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THE CAPITAL RETURN OF AN UNLISTED BANK

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Abstract
The problem to determine the capital cost, in general, is relatively simple, but not trivial. In the particular case of study, related to the capital of an unlisted bank, it is a bit less.
In the use of the Capital Asset Pricing Model equation there is a series of obstacles that make its application not so immediate, so the non-triviality of the model.
The goal of this work is to use the CAPM equation to give a value to the capital cost invested in an unlisted bank, particularly in a credit cooperative bank.
The biggest obstacle is given by the Beta determination that we intend to use, if we refer to unlisted companies, it becomes difficult to determine this coefficient.
With the present work we have followed a first step that connects each listed bank returns with the average market returns, market is composed by the listed banks portfolio, so we have obtained a *Business Risk Index* (BRI) related to these banks. We have started from this index to relevered it on the basis of each unlisted BCC financial structure. In this way we obtain Beta coefficient of this sample.
Alternatively, it has been built a basket of unlisted bank returns of the same sector under analysis, thenrelating the returns of individual observed banks with the average returns provided by the banks observed market portfolio, we obtain the regression Beta.
At the end we determine a final alternative to assess the Beta values by building a Business Risk Index (BRI) sector obtained from the BCC market.
The analysis of the various alternatives used to determine the Beta values, leads to some interesting observations and considerations in the evaluation of the capital return invested in an unlisted bank.
Key words: cost of capital, investment risk, unlisted banks, systematic risk, beta coefficient.

1. Introduction

The growing dynamism of the markets has made the capital subscribers, both risk and debt, particularly attentive in order to the required return reflects the risk undertaken.
The company is therefore constantly called upon to assess the effects of its operations in terms of cost of financing sources before maximizing the value. In that sense it is fundamental the estimate of the cost of capital invested in the business activity.
The cost of company capital expresses the expected return from the company financers. A critical aspect is the estimate of the cost of equity, which expresses the return expected by shareholders considering the risk assumed in the business activity.
In this work we are going to deal with the cost of capital determination invested in a Cooperative Credit Bank, also colled unlisted Bank.
There are different methods, one of the models is structured on an analytical and quantitative logic which is best known and employed in the professional practice that is the *Capital Asset*

Pricing Model (CAPM)[1].

This model is based on the principle of risk-return, were the risk is the dispersion of the actual returns versus the expected returns and the main basic elements are:

- the proportional relationship between risk and expected return;
- the distinction between not risky business performance and risky assets;
- the distinction between systematic risk and specific risk;
- the determination of the stock risk related to the systemic risk that produces in the portfolio;
- the measure of the systematic risk of the title using the beta coefficient.

In order to facilitate the discussion, we refer to the performance of the stock market as an expression of business value and then to the cost of equity capital.

2. The model

The model is based on restrictive assumptions, such as:

- investors are risk averse and maximize their expected utility[2];
- the adoption of the mean-variance criterion to select portfolios;
- the decisions are taken on the basis of single-period horizons;
- investments and indebtedness are possible at the same risk-free rate;
- the expectations in terms of expected returns, variances and covariances are uniform for each investor;
- transaction costs and tax liens are not considered.[3]

Starting from these assumptions we formulate of the relationship between risk and return, which is the thesis of *CAPM*.

3. The Capital Market Line

The *Capital Market Line (CML)*[4]expresses the relationship between risk and expected return of the market portfolios and it compares each level of risk-return with the market portfolios, as the only efficient portfolio.

In the case of portfolio made up of *n* stocks and r_i is the *i-th* stock return, its return will be:

$$r_{ptf} = \sum_{i=1}^{n} x_i r_i$$

The calculation of this portfolio volatility is more difficult, since it is not the weighted average of the individual volatility[5], but also it considers the covariance between the stocks and the market:

$$Cov(r_i, r_m) = \frac{\sum_{i,t=0}^{n}\sum_{m,t=0}^{n}\left(r_{i,t} - \bar{r}_{i,t}\right)\left(r_{m,t} - \bar{r}_{m,t}\right)}{n-1}$$

or even better the correlation between the title returns and the reference market r_m:

$$Corr(r_i, r_m) = \frac{Cov(r_i, r_m)}{\pm_i \pm_m} \in [-1,1]$$

To calculate the variance of a portfolio, if we consider that:

$$\pm^2_{ptf} = Cov(r_{ptf}, r_{ptf})$$

where in the case of two titles we have

$$\pm^2_{ptf} = Cov(x_1 r_1 + x_2 r_2, x_1 r_1 + x_2 r_2)$$

or

$$\pm^2_{ptf} = x_1 x_1 Cov(r_1, r_1) + x_1 x_2 Cov(r_1, r_2) + x_2 x_1 Cov(r_2, r_1) + x_2 x_2 Cov(r_2, r_2)$$

therefore

$$\pm^2_{ptf} = x_1^2 \pm_1^2 + x_2^2 \pm_2^2 + 2 x_1 x_2 Cov(r_1, r_2)$$

If we consider that our titles portfolio may also contain a risk free asset, in addition to all risky assets, and if we consider a portfolio consisting of only two titles, one of which is risk-free, we will have that:

$$r_{ptf} = x r_f + (1-x) r_i$$

where *x* represents the weight of the risk-free asset within the portfolio, while r_i represents the average expected return of the risky asset, and r_f the risk-free stocks return. The volatility portfolio, in the case of a risky stock, will be:

$$\pm_{ptf} = (1-x) \cdot \pm_i$$

because the risk-free component volatility is zero.

If we consider the risky activity not as a single asset, but as a finite set of these one, or a portfolio,

[1]The model was developed in the Sixties and can be attributed to W.F. Sharpe, *Capital Asset Price: A Theory of Market Equilibrium Under Condition of Risk*, in Journal of Finance, n. 19, 1964; J. Mossin, *Equilibrium in a Capital Asset Market*, in Econometria, ottobre 1966; J. Lintner, *The Valutation of Risk Asset and Selection of Risk Investment in Stock Portfolios and Capital Budget*, in The Review Economics and Statistics, n. 47, 1965. Model used in Europe only in the mid eighties.

[2]M. Blume, I Friend, *The Asset Structure of Individual Portfolios and Some Application for Utility Function*, in The Journal of Finance, maggio 1974

[3]Vincenzo Capizzi, *Costo del Capitale e operazioni di investment banking*, Egea, 2003

[4] Berk J, De Marzo, *Finanza aziendale*, Perason, Mondadori, Milano, 2008

[5]Berk J., De Marzo P., Venanzi D., Capital budgeding, 2009, Perason

we can represent the set of portfolio combinations that can be obtained from the composition of risky assets with the risk-free asset.

In the two extreme cases, the first composed by only risk free stocks, in a cartesian axes system with standard deviations on the x-axis and the portfolio returns on the y-axis, we will have a point in the coordinate plane $A=(0,r_f)$, while in the second extreme case of only risky securities composition, the point of the plan will have coordinates $B=(\pm_i, r_i)$. The line passing through these points represents the possible combinations of efficient portfolios, line that satisfies the following equation:

$$\frac{r_i - r_f}{y - r_f} = \frac{\pm_i - 0}{x - 0} \Leftrightarrow \frac{r_i - r_f}{\pm_i} = \frac{y - r_f}{x}$$

where $\frac{r_i - r_f}{\pm_i}$ represents the angular coefficient of the line, the measure of reward per unit of risk, while r_f, is the intercept with the ordinates, for which the line is identified by the following function, with the independent variable the risk expressed through portfolio volatility

$$r_{ptf} = r_f + \frac{r_i - r_f}{\pm_i} \pm_{ptf}$$

then the *Capital Market Line (CML):*

$$r_{ptf} = r_f + \frac{r_m - r_f}{\pm_m} \pm_{ptf}$$

that considers the risk and the market expected return, as the efficient portfolios are composed by market portfolio.

In analytical terms, if we consider an investment divided into $\sim$ quantity of the title *i-th* or portfolio *i-th*, and $(1-\sim)$ quantity in the market, the return on this investment in the investment function $\sim$, it will be given by the function

$$f(\sim) = \sim r_i + (1-\sim) r_m$$

while the risk in terms of standard deviation, will be given by the function

$$g(\sim) = \left[\sim^2 \pm_i^2 + 2\sim(1-\sim)\pm_{i,m} + (1-\sim)^2 \pm_m^2\right]^{\frac{1}{2}}$$

from which the derivatives of the respective functions are

$$f'(\sim) = r_i - r_m$$

$$g'(\sim) = \frac{\sim \pm_i^2 + (1-2\sim)\pm_{i,m} + (\sim - 1)\pm_m^2}{\pm_\sim}$$

