Introduction to management statistics finance essay

Finance

IntroductionStatistics " is the study of the collection, organization, analysis, interpretation, and presentation of data. It deals with all aspects of this, including the planning of data collection in terms of the design of surveys and experiments" (Dodge, 2006)This research introduces various statistical terms in the form of problems, which are further calculated to show sequentially how an answer is arrived at. This research introduces readers to terms such as the Laspeyres and Paache price index, decision tree, time series, regression and linear programming. Project BackgroundThis project is done as a partial fulfillment of the researcher course of study, and forms an important part of the overall final grade. This research was done not only to edify the researcher on the content of the course, but also to be used as a tool for other readers to understand and get a clearer and more simplified approach to solving statistical problems like those that are in this research. This research may be used as question and answer booklet in the future for student who may have difficulty in this area. Literature reviewMathematics, economics, statistics and other numerical courses pose as a challenge for many, and the difficulty surrounding these problems are base in not the calculating part of it, but the interpretation part. Many may view statics and advance mathematic of any form as not being a necessity in society’s day to day running’s however, Florence Nightingale (a pioneer nurse, writer and avid statistician) stated " statistic..... the most important science in the whole world: for upon it depends the practical application of every other science and of every art; the science essential to all political and social administration, all education, all organization based upon experience for it only gives the result of our

experience" (PSI, 2007)Statistics " is the study of the collection, organization, analysis, interpretation, and presentation of data. It deals with all aspects of this, including the planning of data collection in terms of the design of surveys and experiments" (Dodge, 2006)The importance of statistics is evident and cannot be over stated as calculations such as Laspeyres Price Index help economist determine inflation, taxation, value of a dollar, G. D. P among many other economic variations of a base year as appose to another particular year. Price index is the " Measure of change in a set of prices, consisting of a series of numbers arranged so that a comparison of the values for any two periods or places will show the change in prices between periods or the difference in prices between places. Price indexes were first developed to measure changes in the cost of living in order to determine the wage increases necessary to maintain a constant standard of living." (Farlex, 2008)ObjectivesThis research aims to: Introduce advance mathematical terms, symbols and methodologies to readers, so that they may have a better understanding and use of such term in the business environmentProvide a clear understanding of, while demonstrating correct methods for solving Mathematical problems in a simplified way. Show the importance of how methodologies such as Differentiation, Decision Tree ect. can be applied to economics and daily lives. MethodologyThe completion of this research was mostly done via the primary and secondary sources, as the lecturer and other colleagues played an integral role. Primary day was obtain by conducting short interview with the lecturer for assurance that the research was on the right path as well as, information gained during lecture sessions. Secondary data was obtained from the use of books such as

Qualitative Methods for Business by Butter-Worth, Heineman and Baglear (2004), from website and YouTube short course videos on how to solve such research problems. Research Findings

Task one

Introduction to management statistics: Using the information in the table: Calculate: MeanModeObservation (X)Frequency (F)1041552094016608805100 3Solution: Observation (X)Frequency (F)F(x)1044015575209180401664060848080540010033 00Total= 50Total= 2115MeanFormula: μ= ∑ f (x)f (n)Step one: ∑ f (x) = 211540+75+180+640+480+400+300= 2115Step two: f (n) = 50Total sample (n) of " f" is = 4+5+9+16+8+5+3 = 50Step three: 2115 42 = 42 3/10 OR 42. 350 1ModeThere is no formula for the mode however, the number of observations that occur the most determine the mode. Therefore: The observation " 40" which occurs " 16" times would be the mode.

Task two

Regression; Calculate the r (correlation) between x and y. Interpret the value. Days of the monthTable scale of the product A (X)Table scale of the product B (Y)1st day15164th day14137th day101110th day181915th day151318th day202222nd day161525th day151727th day121630th day1317Total = 148Total = 159Solution:

x

y

xy

x2

y2

1st day15162402252564th day14131821961697th day101111010012110th day181934232436115th day151319522516918th day202244040048422nd day161524025622525th day151725522528927th day121619214425630th day1317221169289∑= 148∑= 159∑= 2417∑= 2264∑= 2619Formula: n ∑ X_i Y_i – ∑ X_i ∑ Y_iR = r = √ (n ∑ X_i2 – (∑X_i)2) (n ∑Y_i 2 – (∑Y_i)2)Step one: n ∑ X_i Y_i – ∑ X_i ∑ Y_i10 (2417) – (148) (159) = 24170 – 23532 = 638Step two: √ (n ∑ X_i2 – (∑X_i)2) (n ∑Y_i 2 – (∑Y_i)2)(10 (2264) – (148)2) (10 (2619) – (159)2) =(22640-21904) (26190 – 25281) =(736) (909) = 669024√ 669024 = 817. 939Step three: 638817. 939= 0. 78ii. Interpret the valueThe value r ≈ 0. 78, indicate that X has a strong positive relationship to Y.

