## Application of Principal Component Analysis to Investigate the Proliferation of Armed Movements and Insurgencies in Recent Time in Sudan.

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**Abstract:** This article describes thepplication of principal component analysis to investigate the proliferation of armed movements and insurgencies in recent time in Sudan.

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**Keyword**: Principal component, Proliferation, armed

1. **Introduction:**

The difficulty of the study of analyzing multi variables can be attributed in the first place to the need to understand and explain the tangled relationships between the variables that affect the phenomena understudy. A second obstacle is the plethora of data that has to be analyzed. As well as the need to include many advanced mathematical model in order to derive statistical methods that can aid statistical inference regarding multi variables reduction. Factor analysis, based mainly on the possibility to aggregating variables regarding their correlation coefficient is viewed as one of method analyze of multi variables.(5)

The motivation of this paper comes from the proliferation of armed movement in recent time in Sudan. The researcher has employed a multi variable method –factor analysis using principal component method to reduce large number of variables into considerably viewer one, however the difficulties of this approach lies in problem of naming listed variables from among larger.

It is believed that the rise of armed insurgency against ruling regimes is a factor that hampering development in all fields, equally to these rebellions bloodshed among citizen of and, indeed wars of every kind weaken internal solidarity.(7)

This study is intended to identify the major factors related to the rise of armed movements, be they economic political, foreign,…ect. Moreover , we aim to furnish our library with reference on this little studied subjects.

The importance springs from the fact that it attempts to reach solutions for a problem that has preoccupied intellectuals, leaders, government and parties in Sudan on addition solution proposed are grounded.

The researcher adopted the statistical data including factor analysis, considered one most important approaches which fact that testifies to accuracy of the results. The study follows the deductive approach in order to pinpoint the theoretical frame is used to collect, classify and present the study data through the appropriate statistical methods.

1. **Hypothesis of study:**

In the first place "in this research following hypothesis postulated: mainly factors can played for the rise of armed movement in Sudan,". A second hypothesis to be testified is that:"there are many potential factors that can draw recruit to these armed forces".

1. **Data and Methodology:**

Source of Data: A questionnaire was employed to obtain the primary data of the study, in the form of triple Likert scale with options ranging from( agree (three points), neutral (2points) and disagree (one point).

A sample method was used to determine a size on the following equation:

Such that: n=sample size, z= confidence interval, p=proportion of those previously joined to armed movements and, d2 = estimation error.(6)

**3-1 PCA:**

Principal component analysis is a variable reduction procedure. It is useful when you have obtained data on a number of variables (possibly a large number of variables), and believe that there is some redundancy in those variables. In this case, redundancy means that some of the variables are correlated with one another, possibly because they are measuring the same construct. Because of this redundancy, you believe that it should be possible to reduce the observed variables into a smaller number of principal components (artificial variables) that will account for most of the variance in the observed variables.

The main components method leads to disclosure of relationships and new interpretations have never thought of existence.(5)

Principal component analysis (PCA) involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components.(1) The best results can be obtained from the analysis is when the original variables high correlation positively or negatively The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.

The other main advantage of PCA is that once you have found these patterns in the

data, and you compress the data, ie. by reducing the number of dimensions, without

much loss of information. This technique used in image compression, as we will see

in a later section.(3)

**Apply PCA to Reduce the Dimension of the Armed Forces:**

Step 1: Organize the dataset in a matrix X.

Step 2: Normalize the data set using Z-score.

Step 3: Calculate the singular value decomposition of the data matrix. X =UDV T

Step 4: Calculate the variance using the diagonal elements of D.

Step 5: Sort variances in decreasing order.

Step 6: Choose the p principal components from V with largest variances.

Step 7: Form the transformation matrix W consisting of those p PCs.

Step 8: Find the reduced projected dataset Y in a new coordinate axis by applying W to X. (2)

**3-2 Kaiser-Meyer-Olkin (KMO)** **measure of sampling adequacy** Kaiser-Meyer-Olkin’s sampling adequacy criteria (usually abbreviated as KMO) with MSA (individual measures of sampling adequacy for each item): Tests whether there are a significant number of factors in the dataset:

Technically, tests the ratio of item-correlations to partial item correlations. If the partials are similar to the raw correlations, it means the item doesn’t share much variance with other items. The range of KMO is from 0.0 to 1.0 and desired values are *>* 0*:*5\*5. Variables with MSA being below 0.5 indicate that item does not belong to a group and may be removed form the factor analysis.(4)

If two variables share a common factor with other variables, their partial correlation (aij) will be small, indicating the unique variance they share.





