Exploring
The ECONOMIC FREEDOM INDEX 2019

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About The Economic Freedom Index

- This dataset belongs to The Heritage Foundation

  https://www.heritage.org/index

- Data source : https://www.kaggle.com/datasets

- Dimension of data : 174 * 33 (after refining)

- The Economic Freedom Index is poised to track over two decades of the advancement in economic freedom, prosperity, and opportunity.

Objectives

Using Minitab 17

- Classification of countries as Developed and Underdeveloped using Discriminant Analysis

- Investigation of variables that affect economic condition of a country

- Investigation of impact of unmeasured factors on the variables

- Formation of clusters of countries

Variables Used

- GDP per capita (GDP/population)

- Fiscal Health

- Unemployment %

- Inflation %

- Labor Freedom

- Investment Freedom

- Property Rights

- Judicial Effectiveness

Discriminant Analysis

- http://worldpopulationreview.com has enlisted First World countries i.e.

  developed countries till July 2018.

- Notations : 1 – Developed (31), 0 – Underdeveloped (not developed) (143).

- Squared difference between the two groups is observed to be 6.94301.

Summary of Classification

	TRUE group	
Put into Group	**0**	**1**
0	<u>130</u>	2
1	13	<u>29</u>
Total N	143	31
N correct	130	29
Proportion	0.909	0.935

N = 174
N Correct = 159
Proportion Correct =0.914

Linear Discriminant Function for Groups

	0	1
Constant	-14.587	-24.382
GDP per Capita (PPP)	0	0
Fiscal Health	<u>0.054</u>	<u>0.06</u>
Unemployment (%)	<u>0.214</u>	<u>0.236</u>
Inflation (%)	0.02	0.025
Labor Freedom	<u>0.252</u>	<u>0.189</u>
Investment Freedom	<u>0.088</u>	<u>0.106</u>
Property Rights	<u>0.093</u>	<u>0.218</u>
Judicial Effectiveness	0.024	0.074

- **Misclassified as developed countries** :

  Chile, Croatia, Hong Cong*, Lithuania, Macau*, Malaysia, Malta, Mauritius,

  Qatar, Slovakia, Taiwan, UAE, Uruguay

- **Misclassified as underdeveloped countries** :

  Greece, Turkey

- Countries with (*) are autonomous territories.

- Greece and Turkey have unemployment % as 21.5 and 11.3 respectively.

- Highest probability of misclassification is for Taiwan, 0.981.