for $\sim = 0$ the curve of this portfolio is tangent to the curve of *CML* into point corresponds to the market portfolio and must not overcome *CML*[6], and it is

$$g'(0) = \frac{\pm_{i,m} + \pm_m^2}{\pm_m}$$

If consider that the inclination of the curve is equal to

$$\frac{f'(0)}{g'(0)} = \left(\frac{\pm_{i,m} + \pm_m^2}{\pm_m}\right)^{-1} (r_i - r_m) = \frac{(r_i - r_m)}{\pm_{i,m} + \pm_m^2} \pm_m$$

in the tangent point of market portfolio, the drawn curve has the same slope of the *CML*, therefore

$$\frac{(r_i - r_m)}{\pm_{i,m} + \pm_m^2} \pm_m = \frac{r_m - r_f}{\pm_m}$$

If we resolve the previous equation considering the expected return of the *i-th* title and we remember what the Beta corresponds, we have

$$r_i - r_m = \frac{r_m - r_f}{\pm_m^2}\left(\pm_{i,m} + \pm_m^2\right) \Leftrightarrow r_i - r_m = (r_m - r_f)\left(\frac{\pm_{i,m}}{\pm_m^2} + 1\right)$$

that is

$$r_i = r_f + (r_m - r_f)$$

then the equation of *CAPM*.

4. The Security Market Line (SML)

Investors may be interested in the risk relationship performance of individual risky assets, which are non-market portfolios. The systematic risk is related to the individual asset, which depends on the relationship between this and the market, and we can express it as:

$$\pm_{sist,i} = \circ_{i,m} \cdot \pm_i$$

which is assumed by the correlation between the title and the market, weighted by its volatility.

For which in the previous equation of *CML*, you get:

$$r_i = r_f + \frac{r_m - r_f}{\pm_m} \circ_{i,m} \cdot \pm_i$$

function that expresses the relationship between risk and return of a specific activity. If we consider the beta coefficient, which expresses the systematic risk of the asset versus the reference market and which is given the ratio between systematic risk and the market portfolio risk

$$= \frac{\pm_{sist,i}}{\pm_m} \Leftrightarrow \quad = \frac{\circ_{i,m} \cdot \pm_i}{\pm_m}$$

[6] D.G. Luenberger, *Investment Science*, Oxford University Press, 1998 (trad. It., *Finanza e Investimenti*, Apogeo, Milano, 2006)

we have:

$$r_i = r_f + \left(r_m - r_f\right)$$

function that identifies the *Security Market Line (SML)*, which express of the linear relationship between the return of individual risky asset or risky securities portfolio, and the market return, this relation is determined by the coefficient , that provides an efficient frontier of individual risky assets. The thesis of *Capital Asset Pricing Model (CAPM)*, according to which the expected returns of the observed activities, if regularly "priced", must be placed along the *SML*, which is along the line which considers the risk measured by the coefficient [7].

5. The coefficient Beta

The determination of Beta, the core of our work, that is the measure of the risk of an asset in our case, the ratio between the institution's volatility under examination, due to market risk, and the volatility of the overall market[8]. The Beta is also considered as an expression of the systematic risk of the asset, equal to the covariance of the excess returns of the entity compared to the excess returns of the market portfolio[9]. As in *asset pricing theory*, the cost of capital is a function of only systematic risk, coefficient beta can be understood as the link between macro-economic determinants and the premium for equity risk of a specific activity, which in our case study is a non-listed bank[10].

The *CAPM* assumes a linear relationship between the beta of an asset and its returns, it expresses the activity sensitivity to market fluctuations. The risk in *CAPM* is expressed by the market portfolio, so the measure of the risk of the considered activity, is not given by its standard deviation, but by its beta coefficient, where for

- $= 1$ the activity assumes the same sensitivity of macroeconomic events on the market portfolio;
- < 1 the activity is less sensitive to market events;
- > 1 the activity is more sensitive to market events;
- $= 0$ the activity is not sensitive to market events.

The methodologies to determine the beta coefficient are different:

- Bottom-Up Beta;
- Regression Beta;
- Accounting Beta.

