

# Managing healthcare project financing investments: a corporate finance perspective

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**Abstract:** Healthcare infrastructures are a typical risky investment, which can be financed in many different and competing ways, and Public Private Partnership and project financing techniques are increasingly recognized as a useful and appropriate device. Risk identification, transfer, sharing and management are a key point of the whole structure and the risk matrix, used in order to classify and - wherever possible - measure risk is an unavoidable part of the investment package. To the extent that it can be professionally managed by specialized agents, risk sharing or transmission is not a zero sum game, even if risk pricing is never a trivial issue. While the public part traditionally bears core market risk (demand for health services), other key risks, such as those related to construction and management of commercial (hot) activities, are typically transferred to the private part, often represented by a private entity. A corporate finance perspective is crucial for preparing a proper business model, where economic and financial flows are projected along the time span of the investment, with managerial and strategic insights for not ephemeral sustainability. Capital structure issues, rotating around (optimal) leverage, are eventually discussed, starting from a Modigliani & Miller framework, with practical insights and sensitivity analyses.

**Keywords:** PPP, Hospitals, Discounted Cash Flows, Modigliani & Miller Theorems, Cost of Capital, Risk, Leverage, Bankability, Corporate Governance

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## 1. Introduction

Healthcare project finance (PF) is concerned with the financing of long-term hospital social infrastructures ([1], [2], [3]) based upon a complex financial structure where project debt and equity are used to finance the project, rather than to reward project sponsors. Healthcare is highly networked and systemic industry, with a practical impact on projects, which need to be well introduced in the territory and synergic with other healthcare and infrastructural facilities [4], [5], [6].

Usually, a PF structure involves a number of equity investors, known as sponsors, as well as a syndicate of banks that provide loans to the operation. The loans are most commonly non-recourse, paid entirely from project cash flow, rather than from the general assets or creditworthiness of the project sponsors. PF is typically more sophisticated than alternative financing methods and Public Private Partnership (PPP) models ([7], [8], [9], [10]) require experienced coordination.

Risk transfer and sharing from the public to the private part is a key element: a principal / agent optimal risk allocation and co-parenting are the core "philosophy" of PF.

Risk transfer is deeply involved with the allocation of risks associated with the operation of a PF contract, according to the principle that it should lie with the party best able to manage it.

Within the healthcare sector, considering investments in new hospitals, "cold" projects, where revenues and demand for services mainly depend on the public part, are predominant, since "hot" revenues for the private part are mainly represented by commercial activities related to the core investment (parking; restaurants, shops around or within the hospital, etc.). The hotter the project, the higher the transmission of core demand risk to the private part. Hot revenues are typically discounted at higher risk rates by the financing banks of the private counterpart, even if these revenues are more flexible than cold ones and may allow for scalable extra gains, this being the benign scenario represented by upside risk (i.e., the statistical probability that revenues may be higher than expected).

The price to be paid from the public part to the private concessionaire depends on the cost of the healthcare project [11] and is divided into three synergistic components:

a) public contribution to the construction costs [12], to be paid according to the building phases;

- b) periodic availability payments for making the facilities working and available during the management phase;
- c) economic margins on no core services contracted out to the private entity.

Investment risks [13] mainly concern:

1. Risks concerning the construction site
2. Risks of planning - engineering – construction
3. Financial Risks
4. Governance - sponsor Risk
5. Operating and Performance Risks
6. Market Risks
7. Network and interface risks
8. Procedural, contractual and legislative risks
9. Macroeconomic - systemic risks

Risk can take shape in many different forms, as seen above, but a synthetic consideration may be focused on "ultimate" risk for the public or the private part (which is the worst event that can happen?). The literature on PF risk is vast (see [14], [15]) and often focused on proper risk allocation issues ([16], [17], [18], [19], [20]). "Make it or buy" decisions for the public part and choices between self construction of healthcare facilities and PPP agreements, are driven by risk sensitive Value for Money considerations, which have to consider even the long term impact of macroeconomic variables, such as interest rates or inflation [21].

Apart from force majeure considerations, the ultimate risk may tentatively be considered the following:

- for the public part, risk that the hospital does not properly work, not being functional to the changing needs of the patients, and that these inefficiencies bring extra costs and delays; a correct assessment of the responsibilities of the PF instrument is however necessary, since malfunctioning would probably be present even choosing other financing models and core (health) market risk is typically not included in the PF package;
- for the private entity and its shareholders, risk that the whole investment, across its (long) life, is not profitable, eroding the forecast Net Present Value (NPV) or yielding insufficient financial returns [22];
- for lending institutions, risk that debt (principal and interests) is not timely and properly paid back.

Hospital investments are capital intensive projects with a cash flow timing mismatch for the private entity, for which the construction period is riskier (due also to peaking leverage). Not uniform risk distribution across the life span of the project is so another hot issue. Contract design is crucial in setting reciprocal rewards and obligations.

The paper is structured as follows: an accounting presentation of the economic and financial plan – which represents the basic backbone of the investment – is contained in the next section, followed by a description of the weighted average cost of capital, which represents the key financial risk parameter, both in a theoretical Modigliani & Miller world and empirically. The Modigliani & Miller proposition II is then challenged and a short empirical sensitivity analysis on a real (generalized) case is eventually

illustrated. Final remarks with tips for further research conclude the paper.

This topic matters for many complementary applications, such as for instance bankability and debt service, evaluation of the Special Purpose Vehicle and investment management of its shares (even in the secondary market), risk assessment and mitigation, estimate of Value for Money ([4], [23]), and corporate governance issues among stakeholders, within a PPP framework.

