Statistical Analysis of the COVID's impact for Italian Software Production Startups

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1 Introduction

The selected sector is that of software production and IT consulting. The chosen companies registered as startup enterprises in 2016, ensuring they had at least 3 years of existence by 2019. Our intention is to assess which companies have improved with the impact of COVID and what the main drivers have been. We worked on excel and R for this project.

1.1 Data Research Strategy

Out of the initially selected companies in AIDA, there were 175 (as visible in the 'Research Strategy' Sheet in the Excel.xls file):

- 12 were excluded due to the lack of data in the year 2020.
- 24 were excluded due to a general lack of data.
- 15 were excluded due to the absence of specific data necessary for constructing certain indices.

The final sample consists of 124 companies for 2019 and 2020 (Visible in 'Results' sheet in the Excel.xls file).

2 Financial Ratios Selection

The financial ratios we have chosen to use are 6, appropriately adjusted when necessary and divided as follows:

- Profitability: Ebitda Margin and ROA.
- Financial Strength: Financial Independence Ratio and Third-Party Dependence.
- Liquidity: General Liquidity Ratio and CCN/ATT (appropriately standardized for assets to make it comparable).

3 PCA Analysis

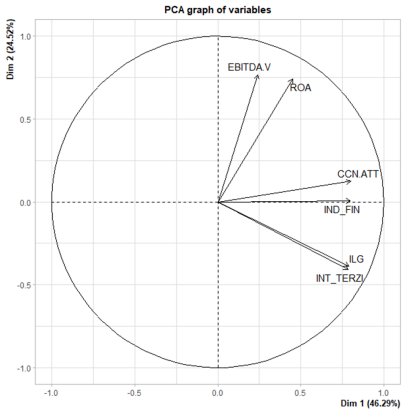
We have organized the data for 2019 and 2020 into the same column and then performed PCA. We determined the number of principal components to use, and upon examining the eigenvalues, it was evident that the third principal component did not provide significant utility. We checked (in Sheet 'coreigtot' in the Excel.xls file) if rotation was necessary, but it was not required [check Figure 1]. In the "Scores" sheet, we extracted coordinates from the map of individuals and checked the following:

- We examined which companies improved between 2019 and 2020 (Column N), those that deteriorated (Column O), and those that only improved in profitability or financial strength (Columns P and Q, respectively).

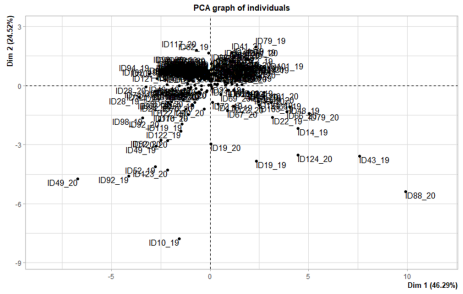
```
> pca$eig
       eigenvalue percentage of variance cumulative percentage of variance
comp 1  2.7771369             46.285614                          46.28561
comp 2  1.4713019             24.521698                          70.80731
comp 3  0.7546853             12.578089                          83.38540
comp 4  0.4458550              7.430917                          90.81632
comp 5  0.4174443              6.957405                          97.77372
comp 6  0.1335766              2.226277                         100.00000
```

Figure 1: Eigenvalues

- In Column G, companies that were in the first quadrant of the factorial map in 2020 (top right); Column I, companies that improved between 2019 and 2020 and either remained or shifted to the first quadrant. Column J indicates the quadrant in which the company was positioned in 2019.
- This allowed us to select 15 companies, considering 11 of them because 10 moved from other quadrants to the first quadrant, and one of the five already in the first quadrant exhibited significant improvement (see "1st Quad. Significance" sheet).



(a) PCA graph of variables



(b) PCA graph of individuals

4 Final Results

In the 'Wilcoxon' sheet in the Excel.xls file, we employed the non-parametric Wilcoxon test with the aim of identifying the key drivers among financial strength, liquidity, and profitability. To identify the top-performing companies, we used the criterion of the highest variation in the second PC (Profitability). Refer to the 'Final' sheet in the Excel.xls file, for more details. See the slides (In Italian) to see the best performers.

	Dim.1	Dim.2
ROA	0,451248	0,74235194
EBITDA.V	0,240834	0,76767975
ILG	0,788589	-0,3876706
CCN.ATT	0,801822	0,12387297
IND_FIN	0,797729	0,00639976
INT_TERZ	0,783804	-0,4064595

	Dim.1	Dim.2			Dim.1	Dim.2
ROA	0,451248	0,74235194		ROA	0,562778	0,967007
EBITDA.V	0,240834	0,76767975		EBITDA.V	0,300358	1
ILG	0,788589	0,38767056	>	ILG	0,983496	0,50499
CCN.ATT	0,801822	0,12387297		CCN.ATT	1	0,16136
IND_FIN	0,797729	0,00639976		IND_FIN	0,994895	0,008336
INT_TERZ	0,783804	0,40645953		INT_TERZ	0,977528	0,529465

Figure 3: Dim 1 = Financial Strength and Liquidity

Figure 4: Dim 2 = Profitability