Evaluation of beta (β) by the external control in public-private partnership (PPPs) contracts

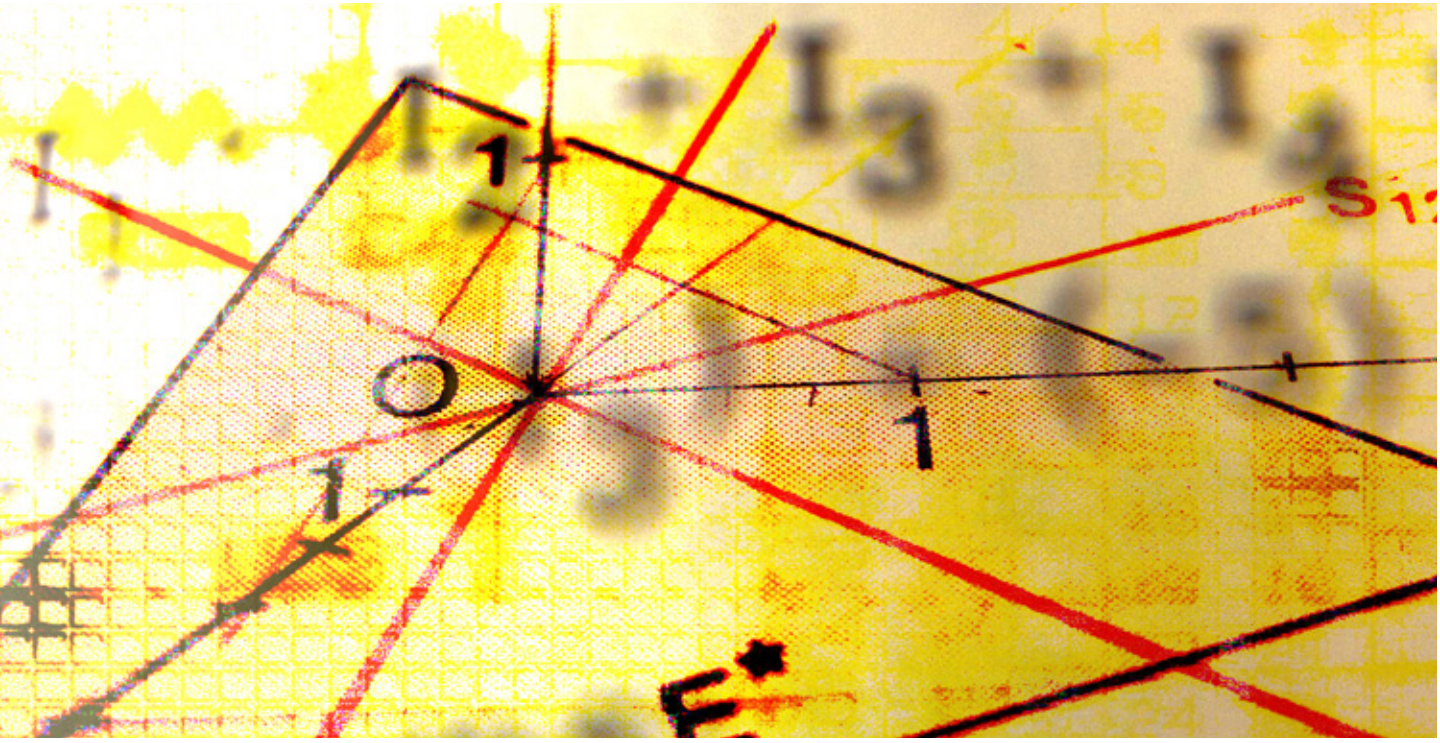
Orivam Ibiapina da Silva is a government auditor of the Court of Accounts of the Federal District (Brazil). He holds a Bachelor degree in Economics from Federal University of Piaui (UFPI) and a Master degree in Economics from University of Brasilia (UnB).