## 2. The Corporate Finance Framework: an Overview of the Economic and Financial Plan

The corporate finance framework of the investment represents its basic backbone, linking the balance sheet of the private entity with its profit & loss account and cash flow statement, as shown in Figure 1. The business plan, together with its quantitative elements [24], represented also by dashboard indicators (NPV and IRR, WACC, leverage, debt service cover ratio, payback ...) is the leading document behind any strategic decision, concerning Value for Money, feasibility, bankability, etc.

The asset structure of the PF investment depends on its contractual agreements, which may follow a typical project, build, finance, operate and transfer (PBOT) scheme, or many other variants, known as "Alphabet soup" [25] - a metaphor for an abundance of abbreviations or acronyms:

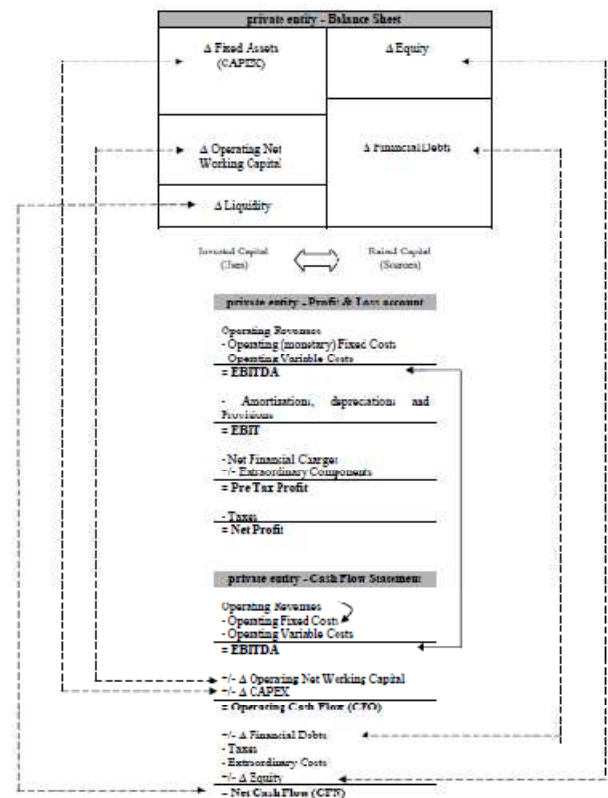


Figure 1. Private entity balance sheet, profit and loss account and cash flow statement.

- PBOT Project-Build-Finance-Operate-Transfer
- BDOT Build-Design-Operate-Transfer
- BLT Build-Lease-Transfer
- BOO Build-Own-Operate
- BOOS Build-Own-Operate-Sell
- BOOT Build-Own-Operate-Transfer
- BOT Build-Own-Transfer
- BTO Build-Transfer-Operate
- BRT Build-Rent-Transfer

BTO is possibly the most common option within the (public) healthcare industry. For what concerns in particular the transfer option, the hospital with its facilities is typically freely transferred at the end of the construction (or, more frequently, from the very beginning of the investment), so enabling the public counterpart to depreciate the hospital since its completion. Should the hospital be transferred at the end of the concession, the depreciation schedule would be managed by the private part.

In case of onerousness of the property transfer, the final price (normally agreed upon in the PF original contact) should be conveniently discounted using a (mildly) risky rate.

Should the private part transfer for free the hospital from the very beginning, it would be anyway entitled to depreciate the intangible right to use it, along the whole life of the concession.

Figure 2 briefly illustrates the evolution of the capital structure (raised capital, corresponding to Equity + Financial Debts, examined in [26], [27] and [28]) along the whole investment period.

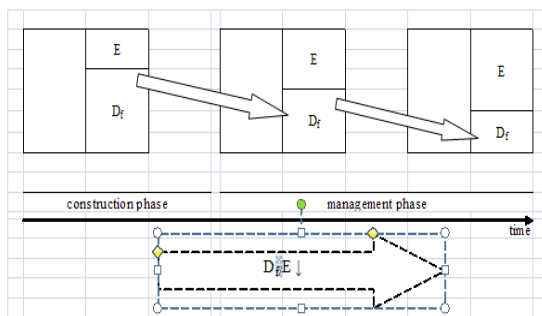


Figure 2. Capital structure changes across time.

Leverage decreases over time, reaching its peak at the end of the construction and then slowly and gradually diminishing, following an agreed payback pattern where senior debt tends to be reimbursed before subordinated debt, whose risk (and interest spread) is intrinsically slightly higher.

### 3. A Synthetic Financial Measure of Risk: Wacc

The weighted average cost of capital (WACC) is the rate that a company is expected to pay to finance its assets. WACC is the minimum return that a company must earn on existing assets to satisfy its creditors, owners, and other

providers of sources of capital, consisting of a calculation of a firm's cost of capital in which each category of capital is proportionately weighted.

All else being equal, the WACC of a firm increases as the beta ( $\beta$ ) and rate of return on equity increases, as an increase in WACC notes a decrease in valuation and a higher risk.

In an ideal situation where the average  $\beta_{\text{equity}} = 1$  and the  $\beta_{\text{riskless debt}}$  approaches 0, considering a possible weighting where the ratio equity versus debt is 20 : 80, the  $\beta_{\text{assets}}$  is the following:

$\beta_{\text{assets}} \approx 1 * 20\% + 0 * 80\% \approx 0.2$	$\beta_{\text{equity}} = 1$
	$\beta_{\text{debt}} > 0$

Figure 3. Standard Beta of assets, debt and equity.

