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Do Public-Private Partnerships Create Value for Money for the Public Sector? The Portuguese Experience

by
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Over the last few decades, public-private partnerships have been increasingly used by governments around the world to finance and manage complex operations. Doubts about their efficiency have been raised, however. Criticism of public-private partnerships reflects the fact that governments tend to use them as "off-budget" operations, to avoid fiscal constraints. Do they generate "value for money" to the public sector? The literature is less than unanimous. How one assesses value for money in these types of arrangements has become extremely important for public managers.

In this article, we propose that the best way to evaluate value for money is to conduct a public sector comparator prior to the bid. To do this, it is necessary to estimate the costs in the case of a public procurement versus public-private partnerships payments, and to define what discount rates will be used (in order to find the net present value of the two options), to best compare and make the right decision for taxpayers. One of the most important costs to include in a public sector comparator is the risk transfer to the private sector, which is the ultimate motive for a greater level of efficiency. Having a not-optimal risk allocation will reduce the probability of a good decision from public managers. The scope of this work does not include, however, whether or not public investment should be carried out. The cost-benefit analysis of the investment versus other options should be made prior to the analysis described here.

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Do public-private partnerships generate more efficiency and create more "value for money" for the public sector? When and under which conditions do they prove to be more efficient than traditional procurement? When should public managers choose to develop projects using public-private partnerships and when should they use more traditional forms of procurement? These are the questions that will drive the discussion in this article.

Although there is no unanimous definition of public-private partnerships, for the purposes of this article, we have used the OECD definition of a PPP as:

> … an agreement between the government and one or more private partners (which may include the operators and the financers) according to which the private partners deliver the service in such a manner that the service delivery objectives of the government are aligned with the profit objectives of the private partners and where the effectiveness of the alignment depends on a sufficient transfer of risk to the private partners (OECD, 2008, p. 17).

The involvement of private companies in public-private partnerships can vary from designing roads, hospitals, schools or prisons to financing and maintaining them.

With regard to defining "value for money", it should not be about cost-effectiveness alone, without regard for the quality of the service provided. In fact, value for money is the least expensive option for the same output and quality of service.

In choosing to develop a project using traditional public procurement, or public-private partnerships, the decision should be based on a financial evaluation of the alternatives. This article's intention is to determine a methodology to evaluate whether a certain public investment should be conducted by traditional procurement or by using public-private partnerships.

This work is motivated by the fact that countries have been increasingly using public-private partnerships, and in many cases, doubts about their efficiency have been raised. The truth is that public-private partnerships help fill the so-called "infrastructure gap", considering that many governments cannot afford high levels of investment. Governments also tend to believe that they can save money by bringing private sector efficiency into public sector projects.

Is this presumption correct? Does the private sector add value and efficiency to public projects? We aim to answer these questions as well in the pages to come.

1. A brief survey of the literature

1.1. Introduction and main concepts

Over the years, the main discussion in the literature about public-private partnerships has been whether the arrangement is on, or off, the balance sheet. It has not been about whether or not it represents good value for money (Grimsey and Lewis, 2005).

Grimsey defines value for money as "the best price for a given quantity and standard of output, measured in terms of relative financial benefit". What is necessary here is a

comparative analysis of the costs of the different solutions for the same outputs, in order to make comparisons with the bidder's cash flow.

Moralos and Amekudzi (2008) argue that value for money aids public agencies in determining whether to pursue a project as a public-private partnership rather than through traditional procurement procedures, as long as they can account for the costs and savings throughout the project's lifetime. Value for money should also ensure that the public sector is focussed on the quality and competence of the private sector work and not on the lowest bid. Value for money is one of the leading tools available to public managers to assess the value of pursuing a project through a public-private partnership *versus* traditional procurement, because it provides the public sector with a simple methodology and an easy tool for estimating costs, benefits and risks involved in the project. It can also be applied to different countries and different realities.

According to Shaoul (2005), value for money is also associated with the three "Es": economy, efficiency and effectiveness.

Value for money in a public-private partnership scheme is related to the idea that public-private partnerships can produce a flow of services at least equivalent in quality to that which could be provided by the public sector, but at a lower overall cost (taking everything into account, particularly the allocation of risk).

According to Fitzgerald (2004), value for money can be delivered through risk transfer, innovation, greater asset utilisation and integrated whole-of-life management.

There are usually two components of value for money: a quantitative one (including all factors that can be measured by the public sector comparator), and a qualitative one (aspects that cannot be quantified).

Grimsey and Lewis (2007) point out that on the public side, public-private partnership schemes appear to work well. The difference lies in levels of responsibility and accountability, because the public sector is not exposed to the economic drivers that private companies are. The cost for the public sector to raise the necessary funds for the project has no relation with project risks. A wide variety of performance outcomes can be swept under the administrative mat, and the principals involved are often insulated from the consequences of their actions and decisions.

Well-structured public-private partnerships can introduce clear lines of accountability, transparency of outcomes and performance. In fact, one of the benefits of public-private partnerships is the ability to resolve the large cost overruns and delays in traditional public procurement ("optimism bias"). Grimsey and Lewis (2007) enumerate several studies where public-private partnerships construction performance was evaluated and where the overall gains of public-private partnerships are demonstrated. For this purpose, value-for-money tests are based on comparisons of the public-private partnerships application with the benchmark cost of providing the specified service using conventional public procurement methods.

Spackman (2002) argues that private financing of public services has produced clearer objectives, new ideas, better planning, and the incentives of wider competitive tendering, but also higher top management attention, consultancy and legal fees and risk premiums. Spackman refers to the Arthur Andersen (2000) study, which concludes that public-private partnerships offer excellent value for money.

Economic theory suggests that the performance differences may lie in the characteristics of public-private partnerships that differentiate them from conventional procurement. The literature has identified three reasons for this: ownership, bundling and risk transfer.

Blanc-Brude, Goldsmith and Valila (2006) argue that ownership rights are a good starting point for considering the economic consequences of public-private partnerships, under incomplete contracting arrangements (Macniel, 1974; Grossman and Hart, 1986; Hart and Moore, 1990). Under a public-private partnership, the public sector transfers land, property or facilities controlled by it to the private sector, which is given ownership or control rights for the term of the concession or lease. This assignment of the residual control rights provides an incentive for the private sector entity to undertake relation-specific cost-saving investment (for example, in road maintenance technology) that increases productive efficiency. In the absence of this assignment, the private firm would not be sure that the investment would pay off and there would be under-investment in the new technology. Turning over control rights for the infrastructure can alleviate this problem.

Another defining characteristic of public-private partnerships is "bundling", whereby the infrastructure assets construction and operation are combined in a single contractual framework (Hart, 2003). The issue has been framed in terms of transaction costs, with the choice being between bundled or unbundled structures, decided by whether it is easier to write contracts on service provision than on the quality of the building.

The transfer of risk to the private sector can also make a public-private partnership more cost efficient than traditional procurement. Grout (1997, 2003, 2005) emphasises information costs and the incentive structure created by the public-private partnerships service payment mechanism. An effective transfer of risk from the public to the private sector can lead to a more explicit treatment of risk, since it is the acceptance of risk that gives the private entity the motivation to price and produce efficiently. Private finance (debt and equity) is central to this process, although its role has been overlooked thus far in the theoretical public-private partnerships literature. That is the only way, which is not possible in the public sector, to use risk management techniques. In the public sector, risk is transferred to taxpayers or end users, and therefore, the cost of capital is lower than in the private sector.

Moralos and Amekudzi (2008) identified four phases in a public-private partnership procurement process:

1. an initial feasibility assessment, in which is determined whether the project is economically viable and whether it should be run under public-private partnerships;
2. the procurement phase, that is the bidding process;
3. the construction phase; and
4. the operation phase.

Typically value for money is conducted during Phase 1. It may also be used in Phase 2, but just to assure that the bids from the private sector are below the costs under traditional procurement.

1.2. Public sector comparator

There are four alternative approaches to evaluating value for money for public-private partnerships: *i*) a full cost-benefit analysis; *ii*) a public sector comparator (PSC)

public-private partnership comparison before bids are invited; *iii)* a UK-style public sector comparator value-for-money test after bids; and *iv)* reliance on a competitive bidding process.

