

The secret of top ranked CEOs

Nouaille Estelle,
Caulliez Thaïs,
Poirot Maxence,
Langjahr Jules

The National French Civil Aviation University

PREV Empirical project - Spring 2022

Table of contents

- 1 Introduction
- 2 Variables
- 3 First analysis of the variables
- 4 Model on ranking
- 5 Conclusion

Table of contents

- 1 Introduction
- 2 Variables
- 3 First analysis of the variables
- 4 Model on ranking
- 5 Conclusion

Our project and database

Our project:

As students in a reputable engineering school, we headed toward this project in order to analyse and discover the career paths of the most powerful CEOs. Is there a reason one of them is better ranked than an other ? Can we model it ?

Our database:

- Studying the top 150 most successful CEOs in 2022.
This ranking is based on their individual business performance and on the company's track record on environmental, governance and social issues
- N=150 extracted in order from n°1 to n°150. All database gathered manually
- Sources : CEOWorld Magazine, Wikipedia, LinkedIn and Wallmine

Table of contents

- ① Introduction
- ② Variables
- ③ First analysis of the variables
- ④ Model on ranking
- ⑤ Conclusion

Our variables - CEOs characteristics

Variable	Details
RANKING	Rank of the CEO
AGE	AGE of the CEO
FORTUNE	Fortune of the CEO (billions of dollars)
COMPENSATION	Compensation of the CEO (millions of dollars)
PH	Parental heritage (0=No, 1=Yes)
ORIGIN	Country of origin of the CEO (0=US, 1=Europe, 2=Asia, 3=Oceania 4=Africa, 5=America (except US), 6=Russia)
FEMALE	The CEO is a women (0=No, 1=Yes)
WHITE SKIN	the CEO is white skinned (0=No, 1=Yes)

Our variables - Career paths

STUDY	Formation Sector (0=MBA, 1=Engineering, 2=Economics, 3=Laws 4=Science, 5=Arts, 6=Finance, 7=Management 8=Accountancy)
YSTUDY	Time spent studying (0=Less than 5 years, 1=Plus or Equals to 5 years)
CEO1	Number of years in the company before being CEO
CEO2	Number of years of work before being CEO
CEO3	Number of years being CEO
UNIVERSITY	University where the CEO studied (0=Ivy League, 1=Top 200, 2=Other)
BC	The CEO created his company (0=No, 1=Yes)

Our variables - Companies

PROFIT	Profit of the company (billions of dollars)
EMPLOYEES	Number of employees in the company
SECTOR	Sector of activity of the company (0=Computer and Informatics, 1=Banking 2=Petrol and Energy, 3=Transport, 4=Finance 5=Health Care, 6=Food and Beverages, 7=Clothing 8=Entertainment, 9=Consumer Goods)
HQ	Country where the company is headquartered (0=US, 1=Europe, 2=Asia, 3=Oceania, 4=Africa 5=America (except US), 6=Russia)

Table of contents

- 1 Introduction
- 2 Variables
- 3 First analysis of the variables**
- 4 Model on ranking
- 5 Conclusion

CEOs characteristics

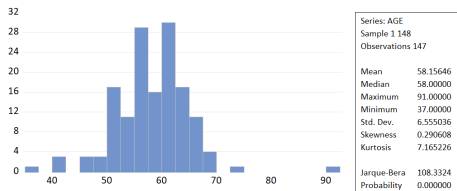


Figure: Histogram AGE

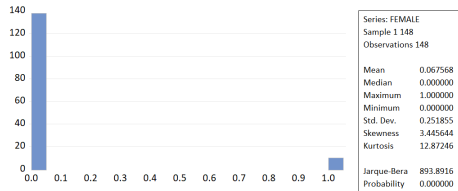


Figure: Histogram FEMALE

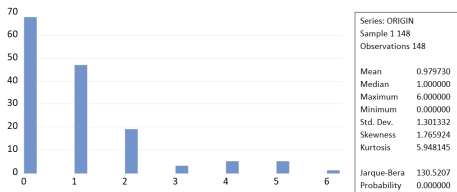


Figure: Histogram ORIGIN

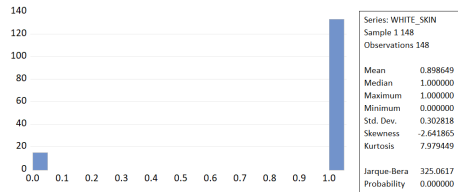


Figure: Histogram WHITE SKIN

Observations

Age: Most CEOs are between 50 and 70 years old. Exceptions are Mark Zuckerberg (37 yo) and Warren Buffet (91 yo)

