RANKING NORTHERN STATE OF NIGERIA IN TERMS OF THEIR SOCIO-ECONOMIC DEVELOPMENT USING PRINCIPAL COMPONENT ANALYSIS (P.C.A)

Manga, U.S.[1]

1. INTRODUCTION

The Nigerian northern states are regional group of nineteen states established to promote cooperation and economic integration in all field of economic activity, especially Industry, Transports, Telecommunications, Energy, Agriculture, natural-resources, Commerce, monetary and financial matters, social and cultural issues among the member state (Ash and Sedar, 2000).

Economic relations between states may lead to different types of integration varying from the establishment of free trade areas to customs unions. Others benefit of economic integration includes higher productivity through an easier and more unrestricted movement of capital, more efficient division of labor, a faster growth in the state trade, a more rapid development of new opportunities for investment, an increase ability to compete in global market. (Ash and Sedar, 2000).

However, the poor economic health of member's state, the early 1980s has been a major event that makes integration difficult. Also differences in political ideology, political instability and lack of good governance have influenced attitudes and approaches to regional integration. Nevertheless, the level of cooperation achieved is not inconsiderable so far. Member states have a considerable economic potential, that might eventually lead to the establishment to free trade area, or in time the establishment of a common market. The various changes affecting the world during the last decades have been brought about a global structural evolution. The nature of investment and factor, the rules and spatial configuration have evolved considerably. Since the 80s, the institutional expression of regionalization has become present in theory as well as in economic practice in order to be able to respond to the challenges and opportunities resulting from globalization and liberalization of exchanges. Attempt were made by both the CIA and UNDP to classify state in terms of their energy and rank states in terms of their energy and economic levels. CIA, (2000) classified them in terms of economic and energy levels by using one variable, while UNDP, (2002) classified them by using a set of predefined variables. In these classifications, no standard statistical techniques were applied, and therefore any conclusion made may be misleading.

In this paper, effort was made to rank Northern state of Nigeria in terms of their levels of socio-economic development. The research work will provide a set of variable that can be considered to be a standard of measurement of socio-economic development in northern state. It shows the position of northern state and hence constitutes a booster to each individual state to improve her socio-economic development status, and helps the state to play an important role in the global

ISBN - 978-93-81583-56-2

economy. As there are numerous measurement that might have been used as indicators of the level of socio-economic development, the use of multivariate analysis is necessary And also the Bartlet test of spheriscity shows that the correlation matrix of the data is not unit matrix. In this situation, the favorite statistical techniques is the principal component analysis (PCA).

2. METHOD

When Nigeria recorded 36 states in the federation in October, 1996 by late General Sani Abacha. The Northern part of the state registered 19 states in the country. The State include Adamawa, Bauchi, Benue, Bornu, Gombe, Jigawa, Kaduna, Kano, Katsina,Kebbi,Kogi, Kwara, Nasarawa, Niger, Plateau, Sokoto,Taraba, Yobe and Zamfara State. Nigerian states economies are at varying stage of development. Nigeria's economy, the region's largest with GDP of 39.5 billion in 2001 is larger than the combined GDP of other states.The substantial external debt of individual state remain one of the region's greatest challenge, while the region's economy grew at a combined rate of 3.4 in 2001. The region's major export commodities were ground nut, sugar cane, cassava, minerals, and gold.

Thirty seven variables principally selected as level of social and economic development were obtained from Kaduna State chambers of Commerce and industry.The indicators are listed in two groups, economic indicators and social indicators composed of 15 and 22 variables respectively. The idea behind this , is to get after applying the statistical analysis a combination of social and economic indicators based on which the ranking of Nigerian Northern State can be achieved. It should be noted that 15 economic indicators and 22 social indicators were selected because data were available for the nineteen Northern State.

Economic indicators

The following were the selected economic indicators used for the study:

Gra GDP	Growth Rate of GDP
SAGDP	Share of Agriculture in GDP
SIGDP	Share of Industry in GDP
SSeGDP	Share of Service in GDP
Sdgdp	Share in Debt in GDP
SIGGDP	Import of Goods an Services (%GDP)
SEgGDP	Export of GOODS AND Services (%GDP)
SPA	Share of population in Agriculture
SIGDP	Share of Direct Foreign Investment in GDP
EAPRa	Economically Active Population Rate
CGFGDP	Gross Capital Formulation (%GDP)
Stdo	Short term Debt Outstanding
APC	Aid per capital
PGDP	gdp Per capital
Gniam	GNI (Altas method)