The public sector comparator is based on estimates of full costs, revenues and risks, set out in cash flow terms, discounted at the public sector rate to determine the net present value (NPV), and after that compared with the discounted value of payments (along with risks and costs retained by the public sector) to the private supplier. This could be done before the bid, using a hypothetical public sector comparator and a "shadow" public-private partnership, or prior to the final approval of the deal.

The public sector comparator is therefore the financial difference between the two procurement options for the same project. Grimsey argues that the public sector comparator is much simpler and easier to compile than any of the alternatives presented. It is presented as a cost-effective trade-off between a full cost-benefit analysis of all project options (as is done in Germany) and simply selecting the best private bid (as in France). It also ensures that all options are subject to the same analysis and tests.

Grimsey also recommends that a public sector comparator calculation should be carried out prior to evaluating the bids for two reasons: one, so that the public sector comparator will be a "pure" public sector option; second, to allow the public decision maker to know what the private bid should have to improve value for money when compared to the public sector comparator. Therefore, it is very important to keep the public sector comparator up to date. The public sector comparator becomes a negotiating tool for the public sector, which leads to achieving the best possible deal.

A raw public sector comparator should provide a base costing including capital and operating costs, and represent a full and fair estimate of all costs of publicly delivering the same volume and level of performance, service and residual asset value that is required from the private sector under the public-private partnership alternative.

Once the NPVs of both the public sector comparator and the public-private partnership have been prepared and adjusted to a comparable basis, then a simple comparison of the two can be carried out. *Ceteris paribus* (*i.e.* quality and risk allocation), value for money is demonstrated when the total present value cost of private sector supply is less than the net present value of the base cost of the service, adjusted for the cost of the risks to be retained by the government, cost adjustments for transferable risk, and competitive neutrality effects.

Grimsey and Lewis (2005) suggest that there are alternatives to the public sector comparator and that calculating it involves many complexities and ambiguities that must be a relevant factor in the decision of which type of procurement to choose. Nevertheless, developing a public sector comparator framework will be an important tool for public sector managers, because it will help them to understand the project, the risks involved and how to deal with them contractually. In fact, the risk analysis required for the public sector comparator must be seen as part of a broader process of risk identification, allocation and management. In many cases, the difference between the public sector comparator and the private sector proposal will be relatively narrow and the procurer has to make professional judgments as to the value for money to be derived from contracting with the private sector and the risks which that route involves, while not ignoring that there are also large risks in the public procurement route, as indicated by the "optimism bias".

1.3. Risk allocation

To achieve value for money by using public-private partnerships, transfer risks are an essential part of the process. These are not limited to construction risks (and as Grimsey states, there is a long history of publicly procured contracts being delayed and turning out to be more expensive than budgeted), but other types of risks as well. Therefore, much of the risk of public-private partnerships comes from the complexity of the project itself.

Grimsey and Lewis (2000) state that value for money requires an equitable allocation of risks between the public and private sectors. It is fundamental not to create a conflict between public sector need to demonstrate value for money and private sector need for robust revenue that supports the project finance. Risk evaluation is complex, requiring that it be analysed from the different perspectives of the public and private sectors. Knight's (1921) definition of risk and uncertainty is used in this analysis (risk is randomness with knowable probabilities; uncertainty is randomness with unknowable probabilities).

In an empirical study of a high-school project, Heald (2003) found that value for money depended entirely on an assessment of the transfer of risk. Heald found that risk transfer (estimated at over GBP 2 million) was crucial to the economic viability of the project. Two factors contributed significantly to the risk transfer: the costs rates applied in the construction phase and design quality. Taken together these two factors constitute around two-thirds of the value of the entire risk transfer. Any inaccuracies in these areas could have major implications in terms of value for money.

In a study by the Audit Commission (2003), it was found that economic viability was entirely down to risk transfer in 9 of the 11 schemes. In fact, without risk transfer, five of the projects would have negative value-for-money percentages of more than 10%.

Regardless of uncertainty, the measurement and methodology of risk transfer is rendered problematic because all possible outcomes cannot be predicted and weighted, and the complete array of results covering all eventualities cannot be compiled when the issue is uncertainty, not risk.

After evaluating risks, the public sector must find the optimal risk allocation to determine which part would be the best to manage each risk. Risk transfer is a very important driver for value for money. Transferring too little risks to the private sector would make the project inefficient, but transferring too much will result in higher payments and reduce value for money (Moralos and Amekudzi, 2008).

In practice, governments do not usually budget for systematic risks or uncertainty, and therefore, the public sector comparator can only contain project-specific risks that are identified and quantified with no adjustment for systematic risk or uncertainty. This is because the public sector as a whole can ignore uncertainty across their whole portfolio, while the private sector cannot.

1.4. Discount rate

The rate at which future cash flows are discounted is another important issue in the literature about public-private partnerships and the public sector comparator. The public sector comparator is assessed over the life of the public-private partnerships in NPV terms, which means that the rate used to discount cash flows has a big impact.

There are five main approaches. One is based on the fact that the discount rate should reflect government-policy preferences, using a "social rate of time preferences". Grimsey

and Lewis (2005) suggest that the discount rate should have two elements: first, the basic "social time preference rate" (STPR). This represents the rate that society is willing to pay for receiving something now rather than in the future. Calculations (*e.g.* HM Treasury, 2003) suggest that, in most developed countries, this is around 3.5-4.0% in real terms (*i.e.* before allowing for price inflation). Second, some allowance for other factors, mainly to ensure that the public sector does not assess the benefit of projects without taking into account the risk to which it exposes taxpayers in the process (for example, the potential to incur additional costs if things go wrong).

As far as STPR is concerned, Spackman (2002) argues that it will be unmanageable for any government to administer different general rates for these two quantities. It would be computationally complicated, and generate endless confusion. However, the distinction between them is essential to understanding the economics of public sector costing.

The second approach, which derives from the first one, argues that the discount rate should reflect the "social opportunity cost of capital". This will depend on the level of non-diversifiable risk in a project. It is in effect the pre-tax internal rate of return (IRR) that can be expected from private sector investments with the same risk. This calculation uses a deviation of the capital asset pricing model (CAPM), and is used by Canada and New Zealand.

The third approach is a hybrid of the "social time preference rate" and the "social opportunity cost of capital". This approach assumes that the appropriate public cost of capital for most practical purposes is the sum of the tax-exclusive real interest cost of government debt, the typical quantum of tax paid on marginal returns to private sector capital, and a factor for "systematic risk". The tax component is conceptually clear, but estimation is complex. Current UK Treasury guidance, originally drafted when real interest rates were much higher than today, suggests that this cost of capital falls within the same range of plausibility (4-6%) as social time preference. The adjustment for UK tax, however, combined with the adjustment for risk, cannot easily justify adding more than about one percentage point to the cost of indexed gilts, which in early 2002 was 2.0-2.5%.

The fourth approach is the "equity premium", *i.e.* the cost of capital for the public sector is considerably below the CAPM values, and so the discount rate should be the pre-tax government borrowing rates.

The fifth approach uses the risk-free interest rate of the country, *i.e.* the interest rate of the public debt, according to the maturity of the project.

Many authors (*e.g.* Brealey and Myers, 2003), following the "perfect capital markets", suggest that the idea that the public sector has a lower cost of finance is an illusion. If that were true, it would simplify the public-private partnership policy, but it is not clear. Grout (2003) argues that despite the lack of unanimity, there is a tendency for economists to favour the use of similar discount rates in the idealised situation of complete markets. However, he states that the reason for the divergence between private sector and public sector discount rates is not related to the usual arguments provided in the literature. Even in a world of complete capital markets and no distorted taxation, it may still be appropriate to use a higher discount rate for public-private partnerships than the public sector equivalent.

In some countries, the long-term borrowing rate is used as a proxy for the discount rate. In countries with an AAA credit rating this rate tends to be close to the "social time preference rate" and below a risk-adjusted discount rate. On the contrary, the United Kingdom has

used a 6.0% discount rate for many years, recently adopting a 3.5% "social time preference rate", with instructions to public authorities to estimate the other factors separately, like risk, that were previously reflected in the discount rates.

