	1
	7	-	6	=	1	1
	4	-	6	=	-2	4
	6	-	6	=	0	0
	7	-	6	=	1	1
					---	8

Variance = $8 \div 5 = 1.6$

Standard deviation = $\text{SQRT}(1.6) = 1.265$

8. (c) histogram
9. (a) bar and pie chart
10. (d) scatter plot
11. (b) crosstabulation
12. 50 percent
13. \$22,000 and \$38,000
14. \$14,000 and \$46,000

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Lab D - Two-Variable Data Analysis, Graphs, and Charts

1. Run a crosstabs of ZONE by REMODEL.

Statistics..Summarize..Crosstabs and enter REMODEL as the column variable and ZONE as the row variable.

What percentage of the apartments have been remodeled?

Which zone has the most remodeled units? _____

2. Run a breakdown (Compare Means) of PRICE by ZONE.

Statistics..Compare Means..Means. Enter PRICE as the dependent variable and ZONE as the independent variable.

Which zone has the highest average price? _____

3. Compute a new variable price per square meter, PRICEPSM = PRICE/TOTAREA.

Transform..Compute. Enter PRICEPSF as the Target Variable and PRICE/TOTAREA into the numeric expression.

4. Produce a boxplot of PRICEPSM by

Graph..Boxplot..Define and enter PRICEPSM as the Variable and ZONE as the Category Axis.

5. Repeat the analysis, substituting STORIES and STORY into the Category axis.

Does price per square meter tend to increase with STORIES or STORY? _____

6. Run a scatter plot of PRICE with TOTAREA.

Graphs..Scatter..Define. Enter PRICE as the Y-Axis variable and TOTAREA as the X-Axis variable.

Do the variables appear highly correlated? _____

Edit the graph. Add a title. Delete cases that have no total area (bad data) by double clicking on the horizontal axis title (TOTAREA) and changing the Minimum Value to 20, Major Increments to 20, and Minor Increments to 10.

an

Add a line of "best fit," by clicking Chart..Options..Total and then OK.

You can also customize the data points by clicking on them or choosing Attributes..Marker.

When satisfied, save the chart.

Click..Save Chart and enter SCATTER.CHT.

7. Run a scatter graph of LIVAREA with TOTAREA.

Do the two variables appear highly correlated? _____

8. Find the correlation coefficient between the two variables.

Statistics..Correlate..Bivariate. Enter LIVAREA and TOTAREA and click OK.

What is the correlation coefficient? _____

9. Run a line chart of median PRICE with ROOMS.

Graphs..Line..Define. Click Other Summary Function, enter PRICE as the Variable, and click Change Summary..Median of Values..Continue. Then enter ROOMS as the Category Axis and click OK.

Does the median price change with the number of rooms? _____

10. Repeat the analysis, substituting ZONE for ROOMS.

11. As time permits, conduct additional analyses of interest.

12. When finished, exit SPSS. Answer no when prompted to save any open files.

Correlation and Regression Analysis

I. Correlation Analysis

- A. Measures linear relationship between two variables or pairs of variables
- B. Coefficient of correlation -- ranges from -1 to +1
- C. Correlation matrix -- shows correlations between all pairs of variables

II. Simple (one variable) Regression

- A. Dependent variable -- quantity being estimated (e.g., sale price)
- B. Independent variable -- input or factor variable (e.g., square feet or meters of living area)

III. Least Squares Principle

-- Regression minimizes sum of squared errors between actual values (sales prices) and predicted value. This is the line of "best fit."

IV. Basic Regression Statistics

- A. Constant -- a constant dollar amount found at the point where the regression line intersects the Y-axis (e.g., \$499.34 in the demonstration example)
- B. Regression coefficient -- the amount or amount per unit associated with each variable in the model (e.g., \$480.46 the example)
- C. Standard error -- the standard deviation of the regression coefficient (two standard errors form a 95% confidence interval around the regression coefficient)
- D. t-value -- the ratio of the regression coefficient to its standard error. The higher the number, the better (coefficients with t-values of greater than 2.00 are "significant" at the 95% confidence level)

$$t\text{-value} = \text{coefficient} \div \text{std. error}$$

- E. R-Square -- the percentage of the variation in sales prices explained by the regression model
 - 1. Maximum value is 100%
 - 2. Higher the number, the better

Correlation and Regression Analysis

- F. Standard error of estimate (SEE) -- standard deviation of the regression errors. The lower the number, the better (approximately 95% of the regression errors will fall within two standard error)
- G. Coefficient of variation (COV) - ratio of the standard error of estimate to the average sale price

$$\text{COV} = \text{SEE} \div \text{ave}(\text{SP})$$

V. Multiple Regression Analysis

- A. Includes multiple independent variables
- B. Independent variables should be those related to local real estate value, i.e., reflect supply and demand
- C. Accuracy depends on:
 - 1. Data availability and accuracy
 - 2. Model specification - variables included in model
 - 3. Model calibration - techniques used to determine coefficients

CORRELATION MATRIX

- - Correlation Coefficients - -

	PRICE	LIVAREA	OTHAREA	TOTAREA	ROOMS	STORIES
PRICE	1.0000	.6470**	.5124**	.6583**	.5641**	-.0811
LIVAREA	.6470**	1.0000	.5527**	.8826**	.8702**	.1658**
OTHAREA	.5124**	.5527**	1.0000	.8796**	.5540**	.2102**
TOTAREA	.6583**	.8826**	.8796**	1.0000	.8093**	.2132**
ROOMS	.5641**	.8702**	.5540**	.8093**	1.0000	.1907**
STORIES	-.0811	.1658**	.2102**	.2132**	.1907**	1.0000
GARAGE	.1063	.0685	.1926**	.1478*	.1659**	.1285*
REMODEL	.1514**	.1491**	.1332*	.1602**	.1491**	.1040
ZONE	-.4588**	-.0289	-.0553	-.0476	.0961	.2810**
PARAD	.0126	-.0651	-.1681**	-.1320*	-.0747	.0093
PODVAL	-.0083	.0175	.0225	.0227	.0322	-.0314
STORY	-.1066	.0533	.0999	.0868	.0670	.5465**

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed

	GARAGE	REMODEL	ZONE	PARAD	PODVAL	STORY
PRICE	.1063	.1514**	-.4588**	.0126	-.0083	-.1066
LIVAREA	.0685	.1491**	-.0289	-.0651	.0175	.0533
OTHAREA	.1926**	.1332*	-.0553	-.1681**	.0225	.0999
TOTAREA	.1478*	.1602**	-.0476	-.1320*	.0227	.0868
ROOMS	.1659**	.1491**	.0961	-.0747	.0322	.0670
STORIES	.1285*	.1040	.2810**	.0093	-.0314	.5465**
GARAGE	1.0000	.2078**	.0161	-.0160	.0944	.0773
REMODEL	.2078**	1.0000	.0611	-.0635	.0997	.0883
ZONE	.0161	.0611	1.0000	-.0189	.0916	.1513**
PARAD	-.0160	-.0635	-.0189	1.0000	.0323	.0607
PODVAL	.0944	.0997	.0916	.0323	1.0000	-.0968
STORY	.0773	.0883	.1513**	.0607	-.0968	1.0000

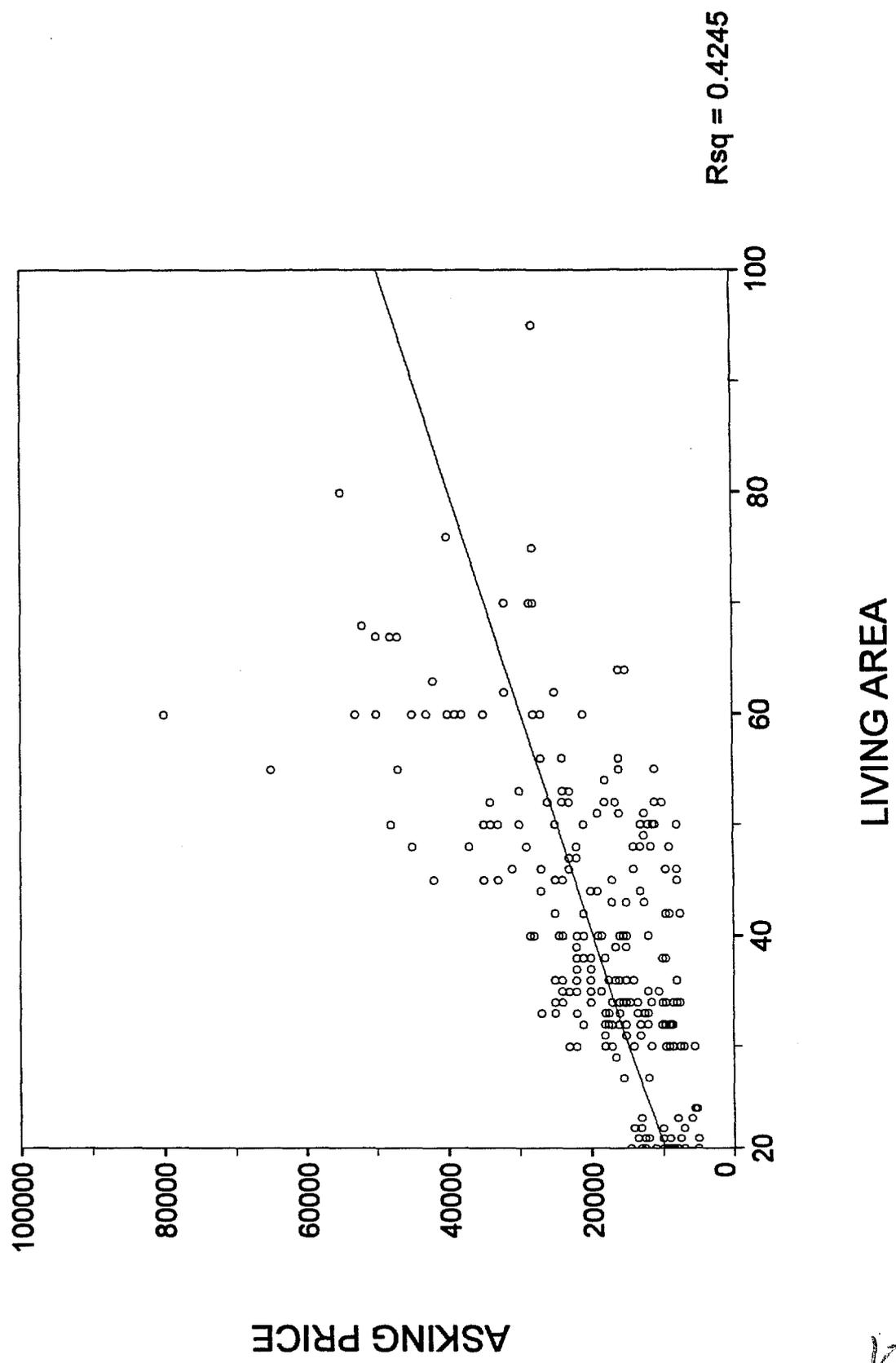
* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

" . " is printed if a coefficient cannot be computed

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EXAMPLE OF REGRESSION LINE

ASKING PRICE AND LIVING AREA



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REGRESSION OF ASKING PRICE ON LIVING AREA

***** MULTIPLE REGRESSION *****

Equation Number 1 Dependent Variable.. PRICE ASKING PRICE

Block Number 1. Method: Enter LIVAREA

Variable(s) Entered on Step Number

1.. LIVAREA

Multiple R .64696
 R Square .41856
 Adjusted R Square .41662
 Standard Error 8720.21503

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	16367380566.86323	16367380566.8632
Residual	299	22736602888.28630	76042150.12805

F = 215.24090 Signif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
LIVAREA	480.446985	32.747871	.646962	14.671	.0000
(Constant)	499.344552	1316.107083		.379	.7047

End Block Number 1 All requested variables entered.

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Lab E - Multiple Regression Analysis

1. Open the data file, APT.SAV.
2. Select cases that meet the following conditions:
 - a. TOTAREA > 0 (bad data)
 - b. LIBAREA > 0 (bad data)
 - c. FURNISH = 0 (deletes only one case)
 - d. NISHA = 0 (deletes only one case)
 - e. PRICE < 60000 (deletes two outliers)

Data..Select Cases..If Condition is Satisfied..If. Then enter the following expression:

TOTAREA > 0 AND LIVAREA > 0 AND FURNISH = 0 AND NISHA = 0 AND PRICE < 60000

Click Continue..OK. The message "Filter On" should appear in the bottom right-hand corner of your screen.

3. Produce a histogram of PRICE.
How many cases are used in the analysis? _____
How many were deleted? _____
What is the average PRICE of the remaining cases? _____
4. Run a scatter plot of PRICE with LIVAREA and fit a regression line to the data.
5. Run a regression of PRICE on LIVAREA.
Statistics..Regression..Linear and enter PRICE as the dependent variable and LIVAREA as the independent variable. Then click OK.
What is the Constant? _____
What is the coefficient of LIVAREA? _____
What would be the predicted value of an apartment with 40 square meters? _____
What is the R-Square? _____

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6. Rerun the regression including ZONE as an independent variable.

What is the Constant? _____

What is the coefficient of LIVAREA? _____

What is the coefficient of ZONE? _____

What would be the predicted value of an apartment with 40 square meters located in zone 2? _____

What is the equivalent value in zone 4? _____

In zone 6? _____

What is R-Square? _____

7. Compute a binary variable for location in zone 1.

Transform..Compute. Enter ZONE1 as the target variable and "0" into Numeric Expression and click OK.

Transform..Compute. Change Numeric expression to "1" and click If..Include if Case Satisfies Condition and enter ZONE = 1 and click Continue..OK. Answer OK to "Change Existing Variable."

