

CORRELATION BETWEEN INVESTMENT AND INCREASE IN THE NUMBER OF EMPLOYEES IN FACEBOOK SOCIAL NETWORK

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DOI: <https://doi.org/10.31410/limen.2018.360>

Abstract: *One of the main factors through which we value the performance of a business organization is with the rising number of employees. This is a factor that work in the organization is going well. If we want the rising number of employees to be stable than it should be done proportionally with the rising number of investments in organization and its development. Statistics is a science of numbers which helps us finding a relation or in common between these two occurrences. Company that we are going to find this relation between two occurrences is Inc. Facebook. Analyses of its studying and correlation will be extended in a period of years, precisely from 2009. Inc. Facebook was taken as a case study because this company is very serious and also for the fact that it has above one billion users of its services and from the beginning of 2004 it had an increase of employees and investments. From this study we will see how this relation between these two occurrences is strong and almost perfect so it will have the maximal value of 1, or it will come near it. As lower from 1 as it can get then also the strength of the connection weakness. Results from this study are very important because based on trending investment we can predict future investments.*

Keywords: *correlation, employees, investments, Facebook, strength, etc.*

INTRODUCTION

Facebook is an educational and entertaining web page, which belongs to Inc Facebook., located in Palo Alto, California. Facebook is a social media that started in February 2004 and is operated by Inc. Facebook. Users can add people as friends and sent their messages, and update their personal profile to inform friends about themselves. Beside this, users can join networks organized from work, school or college. Facebook name comes from books that are published from American universities and there are written names of all the students of that university, this is done in order to recognize other students there. Everyone above 13 years old can be a Facebook user.

Facebook was faced with some problems. It was banned in some counties including Pakistan, Syria, China, Vietnam and Iran. It was also banned in many work places to discourage employees that lose most of the time using this service [1].

1. HOW EVERYTHING STARTED

Mark Zuckerberg was 19 years old when he started “Facebook” from his dormitory room in Harvard. Within 24 hours 1000 people from his school were signed up and after one month half of his school members had a Facebook profile. Today after 12 years this web page has above one and a half billion users all over the world and Zuckerberg is the youngest billionaire in the world – with a wealth around 1.5 billion dollars [2]. Zuckerberg created not only a social

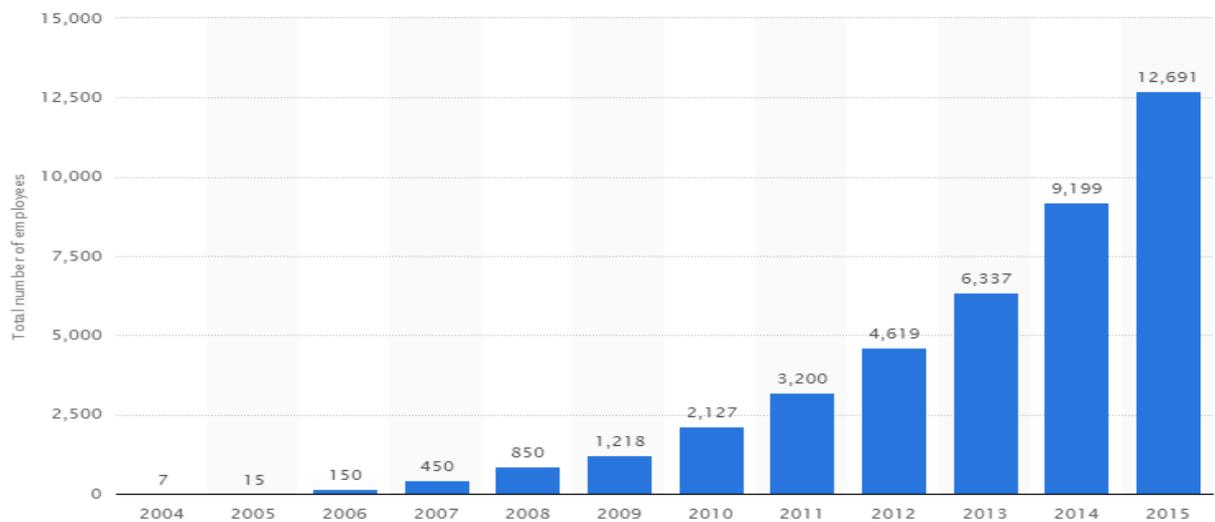
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network that shows us a person's life, but also expands it. Facebook phenomenon was represented also from politicians, and from artists. Everyday 15 million users change their status on "Facebook" and 850 million photos are added every month. User's average number of friends is 130. In the beginning people were worried to show their identity on internet, but now some of them show various details from their life. Although with a wealth from 1.5 billion dollars "Facebook" has to work hard to adapt technology and to have financial winnings.