- Croatia, Slovakia and Uruguay have high unemployment %, Croatia has the highest one, 11.2. For other 10 countries, it is < 7, but high scores on other variables compensate the effect (which is same as Italy, a developed country with unemployment % 11.3).
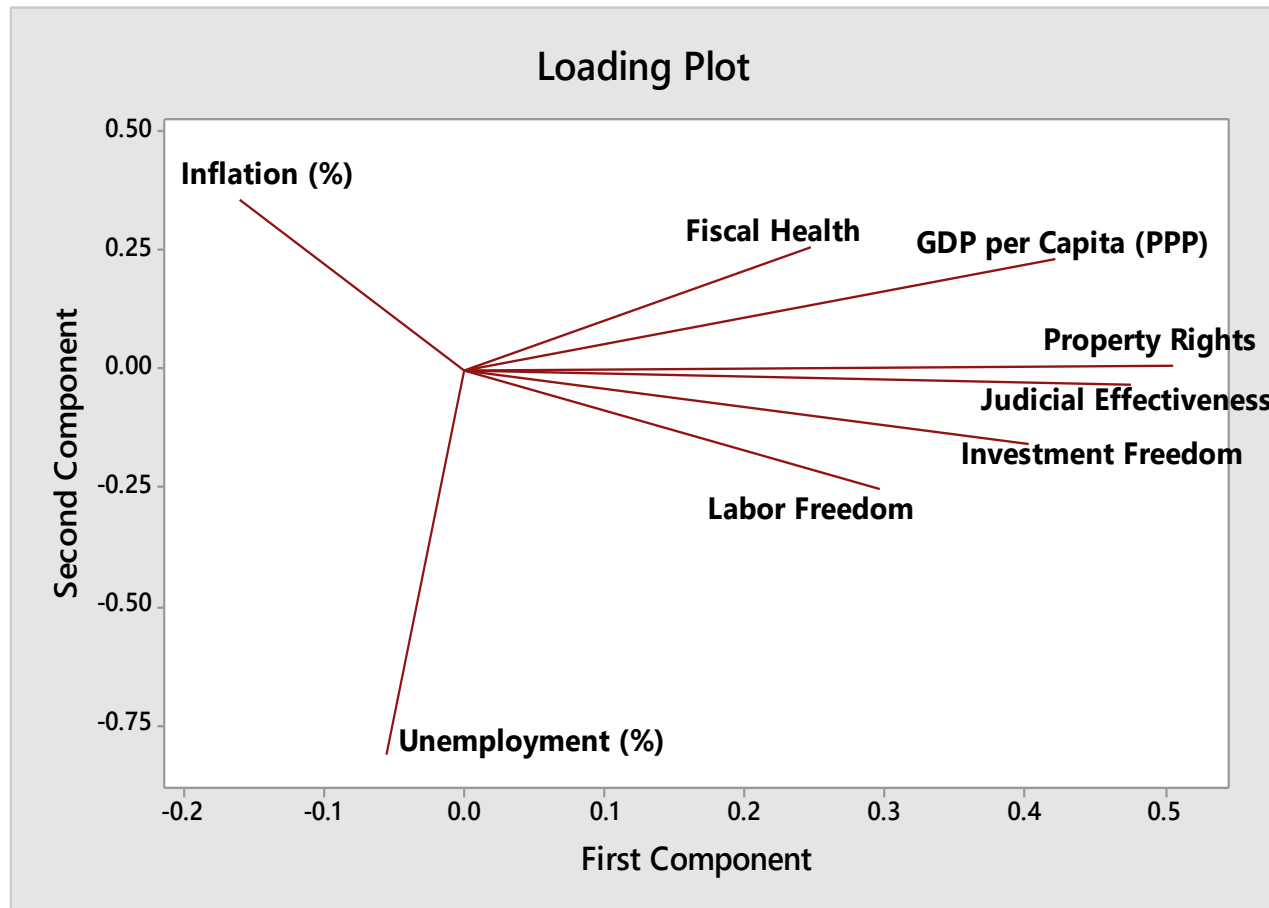
Principal Components Analysis

- First five PCs explain more than 80% of variation, contribution of first PC is highest one.

Eigen value	3.3794	1.087	0.9887	0.8484	0.7468	0.4789	0.3264	0.1445
Proportion	0.422	0.136	0.124	0.106	0.093	0.06	0.041	0.018
Cumulative	0.422	0.558	0.682	0.788	0.881	0.941	0.982	1

- Loading plot and PCs obtained are :

Variable	PC1	PC2
GDP per Capita (PPP)	0.422	0.232
Unemployment (%)	-0.056	-0.813
Fiscal Health	0.247	0.259
Labor Freedom	0.297	-0.252
Investment Freedom	0.402	-0.16
Property Rights	0.505	0.008
Judicial Effectiveness	0.476	-0.032
Inflation (%)	-0.161	0.357