8. To check your work, run a crosstabs of ZONE1 with ZONE.

Statistics..Summarize..Crosstabs and enter ZONE1 as the column variable and ZONE as the row variable.

All properties in zone 1 should have a value for ZONE1 of 1. All other properties should have a value for ZONE1 of 0.

9. On your own, create a similar variable for ZONE3. Again check your work by running a crosstabs of ZONE and ZONE3.

NOTE: No binary variable will be created for zone 2, which will be serve as the "reference" zone.

10. Finally, create a third binary variable, ZONE456, for lcoation in zones 4-6. Recall that these three zones appeared equivalent in location value.

11. Check your work by listing the following variables: ZONE, ZONE1, ZONE3, and ZONE456.

Statistics..Summarize..List Cases and enter the four ZONE, ZONE1, ZONE3, and ZONE456.

Ensure that the variables are consistent. For example, if a property is in zone 3, ZONE3 should be "1" and ZONE1 and ZONE456 should be zero. If a property is in zone 2, all three binary variables should be zero.

12. Rerun the regression, removing ZONE and entering ZONE1, ZONE3, and ZONE456.

What is the Constant? _____

What is the coefficient of LIVAREA? _____

What is the coefficient for ZONE1? _____

ZONE3? _____ ZONE456? _____

What would be the predicted value of an apartment with 40 square meters located in zone 2? _____

What is the equivalent value in zone 4? _____

What is the equivalent value in zone 6? _____

What is the R-Square? _____

Is this model superior to the previous model? _____

Explain: _____

13. As time permits, experiment with including additional variables in the regression model. Strive for a model that has a high R-Square value and also "makes sense."

What is your final R-Square value? _____

14. List any additional variables that are not available that you think would help to improve the R-Square:

Review Questions: Correlation and Regression

1. Which of the following correlation coefficients would indicate a strong negative correlation between two variables:
- a. zero
 - b. -.30
 - c. -.80
 - d. 0.90

2. Consider the following regression model:

$$\text{PRICE} = 5,000 + (310 \times \text{LIVAREA}) - (160 \times \text{AGE})$$

What would be the indicated value of a home that has 120 square meters of living area and is 40 years old?

- a. \$30,800
 - b. \$35,800
 - c. \$42,200
 - d. \$47,500
3. Regression analysis works on the principle of minimizing the _____ errors.

4. Assume the following

Variable	Coefficient	Standard Error	t-value
LIVAREA	145.00	16.00	9.06
QUALITY (1-5)	1460.00	249.57	5.85
AGE	-188.00	76.42	2.46

One can be 95% confident that the true coefficient for LIVAREA is between _____ and _____.

5. Which variables are "significant" in the model at the 95% confidence level.
- a. LIVAREA
 - b. QUALITY
 - c. AGE
 - d. All three
6. Which of the following expresses the percentage of the variation in sales prices explained by the regression model
- a. Regression coefficient (B_1)
 - b. Coefficient of correlation (r)
 - c. Standard error of estimate
 - d. R-Square

7. Consider the following information

R-Square = .790

Standard error of estimate = 8,000

Average sale price = \$35,000

What is the coefficient of variation? _____

8. In the above question, provided the regression errors were normally distributed, approximately 95 percent would be no greater than

- a. 79 percent
- b. \$8,000
- c. \$16,000
- d. \$24,000

9. The most important requirement in developing an effective regression model is

- a. Linear relationships
- b. Normal distribution of the sales price
- c. Large samples
- d. Accurate data

10. Assume that a model is being developed for a region which has six neighborhoods. How many binary neighborhood variables should be tested in the model?

- a. Three
- b. Four
- c. Five
- d. Six

Review Questions: Correlation and Regression

Solutions:

1. (c) $-.80$
2. (b) $\$5,000 + (310 \times 120) - (160 \times 40) = 35,800$
3. squared
4. $\$113.00$ and $\$177.00$
5. (d) all three
6. (d) R-Square
7. $COV = \$8,000 \div \$35,000 = .229$
8. (c) $\$16,000$
9. (d) accurate data
10. (c) five (one neighborhood serves as the "reference")

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Steps in Setting up a Market Value-Based Property Tax System

slide 13

- I. Project and program management
 - A. Project team
 - B. Strategic Planning
 - 1. Situation Analysis
 - 2. Setting Goals and Objectives
 - C. Project planning and control
- II. Preliminary steps
 - A. Design
 - B. Pilot (demonstration) projects
 - C. Estimating work loads and production rates
- III. Organizational responsibilities
 - A. Inter-agency coordination
 - B. Data systems
 - C. Market monitoring and valuation modeling
 - D. Model application, review, and field work
 - E. Assessment
 - F. Collection
 - G. Role of taxpayers and private sector
- IV. Documentation of system requirements, design, and procedures
- V. Securing necessary resources
 - A. Funding
 - B. Staffing
 - C. Computer software and equipment
 - D. Office facilities, vehicles, and so forth

- VI. Recruiting and training staff
 - A. Mapping
 - B. Data collection and data entry
 - C. Analysis and model building
 - D. Model application and review
 - E. Special valuation problems
 - 1. Land (urban and agricultural)
 - 2. Large industrial and commercial enterprises
 - 3. Movable property
 - 4. Natural resources
- VII. Compiling cadastral maps
- VIII. Collecting information on land plots and buildings and building data files
- IX. Collecting, screening, and analyzing market information
 - A. Sales
 - B. Rents and related expenses
 - C. Current construction costs
- X. Mass valuation model building
- XI. Applying mass valuation models and reviewing the value estimates
- XII. Issuing valuation notices and responding to taxpayer inquiries and appeals
- XIII. Finalizing the value estimates and completing the assessment roll
 - A. Privileges
- XIV. Issuing tax bills and collecting taxes

Setting up a Property Tax Administration

- **Systems Approach**
- **Government Commitment**
- **Funding and Resources**
- **Administrative Organization**
- **Cadastral System**
- **Valuation System**
- **Tax Collection System**
- **Taxpayer Assistance**
- **Timetable**

Формирование административной системы налогообложения собственности

- Системный подход
- Государственные обязательства
- Фонды и ресурсы
- Административное устройство
- Система учетных кадастров
- Система оценки стоимости
- Система сбора налогов
- Помощь налогоплательщикам
- График

1/3

Systems Approach

- **Advantages**
 - Understand setting better
 - Distinguish nominal (legislated) policies from actual policies
 - Allow for human element
- **Elements**
 - Statements of Goals and Objectives
 - Situation Analysis
 - Formal Plans

Системный подход

- **Преимущества**
 - Лучшее понимание установок
 - Понимание различий между номинальными (законодательными) нормами и реальными положениями
 - Человеческий фактор
- **Элементы**
 - Определение целей и задач
 - Анализ ситуации
 - Формальный план

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Government Commitment

- For funding and resources
- To resolve bureaucratic problems
- To ensure credible enforcement

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Государственные обязательства

- По фондами и ресурсами
- Разрешение проблем бюрократического характера
- Обеспечение принудительных мер

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Funding and Resources

- Budget for property tax administration
- Staff
- Computers and equipment
- Maps
- Other (materials and services)
- Technical assistance

Фонды и ресурсы

- Административный бюджет налогообложения на имущество
- Кадры
- Компьютеры и иное оборудование
- Карты
- Другое (материалы и услуги)
- Техническое обеспечение

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Administrative Organization

- **Tier(s) of government responsible for property tax administration**
- **Internal organization of property tax administration**
- **Linkages with other functions**
 - **Legal cadastre**
 - **Building inventory offices**
 - **Surveying and mapping institutions**
 - **Territorial planning offices**
 - **Building regulation offices**
- **Private sector role**

Административное устройство

- Государственные органы, ответственные за административное управление налогообложением собственности
- Внутренняя организация административного управления налогообложением собственности
- Увязка с другими аспектами деятельности
 - Юридические кадастры
 - Органы инвентаризации зданий
 - Организации геодезической съемки и картирования
 - Органы территориального планирования
 - Органы строительной инспекции
- Роль частного сектора

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Tax Collection System

- **Administrative arrangements**
- **Billing**
- **Collection**
- **Enforcement**
- **Accounting and distribution of receipts**

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Система сбора налогов

- **Административные установки**
- **Выставление счетов**
- **Сбор налогов**
- **Принудительные меры**
- **Учет и распределение налоговых поступлений**

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Taxpayer Assistance

- General publicity
- Forms and instructions
- Personal assistance

12/1

Помощь налогоплательщикам

- Общая гласность
- Формы (документы) и инструкции
- Персональная помощь

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СЕМИНАР ПО ИСПОЛЬЗОВАНИЮ КОМПЬЮТЕРОВ ПРИ МАССОВОЙ ОЦЕНКЕ НЕДВИЖИМОСТИ

Семинар проводится
Ричардом Алми и Робертом Глоудеманом

ICMA

Ереван, Армения.

11-15 ноября, 1996.

На семинаре будут представлены концепции по массовой оценке недвижимости, с использованием компьютерной техники. Семинар организован для руководящих работников, которые занимаются или будут заниматься техническими вопросами, касательно оценки земли и зданий, в целях налогообложения. Представители Министерства Градостроительства и Государственной Налоговой Инспекции приглашены участвовать в семинаре. Цель семинара, ознакомить участников-профессионалов с эффективными методами массовой оценки недвижимости, а также со статистической компьютерной программой, используемой для дополнительного рыночного мониторинга, а также для оценки демонстрационных проектов, с последующей заменой существующих оценок земли и строений, основанных на нормативные ставки, на современные методы, основанные на рыночных механизмах.

Программа семинара.

Понедельник, 11 ноября 1996.

- | | |
|---------|--|
| 10 : 00 | Приветствие и вступительное слово |
| 10 : 30 | Содержание компьютеризованной массовой оценки недвижимости |
| 12:30 | Обед |
| 13: 30 | Работа с данными. |
| 15: 00 | Изучение вопросов - работа с информацией. |

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15:30 Представление статистической программы и SPSS.

Вторник, 12 ноября, 1996.

10: 00 Лаборатория А- Ввод и распечатка данных.

12: 00 Описательная статистика
Размещение выбранных объектов в определенном порядке
Частотное распространение и проценты

12: 30 Обед

13: 30 Критерии центральной тенденции и дисперсии.

14: 30 Решение задачи- расчеты критерий центральной тенденции
и дисперсии.

15: 00 Графики и диаграммы с одной переменной

15: 30 Лабораторная работа В- Анализ данных.

Среда, 13 ноября 1996.

10: 00 Обзор

10: 30 Лабораторная работа С- Анализ данных с одной переменной ,
графики и диаграммы.

12: 30 Обед

13: 30 Анализ двух и трех переменных

14: 00 Лабораторная работа Д- Анализ данных с двумя
переменными, графики и диаграммы.

16: 30 Обзор вопросов - Описательная статистика.

Четверг, 14 ноября 1996.

10: 00 Обзор

10:30 Анализ корреляции и регрессии

12: 30 Обед

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13: 30 Лабораторная работа Е- Анализ многократной регрессии.

15: 30 Обзор вопросов - Корреляция и регрессия.

Пятница, 15 ноября, 1996.

10: 00 Обзор

10: 30 Шаги по внедрению системы налогообложения, основанной на рыночных механизмах оценки недвижимости.

12: 00 Оценка работы семинара и заключение.

Содержание компьютеризованной массовой оценки недвижимости.

I Основные концепции.

- А. Стоимость, цена и оценка.
- Б. Оценка и исчисление налога.
- В. Сравнение методов единичной оценки с методами массовой оценки.
- Г. Разница между юридическим и фискальными кадастрами.

II. Роль массовой оценки при налогообложении собственности.

А. Приводимые предположения.

- 1. Общепринятый день оценки.
- 2. Величина прав на недвижимость, это полный пакет прав, который юридически может принадлежать собственнику. ("fee simple").
- 3. Предполагается, что собственность должна использоваться наиболее экономично (самое высокое и лучшее использование).

Б. Сбор данных и управление.

- 1. Кадастровые карты.
- 2. Регистры земли и строений.
- 3. Регистрация налогоплательщиков.

В. Изучение рынка и предварительный анализ.

Г. Построение модели массовой оценки.

Д. Применение моделей по массовой оценке.

Е. Обеспечение качества.

Ж. Уведомление, информация налогоплательщика, жалобы.

III. Система и взаимосвязь данных.

А. Источник данных

- 1. Рыночные данные (информация о продаже).
- 2. Изменения в земельных участках и зданиях.
- 3. Владельцы/Налогоплательщики.

Б. Система сбора налогов.

- ↪ В. Географические информационные системы.

