AN ALTERNATE MODEL FOR CALCULATING COSTS OF OWN RESOURCES Jorge Rosillo

ABSTRACT: *The objective is to analyze the possible strengths and weaknesses found in the Gordon and Sharpe models for calculating costs of proper resources, and to propose a new one based on a hierarchic analysis of decisions.*

KEY WORDS: *Cost of own resources, WACC (Average Capital Costs), decisions, Financial indicators, Valuation.*

The creation or destruction of the value of a firm or project is established depending on the expectancy there is in making money in the future; if expectancy is high, the value of its shares increases inside the market, but if expectancy is low, the shares lose value in the market. Its measure is made based on results of net income and outcome flows and the calculation of WACC or Average Capital Cost, which corresponds to the interest rate used for discount; this last one is the average interest rate of the firm's or project's financial sources.

For calculating the cost of own resources, two models have been used and its use has been generalized; the first one, proposed by Gordon, which is based on expectancy of future or long term dividends, and the second one by Sharpe. Both models have the common property of heading their analysis towards firms which participate in the stock market, which makes them very restrictive, now that more than 90% of existing firms in the orb don't normally participate in the stock market.

THE GORDON MODEL

The model is based on the expectancy there is on the payment of dividends to shareholders of a company. It considers two possibilities; growing dividends, or dividends which remain constant. Calculating the cost of own resources is done considering payments to shareholders as a perpetual activity, in the following way:

1) Non-growing dividends: Based on the assumption that dividends are paid perpetually and maintained constant throughout time.

$$\mathbf{K_E = \frac{d}{P}}$$

Where:

K_E = Cost of own resources
d = Perpetual periodic dividends
P = Value of the shares in the market.

2) Growing dividends: It is assumed that dividends are paid perpetually, while growing at a constant rate g%. Thus,

$$\mathbf{K_E} = \frac{\mathbf{d_0(1+g)}}{\mathbf{P_0}} + \mathbf{g}$$

To test this model, let's assume that the following historical data corresponds to dividend payments of a hypothetical firm:

Period	Dividends per share "ABC Textiles"	% growth in dividends per period
Dec-90	345	
Dec-91	360	4,35%
Dec-92	360	0,00%
Dec-93	365	1,39%
Dec-94	370	1,37%
Dec-95	376	1,62%
Dec-96	382	1,60%
Dec-97	396	3,66%
Dec-98	402	1,52%
Dec-99	410	1,99%
Dec-00	415	1,22%
Dec-01	413	-0,48%
Dec-02	423	2,42%
Dec-03	418	-1,18%
Dec-04	418	0,00%

If all the data were collected since December 1990 to calculate the value of "g", this would be the following result:

$$\mathbf{418 = 345(1+g)^{14}}$$

$$\mathbf{\frac{418}{345} = (1+g)^{14}}$$

$$\mathbf{g = 1,38\%}$$

Nevertheless, if the value of "g" was to be calculated only from data collected since December 2000, this would be the result:

$$\mathbf{418 = 415(1+g)^{4}}$$

$$\mathbf{\frac{418}{415} = (1+g)^{4}}$$

$$\mathbf{g = 0.18\%}$$

The results above show that under this model, the value of the cost of own resources depend on the way "g" is calculated. At first, it may be thought the best decision is to collect the most recent data possible (over the last few years), given that it represents the most updated information; however, seen from a statistical point of view, it is largely recommended to consider the most wide historical data possible, so that all predictions made become more accurate. The way results are observed depends on the historical data upon which it is analyzed; this, therefore, constitutes one large weakness of the Gordon model.

THE SHARPE MODEL

The Sharpe model exists as an alternative to the Gordon model; it works with SML (Security Market Line) but does not consider taxes. It is defined as following:

Cost of own resources = $K_E = i_L + \beta\ (i_M - i_L)$, where

i_L = Risk-free interest rate

β= Sensitivity of the profitability of a firm's shares in relation to the market (or market's portfolio) profitability

i_M = Market (or market's portfolio) profitability

$(i_M - i_L)$ = Risk Premiun

$$\beta = \frac{Co\operatorname{var} iance_{FIRM+MARKET}}{Variance_{MARKET}} ,$$

Which means that β corresponds to the gradient of the line which relates the shares' profitability of firm "x" with the market.

