1. Find skewness of “ARPU” for each month and COS separately. Give interpretation for distribution of revenues.

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| **Statisticsa** | | | | | | |
|  | | ARPU\_Sep | ARPU\_Oct | ARPU\_Nov | ARPU\_Dec | ARPU\_Jan |
| N | Valid | 1319 | 1383 | 1476 | 1469 | 1141 |
| Missing | 206 | 142 | 49 | 56 | 384 |
| Skewness | | 3.756 | 4.084 | 4.468 | 3.127 | 4.297 |
| Std. Error of Skewness | | .067 | .066 | .064 | .064 | .072 |
| a. COS = Gencol | | | | | | |

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| **Statisticsa** | | | | | | |
|  | | ARPU\_Sep | ARPU\_Oct | ARPU\_Nov | ARPU\_Dec | ARPU\_Jan |
| N | Valid | 11092 | 11566 | 12391 | 12678 | 9562 |
| Missing | 1941 | 1467 | 642 | 355 | 3471 |
| Skewness | | 2.987 | 3.217 | 3.065 | 3.613 | 3.671 |
| Std. Error of Skewness | | .023 | .023 | .022 | .022 | .025 |
| a. COS = Sade | | | | | | |

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| **Statisticsa** | | | | | | |
|  | | ARPU\_Sep | ARPU\_Oct | ARPU\_Nov | ARPU\_Dec | ARPU\_Jan |
| N | Valid | 535 | 556 | 588 | 598 | 460 |
| Missing | 70 | 49 | 17 | 7 | 145 |
| Skewness | | 2.402 | 2.104 | 2.351 | 2.295 | 2.044 |
| Std. Error of Skewness | | .106 | .104 | .101 | .100 | .114 |
| a. COS = Serbest | | | | | | |

For each COS and for each month, positively skewed distribution or skewed to the right. Because skewness > 0.

1. Evaluate normality of similar variables.

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| **Tests of Normalitya** | | | | | | |
|  | Kolmogorov-Smirnovb | | | Shapiro-Wilk | | |
| Statistic | df | Sig. | Statistic | df | Sig. |
| ARPU\_Sep | .158 | 427 | .000 | .788 | 427 | .000 |
| ARPU\_Oct | .154 | 427 | .000 | .809 | 427 | .000 |
| ARPU\_Nov | .155 | 427 | .000 | .796 | 427 | .000 |
| ARPU\_Dec | .160 | 427 | .000 | .813 | 427 | .000 |
| ARPU\_Jan | .152 | 427 | .000 | .816 | 427 | .000 |
| a. COS = Serbest | | | | | | |
| b. Lilliefors Significance Correction   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Tests of Normalitya** | | | | | | | |  | Kolmogorov-Smirnovb | | | Shapiro-Wilk | | | | Statistic | df | Sig. | Statistic | df | Sig. | | ARPU\_Sep | .176 | 1030 | .000 | .681 | 1030 | .000 | | ARPU\_Oct | .171 | 1030 | .000 | .675 | 1030 | .000 | | ARPU\_Nov | .175 | 1030 | .000 | .645 | 1030 | .000 | | ARPU\_Dec | .169 | 1030 | .000 | .720 | 1030 | .000 | | ARPU\_Jan | .181 | 1030 | .000 | .673 | 1030 | .000 | | a. COS = Gencol | | | | | | | | b. Lilliefors Significance Correction | | | | | | |  |  |  |  |  | | --- | --- | --- | --- | | **Tests of Normalitya** | | | | |  | Kolmogorov-Smirnovb | | | | Statistic | df | Sig. | | ARPU\_Sep | .169 | 8378 | .000 | | ARPU\_Oct | .165 | 8378 | .000 | | ARPU\_Nov | .162 | 8378 | .000 | | ARPU\_Dec | .167 | 8378 | .000 | | ARPU\_Jan | .179 | 8378 | .000 | | a. COS = Sade | | | | | b. Lilliefors Significance Correction | | | |   Variables are not normally distributed. Because Significance (0.011 and 0.335) is less than 0.05. | | | | | | |