MA

Price	Цена	Cost	Себестоимость	Value	Стоимость
<ul style="list-style-type: none"> The money required to obtain a thing 	<ul style="list-style-type: none"> Деньги необходимые для приобретения вещи 	<ul style="list-style-type: none"> The money expended in obtaining a thing or attaining an object 	<ul style="list-style-type: none"> Деньги потраченные на приобретение вещи или сохранение объекта 	<ul style="list-style-type: none"> The monetary worth of a thing 	<ul style="list-style-type: none"> Денежная стоимость вещи
<ul style="list-style-type: none"> Factual in nature 	<ul style="list-style-type: none"> Фактическая по характеру 	<ul style="list-style-type: none"> Factual in nature 	<ul style="list-style-type: none"> Фактическая по характеру 	<ul style="list-style-type: none"> An opinion Hypothetical in nature 	<ul style="list-style-type: none"> Мнение Гипотетический по характеру

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Types of Value

Типы Стоимости

-
- | | |
|---------------------------|---|
| • Market value | • Рыночная стоимость |
| • Use or investment value | • Инвестиционная
стоимость или
стоимость
использования |
| • Insurance value | • Страховая стоимость |
| • Assessed value | • Оцененная стоимость |

Market Value

Рыночная Стоимость

-
- | | |
|---|--|
| • Cash (equivalent) price | • Стоимость наличными (эквивалентная) |
| • Competitive and open market | • Конкуренстный и открытый рынок |
| • Sufficient exposure to (time on) the market | • Достаточная открытость (достаточное время) рынку |
| • No undue pressure on the buyer or seller | • Отсутствие ненадлежащего давления на покупателя или продавца |
| • Well-informed buyer and seller | • Хорошо информированный продавец и покупатель |

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Single property appraisal

Оценка единичного
имущества

Basic Appraisal Methods

Основные Методы
Оценки

- Sales comparison
- Income capitalization
- Cost of construction
- Сравнение продаж
- Капитализация
доходов
- Себестоимость
строительства

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Single Property Appraisal
Process

Процесс Оценки
Единичного Имущества

Define the appraisal
problem

Определить задачу
оценки

Preliminary analysis and
plan: select and collect
data

Предварительный анализ
и план: отбор и сбор
данных

Estimate most economic
use

Расчет наиболее экономичного
использования

Estimate land (site) value

Расчет стоимости земли
(местности)

Estimate total land and
building value

Расчет полной стоимости
земли и здания

Reconcile value indicators
and reach conclusion
(Reconcile the Differences)

Проверка индикаторов
стоимости и заключение
(Проверка разниц)

Report conclusion
(to the client)

Отчет о заключении
(клиенту)

Mass Appraisal Process
(Property Tax)

Процесс Массовой
Оценки (Налог на
Имущество)

Data collection

Сбор данных

Preliminary analysis

Предварительный анализ

Valuation model building

Создание модели
оценивания

Model application and
review

Применение и обзор
модели

Documentation and
reporting

Документация и
отчетность

Single property appraisal

Оценка единичного
имущества

Estimate Most Economic
Use

Расчет наиболее экономичного
использования

- Land as if vacant and available
- Property as improved (existing or proposed)

- Земли в качестве свободной и доступной
- Имущества в качестве благоустроенного (реально или предположительно)

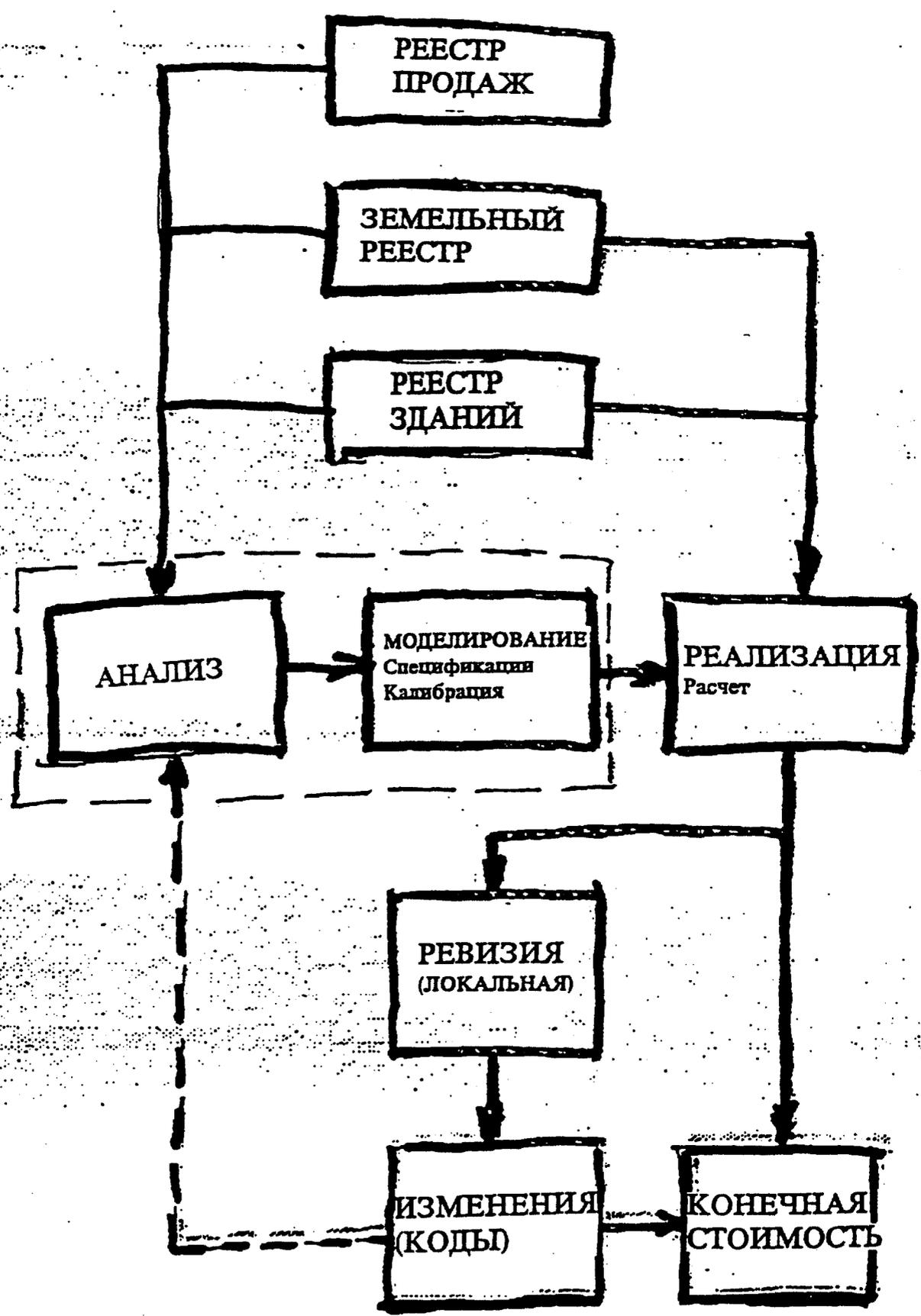
Система учетных кадастров

- Административные установки
- Списки налогоплательщиков
- Имущественные реестры
- Карты кадастров
- Система нумерации кадастров
- Картотека данных параметров рынка (цены на продажу, арендная плата и т.д.)

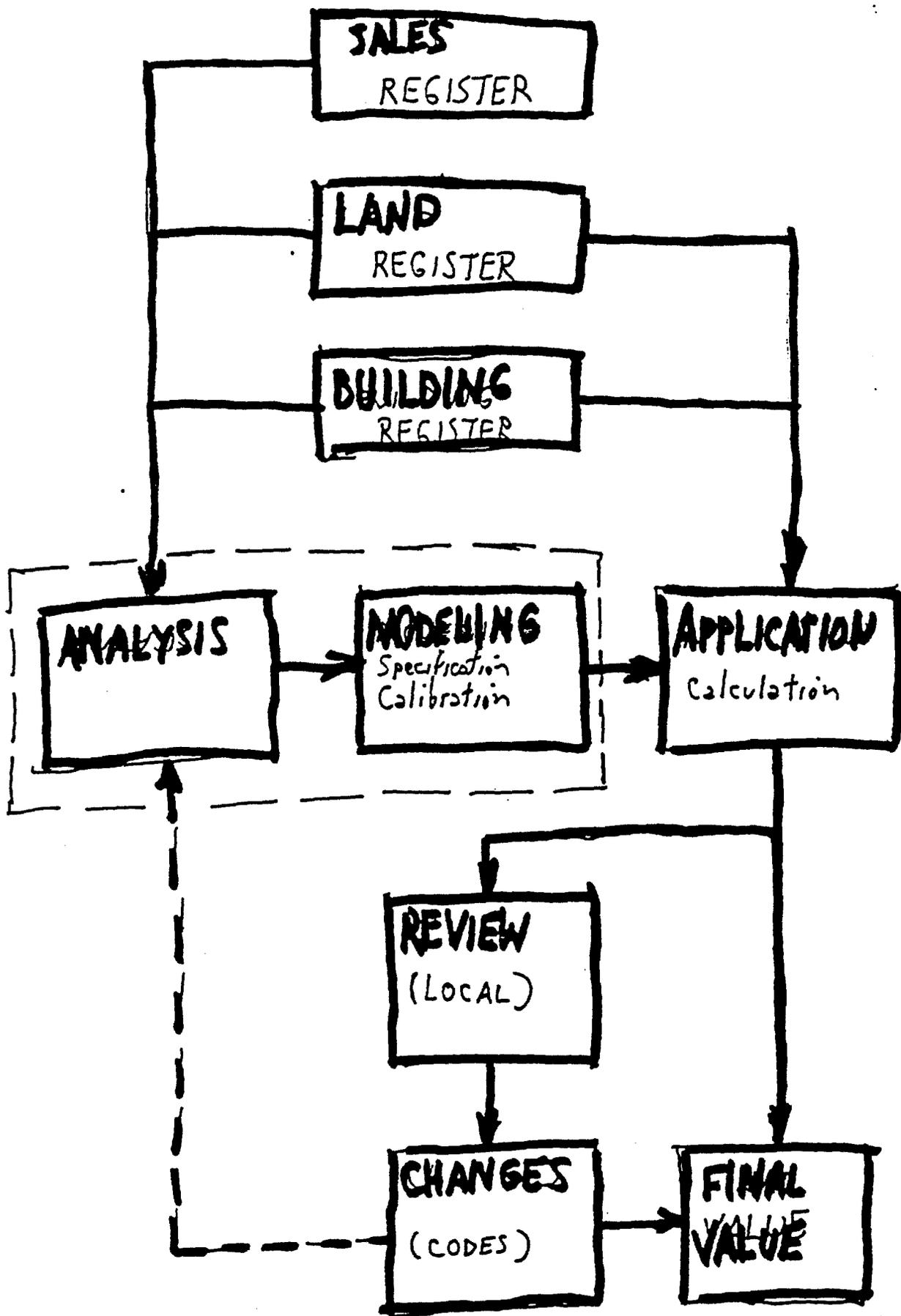
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Cadastral System

- Administrative arrangements
- Taxpayer register
- Property register
- Cadastral maps
- Cadastral numbering system
- Market data files (sales prices, rents, etc.)



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Система оценки стоимости

- Административные установки
- Оценка рынка и предварительный анализ
- Моделирование оценки стоимости
- Расчеты стоимостей
- Пересмотр стоимостей
- Апелляции

Valuation System

- Administrative arrangements
- Market monitoring and preliminary analyses
- Valuation modeling
- Calculation of values
- Review of values
- Appeals

РАБОТА С ДАННЫМИ.

I. Важность наличия точной информации.

- А. Данные о продаже.
- Б. Данные, характеризующие собственность.

II. Оценка существующей информации.

- А. Полнота информации--есть ли в наличии необходимые данные?
- Б. Точность-- надежна ли данная информация?

III. Информация, важная для массовой оценки.

А. Характеристика земельного участка.

1. Размер участка.
2. Характеристика района.

Б. Основная структура.

1. Жилая площадь
2. Качество строительства.
3. Период эксплуатации или состояние.
4. Проект и удобства.

В. Дополнительные постройки (гараж, пристройка)

Г. Местонахождение.

1. Экономический район или зона.
2. Район

IV. Типы данных.

А. Количественные (продолжающиеся)

1. Может включать непрерывные цены.
2. Обычно основывается на расчеты или измерения.
3. Примеры: жилая площадь, количество комнат, срок .

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Б. Качественные(категорические)-- цены предопределяются.

1. Раздельные - более двух вариантов

Примеры: качество строительства, проект, вид крыши.

2. Бинарные -- только два варианта (да/нет).

Примеры: измененные, меблированные, с подвальным помещением.

В. Цифровые в противовес альфа- цифровым данным.

А. Только цифровые данные могут использоваться при моделировании.

Б. Для моделирования, альфанумерические данные должны быть переведены в цифровые.

V. Редактирование информации.

А. Цель--- сокращение ошибок в информации.

Б. Типы редактирования данных

1. Объемное редактирование

----чтобы быть уверенным, что, все количественные данные необходимы (например, цена продажи > 0)

----чтобы быть уверенным, что все качественные данные действительны (например, меблировка 0 или 1)

2. Последовательное редактирование----чтобы быть уверенным, что информация последовательна (например, общая площадь =>жилая площадь).

VI. Исключения.

1. Необычные данные

2. Необходимо проверить точность

3. Могут быть упразднены (не используются в модели).

Обзор вопросов - работа с информацией.

1. Перечислить нескольких составных данных, важных для оценки жилой недвижимости.
2. Строительная площадка, в качестве примера, в которой:
 - а. непрерывная переменная
 - б. качественная переменная
 - в. дискретная переменная
 - г. бинарная переменная.
3. В качестве примера приводиться внешняя стена, в которой:
 - а. качественная переменная
 - б. дискретная переменная
 - в. непрерывная переменная
 - г. бинарная переменная.
4. Подтверждение того, что количество комнат больше чем 0, является примером ----- редактирования.
5. Подтверждение того, что первый этаж не больше, чем общая жилая площадь, является примером ----- редактирования.
6. Разделение на категории следующих составных данных : непрерывная (в), дискретная (г), или бинарная (б).
 - а. -----проект здания
 - б. -----район проживания
 - в. -----код района
 - г. ----- закрытые стоянки(да/нет)
 - д -----качество строительства.
7. Необычная информация, которая может быть упразднена до проведения оценочного анализа, такая как:
 - а. Непрерывные данные
 - б. Дискретные данные
 - в. Альфанумерические данные
 - г. Исключения
8. Все данные, которые используются в моделировании должны быть:
 - а. В алфавитном порядке
 - б. Цифровые.
 - в. Непрерывные.
 - г. Исключения.