Female: Only 6,7% of the 148 top CEOs are Women

Origin: Most of them come from the US, Europe and Asia

White Skin: Only 10% are non White skinned people

Parental Heritage: Out of the 74 observations, more than 50 CEOs come from a favorable childhood and were helped financially by their parents

CEOs characteristics

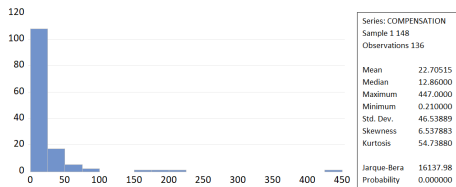


Figure: Histogram COMPENSATION

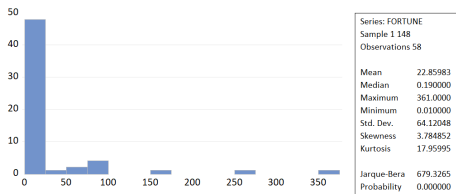


Figure: Histogram FORTUNE

Compensation Remarks

Most of the CEOs earn between 210,000 \$ and 25 millions \$ a year

Fortune Remarks

Only 58 observations. We could only find the fortune for the top ranking CEOs. The mean is 22,85 billions \$

CEOs education and career paths

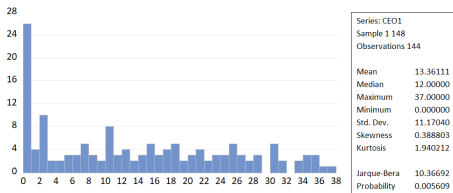


Figure: Histogram CEO1

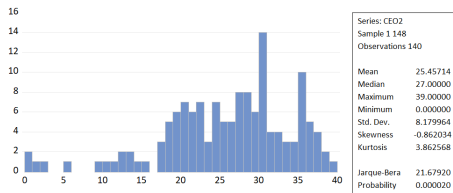


Figure: Histogram CEO2

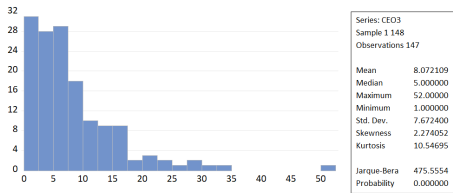


Figure: Histogram CEO3

CEO Remarks

Only 26 of these CEOs never worked in the company before (12 are BCs)
They worked in average 25 years before becoming CEO
70% of them were promoted CEO after 2010

CEOs education and career paths

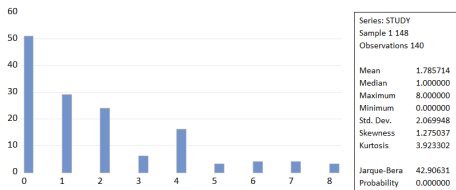


Figure: Histogram STUDY

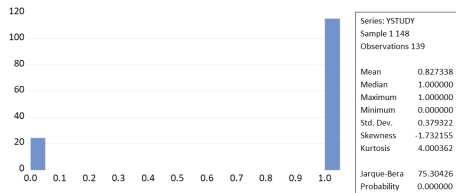


Figure: Histogram YSTUDY

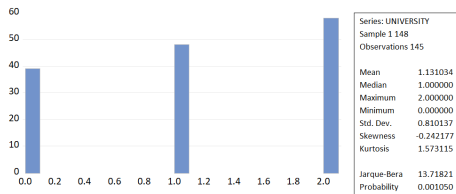


Figure: Histogram UNIVERSITY

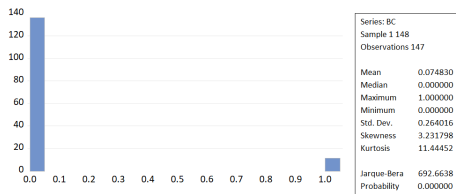


Figure: Histogram BC

Observations

Study: 80% of the CEOs graduated from an MBA, Engineering or Economics

Years Study: More than 80% of the CEOs studied for more than 5 years

University: CEOs are more or less equally distributed between Ivy leagues, top 200 Universities and others

Business Creator: Only 12 of them are entrepreneurs and launched their own business.