ABSTRACT

One of the External Control's constitutional responsibilities is to appraise the financial and economic viability of Public-Private Partnership projects (PPPs). In this context, it is important to evaluate the Weighted Average Cost of Capital (WACC) – the enterprise's appropriate rate of return – according to the Federal Court of Accounts – Brazil (TCU). One of the components in the WACC calculation is beta (β), which represents the systemic risk of a firm or sector. Calculating beta in PPP contracts involves some problematic issues, because it usually includes construction, purchase of equipment and service provision, i.e., more than one economic sector. This paper aims to show that, according to the financial theory, it is more appropriate to use the weighted average of the betas of each sector involved in the project rather than using only the beta of the predominant sector. This conclusion was applied to the Health PPP analyzed by the Court of Accounts of the Federal District (TCDF).

1. 1. EXTERNAL CONTROL OF PUBLIC-PRIVATE PARTNERSHIPS (PPP)

According to Law no. 11079/04, article 2 (which establishes general rules for bidding and contracting PPPs in public administration), a public-private partnership is a concession agreement that involves two new modalities: administrative and sponsored.



These forms of concession are different from the regular ones, for the latter are ruled by Law no. 8597/95, which is subsidiarily applicable to the PPP Law.

As PPP contracts executed by public administration constitute administrative agreements that involve the disbursement of Treasury resources, they are controlled by the Courts of Accounts, according to articles 70 and 71 of the Brazilian Constitution (1988).

In this context, the Federal Court of Accounts – Brazil (TCU) edited the Normative Proceeding no. 52, from July 4, 2007, whose 1st article provided that: "The Federal Court of Accounts has the mandate to follow the processes of bidding and contracting Public-Private Partnerships, as mentioned in Law no. 11079/2004, and also to monitor the execution of established partnership agreements." (TCU, 2014, p. 1)

The Court of Accounts of the Federal District (TCDF) published Resolution no. 189, from Sept. 9, 2008, whose content is similar to the TCU norm.

One of the basic duties of the Courts of Accounts is the financial and economic evaluation of the PPP project by means of analyzing the viability studies presented by the promoter of the bidding process. For that reason, providing electronic spreadsheets is mandatory, as mentioned in article 4, "d"- 6 of the NP 52/TCU (TCU, 2014, p. 2-3).

In this research, one of the technical elements investigated is the adequacy of the WACC (Weighted Average Cost of Capital).

2. WEIGHTED AVERAGE COST OF CAPITAL (WACC)

The WACC is the weighted average cost of debt and equity. It is supposed to be used to discount the cash flows of projects whose risk is the same as the firm's, and it is funded at the same percentage of the firm's debt (ROSS, 2002, p. 270).

The formula for calculating the WACC is the following:

$$r_{WACC} = (S/(S+B))xr_s + (B/(S+B))\ xr_Bx(1 - T_c)$$

Where: S = equity; B = debt; r_s = cost of equity; r_B = cost of debt; T_c = income and social contribution tax rates

The WACC is important for the external control because it is the discount rate to be used in the cash flow of the enterprise; therefore, it enables the verification of fee adequacy to the user and/or the public partner's pecuniary counterpart in the PPP contract (TCU, 2015).

Thus, two analyses are important in this case:

- verification of consistency in the premises adopted in the financial and economic modeling;
- adequacy of the private partner's financial return in comparison with the Government's pecuniary consideration.

3. BETA (β) IN PPP CONTRACTS

Now we will comment on beta, a component of the cost of equity (rs) in the WACC equation.

The cost of equity represents the discount rate of a project that is correspondent to a financial asset with a similar risk. It is the minimum return to invest the firm's resources instead of sharing dividends to shareholders (ROSS, 2002, p. 257). In general, the Capital Asset Pricing Model (CAPM) is used to calculate rs, which is obtained from the following formula:

$$r_s = r_f + \beta x(r_m - r_f)$$

Where: rf = risk-free rate; β = beta; rm = market rate of return

The CAPM indicates that the expected return on a firm's stock has a linear relation with its beta (ROSS, 2002, p. 231), which "measures the sensitivity of a security bond to the market movements." (ROSS, 2002, p. 227)

The value of beta (β) is the result of the covariance between the returns on a specific asset and the market portfolio, due to the market variance[1] (ROSS, 2002, p. 260).