Score Plot
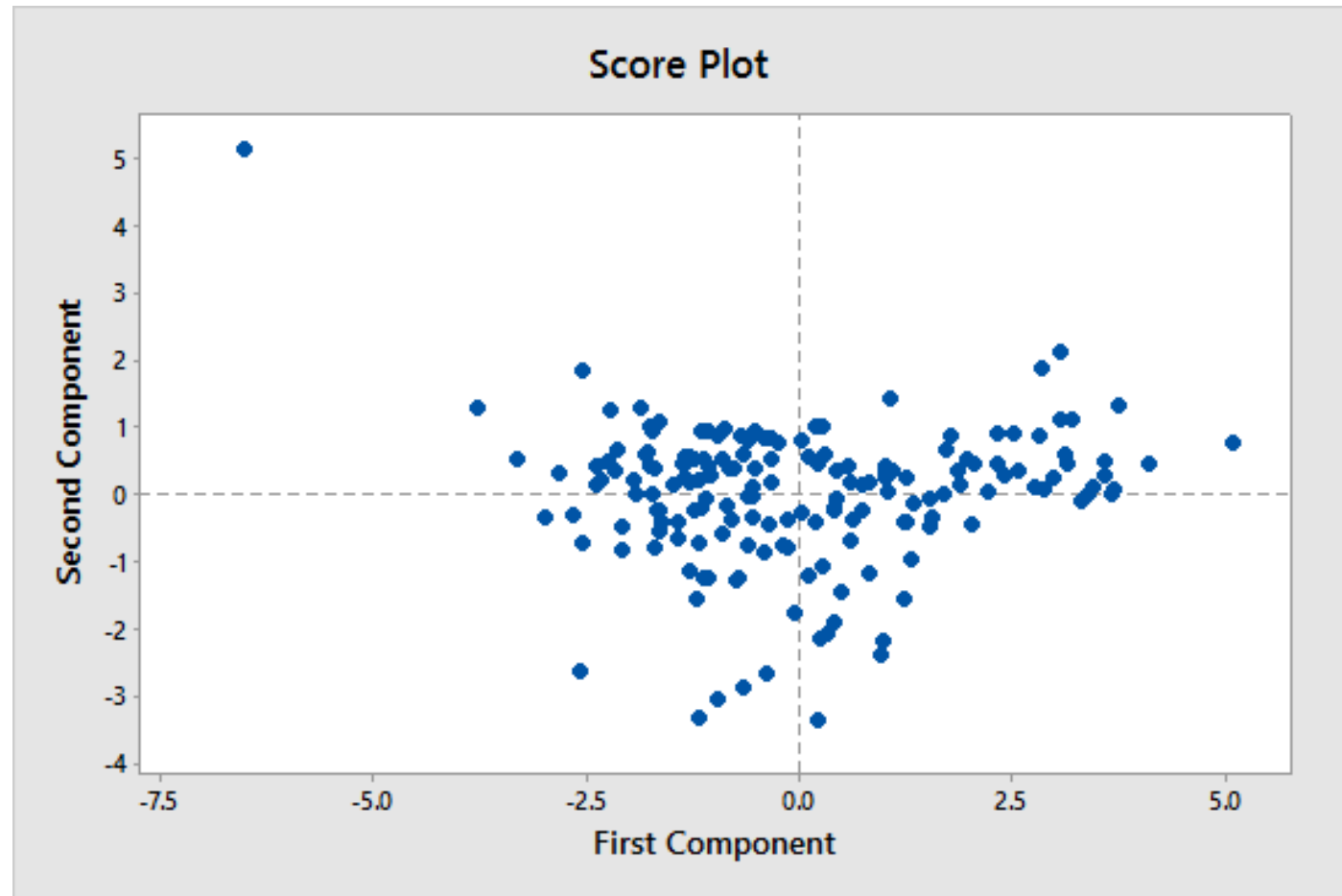
- Strong correlation among variables is observed, mainly positive.

  Property rights and Judicial effectiveness are highly positively correlated, which help GDP and Fiscal health to go up. Investment freedom and Labor freedom increase when economy goes towards stability.

- Inflation and Unemployment percentages are negatively correlated to most of the above variables.

Factor Analysis

- PCA method was used, without rotation.

