Case study: Facebook Inc.

Caso de estudio: Facebook Inc.

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Abstract

The main objective of this paper is to demonstrate a mathematical form whether to invest in a technology company like Facebook or not, we know that the global environment and the great speed at which information technologies are developed we think orillan that at this time there is no safer than doing technology investment, but there are more factors to consider and from another point of a more social and human leads us to ask new questions that cause us to make a decision uncertainty, for example if the use of a social network is not as fun as before, or if you step fashion, or whether to move to a better, although this can be measured statistically, representative sampling would be necessary and when we speak of a platform using more than 1.3 billion users around the world becomes very complex to try to measure trends to see if the company will grow or not, or whether to invest or not, so I will only focus on resolving the question of whether to invest in Facebook or not. Through the document develop mathematical models which provide us with a more accurate result to make a decision, we will use variables of the financial operation of the company in the BVM, this data will be collected in real time the BVM page and end the purpose of this document is to know with scientific arguments whether or not to invest in the purchase of shares of that company.

Resumen

El objetivo principal de este trabajo es demostrar de forma matemática si se debe invertir en una empresa tecnológica como Facebook o no, sabemos que el entorno global y la gran velocidad a la que se desarrollan las tecnologías de la información nos hace pensar que en estos momentos no hay nada más seguro que hacer una inversión tecnológica, pero hay más factores a tener en cuenta y desde otro punto de vista más social y humano nos lleva a plantearnos nuevas preguntas que nos hacen tomar una decisión de incertidumbre, por ejemplo si el uso de una red social ya no es tan divertido como antes, o si pisas la moda, o si te pasas a una mejor, aunque esto se puede medir estadísticamente, sería necesario un muestreo representativo y cuando hablamos de una plataforma que utiliza más de 1. 3.000 millones de usuarios en todo el mundo se hace muy complejo intentar medir las tendencias para ver si la empresa va a crecer o no, o si hay que invertir o no, por lo que sólo me centraré en resolver la cuestión de si hay que invertir en Facebook o no. A través del documento desarrollaremos modelos matemáticos que nos proporcionen un resultado más preciso para tomar una decisión, utilizaremos variables de la operación financiera de la empresa en la BVM, estos datos serán recolectados en tiempo real la página de la BVM y al final El objetivo de este documento es conocer con argumentos científicos si se debe o no invertir en la compra de acciones de dicha empresa.

Facebook, Social network, Technology, Users, BMV, Nasdaq, DAU's, MAU's, ARPU, Market shares, BMV

Facebook, Red social, Tecnología, Usuarios, BMV, Nasdaq, DAU's, MAU's, ARPU, Cuotas de mercadoa

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Introduction

The company mentioned in this financial analysis is used to represent a real case study, this work has a totally academic spirit and we will focus on an Information Technology company, for this case we have selected the emblematic American company founded by Mark Zuckerberg in 2004, known as Facebook. Beyond the story we all know about how FB was founded, in this document we are going to focus on scientifically analyzing whether or not it is profitable to invest in this company. The theory tells us that it is one of the most profitable companies in the world and there is practically no risk of losing money, so this idea is the one we are going to confirm or discard as we reach the final result.

Reasons to invest in FB

We know that millions of people around the world use FB, we are talking about more than 1300 million users, if we think about e-commerce, electronic advertising, games, applications, music, videos, photos, etc. we can understand that there are millions of millions of dollars circulating through this company directly and indirectly, so without having much knowledge in Finance or Economics we could assume that our investment would be safe in a company of this type, so the first hypothesis would be to invest with closed eyes in the FB company.

(CNNMexico) - Facebook began trading on the Nasdaq stock market on Wall Street under the acronym FB. Its shares opened at 42.05 dollars and in a short time increased 11% with respect to the price of the initial public offering (IPO).

The following figure shows information on the Class A common stock that has been listed on the NASDAQ Global Market under the ticker symbol FB, prior to 2012 there was no public offering of shares in the market. Here are the high and low prices of the Class A common stock by period.

	2014		2013	
	High	Low	High	Low
First Quarter	$ 72.59	$ 51.85	$ 32.51	$ 24.72
Second Quarter	$ 68.00	$ 54.66	$ 29.07	$ 22.67
Third Quarter	$ 79.71	$ 62.21	$ 51.60	$ 24.15
Fourth Quarter	$ 82.17	$ 70.32	$ 58.58	$ 43.55

Figure 7.1
Source: http://investor.fb.com/annuals.cfm

The following graph shows a comparison from May 18, 2012 (the date it began trading on NASDAQ) through December 31, 2014, of the Class A stock's cumulative total return for the Standard & Poor's (S&P 500 Index) and on Nasdaq (NASDAQ Composite).

