



THE UNIVERSITY OF
WESTERN AUSTRALIA

BUSINESS SCHOOL

MGMT5504

SEMESTER 2 2022- LECTURE 1



“Data don’t make any sense,
we will have to resort to statistics.”



ACHIEVE INTERNATIONAL EXCELLENCE



The Basics

↘ **Lecturer**

- Ying Huang

↘ **Textbook**

- Jaggia, S. and Kelly, A. (2019) Essentials of Business Statistics, McGraw-Hill Education
- Reid Library – numerous stats books

↘ **Unit structure**

- ∇ week lecture videos accompanied by online activities/discussions

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Jaggia: Business Statistics: Communicating with Numbers, 2e
by Sanjiv Jaggia

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Flow runner

SMARTBOOK **Business Stats - Business Statistics: Communicating with Numbers, 1e, Jaglla Numerical Descriptive Measures**

PREVIEW READ PRACTICE RECHARGE [Icons] Assignment Progress

a less dispersed data set.

The Variance and the Standard Deviation

Assignment Recharge Reports

3 Numerical Descriptive Measures

Learning Objectives

- Measures of Central Location
- Percentiles and Box Plots
- The Geometric Mean
- Measures Of Dispersion
- Mean-variance Analysis and the Sharpe Ratio
- Chebyshev's Theorem and The Empirical Rule
- Summarizing Grouped Data
- Covarlance and Correlation

ASSIGNMENT PROGRESS

56%

START LEARNING

Learn Smart

12 Chi-Square Tests

Due date: 0 0 (0 points)

Assignment progress: 0%

1 Statistics and Data

2 Tabular and Graphical Methods

3 Numerical Descriptive Measures

4 Introduction to Probability

5 Discrete Probability Distributions

6 Continuous Probability Distributions

7 Sampling and Sampling Distributions

8 Estimation

9 Hypothesis Testing

10 Statistical Inference Concerning Two

11 Statistical Inference Concerning

12 Chi-Square Tests

Learning technology by area9

Assessment	Weight	Submission	Deadline
1a & 1b. Activity quizzes x 2	15% each (30% total)	<ul style="list-style-type: none"> Individual Answer quiz via LMS 	1a - Week 4 (starting 15 Aug) via LMS 1b - Week 8 (starting 19 Sep) via LMS
2a. Statistics in practice: Group presentation	20%	<ul style="list-style-type: none"> Groups of 5-6 Present in class 	Week 11 (starting 10 Oct) online
2b. Statistics in practice: Individual infographic	15%	<ul style="list-style-type: none"> Individual Submit on LMS 	Week 12 (starting 17 Oct)
3. Final exam	35%	<ul style="list-style-type: none"> Individual Oral examination 	Week 12 (starting 17 Oct)



Unit Outline

Three modules

➤ **1 Introduction and presenting data**

- Our unit and its objectives;
- What is business statistics/data analysis;
- Types of data: cross-sectional vs time series;
- Data sources, data collection and sampling methods;
- Presenting data in tables and in charts (hands-on/practice);
- Summary statistics.

➤ **2 Probability distributions and inference**

- Probability – introduction, probability rules;
- Probability distributions (pdf);
- Expected value and variance of a random variable;
- Statistical inference – sampling, confidence intervals;
- Hypothesis testing - types of errors, p-values;
- One and two-sample tests (hands-on);
- Comparing group differences (hands-on);
- χ^2 test for independence.



Unit Outline - Cont' d

➤ **3 Prediction and forecasting**

- Correlations;
- Simple and multiple linear regression – assumptions, solution, interpretation, prediction (hands-on);
- Regression diagnostics;
- Time series – introduction.



Examples of data analysis and decision making

➤ How did you go to the University today

Info: car driving (road congestion, parking); PT(bus, train, timetable); walk and cycling (weather)

➤ What strategy do companies employ to increase profits?

Marketing segmentation? Pricing scheme?

➤ The use of Park-and-ride facilities in the city

How many railway stations?

Which railway stations?

How many parking bays?