From the assets' risk structure (volatility) we derive hints about the convenience of issuing convertible debt; while the risk is typically quite low within a PF healthcare initiative, hybrid debt is rather uncommon, since subordinated debt is already considered as quasi equity and the SPV's shareholders typically do not need or require any further equity kicker to increase their stake.

In the real world,  $\beta_{\text{equity}}$ , including quasi equity subordinated debt, is slightly below average unity, ranging at about 0.9, while  $\beta_{\text{debt}}$ , essentially represented by senior debt, is higher than zero - being risky - but lower than the cost of equity. So the private entity representation may be the following:

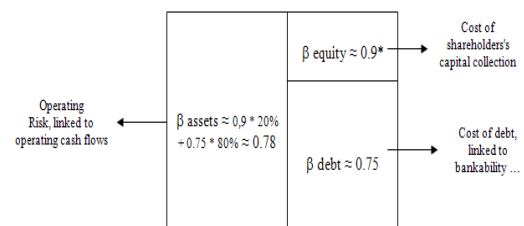


Figure 4. Project finance Beta of assets, debt and equity.

Capital is slightly riskier than subordinated debt, since dividends can be paid out only after many years of management, when retained earnings are consistent enough and have an adequate cash coverage (Free Cash Flow to Equity), whereas interests on subordinated loans may be cashed out earlier by the same equity-subordinated debt holders. And since senior debt commands a priority over subordinated debt in repayment of both interests and principal, its market price is slightly lower (by some 50 basis point ...). So a tentative  $\beta$  can be estimated at around 0.7 – 0.8.

Market value of the firm's equity and debt is difficult to assess if the private entity is not listed - this being the stan-

dard case. Should this be the case, value of equity may consider as a proxy market capitalization, while the value of debt could be represented by listed bonds; in standard private entities, capital markets benchmarks can conveniently be used only in countries or industries where there is a significant number of listed and comparable companies. The very fact that each project is unique represents an obstacle to market comparisons.

In most developed financial markets, the presence of sophisticated institutional investors can ease the start of a secondary market for debt and equity, and in such a case pricing becomes an unavoidable - but precious - issue.

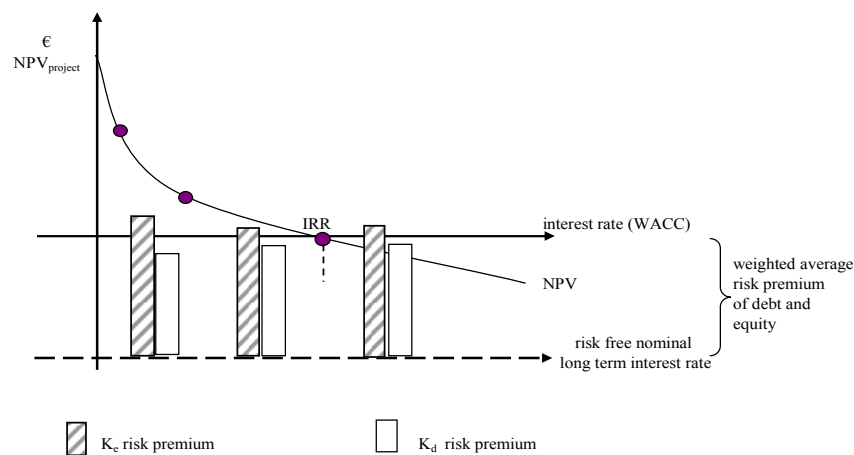
The WACC is a key parameter in PF, strongly connected with other key financial ratios. The WACC level can be a - very rough - measure of the risks effectively transferred from the public to the private part and so relevant also for Value for Money considerations. And the financial structure of the private entity (initial and subsequent, along the whole

life of the project) is another complementary indicator of the risk borne by the private part, up to the limit (absolute and relative debt, measured by leverage) accepted by the financial sponsor.

A leverage simulation - with a break even point (floor) / disaster case scenario - may be helpful in detecting which is the maximum bearable debt.

The relationship between the NPV of the project and its Internal Rate of Return (IRR) can be represented in the following figure 5, well known to any corporate finance practitioner. According to the graph - and the formulas of NPV and IRR - when WACC grows, the discounted cash flows of the project get smaller, approaching zero; actually, IRR represents the point at which NPV is equal to zero.

Sensitivity analyses, aiming at finding the break even point under stress tests, where each variable at a time changes, are particularly useful.



**Figure 5.** Net Present Value and Internal Rate of Return of a project.

$IRR_{\text{project}}$  constantly has to be compared with WACC: if the latter exceeds the former, bypassing sustainable financial break even, problems of bankability arise and if they are not ephemeral, cash burn outs may occur.

Projects evaluations using NPV suffer from lack of flexibility. The use of real options allows considering in the model the possibility to differ, expand, suspend, abandon, terminate a project. In the public healthcare industry, flexibility is however typically limited, possibly concerning "hot" revenues deriving from commercial no-core businesses.

During the tender, NPV is driven down by competitive bidders, but not to the point of making the project unbankable.

If the winner has a very low NPV - even approaching zero - one might wonder why the project is still profitable and bankable. The only possible explanation is that revenues are underestimated and / or costs are overstated and there can be (significant) saving. In some detrimental cases, "unofficial" money can fuel corruption and fraud.