The chart assumes $100 was invested at market close on May 18, 2012 for the Class common stock of Facebook, Inc.

Figure 2
Source: http://investor.fb.com/annuals.cfm
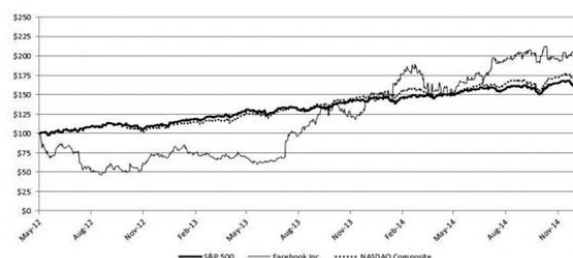
Reasons not to invest in FB

From what we have been able to read so far we can assume that there is no risk in investing in a company like FB, and even more if we take more references of companies in the middle as could be Google Inc. that when it made public its offering in the New York Stock Exchange in 2004 its shares had a value of US$ 85, today those shares are worth more than US$ 600, this is a 613% appreciation in 10 years.

However, different financial advisors around the world agree that FB's user growth in recent years has tended to decline and its operating costs and expenses have grown at a higher rate than its revenues, in addition to qualifying that its popularity is decreasing significantly, the question is how they justify that the value of the stock is so high since FB is not really a product like a smartphone or a computer. Here we have the second hypothesis, FB's popularity will decrease over time and the value of the company will have a downward trend.

Facebook invests millions of dollars in research, for example its metrics are based on daily active users, mobile users, and average revenue per user: Daily active users (DAUs), MAUs, mobile MAUs, and average revenue per user (ARPU). These metrics are based on the activity that users have on FB in addition to the impact that advertising has on each of them.

Figure 3
Source: http://investor.fb.com/annuals.cfm

Figure 4
Source: http://investor.fb.com/annuals.cfm

We can see that these graphs represent an incremental trend of activity at the technological level, by this I mean that we can see the number of users globally or by region or country that sign on the platform, but referring to our second hypothesis with these graphs we do not reach to measure the social and human part that for example would be fashion trends, preferences to new technologies, the change in the tastes of people, etc.. This is why we cannot be sure that the trend of future usage will be incremental, so if the opposite were the case it would reflect a decrease in the value of the company.

Financial approach

We are talking about a company with more than 1.3 billion users around the world and we would need representative samples at a social level such as those that Facebook makes at a technological level, not to mention that it is not the objective of this document, what we will do is a detailed analysis through mathematical models to answer the question of whether or not to invest in the company and to be able to support it from a financial approach.

Facebook on the Mexican Stock Exchange (BVM)

In order for a company to be listed on the stock exchange it must meet certain requirements, as we know there are different types of stock exchanges and indicators around the world. The Standard & Poor's 500, the Dow Jones, Exchange (NYSE), Japan Topix, United Kingdom Financial Times-30 (FT- ordinari), etc. For this case study we will work with data collected in real time from the BVM (Mexican Stock Exchange).

Company profile: Name: FACEBOOK, INC.

Country of origin: United States

Stock Exchange: NASDAQ

Date of incorporation	01-JAN-2004
Date of Listed on BMV	02-OCT-2012
Corporate Offices	N/A
Sector	Information Technology.
Subsector	Software and Services
Bouquet	Software and Internet Services.
Sub Branch	Software and Internet Services.
Activity Economic	The Company, through its website, enables communication by developing technology that allows the sharing of information, photographs, videos, among others. information, photographs, videos, among others.

Table 1 General Data

Facebook on the Mexican Stock Exchange (BVM)

Company's Legal Information: Password: FB

Series: Capitals Web: N/A FACEBOOK, INC.

