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Relationship between Instagram Following and Salary

Student Name

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Course

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Date

Relationship between Instagram Following and Salary

Research question

Is there a relationship between top celebrities' and fashion models' Salary and their Instagram following?

Introduction

Social media growth has impacted many people's lives, especially celebrities and fashion designers. Instagram is one of these platforms where celebrities maximize their influence by showcasing various fashion and designs from various parts of the globe. In December 2021, when I watched the model of the year awards, I noticed that most celebrities who earn a lot of money have a huge following on their social accounts, such as Instagram. Through this information, I decided to compute the correlation between celebrities' Instagram following and SalarySalary.

Mathematical exploration

In this IA, various mathematical tools will be applied. Some of these tools include the Pearson correlation method, which will be used to find the direction and strength of the relationship. The scatter plot is used to represent raw data in graphical form, which also shows the direction of the correlation (positive or negative). An uphill trend shows a positive correlation, while a downhill trend shows a negative trend. After data collection, I will also use the collected data to find the mean and standard deviation.

Hypothesis

In this exploration, I predict that there is a positive association between Instagram following and celebrities' salaries. As Instagram following increases, the salary also increases. The scatter graph will have a positive graph line, still confirming the positive correlation between Instagram following and Salary.

Aim

This internal assessment aims to use mathematical tools to find the relationship between celebrities' salary and their corresponding Instagram following. Some of the mathematical tricks used include; Pearson correlation, scatter graph, and Chi-square methods.

Raw data

To compute the relationship between fashion models' salaries and Instagram following, I collected data for the top 15 celebrities in the world. The data will comprise 5 models from England (Europe), the United States of America (Central America), and Brazil (South America), as recorded in table 1 below;

Table 1: Raw data

Name	Nationality	Instagram followers (million)	Salary (million USD)
Gisele Bündchen	Brazil	18.5	40.0
Adriana Lima	Brazil	13.9	11.0
Alessandra Ambrosio	Brazil	10.7	10.4
Isabeli Fontana	Brazil	1.2	4.0
Ana Beatriz Barros	Brazil	0.451	1.0
Kendall Jenner	American	21.7	40.0
Bella Hadid	American	48.9	19.0

Adriana Lima	American	13.9	11.0
Chrissy Teigen	American	36.8	12.0
Liu Wen	American	5.5	7.0
Cara Delevingne	England	43.4	10.73
Rosie Huntington	England	14.5	8.71
Kate Moss	England	1.3	6.72
David Gandy	England	1.0	5.37
Naomi Campbell	England	12.1	4.0

Statistical Analysis

Based on the data above, I decided to use a mathematical approach to calculate the mean/average and the standard deviation.

Mean

This is the average value of the total dataset, and it can be calculated using the following;

$$A = \frac{\sum x}{n}$$

Given

A = average/mean

x = Instagram followers and SalarySalary

N =Total number of models

I used the above formula to develop the following table;

Table 2: Average/mean table

Instagram following (million)	Salary (million USD)
18.5	40.0
13.9	11.0
10.7	10.4
1.2	4.0
0.451	1.0
217	40.0
48.9	19.0
13.9	11.0
36.8	12.0
5.5	7.0
43.4	10.73
14.5	8.71
1.3	6.72
1.0	5.37
12.1	4.0
$\sum x = 439.151$	$\sum x = 190.93$

$$A . m(\text{instagram})\text{followers} = \frac{439.151}{15} = 29.27\text{million}$$

$$A . m(\text{salary}) = \frac{190.93}{15} = \$12.667 \text{ million}$$

It can be noted that, on average, each celebrity has 29.27million followers, and at the same time, each celebrity earns an average of 12.667 USD.

