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PUBLIC-PRIVATE PARTNERSHIPS IN HEALTH

Improving Infrastructure and Technology

Edited by
Veronica Vecchi
and Mark Hellowell

Public-Private Partnerships in Health

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Editors

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To You, always a step ahead of me (?).
To You, a disruptive challenge for my mind and emotions.

Veronica

To those who consult this book to better serve the general welfare.

It is the maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy…What is prudence in the conduct of every private family, can scarce be folly in that of a great kingdom.

Adam Smith, The Wealth Of Nations

Mark

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Introduction

Increasingly, health sector policymakers deliver their objectives via public-private partnerships (PPPs) in which private companies are contracted to carry out a range of activities, including the delivery of physical assets—infrastructure and technologies—and related clinical and non-clinical services. Although large-scale and routinised use of PPPs originated in advanced economies such as Australia, Canada, France, Italy and the UK, it has recently expanded to many countries in which experience with public-private engagement is far more limited. In the latter case, PPPs—which enjoy influential support from multilateral development agencies and the World Bank in particular—often form part of broader efforts to enhance the role of the private sector in the implementation of health system's strengthening goals.

Due to the long-term character, financial complexity and risk-allocation mechanisms of the PPP model, it represents the most complex form of contracting transaction yet to have emerged in the health sector. As the model expands into new markets, and is also newly adopted by health agencies *within* countries where the model is already established, there is a recognition among scholars and practitioners alike that the competencies currently existing within the public sector are inadequate to the task of designing and implementing PPPs in which the general welfare of the population is safeguarded and advanced.

A considerable amount of effort has been exerted by international financial institutions and other supranational entities to address this capacity gap. The World Bank, most notably, has published numerous manuals, guidelines and literature reviews which address the high-level challenges

faced by policymakers. Now, the challenge is to draw on and supplement that knowledge in defining the lessons for those at the front line—the managers of public authorities and the business that are at the front line of project delivery, and to make those lessons relevant to address the specific challenges in the health sector.

Based on over ten years of focused work on PPPs in the sector (as researchers, instructors and consultants), this book synthesises and distils the knowledge and experience accumulated by the two authors, Veronica Vecchi and Mark Hellowell, alongside that provided by others, with the aim of providing a clear guide to all actors (policymakers, managers and private companies) in the PPP domain. The goal is to produce a reference guide in which core principles, rooted in theory, evidence and practice, are articulated in a way that makes them operationally relevant to all PPP stakeholders.

We would like to thank all those people that in the last ten years have helped us in drawing attention to crucial, but poorly understood, challenges in this domain, and design relevant methods for addressing them. In particular, we would like to thank colleagues belonging to the PPP network established by CBS, Sauder and Monash Universities.

Veronica would like to thank her professional partner, Velia M. Leone, and the public and private managers she has met during her professional life, as consultant and as executive education professor. A special thank you to the World Bank and African Development Bank, to the members of the Italian Healthcare Minister Committee for the investments' assessment, and to the Italian Finance Minister Committee in charge of drafting the PPP standard contract for the opportunity to transform the evidence-based learning into institutional guidelines. Finally, a big thanks to Manuela, Niccolò and Francesca, for the constant professional support, "for laughing with me, for tolerating me"; to Lori for "keeping my spirits high" and to Giovanni Gorno Tempini for the amazing opportunity to teach together "Long Term Investments and PPP".

Mark would like to thank all those in national and global public policy communities who have helped keep his work accessible, relevant and, hopefully, impactful in driving forward progressive change in this domain.

CHAPTER 1

Public Private Partnerships and the Quality and Efficiency of Healthcare Services

Mark Hellowell

Abstract Although the use of public private partnerships (PPPs) is endorsed by agencies at the national and supranational levels, there is little guidance for decision-makers on what good outcomes look like and the circumstances in which such outcomes are likely to occur. Enhanced understanding of these issues can improve the governance of large-scale and complex contracting in the health sector. Drawing on a narrative review of the available theoretical and empirical research, this chapter shows that PPPs have the potential to generate a number of benefits, including (i) better investment decisions, (ii) more efficient infrastructure delivery and (iii) higher quality health services. However, PPPs are also associated with additional transaction and financing costs, and may give rise to affordability challenges. And addressing these threats to the public interest requires diligent and competent managerial intervention.

Keywords PPPs • value for money • affordability • transaction costs • finance costs

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1.1 Introduction

Although the use of public private partnerships (PPPs) is endorsed by Governments and agencies at both national and supranational levels (Montagu and Harding 2012), there is little guidance for decision-makers in terms of the circumstances in which they are likely to deliver better outcomes than the alternatives, and why. Better understanding of these issues is needed to ensure that appropriate PPP strategies are selected, and that the related processes are well-designed and implemented. This chapter aims to address this need, and draws on a narrative review[1] of theoretical and empirical research in order to identify the benefits that PPPs can generate compared to alternative mechanisms of delivery and, alongside the sources of additional costs and risks that they give rise to, in order to ensure that the right investments are selected and that these represent value for money.