Value type	Serie	Isin	Status	Description
1A	*	US30303M1027	Activate	Shares international quotation system

Table 2

Figure 5 Stock market transaction. Date of quotation: 10/27/2015
Source:http://www.bmv.com.mx/es/emisoras/estadisticas/ FB-7807-7958

Variable	Descripción	Valor
P_a^M	Precio máximo	1721
P_i^M	Precio mínimo	1705.48
V	Variación	-0.240954
PPP	PPP	1709.89
MP_a^a	Max. Año anterior	1194.23
M_a^i	Min. Año anterior	716
A_c	Acción en circulación	2,248,896,000
Pu	Precio / Utilidad	0
P^{VL}	Precio / Valor libro	0
P^{Uh}	Precio ultimo hecho	1711.3
V_c	Volumen de compra	6000
V_v	Volumen de venta	6000
P_c	Postura de compra	1708.41
V^{La}	Valor libro por Acción	0
V_o	Volumen operado	9496
D_p	Tipo de cambio	16.686
D_I	Constante	1
P_v	Postura de venta	1715.29
IPC	Índice de Precios al consumidor	2.59
IPC_S	Índice de Precios al consumidor Sub	2.30
U_a	Utilidad / Acción	0
P_1	Partición	1706.75
P_2	Partición	1706.77
P_3	Partición	1706.77
P_4	Partición	1714.5
P_5	Partición	1715.29
P_6	Partición	1726.5
P_7	Partición	1730

Table 3 Record of the operation
Source:http://www.bmv.com.mx/es/emisoras/estadisticas/ FB-7807-7958

Risk and Return Model (Levy)

CDO: Turnovsky modeling assumption.

Put:

$$P = \frac{[V_V - P_V]^{\frac{1}{2}}}{V_O \cdot P^{Uh}} + \frac{3}{4}\left[\frac{(P^{VL})}{(P_u)}\right] \rightarrow \int_V^U {}^U_{La}$$

$$P = \frac{[6000 - 1715.29]^{1/2}}{7784.7} + \frac{3}{4}\left[\frac{(0)}{0)}\right] \rightarrow \int_0^0$$

$$P = \frac{[4284.71]^{1/2}}{7784.7} + \frac{3}{4}\left[\frac{(0)}{(0)}\right] \rightarrow \frac{ln(1)}{log(-1)}$$

$$P = \frac{65.457}{7784.7} + 0 \rightarrow 0$$

$$P = 0.0084$$

$$P = 0.84\%$$

Call:

$$C = \left[\frac{V_c - P_S}{\left[\frac{V_o}{P^{Uh}}\right]^{\frac{1}{2}}}\right]^{\frac{3}{4}} + \int^{P_{VL}} - \left[\int^{P_u} + \int\right]_{n_{\alpha-1}}^{U^a + V^{La}} = \left[\frac{6000 - 1708.41}{\left[\frac{9496}{1711.3}\right]^{\frac{1}{2}}}\right]^{\frac{3}{4}} + \int^0 - \left[\int^0 + \int\right]_{\alpha-1}^{0+0}$$

$$C = \left[\frac{4291.59}{\left[\frac{9496}{1711.3}\right]^{\frac{1}{2}}}\right]^{\frac{3}{4}} + \frac{\ln 1}{\log} - \left[\frac{\ln 1}{\log} + \frac{\ln}{\log}\right]_{n-\frac{1}{2}}^0$$

$$C = \left[\frac{4291.59}{[5.548]^{\frac{1}{2}}}\right]^{\frac{3}{4}} + \frac{\ln 1}{\log} - \left[\frac{\ln 1}{\log} + \frac{\ln}{\log}\right]_{n-\frac{1}{2}}^0 = \left[\frac{4291.59}{2.355}\right]^{\frac{3}{4}} + \frac{\ln 1}{\log} - \left[\frac{\ln 1}{\log} + \frac{\ln}{\log}\right]_{n-\frac{1}{2}}^0$$

$$C = [1822.33]^{\frac{3}{4}} + \frac{\ln 1}{\log} - \left[\frac{\ln 1}{\log} + \frac{\ln}{\log}\right] + \frac{0}{-1} = 278.91 + 0 - 1$$

$$C = 2.44 \, log$$

$$C = 0.38 * 100 / 100$$

$$C = 0.38\%$$

Market price:

$$PM = \frac{\partial\left[\frac{Pu + \partial P^{VL}}{P^{Uh}}\right] + \left(\frac{\partial P_V}{\partial P_C}\right)^{\frac{3}{4}} - \left(\frac{\partial V_V - 1}{\partial V_C + 1}\right)^{\frac{1}{2}}}{\int_{P_u}^{V_o}}$$

$$PM = \frac{(-1)\left[\frac{0 + (-1)(0)}{1711.3}\right] + \left(\frac{(-1)(1715.29)}{(-1)(1708.41)}\right)^{\frac{3}{4}} - \left(\frac{(-1)(-0.24) - 1}{(-1)(1) + 1}\right)^{\frac{1}{2}}}{\int_0^{9496}}$$