Standard deviation

The formula to calculate the standard deviation is given below;

$$\sigma = \sqrt{\frac{\sum (x_1 - \mu)^2}{N}} \quad (\text{McGrath et al., 2020})$$

Where;

σ = S.D

N= number of celebrities

x_1 = individual value (Instagram followers and SalarySalary)

Applying the above formula, I developed the following table;

Table 3: Standard deviation table

Instagram (million)	$\sum (x_1 - \mu)^2$	Salary (million USD)	$\sum (x_1 - \mu)^2$
18.5	115.9929	40	744.1984
13.9	236.2369	11	2.9584
10.7	344.8449	10.4	5.3824
1.2	787.9249	4	76.0384
0.451	830.534761	1	137.3584
217	35242.5529	40	744.1984
48.9	385.3369	19	39.4384
13.9	236.2369	11	2.9584
36.8	56.7009	12	0.5184
5.5	565.0129	7	32.7184
43.4	199.6569	10.73	3.9601
14.5	218.1529	8.71	16.0801

1.3	782.3209	6.72	36
1	799.1929	5.37	54.0225
12.1	294.8089	4	76.0384
	41095.5074		1971.869

$$\sigma(\text{instagram following}) = \sqrt{\frac{41095.5074}{15}} = 52.34$$

$$(\text{Salary}) = \sqrt{\frac{1971.869}{15}} = 11.46$$

Chi-square

This is a method that is used to find the level at which variables depend on each other.

The formula to calculate Chi-square;

$$x^2 = \sum \frac{(O_i^2 - E_i^2)}{E_i} \quad (\text{Connelly, 2019})$$

Given that;

$$E_i = \text{Listed value}$$

O_i =hypothetical value

$$x^2 = \text{Chi - squared value}$$

Prior to computing the correlation coefficient, it is imperative to state both the alternative and null hypotheses, as shown below;

H_0 =Salary is independent of the Instagram following ($\mu \leq 0.5$)

H_1 = SalarySalary is dependent on the Instagram following ($\mu > 0.5$)

I applied the topic above to develop the following table;

(million)	Observed value (O)	Expected value (e)	Chi-square $x^2 = \frac{(O_i^2 - E_i^2)}{E_i}$
18.5	40	12.728	112.9791
13.9	11	12.728	-3.2214
10.7	10.4	12.728	-4.2302
1.2	4	12.728	-11.4709
0.451	1	12.728	-12.6494
21.7	40	12.728	112.9791
48.9	19	12.728	15.63466
13.9	11	12.728	-3.2214
36.8	12	12.728	-1.41436
5.5	7	12.728	-8.87822
43.4	10.73	12.728	-3.68236
14.5	8.71	12.728	-6.76759
1.3	6.72	12.728	-9.18004
1	5.37	12.728	-10.4624
12.1	4	12.728	-11.4709
			154.9436

The chi-square from the above table is 154.9436, which is > 0.5 . Thus the alternative hypothesis, which states that "Salary is dependent on the Instagram following," will be adopted. The null hypothesis states that "Salary is independent of the Instagram following" will be ignored.

Pearson correlation

The Pearson method is used to calculate the relation between dependent and independent variables within a dataset. To compute the correlation coefficient of the above data;

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\left[\sum (x - \bar{x})^2 \sum (y - \bar{y})^2 \right]}}$$

Where;

r = link between salary and Instagram following

X = Instagram following

\bar{x} = Average number of Instagram followers

y = Model's Salary

\bar{y} = average model's Salary

I used the above formula to develop the following table;

followers (x)	Salary	dx(x- \bar{x})	dy (y- \bar{y})	dx dy	(dx) ²	(dy) ²
18.5	40	-10.77	27.28	-293.806	115.9929	744.1984
13.9	11	-15.37	-1.72	26.4364	236.2369	2.9584
10.7	10.4	-18.57	-2.32	43.0824	344.8449	5.3824
1.2	4	-28.07	-8.72	244.7704	787.9249	76.0384
0.451	1	-28.819	-11.72	337.7587	830.5348	137.3584
217	40	187.73	27.28	5121.274	35242.55	744.1984
48.9	19	19.63	6.28	123.2764	385.3369	39.4384
13.9	11	-15.37	-1.72	26.4364	236.2369	2.9584