Benninga–Sarig modifies the Sharpe model considering taxes[1], and this way defining costs of proper resources.

Cost of own resources = $K_E = i_L(1 - T) + \beta\ (i_M - i_L(1 - T))$, where

T = Tax rate imposed on benefit or profit

The following is an analysis of the model proposed by Sharpe, using this historical data:

[1] Benninga Simon, "Financial Modelling" MIT Press 1999, page 36

Table N° 1
SHARES' PROFITABILITY PER FIRM AND PERIOD

Period	FIRM "A"	FIRM "B"	FIRM "C"	FIRM "D"	FIRM "E"	FIRM "F"	FIRM "G"	MARKET
Dec-90	7.00%	**-5.00%**	20.00%	7.00%	**14.00%**	6.00%	10.00%	8.43%
Dec-91	8.00%	**-4.00%**	20.00%	6.00%	**14.00%**	7.00%	9.00%	8.57%
Dec-92	5.00%	**-3.00%**	20.00%	10.00%	**14.00%**	7.00%	8.00%	8.71%
Dec-93	8.00%	**3.00%**	20.00%	12.00%	**14.00%**	6.00%	10.00%	10.43%
Dec-94	9.00%	**5.00%**	20.00%	12.00%	**18.00%**	5.00%	15.00%	12.00%
Dec-95	10.00%	**7.00%**	20.00%	9.00%	**18.00%**	7.00%	13.00%	12.00%
Dec-96	12.00%	**9.00%**	18.00%	9.00%	**18.00%**	9.00%	10.00%	12.14%
Dec-97	14.00%	**8.00%**	18.00%	9.00%	**18.00%**	6.00%	8.00%	11.57%
Dec-98	6.00%	**5.00%**	18.00%	9.00%	**18.00%**	8.00%	-7.00%	8.14%
Dec-99	8.00%	**4.00%**	18.00%	9.00%	**19.00%**	10.00%	-6.00%	8.86%
Dec-00	9.00%	**-3.00%**	6.00%	4.00%	**20.00%**	8.00%	6.00%	7.14%
Dec-01	9.00%	**-5.00%**	6.00%	-3.00%	**21.00%**	4.00%	8.00%	5.71%
Dec-02	12.00%	**-7.00%**	6.00%	-5.00%	**22.00%**	4.00%	10.00%	6.00%
Dec-03	14.00%	**-7.00%**	6.00%	-5.00%	**22.00%**	8.00%	10.00%	6.86%
Dec-04	16.00%	**-9.00%**	6.00%	-5.00%	**22.00%**	9.00%	12.00%	7.29%

The last column of the table shows market profitability; it is calculated as the average profitability of all of the shares per period. Alternatively, this can be quantified by profitability changes in the stock market rates.

Based on the information above, each "Beta" was calculated for each one of the firms in the example, which together constitute the whole hypothetical market. Results were the following, with their corresponding "R^2"coefficient (See graphs under Appendix N°1):

Table N° 2
BETA AND R^2 COEFFICIENT CALCULATION PER FIRM

	FIRM "A"	FIRM "B"	FIRM "C"	FIRM "D"	FIRM "E"	FIRM "F"	FIRM "G"
BETA	-0.0221	2.3771	2.2260	2.2723	-0.6062	0.1010	0.6519
R^2	0.0002	0.7287	0.5755	0.6185	0.2004	0.0156	0.0545

The Sharpe model presents certain limits on its applicability: its style is headed towards firms which participate in the stock market, which means their risk is measured upon the variability of their shares' profitability with respect to variability of the market's profitability – which is how usually, "beta" is defined; or simply, by the gradient of a straight line conformed by the firm's profitability versus market profitability in the analyzed period.