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Представление статистической программы и SPSS.

I. Вступление в статистическую программу.

A. Возможности

1. Описательная статистика.
2. Многократная регрессия
3. Другая статистика
 - а. Параметрическая (предполагает нормальное распределение)
 - б. Непараметрическая (нет предположений касательно распределения данных)
4. Графический анализ.

Б. Ограничения.

1. База данных не " динамична" (переменные не могут быть связаны, как это делается в развернутом виде " spreadsheet").
2. Требуется хороших знаний пользователя
3. Требуется правильного суждения.

В. Режим работы.

1. Интерактивный/диалоговый
 - а. DOS-выбор из меню
 - б. Windows- работа с "мышкой"
2. Batch/Группа(командный режим) - включает написание программ.

Г. Некоторые известные пакеты программ.

1. SPSS (Статистический пакет для социальных наук)
2. NCSS (Сверхбыстродействующая статистическая система).
3. SAS (Система статистического анализа).

II. Обзор SPSS

A. Что такое SPSS?

1. Программа, широко используемая в образовании и социальных науках.
2. Interface/ Согласование: интерактивный и групповой/interactive and batch.

Б. Основные меню и под-меню.

В. "Window" или типы файлов/картотека

1. Окно данных (содержит файлы данных).
2. Окно выходное (содержит результаты)
3. Окно таблиц (содержит таблицы файлы).
4. Синтаксическое окно (программные файлы).

III. Работа с файлами, распечатка, помощь./Files, Printing/Help.

А. Ввод и сохранение данных.

1. Типы данных

а. Буквенно-цифровой (" строка")--- может содержать буквы и цифры.

б. Цифровой--содержит только цифры.

2. Отметки переменных и величин.

Б. Вводимые и выводимые данные.

1. Можно 'импортировать" spreadsheet,(WK1) и файлы базы данных (dbf).

3. Можно "экспортировать" данные в другие программы.

В. Распечатка

1. Команда принтера
2. Схема распечатки.

Г. Обслуживающая программа и Помощь/ Utilities and Chart .

IV. Манипулирование с данными.

А. Сортировка данных (sort cases)

В. Выбор данных (select cases).

V. Преобразование переменных.

А. Обработка новых переменных. (Compute).

В. Кодирование переменных (Recode).

VI. Получение основной статистики.

А. Способы и стандартные отклонения (descriptives).

Б. Частотное распределение (frequencies).

В. Списки данных (list cases).

Лабораторная работа А- Ввод и списки данных.

1. Открыть новый файл

File. New. Data/Файл. Новый . Данные .

2. Ввод следующих данных:

уч-ок PARCE	кач-во GRADE	год YRBT	жил.пл-дь. LIVAREA	район NBHD	комнаты ROMMS	цена PRICE.
L						
1	4	1976	46	103	3	50,000
2	3	1984	58	101	4	65,000
3	3	1965	40	101	3	47,000
4	2	1947	63	102	5	80,000
5	3	1980	52	103	3	70,000
6	4	1989	34	101	2	32,000
7	2	1953	39	102	2	39,500
8	3	1977	55	103	4	60,990
9	2	1982	36	102	3	35,000
10	3	1988	50	101	4	55,250

3. Приурочить выше отмеченные знаки к переменным величинам.

Два раза нажать на маус в колонке знака и войти в название переменной.

4. Войти в следующие переменные знаки по качеству: 2- прекрасное, 3- среднее, 4- хорошее.

5. Сохранить данные, дав название файлу, Lab-A. sav.

6. Сортировать данные по ценам.

Данные.. Сортировка...выбор цены./Data..Sort Cases... choose price.

7. Перечислить следующие данные для каждого участка: Участок, категория, цена.

Статистика. Итоги. Сноска./ Statistics..Summerize..List cases.

8. Выбрать участки для категории 3.

Данные. Выборка. Если условие удовлетворяет, войти в Grade 3, Затем нажать Continue...О.К.

Обратите внимание, что другие категории по недвижимости "фильтруются", но не убираются из активной информации файла.

(Обратите внимание на сообщение " filter on", в нижнем, правом углу вашего экрана).

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9. Снова проделать следующее для каждого участка: Участок, класс, цена./Price, grade, Price. Убедиться, что все эти участки относятся к классу 3. Сколько участков в вашем списке?---

10. Повторить все действия для всех 10 случаев.

Data. Select Cases.. Allcases..Continue..OK.

Примечание: сообщение " filter on" не должно быть на экране, с правой стороне, в углу вашего экрана.

11. Сортировать участки по категории и цене.

Данные. Выборка. Категория, и затем, Цена.

12. Самостоятельно, составить Grade, Rooms, NBHD, Price.

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Описательная статистика

I. Размещение выборочных объектов в определенном порядке.

- A. Данные в порядке возрастания.
- Б. Хорошо для малых групп данных.

II. Частотное распределение

- A. Указать количество (или процент) случаев для каждой величины.
- Б. Можно использовать для всех типов данных (буквенно-цифровой и цифровой).
- В. Особенно хорошо использовать для качественных данных.

III. Процентиль.

- A. Разделить группу данных на желаемые процентиля, например, квартили или дектили.
- Б. Только относится к цифровым данным.

IV. Расчеты.

- A. Медиана/ Среднее значение выборки--средняя величина.

Примечание: если данное число четное, медиана является средней точкой между двумя средними величинами.

- Б. Средняя величина- среднее значение составных

1. Получается в результате суммирования величин и деления на выборочную совокупность размеров.

2. На данную величину больше воздействуют предельные величины, чем средние.

- В. Наиболее вероятное значение/мода.-----наиболее часто употребляемые величины/значения.

V. Измерение дисперсии/случайной величины.

- A. Ширина распределения/ Range---разница между минимальными и максимальными величинами.

- Б. Межквартильная ширина- третья квартиль без первой квартили

В. Среднее абсолютное отклонение- среднее, отклонение от медианы.

$$1. \text{ Ave Abs Dev} = \frac{\sum [\text{ABS} (X_i - \text{MEDIAN})]}{n}$$

где ABS = абсолютная величина.

2. Непараметрическое измерение дисперсии/ случайной величины.

Г. Изменчивость/variance.---- сумма возведенного в квадрат отклонений от среднего, разделенного на n-1.

$$1. \text{ Изменчивость} = \frac{\sum (X_i - \text{Mean})^2}{n-1}$$

2. Параметрическое измерение дисперсии.

3. Используется в последующих статистических анализах и вычисления стандартных отклонений.

Д. Стандартное отклонение- квадратный корень изменчивости.

1. Std Dev= SQRT(изменчивость)

2. Когда данные нормально распределены:

- Приблизительно 68% будет лежать в пределах \pm одного стандарта отклонений средней величины.
- приблизительно 95% будет лежать в пределах \pm двух стандартных отклонений от средней величины.
- Приблизительно 99% будет лежать в пределах \pm трех стандартных отклонений от средней величины

**ПРИМЕР РАЗМЕЩЕНИЯ ОБЪЕКТОВ В ОПРЕДЕЛЕННОМ ПОРЯДКЕ.
ЗАПРАШИВАЕМЫЕ ЦЕНЫ - ЗОНА 5.**

5200
5500
6300
7000
7500
8000
8000
8000
8000
8000
9500
10000
10000
11000
12000
12500
13000
24000

Прочитанное количество примеров: 19
Количество примеров в списке: 19.

ПРИМЕРЫ ЧАСТОТЫ РАСПРЕДЕЛЕНИЯ

КОМНАТЫ

Стоимость Value	Частота Frequency	Процент Percent	Подтвержденный процент Valid Percent	Совокупный процент Cum Percent.
1	80	26.6	26.6	26.6
2	112	37.2	37.2	63.8
3	92	30.6	30.6	94.4
4	16	5.3	5.3	99.7
5	1	.3	.3	100.0
Общее	301	100.0	100.0	

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ПРИМЕРЫ ПРОЦЕНТИЛЕЙ:

16 ЦЕН ПО ПРОДАЖЕ

КОЛИЧЕСТВО NUMBER	ЦЕНА PRICE
1	4,000
2	5,000
3	10,000
4	16,000
5	18,000
6	20,000
7	22,500
8	24,000
9	25,000
10	27,000
11	27,000
12	30,000
13	35,000
14	39,000
15	45,000
16	52,000

Первая квартиль = 17,000

Вторая квартиль(MEDIAN) = 24,500

Третья квартиль = 32,500

Межквартильная разница = 32,500-17,000= 15,500.

ПРИМЕРЫ ИЗМЕРЕНИЙ ЦЕНТРАЛЬНОЙ ТЕНДЕНЦИИ.

ДАННЫЕ ПО ВАННОЙ КОМНАТЕ ДЛЯ ВОСЬМИ УЧАСТКОВ.

НЕОБРАБОТАННЫЕ ДАННЫЕ

ОТСОРТИРОВАННЫЕ ДАННЫЕ

УЧАСТОК PARCEL	ВАННЫЕ BATHS	УЧАСТОК PARCEL	ВАННАЯ BATHS
1	2	2	1
2	1	6	1
3	2	7	1
4	3	1	2
5	2	3	2
6	1	5	2
7	1	8	2
8	2	4	3
			14

MEDIAN/МЕДИАНА= 2

MEAN/СРЕДНЯЯ ВЕЛИЧИНА = $14 / 8 = 1.75$

MODE/НАИБОЛЕЕ ВЕРОЯТНОЕ ЗНАЧЕНИЕ= 2.

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ЭТАПЫ ПРИ РАСЧЕТАХ СТАНДАРТНОГО ОТКЛОНЕНИЯ.

1. Вычесть среднее из каждой величины.
2. Возвести в квадрат все отклонения от средней величины.
3. Суммировать возведенные в квадрат отклонения.
4. Разделить на $n-1$ (n = размер образца)

Примечание: полученный результат называется "изменчивостью".

5. Получить квадратный корень от изменчивости

Результат есть "стандартное отклонение".

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ПРИМЕР ИЗМЕРЕНИЯ ДИСПЕРСИИ/СЛУЧАЙНОЙ ВЕЛИЧИНЫ.

ДААННЫЕ ПО ВАННОЙ КОМНАТЕ ДЛЯ ВОСЬМИ УЧАСТКОВ.

УЧАСТОК PARCEL	ВАННАЯ BATHS	СРЕДНЕЕ MEAN	РАЗНИЦ A DIFF.	РАЗНИЦА В КВАДРАТЕ DIFF. SQUARED.
1	2	- 1.75	= 0.25	0.0625
2	1	- 1.75	= - 0.75	0.5625
3	2	- 1.75	= 0.25	0.0625
4	3	- 1.75	= 1.25	1.5625
5	2	- 1.75	= 0.25	0.0625
6	1	- 1.75	= - 0.75	0.5625
7	1	- 1.75	= - 0.75	0.5625
8	2	- 1.75	= - 0.25	0.0625
				3.5000

ДИАПАЗОН/РАЗМАХ ВАРЬИРОВАНИЯ = 3-1= 2.

ИЗМЕНЧИВОСТЬ= 3.50 / 7 = .50

СТАНДАРТНОЕ ОТКЛОНЕНИЕ = SQRT (.50) = . 707

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ЗАДАЧА СЕМИНАРА

РАСЧЕТЫ ПО ИЗМЕРЕНИЮ ЦЕНТРАЛЬНОЙ ТЕНДЕНЦИИ И ДИСПЕРСИИ.

Изучите следующие данные по возрасту зданий:

СОБСТВЕННОСТЬ	ВОЗРАСТ
1	25
2	18
3	7
4	40
5	32
6	12
7	22
8	28

1. Расположите данные в определенном порядке.
2. Какова средняя величина и средний возраст ?.
3. Каков размах варьирования?
4. Какова разница и стандартное отклонение?

РЕШЕНИЕ:

1.

СОБСТВЕННОСТЬ	ВОЗРАСТ	ПОРЯДОК ДАНЫХ ПО ВОЗРАСТУ.
1	25	7
2	18	12
3	7	18
4	40	22
5	32	25
6	12	28

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7	22	32
8	28	40
		184

2. Медиана = $(22 + 25) \div 2 = 23.5$.

Среднее = $184 \div 8 = 23$

3. Размах варьирования = $40 - 7 = 33$.

4. Дисперсия и стандартное отклонение:

Возраст		Средний возраст		Разница		Разница в квадрате
25	-	23	=	2		4
18	-	23	=	-5		25
7	-	23	=	-16		256
40	-	23	=	17		289
32	-	23	=	9		81
12	-	23	=	-11		121
22	-	23	=	-1		1
28	-	23	=	5		25
						802

Дисперсия/изменчивость = $802 \div 7 = 114.57$

Стандартное отклонение = $\text{SQRT}(114.57) = 10.7$.

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ГРАФИКИ И ДИАГРАММЫ ПО ОДНОЙ ПЕРЕМЕННОЙ.

I. Столбиковая диаграмма/ Bar chart (Graphs... Bar).

--- используется для демонстрации количественной дисперсии.

--- высота столбиков указывает на количество случаев/собственности.

II. Круговая диаграмма (Graph...Pie).

---указывает на распределение качественной дисперсии

---альтернатива столбиковой диаграмме.

--- круговые деления представляют процент случаев.

III. Гистограмма (Graphs....Histogram).

--- используется для распределения непрерывной дисперсии.

