**Application of the Univariate Logistic Model for Studying the Effect of the Previous Knowledge about the Studied Courses in the Success of the Student - Case Study of Faculty of Sciences and Humanities (Thadiq) -Shaqraa University-KSA**

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**Abstract**: This paper aims at studying the effect of the previous knowledge about the studied courses in the success of the student in Faculty of Sciences and Humanities (Thadiq) -Shaqraa University-KSA. The Logistic Regression (LR) was used to analyze the data. The important result was, there is significant relationship between the success of the student in the studied courses and the previous knowledge about these courses. Nearly 95 % of the success of the students returned to the previous knowledge about the studied courses. In consequence of the above mentioned results, there are two discussions: The first is to conduct similar studies to other courses in the other faculties, and the second is to take the advantages of this study in the planning and improvement of success proportion.

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**1- Introduction:**

This paper deals with the probability of success in forty courses that teaches in faculty of science and humanity in Shaqraa University (KSA). Logistic function was used in this paper because; the sample size is too large and the number of courses (levels) is more than three.

Some students mentioned that the ease of the studied course due to the previous knowledge about these courses, so that they have good marks. The researchers inquired those students about the ease in the forty courses that configured in Appendix (1). The courses arranged according to the proportion of the students that have previous knowledge about the studied course, and denoted by the variable "X". The variable "X" takes values from 1 to 40 in ascending order, depending upon the proportion of the students who have previous background about the course.

In this paper we will test the hypothesis:



The importance of this paper is that, it addresses an important method that may contribute in improvement of students, success.

This paper aims at testing the effect of the previous knowledge about the studied courses in the success of the students.

There are many studies that have used the analysis of the Logistic Model (Lo.M). The first one who used the logistic function in 1838 was Verhulst, and named it growth function. The term logistic function was used by (Pearl and Read, 1920). (Berkson; 1944) made comparison between the Logistic Model (LO.M.) and Normal Distribution Model (NDM) and reached to the result that the LO.M. was better than the NDM. Also the LO.M. and NDM were used by (Cox; 1970) for data consisted of three dose levels of drug, and found that, the LO.M. has better fit than the NDM. According to (Berkson; 1951), if the data has binomial distribution, LO.M. is better than NDM in fitting of the data, and the estimates of LO.M. are better than the estimates of NDM because, Lo. M estimates are sufficient and efficient. In 1972 Ashton wrote a book explained in how to transform LO.M. to Linear Model (Li. M.). In 1983 Mc Cullagh and Nelder; were used Chi-Square (CST) and Deviance (D) tests for fitting Lo. M. and found that the two tests approached to CST. Mc Cullagh and Nelder were used the Weighted Least Square Method (WLSM), because there was heterogeneity of variance. In 1987 Richard and Little introduced some results appeared that Lo. M for binary data is the best (Richard and Little; 1987). In 1989 Lemeston and Hosmer were used equation (1) to test the suitable partial group of Lo. M.



SSE(q) = Sum of Squares due to Error of the suitable model that contains "q" variables.

SSE(p) = Sum of Squares due to Error that belongs to the Linear Regression of the model which contains "p" variables.

If C(q) is small enough that means the model of "q" variables is the best.

In 1995 Minard authored a book entitled "Applied Logistic Regression Analysis", which contains important applications in social sciences. In 1999 Sequeiria and Taylor transformed the binary Lo.M to study treatment effect by using binary variable "I" for the treatment, with "" factor and continuous variable X; such that:



Where:  are parameters, p is the probability of success, "q" is equal to one minus "p" which is the probability of failure. Finally is the linear transformation of the proportion of the response in the Lo.M. In 2000 the 2nd ed. of the book "Applied Logistic Regression"; that written by David and Stanley appeared. This book contains applications of Lo.M in the field of biostatistics, social science, education, and health. In 2002 Pingchao, Kuklida and Gray authored a research entitled "An Introduction to Logistic Regression Analysis and Reporting", which dialed with educational data. This research is available in the internet website. Also in the internet website in 2006 Sansh and Gozde spread research entitled "Logistic Regression Analysis to Determine the Factors that Affect (Green Card) Usage for Health Services".