"Facebook" on March 31, 2016, had exactly 13.598 employees [3].

1.1. NUMBER OF EMPLOYEES THROUGH YEARS

Number of employees in Inc Facebook during the last years is shown below [4].



1.2 DEVELOPMENT OVER THE YEARS

2004

February: Mark Zuckerberg and co-founder Dustin Moskovitz, Chris Hughes and Eduardo Saverin launched Facebook through their dormitory room in Harvard.

March: Facebook expands from Harvard to Yale, Stanford and Columbia.

June: Facebook shifts its base where it's located also this day, Palo Alto, California.

September: Wall application is added in Profile page.

December: Facebook reaches one million active users.

2005

August: Company officially changed its name from thefacebook.com in Facebook.

October: Photo application is added.

December: Facebook reaches more than 5.5 million active users.

2006

December: Facebook reaches more than 12 million active users.

2007

April: Facebook reaches more than 20 million active users.

October: Facebook reaches more than 50 million active users.
 October: Facebook offers Facebook platform for mobile phones.

2008

February: Facebook is offered in French and Spanish language.
 March: Facebook is offered in German language.
 April: Facebook is offered in 21 languages.
 April: Chat is offered in Facebook.
 August: Facebook reaches more than 100 million active users.

2009

January: Facebook reaches more than 150 million active users.
 February: Facebook reaches more than 1750 million active users.
 February: Facebook adds “Like” button.
 February: Facebook reaches more than 200 million active users.
 July: Facebook reaches more than 250 million active users.
 December: Facebook reaches more than 300 million active users.

2010

February: Facebook reaches around 400 million active users.
 July: Facebook reaches around 500 million active users.

2011

July: Facebook reaches around 750 million active users.

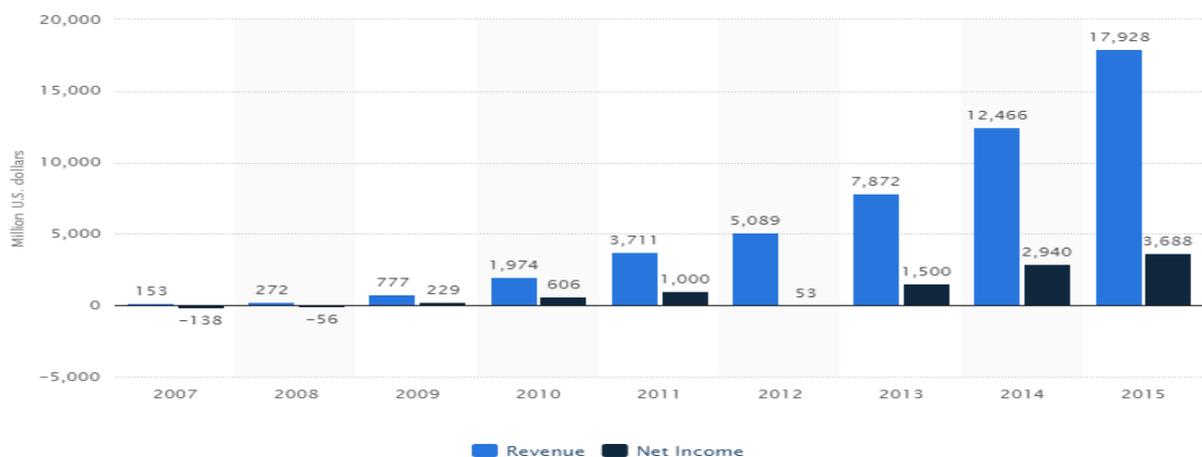
2012

October: Facebook reaches more than 1 billion active users.

2016

March: Facebook reaches more than 1.65 billion active users.

