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Article

Incidence of the Readjustment Rate in Investment Projects of the Cuban Food Production Sector

Incidencia de la tasa de actualización en proyectos inversionistas del sector alimentario cubano

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ABSTRACT

Aim: To design a procedure for selection of the readjustment rate for financial evaluation of investment projects in the food-producing sector, which will enable quantification of expected performance, and the risk assumed by stockholders or investors.

Methods: The model of capital asset valuation, adapted to the Cuban reality.

Results: The estimation of expected risks of investments is made easier, considering the national and international organizational scenarios.

Conclusions: A new financial tool can be used to prevent improvisations during project financial evaluations.

Key words: financial evaluation criteria; readjustment rate; feasibility of investments.

RESUMEN

Objetivo: Diseñar un procedimiento para la selección de la tasa de actualización a emplear en la evaluación financiera de los proyectos de inversión del sector alimentario, la que posibilitará cuantificar el rendimiento esperado y el riesgo que asumirán los accionistas o inversionistas por dicha inversión.

Métodos: Se utilizó el modelo de valuación de activos de capital, adaptado a la realidad cubana.

Resultados: Se facilita la estimación del riesgo esperado de las inversiones considerando el entorno organizacional nacional e internacional.

Conclusiones: Se dispone de una herramienta financiera que puede evitar la improvisación en las evaluaciones financieras de proyectos.

Palabras clave: criterios de evaluación financiera; tasa de actualización; factibilidad de las inversiones.

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INTRODUCTION

In Cuba, food production is one of the most important industry branches. Food processing comprises the quality of raw materials, sales processes, chemical changes during storage, packing, and consumer preferences. This sector requires machinery and equipment with appropriate technology; automation is the current trend in this market, which helps eliminate possible production flaws. The country is engaged in readjusting its economic model, and optimizing mechanisms for insertion in the world market, with significant investments, seeking optimization of industry technologies, and immersion in the world market.

The province of Santiago de Cuba has developed investments in the food industry to increase production capacities. One instance is the Soybean

processing plant (SPP), investment in a new oil refining plant, and improvements in Frank Pais grain processing plant.

Completion of these industrial investment projects requires, from start to finish, transit through a cycle comprising three phases: pre-investment, investment, and operation. The second phase is also known as implementation, and the third, as deactivation and start of production (Council of Ministers, 2014).

In these high priority projects for Cuba, the readjustment rate is an essential element to determine their viability, since the value of readjustment affects the current value of future flows. Accordingly, the aim of this paper is to design a proposal of a procedure that facilitates the selection of the readjustment rate to be used for effective cash flow, and financial evaluation of investment projects in that sector. The parameters for this were based on a financial approach implemented in the provincial food industry, considering the national and international organizational settings.

Hence, aspects like investment processes, learning, use and implementation of the readjustment rate, and organizational efficiency and efficacy must be taken into consideration. Their use should be based on a systemic approach within the process of project management viability.

A study to explore the implementation of the readjustment rate during investment process analyses, in 2018, was done at ERASOL Oil Refining Company, the Frank Pais Grain Processing Company, and the Soy Processing Company, all part of the Food Industry Business Group. A direct structured survey applied to a non-probabilistic sample of 15 experts, and five specialists from each company showed the results below.

- Incorrect financial assessment of investment project feasibility.
- Lack of correspondence between the readjustment rates used and the conditions of the market for such sector; there was no evidence of comparison studies with other similar companies in the world market.

- Investment based on project readjustment rates are prone to fail eventually, since the expected cost-effectiveness results of investment were not provided.
- The opportunity cost of capital invested was not estimated.

This leads to strategic positioning deterioration of companies in the sector, which is the problem to be addressed: the existence of a financial approach of readjustment rate implementation in investment projects under the current conditions of the Cuban economy.