The the Lo.M is used to represent the relationship between explanatory proportional variable with binomial distribution and dummy dependent variable. The dependent variable takes the values 1 if there is response and 0 otherwise, (Seber and Wild; 1989).

Arabi, and Husain introduced a paper entitle "Trends of Secondary Schools Students in Forming Their Choice of Future Specialization whether, the Academic in Two Branches Art and Science", they have used logistic regression, and reached to students marks, actual looking, parents, fathers job, population looking, and future job affected the choice of the future specialization.

**2- Material and Methods**

If Xi represents the explanatory (independent) variable, ni is the sample size of stratum "i", ri is the sample size of the positive response of stratum "i", and (ni - ri) is the sample size of the negative response of stratum "i", then the probability of success is given by equation (3) as follow:



and the probability of failure is given by equation (4) as follow:



Since "p" and "1-p" are functions in "X" we can write them according to the Lo. M as in equations (5) and (6).





The Lo. M is intrinsically linear model, so it can be transformed to L.M and obtain BLUE estimators (Draper and Smith; 1981) and (Rat and David; 1983). In 1944 Berkson transformed the Lo. M to L.M. according to equation (7) by dividing equation (5) by equation (6) and taking logarithm (Berkson; 1944).



From equation (7), "p" is a function of "Z" and "Z" is a function of X, therefore:





The mean and variance of "Z" are given by equations (10) and (11) as follow:





The Weighted Least Square Method (WLSM) should be used because the mean of "Z" is a function of, and its variance is a function of its mean, therefore the variance of "Z" is heteroscedasticity, i.e. .

According to (Kendall and Stuart; 1968) the weight "wi" which in equation (12) was used to have homogeneity of variance.



To estimate ß0 and ß1 the WLSM and partial derivative of ß0 and ß1 were used to equation (13)



At 1st by differentiating equation (13) with respect to ß0 and equate the result by zero, at 2nd by differentiating the same equation with respect to ß1 and equate the result by zero. Finally by solving the two previous equations that obtained by the differentiation we have:



where:

,, 

, 

From the previous equations the vector  can be written as in equation (15):



The estimated value of "Z" can be written as in equation (16):



The Sum of Squares due to Regression (SSR) can be written as in equation (17):



The Sum of Squares due to Error term (SSE) can be written as in equation (18):





The means of  and are given by and, and their variances are given by and .where C00 and C11 are the diagonal elements of the matrix. Since , therefore

 and .

The hypothesis should be tested is:

 against  

To test the above hypothesis the statistic "t" that in equation (20) was used.



where under H0 we have .

Since the sample size which used in the research was very large, calculated value "t" is approach to Z, therefore it will be compared with the tabulated value "1.96", (because 95% confidence limits was used). If the absolute value of the calculated value in equation (21) is greater than 1.96, H0 is rejected, otherwise it accepted.

The coefficient of determination which given by equation (22) was used to determine the dependency percentage of the dependent variable "Z" upon the independent variable "X" in the linear regression.



According to the LSM theorem, the residuals should be normally distributed with mean zero and variance equal to ơ2, and there is no relationship between errors and the variable "X" in one hand, and there is no relationship between the errors and the variable "Z" in the other hand. The existence of the relationship between the two variables can be tested by the Analysis of Variance (ANOVA) of the regression between them.

To obtain sample size for proportional allocation a population of size "N" is divided into "L" strata of sizes N1, N2,…, NL, and select samples of sizes n1, n2,…, nL, respectively, from the "L" strata, the allocation is proportional if  for all i=1,2,3,..,L, (Walpole: 1982).

The stratified random sample was used to select the data. The number of the strata was equal to the number of the studied courses. According to the equation (23) the proportional allocation was used for determination of the stratum sample.



Where is the stratum variance of marks of students in course "i",  is stratum size, is the population size, and D is specified error term.