The risk matrix has a strong impact on the cost of capital (cost of equity and quasi equity, including subordinated debt; cost of senior debt; WACC), especially if we consider the financial aspects of risk, mainly depending on:

- Time span / duration (of the project)
- Financing unavailability (capital rationing)
- Bankability
- Liquidity
- Degree of maturity (of the loans)
- Availability of institutional investors and other qualified sources of funds
- Currency and interest rate risk, sometimes bringing to an Assets & Liability mismatch (of the private entity)
- Amount and cash timing of the public grant, the availability payment and other revenues.

Financial risk is particularly important, since this is how risk is comprehensively priced by capital providers. Periodical market evaluation of the private entity, wherever possible, should embody its overall risk assessment and scoring. But two big problems make this theoretically sound

reasoning hardly working: the very fact that private entities are not listed and, even if they would, capital markets imperfections and malfunctioning in risk pricing.

Even WACC needs being considered within the peculiar healthcare investment framework, being once again influenced by the overall risk profile of the project and by its asymmetric attribution to the private part, whose WACC is a market expression of the “debt + equity” funding risk.

#### 4. To Lend or not to Lend? From Corporate Debt to Project Finance

Standard corporate finance issues, rotating around the capital structure of the company and the interaction between assets and liabilities (invested and raised capital), need being compared to cash flow based PF models, in order to understand which are the differences and how they impact on fundraising. A further personalization is represented by proper consideration of the peculiarities of healthcare investments.

The differences between corporate and project finance approaches may have strong implications on key parameters and issues such as cost of capital, leverage, risk, debt service capacity (bankability), and also on corporate governance issues, concerning the relationships and conflicts of interest among different stakeholders.

In PF, typical corporate governance problems between lenders and borrowers, respectively represented by banks and the private entity, are somewhat milder than the standard ones present in other private companies and standard corporate investment. It is well known that information asymmetries traditionally arise since borrowers have better information about their creditworthiness and risk taking that has the lending bank. They originate conflicts of interest which might seriously prevent efficient allocation of finance: the liquidity allocation problem derives from the fact that although money is abundant, it is nevertheless not easy to give it to the right and deserving borrowers. In the case of PF, the investment has to be carefully designed and analytically described, so reducing the information gap between borrowers and lenders.

Relationship lending, which relies on personal interaction between borrowers and lenders and is based on an understanding of the borrower's business, more than to standard guarantees or credit scoring mechanisms, can take place when the sponsoring banks are part of the private entity's shareholders or - to a lesser extent - if they already have strong ties with the main private entity's shareholders, whose credit trustworthiness is positively acknowledged.

Adverse selection is another typical problem in money lending and it occurs when banks - not knowing who is who - cannot easily discriminate between good and risky borrowers, who should deserve higher interest rate charges.

Moral hazard is a classical “take the money and run problem”, since borrowers might try to abscond with the bank's money or try not to fully engage them in the project

for which they have been financed.

To the extent that there is substantial symmetric information between debt and equity holders, PF simultaneously alleviates the classical inefficient managerial problems of under - and over - investment.

Another positive characteristic of PF is the presence of relatively few information asymmetries in the assets of the private entity. Borrowers typically know the value of their assets, to be used as collateral in traditional asset-based corporate lending investments, much better than lenders, so rising moral hazard conflict which prevent optimal resource allocation; this produces an incentive to minimize information asymmetries.

Liquidity does not bear any information asymmetry, but also capitalized construction costs are easily observable by outside providers of finance, who can monitor work in progress during the construction and get evidence of the effective costs of the private entity.

Incentives for borrowers to exaggerate positive qualities of their projects, with costly or impossible verification of true characteristics by outside parties, are hardly ever the case in PF.

Strategic bankruptcy is false information that the borrower gives about the outcome of his financed investment, stating that it has failed even if it is not true, only in order not to give back the borrowed money.

These classical corporate governance problems are well known in traditional banking - as it will be seen in the comparison reported in table 1 - and they naturally bring to sub-optimal allocation of financial resources and to capital rationing problems that frequently affect even potentially sound borrowers, if they are not able to differentiate themselves from those who bluff.

The signaling effect of debt, according to which only sound firms with borrowing capacity can send a costly message - issue debt - to differentiate them from others, is unlikely in the healthcare context, since the debt pattern should already be known since the beginning. The theory of signaling [29] states that information asymmetry between a firm and outsiders leads the former to make certain changes in its capital structure. Under asymmetric information, firms may prefer debt to equity financing [30].

Within the PF context, these problems can somewhat be mitigated, so reducing agency costs of debt, not only taking profit of milder information asymmetries, but also using simple but effective devices, such as cash flow channeling - since the private entity's cash flows mostly (apart from smaller “hot” revenues) come from one big source, the public part, the bank can compensate cash inflows with expiring debts, so avoiding any potential cash diversion.

PF enhances the crucial verifiability of cash flows through contractual constraints, including a network of project accounts that are under the lender's control and into which project cash flows are required to be deposited [31].

In such a context, moral hazard temptations are relatively unlikely, since it is difficult either to divert the bank's

money from its strategic aim - financing the building - or to avoid getting fully engaged in the project, due to the pressure for quality and achievements coming from the public part - building and running a public hospital is not a joke.

Legal clauses, protecting the financing banks, may consider cash flow verifiability and segregation, using wa-

terfall provisions for debt servicing priorities.

A comparison between standard corporate debt investments and corporate finance, useful also in order to assess Value for Money, bankability issues and profitability, is synthesized in table 1.