- Variables used : except Unemployment % and Inflation %

- First factor explains 55% variation in the variables.
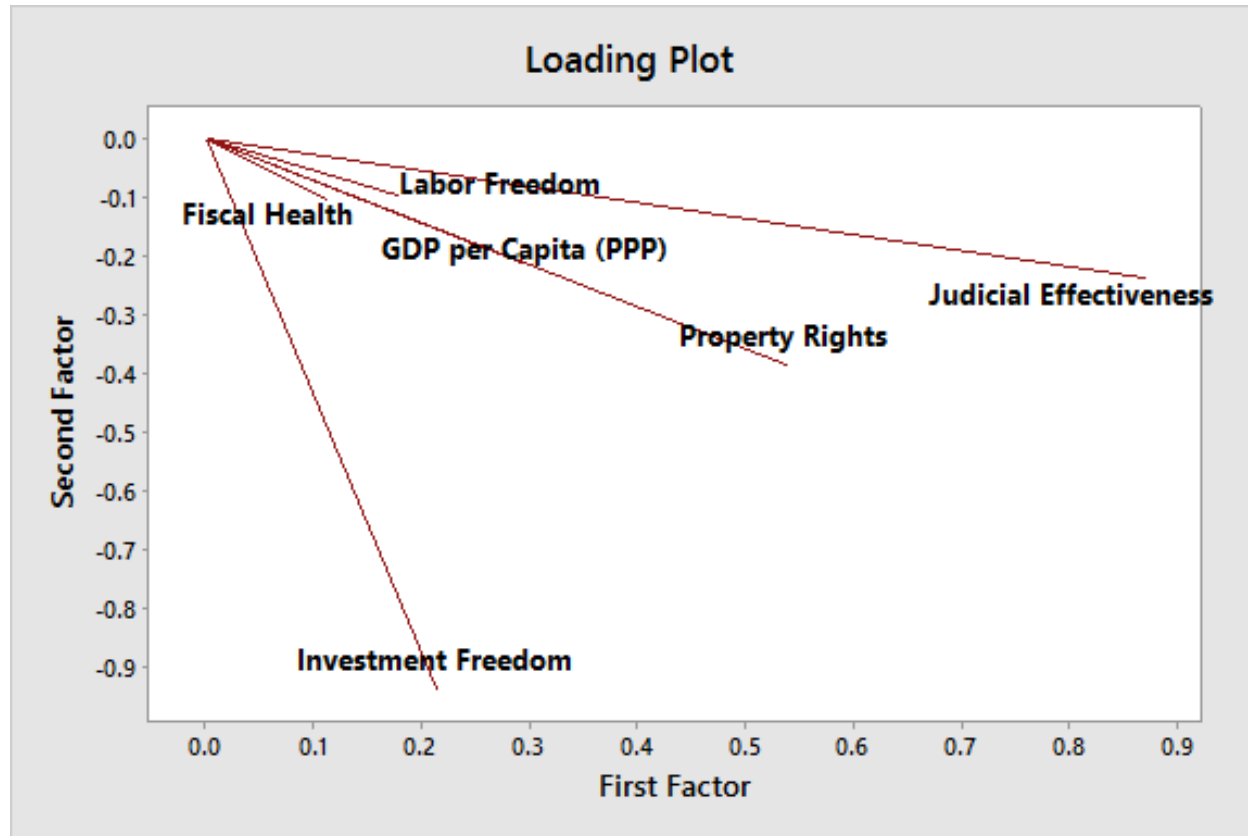
| Variable	Factor1	Factor2
GDP per Capita (PPP)	0.788	0.004
Fiscal Health	0.448	-0.772
Labor Freedom	0.542	0.521
Investment Freedom	0.738	-0.083
Property Rights	0.932	0.04
Judicial Effectiveness	0.883	0.095
Variance	3.3085	0.8857
% Var	0.551	0.148