The value of the readjustment rate depends essentially on the risk-free rate, country-risk, underlying asset, and the risks of production of every particular project. Decree-law No. 327 (Council of Ministers, 2014), named Rules of Investment Process, details the requirements of every stage (pre-investment, investment, and deactivation and start of production). The pre-investment stage defines the approval of studies to start an investment. However, in the existing methodologies (Behrens and Hawranek, 1994; Ministry of Economy and Planning, Cuba, 2001), the update rate to be used for calculating the selection criteria and investment evaluations in each sector or branch is not specified.

DEVELOPMENT

Theoretical rationale

Proper asset valuation is the rationale of investment theory. It is explained through an arithmetic operation in which the readjustment factor of expected flows of each project will be compared according to its current value (Brealey, Myers, and Allen, 2006).

The readjustment rate is the financial factor used, generally, to determine the value of money through time, and particularly, to calculate the current value of future capital or to evaluate investment projects. It is the inverse interest rate, which is used to increase value or add interests in current money, which is calculated as follows:

$$\text{Readjustment factor} = \frac{1}{1+r} \quad (1)$$

$$VA = \frac{C1}{(1+r)^1} + \frac{C2}{(1+r)^2} + \cdots + \frac{Cn}{(1+r)^n} \quad (2)$$

Where

VA= Current value

C= Expected charge

r = Cost-effectiveness or readjustment rate

Suárez S. (1995), Ross, Westerfield and Jaffe (2009), and Brealey, Myers, and Allen, (2010), among others, have studied investment project selection criteria, and have noted that they can be classified in two main groups:

- Approximate criteria or methods that do not include the chronology of different cash flows: these operate as if they were amounts of money perceived at the same time (static method).
- Criteria or methods that take into account cash flow chronology: these use the readjustment procedure in order to homogenize the amounts of money perceived at different times, making it more refined, scientifically (dynamic method).

According to Suárez (1995), some of the static methods are:

- Total net cash flow per money unit spent or compromised.
- Annual net mid cash flow per money unit spent or compromised.
- Recovery time.
- Accounting yield rate.

Total net cash flow per money unit spent or compromised: it consists in summing all the investment cash flows, and dividing the total by the initial payment of the investment. It is also known as cost-effectiveness index or cost-benefit ratio, and it represents the number of money units reinstated by the investment project per every invested unit. The benefit-cost ratio measures the economic benefits reported by the amount of money, initially used with current and future benefits.

According to Suárez (1995), some dynamic methods are:

- Criterion of capital value: the capital value of investment, also known as *good will*, which is equal to the readjusted value of all expected yields. In other words, it is equal to the difference between the readjusted value of expected charges and the readjusted value of foreseen payments. In this sense, only investments whose capital values are positive should be implemented, since they are the ones contributing to the completion of the general objective of the company, and increases in value.
- Brealey, Myers, and Allen (2010) also named this criterion as current net value (CNV), which helps calculate the current value, readjusting future cash flows originated by investment to the corresponding percent of cost-effectiveness.

The CNV formula is,

$$CNV = -Co + \frac{Cf_1}{(1+K)^1} + \frac{Cf_2}{(1+k)^2} + \cdots + \frac{Cf_n}{(1+k)^n} \quad (3)$$

Where:

CNV= Current net value

$Cf_{(1...n)}$ = Cash flow

K= Type of readjustment that can be applied to the investment

Co= Initial investment

This criterion has advantages over other previous criteria:

- It considers different flows of treasury deadlines foreseen in the project, and the opportunity cost of capital.
- It considers the value of money through time; that is, acknowledging that the value of one Peso today is higher than the value of a Peso tomorrow, because one Peso today can be invested, and will produce interests immediately after.

Considering that all the current values are measured in current Pesos, they can be added; therefore, this additive property prevents negative consequences. If there are two projects: A and B, the current net value of the whole investment combined is:

$$CNV = (A + B) = CNV(A) + CNV(B) \quad (4)$$

Limitations:

- A difficulty to specify some k type readjusting.
- The hypothesis of intermediate cash flow re-investment consists in an immediate re-investment of positive cash flows to some kind of k returns coinciding with the type of readjustment, and that the negative cash flows are financed with resources whose cost is also K.