1.3 ANNUAL INCOME



Most of the incomings in Facebook are made from advertisements in so-called banner, and all these ads are from advertising inventory in Microsoft, since Microsoft is the main advertising partner of Facebook [5].

2. INVESTMENTS BY SERIES

List of Facebook investors is as below [6]:

Month/Year	Company	Sum (millions)
09/2004	Peter Thiel	0.5\$
05/2005	Accel Partners	12.7\$
04/2006	Greylock Partners Meritech Capital Partners The Founders Fund	27.5\$
10/2007	Microsoft	240\$
11/2007	Li Ka -shing	60\$
01/2008	European Founders Fund	15\$
05/2008	TriplePoint Capital	100\$
05/2009	Digital Sky Technologies	200\$
06/2010	Elevation Partners	120\$
12/2010	Goldman Sachs Group	500\$ [7]
01/2011	Goldman Sachs Group	1.000\$ [8]

From 18th of May 2012 Inc. Facebook joined stock-market, precisely NASDAQ. After joining stock-market also the incomings started to multiply and in 2012 the incomings were 5 billion dollars [9].

Correlation factor. Through this factor we find the strength of connections between outer investments in Facebook and increasing number of employees in this company. Strength will be analyzed only 3 years before Facebook joined stock-market. Correlation factor is as below:

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

We will observe this factor in these years, 2009, 2010 and 2011, and calculations are shown below.

x-investments by series (values in millions)

y-employees number (values in millions)

n-number of years

Years	x	y	$(x - \bar{x})$	$(x - \bar{x})^2$	$(y - \bar{y})$	$(y - \bar{y})^2$	$\frac{(x - \bar{x})}{(y - \bar{y})}$
2009	200	0.001218	-406.7	165404.9	-0.000963	0.00000093	0.3921
2010	620	0.002127	13.35	178.2225	-0.000055	0.0000000303	-0.00074
2011	1.000	0.0032	393.35	154724.2225	0.001018	0.000001034	0.40043
Σ	1.820	0.006545	0	320307.335	0	0.00000197	0.792

$$\bar{x} = \frac{\sum x}{n} = \frac{1.820}{3} = 606.7 \qquad \bar{y} = \frac{\sum y}{n} = \frac{0.006545}{3} = 0.0022$$

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}} = \frac{0.792}{\sqrt{320307.335 * 0.00000197}} = \frac{0.792}{\sqrt{0.631}} = \frac{0.792}{0.794} = 0.997 \approx 1$$

This result shows that there is a strong connection between increasing investments and increasing number of employees in company. Connection or correlation is almost perfect.

3. DEVELOPMENT TENDENCIES

In the table below we are showing investments by years, according to this we find development tendencies in Facebook.

Month/Year	Sum (millions) of investments (y)	x (sign of period [10])	x ²	xy	y _c
2004	0.5\$	-3	9	-1.5	-66.4
2005	12.7\$	-2	4	-25.4	16.48
2006	27.5\$	-1	1	-27.5	99.36
2007	300\$	0	0	0	182.24
2008	115\$	1	1	115	265.12
2009	200\$	2	4	400	348
2010	620\$	3	9	1860	430.88
	Σ=1275.7	Σ=0	Σ=28	Σ=2320.6	Σ=1275.7

To find developing linear trend of Facebook we'll have to find a and b parameters, we find them from this system below:

$$\sum y = na + b \sum x$$

$$\sum xy = a \sum x + b \sum x^2$$

In the system equations above n shows real number of years, in this case 7. Based on the data from the table above we solve the above system.

$$1275.7 = 7a + b \cdot 0$$

$$2320.6 = a \cdot 0 + 28b$$

$$1275.7 = 7a$$

$$2320.6 = 28b$$

$$a = \frac{1275.7}{7} = 182.24$$

$$b = \frac{2320.6}{28} = 82.88$$

We substitute gained parameters a and b in trend function as below [11]:

$$y = a + bx = 182.24 + 82.88 \cdot x$$

We substitute x value in above equation and gain trend value:

$$y_c(2004) = 182.24 + 82.88 \cdot (-3) = 182.24 - 248.64 = -66.4$$

$$y_c(2005) = 182.24 + 82.88 \cdot (-2) = 182.24 - 165.76 = 16.48$$

$$y_c(2006) = 182.24 + 82.88 \cdot (-1) = 182.24 - 82.88 = 99.36$$

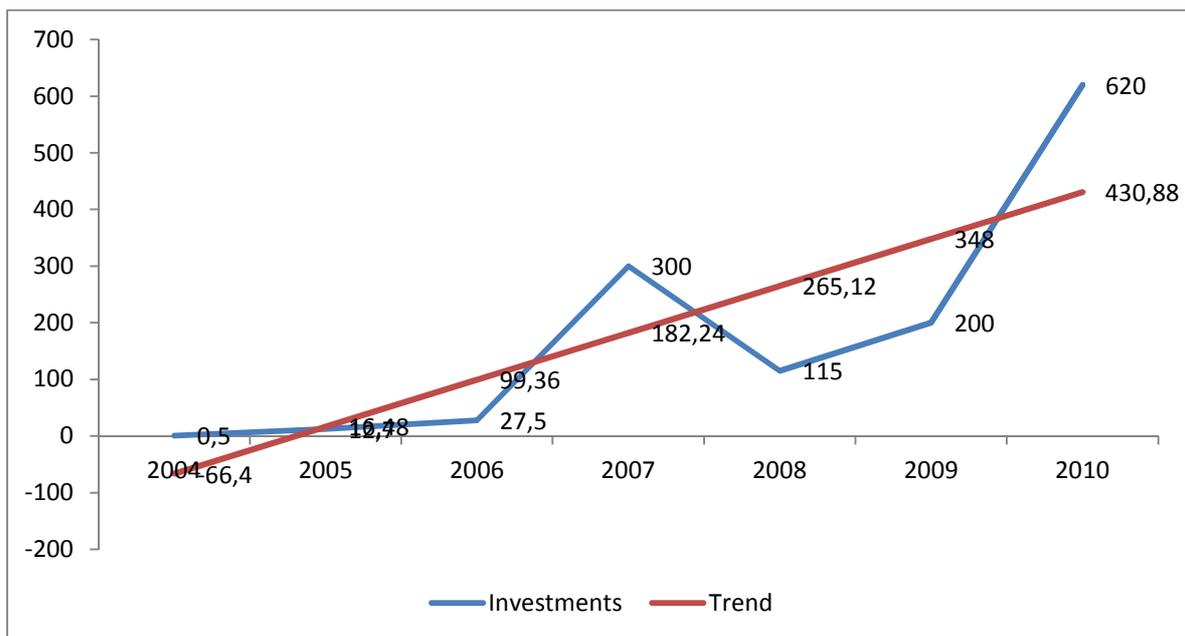
$$y_c(2007) = 182.24 + 82.88 \cdot 0 = 182.24 + 0 = 182.24$$

$$y_c(2008) = 182.24 + 82.88 \cdot 1 = 182.24 + 82.88 = 265.12$$

$$y_c(2009) = 182.24 + 82.88 \cdot 2 = 182.24 + 165.76 = 348$$

$$y_c(2010) = 182.24 + 82.88 \cdot 3 = 182.24 + 248.64 = 430.88$$

Let us graphically present investment and development trends in the context of years.



From the graphic above it is shown that tend of investments in company is linear, and based on the function of the trend we can make the investment forecast for a far longer period. So, if we wish to obtain the investment in a company for the year 2016, then the period sign must be 7 ($x=7$) and we calculate the investment for 2016:

$$y_c(2016) = 182.24 + 82.88 \cdot 7 = 182.24 + 414.4 = 762.4$$

By formula function we found that the trend of expected investments in companies is expected to be 762.4 million dollars.

4. CONCLUSIONS

Today in world a large number of social networks intend to socialize the youth. Apart them also professional networks and smaller networks exist for specific purposes. One of the most used networks is Facebook which is irreplaceable for youth socialization.

Connection between investments in Facebook from the outers has gone proportionally with the increasing number of employees, where connection factor (r correlation) is equal with 1. This shows that the creators of Facebook apart of their vision of development, information sharing and knowledge they have followed also precisely the logic of enterprise developing economy.

In 2012 Facebook has joined the stock-market so trend that we have shown in paper could not be the one because in stock-market you could win a lot more or you could lose it all in a rapid way.

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