In this paper we used the Regression Beta, that considers the linear correlation between the variables, where we calculate the covariance of market returns and the *i-th* activity. If the measure of the intensity of the linear link, through the correlation coefficient and the determination of the significance and representativeness of the regression line which is built. Therefore the more the regression model will be valid, the more reliable will be the estimation of the Beta coefficient. The reliability of the determination of the Beta, is first tested by the coefficient of determination:

$$R^2 = \circ^2_{(r_m,r_i)} = \left(\frac{\pm_{(r_m,r_i)}}{\pm_{(r_m)}\pm_{(r_i)}}\right)^2 \in [0,1]$$

This coefficient indicates how much of the variability of the dependent variable is explained by the independent variable, explaining in this way, how much of the *i-th* risk assets has systematic nature. More this value tends to unity, greater is the dependence of the Beta from the benchmark portfolio.

Determining the market return, in theory requires the definition of the market portfolio.[11]Since it is an analysis of unlisted Banks, precisely on a sample of 9 Apulian BCC, which for convenience is designated with consecutive numbering, we do not have the option possibility to take as an market portfolio the Mib30 or FITSE Mib, since there is no correlation between the two variables. Thus we have decided to identify three steps leading to the determination of our Beta.

6. The first step

The first hypothesis aims to identify a *Business Risk Index (BRI)*, on a sample of listed Banks, made up of 17 units (*UniCredit, Ubi Banca, Mediobanca, Intesa Sanpaolo, Finecobank, Credito Valtellinese, Credito Emiliano, Banco Popolare, Banco di Sardegna Rsp, Banco di Desio e Brianza, Banca Profilo, Banca Pop Sondrio, Banca Pop Milano, Banca Pop Emilia Romagna, Banca Monte Paschi Siena, Banca Finnat*e *Banca Carige*), and for each of them we have calculated the annual return, r_{bq} for an interval of 9 years, similar to that considered for BCC, from 2006 to 2014

[7] L. Guatri, M. Bini, *Nuovo trattato sulla valutazione delle aziende*, Egea, 2005

[8] Berk J, De Marzo, *Finanza aziendale*, Perason, Mondadori, Milano, 2008

[9] L. Guatri, M. Bini, *Nuovo trattato sulla valutazione delle aziende*, Egea, 2005

[10] A. Poli, *Il costo del capitale. Teoria della finanza e mercati finanziari*, Etas libri, 1997

[11] L. Caprio, *Le decisioni di investimento nei mercati di capitali. I modelli media-varianza*, Utet, Torino, 1989

$$r_{bq} = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{Div}{P_{t-1}}$$

and for the purposes of our work, we have considered the return in continuous, j_{Bq}. Therefore being

$$r_{bq} = \frac{P_t + Div - P_{t-1}}{P_{t-1}} = \frac{P_t + Div}{P_{t-1}} - 1$$

we have

$$j_{bq} = \log(r_{bq} + 1)$$

Then we have been determined $\;_L$, Beta Levered of individual listed Banks in the considered interval, by regression between each individual bank return and average market returns, made by 17listedBanks portfolio. Since $\;_L$,suffers the financial structure of theconsidered unit,[12]we have proceeded to determine Beta Unlevered, $\;_U$:

$$\;_U = \frac{\;_L}{1 + \left[\frac{Dq}{Eq}(1 - t_q)\right]}$$

where D_q indicates the dubt level, E_q the risk capital and t_q the tax burden of the individual listed Banks.

The average of $\;_U$ gives us the *BRI*, amounted to **0.18** and from which we departed to relevering it, according to the financial structure of each BCC and to get thus the risk coefficient of the unlisted banks sample:

$$\;_{RL} = BRI\left[1 + \frac{Dc}{Ec}(1 - t_c)\right]$$

where D_c indicates the dubt level, E_c the risk capital and t_c the tax burden of the considered BCC.

Before using the *BRI*, we carried out a further verification. A property of the regression line $y = \beta x + \alpha$ is that this line passes through the midpoints, with coordinates, average return of the individual listed banks $\bar{r}_{bq}$ and average portfolio return $\bar{r}_m$:

$$\bar{r}_{bq} = \;_L\bar{r}_m + \sim \;\Leftrightarrow\; \sim = \bar{r}_{bq} - \;_L\bar{r}_m$$

from which we have deduced alpha coefficients of each bank, then the line that binds the return of each bank r_{bq}, to market return r_m

$$r_{bq} = \;_L r_m + \sim$$

If the calculated Beta, perfectly fits the systematic risk of the bank compared with the market, Alpha should be zero. An alpha different from zero, may be due to random and no systematic errors, so we used the Student's T test[13] to verify the following hypotheses:

$$H_1 : \;_L = 0 \text{ e } H_2 : \;_L \neq 0$$

for Beta, and

$$H_1 : \sim = 0 \text{ e } H_2 : \sim \neq 0$$

for Alpha.