If, The variables are measuring a common factor, and KMO ≅ 1.0, while

KMO ≅ 0.0 if , therefore The variables are not measuring a common factor.

**4-Results:**

The study showing that correlation matrix-which is two large-to present in this study, it apparent there is a proportional correlation and inverse one between the various variables, equally only a weak or moderate correlation exist probably due to the employment of triple Likert Scale used in the questionnaire.

**Table(1): Kaiser-Meyer-Olkin )KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity:**

|  |
| --- |
| KMO and Bartlett's Test |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .872 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 14638.191 |
| Degree of freedom | 2145 |
| Sig. | .000 |

From table(1) display KMO measure adequacy and Bartlett's test Sphericity. It can shown that value equals to 0.872 which is more than 0.05 and this is an evidence of increase reliability of factors obtained from Factor Analysis and so, we can be sure of a adequacy of the sample. Moreover the probability value reach through Bartlett's test is 0.00 which is less than 0.05 and this can be interpreted as meaning that correlation is not equal to the identity matrix, and that some measure of correlation exist and consequently the factor analysis for the data is visible.

In table (2) : illustrating initial and extract values for the communalities the common factors can explain high proportion of variance of variable since all of these exceed 0.5 with exception of the value x48 which is equals 0.493 which approximates 0.5, indicating that 49.3% of variance within the variable value of x48 is explicable through the common factor.

Tables - (3-1), (3-2) and (3-3) display the total explained variance which comprises three parts:

**Table(2): Table():Extraction Method: Principal Component Analysis (Communalities):**

|  |  |  |
| --- | --- | --- |
| **Communalities** |  | **Communalities** |
| **Var** | **Initial** | **Extraction** |  | **Var** | **Initial** | **Extraction** |
| **X1** | 1 | .785 |  | **X34** | 1 | .756 |
| **X2** | 1 | .738 |  | **X35** | 1 | .688 |
| **X3** | 1 | .724 |  | **X36** | 1 | .682 |
| **X4** | 1 | .715 |  | **X37** | 1 | .624 |
| **X5** | 1 | .712 |  | **X38** | 1 | .666 |
| **X6** | 1 | .734 |  | **X39** | 1 | .729 |
| **X7** | 1 | .614 |  | **X40** | 1 | .632 |
| **X8** | 1 | .722 |  | **X41** | 1 | .662 |
| **X9** | 1 | .603 |  | **X42** | 1 | .729 |
| **X10** | 1 | .568 |  | **X43** | 1 | .702 |
| **X11** | 1 | .698 |  | **X44** | 1 | .710 |
| **X12** | 1 | .496 |  | **X45** | 1 | .751 |
| **X13** | 1 | .641 |  | **X46** | 1 | .594 |
| **X14** | 1 | .536 |  | **X47** | 1 | .667 |
| **X15** | 1 | .743 |  | **X48** | 1 | .678 |
| **X16** | 1 | .740 |  | **X49** | 1 | .652 |
| **X17** | 1 | .635 |  | **X50** | 1 | .656 |
| **X18** | 1 | .550 |  | **X51** | 1 | .614 |
| **X19** | 1 | .636 |  | **X52** | 1 | .683 |
| **X20** | 1 | .702 |  | **X53** | 1 | .678 |
| **X21** | 1 | .621 |  | **X54** | 1 | .637 |
| **X22** | 1 | .582 |  | **X55** | 1 | .672 |
| **X23** | 1 | .727 |  | **X56** | 1 | .676 |
| **X24** | 1 | .687 |  | **X57** | 1 | .706 |
| **X25** | 1 | .689 |  | **X58** | 1 | .660 |
| **X26** | 1 | .672 |  | **X59** | 1 | .659 |
| **X27** | 1 | .563 |  | **X60** | 1 | .529 |
| **X28** | 1 | .702 |  | **X61** | 1 | .573 |
| **X29** | 1 | .565 |  | **X62** | 1 | .696 |
| **X30** | 1 | .731 |  | **X63** | 1 | .760 |
| **X31** | 1 | .704 |  | **X64** | 1 | .683 |
| **X32** | 1 | .814 |  | **X65** | 1 | .613 |
| **X33** | 1 | .781 |  | **X66** | 1 | .548 |
| Extraction Method: Principal Component Analysis. |  | Extraction Method: Principal Component Analysis. |

The first part deal with initial values which related to imaginary roots of the correlation matrix and which, specifies the factors remaining for the analysis as the factors having values less than 1 shall be excluded. Moreover the initial solution shall be undertaken in the assumption that a number of factors equals to the number of variables entered. Thus we have the following:

1. "The total column" include the Eigen roots of each factor, taken into consideration the fact that the total value of this column is equal to the number of the variables, i.e 13.325+7.666+4.027+2.728+2.728+…+0.088=66
2. "The displaying ratio of the variance explained through each factor will be calculated as follows": the variance ratio of each factor equal to: 

**Table(3-1)**

|  |
| --- |
| **Total Variance Explained** |
| **Component** | **Initial Eigenvalues** |
| **Total** | **% of Variance** | **Cumulative %** |
| **1** | 13.325 | 20.190 | 20.190 |
| **2** | 7.666 | 11.616 | 31.806 |
| **3** | 4.027 | 6.102 | 37.907 |
| **4** | 2.728 | 4.133 | 42.041 |
| **5** | 2.428 | 3.679 | 45.719 |
| **6** | 2.125 | 3.219 | 48.938 |
| **7** | 1.672 | 2.533 | 51.471 |
| **8** | 1.644 | 2.490 | 53.962 |
| **9** | 1.458 | 2.209 | 56.171 |
| **10** | 1.305 | 1.977 | 58.148 |
| **11** | 1.270 | 1.924 | 60.072 |
| **12** | 1.191 | 1.804 | 61.876 |
| **13** | 1.154 | 1.749 | 63.625 |
| **14** | 1.078 | 1.633 | 65.258 |
| **15** | 1.022 | 1.549 | 66.807 |
| **16** | .959 | 1.453 | 68.260 |
| **17** | .932 | 1.413 | 69.673 |
| **18** | .909 | 1.377 | 71.049 |
| **19** | .885 | 1.341 | 72.390 |
| **20** | .823 | 1.247 | 73.637 |
| **21** | .777 | 1.177 | 74.815 |
| **22** | .762 | 1.154 | 75.969 |
| **23** | .727 | 1.101 | 77.070 |
| **24** | .690 | 1.046 | 78.115 |
| **25** | .681 | 1.032 | 79.147 |
| **26** | .655 | .993 | 80.140 |
| **27** | .640 | .969 | 81.109 |
| **28** | .623 | .943 | 82.052 |
| **29** | .589 | .893 | 82.945 |
| **30** | .569 | .862 | 83.807 |
| **31** | .523 | .792 | 84.599 |
| **32** | .514 | .780 | 85.378 |
| **33** | .494 | .749 | 86.127 |
| **34** | .486 | .737 | 86.864 |
| **35** | .458 | .694 | 87.558 |
| **36** | .448 | .679 | 88.237 |
| **37** | .424 | .643 | 88.880 |
| **38** | .410 | .621 | 89.501 |
| **39** | .409 | .619 | 90.120 |
| **40** | .391 | .592 | 90.713 |
| **41** | .370 | .561 | 91.273 |
| **42** | .354 | .537 | 91.810 |
| **43** | .346 | .525 | 92.335 |
| **44** | .336 | .509 | 92.844 |
| **45** | .322 | .488 | 93.331 |
| **46** | .309 | .469 | 93.800 |
| **47** | .300 | .455 | 94.255 |
| **48** | .287 | .435 | 94.691 |
| **49** | .280 | .424 | 95.115 |
| **50** | .273 | .413 | 95.528 |
| **51** | .261 | .396 | 95.924 |
| **52** | .246 | .373 | 96.297 |
| **53** | .230 | .348 | 96.645 |
| **54** | .229 | .347 | 96.992 |
| **55** | .217 | .330 | 97.322 |
| **56** | .207 | .314 | 97.636 |
| **57** | .205 | .311 | 97.947 |
| **58** | .195 | .296 | 98.243 |
| **59** | .185 | .281 | 98.524 |
| **60** | .169 | .257 | 98.781 |
| **61** | .162 | .245 | 99.026 |
| **62** | .153 | .231 | 99.257 |
| **63** | .147 | .223 | 99.480 |
| **64** | .139 | .210 | 99.690 |
| **65** | .116 | .176 | 99.866 |