Task three

Calculate the Lapeyres and Paasche price indices for the following data. Take 2005 as the base year.

Liter of Beer

Liter of Whiskey

Liter of Wine

Year

PriceQtyPriceQtyPriceQty

2005

0. 9520019. 801010. 5036

2006

0. 9915020. 391211. 1548

2007

1. 0512020. 991112. 3560i. Laspeyres Price Index (LPI) = ∑ qo pn∑ qo poStep one: ∑ q05 p05∑ q05 p05(200×0. 95) + (10×19. 80) + (36×10. 50) (200×0. 95) + (10×19. 80) + (36×10. 50)= 190+198+378190+198+378= 766766 = 1 ×100 = 100Step two: ∑ q05 p06∑ q05 p05= (200×0. 99) + (10×20. 39) + (36×11. 15)(200×0. 95) + (10×19. 80) + (36×10. 50)= 198+203. 9+401. 4190+198+378= 803. 3766= 1. 049= 1. 049×100 = 104. 9Step three: ∑ q05 p07∑ q05 p05= (200×1. 05) + (10×20. 99) + (36×12. 35)(200×0. 95) + (10×19. 80) + (36×10. 50)= 210+209. 9+444. 6190+198+378= 864. 5766= 1. 129= 1. 129×100 = 112. 9ii. Paasche Price Index (PPI) = ∑ qn pn∑ qn poStep one: ∑ q05 p05∑ q05 p05(200×0. 95) + (10×19. 80) + (36×10. 50)(200×0. 95) + (10×19. 80) + (36×10. 50)= 190+198+378190+198+378= 766766= 1 ×100 = 100Step two: ∑ q06 p06∑ q06 p05= (150×0. 99) + (12×20. 39) + (48×11. 15)(150×0. 95) + (12×19. 80) + (48×10. 50)= 148. 5 + 244. 68 + 535. 2142. 5 + 237. 6 + 504= 928. 38884. 1= 1. 050= 1. 050×100 = 105. 0Step two: ∑ q07 p07∑ q07 p05= (120×1. 05) + (11×20. 99) + (60×12. 35)(120×0. 95) + (11×19. 80) + (60×10. 50)= 126 + 230. 89 + 741114 + 217. 8 + 630= 1, 097. 89961. 8= 1. 141= 1. 141×100= 114. 1

Task four

Time series the number of rate captured in a grain stor is summarized below. Use simple exponential smoothing with alpha = 0. 2 and alpha = 0. 7 to forcast the number of rates that will be caught in week 7. GUIDEWeek 1. 216Week 2. 224Week 3. 217Week 4. 233Week 5. 245Week 6. 229Solution: TYF (α= 0. 7)F (α= 0. 2)Week 1. 216216216Week 2. 224216216Week 3. 217221. 6217. 6Week 4. 233218. 4217. 5Week 5. 245228. 6220. 6Week 6. 229240. 1225. 5Week 7. 232. 33226. 2Time series formula: F t+1 = Ft + α (Yt – Ft) with 0 ≤ α ≤ 1F t+1 = α Yt + (1– α) Ft

α= 0. 7

Step one: F 0+1= αYt + (1–α) F1F1 = 0. 7Y1 + (1 – 0. 7) F1= 0. 7 (216) + 0. 3 (216)= 151. 2 + 64. 8 = 216Step three: F 2+1= αYt+(1–α) F3F3 = 0. 7 Y3 + (1– 0. 7) F3F3 = 0. 7 (224) + (1 – 0. 7) 216= 156. 8 + 0. 3 (216)= 156. 8 + 64. 8 = 221. 6Step five: F 4+1= αYt + (1–α) F5F5 = 0. 7 Y5 + (1– 0. 7) F5F5 = 0. 7 (233) + (1– 0. 7) 218. 4= 163. 1 + 0. 3 (218. 4)= 163. 1 + 65. 52 = 228. 6Step seven: F 6+1= αYt+(1–α)F7F7 = 0. 7 Y7 + (1– 0. 7) F7F7 = 0. 7 (229) + (1– 0. 7) 240. 1= 160. 3 + 0. 3 (240. 1)= 160. 3 + 72. 03 = 232. 33Step two: F 1+1= αYt + (1–α) F2F2 = 0. 7 Y2 + (1– 0. 7) F2= 0. 7 (216) + 0. 3 (216)= 151. 2 + 64. 8 = 216Step four: F 3+1= αYt + (1–α) F4F4 = 0. 7Y4 + (1–0. 7) F4F4 = 0. 7 (217) + (1 – 0. 7) 221. 6= 151. 9 + 0. 3 (221. 6)= 151. 9 + 66. 48= 218. 4Step six: F 5+1= αYt + (1–α) F6F6 = 0. 7 Y6 + (1– 0. 7) F6F6 = 0. 7 (245) + 0. 3 (228. 6)= 171. 5 + 68. 58= 240. 1