The procedure followed shall be valid, if by the Student's T test shows that:

$$\;_L \neq 0 \text{ e } \sim = 0$$

The value of T, respectively for Alpha and Beta, is thus obtained:

$$T \;= \;/err.std \quad \text{e } T_\sim = \sim/err.std\sim$$

To determine the standard error, it is necessary to calculate the theoretical returns $r_{t,bq}$, of each bank for the whole time interval analyzed:

$$r_{t,bq} = \;_L r_m + \sim$$

necessary to identify the squares residuals sum SS_E, and therefore the variance compared to logarithmic returns, or the variance $\pm^2_E$ of the model errors:

$$\pm^2_E = SS_E/n - 2$$

and finally, the sum of the squares of the deviations of the market returns, compared to its mean value S_{xx}. Taking into consideration that the variance of the market σ^2_M, it results:

$$\pm^2_M = S_{xx}/n - 1 \Leftrightarrow S_{xx} = \pm^2_M(n-1)$$

We can determine the Beta standard error, which is:

$$ErrStd \;= \sqrt{\frac{\pm^2_E}{S_{xx}}}$$

and the intercept Alpha standard error:

$$ErrStd\sim = \sqrt{\frac{S_{xx} + n\bar{r}^2_M}{nS_{xx}}}$$

To determine T and $T_\sim$:

$$T \;= \frac{\;_L}{ErrStd} \text{ e } T_\sim = \frac{\sim}{ErrStd\sim}$$

and compare them to the theoretical values of T Student's table, that for a 5% probability level, is equal to 1.645. So if T is above this value, the probability that the calculated Beta is different from zero for random errors, is only 5%. We can accept the hypothesis of Beta different from zero. The same reasoning is done for T_α, and if we assume values lower than the level of 1.645, it means that

[12] R.S. Hamada, *Portfolio Analisys, Market Equilibrium and Corporate Finnce*, in The Journal of Finance, marzo 1969

[13] The Student's t test is a statistical test that allows you to test some hypotheses. In the present case it has been used to verify the Alpha and Beta parameters. See, Montgomery, Runger, and Hubele, *Statistics for Engineering.*

the probability that Alpha is different from zero is not due to random errors, it is of 95%.Thus we can accept the hypothesis of Alpha equal to zero. The hypothesis of the CAPM that links the asset return to the market return, from only Beta coefficient is confirmed. These comparisons were also performed with the Student's t test for a probability level of 10%, which is equal to 1.282.

Tab. 01, Listed banks Beta and consequent BCC Relevered Beta, results of T Student’s test verification

	L	R^2	~	T	$T_{\sim}$	T_{STU} 5%	T_{STU} 10%		RL	$E(r_i)$
Unicredit	2,871371	0,464196	-0,06445	2,4626	-0,4629	1,645	1,282	BCC 1	1,5382456	7,7385613
Ubi Banca	2,435951	0,408619	0,067347	2,199251	0,509192	1,645	1,282	BCC 2	1,2128242	6,729755
Mediobanca	2,125636	0,234375	0,029537	1,46385	0,170346	1,645	1,282	BCC 3	0,9147307	5,8056653
Intesa San Paolo	2,404436	0,181014	0,113872	1,243845	0,493319	1,645	1,282	BCC 4	1,2709898	6,9100682
Finecobank	0,35175	0,012441	-0,15517	0,29696	-1,09702	1,645	1,282	BCC 5	1,8675413	8,759378
Credito Valtellinese	-1,12971	0,533545	-0,16489	-2,82963	-3,45863	1,645	1,282	BCC 6	2,4075146	10,433295
Credito Emiliano	-0,43058	0,006898	0,154666	-0,22051	0,663317	1,645	1,282	BCC 7	0,8871543	5,7201783
Banco Popolare	1,064607	0,681515	0,131591	3,87028	4,006216	1,645	1,282	BCC 8	1,9090793	8,8881458
B.co di Sard.gna Rsp	-0,00285	4,816408	0,093874	-0,00581	1,601143	1,645	1,282	BCC 9	0,1842387	3,5411401
B.co di De.o e Br.za	-2,73237	0,131024	-0,54949	-1,02735	-1,7302	1,645	1,282			
Banca Profilo	-0,90648	0,013143	-0,40417	-0,30533	-1,14006	1,645	1,282			
Banca Pop Sondrio	2,055654	0,222483	-0,0092	1,415281	-0,05304	1,645	1,282			
Banca Pop Milano	2,162691	0,467795	0,090795	2,480488	0,872089	1,645	1,282			
B.ca Pop E. R.gna	0,111378	0,003558	0,152351	0,158094	1,810995	1,645	1,282			
B.ca M. P. Siena	1,451858	0,083861	0,238606	0,800476	1,101697	1,645	1,282			
Banca Finnat	2,445807	0,152859	0,032217	1,123871	0,123975	1,645	1,282			
Banca Carige	2,720844	0,145386	0,242506	1,091251	0,814515	1,645	1,282			