**Table(3-2)**

|  |
| --- |
| **Total Variance Explained** |
| Component | Extraction Sums of Squared Loadings |
| Total | % of Variance | Cumulative % |
| 1 | 13.325 | 20.190 | 20.190 |
| 2 | 7.666 | 11.616 | 31.806 |
| 3 | 4.027 | 6.102 | 37.907 |
| 4 | 2.728 | 4.133 | 42.041 |
| 5 | 2.428 | 3.679 | 45.719 |
| 6 | 2.125 | 3.219 | 48.938 |
| 7 | 1.672 | 2.533 | 51.471 |
| 8 | 1.644 | 2.490 | 53.962 |
| 9 | 1.458 | 2.209 | 56.171 |
| 10 | 1.305 | 1.977 | 58.148 |
| 11 | 1.270 | 1.924 | 60.072 |
| 12 | 1.191 | 1.804 | 61.876 |
| 13 | 1.154 | 1.749 | 63.625 |
| 14 | 1.078 | 1.633 | 65.258 |
| 15 | 1.022 | 1.549 | 66.807 |

**Table(3-3)**

|  |
| --- |
| **Total Variance Explained** |
| Component | Rotation Sums of Squared Loadings |
| Total | % of Variance | Cumulative % |
| 1 | 11.154 | 16.900 | 16.900 |
| 2 | 7.265 | 11.007 | 27.907 |
| 3 | 3.372 | 5.109 | 33.016 |
| 4 | 2.568 | 3.891 | 36.907 |
| 5 | 2.238 | 3.390 | 40.298 |
| 6 | 2.225 | 3.372 | 43.670 |
| 7 | 2.219 | 3.362 | 47.032 |
| 8 | 1.924 | 2.916 | 49.947 |
| 9 | 1.770 | 2.681 | 52.629 |
| 10 | 1.657 | 2.511 | 55.140 |
| 11 | 1.634 | 2.476 | 57.615 |
| 12 | 1.588 | 2.406 | 60.022 |
| 13 | 1.584 | 2.399 | 62.421 |
| 14 | 1.447 | 2.193 | 64.614 |
| 15 | 1.447 | 2.193 | 66.807 |

**Table(4): Unrotated Component Matrix a**

|  |  |
| --- | --- |
|  | **Component Matrix(a)** |
| **Component** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **X47** | .713 |  |  |  |  |  |  |  |
| **X64** | .712 |  |  |  |  |  |  |  |
| **X34** | .710 |  |  |  |  |  |  |  |
| **X45** | .708 |  |  |  |  |  |  |  |
| **X56** | .698 |  |  |  |  |  |  |  |
| **X58** | .679 |  |  |  |  |  |  |  |
| **X31** | .650 |  |  |  |  |  |  |  |
| **X55** | .640 |  |  |  |  |  |  |  |
| **X62** | .639 |  |  |  |  |  |  |  |
| **X57** | .627 |  |  |  |  |  |  | -.405 |
| **X36** | .624 |  |  |  |  |  |  |  |
| **X38** | .617 |  |  |  |  |  |  |  |
| **X63** | .617 |  |  |  |  |  |  |  |
| **X6** | .609 |  |  |  |  |  |  |  |
| **X61** | .574 |  |  |  |  |  |  |  |
| **X19** | .572 |  |  |  |  |  |  |  |
| **X44** | .557 | -.398 |  |  |  |  |  |  |
| **X23** | .534 |  |  | .461 |  | -.397 |  |  |
| **X65** | .533 |  |  |  |  |  |  |  |
| **X37** | .526 |  |  |  |  |  |  |  |
| **X4** | .523 |  |  |  |  |  |  |  |
| **X43** | .517 |  |  |  |  |  |  |  |
| **X30** | .510 | -.446 |  |  |  |  |  |  |
| **X32** | .507 | -.492 |  | -.457 |  |  |  |  |
| **X40** | .500 |  |  |  |  |  |  |  |
| **X27** | .500 |  |  |  |  |  |  |  |
| **X51** | .497 | -.366 |  |  |  |  |  |  |
| **X33** | .497 | -.402 |  | -.461 |  |  |  |  |
| **X25** | .482 |  |  | .482 |  | -.374 |  |  |
| **X5** | .482 |  |  |  |  |  |  |  |
| **X49** | .403 | .362 |  |  |  |  |  |  |
| **X13** |  | -.582 |  |  |  |  |  |  |
| **X42** | .362 | -.554 |  |  |  |  |  |  |
| **X20** |  | -.541 |  |  |  |  |  |  |
| **X21** |  | -.541 |  |  |  |  |  |  |
| **X28** |  | -.539 |  |  |  |  |  |  |
| **X41** | .353 | -.535 |  |  |  |  |  |  |
| **X35** | .399 | -.515 |  |  |  |  |  |  |
| **X22** |  | -.504 |  |  |  |  |  |  |
| **X46** | .451 | -.461 |  |  |  |  |  |  |
| **X17** |  | .455 | .423 |  |  |  |  |  |
| **X39** | .439 | -.453 |  |  |  |  |  |  |
| **X12** |  | .441 |  |  |  |  |  |  |
| **X24** | .380 | -.416 |  |  |  |  |  |  |
| **X9** |  | .412 |  |  |  |  |  |  |
| **X66** |  | -.409 |  |  |  |  |  |  |
| **X11** |  | .406 | .395 |  |  |  |  |  |
| **X7** | .352 | -.391 |  |  |  |  |  |  |
| **X3** |  | .384 | .350 |  |  |  |  |  |
| **X60** |  | .383 |  |  |  |  |  |  |
| **X29** |  | .379 |  |  |  |  |  |  |
| **X10** |  | .364 |  |  |  |  |  |  |
| **X48** |  |  | .532 |  |  |  |  |  |
| **X1** |  |  | .476 |  |  | .406 |  |  |
| **X50** |  | .387 | .460 |  |  |  |  |  |
| **X18** |  |  | .433 |  |  | .351 |  |  |
| **X2** |  | .399 | .410 |  |  |  |  |  |
| **X15** |  |  |  | .459 |  |  |  |  |
| **X54** | .359 |  |  | -.454 |  |  |  |  |
| **X59** | .351 |  |  |  | -.371 |  |  |  |
| **X26** | .400 |  |  |  |  | -.438 |  |  |
| **X8** |  |  | .424 |  |  | .426 |  |  |
| **X14** |  |  |  |  |  |  |  |  |
| **X52** |  |  |  |  |  |  |  |  |
| **X16** |  | -.371 |  |  |  |  |  |  |
| a 15 components extracted. |