Score Plot
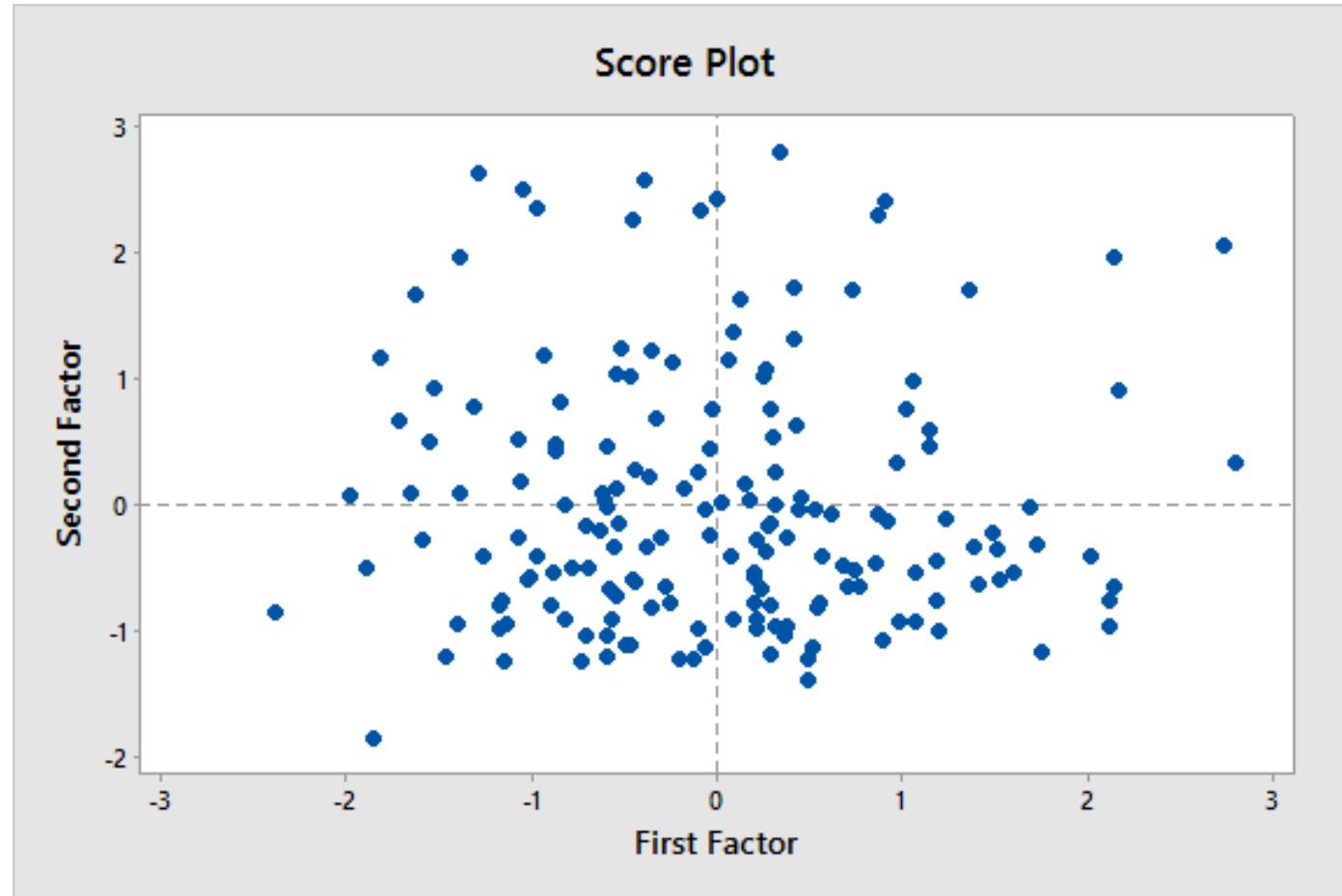
- With rotation first two factors remain important.

- Maximum impact of the first factor is observed in variables Property rights, Judicial effectiveness, GDP.

- The factors may be Education, Geographical position, Availability of natural resources, Historical background, etc.