As we can see in Table 01, even if the determination coefficient R^2 of the considered portfolio, is quite low, on average 0.20, does not affect on our choice. As these values have been used in an indirect way they are served for *BRI* determination.

Some doubt arises from the T Student’s test for the Beta validity different to zero, the result is valid only for 6 banks out of 17, unlike the Alpha coefficient that is correct for about the 90% of the banks. In the last two columns of the table we have reported BCC $_{RL}$, with the consequent expected returns, $E(r_i)$ resulting from the *CAPM* equation.

The market return used, has been the average return of the examined BCC, which is of 6.07%. More complicated is the evaluation of the risk-free return. We have considered government bonds with life on maturity covering the entire period under analysis. Because we didn’t want to refer to only ten-year BTPs, we have included government bonds with life deadlines contained in that range, such as BOT 6 and 12 months[14] , the BTP 3, 5, 7 and 10 years[15]. For each of these, not to dwell to a single emission, we have considered the average returns of 12 emissions made in 2014, obtaining the following

[14]Emissioni BOT annuali:*www.dt.tesoro.it/debito_pubblico/dati_statistici/le_emissioni_del_tesoro.html*

[15]Emissioni BTP a 10 anni: *www.dt.tesoro.it/debito_pubblico/dati_statistici/le_emissioni_del_tesoro.html*

structure of spot rates, on an annual schedule, with $t = 0$

$$i(t,t_k) = \{0.00360, 0.00478, 0.0081, 0.0155, 0.0192, 0.0297\} \Big/ \left\{\frac{1}{2}, 1, 3, 5, 7, 10\right\}$$

considering that

$$\frac{[1+i(t,t_k)]^{t_k-t}}{[1+i(t,t_{k-1})]^{t_{k-1}-t}} = [1+i(t,t_{k-1},t_k)]^{t_k-t_{k-1}} \Leftrightarrow i(t,t_{k-1},t_k) = \left(\frac{[1+i(t,t_k)]^{t_k-t}}{[1+i(t,t_{k-1})]^{t_{k-1}-t}}\right)^{\frac{1}{t_k-t_{k-1}}} - 1$$

we have the following forward rate structure

$$i(t,t_{k-1},t_k) = \{0.00360, 0.00598, 0.00976, 0.02670, 0.02850, 0.05462\} \Big/ \left\{\frac{1}{2}, 1, 3, 5, 7, 10\right\}$$

and also taking into account that we are interested in a return on an annual basis to cover the ten years, so the spot return of a market fairly representative, will be given by

$$i(t,t_k) = \left(\prod_{j=1}^{k} [1+i(t,t_{j-1},t_j)]^{t_j-t_{j-1}}\right)^{\frac{1}{t_k-t}} - 1 \Leftrightarrow i(t,t_{10}) = \left(\prod_{j=1}^{t_{10}} [1+i(t,t_{j-1},t_j)]^{t_j-t_{j-1}}\right)^{\frac{1}{t_{10}-t}} - 1 = 0.02969$$

then the risk-free rate applied.

7. The second step

In this phase, we have considered as market reference the 9 BCC sample, and we have used the Regression Beta between the banks returns and that of market to evaluate the systematic risk of each of them. Therefore for the purposes of the regression, variables considered are:

- the annual return of the *i-th* Bank unlisted r_{nq}, as dependent variable;
- the market portfolio return r_m, as independent variable.

The *i-th* Bank return has been calculated as the ratio between operating income reported in year *t* on equity capital. Since there are no dividends and considering the relative advantages of the business partners, as they are difficult to quantify:

$$r_{nq} = \frac{U_t}{CP_t}$$

The time interval considered is 9 years, from 2006 to 2014.