1. Apply empirical rule to ARPU for each COS.

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| --- | --- | --- |
| **Statisticsa** | | |
| ARPU\_Average | | |
| N | Valid | 1525 |
| Missing | 0 |
| Mean | | 10.7666 |
| Std. Deviation | | 9.53826 |
| Skewness | | 4.094 |
| Std. Error of Skewness | | .063 |
| a. COS = Gencol | | |

Mean +/- 1 Std. Deviation = 10.77 +/- 9.54 = 1.23/20.31

It means 68% (1525\*68%=1037) of values are between 1.23 and 20.31

Mean +/- 2 Std. Deviation = 10.77 +/- 2\*9.54 = -8.31/29.85

It means 95.4% (1525\*95.94%=1463) of values are between -8.31 and 29.85

Mean +/- 3 Std. Deviation = 10.77 +/- 3\*9.54 = -17.85/39.39

It means 99.7% (1525\*99.7%=1520.42) of values are between -17.85 and 39.39

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| --- | --- | --- |
| **Statisticsa** | | |
| ARPU\_Average | | |
| N | Valid | 13030 |
| Missing | 3 |
| Mean | | 14.2525 |
| Std. Deviation | | 12.30846 |
| Skewness | | 3.004 |
| Std. Error of Skewness | | .021 |
| a. COS = Sade. | | |

Mean +/- 1 Std. Deviation = 14.25 +/- 12.31 = 1.94/26.56

It means 68% (13030\*68%=8860.4) of values are between 1.94 and 26.56

Mean +/- 2 Std. Deviation = 14.25 +/- 2\*12.31 = -10.4/38.87

It means 95.4% (13030\*95.94%=1249.58) of values are between -10.4 and 38.87

Mean +/- 3 Std. Deviation = 14.25 +/- 3\*12.31 = -32.68/51.18

It means 99.7% (13030\*99.7%=12990.91) of values are between -32.68 and 51.18

|  |  |  |
| --- | --- | --- |
| **Statisticsa** | | |
| ARPU\_Average | | |
| N | Valid | 605 |
| Missing | 0 |
| Mean | | 28.5438 |
| Std. Deviation | | 23.92420 |
| Skewness | | 1.995 |
| Std. Error of Skewness | | .099 |
| a. COS = Serbest | | |

Mean +/- 1 Std. Deviation = 25.54 +/- 23.92 = 4.62/54.46

It means 68% (605\*68%=411.4) of values are between 4.62 and 54.46

Mean +/- 2 Std. Deviation = 25.54 +/- 2\*23.92 = -22.3/73.38

It means 95.4% (605\*95.94%=580.44) of values are between -22.3 and 73.38

Mean +/- 3 Std. Deviation = 25.54 +/- 3\*23.92 = -46.22/97.3

It means 99.7% (605\*99.7%=603.19) of values are between -46.22 and 97.3

4. Compute following probabilities

a. What is the probability of a Sade COS subscriber has ARPU more than 10 AZN ?

Mean = 14.25

Std. Deviation = 12.31

Z = (10-14.25)/12.31 = -0.18

In table -0.01 shows 0.4286. It means probability of a Sade COS subscriber has ARPU more than 10 is 1-0.4286=0.5714 (57.14%)

b. What is the probability of a Serbest COS subscriber has ARPU between 20 and 40 AZN?

Mean = 28.54

Std. Deviation = 23.92

Z(1) = (40-28.54)/23.92 = 0.48

Z(2) = (20-28.54)/23.92 = -0.36

In table 0.48 shows 0.6844 and -0.36 shows 0.3632. It means the probability of a Serbest COS subscriber has ARPU between 20 and 40 AZN is 0.6844 – 0.3632 = 0.3212 (32.12%)

c. What is the probability of a Gencol COS subscriber has ARPU less than 3 AZN cm?

