

# Quantitative Methods - I

( Data and Variables, The Nature of Quantitative Research, Descriptive and Inferential Statistics)

- The **unit of analysis** for a study indicates what or who should provide the data and at what level of aggregation. Researchers specify whether an investigation will collect data about individuals (such as customers, employees, and owners), households (families, extended families, and so forth), organizations (businesses and business units), departments (sales, finance, and so forth), geographical areas, or objects (products, advertisements, and so forth).
- A **variable** is anything that varies or changes from one instance to another. Variables can exhibit differences in value, usually in magnitude or strength, or in direction.

# TYPES OF VARIABLES

- A **continuous variable** is one that can take on a range of values that correspond to some quantitative amount. Consumer attitude toward different airlines is a variable that would generally be captured by numbers, with higher numbers indicating a more positive attitude than lower numbers.
- A **categorical variable** is one that indicates membership in some group. The term **classificatory variable** is sometimes also used and is generally interchangeable with *categorical variable*. Categorical variables sometimes represent quantities that take on only a small number of values (one, two, or three). However, categorical variables more often simply identify membership.

- A **dependent variable** is a process outcome or a variable that is predicted and/or explained by other variables. An **independent variable** is a variable that is expected to influence the dependent variable in some way. Such variables are independent in the sense that they are determined outside of the process being studied. That is another way of saying that dependent variables do not change independent variables.

EXHIBIT 7.1

Comparing Qualitative and Quantitative Research



Qualitative Research	Research Aspect	Quantitative Research
Discover Ideas, Used in Exploratory Research with General Research Objects	Common Purpose	Test Hypotheses or Specific Research Questions
Observe and Interpret	Approach	Measure and Test
Unstructured, Free-Form	Data Collection Approach	Structured Response Categories Provided
Researcher Is Intimately Involved. Results Are Subjective.	Researcher Independence	Researcher Uninvolved Observer. Results Are Objective.
Small Samples—Often in Natural Settings	Samples	Large Samples to Produce Generalizable Results (Results That Apply to Other Situations)
Exploratory Research Designs	Most Often Used	Descriptive and Causal Research Designs

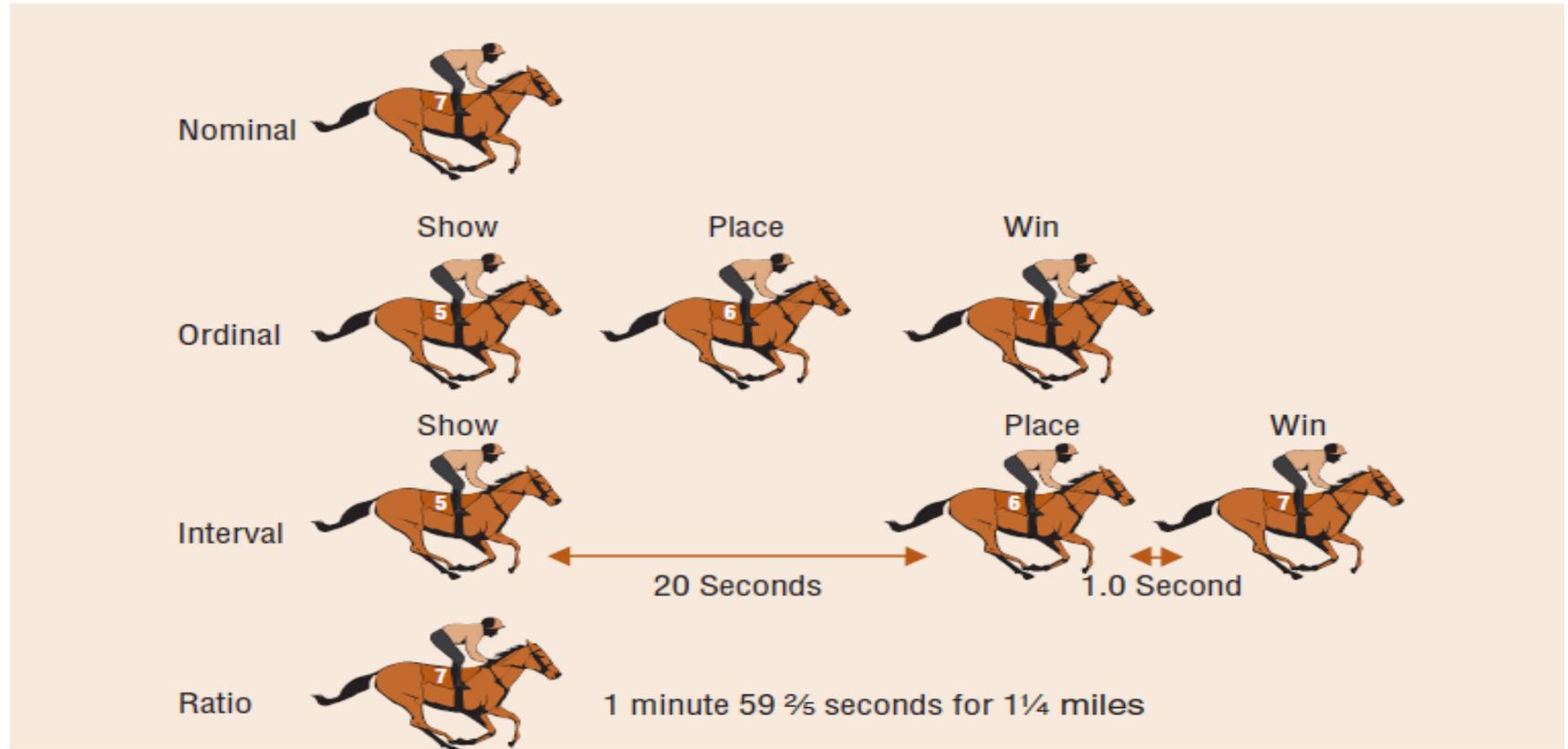
- **Measurement** is the process of describing some property of a phenomenon of interest, usually by assigning numbers in a reliable and valid way.
- A **concept** can be thought of as a generalized idea that represents something of meaning. Concepts such as *age*, *sex*, *education*, and *number of children* are relatively concrete properties.
- Researchers measure concepts through a process known as **operationalization**. This process involves identifying scales that correspond to variance in the concept.
- **Scales**, just as a scale you may use to check your weight, provide a range of values that correspond to different values in the concept being measured.
- Scales provide **correspondence rules** that indicate that a certain value on a scale corresponds to some true value of a concept. Hopefully, they do this in a truthful way