Social indicators

The following indicators were social indicators used in this study

GraP	Population Growth Rate
FeRa	Fertility rate
LiRA	Literacy rate
LeB	Life Expectancy at Birth
IMRa	Infant Mortality Rate
PCEC	Per capita Electric Consumption
SPSEGDP	Share of public expenditure on Education in GDP
PPP	Physicians (per 100,000 people)
SHHGDP	Share of Public Expenditure on Health in GDP
TVPP	TV Receivers per 1000 people
DNPP	Daily News Papers per 1000 people
TMPP	Telephone mainlines per 1000 people
RPP	Radios per 1000 people
UPRa	Radio Populations rate
EAWR	Rate of Economically Active Women
PCP	Personal Computers per 1000 people
INU	Internet users
UFMRa	Under five mortality rate
OSAIWS	Population with sustainable Access to an improved water sources.
PAISF	Population with Access to improve sanitation facilities (%)
CPRa	Contraceptive Prevalence Rate (%)
PUA	Population under Age 15 (% Total)

Basic Concept of Principal component analyses (PCA)

The facts that y_i are uncorrected an have variance λi can be rewritten by saying that the variance- covariance $\sum$ of the vector :

$$Y = \left(yi \right) \tag{1.0}$$

Takes the form $\sum = B\Lambda B^T$, where

$$\wedge = \begin{pmatrix} \lambda i & 0..... & 0 \\ 0 & \lambda 2.... & 0 \\ M & L & M \\ 0 & & \end{pmatrix} \text{ and } B=(b_1, b_2, b_3)= \begin{pmatrix} & & \\ b_{11} & b_{12} & b_{1p} \\ b_{21} & b_{22} & b_{2p} \\ M & M & M \\ 0 & b_{p2} & b_{pp} \end{pmatrix} \tag{1.2}$$

Is a matrix of eigenvectors With this notation $Y = B^T X$

And the equation $b_i^T b_i = 1$, $b_i^T b_i = 0$ and $B^T B = 1$ are the B orthogonal matrix More over the equation $\sum X_i = \lambda_i b_i$ can be generalized as $\sum B = \wedge B$. Note that the diagonal matrix must follow rather than precede B so that we get each element of the same columns multiplied by the same λ_i.

$$\sum = B \wedge B^T \tag{1.3}$$

Which is called the spectral decomposition $\sum$, Hence

$$Y = B^T X, B^T \sum B = \wedge$$

Is a restatement of the fact that Y has variance-covariance matrix $\sum$

So far we have been talking about the computation of principal component from the variance-covariance matrix $\sum$.However; it is quite common to find the principal components from the correlation matrix R, which effectively results to normalizing all the varieties to have unit variance before obtaining principal components. This involves a definite but nevertheless arbitrary decision to make the variable 'equally important'. The diagonal elements of a correlation matrix are all unity, so that

$(tr(R)) = p$ and hence $\sum_{i=1} \lambda_i = p$

Although the derivation of principal components underlying above h been in terms of eigenvalues and eigenvectors of the variance matrix S, it is much more usual to derive them from the corresponding quantities of the correlation matrix R in practice. The reasons is that when that we have variable with different scale, the structure of principal components derive from the above covariance matrix will depend upon the arbitrary choice of units of measurement; also if there are large differences between the variables

Criteria for using principal Components Analysis

After the standardization of the variable, the variance-covariance matrix was calculated. In this case, the Bartlett test of spheriscity was applied to determine whether the correlation matrix is a unit matrix or not. The Bartlett test of spheriscity is given by

$$x^2 = -\left[(n-1) - \frac{1}{6}\left\{2p + 1 + \frac{2}{p}\right\}\right]\left[1n|S| + pIn\left(\frac{1}{p}\right)\sum_{i=1}^{p} \lambda_i\right], where$$

P= number of variable, n = number of component, = i^{th} eigenvalues of S, the variance-covariance matrix and the degree of freedom is $df = (p-1)(p-2)/2$

3. PRESENTATION OF RESULTS AND DISCUSSION

The result of this study showed that the Barlet test statistics x^2 = 10,0000 and, hence the null hypothesis " the correlation matrix is a unit matrix " was rejected at α = 0.005 level of significance. Therefore, principal component analysis could be used to study the data.
Table 3.0: Shows the correlation among indicators (Social and Economic).