1.2 Benefits from Public Private Partnerships in the Health Sector

The economic case for the PPP model resides in its ability to allocate the risks associated with delivering infrastructure and related services more effectively than other approaches. If this is achieved, the model can result in better investment decisions, and may reduce the whole-life costs of providing goods of a given quality (Välilä 2005). The transfer of risk is normally achieved in two ways. First, the payment to the private operator (by contracting authorities or service users) is made *as, when, and to the extent that* the outputs specified in the contract are delivered, creating an incentive for the operator to ensure that the goods being purchased are routinely available for use at the agreed standard (Farquharson et al. 2011).

Accordingly, while the payment to the private operator is, in most cases a prospective global budget,[2] it is paid retrospectively and includes an element that is conditional on performance—specifically, performance in terms of the *availability* and *quality* of contracted assets and services (Hellowell et al. 2015). Therefore, if the payment is linked to key performance indicators that are *well-specified* and *measurable* (De Bettignies and Ross 2004, 2011), adequate arrangements are in place for the monitoring and verification of performance (Domberger and Jensen 1997), and contractual relations are broadly equitable between the parties (Lonsdale and

Watson 2007), then any failure of the private operator to achieve specified outcomes results in *financial losses* (Reiss 2005). The operator has a strong incentive to avoid losses and, therefore, to deliver on its contractually specified obligations.

Second, as the payment mechanism effectively caps the operator's total income, there is an incentive for the operator to minimise its costs of production. A distinctive feature of PPPs is that they "bundle" together a range of activities (design, construction, operations and maintenance, and various categories of service provision) in a single contract, such that the operator of a PPP has both the *capability* and the *incentive* to exploit economies of scope (Schleifer 1998; Grossman and Hart 1986; Hart 2003; Iossa and Martimort 2012), for example by investing in innovations which lower production costs or enhance quality (Barlow and Köberle-Gaiser 2009).[3] If it is further assumed that bidding processes are competitive, and that private operators can foresee the opportunities to minimise costs, the incentive framework places downward pressure on the price of the contract for the purchaser.

However, empirical evidence on the question of whether PPPs can be relied on to deliver *lower* costs and *better* quality in comparison with alternative mechanisms is mixed (Acerete et al. 2012). In general, the evidence suggests that PPPs hold promise for decision-makers that wish to achieve greater *certainty* over outcomes such as cost, quality and service volumes than may be achievable via alternative delivery mechanisms (National Audit Office 2003, 2005). Certainty over outcomes is evidently a different matter compared to how desirable the outcomes are. After all, a project that delivers the specified goods on budget may still represent poor value for money if the price paid for these outcomes (by society or by specific purchasers) is too high (Hellowell 2010). There is, as yet, no conclusive evidence that PPPs have on average led to lower costs or contract prices.

One potential reason is that the bundling and risk-transfer features of the PPP model do not appear to have led to the kind of cost-reducing innovations that are predicted by theory. Barlow and Köberle-Gaiser (2009) undertook interviews to investigate the degree of innovation in the design and construction of PPP hospitals in the UK. They examined evidence from six case studies drawn from early PPP schemes, the identities of which were not revealed. The study showed that, in the view of many contractual stakeholders, the dominance of financial players in project delivery decision served to stifle innovation. The study concluded that

PPPs had led to a fragmentation in responsibilities and an inefficient allocation of risks which, far from encouraging innovation, had in fact impeded it.

1.3 Sources of Additional Costs

There are several features of the PPP model which may generate additional costs. The most important are *transaction costs* and *finance costs* (i.e. the costs of deploying private capital).[4]

The Transaction Cost Economics (TCE) framework, pioneered by Oliver Williamson (1985, 1990), has been used to provide an account of why PPPs are likely to be associated with higher transaction costs than other forms of delivery (Lonsdale 2005). In the TCE framework, economic actors—buyers and sellers—are constrained by *bounded rationality*, while the self-interest orientation of actors is characterised by opportunism, or "self-interest seeking with guile" (Williamson 1985, pp. 47–8). When opportunism on the part of buyers and sellers is combined with bounded rationality, either of the parties may be able to take advantage of lacunae in the other's knowledge to further its pecuniary interests.

The impact of these behavioural factors on outcomes is dependent on two dimensions of the transaction: *asset specificity* (i.e. the extent to which investments by the parties are specific to the transaction) and *uncertainty* (e.g. the extent to which current objectives are subject to change). In a PPP, both asset specificity and uncertainty are high. In the former case, both parties face considerable switching costs if they wish to withdraw from the deal (see Sect. 1.3 for an example). In the latter case, the duration and scope of contracts ensure that, in a rapidly changing industry such as healthcare, there is a strong likelihood of contractual incompleteness and a need for renegotiation during the contract (Lonsdale 2005). In this context, the TCE framework predicts that the processes of contract negotiation and monitoring will be extensive, and involve substantial costs for both buyers and sellers.