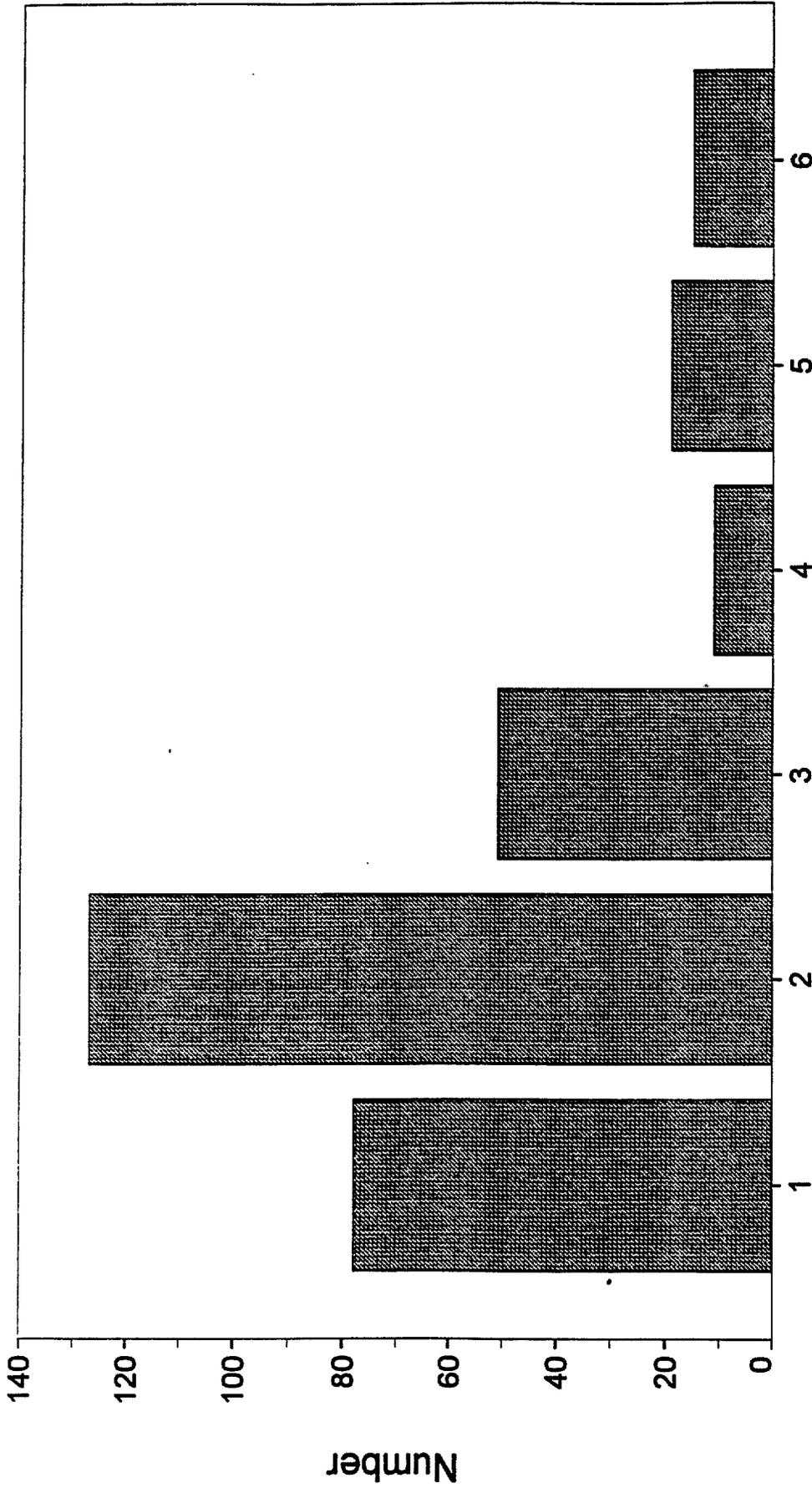
--- программа будет указывать на прерывные точки.

----используется для изучения данных, включая исключения.

BAR

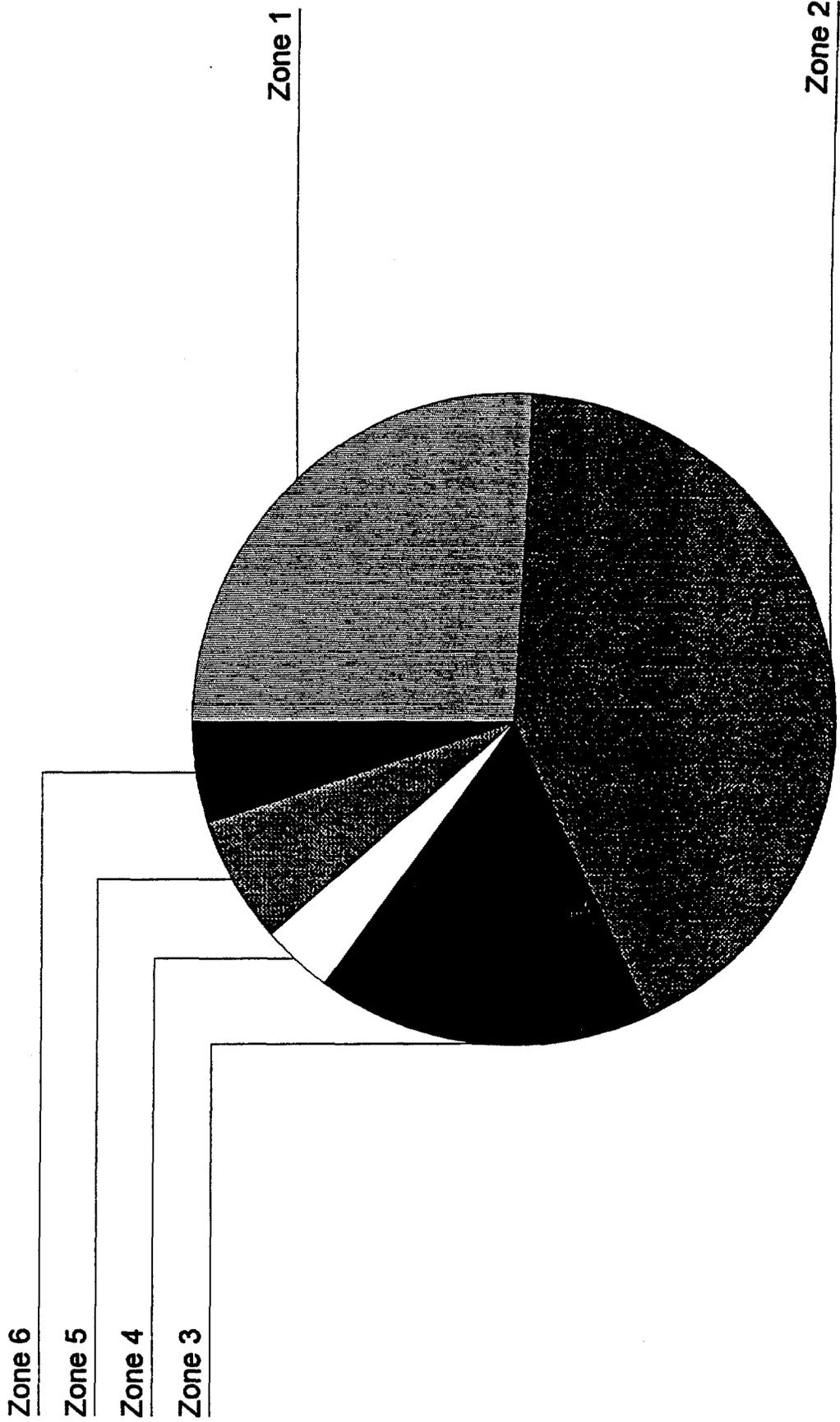
EXAMPLE OF BOX PLOT

PROPERTIES FOR SALE BY ZONE



ZONE

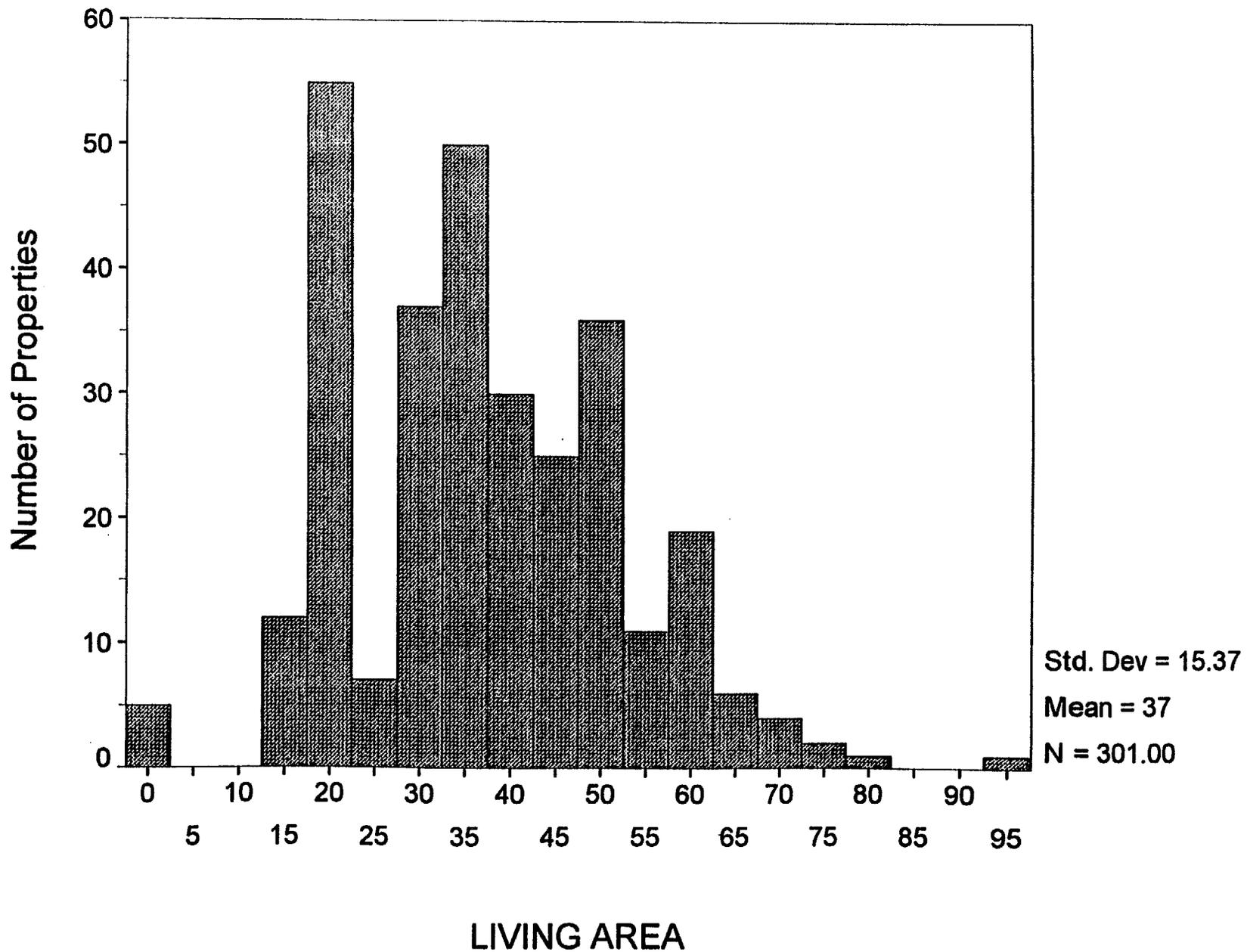
EXAMPLE OF PIE PLOT PROPERTIES FOR SALE BY ZONE



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Handwritten initials or mark.

EXAMPLE OF HISTOGRAM



Урок Б /Lab B-Анализ данных.

1. Найти файл с данными, Lab-A SAV.
File.. Open.. Data.. LAB-A SAV.
2. Прогнать частотное распределение по Району/NBHD.
Statistics.. Summerise.. Frequences.. NBHD.
Сколько районов есть ?-----
3. Прогнать частотное распределение по Категории столбиковой диаграммой.
Statistics.. Summerise.. Frequencies. Grade. Charts. Bar Chart.
Какая категория наиболее популярна (наиболее вероятное значение)? -----
4. Найти срединное значение выборки и среднюю жилую площадь и стоимость продажную цену.
Statistics.. Summarise.. Frequencies. Choose Statistics, Check Median and Mean.

МЕДИАНА
MEDIAN

СРЕДНЯЯ ВЕЛИЧИНА
MEAN

ЖИЛАЯ ПЛОЩАДЬ
LIVAREA
ЦЕНА
PRICE

5. Дать объяснение YRBLT/ Год строительства и ROOMS/Комнаты.
Каковы их средние и стандартные отклонения?
Statistics. Summerize. Descriptives. YRBLT ROOMS.

СРЕДНЯЯ
ВЕЛИЧИНА
MEAN

СТАНДАРТНОЕ ОТКЛОНЕНИЕ
STD. Dev.

YRBLT
ROOMS

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6. Если предположить, что год строительства нормально распределен, около $2/3$ всех домов должны быть построены между:

Верхний предел : 19----

Нижний предел: 19---

7. Сделать круговую диаграмму по комнатам/ROOMS.

Graphs.. Pie Chart.. ROOMS.

Каково наиболее вероятное значение для ROOMS?

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Лабораторная работа В- Анализ данных с одной переменной, графики и диаграммы.

1. Открыть файл, ART SAV.

2. Распечатать данные частотного распределения этажей.

Statistics.. Summarize.. Frequencies. Enter Stories and Click OK.

Какое количество этажей встречается наиболее часто?-----

3. Распечатать частотное распределение балконов. какой тип балкона наиболее популярен?-----

4. Самостоятельно определите сколько квартир имеют гаражи?-----

5. Сколько квартир имеют подвалы?-----
Каково количество мебелированных квартир?---

6. Сделать столбиковую диаграмму комнат.