For instance: the variance ratio explained through the first factor is $\frac{13.325}{66 }×100\%=20.19$

1. "the cumulative Ratio column": represent the ascending correlate variance ratio for the cumulative column.

Part two: is the Extraction Sums of Squared Loadings before rotating of factors, this section includes the same data as in part one, except for the factor that have been extracted, the second section contains the same data as of the first one. Hence, this relates to the factor making up the Eigen roots with values larger than 1.(Tables 4,5).

There are only 15 factors of that kind while the residual factors have been excluded, these factors constitutes 61% of the total variance.

|  |  |
| --- | --- |
|  | **Component Matrix(a)** |
| **Component** |
|  | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **X47** |  |  |  |  |  |  |  |
| **X64** |  |  |  |  |  |  |  |
| **X34** |  |  |  |  |  |  |  |
| **X45** |  |  |  |  |  |  |  |
| **X56** |  |  |  |  |  |  |  |
| **X58** |  |  |  |  |  |  |  |
| **X31** |  |  |  |  |  |  |  |
| **X55** |  |  |  |  |  |  |  |
| **X62** |  |  |  |  |  |  |  |
| **X57** |  |  |  |  |  |  |  |
| **X36** |  |  |  |  |  |  |  |
| **X38** |  |  |  |  |  |  |  |
| **X63** |  |  |  |  |  |  |  |
| **X6** |  |  |  |  |  |  |  |
| **X61** |  |  |  |  |  |  |  |
| **X19** |  |  |  |  |  |  |  |
| **X44** |  |  |  |  |  |  |  |
| **X23** |  |  |  |  |  |  |  |
| **X65** |  |  |  |  |  |  |  |
| **X37** |  |  |  |  |  |  |  |
| **X4** |  |  |  |  |  |  |  |
| **X43** |  |  |  |  |  |  |  |
| **X30** |  |  |  |  |  |  |  |
| **X32** |  |  |  |  |  |  |  |
| **X40** |  |  |  |  |  |  |  |
| **X27** |  |  |  |  |  |  |  |
| **X51** |  |  |  |  |  |  |  |
| **X33** |  |  |  |  |  |  |  |
| **X25** |  |  |  |  |  |  |  |
| **X5** |  |  |  |  |  |  |  |
| **X49** |  |  |  |  |  |  |  |
| **X13** |  |  |  |  |  |  |  |
| **X42** |  |  |  |  |  |  |  |
| **X20** |  |  |  |  |  |  |  |
| **X21** |  |  |  |  |  |  |  |
| **X28** |  |  |  |  |  |  |  |
| **X41** |  |  |  |  |  |  |  |
| **X35** |  |  |  |  |  |  |  |
| **X22** |  |  |  |  |  |  |  |
| **X46** |  |  |  |  |  |  |  |
| **X17** |  |  |  |  |  |  |  |
| **X39** |  |  |  |  |  |  |  |
| **X12** |  |  |  |  |  |  |  |
| **X24** |  |  |  |  |  |  |  |
| **X9** |  | .394 |  |  |  |  |  |
| **X66** |  |  |  |  |  |  |  |
| **X11** |  |  |  |  |  |  |  |
| **X7** |  |  |  |  |  |  |  |
| **X3** | .369 |  |  |  |  |  |  |
| **X60** |  |  |  |  |  |  |  |
| **X29** |  |  |  |  |  |  |  |
| **X10** |  |  |  |  |  |  |  |
| **X48** |  |  |  |  |  |  |  |
| **X1** | .377 |  |  |  |  |  |  |
| **X50** |  |  |  |  |  |  |  |
| **X18** |  |  |  |  |  |  |  |
| **X2** |  |  |  |  |  |  |  |
| **X15** |  |  |  |  | -.358 |  |  |
| **X54** |  |  |  |  |  |  |  |
| **X59** |  |  |  |  |  |  |  |
| **X26** |  |  |  |  |  |  |  |
| **X8** |  |  |  |  |  |  |  |
| **X14** |  | .404 |  |  |  |  |  |
| **X52** |  |  | .432 |  |  |  |  |
| **X16** |  |  |  | .430 |  |  |  |
| **X53** |  |  |  | .427 |  |  |  |