Dudkin and Välilä (2005) showed that a sample of PPPs undertaken in the UK generated higher transaction costs in the pre-contractual phase—about 10% of the capital expenditure value of the project, on average, for both contracting authorities and preferred bidders, and up to 5% of that value for losing bidders—than other forms of procurement. They attributed this to their longer-term character, greater financial complexity and distinct emphasis on risk-sharing, all of which will tend to increase tendering and negotiating costs.[5]

Turning to the private finance component of the PPP model, sources of additional cost may include finance fees and other finance-related expenses, including lenders' fees, that are higher than is the case in the liquid and efficient markets for Government debt (Hellowell 2015). For example, equity investors often hedge against certain risks (such as variation in inflation and interest rates) by purchasing financial derivatives. The associated fees, which add to the costs of production for the private operator—and hence, ultimately, to the price charged to the public sector (Yescombe 2008)[6]—have no equivalent in the other mechanisms of delivery.

In addition, the rates of return on commercial debt and equity may add to costs (Hellowell and Vecchi 2012). The interest cost on private finance has been an important focus of academic research and official audit (e.g. McKee et al. 2006; National Audit Office 2015). It is normally a multiple of the interest rate that Government pays on its own debt. However, it is far from clear that this is a relevant comparator, since debt is only one source of a government's income, alongside taxes, fees, asset sales, interest on cash holdings and so on.

Determining the right approach to estimating the latter varies according to who is doing the analysis. From the perspective of a Ministry of Finance, the cost of using public finance now to invest in a project (as in most forms of conventional procurement), rather than "smoothing out" those expenditures over the contract period (as in a PPP) is equal to the value of the *next best* alternative Government spending project. In contrast, from the point of view of a Ministry of Health, or an individual healthcare organisation,[7] the cost of loans from national/subnational Governments, or from debt instruments issued directly by the organisation, may be more relevant comparators (see Chap. 3).

In both cases, evidence shows that costs are likely to be lower than the private operator's weighted average cost of capital (Hellowell and Vecchi 2010; National Audit Office 2015; Colla et al. 2015). Hence, for PPPs to represent a cost-efficient solution, any savings secured due to the incentives described in Sect. 1.1 (above) must be sufficient to offset the higher interest costs of private finance, alongside the additional transaction costs, over the whole life period of the contract. In effect, this is what the value-for-money analysis (see Chap. 3) needs to establish.

1.4 What Determines the Benefits and Costs?

The sections above have recorded a number of variables that are likely to affect the outcomes from PPPs in terms of their ability to deliver goods in accordance with the timetable, cost and level of quality set out in the contract. In respect of endogenous variables (i.e. those that are relatively amenable to being addressed through policy action), the economic benefits of PPPs are dependent on adequate arrangements being in place for the *specification*, *monitoring* and *verification* of contractor performance. All of these activities are costly. But if they are not effectively undertaken, contracts do not generate the risk-transfer mechanisms needed to create the incentive framework that gives rise to good outcomes. Hence, decision-makers need to assess whether they are able to:

1. identify their long-term service requirements;
2. codify these in a set of measurable indicators;
3. monitor outcomes against those indicators; and
4. pay when those outcomes are acceptable, and ensure they do not pay when they are not.

It is apparent that, where government's contracting and commercial capacity is limited, PPPs—especially in complex areas of activity, such as acute diagnostic, therapeutic and curative care (i.e. the services delivered in *hospitals*)—are unlikely to yield good outcomes, even in terms of cost and quality certainty.[8] However, where markets are mature and purchasers have the skills required to write and enforce contracts, the empirical evidence suggests that such predictability is achievable.

In terms of exogenous variables (i.e. those that are *not* readily amenable to being addressed through policy action), it is evident that the price paid for such certainty could be high unless there is adequate competition for both the operational and financial components of the deal. On the operational side, decision-makers should consider in which service areas the private sector is large enough, diverse enough and competent enough to generate meaningful competition. It is likely that more complex service areas are associated with greater concentration in the market. More competition might be feasible for simpler facilities and simpler services, suggesting these may be a more appropriate starting point.

On the financing side, securing low interest costs has become difficult everywhere. In Organisation for Economic Co-operation and Development

(OECD) markets, changes in financial sector regulation and concerns about the quality of assets held by banks have restricted long-term lending and increased its price.[9] Investors are likely to favour mature markets in which contract models are well-understood and have a track record of delivery (and a strong pipeline, to justify the transaction costs). Lenders will similarly favour tried and tested approaches, and contract forms that facilitate the use of financial instruments with relatively short maturities (Hellowell et al. 2015). In developing countries, financial markets are often ill-equipped to provide the long-term financing required for infrastructure projects. In sub-Saharan Africa, for instance, the longest available loan tenor is five years or less, and even where longer loan terms are available, interest rates are typically high compared with that of OECD countries (Irving and Manroth 2009). Although, in such contexts, the economic costs of using public funds to pay *upfront* for an investment, rather than allowing such costs to be amortised over the contract period, are likely to be high, it is likely that the financial costs of private finance will often present a threat to the long-run sustainability of public spending—and addressing this threat requires diligent attention by policymakers.