**Table 1.** *To lend or not to lend? Comparison between corporate debt and project financing.*

Parameter / situation	Corporate debt finance	Project financing
<b>Guarantees</b>	Asset based projects bear physical guarantees and, to the extent that they are not sufficient, personal covenants from the shareholders.	The guarantee is given by the cash flows of the project. Limited or no recourse models make private entity's shareholders mildly or not responsible.
<b>Leverage</b>	The (optimal) amount of leverage is a consequence of the guarantees and many other parameters (bankability; conflicts of interests and information asymmetries ...).	Typically higher than in standard corporate investments, with a profile more similar to LBOs. Lower risks, described in many parameters in this table, make this possible, to an extent that has to be decided and monitored case by case.
<b>Adverse selection</b>	Adverse selection is a typical problem in money lending, since banks - not knowing who is who - cannot easily discriminate between good and risky borrowers, who should deserve higher interest rate charges.	The track record and reputation of borrowers is less easily identifiable in PF, since the private entity typically has several shareholders, but – to the extent that the borrower is the new private entity and that the investment project is highly detailed, adverse selection problems are not so important in PF.
<b>Moral hazard</b>	Moral hazard is a classical “take the money and run problem”, since borrowers might try to abscond with the bank's money or try not to fully engage them in the project for which they have been financed.	Cash flow channeling through the lending bank makes money hiding extremely difficult.
<b>Information asymmetries</b>	In economics and contract theory, an information asymmetry is present when one party to a transaction has more or better information than the other party.	Moral hazard, adverse selection, assets substitution are much less harmful in PF and cash flows pass through the lending institutions and are easier to forecast and monitor, leading to a consistent reduction in information asymmetries, considering also that there is just one well known (albeit complex) investment to monitor.
<b>Strategic bankruptcy</b>	Strategic bankruptcy is false information that the borrower gives about the outcome of his financed investment, stating that it has failed even if it's not true only in order not to give back the borrowed money. The lender's right to liquidate is central to forcing the borrower to repay its debt.	Less probable with verifiable cash flows.
<b>Probability of default</b>	Should the financed corporation go bankrupt, residual value becomes important and companies with a high level of intangibles, mainly valuable in a going concern context, are typically penalized while asking for money. Debt holders may threat to file for bankruptcy, in order to force repayments. This threat is effective to the extent that there is an expected value from asset liquidation.	A project company private entity is separated and bankruptcy remote from the investing firm sponsors that create it. The project company relies extensively on debt capital provided by creditors to fund project operations. Creditors provide more (less) debt as a percentage of the overall project capital when there is less (more) risk of project failure and non-payment.
<b>Asset substitution</b>	A company's exchange of lower-risk investments for higher-risk investments. Firms may use asset substitution as a form of financing, or as a move to please shareholders. It can be detrimental to the company's bondholders as it increases the possibility of default without any corresponding benefit because bonds have a fixed interest rate. On the other hand, asset substitution can benefit shareholders as it carries the possibility of higher returns. This risk makes debt more difficult and expensive.	This risk is very unlikely in PF, where investments are contractually fixed and observable by financing institutions.



Parameter / situation	Corporate debt finance	Project financing
<b>Level of legal protection of debtholders</b>	Asset based, often with guarantees.	Cash flow based, with little if any guarantee (limited or no recourse).
<b>Cash flow volatility</b>	The volatility of the business model and, in particular the fact that the demand risk is entirely borne by the company, typically makes cash flows highly volatile and hardly predictable - bad news for lenders.	Even in PF cash flows are volatile, but normally consistently less than in other businesses, especially if cold revenues and cash flows are predominant, leaving core demand risk to the public part.
<b>Cash flow segregation</b>	Difficult with multiple projects; would be a (potentially harmful) impediment to managerial discretion. The lender's right to claim money back central to force the borrower to repay, limiting strategic default temptations.	Contractually envisaged in the agreements between the private entity and its lenders, it allows avoiding most conflicts between equity and debt holders.
<b>Cash flow verifiability</b>	Strictly dependent on the business and market model, normally consistently harder than that of PF.	When cash flows are more verifiable, the entire distribution of cash flows available to all fixed and residual claimants shifts to the right.
<b>Upside potential</b>	Reward and excess return of the investment, typically belonging only to the shareholders. Should the risk / return profile be unbalanced, peculiar sources of funds, more suitable to follow the assets' profile, may be issued (convertible bonds or other hybrid securities ...)	Upside potential is limited, due to the limited presence of hot revenues and to contractual caps (market testing ...) on other revenues. As a consequent, there is little if any need to issue hybrid securities.
<b>Evaluation</b>	Cash flow evaluations are difficult, to the extent that this parameter is hardly predictable. Market comparisons are possible and make sense if there is a sufficiently wide and similar database of other transactions.	The evaluation has to consider the following peculiarities: <ul style="list-style-type: none"> <li>• no terminal value, since the private entity is typically dissolved once the concession has expired, its terminal value is zero;</li> <li>• less volatile (more predictable);</li> <li>• precise (contractual) duration of useful life;</li> <li>• market comparisons are hindered by the project's uniqueness.</li> </ul>
<b>Change in the business model (mission drift)</b>	Possible and even frequent, especially from a substantial point of view, trying to adapt the business to a wildly changing market. Unperceived changes increase information asymmetries and assets substitution chances.	There is no risk of a change in the business model, due to little competitive threats and binding contractual agreements.
<b>Time extension of the investment</b>	Normally consistently shorter than in PF, often uneasy to be contractually bound, often overlapping with other investments having different amounts and maturities. As a consequence, even short term financing has a roll over implicit option.	Long term investment, typically exceeding 20 years, is an intrinsic risk.
<b>Residual value</b>	Infrastructural investments typically have a residual value, representing a worthy guarantee if the debt is by then still outstanding.	Little if any residual value if the project is abandoned - a rare case with public hospitals. In any case, with a free transfer of the infrastructure to the public part, the residual value of the private entity is typically zero.