Spackman (2002) states that the cost of senior debt to public-private partnership projects is now typically two or three percentage points above the cost of government debt (including the cost of insurance to achieve an AAA rating). The premium is much higher than the cost of systematic risk to publicly financed projects. This is often described as the "equity premium puzzle", although simple expected utility theory should not be expected to capture people's aversion to fluctuations in equity markets. HM Treasury (2000) suggests that private capital costs add an extra one to three percentage points. The main text of the report says that, while senior debt finance will be not more than between one and three percentage points above the public sector borrowing rate, higher returns will be demanded for junior debt and equity finance. The study did not look closely at financing rates; this should be the subject of further study. However, there are very little data on returns to PFI (private finance initiatives, equivalent to public-private partnerships in the United Kingdom) equity, and it appears that no such study has taken place.

An example from Australia (Victoria Department of Treasury and Finance, 2003), where new guidance material on discount rates was disclosed, recommends the use of a specific discount rate to each project, according to the risk associated with that project. There is an application of the CAPM model to the public-private partnerships project evaluation, recognising in the model that the cost of capital/discount rate is specific to each project and is a function of the risks. In a perfect market, this would lead to the conclusion that, as long as there is sufficient competition to drive every component of the deal to maximum efficiency, the appropriate discount rate would be the rate of return implicit in the winning bid, and therefore one would not need to develop a specific discount rate for analysis.

Grimsey and Lewis (2007) refer to a PricewaterhouseCoopers study. This study takes a starting point that, with competition, project internal rates should reflect exactly the returns required by the various investors, as in the weighted average cost of capital (WACC). In the sample presented in the study, the IRR was on a 7.7% average. The weighted average cost of capital is estimated using CAPM to be 5.3%. Thus the "spread", the amount by which the average project internal rate of return is higher than the cost of capital, is 2.4% per annum. Of this amount, 1.7% is thought to be accounted for by two factors: unrecovered bid costs on other projects (about 1.0%); and the higher cost of private sector borrowing compared with public sector borrowing (about 0.7%). Consequently, the "excess" project return to project investors is estimated at being at most about 0.7%. "At most" is used because some part of this margin, attributed in the report to "structural issues" that have limited competition in the bid market, could be a margin built in for uncertainty, which is not allowed for in the analysis (Grimsey and Lewis, 2005).

Grimsey proposes two methods: one is to adjust risk by adding a risk margin to a risk-free discount rate (reflecting systematic risk rather than idiosyncratic risk). This would mean the use of a risk-adjusted discount rate added to a risk-free discount rate to account for "risky" cash flows, while using a risk-free rate for "non-risky" cash flows. It is a discount rate that reflects the government's time value of money, plus a systematic risk premium for the inherent risks involved in the project. They categorise risk in bands, as very low, low and medium (*e.g.* a project that falls into the very low risk band will have a risk premium of

1.8%, to be added to the 3.0% risk-free rate in real terms). The reward for bearing risk depends only on the systematic risk of an investment, because other risks can be diversified. The other option is to value risk in the cash flows so that a risk-free discount rate is applied to cash flow forecasts that have been adjusted for risk. Although the two processes are in theory alike, in practice they may lead to different results.

The classic paper on variability risk in the public sector is Arrow and Lind (1970), which concluded that cost is generally negligible, because it is spread so widely and hence thinly across the population. Currie (2000), using the arguments discussed below, criticises the application of the Arrow and Lind conclusion to the public sector. Grout (1997) sees it as equally applicable to private sector costs, but also argues that public sector benefits should be discounted at the same risky rate as in the private sector. The three most common criticisms of Arrow and Lind relate to correlation with income, risk spreading, and implications for public ownership.

Grout (2003) uses a financial test for public-private partnerships. In each case, the project delivers a flow of benefits, $vt(g)$ and $vt(p)$, and costs, $Ci(g)$ and $Ct(p)$, where r_v and r_c are the discount rates for benefits and costs and where p, g and t denote public-private partnerships, public sector, and time, respectively. A cost-benefit test would opt for public provision if:

$$\int_0^\infty v_t\,(g)e^{-r_v(g)t}\ \ dt - \int_0^\infty c_t\,(g)e^{-r_c(g)t}\ \ dt > \int_0^\infty v_t\,(p)e^{-r_v(p)t}\ \ dt - \int_0^\infty c_t\,(p)e^{-r_c(p)t}\ \ dt \quad (1)$$

In contrast, a pure finance-base test compares the cost to the government of public provision with the cost to the public sector of conducting the project as a public-private partnership. The financial cost to the government of public provision is the cost stream that the public sector has to fund:

$$\int_0^\infty c_t(g)e^{-rt}\,dt \quad (2)$$

where r is the discount rate used by the government in the pure finance test. Within public-private partnerships, the government has to fund the present value (PV) of the service specified in the contract. That is, service quantity, q_t, is measured and the private sector is funded according to the agreed price, p_t, per unit. The financial cost to the government of the public-private partnerships is:

$$\int_0^\infty p_i\,q_t\ \ e^{-rt}\,dt \quad (3)$$

Using this pure finance test, public provision is preferred if:

$$\int_0^\infty c_t(g)e^{-rt}\,dt < \int_0^\infty p_i\,q_t\ \ e^{-rt}\,dt \quad (4)$$

Risks also have implications for the discount rate. Broadbent and Laughlin (2003) note Grout's (1997) argument, later developed further in Grout (2003), that the value-for-money test is biased against the public sector. His argument runs as follows. When public sector provision is being valued, a discount rate is applied to a cost cash flow. This cash flow represents the cost of building the facility in the public sector. In contrast, for valuing the private sector provision, a discount rate is applied to a stream that constitutes an outlay for the public sector but is a revenue item to the private entity and is being valued from the revenue side. With public-private partnerships, this revenue stream is not the equivalent cost of building the facility. It is the cash flow associated with the flow of benefits valued at the price in the contract. There is no reason to suppose that the risk characteristics are

equivalent for these two cash flows. Indeed, Grout argues that there is every reason to suppose that they are not, because in general, costs are less risky than revenues (particularly when the revenues depend on the provision of services of suitable quality). Therefore, he contends that a higher discount rate should be used for the public-private partnerships than for the public sector equivalent. If not, it will suggest that the private sector is less efficient than the public sector.

Using the Gorman polar form and a linear payment schedule, Grout explicitly calculates the risk characteristics of these cash flows as measured by their beta (the weighted covariance between the cash flow and aggregate income). It is easy to show that the β for the revenue cash flow is:

$$\beta r = \frac{cov(R,m)}{var\ (m)} = \frac{\sigma R}{\sigma m} = p \sum_i b(p) \tag{5}$$

And the β for the cost stream is:

$$\beta c = \frac{cov(C,m)}{var\ (m)} = \frac{\sigma c}{\sigma m} = c \sum_i b(p) \tag{6}$$

where

$$m = \sum_i mi$$

and

$$\rho_{r,m} \frac{\sigma_r \sigma_m}{\sigma_m^2} = \frac{\sigma_r}{\sigma_m} \; with \; \rho_{r,m} = 1$$

Thus the ratio of the betas is equal to the ratio of price to marginal cost:

$$\frac{\beta r}{\beta c} = \frac{price}{marginal\ cost} \tag{7}$$

In general, the public sector cost in the comparison should not be discounted at the same rate as the private sector. Failure to do so will suggest that private provision is less efficient than public provision since the PV of the private will be overestimated relative to the public. That is, the relevant beta for the public sector component of a pure finance test should be that given by (6) and the relevant beta for the public-private partnerships should be that given by (5).

1.5. Final remarks

According to Kintoye *et al.* (2002), as quoted in Ball *et al.* (2007), the lack of transparency in public-private partnerships risk evaluation constitutes an area of serious concern. The public sector comparator inevitably focuses on factors that can be easily quantified and expressed in monetary terms.

Heald (2003) expresses concern about the extent that value-for-money assessments can be carried out by consulting firms that "are not neutral referees, but interested players".

As Moralos and Amekudzi (2008) argue, a public sector comparator is a hypothetical scenario; it relies on estimations made by agencies and the experience of staff, which may lead to significant errors, due to the complex financial models used and lack of experience in the public sector to handle it. Moralos and Amekudzi cite a study by Corner (2006), where the author studied the use of the public sector comparator of PFIs in the United Kingdom using the House of Commons Committee of Public Account's findings and discovered some of the major weaknesses in the applications of the value-for- money analysis. The fact that

a NPV of a public-private partnership turned out to be more costly than a public sector comparator, does not mean that the traditional procurement should be chosen, because the calculations may be biased. The authors state, "The main purpose of the public sector comparator and public-private partnerships comparison is to aid agencies in determining whether to pursue the project as public-private partnerships or not pursue the project at all".