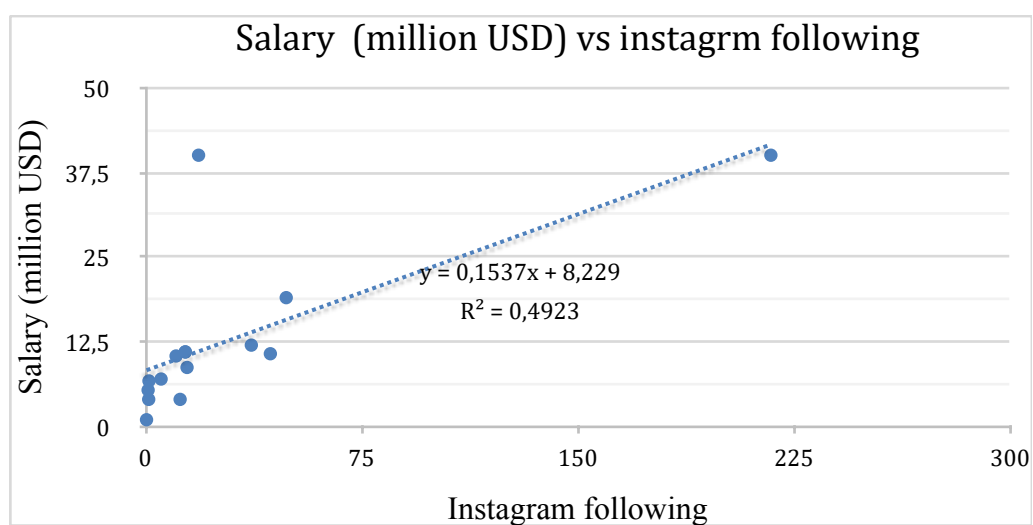
36.8	12	7.53	-0.72	-5.4216	56.7009	0.5184
5.5	7	-23.77	-5.72	135.9644	565.0129	32.7184
43.4	10.73	14.13	-1.99	-28.1187	199.6569	3.9601
14.5	8.71	-14.77	-4.01	59.2277	218.1529	16.0801
1.3	6.72	-27.97	-6	167.82	782.3209	36
1	5.37	-28.27	-7.35	207.7845	799.1929	54.0225
12.1	4	-17.17	-8.72	149.7224	294.8089	76.0384
29.27673	12.72867			6316.208	41095.51	1971.869

$r = 0.701$

From the computation above, it is worth noting that the association coefficient is 0.701. This clarifies that there is a strong positive correlation between the variables; whereas Instagram follows advances, the Salary also increases.

Scatter plot

The data in table 1 can be plotted in a scatter plot, as shown in figure 1 below;



From the graph in the figure above, it can be realized that as the number of Instagram following escalates, the SalarySalary also increases. The graph line above indicates an escalation trend, still confirming that there is a positive link between Instagram following and Salary. The coefficient value from the scatter plot above is;

$$R^2 = 0.4923$$

$$R = \sqrt{0.4923}$$

$$R = 0.701$$

The coefficient value from the above computation is 0.701, indicating that there is a positive correlation between Instagram following and Salary. The calculation concludes that there is a positive link between the two variables and thus confirms my hypothesis, which stated that "there is a positive correlation between celebrity earnings/salary and Instagram following."

Conclusion

The primary objective of this internal assessment was to investigate if there is a relationship between celebrity salary and Instagram following. Before the exploration, I predicted that "there is a positive correlation between celebrity earnings/salary and Instagram following." Various methodologies were used to calculate the coefficient, such as; scatter graphs and Pearson methods. In both methods, it was evident that there is a strong positive association/correlation between celebrities' salaries and Instagram following. As the Instagram following increases, the celebrity's SalarySalary also increases and thus confirming my hypothesis.

Evaluation

The IA was great as the aim, "to use mathematical tools to find the relationship between celebrities' salary and their corresponding Instagram following," was achieved. However, various reasons have contributed to some errors in this exploration. There are various social media platforms such as; Facebook, YouTube, and Tiktok platforms. In this exploration, only the Instagram platform was used. In future exploration, the research should also consider the relationship between salary and social media following.

References

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