1.5 Investment Decisions and Affordability

There is a good deal of empirical evidence that PPP contracts can lead to financial problems for the organisations that procure them (Gaffney et al. 1999; Hellowell and Pollock 2009; Monteiro 2013). Although "affordability" has no precise economic meaning (and is not explicitly defined by any of these authors), the implication of the evidence is that the obligations entered into through PPP contracts have often left authorities with insufficient financial resources to meet their socially defined objectives. The question arises as to why healthcare authorities would pursue investment projects that give rise to unaffordable costs once completed. Technical explanations (poor forecasting techniques, inadequate data, honest mistakes, problems in predicting the future, lack of experience among forecasters, poor commercial skills among public sector negotiators etc.) may play a part in the problem but are unlikely to provide a comprehensive explanation.

Alternative accounts are found in so-called psychosocial theories which focus on the complex nature of managerial decision-making within organisations, public and private. In this view, managers are subject to a so-called planning fallacy: they make important decisions based on myopic optimism rather than on a rational weighting of gains, losses and probabilities, as might be assumed in simple theories of public administration.

Similarly, decision-making within local contracting authorities is likely to be affected by their relationship with central or regional Governments, especially if (i) there is a strong political will behind the use of the private sector for the delivery of assets and services and (ii) the fiscal framework used by Governments leaves the PPP route as, effectively, "the only game in town".

In this context, planners within provider organisations may, in their economic and financial appraisals, strategically underestimate the future costs of projects and overestimate the income that will be available to pay for them. In many health systems, provider organisations may be strongly motivated to pursue large-scale capital investments as a means of increasing their scale, or the size of their claim over the financial resources of local health economies. In this sense, capital investment made possible by the off-budget nature of private financing may serve the interests of individual providers, at least over the medium term, and not those of the wider healthcare system or social welfare more generally.

The actions of managers at the Peterborough and Stamford Hospitals NHS Foundation Trust, in the UK, which in 2007 signed a contract for a PPP hospital with a capital value of £301 million, or 142% of the Trust's turnover, provide support for such an interpretation. Ten months after the new Private Finance Initiative (PFI) facility became operational (and charges began to be levied by the private consortium), the Trust was placed in breach of its authorisation as a Foundation Trust by the financial regulator, Monitor. Despite additional subsidies from other parts of the local health economy, the Trust's income and expenditure deficit in 2011–2012 was 22% of its annual turnover. The Trust's deficit for the financial year 2012–2013 was £54.3 million.

Interviews and a review of board minutes by the National Audit Office showed that the Trust's managers were strongly committed to the project, and were willing to accept "unrealistic projections of future Trust finances". The scheme was also evaluated by the Department of Health, which signed off on the plan despite extensive local opposition. Monitor identified a significant probability that the scheme would be unaffordable to the Trust once "reasonable assumptions" were applied. The regulator, however, lacked the formal powers or influence required to persuade the Trust's board or departmental officials. The scheme was approved by the Secretary of State for Health and ultimately by the Treasury, without Monitor's concerns being resolved to its satisfaction.

In this case, technical explanations of policy failure are inadequate, as managers were willing to accept projections of future Trust finances that

were demonstrably unrealistic. The Department of Health took assurance that the scheme was affordable on the basis that annual payments would not exceed 15% of projected Trust income, but this was not projected to be the case until well into the life of the contract. The failure to acknowledge the risks to affordability thus appears to have been intentional rather than accidental. At central Government level, the failures seem to have been driven by a strong political drive towards private sector involvement in public services, and a budgeting regime that allowed the budgetary impact of privately financed projects to be deferred.

The evidence, in mature markets like that of the UK, and elsewhere (see the case study on Lesotho, for example, in Chap. 2), suggests that PPPs are more likely to be commissioned where there is a strong political push from ministers for private sector involvement in public services, and where there is an absence of realistic alternatives, as when the fiscal framework in effect precludes the State from financing needed investments using public funds. These are clearly major drivers of PPP in many contexts, and it needs to be recognised that these may compromise the quality of investment decisions, and even, in some cases, the ability of health systems to fulfil their social mission to meet population health need.

1.6 Conclusion

There are considerable theoretical benefits to the bundling and risk-transfer features of the PPP model. It is particularly apparent from the evidence that PPPs hold promise for decision-makers who prioritise investments that deliver predictable costs, quality and service volumes. However, PPPs may also be associated with additional costs, especially transaction costs and the costs of private financing. In many cases, a key decision that policymakers and managers need to make about their use of the PPP model is how much extra they are prepared to pay to achieve that predictability.