Another way to find beta is by regression. In this method the monthly data of the firm's stock return, for example, is associated with a return index of the overall market. The straight line obtained presented an inclination that corresponds to beta (ROSS, 2002, p. 261-262).

It is common practice in finances to use the betas of each sector in which a firm operates, or a beta related to the enterprise analyzed: "it is frequently argued that one can better estimate a firm's beta by involving the whole firm" (ROSS, 2002, p. 262).

For that reason, many specialized websites provide such values. They facilitate the analyses because the calculation of a specific beta for a project is time-consuming and, many times, it can be even impossible due to the lack of data for a considerable time horizon.

In PPP projects, choosing the appropriate beta is not a simple task when enterprises involve activities of more than one sector. Usually they comprise construction, supply/maintenance of equipment and service provision.

This could be easily solved by selecting the beta from the predominant sector. However, from the technical point of view, this may not be the best solution.

The beta obtained from the weighted average of the betas of each activity can be considered more adequate regarding the investments and/or services performed by the firm analyzed.

This procedure is based on financial technical manuals, such as the one developed by Tom Copeland, Tim Koller and Jack Murrin. They performed an analysis to evaluate multiple companies, i.e., companies that own more than one business unit.

According to these authors:

> One of the major problems in estimating the cost of equity of business units is that good terms of comparison can be barely found, because most of companies have many business lines and different asset percentages for each of them. One way to overcome this issue is to recognize that the business risk (it means, the unlevered beta) of a company with multiple divisions is the weighted average of the risks in each business line (COPELAND, 2002, p. 316/317).

It means that, based on the percentage participation of each activity in the company's assets, betas could be estimated for two business lines, as in the following formula:

$$beta_{u1} + W_{A1}beta_{uA} + W_{B1}beta_{uB}$$

This conclusion derives from the theory of return on a portfolio of securities, as Ross affirmed:

> The formula for expected return on a portfolio is very simple:
>
> The expected return on a portfolio is simply a weighted average of the expected returns on the individual securities.
>
> EXAMPLE:
>
> Consider Supertech and Slowpoke. From the preceding box, we find that the expected returns on these two securities are 17.5 percent and 5.5 percent, respectively.
>
> The expected return on a portfolio of these two securities alone can be written as:

> Expected return on portfolio =
>
> X_{Super} (17.5%) + X_{Slow} (5.5%) = R_p
>
> where X_{Supe} is the percentage of the portfolio in Supertech and X_{Slow} is the percentage of the portfolio in Slowpoke (ROSS, 2002, p. 210).

Eugene F. Brigham and Michael C. Ehrhardt explain the correspondence between firms with more than one business line and a portfolio of securities:

> A firm itself may be regarded as a "portfolio of assets", and since the beta of a portfolio is the weighted average of betas of its individual assets, adding the barge and distribution center divisions will change Huron's overall beta. The exact value of the company's new beta would depend on the size of the investments on the new divisions in comparison with the Huron's original iron operations. (BRIGHAM, 2012, p. 356).

Thus, there are theoretical fundamentals that support the proposition that a beta for PPP contracts should be weighted according to the participation of investments and/or services in each type of business. In Brigham and Ehrhardt's work, there is a complete example on the use of this methodology[2].

At this point, it is possible to affirm that services in a PPP contract assume a different nature, then, they can be treated as a separate sector from investments. However, they can be considered similar to investments if their operational cost is added to the capital expenditures when defining the participation percentage of the sector. The real case will define the best way to address this issue.

On the next topic we will show the application of this methodology to the Health PPP in the Federal District (DF), Brazil.

4. CALCULATION OF BETA IN THE HEALTH PPP AT THE FEDERAL DISTRICT (DF), BRAZIL

The Government of the Federal District, through the Regional Department of Health, promoted the Competitive Procurement Process no. 1/2013 aiming to establish a PPP to grant the administrative concession for service provision to support the operations of the regional hospital network. This provision should be preceded by infrastructure implementation, as stated on § 2nd, article 2nd, Law no. 11079/04 and § 2nd, article 2nd, District Law no. 3792/06 (as instituted by the Public-Private Partnership Program of the Federal District).