$$PM = \frac{(-1)\left[\frac{0 + (1)}{1711.3}\right] + \left(\frac{(-1715.29)}{(-1708.41)}\right)^{\frac{3}{4}} - \left(\frac{(0.24) - 1}{(-1) + 1}\right)^{\frac{1}{2}}}{\int_0^{9496}} = \frac{(-1)\left[\frac{1}{1711.3}\right] + (1.00)^{\frac{3}{4}} - \left(\frac{-0.76}{0}\right)^{\frac{1}{2}}}{\int_0^{9496}}$$

$$PM = \frac{(-1)(0.000584) + (1.00) - (-1)^{\frac{1}{2}}}{\int_0^{9496}} = \frac{(-0.000584) + (1.00) - (-1)}{\frac{\ln 9496}{\log(o)}}$$

$$PM = \frac{\frac{0.900}{9.15}}{1} = \frac{0.900}{9.15}$$

$$PM = 0.098 * 100 / 100$$

$$PM = 0.098\%$$

Partitions:

$$P = \beta_0(1706.75_1) + \beta_1(1706.77) + \beta_2(1706.77) + \beta_3(1714.5) + \beta_4(1715.29) + \beta_5(1726.5) + \beta_6(1730) + \beta_{-\alpha}^{\xi}$$

Market shares:

$$AM = \frac{\left[\frac{P_a^M + P_i^M}{[PPP]^{1/2}}\right]^{3/4} + \left[\frac{MP_a^a + M_a^i}{A_c}\right] + \xi^2}{} = \frac{\left[\frac{P_a^M + P_i^M}{[PPP]^{1/2}}\right]^{3/4} + \left[\frac{MP_a^a + M_a^i}{A_c}\right] + 1}{}$$

$$AM = \left[\frac{1721 + 1705.48}{[1709.89]^{1/2}}\right]^{3/4} + \left[\frac{1194.23 + 716}{2.248,896.000}\right] + 1 = \left[\frac{3426.48}{[-7097.92]^{1/2}}\right]^{3/4} + \left[\frac{1910.23}{2.248,896.000}\right] + 1$$

$$AM = \left[\frac{3426.48}{-84.24}\right]^{3/4} + 8.49 \times 10^{-07} + 1 = [-40.67]^{3/4} + (-1) + 1 = -16.10 - 1 + 0 =$$

AM = 17.10 log

AM = 1.2 *100 /100

AM = 1.2%

Exchange rate

$$TC = \frac{D_p - D_I}{1/2} = \frac{16.68 - 1}{1/2} = 31.36$$

Inflation

$$\pi = \frac{IPC^{\frac{3}{4}}}{IPC_g} = \left[\frac{2.59}{2.30}\right]^{\frac{3}{4}} = [1.12]^{\frac{3}{4}} = 1.09$$

Integration of the risk model (-) (MRI).

$$MRI = \frac{\left(\left[\frac{P_a^M + P_i^M}{[PPP]}\right]^{3/4} - \left[\frac{MP_a^a + M_a^i}{A_c}\right] + \xi^2\right)^{(D_p - D_I)/(IPC^{3/4})}}{\left(\frac{[V_V - P_V]^{1/2}}{V_Q} - P^{VL} \frac{3}{4}\frac{[PVL]}{(P_u)} + \frac{U_Q}{VLa}\right) + \left[\frac{V_c}{V_Q} - \frac{P_c}{[PU]^{1/2}}\right] + j^P u L - [j^P u + j]...} + ...$$

$$MRI = ...$$

$$MRI = ...$$

$$MRI = \frac{\{2516.48]^{3/4} - \frac{1910.23}{2.248,896.000} + 1\}^{(31.36) - (1.09)}}{\left[\frac{65.45}{7784.7} + \frac{3}{4}[0] \to j_0^0\right] - \left[\frac{4291.59}{2.355}\right]^{\frac{3}{4}} + j^0 - [j^0 + j]_{n-1}^{n+1}} + ...$$

$$MRI = \frac{\{[-41.66]^{3/4} + [0.00084] + 1\}^{30.27}}{\{0.0084 + 0 \to j_0^0\} - \{[1822.33]^{\frac{3}{4}} + j^0 - [j^0 + j]_{n-1}^{n+1}\}} + ...$$

$$MRI = \frac{\{-16.39 + 0.00084 + 1\}^{30.27}}{\{0.0084 + 0 \to j_0^0\} - \{[1822.33]^{\frac{3}{4}} + j^0 - [j^0 + j]_{n-1}^{n+1}\}} + ...$$