Part three: contains the Rotation Sums of Squared Loadings table include the same set of data extracted factors as in part 2 only after rotation. Here the variance ratios explained by the extracted factors after rotation have been redistributed in an equal manner, using the varimax technique for rotation.

Table (4) shows Un rotated Component Matrix.

**Table(5): rotated Component Matrix a**

|  |  |
| --- | --- |
|  | **Component Matrix(a)** |
| **Component** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **X64** | .797 |  |  |  |  |  |  |  |
| **X56** | .770 |  |  |  |  |  |  |  |
| **X47** | .769 |  |  |  |  |  |  |  |
| **X34** | .759 |  |  |  |  |  |  |  |
| **X38** | .729 |  |  |  |  |  |  |  |
| **X45** | .723 |  |  |  |  |  |  |  |
| **X19** | .706 |  |  |  |  |  |  |  |
| **X62** | .688 |  |  |  |  |  |  |  |
| **X58** | .671 |  |  |  |  |  |  |  |
| **X63** | .664 |  |  |  |  | .360 |  |  |
| **X57** | .660 |  |  |  |  |  |  |  |
| **X37** | .659 |  |  |  |  |  |  |  |
| **X55** | .648 |  |  |  |  |  |  |  |
| **X36** | .644 |  |  | .359 |  |  |  |  |
| **X31** | .635 |  |  | .440 |  |  |  |  |
| **X6** | .631 |  |  |  |  |  |  |  |
| **X27** | .567 |  |  |  |  |  |  |  |
| **X61** | .556 |  |  |  |  | .428 |  |  |
| **X40** | .479 |  | .377 |  |  |  |  |  |
| **X20** |  | .779 |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X28** |  | .729 |  |  |  |  |  |  |
| **X21** |  | .702 |  |  |  |  |  |  |
| **X13** |  | .668 |  |  |  |  |  |  |
| **X35** |  | .660 |  |  |  |  |  |  |
| **X22** |  | .626 |  |  |  |  |  |  |
| **X24** |  | .586 |  |  |  |  |  | .440 |
| **X66** |  | .545 |  |  |  |  |  |  |
| **X7** |  | .544 |  |  |  |  |  |  |
| **X44** | .364 | .517 |  |  |  |  |  | -.374 |
| **X41** |  | .511 |  |  |  |  |  |  |
| **X46** |  | .510 |  |  |  |  |  |  |
| **X43** |  | .486 |  |  |  |  |  | -.396 |
| **X18** |  | .482 |  |  |  |  |  |  |
| **X51** | .381 | .442 |  |  |  |  |  |  |
| **X50** |  |  | .717 |  |  |  |  |  |
| **X17** |  |  | .705 |  |  |  |  |  |
| **X29** |  |  | .636 |  |  |  |  |  |
| **X49** | .394 |  | .588 |  |  |  |  |  |
| **X8** |  |  | .410 |  | .356 |  |  | -.352 |
| **X33** |  | .400 |  | .692 |  |  |  |  |
| **X32** |  | .466 |  | .680 |  |  |  |  |
| **X30** |  | .457 |  | .608 |  |  |  |  |
| **X14** |  |  |  |  | .663 |  |  |  |
| **X11** |  |  |  |  | .646 |  |  |  |
| **X9** |  |  |  |  | .613 |  |  |  |
| **X10** |  |  |  |  | .490 |  |  |  |
| **X12** |  |  |  |  | .395 |  |  |  |
| **X59** |  |  |  |  |  | .663 |  |  |
| **X60** |  |  |  |  |  | .532 |  |  |
| **X65** | .444 |  |  |  |  | .483 |  |  |
| **X2** |  |  |  |  |  |  | .789 |  |
| **X3** |  |  |  |  |  |  | .743 |  |
| **X1** |  |  |  |  |  |  | .729 |  |
| **X23** | .444 |  |  |  |  |  |  | .603 |
| **X25** | .408 |  |  |  |  |  |  | .459 |
| **X4** | .439 |  |  |  |  |  |  |  |
| **X5** | .356 |  |  |  |  |  |  |  |
| **X48** |  | .376 |  |  |  |  |  |  |
| **X42** |  | .506 |  |  |  |  |  |  |
| **X39** |  | .544 |  |  |  |  |  |  |
| **X52** |  |  |  |  |  |  |  |  |
| **X53** |  |  |  |  |  |  |  |  |
| **X26** |  |  | .390 |  |  |  |  |  |
| **X16** |  | .393 |  |  |  |  |  |  |
| **X15** |  |  |  |  |  |  |  |  |
| a 15 components extracted. |