The balance of benefits and costs are dependent on a range of variables. Decision-makers need to pay close attention to such variables when deploying this complex and challenging mechanism of delivery. Such variables can be divided into endogenous and exogenous variables—though, even in the former case, their amenability to policy action may be limited. The capacity of public organisations to define what they need over the long duration of the contract, and to verify that this has or has not been delivered by the contractor, is dependent on the availability of specialist human resources. Putting this in place will often require ambitious cross-

sectoral action. In terms of the external environment, adequate competition in supply, and the availability and price of capital finance, will influence the scale of additional costs. Decision-makers need to consider in which service areas the capacity of the private sector, including investors, will be sufficient to generate meaningful competition.

In addition, in the context of strategic behaviour among Government purchasers (which in the case of developing countries may include both State officials and, potentially, their development agency advisors), PPPs can compromise the quality of investments and pose a threat to the ability of healthcare authorities to meet other public interest objectives. Governments that are undertaking complex and large-scale PPP transactions should ensure that they proceed only on the basis of rigorous independent scrutiny of project plans and forecasts, and that they have adequate budgetary institutions and practices in place to support the substantial expenditures that large-scale capital-intensive PPPs inevitably generate—and often over several decades.

Notes

1. The search strategy focused on theoretical and empirical studies that provide insights relevant to the operation of PPPs in the health sector, even if they do not focus on the health sector directly (see Roehrich et al. 2014 for a systematic review of PPPs in the health sector). Peer-reviewed literature was obtained from online bibliographic databases, alongside reference lists from papers obtained in database searches. In addition, the websites of a number of organisations, including supranational agencies, Government ministries and official audit bodies, were searched, and relevant reports and briefings were included in the review.
2. That is, the payment rate is agreed *before* the delivery of goods and is based on the forecast costs of production for the private operator, including the cost of capital. However, billing and payment take place *after* the delivery of goods.
3. It may also be noted that the PPP model may help to address incentive problems within the public sector in terms of a tendency to allow the liability associated with the need to replace fully or almost fully depreciated assets to be deferred to future generations.
4. Under project finance, providers of *debt* are paid only from the project company's revenues, without recourse to the providers of *equity*. That is, the project company's obligations are ring-fenced from those of the equity investors, and debt is secured on the cash flows of the project. These structures involve a large proportion of debt, and the overall cost of capital tends to be higher than in corporate finance structures.

5. For more on this point, see, e.g. Daniels and Trebilcock (1996).
6. We will also see in succeeding chapters that such instruments can increase considerably the costs to the public sector of terminating PPP contracts.
7. Much of the literature on PPPs in the health sector implicitly adopts this perspective (see e.g. Pollock et al. 2011).
8. While evidence is lacking, it may be that simpler PPPs that focus on investment in specific facilities, and/or the management of specific clinical services (e.g. ambulatory surgery centres, diagnostic services, renal dialysis), may be more appropriate in such contexts.
9. Basel III stability ratios, in particular, make long-term loans very expensive in terms of banks' risk-weighted capital adequacy requirements (Reviglio 2012).

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CHAPTER 2

Choosing the Right PPP Model

Veronica Vecchi and Niccolò Cusumano

Abstract Because of the diversity in the structure of national healthcare systems, the objectives set for PPP policies differ between jurisdictions. This chapter focuses on the different PPP models used across the world to fund investments in physical capital in the healthcare sector, such as hospital buildings and technology, and also those used to provide non-core and clinical services. It provides an analysis of the different contractual structures and dominant payment mechanisms used, and for each model presents some relevant cases.

The models analysed in the chapter are as follows: turnkey contracts (DBF and BLT) for building new healthcare infrastructure; managed equipment services (MES) for medical equipment; operation and maintenance (O&M) contracts for the management of non-core services (such as energy management); availability based contracts (DBFMO) contracts for building new hospitals (and their evolution towards the so-called "light model") and BOT/oncession contracts, which may include healthcare infrastructure but are focused on the delivery of clinical services.

Keywords PPP models • DBFM/O • MES • BOT • Payment mechanism

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2.1 Introduction

Because of the diversity in the structure of national healthcare systems, the objectives set for PPP policies differ between jurisdictions. Since the beginning of 1990s, the UK Private Finance Initiative (PFI) has provided a reference model for the use of PPP to develop greenfield or brownfield investments in primary or secondary healthcare facilities. Here, the PPP model has been used as a mean of modernising the healthcare estate without immediate recourse to the public budget, along with the generation of efficiencies in investment decisions and the management of the construction process and the provision of non-core services (see Chap. 1 for an overview). This model has been replicated in several other similar economies, notably Australia and Canada, and in continental Europe alongside emerging markets such as Turkey.