By taking a lineal form and behaviour, relations of the firm and market profitability with R^2 coefficients take a range of values nearer to 0 than to 1; As observed in Table N° 2 of the example, R^2 coefficients with values very near to 0 belong to firms "A", "E", "F" and "G" (0.0002, 0.2004, 0.0156, 0.0545), which questions their statistical validity.

Firm "B" has the largest BETA value, which is 2.3771, and firm "E", has a negative BETA value, –0.6062; the adjusted data was calculated for each period based on the straight-line mathematical equation (See Appendix) and standard deviation values were obtained for both real and predicted data. Firm "B" had an initial data standard deviation value of 6.16% and a final value of 1063.09% with the adjusted data for linear regression. Firm "E" had a standard deviation of 2.997% and a final one of 271.08%, which once more demonstrates the impossibility of making accurate predictions under this system.

Simon Benninga[2] considers that for the case of negative Beta values as obtained with firms “A” and “E” in the example, two positions can be assumed: the first one is that Beta equals zero and the firm’s price diversifiable, and the second one would be to consider that in the long term, the relationship between the firm with negative Beta and the market would not apply, which is why it is more convenient, for calculating own resource costs, (K_E) to use the Beta value of similarly behaved firms.

A different problem arises when we most determine own resources cost in firms which do not participate in the stock market, but that nevertheless need to be valued in case they are sold, or even when, without changing owner, they need to participate in new projects or markets, or make new products. For this last situation, Ignacio Vélez[3] proposes the use of BETA values that belong to firms which already participate in the stock market and offer similar goods or services:

$$\beta_{ans} = \beta_{as}\left[\frac{1+\left(\frac{D_{ans}}{P_{ans}}\right)(1-T)}{1+\left(\frac{D_{as}}{P_{as}}\right)(1-T)}\right]$$, where

β_{ans} = Beta value of non-participating firm “a” in the stock market

D_{ans} = Debt value of non-participating firm “a” in the stock market

P_{ans} = Wealth of non-participating firm “a” in the stock market

β_{as}= Beta value of participating firm “a” in the stock market

D_{as} = Debt value of participating firm “a” in the stock market

P_{as} = Wealth of participating firm “a” in the stock market

T = Tax rate imposed on benefits or profit

However, this proposal may generate worries, as for example, risks involved when handling the Colombian beer-making company BAVARIA, which invests in other international firms with America and was recently bought by SABMiller, cannot be compared with the risks of firms which offer artisan beer to their clients, such as “Palos de Moguer” ; both firms offer practically the same good, but handle totally different risks, which would not make it sensible to consider them as firms with similar risks.

---

2 Benninga Simon “Financial Modelling” MIT Press 1999, page 46

3 Vélez Ignacio, “Decisiones Empresariales bajo Riesgo e Incertidumbre”, Norma 2003 page 403

PROPOSED MODEL

As an alternative to Gordon and Sharpe models, which are only valid under certain specific market conditions, the following proposal is made to calculate the cost of proper resources, or K_E.

A hierarchic analysis of decisions process, proposed by Thomas Saaty[4] is taken as model. The process consists in making comparisons by pairs of indicators or variables, and based on a 1 to 9 (1 minimum, 9 maximum) scale, to establish the advantage of that same indicator for both individuals (that is people, firms, equipment, land, machinery, capital, etc.) compared. Normally, these advantages are measured by experts, who determine, based on the mentioned scale, if an individual beats the other one under the analyzed indicator.

To develop the proposal, three different hypothetical firms are analyzed along with the indicators which are considered ans "risk headers": some of them are profitability ratios, liquidity and indebtedness. For profitability measures, the ROA and ROE indicators were chosen; for liquidity, the current rate and the liquidity rate (defined as Cash plus Banks plus investments in the short term divided by Current liabilities). For indebtedness, the coefficient between Total liabilities and Total Assets was used.

Indicators are presented based on historical data, using models of exponential smoothing.