- A **construct** is a term used for concepts that are measured with multiple variables. For instance, when a business researcher wishes to measure the customer orientation of a salesperson, several variables like these may be used, each captured on a 1–5 scale:
  1. I offer the product that is best suited to a customer’s problem.
  2. A good employee has to have the customer’s best interests in mind.
  3. I try to find out what kind of products will be most helpful to a customer.
- **Nominal scales** represent the most elementary level of measurement. A nominal scale assigns a value to an object for identification or classification purposes only. The value can be, but does not have to be, a number because no quantities are being represented. In this sense, a nominal scale is truly a qualitative scale. Nominal scales are extremely useful, and are sometimes the only appropriate measure, even though they can be considered elementary.

- **Ordinal scales** allow things to be arranged in order based on how much of some concept they possess. In other words, an ordinal scale is a ranking scale. In fact, we often use the term *rank order* to describe an ordinal scale.
- Eg., When class rank for high school students is determined, we have used an ordinal scale. We know that the student ranked seventh finished ahead of the student ranked eighth, who finished ahead of the ninth ranked student. However, we do not really know what the actual GPA was or how close these three students are to each other in overall grade point average.
- **Interval scales** have both nominal and ordinal properties, but they also capture information about differences in quantities of a concept.
- Exhibit 13.4 depicts a horse race in which the win horse is one second ahead of the place horse, which is 20 seconds ahead of the show horse. Not only are the horses identified by the order of finish, but the difference between each horse's performance is known. So, horse number 7 and horse number 6 performed similarly (1 second apart), but horse number 5 performed not nearly as well (20 seconds slower).

Ratio scales represent the highest form of measurement in that they have all the properties of interval scales with the additional attribute of representing absolute quantities. Interval scales possess only relative meaning, whereas ratio scales represent absolute meaning. In other words, ratio scales provide iconic measurement

**EXHIBIT 13.4**  
**Nominal, Ordinal, Interval,**  
**and Ratio Scales Provide**  
**Different Information**



Level	Examples	Numerical Operations	Descriptive Statistics
Nominal	<p>Student ID number</p> <p>Yes – No</p> <p>Male – Female</p> <p>Buy – Did Not Buy</p> <p>East region</p> <p>Central region</p> <p>West region</p>	Counting	<ul style="list-style-type: none"> <li>• Frequencies</li> <li>• Mode</li> </ul>
Ordinal	<p>Student class rank</p> <p>Please rank your three favorite movies.</p> <p>Choose from the following:</p> <ul style="list-style-type: none"> <li>• Dissatisfied</li> <li>• Satisfied</li> <li>• Very satisfied</li> <li>• Delighted</li> </ul> <p>Indicate your level of education:</p> <ul style="list-style-type: none"> <li>• Some high school</li> <li>• High school diploma</li> <li>• Some college</li> <li>• College degree</li> <li>• Graduate degree</li> </ul>	<p>Counting</p> <p>Ordering</p>	<ul style="list-style-type: none"> <li>• Frequencies</li> <li>• Mode</li> <li>• Median</li> <li>• Range</li> </ul>
Interval	<p>Student grade point average (GPA)</p> <p>Temperature (Celsius and Fahrenheit)</p> <p>Points given on an essay question</p> <p>100-point job performance rating provided by supervisor</p>	Common arithmetic operations	<ul style="list-style-type: none"> <li>• Frequencies</li> <li>• Mode</li> <li>• Median</li> <li>• Range</li> <li>• Mean</li> <li>• Variance</li> <li>• Standard deviation</li> </ul>
Ratio	<p>Amount spent on last purchase</p> <p>Salesperson sales volume</p> <p>Number of stores visited on a shopping trip</p> <p>Annual family income</p> <p>Time spent viewing a Web page</p>	All arithmetic operations	<ul style="list-style-type: none"> <li>• Frequencies</li> <li>• Mode</li> <li>• Median</li> <li>• Range</li> <li>• Mean</li> <li>• Variance</li> <li>• Standard deviation</li> </ul>