$$MRI = \frac{-8.49}{\{0.0084 + \frac{\ln(1)}{\log(1)}\} - \{278.91 + \frac{\ln(1)}{\log(-1)} - \left[\frac{\ln(1)}{\log(-1)} + \frac{\ln}{\log}\right] + \frac{0}{-1}\}} + 0$$

$$MRI = \frac{-8.49}{\{0.0084\} - \{278.91 + 0 - [0 + \frac{\ln}{\log}] + \frac{0}{-1}\}} + 0$$

$$MRI = \frac{-8.49}{\{0.0084\} - \{278.91 + 0 - [0 + 0] + 0\}} + 0$$

$$MRI = \frac{-8.49}{\{0.0084\} - \{278.91\}} + 0$$

$$MRI = \frac{-8.49}{-278.90}$$

MRI = 0.030*100/100

MRI = 0.030 %   Riesgo = RI < 1

Integration of the performance model (+) (MRE).

$$MRE = \frac{\left\{\left[\frac{P_a^M + P_i^M}{[PPP]^{1/2}}\right]^{3/4} + \left[\frac{MP_a^a + M_a^i}{A_c}\right] + \xi^2\right\}^{\frac{IPC^{3/4}}{IPC_g}}}{...} + ...$$

$$MRE = ...$$

$$MRE = ...$$

$$MRE = \frac{\left\{\frac{3426.48}{-84.40} + [0.00084] + 1\right\}^{1.08}}{\left(\frac{65.45}{7784.7} + \frac{3}{4}[0] \to j_0^0\right)^{(31.36)}} + \frac{(-1)[0] + 1 - 1}{j_0^{9496}} \int_{1730}^{1706.75}$$

$$MRE = \frac{-21.43}{\left(\frac{0.0084}{279.55}\right)^{31.64}} + \frac{1}{\left(\frac{1}{\ln(9496)}\right)} \frac{\ln(1706.75)}{\log(1730)}$$

$$MRE = \frac{-21.43}{\left(\frac{0.0084}{279.55}\right)^{31.64}} + \frac{-21.43}{8.47} + \frac{1}{\frac{1}{\ln(9496)}} \frac{\ln(1706.75)}{\log(1730)}$$

$$MRE = -2.53 + \frac{1}{0} \frac{\ln(1706.75)}{\log(1730)}$$

$$MRE = -2.53 + \frac{1}{\frac{9.15}{0}} \frac{7.44}{3.23}$$

MRE = −2.53 + 1 (2.30)

MRE = −2.53 + 2.30

MRE = −0.23 *100 /100

MRE = 0.23%

Integration of the risk vs. return (RRM) model.

$$MRR = \int_A^B + [(\log C)^\pi - (\ln D)^{TC}] + \left[\frac{\log B}{\ln A}\right]^{\frac{3}{4}} + [(\log D)^{TC} - (\ln C)^\pi] + \frac{\ln A + \log B}{C - D} + 1$$

MRR = 1 + 1

MRR = 2 Log

MRR = 0.30

MRR = 0.30*100/100

MRR= 0.3%

Company reliability analysis

The logarithm applied to the partitions is constant, which means that the company is financially solvent, it is determined solvent by its R_2= 0.0076 value, which is a value < 0.5.

Partition		Value	Log
P1 8:00 am	-	1706.75	3.23
P2 9:00 am	-	1706.77	3.23
P3 10:00 am	-	1706.77	3.23
P4 11:00 am	-	1714.5	3.23
P5 12:00 am	-	1715.29	3.23
P6 1:00 pm	-	1726.5	3.23
P7 2:00 pm	-	1730	3.23

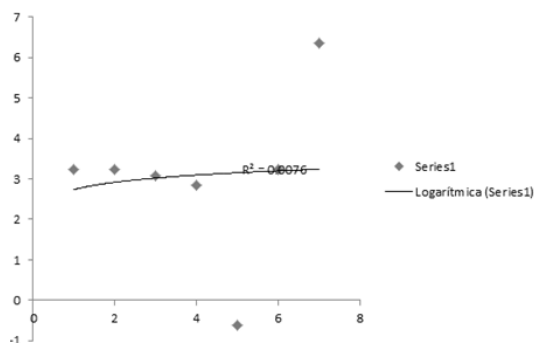| Variable	Value	Log
Maximum	1721	3.23
Minimum	1705.48	3.23
Max. Ant.	1194.23	3.07
Min. Ant.	716	2.85
VAR	-0.24	-0.61
PPP	1709.89	3.23
AC	2,248,896.00	6.35

Table 4

Figure 6
Source: Chart produced in Excel

Level of income and expenses of the company

The company's net income is at risk with negative income at -2.24% of its outstanding shares representing -$5,037,527.04 pesos.