Table 3.0 : Correlation matrix

	GRAGDP	SAGDP	SIGD	SSEGDP	SDGDP	SDGDP	SIGGDP		SIGDP	SPA	EAPRA	PGDP	GNIAM	GCFGDP	STDO
GRAGDP	1.000	-0.693	-0.140	0.672	-0.299	-0.161	0..96	GRAGDP	0.229	-0.118	0.542	0.444	0.435	0.504	-.0046
SAGDP	-0.693	1.000	.0..7	-0.877	0.014	0.112	0.038	SAGDP	-0.219	0.261	-0.219	-0.721	-0.717	-0.340	-0.037
SIGDP	-0.140	-0.007	1.000	0.064	0.053	0.318	0.139	SIGDP	-0.273	-0.009	-0.070	-0.154	-0.169	0.004	0.331
SSEGDP	0.672	-0.877	-0.474	1.000	0.454	1.000	0.699	SSEGDP	0.322	-0.228	0.224	0.709	0.713	0.295	-0.122
SDGDP	-.0299	0.014	-0.155	0.064	1.000	0.454	0.711	SDGDP	0.484	-0.045	-0.051	0.149	0.158	-0247	0.147
SEGGDP	-.0096	-0.038	-0.139	0.101	0.711	0.699	1.00	SEGGDP	0.559	-0.215	-0.036	0.162	0.212	0.317	-0.098
SIGDP	0.2299	-0.219	-0.273	0.322	0.122	0.484	0.559	SIGDP	1.000	-0.233	0.070	0.099	0.108	0.257	0.318
SPA	-0.188	0.261	-0.009	-0.228	-0.045	-0.215	0.232	SPA	-0.046	-0.046	0.238	-0017	0.015	0.397	-0.014
EAORA	0.542	0.219	-0.070	0.224	-0.051	-0.036	0.070	EAPRA	0.238	1.000	0.599	-0.659	-0.647	-0.241	-0.511
PGDP	0.444	-0.721	-0.154	0.709	0.149	0.162	0.099	PGDP	-0.017	0.599	-0.017	-0.659	-0.293	1.000	0.996
GNIAM	9,435	-0.717	-0.169	0.713	0.158	0.212	0.108	GNIAM	0.015	-0.647	-0.275	0.996	1.000	0.126	-.0007
GCFGDP	0.505	-0.340	0.0004	0.295	-0.247	0.317	0.257	GCFGDP	0.397	-0.647	0.397	-0.241	0.350	0.114	0.126
STDO	-0.046	-0.037	0.331	-0.122	0.147	-0.0098	0.318	STDO	-0.014	-0.511	-0.288	0.026	-0.007	0.336	1.000
APC	0.242	-0.461	-0.214	0.507	0.157	0.338	0.013	APC	-0.038	-0.473	-0.345	0.852	0.866	-0.129	-0.299
GRAP	0.083	0.090	-0.353	0.092	0.287	-0.085	0.388	GRAP	0.340	-0.376	0.464	-0.393	-0.404	0.047	0.210
FERA	-0.346	0.630	0.070	-0.593	-0.238	-0.389	-0.474	FERA	-0.342	0.699	0.059	-0.693	-0.702	-0.047	0.210
FIRA	0.061	-0.238	-0.017	0.404	-0.116	0.421	0.311	FIRA	0.106	-0.777	-0.246	0.557	.0570	0.357	0.284
LEB	0.432	-0.448	-0.017	0.404	0.116	0.421	0.211	LEB	0.218	-0.672	-0.086	0.545	0.567	0.727	0.411
IMRA	-0.557	0.666	0.249	-0.707	-0.309	0.367	-0.314	IMRA	-0.253	0.524	-0.157	-0.695	-0.703	-0.633	-0.049
PCEC	0.104	-0.203	0.124	0.125	0.213	0.131	0.498	PCEC	-0.014	-0.418	0.125	0.168	0.567	0.277	0.428
SPSEGDP	0.394	-0.356	-0.393	0.501	0.019	0.018	0.295	SPSEGDP	-0.195	-0.418	0.283	0.300	0.272	0.251	-0.131
SHHGDP	0.000	-0.130	-0.350	0.040	-0.078	-0.425	-0.146	SHHGDP	0.174	-0.106	0.110	0.302	0.359	0.062	0.556
TVPP	0.036	-0.069	0.050	0.042	-0.078	-0.425	0.146	TVPP	-0.428	-0.033	0.212	-0.189	-0.230	0.195	0.377
DNPP	-0.171	0.106	0.165	-0.167	0.308	-0.007	0.434	DNPP	-0.059	-0.537	-0.303	-0.022	-0.060	0.193	0.909
TMPP	0.370	-0.559	-0.296	0.633	0.090	0.425	-0.146	TMPP	0.131	-0.584	-0.273	-0.273	0.900	0.922	0.169
RPP	-0.213	0.045	0.174	-0.118	0.321	0.293	0.225	RPP	0.140	-0.068	0.359	-0.206	-0.210	0.297	-0.053
EAWR	0.504	-0.088	0.079	-0.263	-0.263	-0.235	-0.243	EAWR	-0.044	0.610	0.928	-0.369	-0.358	0.274	-0.333
PCP	-0.091	-0.048	0.276	-0.086	0.010	-0.031	0.228	PCP	0.066	-0.493	-0.345	0.008	-0.011	0.455	0.944
INU	-0.109	-0.010	0.239	-0.102	-0.116	-0.062	0.181	INU	0.066	-0.610	0.154	-0.470	-0.365	-0.033	-0.859
UFMRA	-0.544	0.644	0.273	-0.701	-.0100	-0.461	-0.353	UFMRA	-0.324	0.475	-0.228	-0.670	-0.695	-0.604	0.039
PSAIWS	0.134	-0.427	-0.155	0.449	0.388	0.204	0.498	PSAIWS	0.101	-0.546	-0.198	0.540	0.515	0.056	0.235
CPRA	0.444	-0.476	-0.347	0.586	-0.193	0.310	0.047	CPRA	0.060	-0.692	-0.252	0.818	0.824	0.352	-0.028
PAISF	-0.170	-0.179	0.488	-0.079	0.372	0.384	0.362	PAISF	-0.180	-0.309	-0.211	0.334	0.331	0.112	0.161
PUA	-0.170	-0.179	0.488	-0.006	-0.398	-0.471	-0.565	PUA	-0.368	0.618	0.084	-0.535	-0.556	-0.255	-0.2179
UPRA	0.004	-0.350	0.111	0.258	0.250	0.234	0.172	UPRA	-0.125	-0.829	-0.455	0.650	0.643	0.202	0.369