Selection criteria:

If CNV > 0, investment cost-effectiveness is above the updated or rejection rate. The project can be considered acceptable.

If CNV = 0, the net benefits will be equal to the investment, the debt can be paid, and the investment is recovered. Hence, cost-effectiveness will equal the rejection rate. The project can be considered acceptable.

If CNV < 0, cost-effectiveness is below the rejection rate, and the project should be discarded.

- Cost-effectiveness index or cost-effectiveness rate.

$$I = \frac{\sum_{j=1}^{n} Cfn\ (1+K)^{-n}}{A} (5)$$

A = Initial payment required for investment.

Based on this criterion, only investments whose cost-effectiveness index is higher than the opportunity costs of capital will be acceptable.

- Internal rate of return (IRR).

Brealey, Myers, and Allen (2010,) made the following definition:

The internal rate of return is the readjustment rate in which the current net value equals 0. In other words, it is a cost-effectiveness measure that depends uniquely on the amount and installments of cash flows.

It is calculated through the following expression:

$$CNV = -Co + \frac{Cf_1}{(1+K)^1} + \frac{Cf_2}{(1+k)^2} + \cdots + \frac{Cf_n}{(1+k)^n} = 0\ (6)$$

The procedure begins by setting the current frame of liquidity, using an estimated readjustment rate that can readjust the current net liquidity to the current value.

If CNV is positive, a greater readjustment rate is applied to keep it positive, but near 0. To make it negative, but near 0, another rate is applied.

When the two values are achieved, an IRR is achieved through the following formula of linear interpolation:

$$IRR = i_1 \left(\frac{(v_p) * (i_2 - i_1)}{v_p + \backslash v_n \backslash} \right) (7)$$

Where:

i_1 = Readjustment rate for positive CNV (V_p)

i_2=Readjustment rate for negative CNV (V_n)

IRR = Internal rate of return

An investment project will be accepted according to this criterion, provided that the capital opportunity cost is below the readjustment rate, thus showing the same response as the current value.

Brealey, Myers, and Allen (2010,) considered the following limitations:

- Not all current flows of treasury have the property to decrease CNV whereas the readjustment type increases.
- In the presence of multiple cost-effectiveness rates, a double change of signs in the current flow of treasury occurs. That is, a project can have as many cost-effectiveness rates, as long as many sign changes occur in flows of treasury.
- When projects are mutually excluding, this criterion could be misleading.
- When the temporary structure of interest types cannot be avoided, a comparison would be too complex (p.124-129).

Brealey and Myers (1993) said that the idea that every company has a readjustment rate or cost of individual capital is widespread, though far from being universal. Most large companies use the financial asset balancing model to determine the readjustment rate.

However, Baca (2001) noted the existence of a common belief in a minimum acceptable return rate for project evaluation, in which the maximum rate set by banks for fixed investment installments should be used as reference. This is not appropriate, according to his consideration, since the readjustment rate for

investors would be one that compensate for limits on inflation, and a reward or surcharge for investment money risks.

García (2014) said that the readjustment rate of a project includes risk, which could be expressed through the following expression:

$i = i_1 + (D_r)$ (8)

Where:

i = readjustment rate or risk capital cost.

i_1= risk-free rate (US Treasury Bonds).

D_r= differential cost-effectiveness demanded from projects riskier than the safest alternative (risk compensation).

Three modalities can be used for its calculation:

1. Project cost-effectiveness rate of similar projects or sectoral activity. It is the most commonly used modality today.
2. Methods or models to assess financial assets, which systematize the cost-effectiveness-risk ratio. The capital asset pricing model (CAPM), and weighted average cost of capital (WACC).
3. The addition of a risk correction factor to the market rate.

Moreover, Fernández (2007) considers that risk and returns are the parameters that guide decision-making in terms of investment. Therefore, the relevant indicators of this investment are the changes in company values (returns), and the frequencies in which they occur (volatility-risk).