In other jurisdictions, PPP models have been developed to achieve a distinct set of policy objectives, and the related models are often different. For example, as Acerete et al. (2012) note, the need to transform traditional models of public healthcare provision to ensure sustainability of services is encouraging Governments to consider greater private sector involvement in clinical service delivery. In many low- and middle-income countries, for example, PPPs are often regarded as a method for achieving more ambitious structural change in the health sector, and the scope of contracts is correspondingly larger. In most cases, PPPs in this context involve the private operator building (or leasing) a health facility or technology and drawing on this to deliver free (or heavily subsidised) healthcare services to a defined population. According to the World Bank's Independent Evaluation Group (2013), the majority of health PPPs surveyed included both facilities and services. Of these, the majority (60%) were related to the provision of selective services (such as diagnostic, imaging, dialysis or radiotherapy). The second-largest share was services-based contracts (42%), which supported the achievement of a variety of health objectives with a focus on maternal and child health or the prevention and treatment of infectious diseases. Only 10% of PPP projects were infrastructure-based, with the emphasis on the use of private finance for the construction of new facilities and the operation of non-clinical services.

This chapter provides a closer look at these models and considers which models are best suited to particular policy scenarios and goals.

2.2 Defining the Main PPP Models

The main models of PPP can be identified by their output specification and the tasks assigned to the private partner, and are defined by how the partner is remunerated—that is, the payment mechanism.

The outputs and related tasks may include the construction of a new hospital; the refurbishment and modernisation of an old one (or parts of it); the provision of medical equipment, such as Magnetic Resonance Imaging (RMI), laboratory equipment, operating theatres, which may be clinical or non-clinical in nature. In turn, non-clinical services may relate to facilities management, and this may be "hard" (related to the operation and maintenance [O&M] of the building) or "soft" (cleaning, catering, waste collection, security, and logistics).

Among non-clinical services, there are also those related to the O&M of medical equipment and IT systems (such as Radiology Information Systems—RIS or Picture Archiving and Communication System—PACS). Core services include all those activities directly performed by clinicians—that is, nurses, specialised technicians or doctors etc. When core services are included in a partnership, a public authority can decide whether or not to transfer to the private partner the clinical governance, in other words the responsibilities (and risks) relating to clinical decisions and outcomes. Generally, the clinical governance is included in the partnership in cases in which it is referred to the management of a hospital or new/additional services (Fig. 2.1).

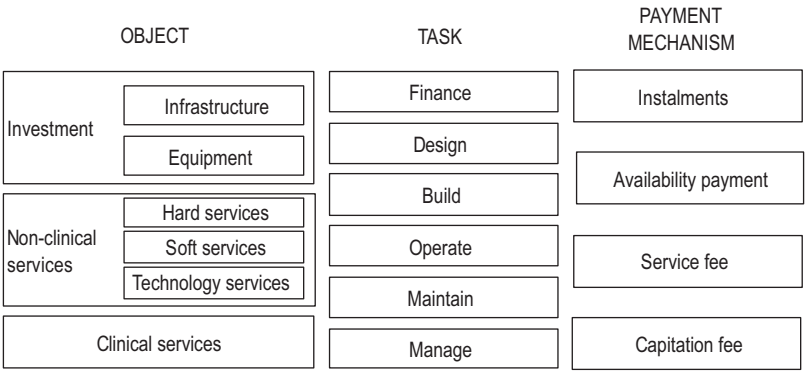

Fig. 2.1 PPP building blocks (Source: Authors)

The payment mechanism is a key element of the risk transfer mechanism at the heart of a PPP contract. A contract can be seen, in fact, as a set of incentives that positively or negatively impact the economic and financial equilibrium of the economic operator. In the health sector the following are the most widespread payment methods.

Lump sum payment: Payment related to the achievement of defined delivery milestones.

Availability payment: Payment linked to the availability of an asset (e.g. a facility or piece of equipment). Availability is achieved when an asset (or a section of the asset) is open, functioning and meets the performance, safety and quality criteria specified by the contract, permitting full use by the public authority.

Service fee: Payment for service performed, such as a finished course of treatment for a diagnosis-related group (DRG). This model is gradually evolving into fee for value/pay for performance systems which, instead of paying per service rendered, rewards the provider for meeting defined clinical outcomes.

Capitation fee: A fixed predefined payment per patient treated.

The choice of PPP model may be influenced by the following elements:

Institutional setting: The existence (or non-existence) of specific PPP policies and programmes; the legal framework regulating health services and PPP contracts; how the health system is organised, financed and the role played by the public sector; the presence of fiscal constraints; trust and perceptions about the private sectors' involvement in the provision of health services; and the horizontal and vertical power allocation between institutional levels and authorities. The institutional setting is relevant in decisions about the most appropriate payment mechanism; it may also generate insti-

tutional (e.g. legal, regulatory, political) risks that the procuring authority should bear, because, as discussed in Chap. 3, they are generally not transferable to the private sector.

