Statistics for Business: syllabus

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1st lesson: Probability calculus [Background]

2nd lesson: Random variables and probability distributions [Background]

3rd lesson: Expected value, variance and other moments [Background]

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1 Expected value

1.1 Expected value versus arithmetic mean

1.2 Properties of the expected value

2 Moments

2.1 Raw moments

2.2 Central moments

3 Variance and standard deviation

3.1 Properties of the variance

4 Expected value and variance as criterions for decision

4.1 Log term: expected value

4.2 Short term: expected value and risk

4.3 Utility function

5 Chebysev's inequality

4th lesson: Bernoulli processes

1 Bernoulli process: definition

1.1 Bernoulli distribution

1.2 Binomial distribution

1.2.1 Expected value and variance

1.2.2 Return period

1.3 Geometric distribution

1.4 Negative binomial distribution

5th lesson: Hypergeometric distribution

1 **Hypergeometric distribution**

2 **Sampling without devolution**

3 **Linking with binomiasl distribution**

4 **Fisher's exact test**

6th lesson: Poisson processes

1 Poisson distribution

1.1 Return period

1.2 Poisson approximation of binomial probabilities

2 Exponential distribution

2.1 Memorylessness and failure rate

7th lesson: Uniform distributions

1   Discrete uniform distribution

1.1   Distribution of the maximum

1.2   Distribution of the minimum

1.3   Sampling in finite populations

1.4   German tank problem

2   Continuous uniform distribution

2.1   Standard uniform distribution

2.2   Distribution of the maximum

2.3   Distribution of the minimum

2.4   Distribution of the range

8th lesson: Power-law distributions

9th lesson: Normal distribution and limit theorems

10th lesson: Introduction to statistical inference

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1 Statistical inference: scope and basic concepts

2 Steps in inference

2.1 Sampling

2.2 Setting the model: the support

2.3 Setting the estimators

2.4 Calculating the parameters: estimation and statistical testing

2.5 Validation

2.5.1 Randomness tests: runs test

2.5.2 Goodness of fit: chi square test

2.5.3 Homogeneity tests: Wilcoxon rank test

11th lesson: Parametric tests

1   Basic methodology

2   Estimators and sampling distributions

2.1   p-value method

2.2   Critical region method

3   Tests of proportion

4   Tests of mean

5   Tests of variance

12th lesson: Confidence intervals

1 Point estimation and interval estimation

2 t interval for the mean

2.1 Construction

2.2 Effect of the confidence level

2.3 Effect of the sample size

2.4 Effect of the standard deviation

2.5 Asymmetrical intervals

3 Interval for the proportion

3.1 Construction

3.2 Effects of the confidence level and sample size

3.3 Asymmetrical intervals

3.4 Sample size calculation

13th lesson: Properties of the estimators

1   Unbiasedness

2   Precision

3   Mean square error

3.1   Uniformly best estimates

3.2   Minimax criterion