The goal of this PPP was to build two hospitals, a medical reporting center and a health examination center. It was also supposed to provide hospital and information and communication technology (ICT) equipment, as well as maintenance, security, cleaning and laundry services, among others.

As one of its competences, the Court of Accounts of the Federal District initiated the Process no. 21250/12 to audit the Health PPP.

On the other hand, the Regional Department of Health of the DF sent to the district court the documents required in the TCDF's Resolution no. 189/08, which contained the WACC calculations of the enterprise in the Information no. 219/13, sheet 332 of the TCDF's Process no. 21250/12 (TCDF, 2013).

The value of the project's beta was 0.92, and it was calculated from the simple arithmetic average of healthcare service betas, which were collected from the Aswath Damodaran's website, as shown in Table 1:

Moreover, the enterprise has substantial investments in civil works and information technology equipments (IT), which are considered in the PPP's timeline, as shown in Table 2:

Investments in health, correspondent to **Clinical equipment and furniture**, represented only 36 percent of the total in the concession. Civil works and

Table 1

Name of the Sector	Average Beta
Healthcare Equipments	1.22
Healthcare Installations	0.60
Healthcare Products	0.93
Healthcare Services	0.94
Average	0.92

SOURCE: sheet 333 of the TCDF's Process no. 21250/12 (TCDF, 2013).

Table 2

INVESTMENTS AND REINVESTMENTS	VALUES (IN THOUSAND REAIS – R$)	PERCENTAGE
Civil Works	413,054	40%
Clinical Equipment and Furniture	368,833	36%
IT Equipments	236,251	23%
Nonclinical Furniture	9,219	1%
TOTAL	1,027,357	100%

SOURCE: sheet 650 of the TCDF's Process no. 21250/12 (TCDF, 2013).

IT equipments had distinguishing percentages of 40 and 23, respectively.

At last, Healthcare services were not predominant in relation to other items (Table 3).

We can see in Table 3 that 35 percent of the operating expenses are exclusively related to healthcare services. If the item **SPE corporate governance** is considered, which includes all activities, the expenses with healthcare services would reach 39 percent.

As **Stocks and logistics** may not be directly related to healthcare items, as well as Security and Cleaning, the percentage mentioned in the previous paragraph can be considered a positive result.

Table 4 displays the total disbursements scheduled for the whole PPP timeline:

Thus, both investments and operating expenses of the future private partner would include significant percentages of civil works and information technology services. Therefore, it was considered inappropriate to characterize this PPP sector as part of the healthcare services to calculate beta.

Table 3

Operating Expenses	Values (in thousand reais – R$)	Percentage
Diet and Nutrition Services	675,968	11%
SPE Corporate Governance	234,687	4%
Cleaning Services	653,767	11%
Reception	260,874	4%
Security	445,825	8%
Hospital Laundry and Linen	746,935	13%
Stocks and Logistics	428,376	7%
Help Desk and Telecommunication	51,527	1%
Building Maintenance	1,057,271	18%
Equipment Maintenance	215,137	4%
IT Equipments	1,152,051	19%
TOTAL	5,922,418	100%

SOURCE: sheet 650/651 of the TCDF's Process no. 21250/12 (TCDF, 2013).

Table 4

INVESTMENTS AND OPERATING EXPENSES	VALUES (IN THOUSAND REAIS – R$)	PERCENTAGE
Civil Works and Building Maintenance	1,470,325	21.2%
Medical Equipments and Services	2,669,936	38.4%
IT Services	1,388,302	20.0%
Other Services	1,421,212	20.4%
TOTAL	6,949,775	100%

SOURCE: sheet 651 of the TCDF's Process no. 21250/12 (TCDF, 2013).

As mentioned previously, technical literature suggests the use of a weighted average of betas in this case, which is the subject of the next topic.