Cluster Analysis

- K means clustering for k=3.

- "Will the developed countries be clustered together?" was the question of interest.
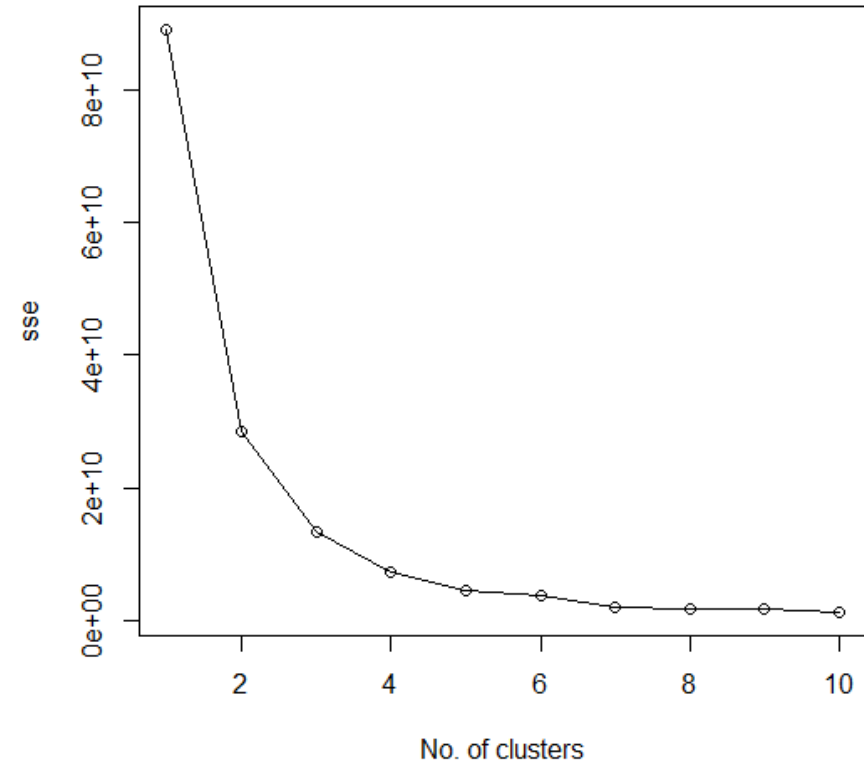
Variable	Cluster1	Cluster2	Cluster3
Fiscal Health	0.4849	0.5061	-<u>1.5493</u>
Labor Freedom	-0.1477	0.5504	-0.3669
GDP per Capita (PPP)	-0.4907	<u>1.1684</u>	-0.4329
Unemployment (%)	0.1592	-0.3161	0.0654
Inflation (%)	-0.0664	-0.1069	0.257
Investment Freedom	-0.2933	0.9	-0.4988
Property Rights	-0.4256	<u>1.2329</u>	-0.6369
Judical Effectiveness	-0.3749	<u>1.1121</u>	-0.5921

- Countries in 3rd cluster have minimum Fiscal health. (42)

- In 2nd cluster, 29 out of 31 developed countries are there. This cluster includes countries who have high values of GDP, Property rights and Judicial effectiveness. (50)

- 1st cluster has countries with all moderate scores, includes 2 Developed countries, Greece and Turkey. (82)

About India

- India is not near complete development when we consider this analysis, with parameters Fiscal health 14.7, Labor freedom 41.8, Investment freedom 40, Property rights 57.3 and Judicial Effectiveness 61.6 though the unemployment % is 3.7.

- India's GDP is good when compared to others but deteriorating Fiscal health and less freedom for investment can be seen as the obstacles in progress.

Limitations and Scope

- Lack of complete knowledge of economical terms and economic conditions of countries.

- Different data sources.

- Large coverage, collected data is gathered over large period, at different times in different countries.

- For analysis, taxation and indices for the government are not considered.

- Data shows good grounds for canonical correlation techniques.

Thank You !