Although the value-for-money assessment can be used to determine whether to pursue public-private partnerships, public agencies must be aware of the complexities of the overall public-private partnerships process and the limitations of the value-for-money methodology. It is important that agencies realise that value for money cannot be the only factor in the decision to pursue a project as a public-private partnership; they must evaluate their own capacity to manage such large, complex, and long-term projects aside from what the final value might say.

Critics of public-private partnerships argue that there is no substantive risk transfer under public-private partnerships. Grimsey and Lewis (2007) claim that this is not correct. Under a public-private partnership approach, the contractor is forced to think longer term and cannot just "walk away", having completed the construction. The contractor has ongoing, long-term responsibility for the facility's performance, which is reflected in performance-based monthly payments. Even if the contractor is unable to fulfil its obligations, and terminates the partnership, it cannot take the facility away and, in most cases, the assets revert to the public sector.

The main reason for using public-private partnerships is that they have proved a way to resolve the large costs overruns and delays in traditional public procurement, the "optimism bias". Grimsey and Lewis (2005) cite two 2002 studies (Flyvbjerg, Holm and Buhl, 2002; MacDonald, 2002) that confirm the results of earlier research by Pickrell (1990) and Fouracre, Allport and Thomson (1990). In the first study, Flyvbjerg, Holm and Buhl examined 258 large transport infrastructure projects spanning 20 countries, the overwhelming majority of which were developed using conventional approaches to public procurement. Costs were found to be underestimated in 90% of the projects, and in most cases, substantially so. In the other major study, the UK Treasury commissioned MacDonald to review 50 large public procurement projects in the United Kingdom over the last 20 years, 11 of which were undertaken under public-private partnerships/PFI. On average, the public-private partnerships/PFI projects came in under time (compared to 17% over time for the others), and capital expenditure resulted in an average 1% cost overrun (relative to an average cost overrun of 47% for traditional procurement projects).

Studies from some specific sectors in the United Kingdom report broadly consistent results. Parker and Hartley (2003) record claims that public-private partnership contracts for UK defence services have resulted in cost savings between 5% and 40% compared with conventional public procurement. That said, the authors express concern regarding whether these cost savings will be maintained over the projects' full durations due to the inherent uncertainties of long-term contracting.

2. Evaluating value for money in the public sector: a proposed theoretical model

When defining a methodology for evaluating value for money in public-private partnerships, the first question to ask is what is the best approach?

A simple answer does not exist, and countries, as we have seen, use several different approaches. Nevertheless, we believe that the best choice is a public sector comparator prior to the bid, for three reasons:

1. It is the best way to know the detailed cost of the project if developed by the public sector. With that information only is it possible to ensure a well-informed decision on the part of the public managers. The public sector choice cannot simply be the lowest bid. It has to be the lower bid, with the same outputs, and below the public sector comparator cost. Otherwise, if the lower bid is still above the public sector comparator, choosing to develop the project via a public-private partnership scheme will be a bad decision. In fact, the core concept of doing a public-private partnership is that the private sector can achieve a greater level of service with lower costs than the public sector. But that is a condition that is necessary to prove and the public sector comparator is the best way to do this. However, that does not mean that after running the public sector comparator, there is no need for a negotiation. On the contrary, a negotiation with the participation of several private bidders is crucial, because that competition among the bidders will enable the public sector to negotiate the best value at the lowest cost.
2. We do not believe that most countries' public administrations will have the necessary resources and skills to undertake more detailed and complex analyses, as is required by a complete cost-benefit analysis of all the alternatives. However, developing a public sector comparator methodology will certainly improve accountability and public management competences.
3. Although running a public sector comparator after the bid might show if value for money were achieved, if the result is negative, a renegotiation of the public-private partnership would be in order. Such a process is more complex and difficult than the public-private partnership process itself. This does not mean that the public sector comparator should not be revised, but only within a few years of operation.

In order to use the public sector comparator methodology suggested here, three preconditions must be met:

1. The government's decision to use a public-private partnership scheme is not already determined by the need to remove an investment from its balance sheet. This is particularly important in countries with strong fiscal rules, like European Union members, and particularly in countries with large budget deficits and high public debt. The bigger the fiscal constraint, the more important this precondition becomes. If the government's decision to accept the project depends only on putting off the annual budget deficit, then value for money will serve no role in the process. The fact that the project is carried out by a private consortium does not guarantee that it will be more efficient than if run by the public sector.
2. The project must be affordable. Affordability being one of the public-private partnership benchmarks, it is necessary that the cost of the project is included within the constraints of the budget and is financially sustainable in the long term. The public authorities should demonstrate that the service fees are affordable within the budget constraints. This means that the service fees should not be manipulated so that the payments are low in the first few years of the contract and high in the long term. This would make the public-private partnership affordable only in the beginning. It is also important to understand that if the choice is between a public-private partnership and no project,

there will be strong pressure to use data and assumptions that misguide the real cost of the two options, in order to lead to a decision to choose the public-private partnership.

3. The investment should be needed and there is no better alternative for the taxpayers' money (the opportunity-cost test). This last precondition is almost always subject to discussion and controversy. Nevertheless, and considering that this is outside the scope of this article, we must say, that contrary to the evaluation of private sector investments, the simple fact that the investment does not achieve the minimum hurdle rate required does not exclude the project by itself. Being a public sector project, other issues matter, besides maximising value, like defence, social assistance, etc.

We regard the public sector comparator as the estimation of the full cost of a project totally funded and operated by the public sector. We also believe that the public sector comparator should be detailed, and should incorporate some of the "project finance best practices", especially regarding costs, revenues, risk assessment, finance and discount rates.

How, then, should a public sector comparator be built? The first step is to collect as much useful and valid information as possible. This could be the first obstacle for public managers. Information will be vital in order to estimate project revenues and expenses. If the operation is already running, and what the government is considering is only a change of management (from public to private) (*e.g.* an already functioning hospital), the exercise is quite simple, especially if there are already good levels of accountability. Measuring costs and revenues in this exercise can, and should, be simple if the public entity already has sound financial statements. The exercise is then to estimate what the realistic savings and efficiency improvements would be. Having found that value, the public sector comparator, in annual terms, will be:

$$PSC = \text{Retained risks} + [\text{public entity costs} * (1 - C) - \text{public entity revenues} * (1 + R)] + \text{estimate cost of risks transfer.} \quad (8)$$

With C = Efficiency gains as a percentage of public entity costs; R = Efficiency gains as a percentage of public entity revenues.

Note: Usually revenues < costs

Therefore, the decision for public-private partnerships in an already operating project is when:

$$[\text{Retained risks} + \text{Annual payment for public-private partnerships} - \text{Corporate tax}] < PSC \quad (9)$$

$$\Leftrightarrow \text{Annual payment for public-private partnerships} - \text{Corporate tax} < [\text{public entity costs} * (1 - C) - \text{public entity revenues} * (1 + R)] + \text{estimate cost of risks transfer} \quad (10)$$

Note that efficiency gains play the major role in this particular case. Therefore, it is vital not to have optimist assumptions on gains, otherwise the public sector comparator will be unrealistic, and will drive private bidders away. Using benchmarks from the private sector, and having independent consultants evaluating those hypothetical gains should be considered.

When regarding a new project, estimating future revenues and expenses is more difficult, and yet, fundamental. If the new project is in a sector where there is already experience, it is easier. Experience from similar projects helps to estimate future data. Yet, managers should not rely completely on that historical background. Estimations of future changes and tendencies are still critical.

However, if the new project is in a sector where there is no past experience, or that experience is limited, a set of tools should be used by managers in order to help make the best possible assumptions. Market testing and scenario analysis are two of the best options.

Setting up the future outflows of the project is the essential part of this analysis. As it is a public project, the annual outflow is:

$$OF = \text{Base costing of the project} \tag{11}$$

Note that there is a large difference to the cash flow to the firm, as used in corporate finance:

$$FCFF = EBIT\,(1 - t) + \text{Depreciations/Amortisations} - \text{Change in NWC} - \text{Capex} \tag{12}$$

where *NWC* is the *net working capital*.

In the public sector, however, there are no earnings before interest and tax (EBIT), once there are no taxes, and there is no interest rate in the project (the public debt is in government, not allocated to any specific project or agency). Therefore, amortisations and depreciations do not have a fiscal impact; thus, there is no reason to consider it.