The data collected from faculty of science and humanities, Shaqraa University (KSA), years 1433-1436 A.H. The total number of the students who studied the courses under research was N=4000, divided proportionally into 40 strata (courses). To determine the sample size 99% confidence limits was used, with marginal error equal to 0.01. The total size of the grand sample was equal to 1850. With respect to the strata, the number of successful was denoted by "ri", and the number of unsuccessful was denoted by "ni-ri" as in Appendices (1) and (2).

According to Appendices (1) and (2), the total number of successful was 1678, and the total number of unsuccessful was 188.

In appendix (1), p was calculated according to equation (3), q according to equation (4), Z according to equation (7), wi according to equation (12),  according to equation (16), and  according to equation (24).



Estimation of equation (14) is:







Testing of the hypotheses:





For testing  against  we have:

****

Since, H0 is rejected.

For testing  against 

****

Since, H0 is rejected.

Computation of coefficient of determination:

By using equations (17), (19) and (22):









Explaining of R2 means that nearly 95% of the success of the students returned to the previous knowledge about the studied courses.

To check whether, there is relationship between and, the correlation and coefficient of determination between the two variables are shown in table (1), and the Analysis of Variance (ANOVA) between the two variables is given in table (2), the result in the two variables is that there is no correlation between the two variables.

Table (1): Correlation and Coefficient of Determination between  and.

|  |
| --- |
| Model Summary |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .002a | .000 | -.026- | .36674754 |
| a. Predictors: (Constant),  |

Table (2): Analysis of Variance Between  and.

|  |
| --- |
| ANOVAa |
| Model | Sum ofSquares | df | MeanSquare | F | Sig. |
| 1 | Regression | .000 | 1 | .000 | .00 | .993b |
| Residual | 5.111 | 38 | .135 |  |  |
| Total | 5.111 | 39 |  |  |  |
| a. Dependent Variable:  |
| b. Predictors: (Constant),  |

To check whether, there is relationship between and, the correlation and coefficient of determination between the two variables are shown in table (3), and the Analysis of Variance (ANOVA) between the two variables is given in table (4), the result in the two variables is that there is no correlation between the two variables. From the previous, the estimated model has no problem of linear regression.

Table (3): Correlation and Coefficient Determination Between  and.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .001a | .000 | -.026- | .36674762 |
| a. Predictors: (Constant),  |

Table (4): Analysis of Variance Between  and.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Sum ofSquares | df | Mean Square | F | Sig. |
| 1 | Regression | .000 | 1 | .000 | .000 | .993b |
| Residual | 5.111 | 38 | .135 |  |  |
| Total | 5.111 | 39 |  |  |  |
| a. Dependent Variable:  |
| b. Predictors: (Constant),  |

**3- Results:**

There is strong relationship exists between the success of the student in the studied courses and the previous knowledge about these courses.

Nearly 95 % of the success of the students returned to the previous knowledge about the studied courses.

**4- Discussions**

In consequence of the above mentioned results, the following points discussed:

To conduct similar studies to other courses in the other faculties.

To take the advantages of this study in the planning and improvement of education success.