Graphs.. Bar.. Define. Enter rooms into the Category Axis and Click OK.

Какое количество комнат встречается наиболее часто?-----

7. Уберите график , вернитесь к основному меню и сделайте круговую диаграмму комнат.

Graphs..Pie.. Define .. Enter Rooms into " Define slices by" and click OK.

8. Уберите график, вернитесь в основное меню и сделайте гистограмму цен.

Является ли распределение приблизительно нормальным?-----

9. Повторите анализ по жилой площади.

Является ли переменная нормально распределенной? -----

10. Отредактируйте гистограмму.

Click Edit.

Сделать центровку названия : " Histogram of living Area."

Click on chart.. Title and type in the title. Click OK.

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11. Какова средняя цена продажи?-----

12. Определить 25 и 75 процентиля от цены.

Statistics.. Summarize.. Frequencies. Enter price and click Statistics Quartiles.

25 процентиль (первая квартиль) = -----

75 процентиль (третья квартиль) = -----

13. Самостоятельно сделать анализ других интересующих вопросов.

АНАЛИЗ ДВУХ И ТРЕХ ПЕРЕМЕННЫХ.

I. Перекрестные таблицы (Statistics... Summerise... Crosstabs)

---используются для сравнения двух количественных переменных.

II. Разбросанный график (Graph. Scatter).

--- показывает отношения между двумя непрерывающими переменными, например, цену продажи и жилую площадь.

--- поставить ' зависимую' переменную на вертикальную ось.

---- поставить " независимую" переменную на горизонтальную ось.

III. Схемы/ (Statistics. Compare Means..Means).

--- показывает среднее значение качественной величины, при помощи значений количественных переменных.

IV. Блочные графики (Graphs.. Boxplot).

--- указывает на распределение количественных переменных, в противовес качественным переменным.

--- Блоки представляют 50% данных

--- Ненужная информация представляет 90 % данных.

--- Круги представляют " исключения" и звездочки представляют 'экстремальные" случаи. (хотя бы три блока продлены из медианы)

V. Линейные графики (Graphs.. Line).

--- используются для вычерчивания статистического графика для одной переменной (например, средняя величина продажной цены), в противовес другой переменной (например, зона).

---помогает анализировать различные аспекты (например, лес, в противовес, деревьям).

VI. 3-D графики (Graphs..Scatter.. 3-D).

---используются для сравнения трех непрерывных переменных

--- координаты "x" и " y" могут быть географическими координатами .

ПРИМЕРЫ ПЕРЕКРЕСТНОГО ТАБУЛИРОВАНИЯ.

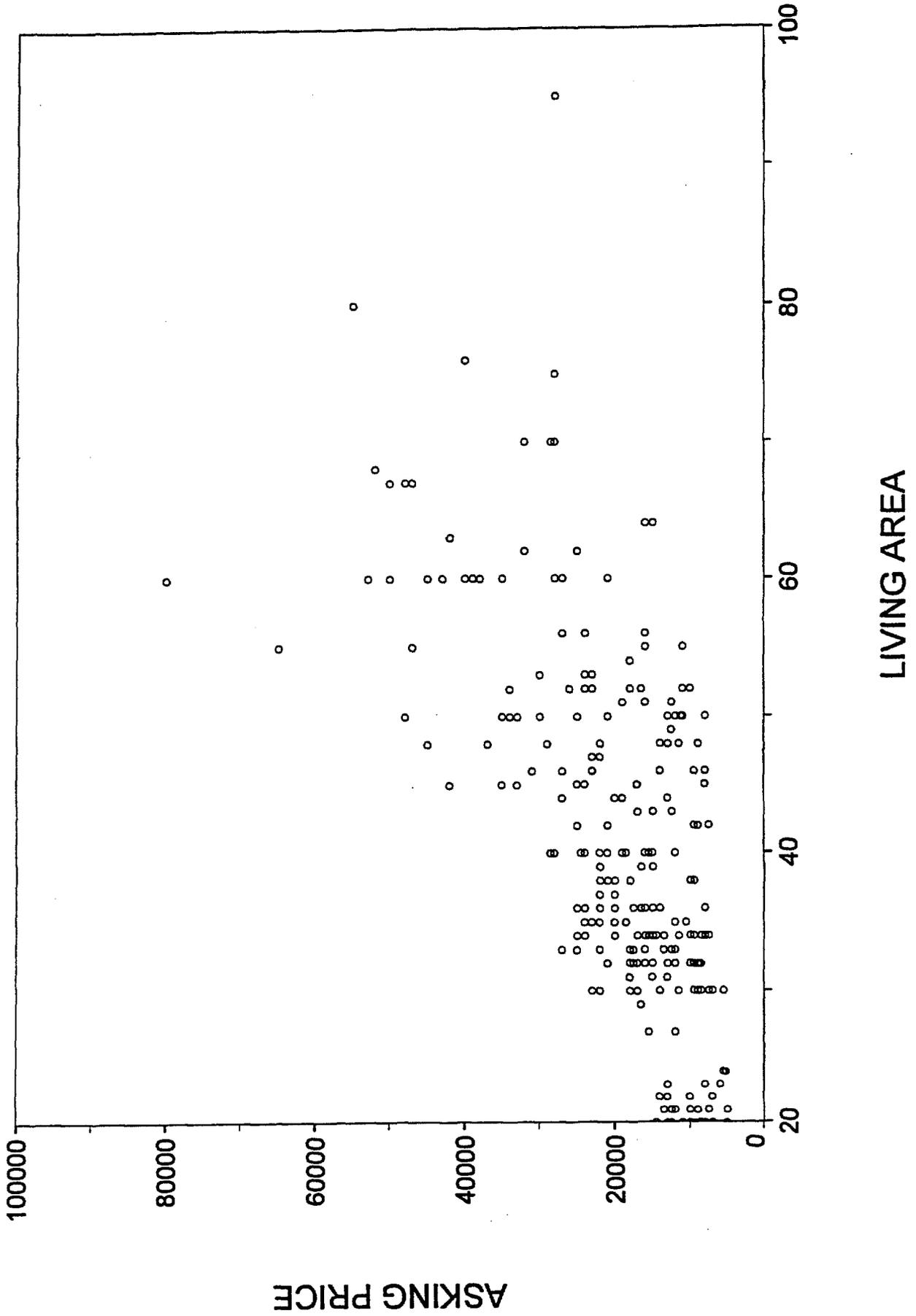
ЗОНЫ ПО КОМНАТАМ.

КОМНАТЫ/ROOMS

	#	1	2	3	4	5	ИТОГО
ЗОНА	1	23	27	26	2		78 25.9
	2	31	51	35	9	1	127 42.2
	3	17	23	9	2		51 16.9
	4	3	5	2	1		11 3.7
	5	3	3	12	1		19 6.3
	6	3	3	8	1		15 5.0
	ИТОГО	80 26.6	112 37.2	92 30.6	16 5.3	1 .3	301 100.0

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EXAMPLE OF SCATTER PLOT



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ПРИМЕР АНАЛИЗА "РАЗБИВКИ"

СРЕДНЕЕ КОЛИЧЕСТВО ЭТАЖЕЙ ПО ЗОНАМ.

----Описание подгрупп населения.----

Сумма этажей/ stories

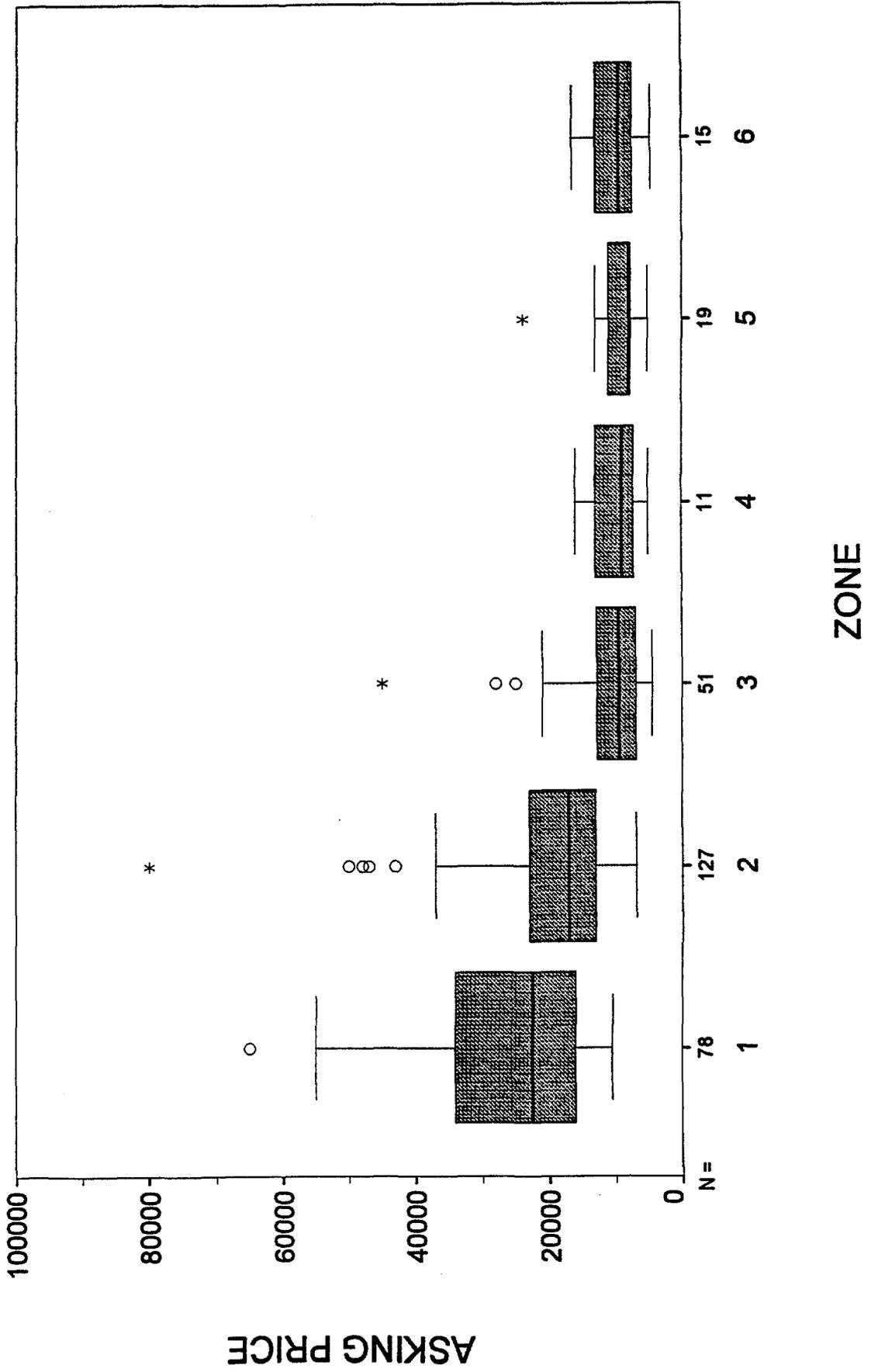
По уровню зон./ zone

Переменная Variable	Метка величины Value Label	Среднее значение Mean	Стандартное отклонение Std Dev.	Примеры Cases
	Для всего населения	7.1329	3.4509	301
Зона	1	6.4231	3.2092	78
Зона	2	6.9921	3.3106	127
Зона	3	6.2353	3.1022	51
Зона	4	7.7273	4.5186	11
Зона	5	11.4211	3.3717	19
Зона	6	9.2000	.7746	15

Итого примеров= 301

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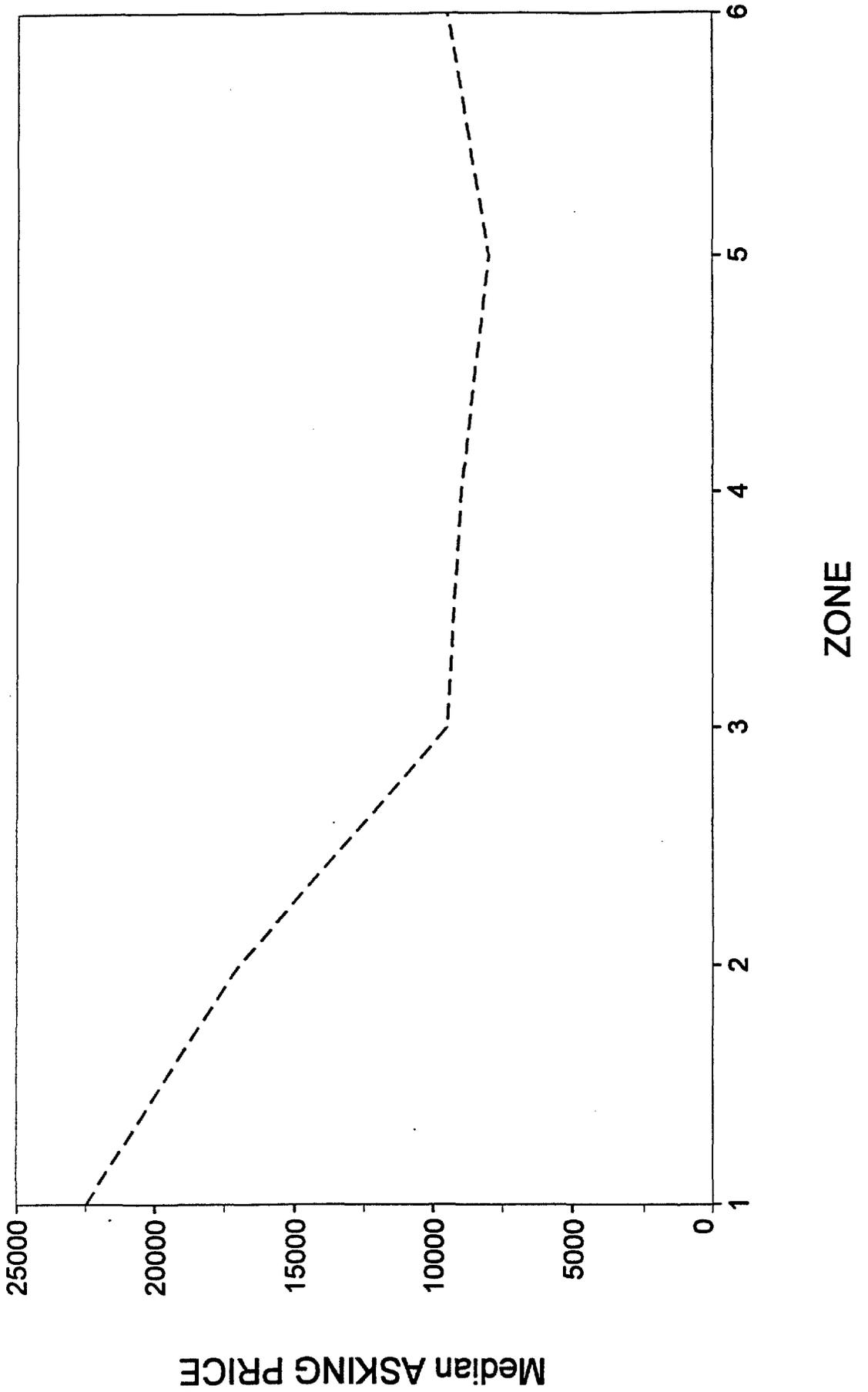
EXAMPLE OF BOX PLOT ASKING PRICES BY ZONE