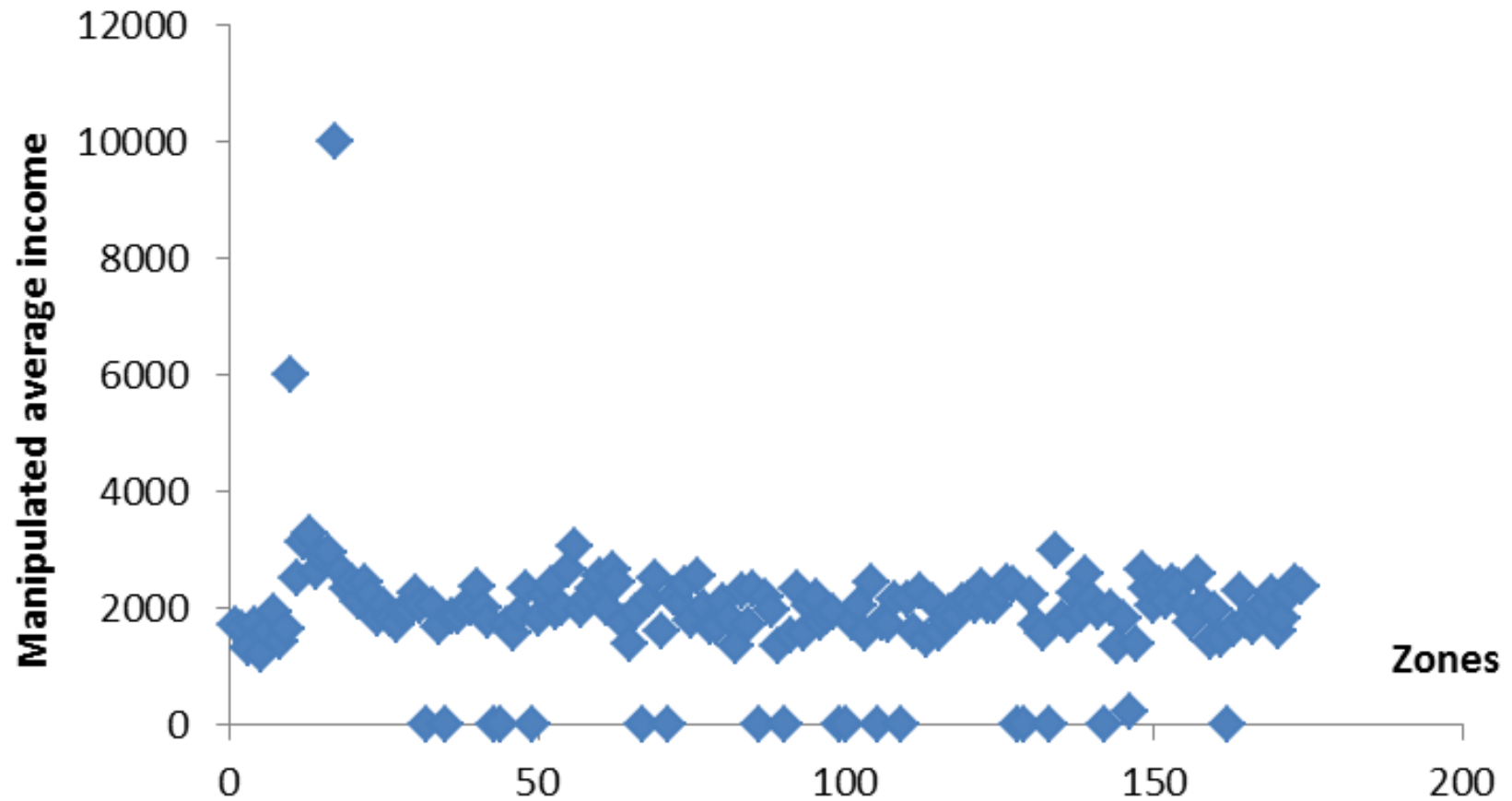




Topic 1 - Data versus Information

- **Data**—raw facts—record measures of certain phenomena which are necessary to provide
- **Information**—facts in a form suitable for managers to base decisions on
- **Information** must be:
 - Accurate/of high quality
 - Relevant
 - Timely
 - Complete







What Does Statistics Mean?