|  |  |
| --- | --- |
|  | **Component Matrix(a)** |
| **Component** |
|  | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **X64** |  |  |  |  |  |  |  |
| **X56** |  |  |  |  |  |  |  |
| **X47** |  |  |  |  |  |  |  |
| **X34** |  |  |  |  |  |  |  |
| **X38** |  |  |  |  |  |  |  |
| **X45** |  |  |  |  |  |  |  |
| **X19** |  |  |  |  |  |  |  |
| **X62** |  |  |  |  |  |  |  |
| **X58** |  |  |  |  |  |  |  |
| **X63** |  |  |  |  |  |  |  |
| **X57** |  |  |  |  |  |  |  |
| **X37** |  |  |  |  |  |  |  |
| **X55** |  |  |  |  |  |  |  |
| **X36** |  |  |  |  |  |  |  |
| **X31** |  |  |  |  |  |  |  |
| **X6** |  |  |  |  |  |  |  |
| **X27** |  |  |  |  |  |  |  |
| **X61** |  |  |  |  |  |  |  |
| **X40** |  |  |  |  |  |  |  |
| **X20** |  |  |  |  |  |  |  |
| **X28** |  |  |  |  |  |  |  |
| **X21** |  |  |  |  |  |  |  |
| **X13** |  |  |  |  |  |  |  |
| **X35** |  |  |  |  |  |  | -.396 |
| **X22** |  |  |  |  |  |  |  |
| **X24** |  |  |  |  |  |  |  |
| **X66** |  |  |  |  |  |  |  |
| **X7** | .438 |  |  |  |  |  |  |
| **X44** |  |  |  |  |  |  |  |
| **X41** |  |  | .482 |  |  |  |  |
| **X46** |  |  |  |  |  |  |  |
| **X43** |  |  |  |  |  |  |  |
| **X18** |  |  |  |  | -.372 |  |  |
| **X51** |  |  |  |  |  |  |  |
| **X50** |  |  |  |  |  |  |  |
| **X17** |  |  |  |  |  |  |  |
| **X29** |  |  |  |  |  |  |  |
| **X49** |  |  |  |  |  |  |  |
| **X8** |  | -.382 |  |  |  |  |  |
| **X33** |  |  |  |  |  |  |  |
| **X32** |  |  |  |  |  |  |  |
| **X30** |  |  |  |  |  |  |  |
| **X14** |  |  |  |  |  |  |  |
| **X11** |  |  |  |  |  |  |  |
| **X9** |  |  |  |  |  |  |  |
| **X10** |  |  |  |  |  |  |  |
| **X12** |  |  |  |  |  |  |  |
| **X59** |  |  |  |  |  |  |  |
| **X60** |  |  |  |  |  |  |  |
| **X65** |  |  |  |  |  |  |  |
| **X2** |  |  |  |  |  |  |  |
| **X3** |  |  |  |  |  |  |  |
| **X1** |  |  |  |  |  |  |  |
| **X23** |  |  |  |  |  |  |  |
| **X25** |  |  |  |  | .379 |  |  |
| **X4** | .696 |  |  |  |  |  |  |
| **X5** | .680 |  |  |  |  |  |  |
| **X48** |  | .605 |  |  |  |  |  |
| **X54** |  | .389 |  |  |  |  |  |
| **X42** |  |  | .629 |  |  |  |  |
| **X39** |  |  | .588 |  |  |  |  |
| X52 |  |  |  | .776 |  |  |  |
| X53 |  |  |  | .683 |  |  |  |
| X26 |  |  |  |  | .596 |  |  |
| X16 |  |  |  |  |  | .732 |  |
| X15 |  |  |  |  |  | .715 |  |
| a Rotation converged in 12 iterations. |