## 5. Modigliani & Miller Proposition II: Boosting Return on Equity with Leverage

The path-breaking Modigliani & Miller [32] (M&M) theorem about optimal capital structure, which shows that

the firm's value depends only on the stream of its Discounted Cash Flows, irrespectively of leverage, has to be adapted from a standard corporate lending framework to a PF scenario, where leverage is typically substantial and debt service guarantees are cash flow based. While the M&M theorem is undoubtedly applicable also to a PF context, some differences between corporate lending and PF, synthetically examined in paragraph 4., are worth considering

and may help in the interpretation of the model.

High leverage is an intrinsic characteristic of PF, boosting both risk and return, as it can be seen from the profitability equation, which formula is the following:

$$K_E = [WACC + (WACC - K_I) * d] \text{Nr/Nr"}$$

Or:

$$\frac{\text{Nr}}{\text{E}} = \left[ \frac{\text{EBIT}}{\text{Ic}} + \left( \frac{\text{EBIT}}{\text{Ic}} - \frac{\text{Fc}}{\text{Df}} \right) * \frac{\text{Df}}{\text{E}} \right] \frac{\text{Nr}}{\text{Nr"}}$$

Where:

$K_E$  = cost of equity  $\approx$  ROE =  $\text{Nr}/\text{E}$  (assuming market weights  $\approx$  accounting weights)

$K_I$  = cost of financial debt =  $\text{Fc} / \text{Df}$

WACC = weighted average cost of capital  $\approx$  ROI  $\approx$   $\text{EBIT}/\text{Ic}$  (assuming market weights  $\approx$  accounting weights)

Nr = Net Result

E = Equity

EBIT = Earnings Before Interests and Taxes

Ic = Invested Capital

Fc = negative interests

$\text{Df}$  = Financial Debts

Nr" = Result before Taxes, Extraordinary costs and revenues and Financial Income

d = financial leverage =  $\text{Df} / \text{E}$

The formula reported above is an adaptation of M&M proposition II, adjusted considering taxation and extraordinary costs and revenues.

When the differential ( $\text{WACC} - K_I$ ) is positive, there may be an irresistible temptation to increase, even significantly, leverage, either incrementing financial debts with an equity invariance, or increasing financial debts more than proportionally to the increase in equity or even leaving unchanged financial debts and decreasing equity, for example with a dividend distribution to the shareholders.

It should however be noticed that, in this case, any leverage increase, due to an increment of the financial debts compared to equity, implies an increase of the denominator of  $K_I$  and also of the whole cost of debt, if negative interests rise above certain thresholds of debt, considered dangerous by the debtholders and requiring additional remuneration by way of risk premium.

The leverage increase has also an impact on WACC: this is evident considering that the denominator of this ratio is given by the invested (= raised) capital, expressed as the sum of equity and financial debts that increase.

Leveraging the sponsor's debt naturally brings to raised capital (=equity + debt) increase and then the company has more available funding. Higher funding means higher invested capital (in fixed assets, receivables, inventory ...); if the increase of invested or raised capital, does not match an increase at least proportional in operating income (EBIT), then there is a dilution of ROI and the increase in leverage makes the whole enterprise business riskier, shrinking the (initially positive) difference ( $\text{WACC} - K_I$ ), sometimes up to the point of making it negative, multiplied by a leverage

increased in the meanwhile. In this case, a dangerous "boomerang" effect occurs.

In formulas, considering an increase in financial debts with equity invariance, considering only the "core" part of the formula, at first glance we have:

$$\left[ \left( \frac{\text{Nr} + \text{Fc}}{\text{Ic} = \text{Df} \uparrow + \text{E} \Leftrightarrow} - \frac{\text{Fc}}{\text{Df} \uparrow} \right) * \frac{\text{Df} \uparrow}{\text{E} \Leftrightarrow} \right]$$

But the increase in financial debt also increases (at least proportionally) of negative interests; the greater availability of capital raised (because, even with an equity invariance, the financial debts increase) is automatically reflected by higher invested capital, which should increase revenue and operational and net profitability, with greater operating result; in the absence of this, there would be a dangerous dilution of richness (need more capital to achieve the same economic results). And then, considering an uncertain variation of the net result ( $\text{Nr}?$ ):

$$\left[ \left( \frac{\text{Nr} ? + \text{Fc} \uparrow}{\text{Ic} = \text{Df} \uparrow + \text{E} \Leftrightarrow} - \frac{\text{Fc} \uparrow}{\text{Df} \uparrow} \right) * \frac{\text{Df} \uparrow}{\text{E} \Leftrightarrow} \right]$$

Beyond certain levels of debt, negative interests (Fc) increase more than proportionately, dangerously eroding the differential ( $\text{WACC} - K_I$ ):

$$\left[ \left( \frac{\text{Nr} ? + \text{Of} \uparrow}{\text{Ic} = \text{Df} \uparrow + \text{E} \Leftrightarrow} - \frac{\text{Fc} \uparrow}{\text{Df} \uparrow} \right) * \frac{\text{Df} \uparrow}{\text{E} \Leftrightarrow} \right]$$

Returns [33] and cost of debt  $K_I$  [34] may be considered even according to the specific healthcare industry parameters.