Three important issues are related to the base costing of the projects (BCP). First, if there are revenues, the base cost will be (*costs – revenues*), assuming that, as is common in these types of projects, revenues are not enough to cover expenses. The second issue is that besides the direct costs of the project (*e.g.* the cost of building a road, and the maintenance costs during the lifetime of the project), it is also necessary to include the indirect costs, such as administrative, hidden costs, costs with eminent domain, opportunity costs and third-party revenues shares, if applied. The third and last issue is related to inflation: a nominal outflow should be used in the analysis.

Therefore, the annual base costing of the project is:

$$BCP = [(\text{direct costs} + \text{indirect costs}) - \text{Revenues}] \tag{13}$$

Having calculated the long-term base costing of the project, it is necessary to find the public sector comparator. However, the risk costs and the tax revenues are not yet included in the calculations.

$$PSC = \text{Capex} + \text{Retained risks} + BCP + \text{public-private partnerships transfer risks estimation costs} + \text{Corporate tax from public-private partnerships} \tag{14}$$

There is no "one rule fits all" for transfer risks, but the literature and experience tell us that for the transfer of risk to be most effective, risks must be transferred to the party best able to manage them. Risk can be defined as the probability that the actual outcome (*e.g.* sales, costs, profits, etc.) will deviate from the expected one, and should be distinguished by endogenous and exogenous risks.

The transfer risks estimation costs is probably the most important step in these analyses, mainly because this is where the private sector efficiency is more likely to be ensured. A public sector comparator that is not risk adjusted will not give a clear and realistic image of the total cost of the project, once the NPV of the payments of a public-private partnership is likely to be higher than the NPV of the project costs, because of the higher cost of finance. In order to estimate the risk transfer to the private sector, it is necessary to identify all the relevant risks to be transferred, assign a cost for each one, if they were retained by the public sector, and then measure the probability of the event occurring and its cost impact. Then, it is also necessary to determine the probable timing

for that event occurring and calculate the NPV of those risks, and adding that NPV to the public sector comparator. However, a variety of outcomes should be used instead of a single risk transfer NPV.

If sufficient data are available, the probability of the deviation of those outcomes can be estimated statistically. Some statistics tests must be used regarding simulations, and considering the risks allocation as a probability distribution. However, if that is not possible, should data be insufficient, then subjective, but realistic, probabilities might be used, using benchmarking with other sector projects (for instance, the Australian government uses 8% of the project value to estimate transferable risks [OECD, 2008]). Unlike the private sector, the public sector is not profit driven, and therefore the risk of deviations in costs or revenues is much higher. Delivering a service or good under public-private partnerships must be used to reduce those risks. It is then necessary to find the optimal allocation of risk between the two parties, private and public. But it is also important to ensure that no highly subjective judgments about the value of risks transferred are made in order to make public-private partnerships less expensive than the public sector comparator. This risk calculation should not be made to overrun costs in the public sector so as to choose the private sector solution.

Public-private partnerships are one of the best ways to transfer risks from the public to the private sector. Public-private partnerships become a risk-sharing agreement with the private bidder. Therefore, the risk allocation process is vital to success. Projects must have an optimal risk allocation, and if insufficient risks were allocated to the private sector, it will be very difficult for a public-private partnerships to generate value for money. This is because risk transfer becomes much more effective when there is a "whole of cycle" contract with a single private entity. This allows the public entity to know the exact cost of providing the service in the long term, having a predictable budget. The "whole of cycle" means that the risk associated with changes during the long-term contract and the complexity involved in this type of large-scale project are being considered.

It is also important to know that if the risks transferred to the private sector were really and definitely transferred, and that they will not revert again to the public sector. If there is a probability that during the life of the contract the risk could revert to the public sector, this has to be evaluated and considered in the calculations of the risk transfer estimated costs. A fundamental analysis would include the renegotiation and the financial rebalancing agreement.

An important issue which the literature and experience tend to forget in the calculation of the public sector comparator is corporate taxes. Once there are corporate taxes in most countries, and as public-private partnerships consortiums usually do not have a tax-free benefit, the tax revenues from the private initiative have to be accounted for in the public sector comparator. It is simple to understand why: if the decision is to carry out the project via the public sector, those revenues will not exist, and therefore, there is an opportunity cost in the decision that must be taken into account.

$$T = EBT * \text{marginal corporate tax} - \text{Tax benefits} \quad (15)$$

The cost of the public-private partnership, which is the NPV of the payments agreed with the private bidder, plus the cost of the risk retained.

$$\text{Public-private partnerships cost} = \text{Retained risks} + \text{Cost of service payments} - \text{Corporate tax} \quad (16)$$

$$\text{Public-private partnerships cost} < \text{PSC cost} \quad (17)$$

Cost of service payments – Corporate tax < – Capex + BCP + public-private partnerships transfer risks estimation costs + Corporate tax from public-private partnerships (18)

As the retained risks are equal on both sides of the equations, and are discounted at the same discount rate, we can eliminate both in the equation. However, in practical analysis, costs should be measured in order to find the real impact of those risks.

Another way of analysing the public sector comparator *versus* public-private partnerships is to use incremental outflows (Table 1).

Table 1. **Incremental outflows for public-private partnerships *versus* the public sector comparator**

Gains (in NPV)	Losses (in NPV)
Capex	Payments to the private bidder
+ Reinvestments or major reparations	Corporate tax
+ *BCP = [(direct costs + indirect costs) – Revenues]*	
+ Corporate taxes	
+ Transferred risks	

Notes: Incremental OF = public-private partnerships – public sector comparator.
If NPV > 0 – Choose public-private partnerships.
If NPV < 0 – Choose public sector comparator.

At this point, one aspect must be stressed: as the public sector tends to be less efficient than the private sector, it is necessary to ensure that this analysis is realistic, and therefore, a sensitive analysis of the numbers is fundamental. One should analyse the impact of deviation in each one of the public sector comparator components, especially the initial capital expenditure (although the risk of cost deviation can be mitigated by a construction contract with a private company), and especially the operational costs in the long term.

What discount rate should be used? As we have seen, the literature is everything less than unanimous on this question.

We do not think that the public sector should exclusively use the private sector rate, for two reasons. First, doing so will undermine the private sector need for efficiency. Second, the exogenous risks from the public sector perspective are always lower than the private sector. But, we also do not agree with the simple use of the public debt interest rate. Although there is an argument for the use of a generic discount rate, *i.e.* that the public sector spreads risks over many projects, the average risk should be used rather than the project risk. We do not agree with this proposition, mainly because this would mean treating high-risk and low-risk projects in the same way. Besides, there is a substantial difference in the cash flows that are being discounted. In the public sector comparator, costs consist mainly in a high level of initial capital expenditure and a low level of long-term operational costs, whereas the costs of public-private partnerships consist in a long-term payment to the private bidder.

We think that there should be three discount rates applied to the public sector comparator and two discount rates to the public-private partnerships.

For the public sector comparator, a riskless discount rate should be used to discount the capital expenditure and the retained risks. The rate should be the interest rate of bonds for the maturity of the project (should be the *Rf*). There is a simple reason for that: the capital expenditure is in the first years of operating, which means that the impact of the discount rate is small. Besides that, a fixed price contract can be made with the private sector for the

construction of the infrastructure, reducing the risk of cost deviation to a very low level. Also retained risks in public-private partnerships tend to be risks that the public sector is more likely to manage, and if they occur, the cost can be financed by public debt.

A default risk interest rate should be used for discounting the cost of service and maintenance, and also for the transferred risks. The reason for this is that two future cash flows are subject to the same risk, whether they are managed by the public or private sectors. The risks transferred in a public-private partnership are risks that the private sector is more likely to manage, and so they should be discounted at that risk rate. The CAPM model should be used for calculating that risk.

$$CAPM: E(Ri) = Rf + \beta i\,[E(Rm) - Rf] \quad (19)$$

As for the $E(Rm)$ and the βi, if the public-private partnership is in a sector where the private sector is already present, like roads or health, the benchmark with the market is possible and it is the best solution. If the public-private partnership is in a sector where there is no private initiative, there should be an attempt to measure the risk associated with the project.