According to this author, this basic operation of flow update requires two main components: first, a reasonable estimation of possible future flows of companies or projects; second, a proper readjustment rate in which the future flows will be weighted, depending on experience and technical expertise of the business operators or implementers. Knowledge of the technological and economic reality of the sector will be required, as well as the surrounding or specific or individual competence of every company. Besides, it should also show the opportunity cost by the investor who will allot resources to that investment alternative, along with the risk assumed by investing in a particular project or company.

Furthermore, Ross *et al.* (2009) noted that the readjustment rate of a project should be the expected returns over a financial asset with comparable risk. Meanwhile, Brealey, Myers, and Allen (2010) considered that the readjustment rate of fund flows or cash flows of a project consists in rewards demanded by investors for taking delayed payment; that is, the minimum acceptable rate or the opportunity cost of capital, where the latter shows the "sacrificed" return of investing in this project, instead of investing in shares.

During evaluation of investment projects, especially during pre-investment, it is important to consider the dividends for fund providers, so the expected return is the main link, as the readjustment rate is the one showing time difference, and the returns expected by investors. Thus, it becomes the basis of calculation of the current net value, and treatment of risk pricing[1].

Brealey, Myers, and Allen (2010) defined the proper readjustment rate for average risk projects in a company. It consists in the company's capital cost defined as the expected returns of a portfolio containing all existing shares. That is, the opportunity cost of capital invested in the assets of a company.

In the 1970s several models were developed, particularly CAPM and WACC, which were conditioned by a hypothetical efficient market, and their implementation has depended on the assumptions of a developed market economy.

Hence, to perform calculations in a non-efficient market, as the Cuban economy is, will require adjustments, in order to incorporate the particularities of this market. Specifically, several assumptions of the original model should be disregarded, since they are not suitable to measure a non-efficient market. These include:

- Market imperfection.
- Existence of taxes, transaction costs, and information costs.
- Investors cannot lend and borrow to and from the risk-free rate.
- Absence of sufficient liquidity due to inexistence of stock markets.

Besides, in a market like the Cuban, it is necessary to add the cost of the debt. On one side, and a bonus or measure of intermediation and transaction costs; on the other, a risk bonus associated to investing or borrowing. This is related to the recognition of additional risk bonuses to the investors.

Hence, international references, which at least match the semi-strong hypothesis or market efficiency, are considered for adjusted application of WACC in Cuban industries. The stability of market-related units and reference parameters used, in reference to the base currency, is extremely important. This involves currency conversion pricing of the reference country. Otherwise, value weighting in different units will distort the opportunity cost to be estimated, lacking validity.

Analysis and discussion

The traditional model (CAPM) can be used to calculate the cost of equity capital or ownership cost. Accordingly, investors will receive a return rate for their capital, in keeping with the risks assumed. This model determines the existence of a risk-free rate (R_f) with no risk of bankruptcy or counterpart (default risk), whose return is certain. Besides, there is a portfolio containing all the market files, and a return surplus (additional return) in addition to the return from the risk-free asset.

The free-risk rate, the Cuban inter-banking market rate, and the calculation of accounting betas will be used to adapt the model to the conditions of the Cuban economy, based on the actual assets of companies. Additional risk bonuses will be taken into consideration, depending on external condition factors.

All this contrasts the Cuban economy, with no predominance of market laws, though the models can be adjusted. It will permit an approximate vision of the calculation of the readjustment rate or capital cost, which can be neared to the market rates, using historic accounting criteria.

In the absence of a market of capitals through which supply and demand favor long-term loans, it is impossible to know the mean returns of the market, as well as the price of shares, which is determined by the economic indicators of established stock markets in the world. As a result, the proper update rate for financial evaluation of investment cannot be determined.

In a risk analysis study, De la Oliva de Com (2001) noted that the existence of financial markets in Cuba is limited to purchase-sale of stocks through direct deals between the parties of established limited capital companies. This means a lack of public pricing of stock value or a developed side-market, in which these stocks can be sold and purchased. Hence, this is a poorly liquid market.