	APC	GRAP	FERA	LIRA	LEB	IMRA	PCEC		SPSE GDP	SHHGDP	TVPP	DNPP	TMPP	RPP	PPP
GRAGDP	0.242	0.083	-0.346	0.061	0.432	-0.557	0.104	GRAGDP	0.394	0.000	0.036	-0.171	0.370	0.242	-0.213
SAGDP	-0.461	0.090	0.630	-0.238	-0.448	0.666	-0.203	SAGDP	-0.356	-0.130	-0.069	0.106	-0.559	0.134	0.045
SIGDP	-0.214	-0.353	0.070	-0.002	-0.017	0.249	0.124	SIGDP	-0.393	-0.350	0.050	0.165	-0.296	-0.266	0.174
SSEGDP	0.507	0.092	-0.593	0.216	0.404	-0.707	0.125	SSEGDP	0.501	0.282	0.042	-0.167	0.633	0.011	-0.118
SDGDP	0.157	0.287	-0.238	0.186	-0.116	-0.039	0.213	SDGDP	0.019	0.279	-0.078	0.308	0.090	-.0.161	0.321
SEGGDP	0.388	-0.085	-0.389	0.503	0.421	-0.367	0.131	SEGGDP	0.018	0.700	-0.425	-0.007	0.453	0.129	0.293
SIGDP	0.013	0.388	-0.474	0.474	0.211	-0.314	0.498	SIGDP	0.195	0.174	-0.428	-0.059	0.131	0.140	0.204
SPA	-0.473	0.376	0.699	-0.777	-0.672	0.524	-0.418	SPA	-0.106	-0.033	0.119	-0.537	-0.584	-0.068	-0.611
EAPRA	-0.345	0.464	0.059	-0.246	-0.086	-0.157	0.125	EAPRA	0.283	0.110	0.212	-0.303	-0.273	0.359	-0.475
PGDP	0.852	-0.395	-0.693	0.557	0.545	-0.695	0.168	PGDP	0.300	0.302	-0.189	-0.022	0.900	-0.206	0.294
GNIAM	0.866	-0.404	-0.702	0.570	0.567	-0.703	0.146	GNIAM	0.272	0.359	-0.230	-0.060	0.922	-0.210	0.306

Table 3.0 : Correlation matrix(continued)