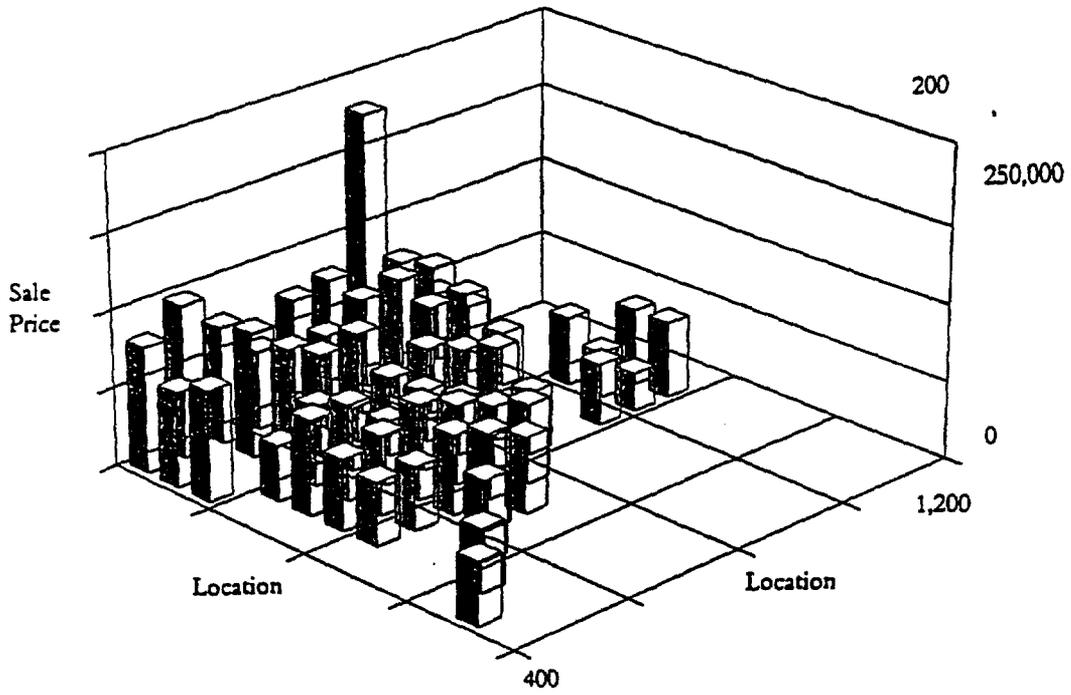
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EXAMPLE OF LINE CHART MEDIAN ASKING PRICES BY ZONE



Example of 3-D Chart
Sale Price vs X-Y Location Coordinates



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ОБЗОР ВОПРОСОВ: ОПИСАТЕЛЬНАЯ СТАТИСТИКА.

1. Порядок, наиболее приемлемый для :
 - а. Небольшой группы качественной переменной
 - б. Небольшой группы количественной переменной
 - в. Большой группы качественной переменной
 - г. Большой группы количественной переменной.

2. ----- содержит середину 50% от распределенных данных.

3. Средняя величина в ряду -----

4. Вычислить среднее значение по следующему числу комнат: 5,7,7,4, 6,7.-----

5. Каково наиболее вероятное значение для выше отмеченных данных?

6. Каков размах варьирования?-----

7. Какова степень стандартного отклонения?

8. Какие, из ниже отмеченных критерий, используются для перечисления количества случаев, для каждой величины дискретной переменной?
 - а. Среднее значение.
 - б. Рассеянный график
 - в. Гистограмма
 - г. Частотное распределение.

9. Какие из нижеприводимых критерий, наиболее схожи (могут использоваться для демонстрации одного и того же) ?
 - а. Блочная диаграмма и круговая диаграмма.
 - б. Размещение выбранных объектов в определенном порядке и линейная диаграмма.
 - в. Средние и стандартные отклонения.
 - г. Частотное распределение и рассеянный график.

10. Цену продажи и жилую площадь можно лучше всего сравнить графически при помощи следующих компонентов:

- а. Гистограммы.
- б. Частотное распределение
- в. Блочный график
- г. Рассеянный график.

11. Какие из следующих критериев могут быть использованы при демонстрации количества домов по признаку качества строительства и района?

- а. Блочный график.
- б. Перекрестное табулирование.
- в. Стандартное отклонение.
- г. Рассеянный график.

12. Затемненная часть графика представляет ----- процентов данных.

13. Предположим, что средняя цена продажи равняется \$ 30,000, а стандартное отклонение равняется \$ 8,000.

Если предположить, что данные нормально распределены, приблизительно две трети цен по продаже будут между \$ ---- и \$-----.

14. Приблизительно 95% будут находиться между \$ ----- и \$ -----.

Обзор вопросов: Описательная статистика.

Решения:

1. (б) Небольшие примеры количественных переменных.

2. Меж-квартильные диапазоны.

3. Медиана

4. Средняя величина = $(5+7+7+4+6+7) \div 6 = 36 \div 6 = 6$.

5. Наиболее вероятное значение = 7

6. Диапазон варьирования = $7-4=3$.

7.

комнаты		Среднее значение		Разница	Разница в квадрате
5	-	6	=	-1	1
7	-	6	=	1	1
7	-	6	=	1	1
4	-	6	=	-2	4
6	-	6	=	0	0
7	-	6	=	1	1
					8

Дисперсия = $8 \div 5 = 1.6$.

Стандартное отклонение = $\text{SQRT}(1.6) = 1.265$.

8.(в) Гистограмма

9.(а) Столбиковая и круговая диаграмма

10.(г) Рассеянный график

11.(б) Перекрестное табулирование

12. 50 процентов.

13. \$ 22,000 и \$ 38,000

14. \$ 14, 000 и \$ 46,000.

MA

Лабораторная работа Г - Анализ двух переменных данных, графики и диаграммы.

1. Распечатать перекрестную таблицу зон при помощи ремоделирования/Remodel Statistics..Summeraise... Crosstabs. enter Remodel в колонке переменных и Zone в ряду переменных.

Каков процент квартир, которые были перемоделированы?

В какой зоне наибольшее количество перемоделированных квартир?---

2. Распечатать разбивку (сравнить средние значения 0 цен по зонам.

Statistics.. Compare means.. Means.. Войти в Цены, как зависимая переменная , и в Зону, как независимая переменная.

Какая зона имеет наибольшую среднюю цену?-----

3. Рассчитать новую переменную цену каждого квадратного метра PRICEPSM= PRICE/TOTAREA .

Transform..Compute. Войти в PRICEPSM в качестве Target Variable and PRICE/TOTAREA в цифровом выражении.

4. Сделать влочный график PRICEPSM

Graph.. Boxplot.. Определить и войти в PRICEPSM в качестве Variable and Zone as the Category Axis.

5. Повторить пример, заменяя этажи/stories и этаж/story в категорию осн/Category axis.

Увеличивается ли цена квадратного метра в соответствии с этажами или этажом?

6. Распечатать рассеянный график цен/PRICE с TOTAREA.

Graphs..Scatter.. Define. Enter PRICE as the y-Axis variable and TOTAREA as the x-Axis variable.

Происходит ли значительное соотношение переменных?

Отредактируйте график. Добавьте название. Уверите объекты, которые не имеют общей площади (плохие данные), нажав два раза на горизонтальную ось (TOTAREA) и изменяя Минимальное значение до 20, максимальный прирост /Major Increments до 20 и минимальный прирост / Minor Increments до 10.

Добавьте линию 'вольше всего подходит' командой Click Chart.. Options..Total...
OK.

7. Распечатайте рассеянный график LIVAREA с TOTAREA(жилая площадь с общей площадью).

Являются ли две переменные высоко соотносимыми?----

9. Распечатать линейный график средних Цен с Комнатами.

Graphs. Line. Define. Нажать на Другие суммарные функции / Other Summary Functions , войти в цены/PRICE в качестве переменной, а затем нажать Change Summary. Median of Values..Continue. Затем войти в ROOMS, Category Axis, OK.

Меняется ли средняя цена в зависимости от количества цен?-----

10. Повторить анализ, заменяя Зону на Комнаты.

11. Если позволит время, провести анализ дополнительных примеров.

12. При окончании, выйти из SPSS. Когда задается вопрос " Do you want to save any open file?", ответ должен быть "нет".

Анализ корреляции и регрессии.

I. Анализ корреляции.

- А. Измеряет линейные отношения между двумя переменными или парами переменных.
- Б. Коэффициент корреляции----- диапазон от 1 до + 1.
- В. Корреляционная матрица -- показывает корреляцию между всеми парами переменных.

II. Простая (одна переменная) регрессия.

- А. Зависимая переменная - оцениваемая величина (например, цена продажи).
- Б. Независимая переменная -- фактор переменной (например, квадратные метры или метры жилой площади).

III. Принцип наименьших квадратов

Регрессия минимизирует сумму квадратичных ошибок между фактической стоимостью (цена продажи) и предсказанной стоимостью.

IV. Основные регрессивные данные.

- А. Константа ---- постоянное количество долларов в точке пересечения регрессивной линии с осью Y (например, \$ 499. 34 в демонстрационном примере).
- Б. Коэффициент регрессии---- величина или количество на каждую единицу, ассоциируемая с каждой переменной в модели (например, \$ 480. 46).
- В. Стандартная ошибка-- стандартное отклонение от коэффициента регрессии (две стандартные ошибки составляют 95% полного интервала в окрестности коэффициента регрессии).
- Г. t- value --соотношение коэффициента регрессии к его стандартной ошибке. Чем выше число, тем лучше(коэффициенты с t-величиной выше 2. 00, являются " значительными " на уровне полноты 95 %).

$$t - value = \text{коэффициент} \div \text{стандартное отклонение.}$$

Д. R-Square -- процент изменения в продажных ценах , представленная в модели регрессии.

1. Максимальная величина есть 100%.
2. Чем выше число, тем лучше.

Е. Стандартная ошибка расчета (SEE) -- стандартное отклонение от регрессивных ошибок. Чем ниже число, тем лучше. (Приблизительно 95 % регрессивных ошибок будут приходиться в пределах двух стандартных ошибок).

Ж. Коэффициент отклонения (COV) - это соотношение стандартной ошибки расчета к средней цене продаж.

$$COV = SEE \div ave (SP)$$

V. Анализ многократной регрессии.

А. Включает многократные независимые переменные

Б. Независимыми переменными должны быть те , которые относятся к местной стоимости недвижимости, то есть отражают спрос и предложение.