α= 0. 2

Step one: F 0+1 = αYt + (1–α) F1F1 = 0. 2 Y1 + (1– 0. 2) F1F1 = 0. 2 (216) + (1– 0. 2) 216= 43. 2 + 0. 8 (216)= 43. 2 + 172. 8= 216Step three: F 2+1 = αYt + (1–α) F3F3 = 0. 2 Y3 + (1– 0. 2) F2F3 = 0. 2 (224) + (1 –0. 2) 216= 44. 8 + 0. 8 (216)= 44. 8 + 172. 8 = 217. 6Step five: F 4+1 = αYt + (1–α) F5F5 = 0. 2 Y5 + (1– 0. 2) F5F5 = 0. 2 (233) + (1 –0. 2) 217. 5= 46. 6 + 0. 8 (217. 5)= 46. 6 + 174 = 220. 6Step six: F 6+1 = αYt + (1–α) F7F7 = 0. 2 Y7 + (1– 0. 2) F7F7 = 0. 2 (229) + (1 –0. 2) 225. 5= 45. 8 + 0. 8 (225. 5)= 45. 8 + 180. 4 = 226. 2Step two: F 1+1 = αYt + (1–α) F2F2 = 0. 2 Y2 + (1– 0. 2) F2F2 = 0. 2 (216) + (1– 0. 2) 216= 43. 2 + 0. 8 (216)= 43. 2 + 172. 8 = 216Step four: F 3+1 = αYt + (1–α) F4F4 = 0. 2 Y4 + (1– 0. 2) F4F4 = 0. 2 (217) + (1 – 0. 2) 217. 6= 43. 4 + 0. 8 (217. 6)= 43. 4 + 174. 08 = 217. 5Step six: F 5+1 = αYt + (1–α) F6F6 = 0. 2 Y6 + (1– 0. 2) F6F6 = 0. 2 (245) + (1 –0. 2) 220. 6= 49 + 0. 8 (220. 6)= 49 + 176. 5 = 225. 5

Task five

Inferential statisticsA cruise ship was interested in the typical duration each client spent in the breakfast buffet. The entry and exist times of 30 cruisers was noted. i. Calculate and approximate 99% confidence interval for the mean breakfast time.

433536253035422818213943343827343841194434391936293324403118SUM = 973Step one: finding the meanμ= ∑ xn= 97330= 32. 433Step two: finding the varianceS2 = ∑ (χ i – μ) 2n – 1

χ

$\chi - \mu$

$(\chi - \mu)2$

4310. 57111. 7352. 576. 6396. 5743. 2341. 572. 5341. 572. 5330. 570. 3352. 576. 6429. 5791. 64310. 57111. 7385. 5731. 0396. 5743. 124-8. 4371. 1363. 5712. 728-4. 4319. 6341. 572. 5418. 5773. 419-13. 43180. 4407. 5757. 325-7. 4355. 218-14. 43208. 2385. 5731. 019-13. 43180. 4363. 5712. 731-1. 432. 030-2. 435. 921-11. 43130. 627-5. 4329. 44411. 57133. 929-3. 4311. 818-14. 43208. 2∑ = 973∑ = 1877. 1S2 = ∑ (χ i – μ) 2n – 1= 1877. 130 – 1= 1877. 129= 64. 73S2 = 64. 73√ S2 = √ 64. 73S = 8. 05Step three: calculating the 99% CI. Formula: (χ ± t)= 32. 43 + (2. 576) 8. 05√ 30= 32. 43 + (2. 576) (1. 47)= 32. 43 + 3. 79= 36. 2

OR

= 32. 43–3. 79= 28. 6Thus the 99% CI = (36. 2, 28. 6)

Task six

Linear programmingMinimize; cost = 9x+3ySubject to the following constraints; Constraints 1: Y ≥ 5Constraints 2: 6X + 7Y ≥ 210Constraints 3: 7X + 15Y ≥ 525Constraints 4: 5X + 28Y ≤ 700Constraints 5: X ≥ 0, Y ≥ 0Which of the constraints are binding and which are non-binding. In solving the problem let’s assume X = 0 and Y = 0 to solve the inequalities, so as to find the coordinates for x and y on the graph

Constraints 2: 6X + 7Y ≥ 210

Constraints 3: 7X + 15Y ≥ 525

6x + 7(0) = 2106x + 0 = 2106x = 21066x = 356(0) + 7y = 2100 + 7y = 2107y = 21077y = 30coordinates are (x, y) (35, 30)7(0) + 15y = 5250 + 15y = 52515y = 5251515y = 357x + 15(0) = 5257x + 0 = 5257x = 52577x= 75coordinates are (x, y) (35, 75)