	EAWR	**PCP**	**INU**	**UFMRA**	**PAIWS**	**CPRA**	**PAISF**	**PUA**	**UPRA**
GRAGDP	0.504	-0.091	-0.109	-0.544	0.134	0.444	-0.170	-0.113	0.004
SAGDP	-0.088	-0.048	-0.010	0.644	-0.427	-0.476	-0.179	0.448	-0.350
SIGDP	-0.008	0.276	0.239	9.273	-0.155	0.347	0.488	-0.006	0.111
SSEGDP	0.079	-0.086	-0.102	-0.701	0.449	0.586	-0.709	-0.398	0.250
SDGDP	-0.263	0.010	-0.116	-0.100	0.388	-0.193	0.372	-0.368	0.250
SEGGDP	-0.235	-0.031	-0.062	-0.461	0.204	0.310	0,384	-0,471	0.234
SIGDP	-0.243	0.228	0.181	-0.353	0.498	0.047	0.362	-0.565	0.272
SPA	0.610	-0.493	-0.470	0.475	-0,546	-0,692	-0.309	0.618	-0.829
EAPRA	0.928	-0.345	-0.365	-0.228	-0.198	-0.252	-0.211	0.084	-0.455
PGDP	-0.369	0.008	-0.033	-0.670	-0.540	0.818	0.344	-0.535	0.650
GNIAM	-0.358	-0.011	-0.052	-0.695	0.515	0.824	0.331	-0.556	0.643
GCFGDP	0.274	0.455	-0.365	-0.228	-0.198	-0.252	-0.211	0.084	-0.455
STDO	-0.333	0.944	0.859	0.039	0.235	-0.028	0.161	-0.179	0.369
APC	-0.381	-0.300	-0.375	-0.478	-0.378	0.709	0.397	-0.426	0.453
GRAP	0.291	0.134	0.165	0.148	0.003	-0.382	-0.546	0.191	-0.422
FERA	0.218	-0.195	-0.166	0.867	-0.588	-0.651	-0.403	0.935	-0.716
FIRA	-0.335	0.246	-0.077	-0.739	0.494	0.682	0.316	-0.485	0.566
LEB	-0.132	0.510	0.179	-0.669	0.298	0.682	0.316	-0.485	0.566
IMRA	-0.045	-0.066	-0.080	0.974	-0.450	-0.775	-0.264	-.688	-0.567
PCEC	0.046	0.259	-0.562	-0.464	0.581	0.232	0.384	-0.667	0.514
SPSEGDP	0.160	-0.210	0.251	-0.547	0.402	0.411	-0.144	-0.285	0.144
SHHGDP	0.059	-0.482	0.682	-0.512	0.179	0.334	0.388	-0.432	0.239
TVPP	0.318	0.314	-0.156	-0.005	-0.015	-0.151	-0.52	0.090	-0.011
DNPP	-0.334	0.789	-0.165	0.015	0.405	-0.046	0.212	-0.300	0.453
TMPP	-0.355	-0.109	-0.165	-0.679	0.404	0.865	0.325	-0.518	0.515
RPP	0.424	-0.140	0.594	0.298	0.018	0.103	-0.111	-0.269	-0.034
EAWR	-0.458	0.701	-0.403	-0.095	-0.324	-0.274	-0260	0.264	-0.460
PCP	1.000	-0.378	0.953	-0.014	0.144	0.024	0.110	-0.115	0.354
INU	-0.378	1.000	1.000	0.007	0.144	0.054	-0.039	-0.074	0.288
UFMRA	-0.403	0.953	0.007	0.007	1.000	-0.412	-0.745	-0.245	0.731
PSAIWS	-0.095	0.014	0.046	1.000	0.380	0.474	-0.548	-0.476	0.538
CPRA	-0.324	0.024	0.054	-0.412	1.000	0.380	1.000	0.118	-0.476
PAISF	-0.274	0.110	-0.039	-0.745	0.474	0.118	1.000	-0.440	1.000
PUA	-0.260	-0.115	-0.074	-0.245	0.474	0.118	1.000	-0.440	0.604
UPRA	0264	0.354	0.288	0.731	-0.542	0.729	0.538	0.604	1.000

Table 3.1 : Component with eigenvalues greater than one

Component	Eigen values	% of variance	Cumulative %
1.	12.276	33.179	33.179
2.	6.301	17.030	50.209
3.	4.781	12.922	63.131
4.	3.405	9.203	72.334
5.	2.399	6.484	78.817
6.	2.288	6.185	85.002
7.	1.796	4.610	89.612
8.	1.185	3.103	92.815