4.1 CALCULATION OF THE HEALTH PPP'S BETA THROUGH THE WEIGHTED AVERAGE OF BETAS OF ALL SECTORS INVOLVED

At first, we must clarify that, due to the difficulty to find a specific beta for the item Other services (see Table 4), only the values related to investments were used in this analysis (see Table 2).

Based on the same database suggested in the consortium document (Aswath Damodaran's website), the unlevered betas of the three business lines involved in the PPP were collected (sheets 377/378, Process no. 21250/12): Engineering and construction, IT services and Medical services.

Table 5

SECTOR	BETAS
Engineering & Construction	1.17
IT Services	1.00
Medical Services	0.59

FONTE: (DAMODARAN, 2013).

The debt/equity ratio for the three sectors (D/E) was extracted from the same website (DAMODARAN, 2013):

Table 6

SECTOR	D/E
Engineering & Construction	13.23%
IT Services	5.72%
Medical Services	50.23%

SOURCE: (DAMODARAN, 2013).

The final result was achieved by using the formula presented by the Regional Department of Health in the Process no. 21250/12, sheet 332 (TCDF, 2013):

$$\beta \times [1 + (D/E) \times (1 - T)]$$

This expression is known as the Hamada equation[3] and it allows finding the levered beta (from the unlevered beta) of the company's debt ratio and the income tax rate[4].

The betas obtained for each sector are presented below. The data was collected from Aswath Damodaran's database (DAMODARAN, 2013) in January 2013, according to Process no. 21250/12, sheets 377/378 (TCDF, 2013):

$\beta_{EC} = 1.17 \times [1 + 0.1323 \times (1 - 0.34)] = 1.27$ (Beta for Engineering and construction)

$\beta_{TI} = 1.00 \times [1 + 0.0572 \times (1 - 0.34)] = 1.04$ (Beta for Information Technology services)

$\beta_{SM} = 0.59 \times [1 + 0.5023 \times (1 - 0.34)] = 0.78$ (Beta for Medical services)

In order to achieve the project's beta, weighing was performed with the investment percentage of each sector. For that reason, the investments and reinvestments table was adapted (TABLE 1):

- Civil works are equivalent to the Engineering and construction from Damodaran's table (DAMODARAN, 2013);
- Clinical equipments and furniture are equivalent to the Medical services from Damodaran's table (DAMODARAN, 2013);
- Investments in nonclinical furniture, which represented only 1 percent of the total, are also considered Medical Services.

Therefore, the percentage participation in investments presented the following results:

Finally, the Health PPP's estimated beta would be:

$$\beta_{SPE} = W_{EC}\beta_{EC} + W_{TI}\beta_{TI} + W_{SM}\beta_{SM}$$

$$\beta_{SPE} = (0.4 \times 1.27) + (0.23 \times 1.04) + (0.37 \times 0.78)$$

$$\beta_{SPE} = 1.03$$

Therefore, considering that the Health PPP in the DF involves more than one business line, the beta found in this work was different from the one presented by

Table 7

INVESTMENTS AND REINVESTMENTS	VALUES (IN THOUSAND REAIS – R$)	PERCENTAGE
Engineering & Construction	413.054	40%
Medical Services	378.052	37%
IT Services	236.251	23%
TOTAL	1.027.357	100%

SOURCE: sheet 654 of the TCDF's Process no. 21250/12 (TCDF, 2013).

the Regional Department of Health , 0.92, to indicate the risk in this sector.

Founded on a methodology supported by the financial theory, the value 1.03 was calculated by means of the weighted average of the betas of each PPP activity.

5. FINAL REMARKS

PPP projects usually involve firms with different business lines, and it can generate some difficulties when choosing the beta that better represents the enterprise.

Based on the financial literature and describing a practical and effective application, this paper showed that, instead of selecting the beta of the predominant sector, calculating the weighted average of the betas of each sector would be a more technical procedure. In this case, it is necessary to consider the percentage participation of each activity in the investments and/or service provision.

As a conclusion, the Federal Court of Accounts can now consider this technical perspective as a parameter to evaluate beta in WACC calculations in PPP projects.

