This is Factor Analysis report on Military expenditures of 6 countries. Factor Analysis provide good results especially on intangible not concrete variables. And one of those is a country’s defence tendency. So, I picked the military expenditures of 6 countries in US dollars between 1962 and 2018. (<https://www.kaggle.com/nitinsss/military-expenditure-of-countries-19602019>) Those are USA, AUS, CAN, DEU, FRA, and GBR. Obviously the latter three are EU countries. So the question in my mind is if there is contrast in military expenditures between EU and Non-EU countries. (*Data source: Stockholm International Peace Research Institute (SIPRI) The World Bank Database*) (I used Factor Analysis GUI <https://github.com/aslanismailgit/Factor-Analysis-MATLAB-GUI>)

The results are interesting. Below are the loadings, rotated loadings, communalities, specific variances, cumulative variance explained by each factor.



Results:

1. PC method explains 98% of the total variance with 2 factor.
2. ML method explains 97% of the total variance with 2 factor.
3. Two factor model explains most of the common variance.
4. Specific variance after factor model is “quite” small.
5. Factor 1:
   1. (PC and ML, un-rotated) Factor 1 has the same direction and almost the same magnitude for all variables (indication of common tendency for all variables (or countries))
   2. (PC and ML, rotated) Factor 1 has “bigger” loading coefficients for USA, AUS, CAN (this will be more clear with the loading plot). There is contrast between EU and non-EU countries.
6. Factor 2:
   1. (PC and ML, un-rotated factors) Factor 2 has different direction for three countries
   2. (PC and ML, rotated factors) Factor 2 has a contrast in loadings for EU and Non-EU countries. (This will be more clear with the loading plot).
7. The rotated factors show that along the axes 1 (formerly x, now latent factor 1) three countries have different loadings than the other three. That is also true for axes 2 (formerly y, now latent factor 2). See below plots.

Conclusions and Interpretations

1. Two factor model can be retained with above results
2. First factor can be explained (named) as “General Defence Tendency”. (*Regarding Factor 1 (rotated), in fact, there is also a difference in magnitude for three countries. A more proper naming could be done, it might be “Leading defence tendency”. More subject matter expert opinion is required*)
3. Second factor can be “EU-NonEU (European) Defence Tendency”
4. Even though the rotated factor 1(s) indicate 2 different groups (contrast in magnitude), some sources says (wichern, p547) *“A general factor (that is, one on which all variables load highly) tends to be destroyed after the rotation. For this reason, in cases where a general factor is evident, an orthogonal rotation is sometimes performed with the general factor loading fixed. Stock-price example”*. So it can be kept as “General Defence Tendency”.
5. Trying to make some comments on predicted scores shown on the plots below, I think it can be said that the groups’ defence tendencies overcame the other group during some time periods. (each point representing that years defence tendency score in terms of factor 1 (General) and 2(EU), if one factor has greater value than the other one for a specific year, that means in this year that group’s tendency is higher)

Regarding the results, FA provided a good insight into the defence tendencies of countries, especially taking geographic and/or political differences into account.

To be honest, I have read about the “wow criteria” and I was a bit suspicious about that. However, with above results I see, I can say FA is powerful tool that each analyst should have in his/her backpack.

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