Table 3.3: components matrix of PCs having variance proportion greater than 9%

	Component			
	1	**2**	**3**	**4**
FERA	0927	-0.01	-0.195	-0.096
IMRA	-0.872	0.226	-0.341	0.076
UFMRA	-0.862	0.301	-0.309	-0.02
GNIAM	0.854	-0.238	-0.278	-0.248
PGDP	0.846	-0.210	-0.265	-0.278
LIRA	0.844	0.216	0.035	0,182
TMPP	0.819	-0.349	-0.365	-0.113
CPRA	0.817	0.233	-0.096	-0.287
PUA	09.812	-0.061	-0.093	-0.013
UPRA	0.797	0.340	-0.200	-0.013
SPA	-0.790	-0.410	0.183	0.168
LeB	0.764	0.168	0.094	-0.248
APC	0.667	-0.411	-0.562	-0.064
PSAIWS	0.654	0.120	0.033	0.208
SSEGDP	0.622	-0.481	0.263	-0.240
SAGDP	-0.621	-0.481	0.263	0.392
PCEC	0.505	0.318	0.488	0.242
PAISF	0.464	0.226	-0.323	0.263
STDO	0.244	0.891	0.249	-0.172
PCP	0.221	0.862	0.191	-0.251
DNPP	0.252	0.859	0.273	0.088
INU	0.169	0.811	0.219	-0.290
PPP	0.429	0.669	-0.249	-0.056
ShHGDP	0.421	-0.528	-0.271	0.459
SiGDP	-0.153	0.432	-0.147	-0.218
EARPRA	-0.203	-0.488	0.716	0.106
GCFFGDP	0.432	0.100	0.583	-0.181
TVPP	-0.096	0.293	0.553	-0.246
RPP	0.107	-0.132	0.543	0.202
SPSEGDP	-0.357	-0.304	0.543	0.056
GRAGDP	0.365	-0.462	0.484	-0.469
SEGDP	0.428	0.251	0.256	0.737
SDGDP	0.221	0.167	-0.106	0.704
SDGDP	0.467	-0.068	-0.115	0.684
SIGDP	0.224	-0.156	0.338	0.367

It shows that the original variables can be group under four components as follows
Variable groups under the first component are :

FeRa,
IMRa,UFMRa,GNIAM,PGDP,LiRA,TMPP,CPRa,PUA,UPRa,SPA,LEB,APC,PSA
IWS
SSeGDP,SAGDP,PCEC and PAISF

Variable grouped under the second component are:
STDO, PCP, DNPP, INU, SHHGDP, PPP and SIGDP
Variable grouped under the third component are: EAPRA, GRAP, EAWR, GCFGDP,TVPP,
RPP, SPSEGD and Gra GDP
Variable grouped under the fourth components are: SEGGDP, SDGDP, SIGGDP and SIGDP

Since only 18 and 37 indicators are related to the first component, and the remaining to the seconds, third and fourth, supplementary techniques were used to determine the yardstick. We then obtain:
FERA,IMRA,UFMRA,GNIAM,PGDP,LIRA,TMPP,CPRA,PUA,UPRA,LEB,PSAI
WS,SAGD
STDO, PCP, DNPP, INU, SIGDP, GRAP, TVPP and RPP
The above selected indicators formed a set of 24 socio – economic indicators (about 65% of the 37 indicators). There is then no need to rotate the components. This set can therefore be used in ranking the state
Table below displayed the component score coefficient matrix of the eight components having eigenvalues greater than one. In this study only those of the first four components (component one to four)(where used because the retained indicators were all grouped under matrix.

Table3.4: Component score coefficient matrix

	Component						
	GRAGDP	**SAGDP**	**SIGD**	**SSEGDP**	**SDGDP**	**SDGDP**	**SIGGDP**
GRAGDP	.030	-073	101	0.444	-0.170	-0.113	0.004
SAGDP	-051	.050	-.045	-0.476	-0.179	0.448	-0.350
SIGDP	-012	.069	-.031	0.347	0.488	-0.006	0.111
SSEGDP	051	-076	.055	0.586	-0.709	-0.398	0.250
SDGDP	.018	.026	-022	-0.193	0.372	-0.368	0.250
SEGGDP	.038	-011	-024	0.310	0,384	-0,471	0.234
SIGDP	.035	040	.050	0.047	0.362	-0.565	0.272
SPA	.018	-025	.071	-0,692	-0.309	0.618	-0.829
EAORA	-.064	-065	.038	-0.252	-0.211	0.084	-0.455
PGDP	-.017	-078	.150	0.818	0.344	-0.535	0.650
GNIAM	.069	-033	-058	0.824	0.331	-0.556	0.643
GCFGDP	.070	-038	122	-0.252	-0.211	0.084	-0.455
STDO	.035	.016	052	-0.028	0.161	-0.179	0.369
APC	.018	.141	-118	0.709	0.397	-0.426	0.453
GRAP	.054	-.065	.136	-0.382	-0.546	0.191	-0.422