As for the public-private partnerships, the future payments to the private consortium should be treated as public debt, because that is what they really are (future payment obligations due to today's decisions). As that, the public debt interest rate for the maturity of the project should be used to discount those future payments. Although each public-private partnership should be discounted with this rate, the intensive use of public-private partnerships, and the budget consequences in the long term, may affect the rating of the public sector, leading to a higher interest rate, and therefore, affecting the future evaluation of public-private partnerships (Table 2).

Table 2. **Discount rates**

Discount rates	Public-private partnerships	Public sector comparator
Rf: risk-free rate	Payments Retained risks	Capital expenditures Retained risks
$Ru = Rf + \beta u\,[Rm - Rf]$	n.a.	Operational costs Transferred risks
$Re = Rf + \beta l\,[Rm - Rf]$	Corporate tax	Corporate tax

Note: With βu the unlevered beta and βl the levered beta.

3. The Portuguese experience

By way of practical analysis, we will use the Portuguese experience on public-private partnerships. Portugal set up its first public-private partnership in 1993 (Vasco da Gama Bridge in Lisbon), and since then, it has promoted 14 public-private partnerships (through 2008). The public-private partnership projects were primarily in transport, basically roads. Recently, the Portuguese government has announced the launch of public-private partnerships in health, roads, the new Lisbon international airport and the TGV (*train à grande vitesse*, or high-speed train).

For 15 years, the 14 public-private partnerships contracted represented a private investment of EUR 10 billion and around EUR 20 billion of public payments for the next 30 years, according to a Court of Audit Report. Portugal invests more than any other country in public-private partnerships when considering the value of the public-private partnerships per capita, and about twice as much as the United Kingdom (PricewaterhouseCoopers, 2005).

Parpública, a taskforce under the Ministry of Finance, was created to advise and evaluate public-private partnerships, with the mission of promoting the use of public-private partnerships in the development of public services, to lead to better quality and efficiency. Parpública is also the entity responsible for technical support of the Ministry of Finance in public-private partnership procedures.

Until 2006, Portugal had never run a public sector comparator when setting up public-private partnerships. The first public-private partnerships with a public sector comparator prior to the bid were the new hospital in Braga and the new hospital in Cascais. Until then, the decisions on public-private partnerships were based on the best bid. Since 2003, a discount rate of 6.08% was set when evaluating public-private partnerships. This discount rate was applied in the 2006 public-private partnerships for the new Braga and the new Cascais hospital.

The example that we will use is the most controversial public-private partnerships in Portugal, the SCUT (*Sem Custos para o Utilizador*, which means "without costs to the user") highway project. This was divided into seven procedures between 1999 and 2001. Since it was set up, there has been strong discussion and controversy whether this was the best option, and if these public-private partnerships have, in fact, delivered value for money to the public sector.

The SCUT public-private partnerships were designed for a total of construction of 930 kilometres of highways, with a shadow toll payment, where the state budget, rather than the users, pays the private consortium. The state has arranged an annual yearly payment for the utilisation of the roads with the private bidders, therefore using the taxpayers' money instead of directly charging the users. These payments were structured in three bands:

- Band A: a payment of x per vehicle per kilometre for the first (a * 1 000) vehicles per day (vpd)/km.
- Band B: a payment of y per vehicle per km for the next (b * 1 000) vpd/km.
- Band C: All higher levels of vpd/vkm = no payment.

The main argument for this arrangement was that most of the highways were in poor regions, and that the construction of these facilities would help to develop those regions. However, only 55% of the total kilometres was in regions with these characteristics, which suggests that somehow this public benefit was unfair. Criticism of the SCUT agreement has also concerned affordability, mainly because the state payments were delayed to start in 2006, and there was no accommodation on the fiscal sustainability of the budget, considering that since 2001, Portugal has been facing fiscal constraint regarding deficit. In fact, to pay the annual SCUT fee from 2006 to 2020, it is necessary to allocate each year 20% of value-added tax (VAT) revenues, or 27% of income tax, or the total annual budget of the Ministry of Transport.

When setting up the SCUT public-private partnerships, there was no public sector comparator conducted by the government. That was, in our opinion, one of the major reasons for the discussion on whether this decision created value for money or not. The decision to use public-private partnerships was not based on any financial analysis, and there was no idea of what would be the cost of doing it solely by the public sector. This was also a conclusion of the 2003 audit on public-private partnerships, from the Court of Audit of Portugal. In fact, there was no study on the economy, efficiency and effectiveness of these public-private partnerships.

The risk analysis was also misguided in this project. The audit stated that for instance, in the SCUT Beira Litoral, the bidder that won transferred fewer risks than the other proposal. As an example, the fact that the bidder did not take the risks of tunnel construction, making the public sector pay the extra cost of one kilometre of tunnels, made the proposal more expensive than the one that was initially negotiated.

In the SCUT public-private partnerships, the public sector accepted some risks that should have been assigned to the private sector (*e.g.* the risk of widening the roads due to more traffic, or the costs of eminent domain), and others were assigned to the private sector, when they should have remained on the public side (*e.g.* the environmental studies and projects). Other aspects related to risk assessment is that the risks retained by the public sector were not calculated.

Portugal has set up a large number of public-private partnerships in a short period of time, without ensuring that the public sector was capable of managing them. The newness of the experience, added to the fact that the Portuguese administrations were not prepared for such a level of complexity and technique, were some of the factors that led to some bad decisions in this area. In addition, there was no legal framework until 2003, and until that date, the participation of the Ministry of Finance was next to nothing. Instead of launching a high number of public-private partnerships, a pilot should have been undertaken. This is particularly true in the health sector, where from 2002 to 2009, ten public-private partnerships were launched, without any experience, and in very complex models, with no parallels in any other country.

Some of the reasons for the failure of the public-private partnerships in the health sector were: the complexity of the model, which made the analysis very technical, and therefore more prone to error; the absence of similar international experiences; the lack of experience and qualified human resources in public-private partnerships in the Health Ministry; the red tape costs; the high number of public-private partnerships and the investment associated; the failure to comply with the deadlines for several procedures; and the inflexibility of the bidder procedures.

4. Data and results

With regard to the SCUT project, the payments agreed by the state in 2000 are presented in Table 3. They were programmed to start in 2006 and finish by 2031. The Portuguese Republic interest rate debt in 2003, for a ten-year maturity, was 4.5%. Therefore, the NPV of the payments is around EUR 7.98 billion (in 2002).

In 2003, the Portuguese government decided to use a 6.0% discount rate for public-private partnership projects. Using that rate, the NPV of the payments is around EUR 6.65 billion (in 2002) (Table 4).

Assuming that 930 kilometres could have been built and maintained by the public sector, what would have been the cost?

Although the cost of a highway depends on the localisation, due to the field constraint, most of these roads were built in northern and central Portugal, with a more difficult terrain (data provided by BRISA [the largest highway operator in Portugal, which today has more than 1 500 kilometres of concessions, and in 2001 was mainly publicly owned and had around 1 000 kilometres] in 2001) (Table 7).

The total cost for the private sector was around EUR 3 billion, according to Table 9.

Table 3. **Annual payments to the SCUT public-private partnerships, with a 4.5% discount rate**

In EUR thousands

	Annual payment (in EUR million)	Discount factor	NPV payments	Taxes	Discount factor	NPV taxes	NPV PPP
2003	22 032	1.045	21 083	0	1.258	0	21 083
2004	51 471	1.092	47 134	0	1.583	0	47 134
2005	253 729	1.141	222 342	0	1.991	0	222 342
2006	329 272	1.193	276 115	0	2.505	0	276 115
2007	588 523	1.246	472 261	0	3.151	0	472 261
2008	658 658	1.302	505 781	12 964	3.964	3 271	502 510
2009	668 124	1.361	490 957	90 519	4.986	18 154	472 802
2010	678 644	1.422	477 212	94 872	6.273	15 125	462 087
2011	704 005	1.486	473 728	102 922	7.891	13 043	460 685
2012	695 867	1.553	448 088	102 581	9.927	10 334	437 754
2013	650 085	1.623	400 582	92 815	12.488	7 432	393 149
2014	667 784	1.696	393 768	98 903	15.710	6 296	387 472
2015	682 721	1.772	385 240	104 284	19.763	5 277	379 963
2016	662 584	1.852	357 777	100 880	24.862	4 058	353 720
2017	686 006	1.935	354 473	108 348	31.276	3 464	351 009
2018	645 482	2.022	319 171	99 813	39.345	2 537	316 634
2019	666 629	2.113	315 433	106 676	49.496	2 155	313 278
2020	661 835	2.208	299 679	107 036	62.266	1 719	297 960
2021	610 931	2.308	264 717	95 849	78.331	1 224	263 494
2022	618 968	2.412	256 651	99 377	98.540	1 008	255 642
2023	609 800	2.520	241 961	98 583	123.963	795	241 166
2024	575 704	2.634	218 595	91 536	155.946	587	218 008
2025	530 530	2.752	192 768	81 698	196.180	416	192 352
2026	424 213	2.876	147 500	54 436	246.794	220	147 280
2027	393 297	3.005	130 862	45 822	310.467	148	130 714
2028	393 755	3.141	125 373	45 118	390.568	116	125 257
2029	370 162	3.282	112 785	38 376	491.335	78	112 707
2030	281 947	3.430	82 207	15 454	618.099	25	82 182
2031	171 118	3.584	47 744	0	777.568	0	47 744
Total	**14 953 876**		**8 081 988**			**97 482**	**7 984 506**