The Average Company

Profit: 31 billions \$

Employees: 154 000

Sector: Most probably around the sectors of Computer & Informatics, Finance or Healthcare

Headquarters: Most probably located in the US or in Europe

Expected marginal effects

Variable	Expected Marginal Effects
YSTUDY	-
FORTUNE	--
COMPENSATION	--
PH	-
CEO2	-
CEO3	--
UNIVERSITY	+
FEMALE	++
WHITE SKIN	-
PROFIT	--
HQ	+

Unknown impact on RANKING:

AGE, STUDY, CEO1, ORIGIN, BC, EMPLOYEES, SECTOR

Table of contents

- ① Introduction
- ② Variables
- ③ First analysis of the variables
- ④ Model on ranking
- ⑤ Conclusion

Our first model - Midway into the project

First thoughts

At this moment in the project:

- We performed our first model with the 18 explanatory variables but found irrelevant values for $R^2 \geq 80\%$ and only 28 included observations due to the lack of information for **FORTUNE** and **PH**
- What so ever, our F-Statistic was pretty low and the model was not relevant at all

Solutions

We will remove the explanatory variables **FORTUNE** and **PH** for the second model

Second model - Eviews modelisation

Dependent Variable: RANKING
Method: Least Squares
Date: 04/24/22 Time: 17:55
Sample (adjusted): 7 147
Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	57.81823	41.87841	1.380621	0.1704
AGE	-0.058544	0.905084	-0.064683	0.9486
CEO1	-0.480452	0.376587	-1.275806	0.2049
CEO2	-0.458045	0.852629	-0.537215	0.5923
CEO3	-0.788661	0.854754	-0.922675	0.3583
COMPENSATION	0.043207	0.152988	0.282420	0.7782
EMPLOYEES	-3.58E-05	1.36E-05	-2.641603	0.0095
FEMALE	14.61507	14.20824	1.028633	0.3061
HQ	5.610071	4.508342	1.244376	0.2162
ORIGIN	-0.422414	4.133821	-0.102185	0.9188
PROFIT	0.048101	0.097382	0.493939	0.6224
SECTOR	0.205621	1.543451	0.133222	0.8943
STUDY	1.470908	1.927210	0.763232	0.4471
UNIVERSITY	2.990655	4.945078	0.604774	0.5467
WHITE_SKIN	27.24916	15.33357	1.777092	0.0785
YSTUDY	19.48027	10.81561	1.801126	0.0746

R-squared	0.163992	Mean dependent var	79.05042
Adjusted R-squared	0.042243	S.D. dependent var	40.32303
S.E. of regression	39.46216	Akaike info criterion	10.31307
Sum squared resid	160398.0	Schwarz criterion	10.68674
Log likelihood	-597.6279	Hannan-Quinn criter.	10.46481
F-statistic	1.346969	Durbin-Watson stat	0.239570
Prob(F-statistic)	0.188608		

Interpretations

- We only have EMPLOYEES, WHITE SKIN and YSTUDY significant at the 90% level which is worst than our first model
- R^2 is also smaller but closer to our expectation
- We now have 80% of included observations but the model is not relevant according to the F-Statistic

Figure: Second model on RANKING

How to improve our model?

Correlation Matrix

Correlation $\geq 70\%$: BC - CEO1 = 71%

Correlation $\geq 50\%$: HQ - ORIGIN = 67%, CEO2 - CEO3 = 54%
and SECTOR - STUDY = 51%

Interpretation:

- When a CEO is a Business Creator, it reduces the value of CEO1 to 0
- CEOs generally have their company located in their birth country
- Total work years = Work years before CEO + Work years since CEO = CEO2 + CEO3, that is why it is not relevant to have both variables
- CEOs generally work in a company related to their studies

Solution

We will remove the explanatory variable **BC, ORIGIN, CEO2, CEO3, SECTOR** and **STUDY**

Impact-less variables

After analysing the coefficients and the significance of the variables, we decided to remove:

- **From the CEOs Characteristics: AGE and COMPENSATION**
- **From the CEOs companies: PROFIT**

Explanations

We did so because the distribution of these variables seemed randomly distributed between the CEOs and had no impact on the ranking.