- **Discipline** - methodology of extracting useful information from a data set
- To do good statistics, you must:
 - **Find the right data (we do not collect primary data!)**
 - **Use the appropriate statistical tools.**
 - **Clearly communicate the numerical information into written language.**
- **Group of data** (people gather statistics from their business operation)
- **Distributions** used in the analysis of the data



What Does Statistics Mean? – Cont'd

↘ *Descriptive statistics*

Collecting, presenting and describing data

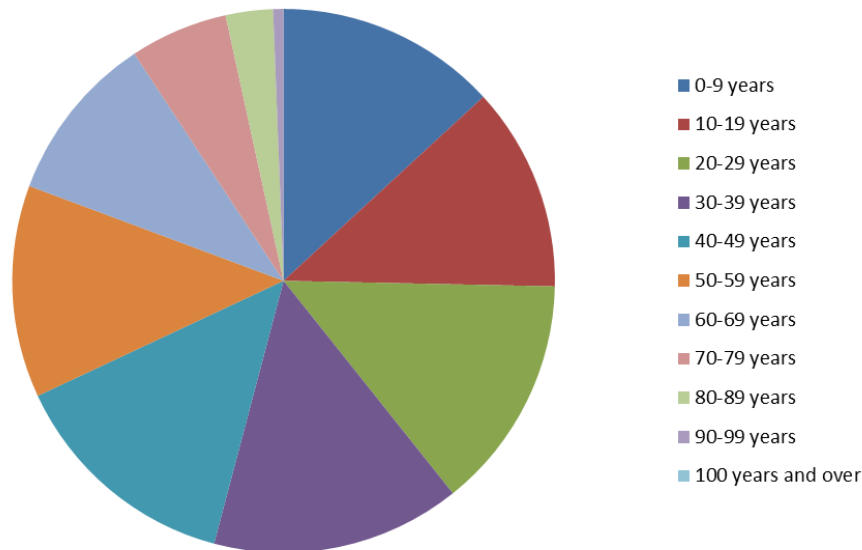
- E.g., number of people, trends in employment
- Numerical and graphical tools



Descriptive Statistics: Age group of whole population in WA

Source: ABS census 2016

Age	0-9 years	10-19 years	20-29 years	30-39 years	40-49 years	50-59 years	60-69 years	70-79 years	80-89 years	90-99 years
Person	325879	300802	345242	367306	344517	312333	248900	144417	69775	15033



Mean $\mu = 37.8$

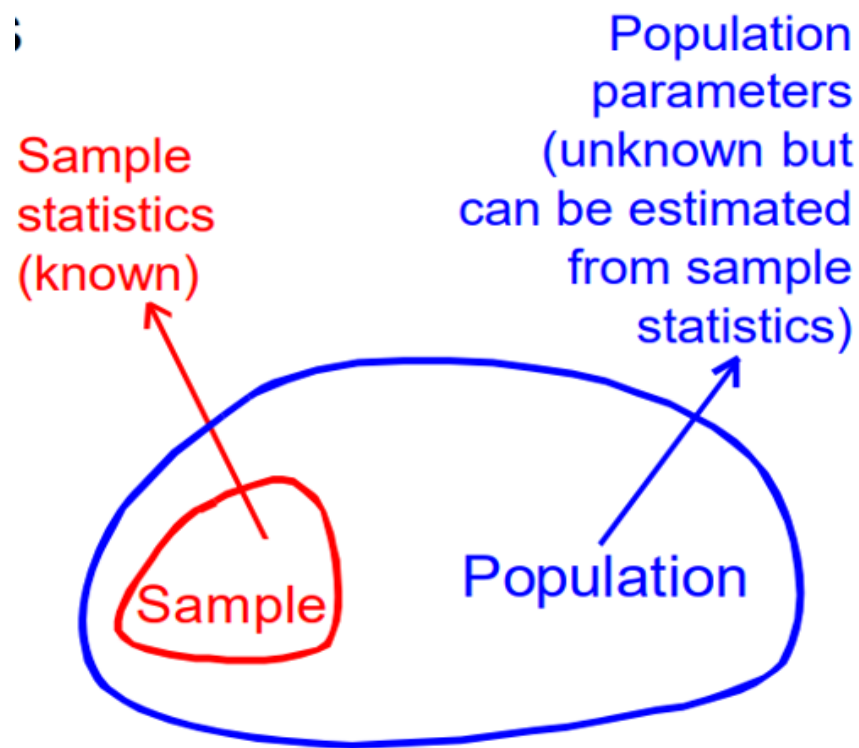
Variance $\sigma^2 = 511.45$ and Standard Deviation $\sigma = 22.6$



➤ *Inferential statistics*

Make an inference (draw conclusions and/or make decisions) about a population from a sample