Comparisons between firms are made by pairs, and for instance, the coefficient between a ROE indicator of firm "A" with that one of firm "B" is calculated, and this relation allows us to determine the advantage or disadvantage of one firm upon the other. The model uses Saaty's method, but does not use the scale, nor the experts' judgement.

Example:

TABLE N°1
INDICATORS (OR RATIOS) SHOWN PER FIRM

RATIO	FIRM "A"	FIRM "B"	FIRM "C"
ROA	5%	4%	12%
ROE	16%	18%	19%
CURRENT RATE	1.5	1.7	2
LIQUIDITY	30%	20%	38%
INDEBTEDNESS	20%	80%	15%

Based on the above information ratios are to be compared; for example, the ROA indicator of firm "A" with ROA indicator of firm "B" is analyzed and the coefficient between them is calculated. In this case, 5% / 4% = 1.25, which means that firm "A" 's ROA coefficient beats firm "B" 's coefficient 1.25 times.

[4] Saaty Thomas L. "Fundamentals of Decision Making" RWS Publications, 1994

The ROA, ROE and CURRENT RATE indicators are defined as “DIRECT”, which means that the larger the indicator is, the better it is for the firm; on the contrary, for indicators which are “INVERSE”, lower values are considered healthier for the firm. For the indebtedness ratio, for example, the coefficient between indebtedness of firm “A” and that of firm “B” is calculated; according to the data in TABLE N° 1, the ratio would give (20% / 80%) = 0.25. Given that this indicator belongs to the “INVERSE” indicator group, the reciprocal of the coefficient must be calculated to end up with a final result of (1 / 0.25) = 4; this result shows that indicator of firm “A” (which has a 20% indebtedness percentage) is 4 times better than the indicator of firm “B” (which has an 80% indebtedness percentage).

The results of comparisons between ratios are reviewed in the following table:

TABLE N° 2
COMPARISONS PER PAIRS

RATIO	FIRMS A and B	FIRMS B and C	FIRMS A and C
ROA	1.25	0.33	0.42
ROE	0.89	0.95	0.84
CURRENT RATE	0.88	0.85	0.75
LIQUIDITY	1.50	0.53	0.79
INDEBTEDNESS	4.00	0.19	0.75

After this, each indicator has to be normalized, that is that its importance has to be defined. In other words, a hierarchic order that the firm has in respect to the indicator is established within the analysis. An example of this can be done with the ROA indicator.

TABLE N° 3
ROA COMPARISONS PER PAIRS

ROA	FIRM "A"	FIRM "B"	FIRM "C"
FIRM "A"	1.00	1.25	0.42
FIRM "B"	0.80	1.00	0.33
FIRM "C"	2.40	3.00	1.00
TOTAL SUM	**4.20**	**5.25**	**1.75**

It can be observed in Table N° 3 that the relation between ROA indicator of firm “A” with firm “B” is 1.25, and the relation between firms “B” and “A” is 0.80, which is the inverse of 1.25; all other relations are established in the same way. The matrix’s diagonal appears to have a value of 1, given that it represents the ration of the firm with itself.

Finally, all columns are added together and each cell is divided by the total sum, this way becoming normalized, or adopting a degree of importance in terms of the rates of the other firms. (See Table N°4).

TABLE N°4
IMPORTANCE OF ROA INDICATOR FOR EACH FIRM

ROA	FIRM "A"	FIRM "B"	FIRM "C"	TOTAL
FIRM "A"	24%	24%	24%	24%
FIRM "B"	19%	19%	19%	19%
FIRM "C"	57%	57%	57%	57%
				100%

In the same way that calculations for ROA were made, they are made for the other indicators. Results are shown in Tables N°5 to N° 12.