One choice of CAPM is the model developed by Ross, in 1976, arbitrage pricing. The arbitrage pricing theory states that the returns of each stock depends, on one side, on macroeconomic dominating influences or factors; and on the other, on "noise" (specific company events). However, this theory does not mention the factors; thus return is assumed to depend on the following expression:

$$\text{Return} = a_1 + b_1(r_{\text{factor1)}} + b_{2(\text{rfactor2)}} + b_{3(\text{rfactor3}}) + \ldots + \text{noise} \quad (9)$$

The theory of arbitrage pricing claims that the expected risk bonus of a stock depends on the expected risk bonus associated to every factor, and on the sensitivity of the stock to each factor (b_1, b_2, b_3).

According to a procedural standpoint, it is hard to quantify the impact of certain risks on the value of an asset. However, considering that markets are efficient, and conduct proper pricing of their assets based on the existing information about them, nondiversifiable risk pricing will be obtained through market observation.

The Capital Asset Pricing Model is based on this formula:

$$R = R_F + \beta \times (R_M - R_F) \quad (10)$$

Where:

R = Expected return

R_f = Risk-free rate

R_M = Expected returns of market portfolio

The concepts of bonuses and risks, and their different types will be explained in detail to clarify the information given above.

Business risk bonus: it is determined by the market bonus and business β. It acknowledges the expected return by investors who will participate in a specific and risky deal, instead of a risk-free asset. It means that these particular investors could have invested in risk-free assets, but decided to invest in a business with an uncertain return.

The only reason for a rational investor to do this is because the return will be above the income from a risk-free asset, as a way of justifying risk. Should there be a completely diversified portfolio, it would bring additional returns equal to the market bonus. Nevertheless, each asset will have a greater or lesser risk than the market, and therefore, the expected return from assets must be in accordance with the risk. This adjustment is done by incorporating the β from each asset, since it makes reference to market risks (nondiversifiable) faced throughout this particular activity.

Nondiversifiable risk: in this type of risk, also known as unique risk, is the one that can be eliminated through diversification. It corresponds to different unique and-or discriminating factors that would only matter in a particular sector, incorporating all the unique or relevant risks to the sector of interest.

This risk is opposed to market or nondiversifiable risk. For instance, the one capturing all the risks to which every market company, regardless of the sector, would be exposed to.

As diversifiable risk only matters to the sector of interest, with a calculation of the optimum readjustment rate, the weighted average capital cost does not take the risk within unique risks, which might imply under or over estimation of the readjustment rate to price current projects and new investments. In other words, it does not acknowledge the fact that companies are exposed to additional and different unique or market risks.

Country risk: besides this nondiversifiable risk, WACC should consider the country risk, which corresponds to the additional risk of investing in the assets of not completely developed, or unstable economy.

The country risk issue had stimulated international discussions with scholars who claim that in a global economy, capitals can flow freely in every direction, thus diversifying it. It means that investors should have the capacity to carry a portfolio of assets across the world, which would take away country risk, and if that, no additional bonus should be considered in relation to this risk. However, it fails to consider the existence of the cost of transactions, and international obstacles for investors to have a true global portfolio.

Methods used

The model of Sharpe (1964) is adjusted to these stages. It holds the theory that returns required from investment are obtained from the sum of risk-free returns plus the market-risk bonus, multiplied by the beta coefficient of the j^{th} concrete investment to be evaluated. The market-risk bonus shows the difference of mean market return and the risk-free rate.

In market economy countries, risk-free returns are estimated through the returns of documents and short-term liabilities issued by States, which is difficult in the case of the Cuban economy, as explained previously. However, it could be feasible, considering the return reference provided by the National Banking System, regarding fixed deposits or the rates of inter-bank loans to companies, for several years.

Market-risk bonus

In Cuba, whose economic model is constantly being optimized, the calculation of the risk bonus is recommended to include a period of time comprising not many previous years, since information will not ensure reliable results. A five-year period is suggested.