To this value, we must add the cost of large highway repairs. We estimate a need for such repairs every ten years, with a cost of 10% of the construction cost per kilometre, and so, EUR 290 million ten years after the operation started (in 2013), and that value adjusted for inflation another ten years later (in 2023, with the value of EUR 350 million). The discount factor for the capital expenditure will be the same used to discount the future payments to the public-private partnerships: 4.5% or 6.0%.

There is no widely accepted process for determining the costs associated with performing highway maintenance if done by the transportation agency itself.

The annual cost of maintenance and operating highways for BRISA represents around 30% of sales. In 2001, this came to around EUR 150 million (30% * EUR 500 million; Table 8). That represents a maintenance and operating cost of EUR 190 000 per kilometre. Over the next few years, from 2003 to 2009, the annual operating and maintenance cost per kilometre was around EUR 150 000. The SCUT 930 kilometres would mean an operating cost of EUR 140 million a year. However BRISA has some operational costs that SCUT does not have, mainly regarding the charging of tolls. A large part of the BRISA operational costs are regarding toll charges; these costs do not exist in SCUT. Although

Table 4. **Annual payments to the SCUT public-private partnerships, with a 6.0% discount rate**

In EUR thousands

	Annual payment (in EUR million)	Discount factor	NPV payments	Taxes	Discount factor	NPV taxes	NPV PPP
2003	22 032	1.060	20 785	0	1.258	0	20 785
2004	51 471	1.124	45 809	0	1.583	0	45 809
2005	253 729	1.191	213 036	0	1.991	0	213 036
2006	329 272	1.262	260 814	0	2.505	0	260 814
2007	588 523	1.338	439 779	0	3.151	0	439 779
2008	658 658	1.419	464 328	12 964	3.964	3 271	461 057
2009	668 124	1.504	444 341	90 519	4.986	18 154	426 187
2010	678 644	1.594	425 790	94 872	6.273	15 125	410 665
2011	704 005	1.689	416 699	102 922	7.891	13 043	403 656
2012	695 867	1.791	388 568	102 581	9.927	10 334	378 235
2013	650 085	1.898	342 457	92 815	12.488	7 432	335 024
2014	667 784	2.012	331 868	98 903	15.710	6 296	325 573
2015	682 721	2.133	320 086	104 284	19.763	5 277	314 809
2016	662 584	2.261	293 062	100 880	24.862	4 058	289 004
2017	686 006	2.397	266 246	108 348	31.276	3 464	282 782
2018	645 482	2.540	254 092	99 813	39.345	2 537	251 555
2019	666 629	2.693	247 562	106 676	49.496	2 155	245 407
2020	661 835	2.854	231 870	107 036	62.266	1 719	230 151
2021	610 931	3.026	201 921	95 849	78.331	1 224	200 697
2022	618 968	3.207	192 997	99 377	98.540	1 008	191 989
2023	609 800	3.400	179 376	98 583	123.963	795	178 581
2024	575 704	3.604	159 761	91 536	155.946	587	159 174
2025	530 530	3.820	138 891	81 698	196.180	416	138 475
2026	424 213	4.049	104 772	54 436	246.794	220	104 551
2027	393 297	4.292	91 638	45 822	310.467	148	91 490
2028	393 755	4.549	86 551	45 118	390.568	116	86 436
2029	370 162	4.822	76 760	38 376	491.335	78	76 682
2030	281 947	5.112	55 157	15 454	618.099	25	55 132
2031	171 118	5.418	31 581	0	777.568	0	31 581
Total	**14 953 876**		**6 746 596**			**97 482**	**6 649 114**

Table 5. **NPV sensitivity analyis, with a *Rf* = 4.5% (in EUR thousands)**

Operational costs	Capital expenditures									
	Case based	Δ with PPP	Δ = 10%	Δ with PPP	Δ = 20%	Δ with PPP	Δ = 50%	Δ with PPP	Δ = 100%	Δ with PPP
Base case	4 033 646	–3 950 861	4 347 481	–3 637 025	4 639 219	–3 345 287	5 514 431	–2 470 075	6 973 118	–1 011 388
Δ = 10%	4 113 017	–3 871 489	4 457 980	–3 526 526	4 772 404	–3 212 102	5 715 677	–2 268 829	7 287 798	–696 709
Δ = 20%	4 192 388	–3 792 118	4 545 289	–3 439 218	4 859 713	–3 124 793	5 802 985	–2 181 521	7 375 106	–609 400
Δ = 50%	4 430 502	–3 554 004	4 807 214	–3 177 293	5 121 638	–2 862 868	6 064 910	–1 919 596	7 637 031	–347 475
Δ = 100%	4 827 358	–3 157 148	5 243 756	–2 740 751	5 558 180	–2 426 327	6 501 452	–1 483 054	8 073 573	89 067

data are not available, we will use the data provided by the Portuguese Public Road Institute (Estradas de Portugal) to the new "AETransmontana" (Banco Efisa – Análise da viabilidade económica): a SCUT launched in 2007 had an operating and maintenance cost of EUR 65 000 per kilometre.

Thus, the annual operating and maintenance cost of SCUT would be EUR 50.6 million in the first year. We use 3.0% estimation for the annual growth of these costs.

Table 6. **NPV sensitivity analyis, with a *Rf* = 6.0%**

Operational costs	Capital expenditures									
	Case based	Δ with PPP	Δ = 10%	Δ with PPP	Δ = 20%	Δ with PPP	Δ = 50%	Δ with PPP	Δ = 100%	Δ with PPP
Base case	3 863 729	–2 785 385	4 140 318	–2 508 796	4 427 834	–2 221 280	5 250 199	–1 398 914	6 620 809	–28 304
Δ = 10%	3 943 100	–2 706 014	3 943 100	–2 706 014	4 507 205	–2 141 909	5 329 571	–1 319 543	6 700 180	51 067
Δ = 20%	4 022 471	–2 626 643	4 299 061	–2 350 053	4 586 576	–2 062 538	5 408 942	–1 240 172	6 779 552	130 438
Δ = 50%	4 260 585	–2 388 529	4 537 174	–2 111 939	4 824 690	–1 824 424	5 647 056	–1 002 058	7 017 665	368 552
Δ = 100%	4 657 441	–1 991 673	4 934 030	–1 715 083	5 221 546	–1 427 568	6 043 912	– 605 202	7 414 522	765 408

Table 7. **BRISA's financial indicators, 2003-07**

	2003	2004	2005	2006	2007
Sales (EUR million)	560	574	577	586	646
EBITDA (EUR million)	403	424	418	418	460
EBITDA (%)	72%	74%	72%	71%	71%
Operational costs (EUR million)	157 000	163 000	159 000	168 000	187 000
ROE	16%	12%	18%	11%	15%
Number of kilometres	1 000	1 106	1 106	1 106	1 346
Operational costs by km (EUR million)	157	147	144	152	139

Source: BRISA annual financial reports.

Table 8. **BRISA's financial indicators, 2001**

In EUR

Number of kilometres of highways	789.5
Assets valuation – highways	2 865 784 212
Total operational revenues	476 998 882
Total operational costs	63 930 654
Depreciations and amortisations	91 875 292

Source: BRISA 2001 financial statements.