TABLE N° 5
ROE COMPARISONS PER PAIRS

ROE	FIRM "A"	FIRM "B"	FIRM "C"
FIRM "A"	1.00	0.89	0.84
FIRM "B"	1.13	1.00	0.95
FIRM "C"	1.19	1.06	1.00
SUM	**3.31**	**2.94**	**2.79**

TABLE N° 6
ROE IMPORTANCE FOR EACH FIRM

ROE	FIRM "A"	FIRM "B"	FIRM "C"	TOTAL
FIRM "A"	30%	30%	30%	**30%**
FIRM "B"	34%	34%	34%	**34%**
FIRM "C"	36%	36%	36%	**36%**
				100%

TABLE N° 7
CURRENT RATE COMPARISONS PER PAIRS

CURRENT RATE	FIRM "A"	FIRM "B"	FIRM "C"
FIRM "A"	1.00	0.88	0.75
FIRM "B"	1.13	1.00	0.85
FIRM "C"	1.33	1.18	1.00
SUM	**3.47**	**3.06**	**2.60**

TABLE N° 8
CURRENT RATE IMPORTANCE FOR EACH FIRM

CURRENT RATE	FIRM "A"	FIRM "B"	FIRM "C"	TOTAL
FIRM "A"	29%	29%	29%	29%
FIRM "B"	33%	33%	33%	33%
FIRM "C"	38%	38%	38%	38%
				100%

TABLE N° 9
LIQUIDITY COMPARISONS PER PAIRS

LIQUIDITY	FIRM "A"	FIRM "B"	FIRM "C"
FIRM "A"	1.00	1.50	0.79
FIRM "B"	0.67	1.00	0.53
FIRM "C"	1.27	1.90	1.00
SUM	**2.93**	**4.40**	**2.32**

TABLE N° 10
IMPORTANCE OF LIQUIDITY FOR EACH FIRM

LIQUIDITY	FIRM "A"	FIRM "B"	FIRM "C"	TOTAL
FIRM "A"	34%	34%	34%	34%
FIRM "B"	23%	23%	23%	23%
FIRM "C"	43%	43%	43%	43%
				100%

TABLE N°11
INDEBTEDNESS COMPARISONS PER PAIRS

INDEBTEDNESS	FIRM "A"	FIRM "B"	FIRM "C"
FIRM "A"	1.00	4.00	0.75
FIRM "B"	0.25	1.00	0.19
FIRM "C"	1.33	5.33	1.00
SUM	**2.58**	**10.33**	**1.94**

TABLE N°12
IMPORTANCE OF INDEBTEDNESS FOR EACH FIRM

INDEBTEDNESS	FIRM "A"	FIRM "B"	FIRM "C"	TOTAL
FIRM "A"	38.7%	38.7%	38.7%	**38.7%**
FIRM "B"	9.7%	9.7%	9.7%	**9.7%**
FIRM "C"	51.6%	51.6%	51.6%	**51.6%**
				100%

To determine whether comparisons per pairs is a consistent measure, a “consistency rate” indicator is calculated, which is the quotient between the consistency index and the random index calculated by Saaty, according to the number of data collected. Thus,

$$Index\ of\ \ consistency = \frac{\lambda_{\max} - n}{n-1}.$$

If judgements are inconsistent, then λ_{max} will be larger than (n), which is the number of data:

$$\lambda_{\max} = \frac{\sum measures\ of\ consistency}{n}$$

The consistency measures are defined by the sum of the product of the comparisons per pair of each pair of firms by the respective given importance, divided by the importance or “weight” of the analyzed firm; for example, for calculating the measure of consistency of debt contraction ratio of firm ”B”, Tables N° 11 and 12 are used:

$$Measure\ of\ consistency\ of\ B's\ debtcontraction = \frac{0.25 * 0.387 + 1 * 0.097 + 0.19 * 0.516}{0.097}$$

Thus,
Consistency measure of “B”‘s debt contraction = 3.

The same method as above is used, therefore, to calculate the consistency measure for each one of the firms and of the ratios, and results showed this measure to be equal to 3 for all cases (See Table N° 13).

$$\lambda_{\max} = \frac{\sum measures\ of\ consitency}{n} = \frac{3+3+3}{3} = 3$$

The results obtained show absolute consistency, now that comparison per pairs was not made upon experts’ opinion, but upon indicators. And last, a consistency rate is calculated, and defined as:

$$RC = Rate\ of\ consistency = \frac{Index\ of\ consistency}{Saaty's\ Random\ Index}.$$

Saaty’s Random Index for n=3 is equal to 0.58; therefore, the rate of consistency for each indicator is:

$$\textbf{RC} = \frac{0}{0.58} = 0.$$

According to Saaty, the RC index must be smaller than 0.10 for the information to be consistent; given the results obtained, therefore, total consistency is assured.