Procedure proposal for determination of the readjustment rate in financial evaluation of investment projects

This procedure is designed for application in production entities, investments (construction or else), whose planning, control, and evaluation may be nominal or else, in keeping with the legal standards of bodies that regulate investments in Cuba.

The main goals of the procedure are the following:

- To provide a methodological and practical approach to companies in the food sector, which permits calculating a discount rate in the evaluation of new investment projects.
- To adjust international calculation practices of the readjustment rate to the current conditions of the Cuban economy, in the financial evaluation of investment projects, in companies of this particular sector.

The procedure proposal to calculate the discount rate aims to show the conceptual and methodological rationale to calculate the proper discount rate for the investment process, with the ensued contribution to improvements in the outcome of financial evaluation of different studies.

The procedure suggested will rely on these particularities:

- Easiness: the procedure allows for simple information management.
- Extension: it broadens the knowledge in relation to financial evaluation of investment projects.
- Adjustment and adapting: it will permit necessary adaptability of models used to price assets internationally in the food sector of the Cuban business system.
- Forecasting: it will allow decision-makers to envision the future, and to prevent the behavior of certain selection criteria and financial evaluation of new investment projects.
- Strengthening of decision-making: its objectives will focus on proper identification and selection of the readjustment rate that will allow companies not to present underrated and overrated financial indexes in projects, depending on the international financial market.

Fig.1 shows the phases suggested in the procedure to calculate the readjustment rate.

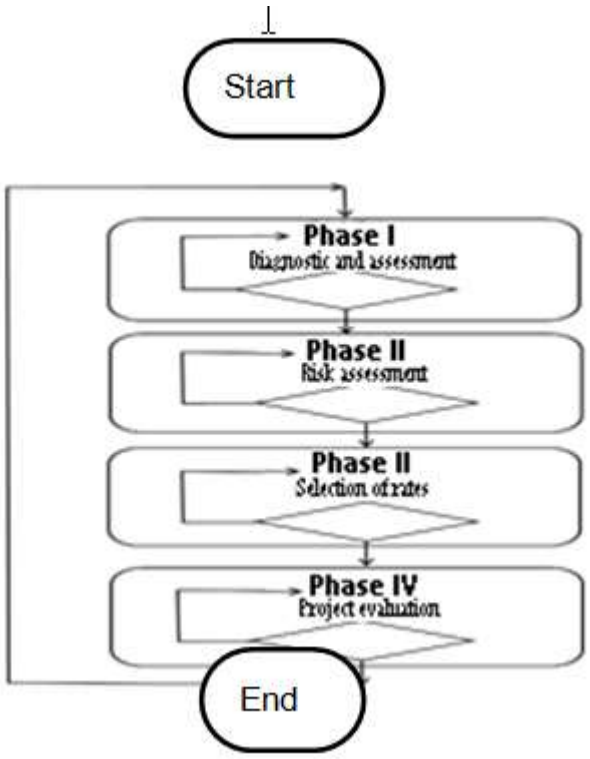

Fig.1 Phases suggested for calculation of the readjustment rate

Brief description of the stages in the procedure:

Phase I: Diagnostic and assessment

Objective: To conduct a detailed analysis about the information provided by the surrounding and the financial market at the time of investment study; as well as assessment of the composition of company funding sources in the target sector.

This developmental stage comprised four steps:

Step 1. Diagnostic and analysis of the financial environment.

Step 2. Diagnostic and analysis of the financial market.

Step 3. Analysis of financial state indicators.

Step 4. Analysis of financial institutions.

Phase II: To evaluate different types of risks that affect companies in the sector studied

Objective: To consider possible risks to which companies in the target sector might undergo; and to set up actions in that direction. Two steps were assessed:

Step 1. Analysis of risk of liquidity and credit.

Step 2. Creation of the diagnostic matrix for liquidity and credit risks.

Phase III: To estimate and select a usable discount rate in cash flow to be projected

Objective: To estimate the proper readjustment rate to calculate selection and evaluation criteria of new investment projects.

Step 1. Review of historical data from the last five years reported in the balance sheet, financial returns sheet, and expenses per company element.