Constraints 4: 5X + 28Y ≤ 700

5x + 28(0) = 7005x + 0 = 7005x = 70055x = 1405(0) + 28y = 7000 + 28y = 70028y = 7002828y = 25coordinates are (x, y) (140, 25)Plotting the points on a graph: The shaded area is the feasible region. Minimize; cost = 9x+3yUsing coordinates at points A, B, C and D from the graph in the optimizing function, minimized cost will be determined. The Coordinates are: A: (7. 37, 23. 68)B: (34. 71, 18. 8)C: (64. 29, 5)D: (29. 17, 5)Now: A: 9 (7. 37) + 3(23. 68)B: 9(34. 71) + 3(18. 8)66. 33+71. 04 312. 39+56. 4= 137. 37= 368. 79C: 9(64. 29) + 3(5)D: 9(29. 17) 3(5)578. 61+ 15 262. 53+15= 593. 61= 277. 53Therefore cost is minimized at point A. Constraints one (y≥5) and three (7x+15y≥525) are non-binding because they are redundant and does not affect solution of the optimizing function, while constraints four (5x+28y ≤700) and two (6x+7y≥210) are binding as any change in these constraints will cause the solution of the optimizing function to change.

Task Seven

What is a decision tree? Decision trees find use in a wide range of disciplines. It is applied in medical and cognitive science, engineering, economics among many other theoretical and math base disciplines. " A decision tree is a

decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm. an algorithm is a step-by-step procedure for calculations. Algorithms are used for calculation, data processing, and automated reasoning." (Shaw, 1995)According to Rafael Olivas in the book " decision trees: A primer for decision making professionals" A decision tree " is a method you can use to help make good choices, especially decisions that involve high costs and risks. Decision trees use a graphic approach to compare competing alternatives and assign values to those alternatives by combining uncertainties, costs, and pay offs into specific numerical values." (Olivas, 2007). An example of a tiplical decision treeFigure 1.(Olivas, 2007)Decision trees provide an effective method of Decision Making because they: Clearly lay out the problem so that all options can be challenged. Allow us to analyze fully the possible consequences of a decision. Provide a framework to quantify the values of outcomes and the probabilities of achieving them. Help us to make the best decisions on the basis of existing information and best guesses. As with all Decision Making methods, decision tree analysis should be used in conjunction with common sense – decision trees are just one important part of your Decision Making tool kit. Decision trees are commonly used in operations research, specifically in decision analysis, to help identify a strategy most likely to reach a goal.

Task Eight

Differentiation is " the mathematical process of obtaining the derivative of a function. The derivative is a measure of how a function changes as its input

changes. Loosely speaking, a derivative can be thought of as how much one quantity is changing in response to changes in some other quantity." (Anton, et al., 2005) differentiation is primarily a tool used for calculating rates of change. Differentiation may be used in economics to gain a competitive advantage in a particular market. This may be achieved when the product itself is differentiated, that is: " the process of distinguishing a product or offering from others, to make it more attractive to a particular target market. This involves differentiating it from competitors' products as well as a firm's own product offerings." (Chamberlin, 1993) In this type of differentiation the company is more focus on cost and quality offering of a product. In a marketing sense the main aim of differentiation is to gain a unique place in consumers’ hearts, a position. When this is achieved the product normally does well and the cost is no longer an issue as the quality will worth whatever it is being sold for. Differentiation may also be used to set prices on goods and service being provided by a company. This may be done by carefully calculating and analyzing the relationship between revenue and cost. " Revenue is the amount of money that is brought into a company by its business activities" while cost is " a monetary valuation of effort, material, resources, time and utilities consumed, risks incurred, and opportunity forgone in production and delivery of a good or service. All expenses are costs, but not all costs (such as those incurred in acquisition of an income-generating asset) are expenses." (dictionary. com, n. d.)Differentiation helps determine at what price to set goods so that a reasonable profit margin may be obtained.

Recommendation

The successful conclusion of this research lead to the researcher recommending its use as a manual or guide for upcoming students taking said course, as the breakdown of formulas and explanation of techniques are at their simplest, it may be viewed as self explanatory. The researcher also recommend that this course to taught to student with a background knowledge of statistics or knowledge os some basic statistical terms as research may help, but students need face to face direction from a tutor or lecturer. Finally the researcher also recommend that in order for students to fully grasp the content of this research much practices must be exercised so that when different situation arise the proper interpretation may be made and the correct application of formula may be applied.

Conclusion

The research introduced various statistical terms in the form of problems, which are further calculated to show sequentially how they are done. Various topic were explored, some of which are Linear Programming, Price Index, Differentiation, Time Series and Regression. These topics are topics which are not normally used in everyday mathematics however, they are used mostly by engineers and economist to help formulate and draw conclusions to very important researches and decisions to be made.

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