TABLE N°13
CONSISTENCY MEASURE, λ_{max}, CONSISTENCY INDEX PER INDICATOR and RC MEASURE

	CONSISTENCY MEASURE	λ_{max}	CONSISTENCY INDEX	CONSISTENCY RATE (RC)
Firm "A" - ROA	3			
Firm "B" - ROA	3	3	0	0
Firm "C" - ROA	3			
Firm "A" - ROE	3			
Firm "B" - ROE	3	3	0	0
Firm "C" - ROE	3			
Firm "A" - Current rate	3			
Firm "B"- Current rate	3			
Firm "C" – Current rate	3	3	0	0
Firm "A" - Liquidity	3			
Firm "B" - Liquidity	3	3	0	0
Firm "C" –Liquidity	3			
Firm "A" - Indebtedness	3			
Firm "B" - Indebtedness	3	3	0	0
Firm "C" – Indebtedness	3			

Having determined the data's consistency, we proceed to calculate each firm's weight (importance) within the total based on tables N° 3 to N° 12:

$$Firm\ "A"'s\ weight = \frac{24\% + 30\% + 29\% + 34\% + 38.7\%}{5} = 31\%$$

$$Firm\ "B"'s\ weight = \frac{19\% + 34\% + 33\% + 23\% + 9.7\%}{5} = 24\%$$

$$Firm\ "C"'s\ weight = \frac{57\% + 36\% + 38\% + 43\% + 51.6\%}{5} = 45\%$$

Based on the above, the average weight (importance) is determined, which would be:

$$Average\ weight(importance) = \frac{31\% + 24\% + 45\%}{3} = 33.33\% \quad ,$$

Or simply, it is the inverse of the number of firms participating, which in this case is equal to three.

Lastly, the weight or importance of each firm is compared with respect to the average weight to establish the results' deviation:

$$Firm\ A's\ index = \frac{Firm\ A's\ weight(importance)}{Average\ weight(importance)} = \frac{31\%}{33.33\%} = 0.93\ ,$$

$$Firm\ B's\ index = \frac{Firm\ B's\ weight(importance)}{Average\ weight(importance)} = \frac{24\%}{33.33\%} = 0.71$$

$$Firm\ C's\ Index = \frac{Firm\ \ C's\ weight(impor\tan ce)}{Average\ \ weight(impor\tan ce)} = \frac{45\%}{33.33\%} = 1.36\ .$$

Based on these indexes, a “risk premium” is established, depending on how much percentage we are located under 1; the rate at which government bonds in any country are paid is considered as a risk free rate. For the example, a 5% annual rate is considered.

Cost of proper resources = K_E = Risk free rate + Measured risk based on the indexes.

Measured Risk based on the indexes = (Percentile points under 100) / 2

For instance, it can be assumed that for each two percentile points under 1, one risk point is assigned. (This parameter can vary according to experts’ opinions).

For firm “A”, which has an index of 0.93, which means 7 points under 100, the risk value and the K_E value would therefore be:

Measured risk based on the indexes for Firm “A” = (7 Points) / 2 = 3,5 Points.

K_E of Firm “A” = 5% + 3.5% = 8.5% annual rate.

For firm “B” which has an index of 0.71, meaning 29 points under 100, the value of the risk and K_E value would be:

Measured risk based on the indexes for Firm “A” = (29 Points) / 2 = 14,5 Points.

K_E of Firm “B” = 5% + 14.5% = 19.5% annual rate.

Lastly, for firm “C” which has an index of 1.36, the value is above 1, which means it wouldn’t have a risk upon indexes, a its value of K_E decrease to end up with a value equal to the free risk interest rate.