Mean = 10.77

Std. Deviation = 9.54

Z = (3-10.77)/9.54 = -0.81

In table -0.81 shows 0.2119. It means the probability of a Gencol COS subscriber has ARPU less than 3 AZN is 21.19%

1. You have given a sample data. For each COS find confidence interval of population “ARPU”.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Descriptivesa** | | | | |
|  | | | Statistic | Std. Error |
| ARPU\_Average | Mean | | 10.7666 | .24425 |
| **95% Confidence Interval for Mean** | **Lower Bound** | **10.2875** |  |
| **Upper Bound** | **11.2457** |  |
| 5% Trimmed Mean | | 9.6001 |  |
| Median | | 8.2864 |  |
| Variance | | 90.978 |  |
| Std. Deviation | | 9.53826 |  |
| Minimum | | .01 |  |
| Maximum | | 135.88 |  |
| Range | | 135.87 |  |
| Interquartile Range | | 7.35 |  |
| Skewness | | 4.094 | .063 |
| Kurtosis | | 31.422 | .125 |
| a. COS = Gencol | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Descriptivesa** | | | | |
|  | | | Statistic | Std. Error |
| ARPU\_Average | Mean | | 14.2525 | .10783 |
| **95% Confidence Interval for Mean** | **Lower Bound** | **14.0411** |  |
| **Upper Bound** | **14.4639** |  |
| 5% Trimmed Mean | | 12.7667 |  |
| Median | | 10.7731 |  |
| Variance | | 151.498 |  |
| Std. Deviation | | 12.30846 |  |
| Minimum | | .00 |  |
| Maximum | | 172.48 |  |
| Range | | 172.48 |  |
| Interquartile Range | | 10.90 |  |
| Skewness | | 3.004 | .021 |
| Kurtosis | | 15.736 | .043 |
| a. COS = Sade | | | | |

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| --- | --- | --- | --- | --- |
| **Descriptivesa** | | | | |
|  | | | Statistic | Std. Error |
| ARPU\_Average | Mean | | 28.5438 | .97266 |
| **95% Confidence Interval for Mean** | **Lower Bound** | **26.6336** |  |
| **Upper Bound** | **30.4540** |  |
| 5% Trimmed Mean | | 25.8614 |  |
| Median | | 21.6233 |  |
| Variance | | 572.367 |  |
| Std. Deviation | | 23.92420 |  |
| Minimum | | .50 |  |
| Maximum | | 168.79 |  |
| Range | | 168.29 |  |
| Interquartile Range | | 24.30 |  |
| Skewness | | 1.995 | .099 |
| Kurtosis | | 5.329 | .198 |
| a. COS = Serbest | | | | |

You have been given Default of Credit Card Clients Data Set: Answer following question

6. Use appropriate diagnostic analysis tests (e.g. Pearson, Chi-Square or Spearman) on SPSS

Statistics and find relationships between variables.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Correlations** | | | | |
|  | | | credit\_amount | age |
| Spearman's rho | credit\_amount | Correlation Coefficient | 1.000 | .026 |
| Sig. (2-tailed) | . | .406 |
| N | 1000 | 1000 |
| age | Correlation Coefficient | .026 | 1.000 |
| Sig. (2-tailed) | .406 | . |
| N | 1000 | 1000 |

Sig. is greater than 0.05. There is no significant between age and credit amount.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Case Processing Summary** | | | | | | |
|  | Cases | | | | | |
| Valid | | Missing | | Total | |
| N | Percent | N | Percent | N | Percent |
| purpose \* property\_magnitude | 1000 | 100.0% | 0 | 0.0% | 1000 | 100.0% |

|  |  |  |  |
| --- | --- | --- | --- |
| **Symmetric Measures** | | | |
|  | | Value | Approximate Significance |
| Nominal by Nominal | Phi | .356 | .000 |
| Cramer's V | .206 | .000 |
| N of Valid Cases | | 1000 |  |

Sig. is less than 0.05. These is significant relationship between purpose and property magnitude. Value is greater than 0.25. The strength of association between 2 variables is very strong.