## 6. An Empirical Sensitivity Analysis

A financial and economic plan template of a public hospital PF is synthetically represented in figure 1. This empirical case considers the impact on the model - with particular reference to its key ratios - of the two most significant parameters:

- a decrease in the availability payment, up to a break even point (where  $\text{NPV}_{\text{project}} = 0$ );
- a shortening in the time span of the management phase (from 25 to 20 years).

The pilot model is taken from a real case, conveniently simplified with rounded up figures and basic assumptions. The main objective is to assess how the key financial parameters change if either the availability payment or the time span of the management period - two key income factors for the private entity - decreases. Cash flow is also affected (for an analysis of cash flow volatility, see [35]), with consequential bankability issues.

In each feasibility study, a similar task may be conveniently carried on, not only to ascertain if and to what extent the pilot model is working and bankable, but also which are the break even points (e.g., when  $\text{NPV}_{\text{equity}}$  reaches zero) which represent an ideal target for the public part: even if private competitors will make bids above this threshold, if



competition is effective they will get closer to this point.

The main conclusion which can be drawn is that a decrease in the availability payment, *ceteris paribus*, worsens all the ratios (NPV, IRR, leverage, cover ratio, payback

period ...).

Figure 6 depicts the impact of changes of the availability payment on the project's NPV, while figure 7 is concerned with cumulative cash flow across time.

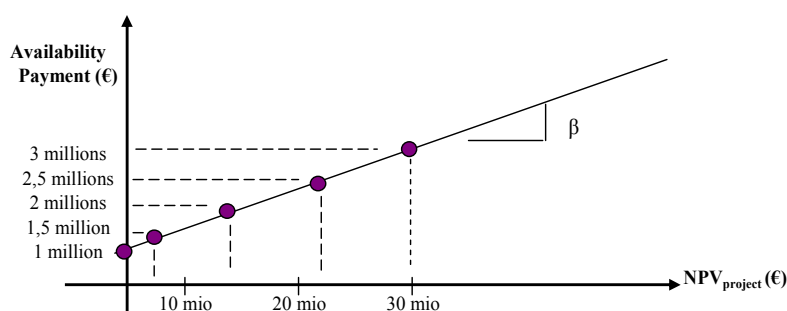


Figure 6. Impact of changes of the availability payment on the project NPV.

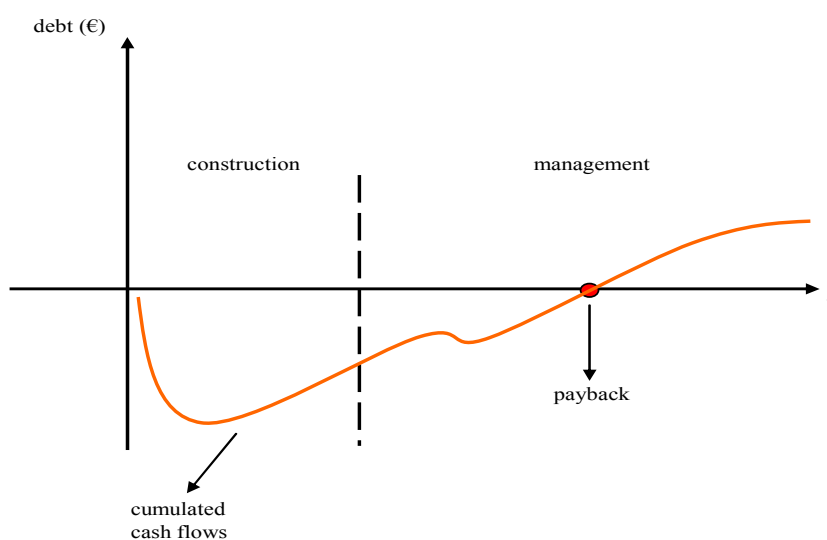


Figure 7. Cumulative cash flows along the concession period.

Table 2. Sensitivity analysis induced by changes in the availability payment.

Sensitivity analysis- availability payment					
	Base case				Break-even
Duration of the concession (years)	3+25	3+25	3+25	3+25	3+25
Annual availability payment (VAT not including base 2009)	3,000,000	2,500,000	2,000,000	1,500,000	1,030,026
Annual service revenues (VAT not including base 2009)	18,675,000	18,675,000	18,675,000	18,675,000	18,675,000
Annual commercial revenues (VAT not including base 2009)	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
NPV equity	17,229,881	11,982,593	6,859,001	1,468,962	3,860,699
NPV project	30,034,485	22,081,887	14,605,403	7,094,621	0
Payback period	2022	2024	2026	2029	2031
Average debt service cover ratio	2.02	1.83	1.64	1.45	1.27
IRR equity	11.66%	10.22%	8.64%	6.86%	4.99%

Sensitivity analysis- availability payment					
	Base case	Break-even			
IRR project	10.91%	9.86%	8.75%	7.55%	6.34%
WACC	6.38%	6.41%	6.38%	6.36%	6.34%
Average leverage	1.19	1.23	1.28	1.34	1.42
Average EBITDA/financial charges	11.04	9.93	8.86	7.79	6.78

The other big revenue driver for the private entity is represented by the time extension of the concession - the longer, the better for the shareholders, knowing that free cash flow to equity is maximized towards the end of the concession, when debt is repaid and the project can become - at least for some time - a sort of "cash cow", what shareholders really love but patiently have to wait for, hoping that nothing bad happens in the meantime.