In the following table we observe the determination coefficients that are on average higher, equal to 0.69, compared to the previous step. The results provided by the T Student’s test are much better, both as regards the Beta value, and for nullity of Alpha. In almost perfect harmony with the *CAPM* line.

Tab. 02, *Beta levered delle BCC e conseguenti rendimenti attesi*

	$_L$	R^2	$\bar{r}_i$	~	T	$T_{\sim}$	T_{STU} 5%	T_{STU} 10%	$E(r_i)$
BCC1	1,186648	0,61	0,060782	-0,00493	3,3160	-0,2227	1,645	1,282	6,648608
BCC2	1,165741	0,52	0,098649	0,03409	2,402224	1,134437	1,645	1,282	6,583797
BCC3	0,335674	0,21	0,041131	0,022542	1,255286	1,361306	1,645	1,282	4,010589
BCC4	3,272182	0,74	0,064751	-0,11646	4,438241	-2,55097	1,645	1,282	13,11377
BCC5	0,047258	0,00	0,102293	0,099676	0,049777	1,695468	1,645	1,282	3,116499
BCC6	1,12027	0,34	0,051341	-0,0107	1,323772	-0,20418	1,645	1,282	6,442836
BCC7	0,792725	0,69	0,03919	-0,00471	3,22599	-0,30961	1,645	1,282	5,427447
BCC8	0,138144	0,02	0,036009	0,028358	0,354194	1,17418	1,645	1,282	3,398246
BCC9	0,941359	0,78	0,03919	-0,01294	4,910721	-1,09032	1,645	1,282	5,888212

In the last column the expected return obtained from the *CAPM* equations reported.

8. The third step

Finally we have made an additional rectification of Beta calculated in the second step. We have determined a *BRI*, considering the BCC. We have adjusted the Beta levered by the weight of the financial structure of each BCC, obtaining the *BRI* which is Beta unlevered average of BCC, equal to **0.23**. Then we have relevered it according to each individual BCC financial structure to obtain Beta relevered used to determine future returns.

Tab. 03, BCC *Beta through BRI*

	$_{L}$	$_{U}$	$_{RL}$	~	T	$T_{\sim}$	T_{STU} 5%	T_{STU} 10%	$E(r_i)$
BCC1	1,186648	0,139274	1,921113	-0,04561	4,241758	-1,62628	1,645	1,282	8,925449
BCC2	1,165741	0,173532	1,514694	0,014765	3,012041	0,474139	1,645	1,282	7,665552
BCC3	0,335674	0,066252	1,142406	-0,02214	2,816843	-0,8814	1,645	1,282	6,511458
BCC4	3,272182	0,464804	1,587337	-0,02316	1,629349	-0,38384	1,645	1,282	7,890745
BCC5	0,047258	0,004569	2,332369	-0,02687	1,817233	-0,33813	1,645	1,282	10,20035
BCC6	1,12027	0,08401	3,006741	-0,11517	2,71709	-1,68075	1,645	1,282	12,2909
BCC7	0,792725	0,161324	1,107966	-0,02217	4,057088	-1,31094	1,645	1,282	6,404694
BCC8	0,138144	0,013064	2,384246	-0,09603	2,552034	-1,65994	1,645	1,282	10,36116
BCC9	0,941359	0,922463	0,230095	0,026447	0,696883	1,293536	1,645	1,282	3,683296

Much better the framework provided by the T Student's test appears. The values which do not conform to *CAPM* assumptions have been reduced to a single unit, both for the Beta risk coefficient and for the Alpha intercept. In the last column we have observed future returns values slightly increased.

9. Conclusions

In this latter step the BCC systematic risk assessment is more better, especially compared to the first, that respect to the second, and highly reliable in relation to its direct dependence on market return.

If we consider also, the Beta average value in the various steps, we can be satisfied because tendentially it approaches unity.

Thus, even if the made hypothesis conduct to quite satisfactory results, we believe they are not sufficient to allow the assessment of the capital cost of an unlisted bank, and we believe appropriate, for the purposes of a stronger and reliable evaluation, to extend this model to a much larger sample consisting of Apulia and Basilicate BCC.

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Sitography

1. Emissioni BOT annuali:www.dt.tesoro.it/debito_pubblico/dati_statistici/le_emissioni_del_tesoro.html

2. Emissioni BTP a 10 anni: www.dt.tesoro.it/debito_pubblico/dati_statistici/le_emissioni_del_tesoro.html