FERA	-026	.014	-041	-0.651	-0.403	0.935	-0.716
FIRA	-075	-.002	.007	0.682	0.316	-0.485	0.566
LEB	.069	.034	020	0.682	0.316	-0.485	0.566
IMRA	.062	.027	-0.179	-0.775	-0.264	-.688	-0.567
PCEC	-071	.036	0.488	0.232	0.384	-0.667	0.514
SPSEGDP	.041	.050	-0.709	0.411	-0.144	-0.285	0.144
SHHGDP	.029	.047	0.372	0.334	0.388	-0.432	0.239
TVPP	.034	.136	0,384	-0.151	-0.52	0.090	-0.011
DNPP	-008	-.055	0.362	-0.046	0.212	-0.300	0.453
TMPP	.021	-021	-0.309	0.865	0.325	-0.518	0.515
RPP	.067	.106	-0.211	0.103	-0.111	-0.269	-0.034
EAWR	.009	-.075	0.344	-0.274	-0260	0.264	-0.460
PCP	.035	.137	0.331	0.024	0.110	-0.115	0.354
INU	-027	.129	-0.211	0.054	-0.039	-0.074	0.288
UFMRA	.018	.048	0.161	-0.412	-0.745	-0.245	0.731
PSAIWS	.014	.019	-0.179	0.474	-0.548	-0.476	0.538
CPRA	-070	-37	0.488	0.380	1.000	0.118	-0.476
PAISF	.053	.036	-0.709	0.118	1.000	-0.440	1.000
PUA	.067	-010	0.372	0.118	1.000	-0.440	0.604
UPRA	0.65	054	0,384	0.729	0.538	0.604	1.000

Ranking of the state in terms of their socio-economical development levels were summarized in Table 3.5 below using the relation.

PCscore = -0.075 Fera – 0.071 IMRa + 0.070 GNIAM – 0.0700 *UGMra + 0.069PGDP + 0.-69LIRA + 0.067 TMPP + 0.067CPRA – SAGDP + 0.038 PAISF + 0.141STD0+0.137PCP + 0.136DNPP + 0.114SPSEGDP + 0.207SDGDP.*

Table 3.5 provides a ranking of Northern Nigeria states. It presented them in a decreasing order based on their score values. We can therefore group these states in four main group

Rank	States	PC scores
1	Kaduna	563.98
2	Kano	283.98
3.	Niger	237.40
4.	Kwara	174.89
5.	Plateau	143.91
6.	Kebbi	124.57
7.	Sokoto	110.47
8.	Kogi	103.17
9.	Katsina	92.289
10.	Bauchi	91.55
11.	Zamfara	71.43
12.	Taraba	36.22
13.	Nasarawa	32.04
14	Yobe	26.57
15	Benue	26.0
16	Adamawa	25.60
17	Borno	25.50
18	Gombe	25.0
19	Jigawa	24.9

From the results of Table3.5, the states are group based on the following principal components score ranges. First group , 500 ≤ PC; second group 200 ≤ PC < 500; third grouping, it shows that Kaduna with principal component score value 563,98 formed the first group and therefore ranked in accordance with CIA (2002) economic and energy classification. This rank is in accordance with CIA (2002) economic and energy classification of Nigeria but disagreed with the UNDP classification due to the fact that it is agricultural state, product that provides 20% of GDP, 95% of foreign exchange earnings and about 65% budgetary revenue. Though Kaduna is occupying the highest rank, the state does not have the highest values on life expectance at birth, literacy rate grow rate of GDP among others. Kano is leading on these indicators. Hence if care is not taken, kaduna may lose its ranks. For the state to maintain its position, effort should be made on the above mentioned indicators, to diversify the source of income, to reduce considerably corruption in all its forms. Also manage properly the revenues the state generates.

The second group is formed by Kano and Niger with PC score values 283.98 and 237.40 respectively. This also agreed with CIA energy classification of Nigeria. These honorable positions might be linked to the industries and agricultural production. In fact industries contribute more than 40% of the revenue. Also because they performed well on the literacy rate and life expectancy. For these states to maintain their ranks, the agricultural production should not be concentrated only on groundnut production since decline on international price of this product would affect dangerously the foreign exchange earnings. Hence affect certain social indicators. For Kano to maintain the 2^{nd} rank the current political crisis (rebellion) should be quickly resolved since it is strangling the economy and as a consequence sensible social indicators like infant mortality rate, life expectancy at birth, grow rate of GDP are seriously affected. Kwara , Plateau ,Kebbi, Sokoto and Kogi formed the third group. This position is certainly occupied because none of them is a landlocked state. In addition, private activities account for about 80% of GDP living only 20% of GDP to other sectors. Apart Plateau and Kano has experienced chronic political crisis. For these state to perform more, they should diversify the source contributing to GDP, they should try to modernize the agricultural sectors.