Step 2. To classify company expenses in the sector, as to fix and variable costs in a five-year period.

Step 3. Calculation of weighted average capital cost by determining the discount rate in every company from the target sector.

The Ross, Westerfield, and Jaffe formula will be used:

$$\mathrm{Wacc} = \frac{\mathrm{V_{rp}}}{\mathrm{V_{rp}+V_d}} * \mathrm{Ceqf} + \frac{\mathrm{V_d}}{\mathrm{V_{rp}+V_d}} * \mathrm{Cdvf} * (1 - \mathrm{T}) \quad (11)$$

Where

W_{ACC} = Weighted average capital cost.

V_{rp}= Value of owned resources (ownership).

V_d = Value of debts (passive).

C_{eqf}= Cost of equity capital funding (CAPM).

C_{dvf}= Cost of debt value funding (debts).

T= Profit tax.

The weighted average capital cost refers to the average calculation of funding sources that sector companies can access for investment. Hence, weighting of all costs will be considered to get a discount rate that will be averaged from such proportions.

Fig.2 details the general formula, considering all the variables included:

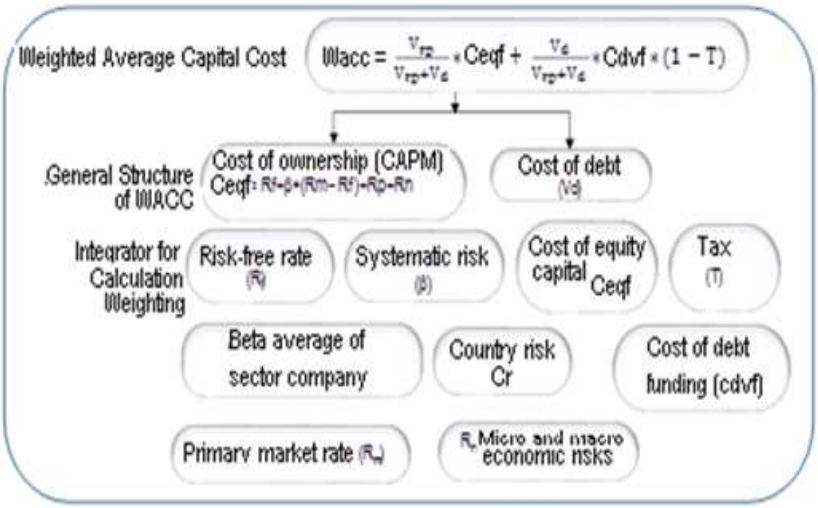

Fig.2 Detailed variable use for WACC calculation

Ownership cost (CAPM) will be calculated using this formula adapted to the financial situation of the country:

$CAPM = Rf+\beta* (Rm− Rf) +Cr+Rn$ (12)

Where

R_f = risk-free rate

β = beta (systemic ownership risk of selected companies)

R_m= expected market cost-effectiveness

(R_m-R_f) = market-risk bonus

C_r = country-risk bonus

R_n = bonuses granted for other macroeconomic and microeconomic risks (lack of liquidity to pay for debt associated to raw materials in the sector, inflationary process, outcome of liquidity and credit-risk matrix).

Step 4. To select, calculate, and compare using the calculated discount rate, cash flows projected in studies done in investment processes of selected company projects in the target sector.

The procedure suggested will use the information provided by the international market as country risk, through a source supplied by Damodaran (2018), on estimated risk by country. Since Cuba does not have bond issuing statistics to be

compare with a developed economy, efficient market indicators weighted by these variables are analyzed, and an estimated value is provided.

Table 1 shows the calculation of readjustment rate determination in one of the companies in the sector.