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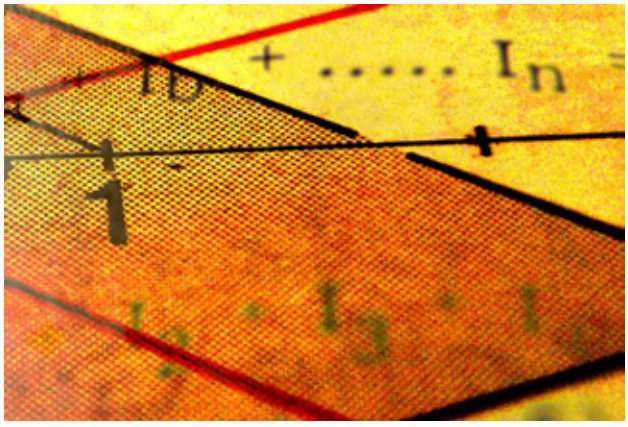

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NOTES

1 $\beta_i = \frac{Cov\,(R_i R_M)}{\sigma^2(R_M)}$

2 Eugene F. Brigham and Michael C. Ehrhardt presented an example of application of the beta calculation through the weighted average of the beta of each sector (BRIGHAM, 2012, p. 356/357):

"Many firms use the CAPM to estimate the cost of capital for specific divisions. To begin, recall that the Security Market Line equation expresses the risk/return relationship as follows:

$r_3 = r_{RF} + (RP_M)\, bR_{ip}$

As an example, consider the case of Huron Steel Company, an integrated steel producer operating in the Great Lakes region. For simplicity, assume that Huron has only one division and uses only equity capital, so its cost of equity is also its WACC. Huron's beta = b = 1.1, = 5%, = 6%. Thus, Huron's cost of equity is (and WACC) 11.6 percent:

$r_3 = 5\% + (6\%)\ 1.1 = 11.6\%$

This suggests that investors should be willing to give Huron money to invest in average-risk projects if the company expects a return of 11.6 percent or more on this money. By average risk we mean the projects having risk similar to the firm's existing division.

Now suppose Huron creates a new transportation division consisting of a fleet of barges to haul iron ore, and barge operations have betas of 1.5 rather than 1.1. The barge division, with b = 1.5, has a 14 percent cost of capital:

$r_{barcaças} = 5\% + (6\%)\ 1.5 = 14.0\%$

On the other hand, if Huron adds a low-risk division, such as a new distribution center with a beta of only 0.5, its divisional cost of capital would be 8 percent:

$r_{centro} = 5\% + (6\%)\ 0.5 = 8.0\%$

A firm itself may be regarded as a "portfolio of assets", and since the beta of a portfolio is a weighted average of the betas of its individual assets, adding the barge and distribution center divisions will change Huron's overall beta. The exact value of the new beta would depend on the relative size of the new divisions versus Huron's original steel operations. If 70 percent of Huron's total value ends up in the steel division, 20 percent in the barge division, and 10 percent in the distribution center, its new corporate beta would be calculated as follows:

New beta = 0.7(1.1) + 0.2(1.5) + 0.1(0.5) = 1.12

Thus, investors in Huron's stock would have a required return of:

$r_{Huron} = 5\% + (6\%)1.12 = 11.72\%$"

3 Hamada equation is explained by Alexandre Assaf Neto (ASSAF NETO, 2009, p. 508):

"The economic risk and the financial risk can be estimated through the indicator of beta, according to Hamada's work and further research on this matter. The basic formula proposed is the following:

$B_L = B_V \times [(P/PL) \times (1 - IR)]$

Where:

B_L = beta coefficient of a company that uses financial leverage. It expresses the economic and the financial risk. It is the total beta;

B_V = beta coefficient of a company without debts. It expresses only the business risk;

P = debt;

PL = equity;

IR = income tax rate.

4 The rate adopted here is the same used by the Secretaty of State for Health, which was 34 percent, and it corresponds to the social contribution and income tax rate.

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