- Population Parameter vs Sample Statistics
- Estimation
- Hypothesis testing
- First year salary of postgraduate students in Australia
- First year salary of postgraduate students from Business School in UWA





Break



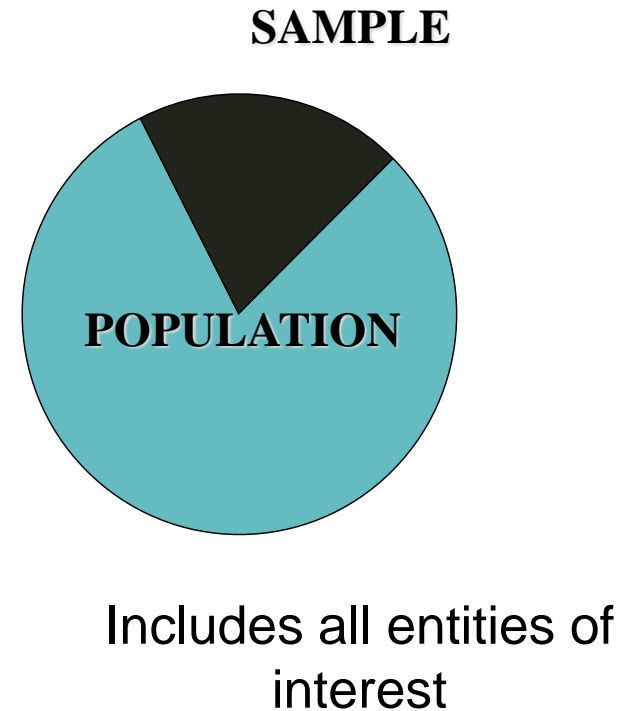


Selecting a Sample

Sample: subset of a larger population

Is it representative?

- Who is to be sampled?
- How large a sample?
- How will sample units be selected?





Sampling

In simple stage or combination (multi-stage)

Probability Samples

Simple Random sampling	A sample arranged so that every element of the population has an equal chance of being selected.
Stratified Random sampling	The number of observations per stratum is proportional to the stratum's size in the population. Within each stratum, the observations are randomly selected.
Cluster sampling	The population is firstly divided up into clusters, then randomly sampled within the chosen clusters.



Example:

Sales for one shoe brand (in total 1000 customers)

	10-19 years	20-29 years	30-39 years	40+ years
Number of customers	200	400	350	50

Sample 100 customers for the survey, how could we do?



Sampling – Cont'd

Non-probability Samples

Non-probability sample	Any sample in which little or no attempt is made to get a representative cross-section of the population (e.g. snowball sampling).
Convenience sample	A form of non-probability sample using respondents who are convenient or readily accessible to the researcher/analyst.



Sources of Estimation Error

↘ Sampling and non-sampling

- Sampling errors

- Systematic Errors & Associated with Sampling (random sampling error)
- The difference between the sample results and the result of a census conducted using identical procedures
- Statistical fluctuation due to chance variations

*Inevitable, ↓
with larger
sample size*

- Non-sampling errors

- Unrepresentative sample results
- Not due to chance
- Due to study design or imperfections in execution (measurement error)
- Sampling frame error
- Non-response error, non-truthful



Types of Data/Variables

Variable – attribute or measurement on members of the population/sample (field in a dbase)

Observation – list of all variable values for a member (case, record)

➤ Cross-sectional and time-series/longitudinal

➤ Categorical – nominal, ordinal

➤ Continuous/Numerical – interval, ratio



Cross-sectional vs time-series/longitudinal

	Median hh weekly income (AUD)			
Census ...	2001	2006	2011	2016
NSW	904	1,036	1,237	1,486
Victoria	878	1,022	1,216	1,419
Qld	812	1,033	1,235	1,402
WA	841	1,066	1,415	1,595
SA	779	887	1,044	1,206
Tas	710	801	948	1,100
NT	957	1,192	1,674	1,983
ACT	1,102	1,509	1,920	2,070