Net income = 2,248,896.00 * (-2.24) = -$5,037,527.04 pesos

Figure 7
Source: Software Consulting and Financial Management ISBN: 978-607-00-6321-4

Calculation of the days with stock/fork item

FB began operations on the BMV on October 02, 2012, by October 27, 2015, it has been in operation for 3 years and 25 days (36 months, 25 days).

Figure 8
Source: Software Consulting and Financial Management ISBN: 978-607-00-6321-4

Net Present Value

Input data

L = log (Ac) = log (2,248,896.00) = 6.35 Ac = 2,248,896.00

N = 1458

I = 2.59 non-core inflation

The capital is 5%, there is no continuity in the market, the graph shows problems due to its sawtooth shape.
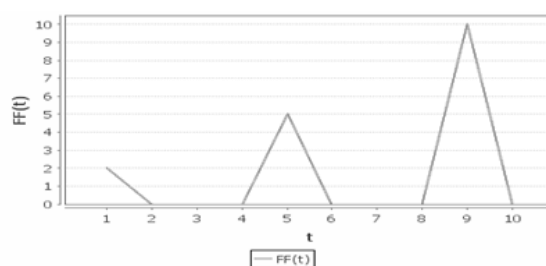
Figure 9 Net Present Value
Source: Software Consulting and Financial Management ISBN: 978-607-00-6321-4

Internal Rate of Return (IRR)

The IRR is 1, the graph shows 2 cosines (loss) and 1 sine (gain), its absolute value is 1.
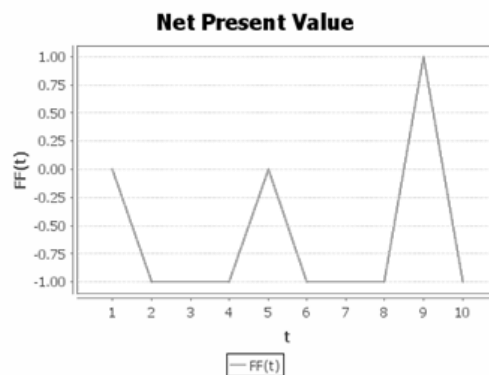
Figure 10
Source: Software Consulting and Financial Management ISBN: 978-607-00-6321-4

Acquisition and subsidy

Input data:

Grace period = 1458 CETE = 3.02
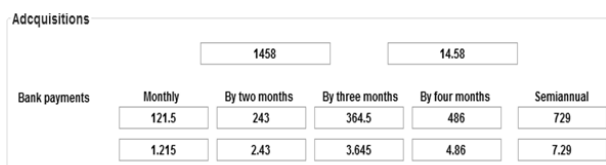
Figure 11 Procurement
Source: Software Consulting and Financial Management
ISBN: 978-607-00-6321-4

Deadline	Rate (%)
Monthly	1.2
Bimonthly	2.43
Quarterly	3.6
Quarterly	4.86
Semiannual	7.29

Table 5

Subsidies

Figure 12
Source: Software Consulting and Financial Management
ISBN: 978-607-00-6321-4

Deadline	Rate (%)
28 days	1.13
91 days	3.6
182 days	7.3

Table 6

Financing

The maximum loan that can be granted to the company is 3 years.

Figure 13
Source: Software Consulting and Financial Management
ISBN: 978-607-00-6321-4

Conclusion

The mathematical models show us that the company is reliable and there is low risk of losing money if we decide to buy shares of it, we have found that the models give us certainty of decision making, this coupled with financial information such as income statements, balance sheet, etc., confirms that investing in FB is a safe gain, then with this information we can assume the answer to the question posed at the beginning of the article, if it is advisable to invest in FB.

But on the other hand the second hypothesis should not be discarded, although mathematics and accounting confirm that FB is a healthy low risk company this can change due to social phenomena and it is not far to think that a social network can be displaced by a new technology, in fact if we go back to the late 90's we have several cases of technologies that were leaders at the time and now do not exist or were bought by a new one, I assume that FB is asking itself these same questions and its business plan is focused on being the leading social network in the world, I hope this is reflected in better service and quality, which all of us who use the network will be grateful for.

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