Market environment: The market may be concentrated, such that only a handful of companies have the skills, economic strength and track records required to manage complex projects. Oligopolies may limit value for money for the ultimate payers (authorities or service users). Furthermore, companies have different business models, internal policies and strategies that influence their approach to PPP and the way they react to projects crafted by the public sector, which may limit the actual possibilities to develop more advanced forms of partnership.

Organisational setting: This dimension relates to the way a public authority is organised for the delivery of the health service and for the design and award of the PPP contract. If, for example, an authority already delivers a service with its own personnel, there could be resistance from employees to transferring to private employment or supervision. On the other hand, an authority may opt for including clinical services in a PPP contract because there is no internal capacity to provide specialised treatments. Another important driver is the background and competence of the team involved in the design and award of the PPP contract.

Transaction costs: Here we refer to the costs related to the design of a PPP project, award and management of the contract. These costs, borne both by the public and private sector, can be very high due to the product and contract complexity, information asymmetries, administrative costs related to public procurement procedures and contract monitoring and evaluation.

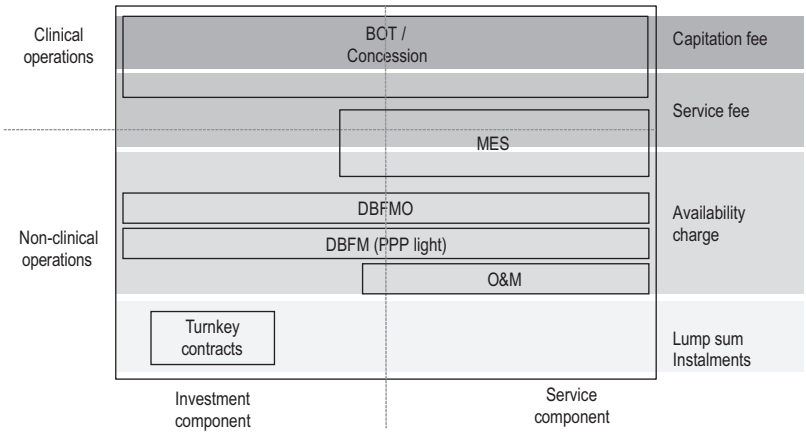

Fig. 2.2 PPP contracts framework (Source: Authors)

It is therefore important, even before looking at technical, financial and contractual solutions, to assess the nature of these dimensions in the context in which the project is located, and determine the possible implications of these for the options appraisal.

We can now move on to describe our framework. Figure 2.2 is an output from combining the building block we presented earlier. The framework distinguishes PPP contracts on the basis of two dimensions: investment and services. Further, for each type of contract, it shows the most appropriate payment mechanism. It is worth noting that the PPP contracts shown in Fig. 2.2 are the most common; however, as written, it is fundamental that the contract is shaped according to the institutional, market and organisational conditions, and the objectives to be obtained. The "me too" approach is never appropriate. Therefore, the examples included are aimed only to explain the features of the PPP model and they do not necessarily represent good practice.

2.2.1 Turnkey Contracts (BF, DBF and BLT)

In turnkey contracts (design and build and finance [DBF] or build and finance [BF]), the private partner—usually an engineering procurement and construction (EPC) company—is contracted to take charge of the financing, design and construction of a new (or substantially redeveloped) facility, with the aim of meeting the authority's on-time, on-budget and

asset quality objectives. The EPC company is usually paid once the works are completed, through a lump sum payment. Therefore, the capital cost also includes the cost of funding (rolled up interest) raised by the EPC to fund the investment. A very similar model is the build lease and transfer (BLT) model, in which the public authority pays the investment through leasing instalments over a 10- or 20-year period. In the BLT contract the counterpart is generally a consortium formed by an EPC company and a financial institution.

BF Case: Bluewater Hospital (Ontario, Canada)
The Bluewater Health project involves the construction of a new seven-storey building, of which five floors are for medical use and two for mechanical and electrical services, in two phases. In 2007, Bluewater Health Authority entered into a project agreement and a guaranteed maximum price contract with EllisDon Corporation to build and finance the facility.

Under the terms of the project documents, EllisDon Corporation was in charge of:

- building the Bluewater Health project within the end of 2011;
- providing a financing package for project construction; and
- ensuring that, at the end of construction, the building meets the requirements specified in the project documents.

In exchange for these activities EllisDon received a lump sum payment at the completion of the construction. EllisDon Corporation offered to construct the facilities for a guaranteed maximum price of $214.1 million, including their financing costs. The builder's guaranteed maximum price could only be adjusted in very specific circumstances, agreed to in advance. Costs associated with delays, including also extra financial costs, that are the responsibility of the builder had to be paid by the EPC contractor. The guaranteed maximum price contract provides that EllisDon Corporation is responsible for all design coordination activities to ensure that the facilities are constructed in accordance with the design. Under a traditional public procurement model, the costs of these risks would have been borne by Bluewater Health.