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**Appendix (1): Variables of the Study**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ourse | Code | X | ni | ri | ni-ri |
| English | NGL111 | 1 | 5 | 2 | 3 |
| English | Eng112 | 2 | 11 | 7 | 4 |
| English | Eng120 | 3 | 42 | 29 | 13 |
| English | Eng113 | 4 | 14 | 10 | 4 |
| English | Eng114 | 5 | 14 | 10 | 4 |
| English | Eng320 | 6 | 7 | 5 | 2 |
| Business | BUS372 | 7 | 14 | 10 | 4 |
| Accounting | ACC231 | 8 | 21 | 15 | 6 |
| English | Eng111 | 9 | 40 | 29 | 11 |
| Q.Methods | Q.M101 | 10 | 25 | 19 | 6 |
| Economics | ECO101 | 11 | 50 | 38 | 12 |
| English | Eng116 | 12 | 9 | 7 | 2 |
| English | Eng182 | 13 | 14 | 11 | 3 |
| English | Eng115 | 14 | 5 | 4 | 1 |
| Accounting | ACC102 | 15 | 35 | 28 | 7 |
| Q.Methods | Q.M102 | 16 | 113 | 92 | 21 |
| law | Law 211 | 17 | 34 | 29 | 5 |
| Psychology | S.B217 | 18 | 21 | 18 | 3 |
| English | NGL114 | 19 | 22 | 19 | 3 |
| English | NGM105 | 20 | 20 | 18 | 2 |
| law | Law 101 | 21 | 79 | 72 | 7 |
| Accounting | ACC101 | 22 | 115 | 105 | 10 |
| Islamic Culture | IC101 | 23 | 128 | 117 | 11 |
| Q.Methods | Q.M121 | 24 | 12 | 11 | 1 |
| Arabic Language | ARAB102 | 25 | 13 | 12 | 1 |
| Business | BUS111 | 26 | 83 | 77 | 6 |
| Q.Methods | Q.M211 | 27 | 14 | 13 | 1 |
| Business | BUS101 | 28 | 70 | 66 | 4 |
| Psychology | PSY141 | 29 | 36 | 34 | 2 |
| Business | BUS351 | 30 | 19 | 18 | 1 |
| Business | BUS371 | 31 | 19 | 18 | 1 |
| Business | BUS341 | 32 | 20 | 19 | 1 |
| Economics | ECO201 | 33 | 21 | 20 | 1 |
| English | NGL118 | 34 | 23 | 22 | 1 |
| Psychology | PSY105 | 35 | 37 | 36 | 1 |
| Islamic Culture | IC103 | 36 | 174 | 167 | 7 |
| Islamic Culture | IC102 | 37 | 261 | 252 | 9 |
| Psychology | PSY140 | 38 | 15 | 14 | 1 |
| Arabic Language | ARAB103 | 39 | 70 | 68 | 2 |
| Arabic Language | ARAB101 | 40 | 125 | 123 | 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| p | q | Z | X |
| .40000 | .60000 | -.40547 | 1 |
| .63636 | .36364 | .55962 | 2 |
| .69048 | .30952 | .80235 | 3 |
| .71429 | .28571 | .91629 | 4 |
| .71429 | .28571 | .91629 | 5 |
| .71429 | .28571 | .91629 | 6 |
| .71429 | .28571 | .91629 | 7 |
| .71429 | .28571 | .91629 | 8 |
| .72500 | .27500 | .96940 | 9 |
| .76000 | .24000 | 1.15268 | 10 |
| .76000 | .24000 | 1.15268 | 11 |
| .77778 | .22222 | 1.25276 | 12 |
| .78571 | .21429 | 1.29928 | 13 |
| .80000 | .20000 | 1.38629 | 14 |
| .80000 | .20000 | 1.38629 | 15 |
| .81416 | .18584 | 1.47727 | 16 |
| .85294 | .14706 | 1.75786 | 17 |
| .85714 | .14286 | 1.79176 | 18 |
| .86364 | .13636 | 1.84583 | 19 |
| .90000 | .10000 | 2.19722 | 20 |
| .91139 | .08861 | 2.33076 | 21 |
| .91304 | .08696 | 2.35138 | 22 |
| .91406 | .08594 | 2.36428 | 23 |
| .91667 | .08333 | 2.39790 | 24 |
| .92308 | .07692 | 2.48491 | 25 |
| .92771 | .07229 | 2.55205 | 26 |
| .92857 | .07143 | 2.56495 | 27 |
| .94286 | .05714 | 2.80336 | 28 |
| .94444 | .05556 | 2.83321 | 29 |
| .94737 | .05263 | 2.89037 | 30 |
| .94737 | .05263 | 2.89037 | 31 |
| .95000 | .05000 | 2.94444 | 32 |
| .95238 | .04762 | 2.99573 | 33 |
| .95652 | .04348 | 3.09104 | 34 |
| .95833 | .04167 | 3.13549 | 35 |
| .95977 | .04023 | 3.17208 | 36 |
| .96552 | .03448 | 3.33220 | 37 |
| .96970 | .03030 | 3.46574 | 38 |
| .97143 | .02857 | 3.52636 | 39 |
| .98400 | .01600 | 4.11904 | 40 |
| 34 | 6 | 81.07428 | Total |
| P8 | WZ2 | Z2 | WZ |
| .60185 | .19728 | .16440 | -.48656 |
| .62166 | .79716 | .31317 | 1.42448 |
| .64108 | 5.77851 | .64376 | 7.20201 |
| .66005 | 2.39882 | .83959 | 2.61797 |
| .67851 | 2.39882 | .83959 | 2.61797 |
| .69644 | 1.19941 | .83959 | 1.30899 |
| .71378 | 2.39882 | .83959 | 2.61797 |
| .73052 | 3.59824 | .83959 | 3.92696 |
| .74663 | 7.49441 | .93974 | 7.73097 |
| .76208 | 6.05874 | 1.32867 | 5.25622 |
| .77688 | 12.11747 | 1.32867 | 10.51244 |
| .79101 | 2.44131 | 1.56942 | 1.94874 |
| .80447 | 3.97918 | 1.68814 | 3.06260 |
| .81726 | 1.53745 | 1.92181 | 1.10904 |
| .82939 | 10.76215 | 1.92181 | 7.76325 |
| .84088 | 37.31180 | 2.18232 | 25.25733 |
| .85173 | 13.17822 | 3.09006 | 7.49675 |
| .86196 | 8.25532 | 3.21040 | 4.60738 |
| .87159 | 8.82742 | 3.40708 | 4.78237 |
| .88064 | 8.69003 | 4.82780 | 3.95500 |
| .88914 | 34.65749 | 5.43242 | 14.86963 |
| .89710 | 50.48186 | 5.52897 | 21.46908 |
| .90455 | 56.20383 | 5.58981 | 23.77208 |
| .91152 | 5.27074 | 5.74990 | 2.19807 |
| .91802 | 5.69978 | 6.17476 | 2.29376 |
| .92408 | 36.25274 | 6.51294 | 14.20536 |
| .92973 | 6.10904 | 6.57897 | 2.38174 |
| .93499 | 29.63901 | 7.85883 | 10.57267 |
| .93989 | 15.16230 | 8.02710 | 5.35163 |
| .94443 | 7.91455 | 8.35425 | 2.73825 |
| .94865 | 7.91455 | 8.35425 | 2.73825 |
| .95257 | 8.23623 | 8.66972 | 2.79722 |
| .95620 | 8.54706 | 8.97441 | 2.85308 |
| .95956 | 9.13913 | 9.55454 | 2.95665 |
| .96268 | 28.26506 | 9.83132 | 9.01455 |
| .96556 | 67.60122 | 10.06211 | 21.31130 |
| .96823 | 96.48634 | 11.10359 | 28.95571 |
| .97070 | 11.64735 | 12.01133 | 3.36071 |
| .97298 | 24.15985 | 12.43522 | 6.85121 |
| .97509 | 33.39001 | 16.96647 | 8.10627 |