The fourth group is formed by Katsina, Bauchi, Zamfara, Taraba, Nasarawa, Yobe, Benue ,Adamawa Kogi, Gombe and Jigawa. In this group occupied their position inevitably because they depend much on agriculture. More over they have the highest values on fertility rate, and infant mortality and none of them has literacy rate value above 40% and life existence at birth in the country, is comprise between 44% and 58%. All these states encountered either chronic political instabilities or rebellion in recent years. For state like Niger in view of more honourable rank, effort should be done in order to modernize the agricultural sectors, to mobilize internal resources, expend properly revenues obtained from drivers taxes. Harmonize the revenue and expenditure so as to be less dependent on aid. More over much should be done to ameliorate infant mortality rate, fertility rate, life expectancy at birth, grow ate of GDP among others.

4. CONCLUSIONS

In this study we rank the Nineteen Northern state in terms of their socio- economic development status, using 37 variables composed of 15 economic variable and 22 social variables. For the selected variable of the data, principal components techniques was chose and 24 socio – economic variables were retained and found to be informative enough about the development level of the state. The remaining 13 variables were considered to be less informative on the basis of these 24 variables, states might be divided into four groups, the first of which included only one state(Kaduna) with a score value above 500, while the second group consisted of 2 state (Kano and Niger) having score values between 200 and 500. The third group is composed of 5 states (Kwara, Plateau,Kebbi, Sokoto and Kogi). Score values greater than 100 an less than 200. The last group is composed of 11 states (Katsina, Bauchi, Zamfara, Taraba, Nasarawa, Yobe, Benue, Adamawa,Kogi, Gombe and Jigawa). Having less than 100 and greater than 0.

5. REFERENCES

1. Anderson, T.W. (1964), *introduction to multivariate statistical analysis.* John Wiley and Sons, New York. P. 272 – 287
2. Ash, G. and Serder, K. (2000). A ranking of ISLAMIC Countries interms of their levels ofSocio-Economic Development .*Journal of Economic Cooperation* 21, 1997.
3. Casin, Ph. (2001). A generalization of principal component analysis to k-sets of variables.,Computational Statistical and Data Analysis.
4. CIA (2003).Regional export products. Bureau of African Affairs, Washington DC, October 27.www.idrc.ca/en/ev-68352-201-1-DO_TOPICS. html.
5. ECA/MULPOC (United NATIONS Economics Commission for Africa, Multinational programming and operational centre). (1993).Directory of West African Inter – organizations. UNECA/MULPOC Nimey Niger.
6. ECkart, C. and Young, G. (1939) , a principle axix transformation for non-harmatan matrices. Americans Mathematics Society Bulletin 45 : 118 – 121
7. ECOWAS (1992), final report of the committee of Eminent persons for the review of the Ecowas Treaty. ECOWAS secretary, LAGOS, Nigeria.
8. ECOWAS (1993b). Regional peace and stability: a prerequisite for integration, 1992/93. Annual of executive secretary general. ECOWAS. Secretariat, Lagos Nigeria
9. Fact sheet (2002),Bureau of Africa Affairs, Washington DC, November 22.
10. Gabriel, K.R, (1971). The biplot graphic display of matrices With application to principal components analysis. Biometrika 53, 3, p.453.
11. Golub, G.H and Reinsch, C. (1970). Singula value decomposition and least square solution. Numerical MATH 14, 403 – 420.
12. Good, I.J, (1969), "Some application of the singular value Decomposition of matrix", Technometrics, 11, 823-831.
13. Gulumbe, S.U and A. Dambaba, (2003).Principal Component Analysis of KEY Energy Indicators of West African Countries. Nigeria Jour. E, Emir.
14. Hotling, H. (1993).Analysis of a complex of Statistical variable s into principal components J. D Psych. 24 :417-441;498-520.
15. Isebrands, J.G. and Thoms, R.C (1975). Introduction to uses and interpretation of principal component analysis in the biology. For. xp. tn. St, PAUL, Minn.
16. Kim J, and Charles, W.M. (1978B). Factor analysis : Statistical methods an practical issues. Thousand Oals, CASage publications, quantitative application in social sciences series, No. 14

17. Kendell, M.C . (1957). A course in multivariate analysis Hafner Publishing Co, NEW York. 185principal components ? topping rules for determining the number of non-trivial axes revisited. Computational Statistical and DATA Analysis 49.974 – 997

18. Rao. C.R (1952). Advanced Statistical methods in biometric research.. John Wiley an Sons New York 390.

19. Seal H. (1964) Multivariate Statistical analysis for biologist. Methuen an Co. LTD., London p. 101 – 122.

20. Sonfdam I.K and Danbaba, A.(2005). Analysis of Modular Child Labour Journal of Applied Science and Technology 6,2, 2005.

21. Spearman, C (1904).General intelligence objectivity determined and measured. Am.j.Psych. 15: 201 – 293..

****

---

[1]*Department of Mathematics*
Kebbi State University of Science and Technology, Aliero. Nigeria
usmathmanga@yahoo.com