Our third model - Eviews modelisation

Dependent Variable: RANKING

Method: Least Squares

Date: 04/24/22 Time: 18:25

Sample (adjusted): 3 148

Included observations: 135 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	33.72431	16.25948	2.074133	0.0401
CEO1	-0.448735	0.316759	-1.416647	0.1590
EMPLOYEES	-3.61E-05	1.16E-05	-3.115155	0.0023
FEMALE	22.37455	13.03706	1.716227	0.0886
HQ	6.463767	3.175479	2.035525	0.0439
UNIVERSITY	7.953024	4.401073	1.807065	0.0731
WHITE_SKIN	24.67996	11.76033	2.098577	0.0378
YSTUDY	21.44829	9.091933	2.359046	0.0198
R-squared	0.171105	Mean dependent var		76.46667
Adjusted R-squared	0.125418	S.D. dependent var		41.53093
S.E. of regression	38.83935	Akaike info criterion		10.21418
Sum squared resid	191578.8	Schwarz criterion		10.38634
Log likelihood	-681.4568	Hannan-Quinn criter.		10.28414
F-statistic	3.745148	Durbin-Watson stat		0.273827
Prob(F-statistic)	0.001012			

Figure: Third model on RANKING

Interpretations

- All of our variables are significant at the 90% level at least (unless CEO1)
- R^2 and the number of included observations have increased
- Probabilities increased significantly
- Relevant model according to the F-Statistic but still low

Testing the classical assumptions

Normality of the errors

We performed a Jarque-Bera test at the 95% level:

$$\left\{ \begin{array}{l} n - k = 135 - 8 = 127 \\ SK = 0,11772 \\ KT = 1,814484 \\ JB^E = 7,98 \end{array} \right. , JB^{CORRECTED} = 7,73 \geq \chi^2(2) = 5,99$$

We reject normal errors.

Heteroskedasticity

We performed a White nR^2 test at the 95% level ($m=18$):

$$nR^2 = 33,49 \geq \chi^2(18) = 28,87$$

We reject Homoskedasticity, so there's Heteroskedasticity of unknown form

Marginal effects evolution

Variable	Expectation	Reality
FORTUNE	--	X
COMPENSATION	--	X
PH	-	X
CEO2	-	X
CEO3	--	X
PROFIT	--	X
UNIVERSITY	+	+
HQ	+	+
FEMALE	++	++
YSTUDY	-	++
WHITE SKIN	-	++
CEO1	≈ 0	≈ 0
EMPLOYEES	≈ 0	≈ 0

Interpretation of some marginal effects

University - Expected

$M.E = 8 \geq 0 \equiv \text{UNIVERSITY} \uparrow \rightarrow \text{RANKING} \uparrow$

It is logic since the quality of the University decreases when UNIVERSITY \uparrow

Female - Expected

$M.E = 22,37 \geq 0 \equiv (\text{FEMALE} = 1) \rightarrow \text{RANKING} \uparrow$

It underlines that there is a significant problem of gender equality among the Top 150 CEOs

Years of study - Unexpected

$M.E = 21,45 \geq 0 \equiv (\text{YSTUDY}=1) \rightarrow \text{RANKING} \uparrow$

Incoherent since studying more would normally imply a better ranking

Table of contents

- 1 Introduction
- 2 Variables
- 3 First analysis of the variables
- 4 Model on ranking
- 5 Conclusion**

Explanatory variables

- CEOs success not driven by compensation or fortune
- Our last model uses only 7 out of the 18 variables we originally had
- Understood the impact of skin color and gender inequality on their success

Our final model

- Model satisfactory enough to discern what drives the success of these CEOs
- Satisfying results in terms of significance of the variables and coefficients.
The classical assumptions are validated

Possible improvement

- Enlarge the variety of information with less known CEOs
- Maximize the number of included observations by avoiding incomplete variables such as FORTUNE and PH

Thank you for your attention!
Questions?