|  |  |  |  |
| --- | --- | --- | --- |
| X2 | W | WX | W.X2 |
| 1 | 1.20000 | 1.20000 | 1.20000 |
| 4 | 2.54545 | 5.09091 | 10.18182 |
| 9 | 8.97619 | 26.92857 | 80.78571 |
| 16 | 2.85714 | 11.42857 | 45.71429 |
| 25 | 2.85714 | 14.28571 | 71.42857 |
| 36 | 1.42857 | 8.57143 | 51.42857 |
| 49 | 2.85714 | 20.00000 | 140.00000 |
| 64 | 4.28571 | 34.28571 | 274.28571 |
| 81 | 7.97500 | 71.77500 | 645.97500 |
| 100 | 4.56000 | 45.60000 | 456.00000 |
| 121 | 9.12000 | 100.32000 | 1103.52000 |
| 144 | 1.55556 | 18.66667 | 224.00000 |
| 169 | 2.35714 | 30.64286 | 398.35714 |
| 196 | .80000 | 11.20000 | 156.80000 |
| 225 | 5.60000 | 84.00000 | 1260.00000 |
| 256 | 17.09735 | 273.55752 | 4376.92035 |
| 289 | 4.26471 | 72.50000 | 1232.50000 |
| 324 | 2.57143 | 46.28571 | 833.14286 |
| 361 | 2.59091 | 49.22727 | 935.31818 |
| 400 | 1.80000 | 36.00000 | 720.00000 |
| 441 | 6.37975 | 133.97468 | 2813.46835 |
| 484 | 9.13043 | 200.86957 | 4419.13043 |
| 529 | 10.05469 | 231.25781 | 5318.92969 |
| 576 | .91667 | 22.00000 | 528.00000 |
| 625 | .92308 | 23.07692 | 576.92308 |
| 676 | 5.56627 | 144.72289 | 3762.79518 |
| 702 | .92857 | 25.07143 | 676.92857 |
| 784 | 3.77143 | 105.60000 | 2956.80000 |
| 841 | 1.88889 | 54.77778 | 1588.55556 |
| 900 | .94737 | 28.42105 | 852.63158 |
| 961 | .94737 | 29.36842 | 910.42105 |
| 1024 | .95000 | 30.40000 | 972.80000 |
| 1089 | .95238 | 31.42857 | 1037.14286 |
| 1156 | .95652 | 32.52174 | 1105.73913 |
| 1225 | 2.87500 | 100.62500 | 3521.87500 |
| 1296 | 6.71839 | 241.86207 | 8707.03448 |
| 1369 | 8.68966 | 321.51724 | 11896.13793 |
| 1444 | .96970 | 36.84848 | 1400.24242 |
| 1521 | 1.94286 | 75.77143 | 2955.08571 |
| 1600 | 1.96800 | 78.72000 | 3148.80000 |
| **22140** | **152.83806** | **2842.44827** | **69784.50704** |