Table 1 Calculation of the discount rate, using CAPM and WACC

Calculation of ownership cost	Years				
Variables	2014	2015	2016	2017	2018
RF	4.0	4.0	4.0	4.0	4.0
B	0.43	0.77	1.11	1.76	1.84
Rm	11.0	11.0	11.0	11.0	11.0
Rm_Rf	7.0	7.0	7.0	7.0	7.0
Cr	15.46	15.46	15.46	15.46	15.46
Rn	5.5	5.5	5.5	5.5	5.5
Ceqf	27.9	30.4	32.7	37.3	37.8
Calculation of debt cost					
Variables	2013	2014	2015	2016	2017
T	35	35	35	35	35
$\frac{Vrp}{Vrp + Vd}$	23.28	24.74	19.6	21.61	17.10
Kd	12.5	12.5	12.5	12.5	12.5
$\frac{Vd}{Vrp + Vd}$	76.7	75.3	80.4	78.4	82.9
Readjustment rate	12.74	13.63	12.96	14.43	13.21

Source: Based on the results achieved in the state of situation

When the yearly rates are achieved, the arithmetic means of yearly rates was calculated, accounting for 13.4%. It suggests that the entity should use at least, a rate equal to the one calculated in their investment process studies, but never a lower rate. That is, it will be the minimum rate to be used for cash flow discounts in new investments, and the calculation of investment selection and evaluation criteria.

Below, the calculation has been broken down into variables used to make the readjustment rates. Calculation of accounting betas as shown in Table 2.

Table 2: Calculation of accounting betas (β) from income and assets

Variables	UM	Years				
		2014	2015	2016	2017	2018
Current asset value	Pesos	26 389 850.73	22536914.30	19068319.74	12551391.88	21180192.69
Current income value	Pesos	44 447 611.52	49 088 748.39	47 895 368.35	43 424 385.89	50 836 090.66
Current fixed cost value	Pesos	16 748 76.80	17 114 88.10	15 685 82.57	13 532 89.32	1 203 343 59
Current variable cost value	Pesos	37 398 326.39	38 215 820.17	35 0248 82.34	30 217 599.05	26 869 460.59
Income B	Index	0.27	0.48	0.67	1.05	1.13
Asset B	Index	0.28	0.52	0.73	1.17	1.20

Source: Based on the results achieved in the balance sheet

Then, the betas were adjusted by leverage (Table 3).

Table 3 Leverage calculation of accounting betas

Variables	UM	Years				
		2014	2015	2016	2017	2018
Betas without leverage	Index	0.52	0.73	1.17	1.20	1.59
Leverage						
Debt-state investment	Index	0.75	0.80	0.78	0.83	1.33
Taxes	%	35	35	35	35	35
Betas with leverage	Index	0.77	1.11	1.76	1.84	2.96

Source: Based on the results achieved in the balance sheet.

To calculate the readjustment rate, the risk-free inter-bank market rate provided by the Central Bank of Cuba was used. It is estimated according to considerations from international authors, like Brealey.

Country risk is assumed by sources from the international market, by *Standard and Poors*.

The macro and micro-economic (Rn) risk bonuses assumed were the ones supplied by specialists in the sector. These include possible liquidity risk, inflationary risk, and others caused by the lack of raw materials for production.

The debt cost (Kd) was assumed as the interest rate average over investment loans from National Banks.

CONCLUSIONS

The implementation of this procedure ensures the calculation of a readjustment rate in the food sector, thus facilitating the determination of required yields for new investment projects during the pre-investment phase.

The adjustment from the original CAPM model is possible, taking into account the specifics of the Cuban economy.

This procedure will allow the food sector to evaluate new projects with a new financial tool that helps prevent improvisations in project financial evaluations.

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Conflicts of interest and conflict of ethics statement

The authors declare that this manuscript is original, and it has not been submitted to another journal. We are responsible for the contents submitted in the manuscript, which has no plagiarism, ethical conflicts, or conflicts of interest.

Author contribution statement

Luis Manuel Almarales Popa: Theoretical background, development of procedure and tools for procedure development. Measurements, analysis of results, conclusions.

Frank Roberto Hierrezuelo Betancourt: Design of the manuscript, redaction of the results and abstract, review of all the manuscript.

NOTES

[1]Inappropriate use of the discount rate may lead to wrong decisions.