For calculating the corporate tax, we have estimated the financial statements of the private operators (Table 9). We used the agreed payments, the operational costs and a debt with a maturity over 20 years and an average cost of debt of 6.75% (Table 10).

Table 9. **Capital expenditures of the SCUT public-private partnerships**

PPP	No. of km	Capex (EUR millions)
SCUT Beira Interior	178	438
SCUT Interior Norte	155	499
SCUT Algarve	129	243
SCUT Costa de Prata	105	298
SCUT Grande Porto	72	465
SCUT Beiras litoral e alta	176	753
SCUT do Norte Litoral	115	228

Source: Portuguese Public Road Institute (Estradas de Portugal).

The major risks to be transferred to the private sector in public-private partnerships are: construction risks, demand risks, operation risks and maintenance risks.

Table 10. **Financial indicators of the private operators of SCUTs**

	Beira Interior	Interior Norte	Algarve	Costa de Prata	Beiras litoral e alta	Norte Litoral	Total
Capex	438 000	499 000	243 000	298 000	753 000	228 000	2 459 000
Debt (%)	90.60	98.00	83.10	91.30	91.20	76.00	90.28
Debt	396 828	489 020	201 933	272 074	686 736	173 280	2 219 871
Equity (%)	9.40	2.00	16.90	8.70	8.80	24.00	9.72
Equity	41 172	9 980	41 067	25 926	66 264	54 720	239 129
Debt/equity	10	49	5	10	10	3	9
Cost of debt (%)	8.83	6.09	6.30	5.92	6.33	7.38	6.75
Cost of equity (%)	13.00	13.18	7.72	11.89	13.10	6.41	10.50
Tax (%)	25.00	25.00	25.00	25.00	25.00	25.00	25.00
WACC (%)	7.22	4.74	5.23	5.09	5.48	5.75	5.59
IRR (before tax) (%)	7.35	9.59	6.67	8.43	9.24	6.68	n.a.

Source: IEP – Portuguese Public Road Institute.

For the construction risks, the fact that the private bidders were all construction firms significantly reduced that risk. This is a risk, usually aligned with environmental projects, archaeology discoveries or costs with eminent domain. We do not think that this level of risk was higher.

In the SCUTs, the actual demand risk transfer to the private sector was limited: Band A was set up for a traffic level that ensured that the lenders were taking little real traffic risk. Once there is only a limit in revenues for a high level of traffic, the level of demand risk is reduced. This model of payment ensures future cash flows, which made the project much less riskier. This fact was disclosed by the financial institutions once the average debt was 90% of the capital expenditure.

As no data are available for this part of the public sector comparator (mainly because studies are not available as they were considered confidential), we will use an estimation of 10% of the total value of the project for the construction risks, and 10% of the operational costs for the maintenance risk.

For the risk transfer to the private sector, the literature tends to consider the risk level on transport as low or medium low. As an example, Australia (Partnerships Victoria), use a low level band for roads with no tolls, giving a $\beta u = 0.5$, with a market risk premium of 6.0%, a real risk free rate of 3.0%, for a discount rate of 6.5%.

The discount factor for the tax income is calculated by using the CAPM:

$CAPM: E(Ri) = Rf + \beta i\ [E(Rm) - Rf]$

where $Rf = 4.5\%$; $\beta i = 3.875$; $E(Rm) = 5.5\% + 4.5 = 10\%$

having $\beta L = \beta u\ [1 + D/E\ (1 - t)] = 0.5 * [1 + 9 * (1 - 0.25)] = 3.875$

where $E(Ri) = 4.5\% + 3.875 * (10\% - 4.5\%) = 25.8\ \%$

The discount factor for the operational costs and the risks transferred to public-private partnerships is:

$RU = RF + \beta u * (Rm - RF) = 4.5\% + 0.5 * 5.5\% = 4.5\% + 2.25\% = 6.75\%$

5. Conclusion

In this article, we have provided an overview of how public-private partnerships are evaluated in terms of creating value for money to the public sector. We have determined

that the literature is less than unanimous about whether public-private partnerships create value for money or not. We have proposed a financial analysis, using the public sector comparator prior to the bid as the best option to do this type of evaluation. This analysis is based on the NPV of the public-private partnership payments and corporate tax revenues *versus* the cost of doing it via public sector procurement, using the NPV of the cost of investment, operation and maintenance, risk transfer and corporate tax revenues lost. We also have established some guidelines to assess what discount rate should be used for each type of future outflow.

To carry out a credible and independent analysis, there are three preconditions: *i)* there must be no predisposition to carry out the work via a public-private partnership in order to strike the investment off budget, due to fiscal constraints; *ii)* the project should be affordable; and *iii)* the investment should be the best allocation for public resources. This final condition is essential to understand the scope of this work. We are not discussing whether or not the investment should be made; this should have already been analysed and decided. The point in this paper is whether to use traditional procurement or public-private partnerships. That is to say, which option brings more value for money to the public sector?

We have used the SCUT experience in Portugal by way of analysis. The results confirm that using public-private partnerships in the conditions set up in the contracts did not add value for money to the public sector. If traditional procurement had been used, it would have been far less expensive, even given the public sector's tendency to be less efficient. We find that, carrying it with the same costs in mind (our base scenario), it would have cost EUR 2 billion or EUR 3 billion less, when considering 4.5% or 6.0% as the *Rf* (Table 11). Even with a 50% extra cost of capital expenditure and operating costs, it still would have been a better solution to use public procurement rather than the public-private partnership.

Table 11. **NPV of the two base scenarios of PPP and PSC**

In EUR thousands

	Rf = 4.5%		Rf = 6.0%	
	PSC	PPP	PSC	PPP
NPV of cost of public sector procurement (including capital and operational expenditure)	3 688 988		3 519 071	
NPV of service fees – NPV of tax		7 984 506		6 649 114
NPV of risk adjustments	305 735		305 735	
NPV of additional tax	38 923		38 923	
Total risk-adjusted NPV cost	**4 033 646**	**7 984 506**	**3 863 729**	**6 649 114**

The level of risk transfer to the private sector in the SCUT was very low, and that undermined the performance of the public-private partnership. We question whether a shadow toll system is the most appropriate one.

We concluded that the negotiation of the SCUT public-private partnerships was not correctly managed, mainly because no studies were undertaken prior to the negotiation. Having carried out a public sector comparator would have shown that the bidders' offer was unrealistic, and that taxpayers' money could have been saved.

It is important to say that the result obtained here does not necessarily mean that public-private partnerships should not be considered as a valid option for the public sector. They are indeed. When considering the level of public debt and the needs for investments

in replacing or creating new infrastructures, private sector efficiency and capability of raising debt is crucial for these efforts. However, in this particular case, the analysis that should have taken place before the decision was lacking. One of the open questions is the externalities impact of building these roads, considering that the option might have been not to build at all. It is necessary to calculate the economic impact of this investment using the social time preference rate.

What we have clearly claimed is that there should be no prejudiced belief in public-private partnerships, and they should be looked upon without any ideological predisposition. This is equally valid for those who believe that using the private sector is a guarantee of better efficiency, and for those who do not believe in private sector virtues.

International experience and results regarding whether public-private partnerships create value for money are not entirely consensual. Some studies indicate that public-private partnerships have created value for money, by reducing costs, deadlines or improving services. In some cases, those studies have been criticised, and the argument that a comparison between the performance of a public-private partnership and traditional procurement might be biased in favour of public-private partnerships. But many projects all over the world have failed, with the public-private partnerships returning to public management.

According to a UK National Audit Office report, public-private partnerships in the United Kingdom have been delivered on time and on budget more often than traditional procurement. Traditional procurement has been on time and on budget only 30% of the time, while public-private partnerships have been on time and on budget around 70% of the time (National Audit Office, 2003).

We argue that public-private partnerships are a good solution, but only when the public sector is capable of negotiating with the private bidders, when they know exactly what the limits of those negotiations are, and when they understand the point at which there are no more advantages in turning to a private sector solution.

In fact, public-private partnerships have the potential to promote greater levels of efficiency by involving the private sector. However, this will only happen if the efficiency earnings exceed the higher cost of finance that the private sector brings due to higher interest rates. This can be achieved by having the private sector invest in reducing lifecycle costs, by using higher standards in construction, by more frequently handling maintenance and by investing in new technology, or simply by having better management and a simpler process.

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