|  |  |  |  |
| --- | --- | --- | --- |
| $$\sqrt{W}$$ | WXZ | e | Z8 |
| 1.09545 | -.48656 | -.81865 | .41318 |
| 1.59545 | 2.84895 | .06299 | .49662 |
| 2.99603 | 21.60604 | .22229 | .58006 |
| 1.69031 | 10.47189 | .25279 | .66350 |
| 1.69031 | 13.08987 | .16935 | .74694 |
| 1.19523 | 7.85392 | .08591 | .83038 |
| 1.69031 | 18.32581 | .00247 | .91382 |
| 2.07020 | 31.41568 | -.08097 | .99726 |
| 2.82400 | 69.57872 | -.11130 | 1.08070 |
| 2.13542 | 52.56219 | -.01146 | 1.16414 |
| 3.01993 | 115.63681 | -.09490 | 1.24758 |
| 1.24722 | 23.38491 | -.07826 | 1.33102 |
| 1.53530 | 39.81374 | -.11518 | 1.41446 |
| .89443 | 15.52650 | -.11161 | 1.49790 |
| 2.36643 | 116.44873 | -.19505 | 1.58134 |
| 4.13489 | 404.11726 | -.18751 | 1.66478 |
| 2.06512 | 127.44470 | .00964 | 1.74822 |
| 1.60357 | 82.93287 | -.03990 | 1.83166 |
| 1.60963 | 90.86501 | -.06927 | 1.91510 |
| 1.34164 | 79.10008 | .19868 | 1.99854 |
| 2.52582 | 312.26229 | .24877 | 2.08198 |
| 3.02166 | 472.31973 | .18595 | 2.16542 |
| 3.17091 | 546.75791 | .11542 | 2.24886 |
| .95743 | 52.75370 | .06559 | 2.33230 |
| .96077 | 57.34400 | .06917 | 2.41574 |
| 2.35929 | 369.33947 | .05286 | 2.49918 |
| .96362 | 64.30694 | -.01767 | 2.58262 |
| 1.94202 | 296.03486 | .13730 | 2.66606 |
| 1.37437 | 155.19713 | .08371 | 2.74950 |
| .97333 | 82.14741 | .05743 | 2.83294 |
| .97333 | 84.88565 | -.02601 | 2.91638 |
| .97468 | 89.51094 | -.05538 | 2.99982 |
| .97590 | 94.15159 | -.08753 | 3.08326 |
| .97802 | 100.52608 | -.07566 | 3.16670 |
| 1.69558 | 315.50911 | -.11465 | 3.25014 |
| 2.59199 | 767.20672 | -.16150 | 3.33358 |
| 2.94782 | 1071.36120 | -.08482 | 3.41702 |
| .98473 | 127.70712 | -.03473 | 3.50046 |
| 1.39386 | 267.19737 | -.05754 | 3.58390 |
| 1.40285 | 324.25061 | .45170 | 3.66734 |