Since this is a challenged parameter during the tender,

competing bidders should wonder, in making their offer, which is the financial and economic break even point:

- shortening the time span of the management phase, always *ceteris paribus*, there is a strong - negative - impact on all the key parameters of the private entity, up to the point of making the investment unattractive for both shareholders and lenders;

- interest rate changes do not have a big impact on the key ratios.

**Table 3.** Sensitivity analysis induced by changes in the management phase.

Comparison between 25 and 20 years of management phase		
Duration of the concession(years)	3+25	3+25
Annual availability payment (VAT not including base 2009)	3,000,000	3,000,000
Annual service revenues (VAT not including base 2009)	18,675,000	18,675,000
Annual commercial revenues (VAT not including base 2009)	5,000,000	5,000,000
Fixed investment sum (including VAT)	100,000,000	100,000,000
Public grants(including VAT)	50,000,000	50,000,000
Share capital	5,000,000	5,000,000
Subordinated debt	10,000,000	10,000,000
Senior debt	46,978,861	47,612,421
VAT facility	4,809,236	4,809,236
Average inflation Rate	3%	3%
Senior debt rate	5.81%	5.81%
Subordinated debt rate	6.06%	6.06%
VAT facility rate	3.12%	3.12%
Risk free rate	4.70%	4.70%
Market risk premium	3.80%	3.80%

Comparison between 25 and 20 years of management phase		
Total financial charges	40,334,867	32,128,333
NPV equity	17,229,881	10,404,963
NPV project	30,034,485	18,940,845
Payback period	2022	2023
Average debt service cover ratio	2.02	2.04
IRR equity	11.66%	10.26%
IRR project	10.91%	9.86%
WACC	6.38%	6.34%
Average leverage	1.19	1.63
Average EBITDA/financial charges	11.01	10.52

Another factor that has an obvious impact on the leverage sustainability - so strongly linked with the bankability of the project and the profitability of the shareholders - is represented by time and by macroeconomic factors which are so strongly linked with the life span of the concession, interest rates and inflation.

The term structure (yield curve) of interest rates, which represents the relation between the interest rate (or cost of borrowing) and the time to maturity of debt for a given borrower, allows to make a forecast of the interests along the whole life of the project; to the extent that the curve is positively sloped, longer term debt commands a liquidity premium over shorter term maturities, with a consequent higher cost of capital; professional investors, especially if represented by banking or financial institutions, are institutionally able to deal with long maturities, reducing risk (matching the maturity of assets with that of liabilities, intermediating funds ...).

While the models are normally quite resilient to interest rate changes, especially if the residual debt - whose capital is progressively reimbursed over time - decreases, inflation may have a bigger impact, especially if cumulating across time.

In general, if costs and revenues are fully indexed, growing inflation simply brings to higher economic margins; as a matter of fact, it is however quite frequent that indexation mechanisms are asymmetric [21], this being a bargaining condition among different competitors in the tender. To the extent that a private entity's revenues are not fully indexed to inflation - with a discount of some 10% to the chosen inflation rate - its economic margins may squeeze, should costs be on the contrary fully indexed. Pass through agreements with sub-contractors are also important to detect if and to what extent the private entity is protected from inflationary shocks and to what extent the risk is transferred.

## 7. Concluding Remarks

PF is an infrastructural investment with extended duration and long and complex gestation process, substantially illiquid due to its lumpiness and indivisibility, capital intensive, highly leveraged and difficult to evaluate - all characteristics that make the investment intrinsically risky. When complexity grows, risk increases and supervision becomes more important.

In many countries, especially those with high public debt, limitations upon the public funds due to constraints (fixed for example by the EU Growth and Stability Pact) have led governments, pushed by an increasing demand in public investments, to invite private sector entities to enter into long-term PPP contractual agreements for the financing, construction and/or operation of capital intensive projects, such as hospitals.

For the public procurer, value-for-money ([4], [23]) is a key parameter in orienting the choice towards PF or elsewhere, while for the private project sponsors, such ventures are characterized by limited equity in the private entity and reliance on direct revenues to cover operating and capital costs, and service external debt finance.

No wonder that in such a context, risk is a complex and core issue, to be analyzed from the different perspectives of the public and private sector entities, with the banking institutions representing the major cash supplier - not a secondary partner:

- for the public entity, *ex ante* risks such as Value for Money comparisons, technical choices such as selection of location and planning and *ex post* monitoring of quality and costs, during the management phase; core market risk (demand of health services) is also entirely borne by the public part;
- for the private entity, profitability for equityholders

(NPV<sub>equity</sub>; IRR<sub>equity</sub>), after having properly served the debt;  
 • for the lending institutions, proper and timely debt service, i.e. getting lent money back.

Unpredictable risk - since goals are always different from outcomes - and “wildly guessed” uncertainties need appropriate detection, sharing, transmission and mitigation, wherever possible. Efficient risk allocation scenarios are one of the solutions that can minimize the risk of under-performing projects and are crucial for bankability. Risk reduction is possible with professional sharing, but up to a certain level, and zero-risk is only a dream.

Investment and management strategies of healthcare PF initiatives have to properly consider the peculiarities of this sophisticated instrument, complicated by the intrinsic difficulties of the underlying industry and its timing, especially during recessions ([36], [37]). Further interdisciplinary research is needed to improve management models, targeting feasible strategic milestones in an increasingly volatile framework.

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