K_E of Firm “C” = 5% + 0% = 5% annual rate

If according to expert judgements, it is considered that for each percentile point under 1, one risk point is assigned, the results obtained would therefore be the following:

For firm “A”, which has an index of 0.93, which means 7 points under 100, the risk value and the K_E value would be:

K_E of Firm “A” = 5% + 7% = 12% annual rate.

For firm “B”, which has an index of 0.71, meaning 29 points under 100, the value of the risk and K_E value would therefore be:

K_E of Firm “B” = 5% + 29% = 34% annual rate.

And finally, as specified before, for firm “C” which has an index of 1.36, the value is above 1, which means it wouldn’t have a risk upon indexes, a its value of K_E decrease to end up with a value equal to the free risk interest rate.

K_E of Firm “C” = 5% + 0% = 5% annual rate.

CONCLUSIONS:

Through the proposed model, it can be demonstrated that Proper resource cost does not involve a unique mechanical procedure as would be solving it with one mathematical equation, but rather a profoundly analytic function; for this reason, it is recommendable to use various models for its calculation in order to confirm its accuracy, this way agreeing with the author Simon Benninga[5].

The proposed model constitutes a tool that gathers, in only one “number”, how the firm is doing, in particular, with relation to other firms in the sector. This allows us to establish individual risk within an industry. The financial rates considered are the ones which most closely show if a firm is in healthy conditions or not; they were defined based on the author’s experience, and also on financial indicators which are used by banks for loans and credits.

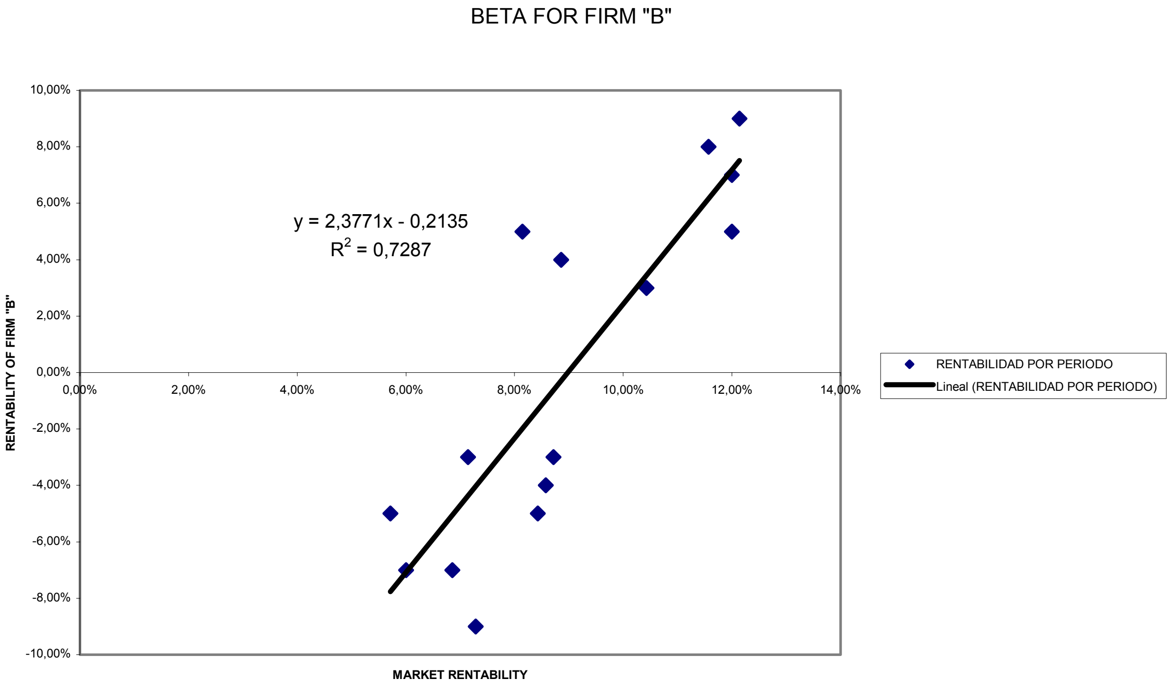
The model was tested with various ranges of values that firm ratios could take, and it was constantly observed how the firms with best ratios presented minimum risks. It is recommendable to use indexes which are projected (or calculated) based on historical data, and using methods such as exponential smoothing or through the analysis of each firm’s financial state.