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| X $\sqrt{W}$ | Z 8 $\sqrt{W}$ | $\sqrt{W}$ e |
| 1.09545 | .45262 | -.89678 |
| 3.19090 | .79233 | .10050 |
| 8.98809 | 1.73788 | .66597 |
| 6.76123 | 1.12152 | .42729 |
| 8.45154 | 1.26256 | .28625 |
| 7.17137 | .99250 | .10268 |
| 11.83216 | 1.54464 | .00417 |
| 16.56157 | 2.06453 | -.16762 |
| 25.41604 | 3.05190 | -.31431 |
| 21.35416 | 2.48592 | -.02448 |
| 33.21927 | 3.76761 | -.28660 |
| 14.96663 | 1.66007 | -.09760 |
| 19.95889 | 2.17162 | -.17683 |
| 12.52198 | 1.33976 | -.09982 |
| 35.49648 | 3.74214 | -.46156 |
| 66.15830 | 6.88369 | -.77535 |
| 35.10698 | 3.61028 | .01990 |
| 28.86421 | 2.93719 | -.06398 |
| 30.58297 | 3.08260 | -.11151 |
| 26.83282 | 2.68132 | .26656 |
| 53.04214 | 5.25870 | .62836 |
| 66.47654 | 6.54317 | .56189 |
| 72.93099 | 7.13094 | .36598 |
| 22.97825 | 2.23301 | .06280 |
| 24.01922 | 2.32097 | .06645 |
| 61.34163 | 5.89630 | .12472 |
| 26.01785 | 2.48868 | -.01703 |
| 54.37647 | 5.17753 | .26664 |
| 39.85669 | 3.77883 | .11505 |
| 29.19986 | 2.75738 | .05590 |
| 30.17318 | 2.83860 | -.02532 |
| 31.18974 | 2.92386 | -.05398 |
| 32.20470 | 3.00895 | -.08542 |
| 33.25266 | 3.09709 | -.07400 |
| 59.34539 | 5.51088 | -.19439 |
| 93.31149 | 8.64059 | -.41860 |
| 109.06942 | 10.07277 | -.25002 |
| 37.41981 | 3.44702 | -.03419 |
| 54.36070 | 4.99547 | -.08020 |
| 56.11417 | 5.14474 | .63366 |

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| **Appendix (2): Sum of the Variables of the Study** |
| Variable | N | Sum |
| e2 | 40 | 2.26462 |
| x | 40 | 820 |
| n | 40 | 1850 |
| r | 40 | 1664 |
| n-r | 40 | 186 |
| p | 40 | 33.85713 |
| q | 40 | 6.14287 |
| Z | 40 | 81.07428 |
| X2 | 40 | 22140 |
| W | 40 | 152.83806 |
| W.X | 40 | 2842.44827 |
| W.X2 | 40 | 69784.50704 |
| W.Z | 40 | 287.08362 |
| W.X.Z | 40 | 6745.72265 |
| W.Z2 | 40 | 661.28116 |
|  | 40 | 71.24101 |
| X  | 40 | 1375.68200 |
| Z^  | 40 | 138.03480 |
| .e | 40 | .01361 |
| Z2 | 40 | 204.46967 |
| Z  | 40 | 138.04841 |
| e | 40 | -.38469- |
| Z^ | 40 | 81.45897 |
| P^ | 40 | 33.99658 |
| q^ | 40 | 6.00342 |
| Valid N (listwise) | 40 |  |

1/23/2015