В. Точность зависит от следующих факторов:

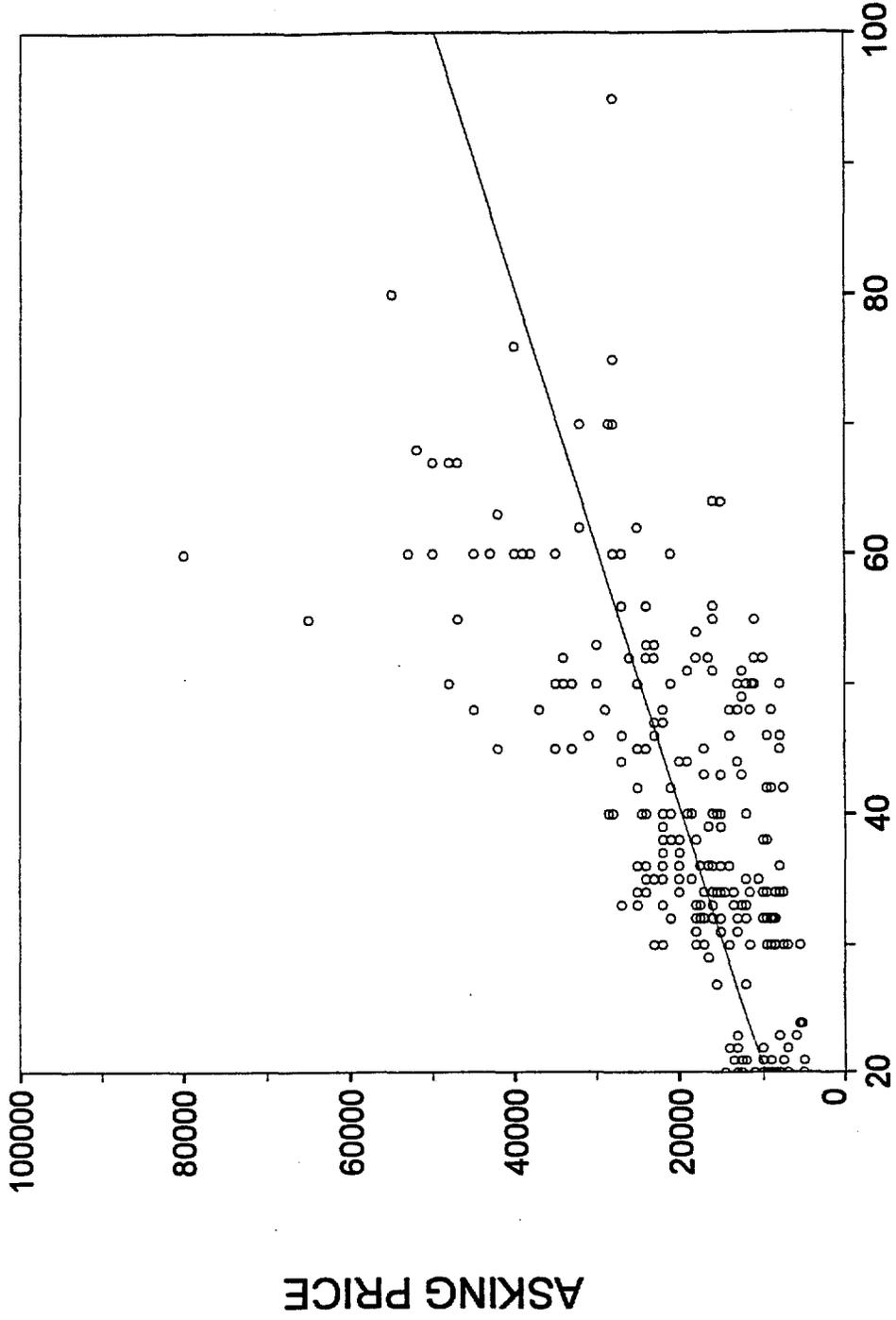
1. Наличие данных и точность
2. Особенности модели- переменные, которые включены в модель.
3. Калибровка модели- метод, используемый для определения коэффициентов.

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correlation matrix follows
(sheet 58 in English set)

EXAMPLE OF REGRESSION LINE

ASKING PRICE AND LIVING AREA



regression output follows

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Лабораторная работа Д- Анализ Многократной Регрессии.

1. Открыть файл APT. SAV.

2. Выберете случаи, которые отвечают следующим требованиям :

- | | | | |
|---|--------------------------|----------|----------------------------------|
| а | Общая площадь
TOTAREA | > 0 | (плохие данные) |
| б | Жил. площадь
LIVAREA | > 0 | (плохие данные) |
| в | МЕБЛИР.
FURNISH | = 0 | (исключает только один случай). |
| г | НИША
NISHA | = 0 | (исключает только один случай) |
| д | ЦЕНА
PRICE | < 6 0000 | (исключает две периферии). |

Data. Select cases.. If Condition is Satisfied.. If. Затем войти в следующее выражение:

TOTAREA > 0 and LIVAREA > 0 and FURNISH = 0 and NISHA= 0 and PRICE < 60000.

Затем продолжить ОК. Сообщение " Filter On" должно появиться в правом углу на вашем экране.

3. Сделать гистограмму цен.

Сколько случаев используется в анализе?-----

Сколько случаев исключаются? -----

Какова средняя цена остальных случаев ?-----

4. Вызвать рассеянный график Цен с Жилой площадью и подогнать линию регрессии к данным.

5. Вызвать регрессию Цен с Жилой площадью .

Statistics.. Regression.. Linear ..Price в качестве зависимой переменной и LIVAREA, в качестве зависимой переменной. Затем ОК.

Что такое константа?-----

Что является коэффициентом от LIVAREA? ---

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Какой будет предполагаемая стоимость квартиры с 40 м² ? -----

Что такое R- квадрат ? -----

6. Снова вызвать регрессию включая Зону, в качестве независимой переменной.

Что такое константа?-----

Что есть коэффициент Жилой площади/LIVAREA?-----

Что является коэффициентом Зоны?----

Какова будет предполагаемая стоимость квартиры с 40 м², расположенной в зоне 2?-----

Какова эквивалентная стоимость в зоне 4?-----

В зоне 6 ?-----

Что такое R-квадрат? -----

7. Вывести бинарную переменную для района в зоне 1.

Transform.. Compute.. Enter Zone1 as the target variable and "0" into Numeric Expression, OK.

Transform. Compute. Измените цифровое выражение на "1" и нажать на if...Включить if Case Satisfies Condition and Enter Zone = 1 and click Continue OK. Ответить OK на " Change Existing Variable".

8. Для проверки своей работы, вызовите перекрестные таблицы ZONE1 с Зоной.

Statistics. Summarise.. Crosstabs Enter Zone1, в качестве переменной в колонке, и ZONE, в качестве переменной ряда

Все виды собственности в зоне 1 должны иметь стоимость для ZONE1 от 1.

Все другие виды собственности должны иметь стоимость для ZONE1 от 0.

9. Самостоятельно создайте похожую переменную для ZONE3. Снова проверьте свою работу при помощи перекрестной таблицы для ZONE и ZONE3.

Примечание: Для зоны 2 никакой бинарной переменной создаваться не будет, так как эта зона будет служить зоной ссылки.

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10. И наконец, создайте третью бинарную переменную для ZONE 456, для расположения в зонах 4-6. Вспомните, что эти три зоны возникли эквивалентно в стоимости района.

11. Проверьте свою работу перечислив следующие переменные : ZONE, ZONE1, ZONE3, ZONE 456.

Statistics... Summarize, List cases and enter the four ZONE, ZONE1, ZONE3, ZONE456.

Убедитесь, что переменные последовательны. Например, если собственность находится в зоне 3, ZONE3, должно быть "1", и ZONE1 и ZONE456, должны быть ноль. Если собственность находится в зоне 2, все три бинарные переменные должны быть ноль.

12. Откройте регрессию, снимая ZONE и входя в ZONE1, ZONE3, ZONE456.

Что такое константа?----

Каков коэффициент LIVAREA?----

Каков коэффициент ZONE1?----- ZONE3, -----ZONE456?

Какой будет предполагаемая стоимость квартиры 40 м², расположенной в зоне 2.----

Какова эквивалентная стоимость в зоне 4?----

Какова эквивалентная стоимость в зоне 6 ?-----

Что такое R- квадрат ? -----

Является ли эта модель лучше предыдущей модели?-----

Объяснение: -----

13. Если позволит время, сделайте такой эксперимент, включая дополнительные переменные в регрессионной модели. Стремитесь иметь модель, которая имеет высокую R-квadratную стоимость и вполне разумна.

Какова Ваша окончательная величина R-квadrата?---

14. Перечислите любые другие дополнительные переменные, которых нет в наличии, но которые по Вашему могут повлиять на R- квадрат.

Обзор вопросов: Корреляция и регрессия.

1. Какие из следующих корреляционных коэффициентов указывают на сильную отрицательную корреляцию между двумя переменными:

- а. ноль
- б. -.30
- в. -.80
- г. 0.90

2. Рассмотрите следующую модель регрессии:

$$\text{Цена} = 5,000 + (310 \times \text{LIVAREA}) - (160 \times \text{AGE}).$$

Какова будет стоимость дома, который имеет 120 м² жилой площади и возраст, 40 лет?

- а. \$ 30,800
- б. \$ 35,800
- в. \$ 42,200
- г. \$ 47,500

3. Анализ регрессии сводится к принципу минимизации ----- ошибок.

4. Предполагается следующее:

Переменная Variable	Коэффициент Coefficient	Стандартная ошибка Standard error	t-величина. t-value
LIVAREA	145.00	16.00	9.06
Жил. пл. QUALITY (1-5)	1460.00	249.57	5.85
Качество AGE	-188.00	76.42	2.46
Возраст			

Можно быть уверенными на 95 % , что правильный коэффициент для жилой площади находится между ----- и -----.

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5. Какие переменные являются “ значительными ” в модели, на уровне 95 % полноты

- а. Жилая площадь/LIVAREA
- б. Качество/Quality
- в. Возраст/AGE
- г. Все три/All three.

6. Какие из нижеприведенных критерий определяют процент переменной величины в продажной цене , представленной в модели?

- а. Коэффициент регрессии (B_1)
- б. Коэффициент корреляции (r)
- в. Стандартная ошибка оценки
- г. R-Square/ P-квадрат

7. Изучите следующую информацию

P-квадрат = . 790.

Стандартная ошибка оценки = 8,000.

Средняя цена продажи= \$ 35, 000.

Каков коэффициент переменной? -----

8. В выше отмеченном примере предполагая, что ошибки регрессии были нормально распределены, приблизительно 95 % будут не больше чем,

- а. 79 процент
- б. \$ 8, 000
- в. \$ 16, 00
- г. \$ 24,000

9. Самое важное требование при разработке эффективной модели регрессии;

- а. Линейные отношения
- б. Нормальное распределение продажных цен
- в. Большие объекты/примеры
- г. Точные данные

10 Предположим, что модель разработана для региона, в котором 6 районов.

Сколько бинарных районных переменных должно быть протестировано в модели?

- а. Три
- б. Четыре
- в. Пять
- г. Шесть

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Шаги по внедрению системы налогообложения, основанной на рыночных механизмах оценки недвижимости.

I. Руководство проектом и программой.

A. Группа проекта.

B. Стратегическое планирование

1. Ситуационный анализ.
2. Установление целей и задач.

B. Планирование и контроль проекта.

II. Предварительные меры.

A. Проект.

B. Демонстрационные проекты.

B. Определење рабочей нагрузки и производственных ставок.

III. Организационные обязанности.

A. Межведомственная координация.

B. Системы данных.

B. Изучение рынка и создание моделей по оценке.

Г. Применение модели , обзор, работа на местах.

Д. Определење налога.

Е. Сбор налогов.

Ж. Роль налогоплательщиков и частного сектора.

IV. Документация по системным требованиям, проекту и процедурам.

V. Наличие необходимых ресурсов.

A. Финансирование.

B. Персонал.

В. Компьютерное оборудование и программы.

Г. Офисное оборудование, техника, и т. д.

VI. Набор и подготовка персонала.

А. Составление схемы/карты.

Б. Сбор и ввод данных.

В. Анализ и моделирование.

Г. Применение модели и обзор.

Д. Отдельные проблемы оценки.

1. Земля (городская и сельскохозяйственная).

2. Крупные промышленные и коммерческие предприятия.

3. Движимое имущество.

4. Природные ресурсы.

VII. Составление кадастровых карт.

VIII. Сбор информации по земельным участкам и зданиям, создание картотеки.

IX. Сбор, ввод и анализирование рыночной информации.

А. Продажа.

Б. Рента и другие расходы.

В. Существующие строительные цены.

Х. Создание модели массовой оценки.

XI. Внедрение модели массовой оценки и обзор предварительной стоимости.

XII. Выдача уведомлений и работа с налогоплательщиками.

XIII. Завершение работы по оценке и составление налоговых списков.

А. Привилегии.

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Դասընթացների գնահատում

Օգտագործեք հետևյալը 1 - 7 հարցերում.

1	2	3	4	5
Կտրուկ ոչ	Մեծ մասամբ ոչ	Չեզոք են կամ կարծիք չունեն	Մեծ մասամբ այո	Կտրուկ այո

1. Արդյո՞ք դասընթացները Չեզ համար հաճելի էին: _____
2. Արդյո՞ք Չեր կարծիքով դասընթացները օգտակար էին և պարունակում էին կարևոր տեղեկություններ: _____
3. Արդյո՞ք դուք ի վիճակի էիք հասկանալ դասընթացների ընթացքում ներկայացված շուկայի և մասսայական գնահատման կոնցեպցիաները: _____
4. Արդյո՞ք դուք ի վիճակի էիք հասկանալ դասընթացների ընթացքում ներկայացված վիճակագրական մեթոդները՝ ներառյալ բազմակի անկումը: _____
5. Արդյո՞ք (SPSS) համակարգչային ծրագիրը Չեր կարծիքով արդյունավետ է (զորեղ և հեշտ է օգտագործել): _____
6. Արդյո՞ք Չեր կարծիքով համակարգչային լաբորատորիայի վարժությունները օգտակար էին: _____
7. Արդյո՞ք Դուք կցանկանայիք մասնակցել այդ դասընթացների թեման շարունակող այլ դասընթացների: _____
8. Ինչ՞ը Չեզ դուր եկավ դասընթացներում բոլորից շատ:
9. Դասընթացների ո՞ր մասը Չեր կարծիքով անօգտավետ էր կամ դժվար:
10. Ի՞նչ Դուք կառաջարկեիք դասընթացները բարելավելու համար:
11. Արդյո՞ք Դուք կարծում եք, որ Հայաստանը կարող է և պետք է իրականացնի շուկայական արժեքով գույքի հարկային համակարգը, ինչպես քննարկվեց դասընթացների ժամանակ:
12. Այլ մեկնաբանություններ և առաջարկներ:

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