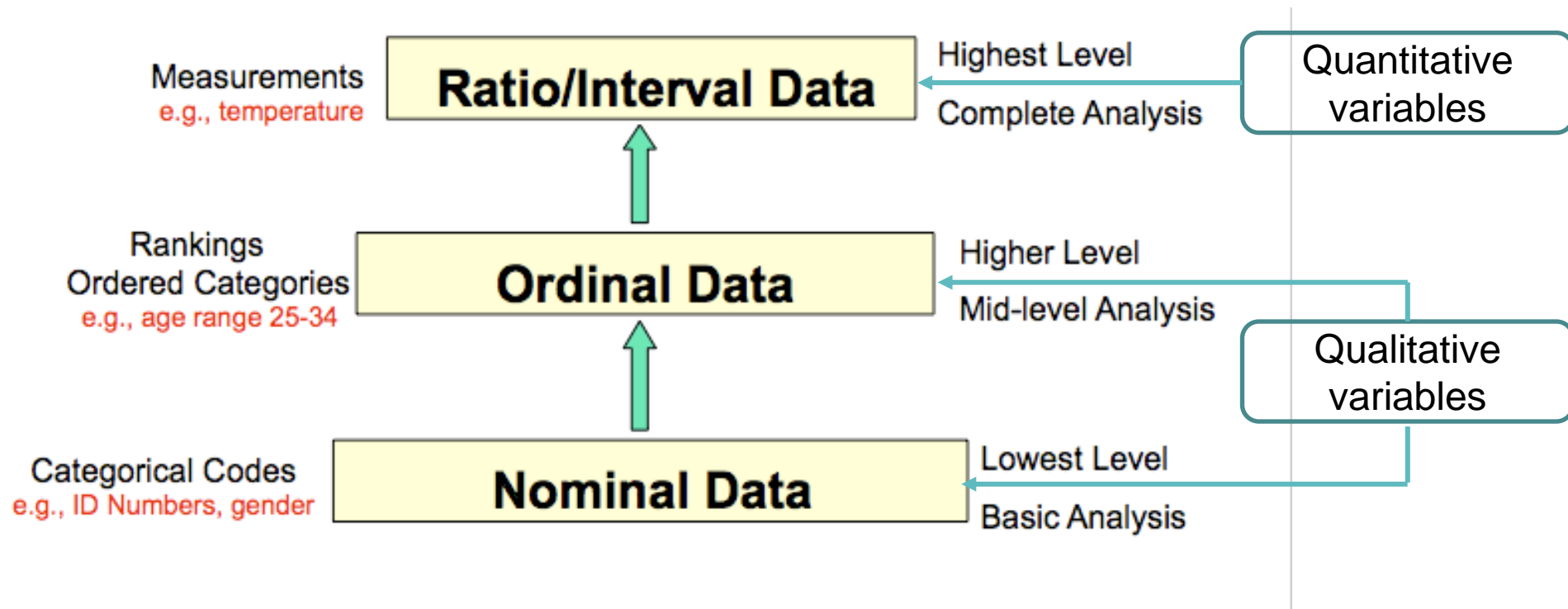


Numbers, numbers...

➤ Go to www.menti.com and enter the code 5122 0377



Data Measurement Levels



Example Text – Tween Survey

- Which radio station was playing on your car drive to the resort?
- Rate the quality of the food at the resort (1 is poor, 2 is fair, 3 is good and 4 is excellent)
- What time do you think should the dining area close?
- How much did you spend at the lodge today?

Tween	Q1	Q2	Q3	Q4	Tween	Q1	Q2	Q3	Q4
1	JAMN94.5	4	5:00 pm	20	11	JAMN94.5	3	3:00 pm	0
2	MIX104.1	2	5:00 pm	10	12	JAMN94.5	4	4:00 pm	5
3	KISS108	2	4:30 pm	10	13	KISS108	2	4:30 pm	5
4	JAMN94.5	3	4:00 pm	0	14	KISS108	2	5:00 pm	10
5	KISS108	1	3:30 pm	0	15	KISS108	3	4:00 pm	5
6	JAMN94.5	1	6:00 pm	25	16	JAMN94.5	3	6:00 pm	20
7	KISS108	2	6:00 pm	15	17	KISS108	2	5:00 pm	15
8	KISS108	3	5:00 pm	10	18	MIX104.1	4	6:00 pm	15
9	KISS108	2	4:30 pm	10	19	KISS108	1	5:00 pm	25
10	KISS108	3	4:30 pm	20	20	KISS108	2	4:30 pm	10



Summary

- We don't lack data, we only need expertise to analyse it
- Descriptive procedures and inferential statistics
- Data sources
- Variables and scale of measurement
- Population and samples
- Tools for describing data (brief intro – to be continued next week)