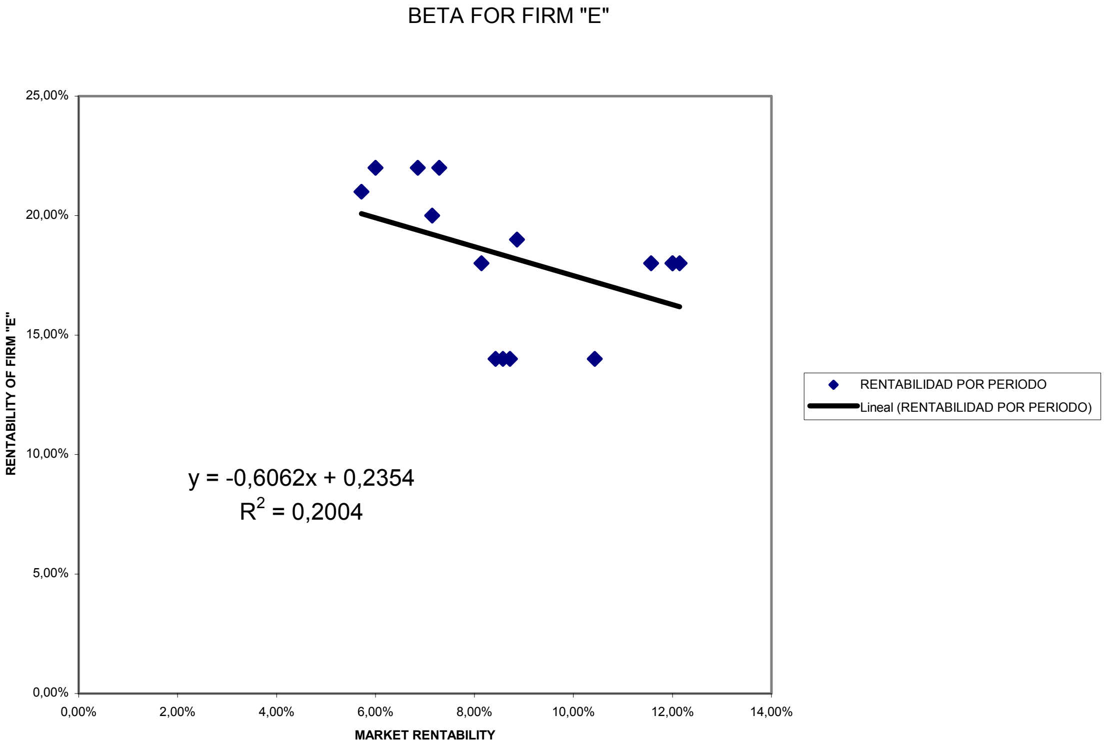
This model can be applied for firms which belong to a specific sector of the industry or with all the firms inside the market; the empirical comparison, therefore, must be done with real firms’ data and not with the hypothetical.

[5] Benninga Simon, “Financial Modelling” MIT Press 1999, page 47

APPENDIX #1

BETA VALUES y LINEAR REGRESSION EQUATIONS FOR FIRMS "B" AND "E"





BIBLIOGRAPHY:

BENNINGA SIMON, “Financial Modelling” MIT Press, 1999
VÉLEZ IGNACIO, “Decisiones Empresariales bajo riesgo e incertidumbre”, Norma 2003.
SAATY THOMAS,” Fundamentals of Decision Making”, RWS Publications, 1994
CRUZ SERGIO, VILLARREAL JULIO, ROSILLO JORGE, “Finanzas Corporativas, Thomson Learning, 2002
DAY ALASTAIR, “Mastering Financial Modelling”, Pearson 2001