**Shape (1): The Factor Scree Plot for Eigen Roots**



Table(5)-Rotated Component Matrix- and Shape (1) show the scree plot of Eigen values of the imaginary roots to the corresponding various factor. The figure displays the Eigen values of each factor extracted. It equally illustrated that the amount of variance to which the change in Eigen value is attributable within each of the factor rapidly diminishes in relation to the successive variable. The figure also, shows the accumulation begin to emerge between the 16 and15 factors correspond to the Eigen value of less than 1.consequantely variables up to 17 are retained.

The first factor includes 11 variables, namely (x44,x45,x47,x46,x43,x42,x39,x41,x40,x64,x22) this could designated as the religious factor.

The second factor includes 7 variables, namely (x32,x31,x33,x30,x35,x34,x36,x51) this could designated as the foreign factor.

The third factor includes 7 variables, namely (x10,x11,x8,x9,x14,x17,x12) this could designated as the political factor.

The fourth factor includes 7 variables, namely (x54,x53,x52,x50,x55,x49,x29) this could designated as the military factor.

The fifth factor includes 3 variables, namely (x3,x2,x1) this could designated as the distribution of recourses and development policies factor.

The sixth factor includes 4 variables, namely (x21,x23,x24,x25) this could designated as the conflict between tribes among themselves on one side and central government on the other side factor.

The seventh factor includes 3 variables, namely (x7,x5,x4) this could designated as economic pressure factor.

The eighth factor includes 2 variables, namely (x38,x37 ) this could designated as the overlapping of border and tribes with neighboring countries factor.

The ninth factor includes 3 variables, namely (x62,x63,x61) this could designated as the poor level of education factor.

The tenth factor includes 3 variables, namely (x26,x65,x59) this could designated as the rise cost of limited education factor.

The eleventh factor includes 2 variables, namely (x57,x58) this could designated as the proliferation of weapon and easy access by people factor.

The twelfth factor includes 2 variables, namely (x16,x15) this could designated as the ineffectiveness of Sudanese diplomacy factor.

The thirteenth factor includes one variables, namely (x18) this it hardly designated as it contain only one factor.

The fourteenth factor includes one variables, namely (x60) this it hardly designated as it contain only one factor.

The fifteenth factor includes 2 variables, namely (x13,x56) this could designated as the colonial heritage of militaristic tendencies factor.

**The data analysis resulted the following:**

**The data of those who have joined the armed movements:**

The most factors that lead to the emergence of the armed movements were: the take off educational, military, religious, political culture, the civil conflicts that caused by the pretext of new and old colonization, internal policy, religious conflict, the bias for some states, foreign greediness, political factor, educational policies as well as the distribution for resource and development policies, the tribes tensions and conflicts on power, economical living pressures, the take of nationality of armed forces and it rudeness, Islamic groups and parties, the weakness and underestimate of the armed forces to settle the situations, and the failure of Sudanese diplomacy.

**5-Conclusion:**

Regarding the factors of supporting and joining armed movements, statistically significant difference was found for sex, age, and educational level. The study reveals that, the ratio of males was 81.1% compared to that 18.9% for females. Also, we show that the age group "less than 20", :21-30", "31-40", "41-50", "51 and over were represented by ratios of 4.6%, 41.5%, 37.8%, 11.1%, and 5% respectively. In addition, we notice that the ratios of educational levels among those who joined the armed movements were 4.2%, 12.6%, 34.4%, 36.1% and 12.8% for illiterate, basic, higher secondary, university and graduate levels respectively. Also, the ratio of those supporting the rise of armed movement, compared to 49.6% for those opposing that opinion. Among the most significant factors for this phenomenon there are the religious factors, inter-border tribal conflicts, political factors such as the relation between the army and political power. Equally, there are influences of popular administration, foreign intervention, and professionalism of the army as well as prior resources of the army and its incapacity to resolve conflicts. There are economic factors such as economic hardship, unfair distribution of wealth and poor development and educational policies regarding curricula and fees.

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