Source: Infrastructure Ontario (2007), Value for Money Assessment Bluewater Health Redevelopment Project

2.2.2 Operation and Maintenance Contracts

In O&M contracts the private partner is in charge of managing and providing preventive, predictive and corrective maintenance of facilities and equipment. In these contracts, the service component is predominant over the physical asset to which the contract relates. The investment component is negligible or limited to the instalment of new equipment, upgrades and extraordinary repairs. Since O&M contracts are focused on services that make the facilities available and/or better-performing, the payment mechanism is generally structured as an availability charge; however, a fee for service model may additionally be used in some cases (e.g. where a higher volume of treatments is desired). O&M contracts usually last from three to ten years.

These contracts are frequently applied for the O&M of heating and cooling systems in order to make them more efficient and environmentally sustainable. The payment is based on the availability measured in heating degree days to be maintained throughout the year. Heating degree days are defined relative to a base temperature—the outside temperature above/below which a building needs no heating/cooling—and quantify the demand for energy needed to heat/cool a building. This payment method provides an incentive to the O&M contractor to keep equipment in good working order consistent with agreed standards. These contracts can also be linked to sustainability goals, that is the reduction of energy consumption. Generally, the risk of fuel price changes, often outside a certain band, is borne by the public authority, while the operator bears performance risk.

O&M contracts can be applied also to the maintenance and upgrade of existing medical equipment; however, in this field managed equipment services (MES) (see below) contracts are usually more appropriate, because they allow to reach more strategic goals. O&M contracts can also include a wide array of non-clinical services and, in this case, they are known as "global service" contract.

The main advantage of this contract model is that O&M costs are fixed and predetermined across the whole life of the contract. The payment for performance means that the private sector has a strong incentive to ensure that facilities and equipment are kept at full functionality. When investment is included, these contracts should ensure that the technical solutions adopted will optimise efficiency in order to keep running costs low.

Case: Inkosi Albert Luthuli Central Hospital, South Africa

The Inkosi Albert Luthuli Central Hospital is a central tertiary care, referral hospital, located in Mayville, Durban, where a private operator, the Impilo Consortium, provides all of the nonclinical services under a 15-year public-private partnership agreement with the KwaZulu Natal Department of Health (KZN DoH). The general opinion of stakeholders over the past seven years of operation is that this PPP is helping to deliver a level of service that could not have been achieved by the public sector alone.

The hospital provides highly specialized services for the entire population of KwaZulu Natal and half of the Eastern Cape Province. The hospital is fully computerized and works on paperless principles. It uses leading-edge medical equipment, from magnetic resonance imaging machines to surgical instruments, and was the first hospital in South Africa to enter into a PPP for the delivery of all its nonclinical services.

An annual unitary payment of R$304.9 million (2001), linked to the consumer price index, is paid in monthly instalments. Service levels were set at state-of-the-art levels, with, for example, five-year replacement schedules for medical equipment and three-year replacement schedules for information and management technology.

With regard to the roles and responsibilities of the private partners, Siemens provides all of the automated medical equipment and services, Drake & Scull is responsible for the facilities management, laundry, and catering, while AME Austria is in charge of information technology.

Source: Farquharson E., Torres de Mästle C., Yescombe E.R. (2011), *How to Engage with the Private Sector in Public-Private Partnerships in Emerging Markets*, The International Bank for Reconstruction and Development/The World Bank: Washington, pp. 126–127

2.2.3 Managed Equipment Service (MES) Contracts

MES are contracts signed between a healthcare provider and a private operator (a medical equipment producer or an independent vendor, typically) for the supply, installation, management, maintenance and updating

(or upgrading) of medical equipment. An MES contract may include, where appropriate, the supply of consumables. When necessary, the contract may also include the execution of the work strictly necessary for the installation of the medical equipment.

An MES contract is generally applied to diagnostic technologies, to chemical analytical laboratories or to IT systems.

The MES can be defined as a "technology-based service contract" in which the private operator works together with the health authority to provide a strategic consulting service, support the analysis and decision-making capacity of the clinical engineering body and enable mid-term technology planning, which can be particularly useful in complex secondary care sites. In fact, an MES contract offers the healthcare provider the ability to leverage the technical ability of an experienced operator to evaluate the most appropriate technologies for the needs of the served population, normally across a period of 9 up to 15 years.

Although the focus of an MES is technology, it is crucial to understand that at its core is the concept of "results-based purchasing", that is the private partner is accountable for outputs (and perhaps even outcomes) and not the inputs or processes of production. The duration of the contract is crucial to understand the investments for the refresh of the equipment, which must be consistent with the evolution of clinical needs over time.

What distinguishes an MES from a normal supply contract (or an operate lease) is that the health authority is actually buying an investment plan with the active management of the technology partner, not a single piece of equipment. An MES can include not only the management of new equipment installed at the beginning of the contract. In fact, the operator can also "step in" to the maintenance and management of already existing equipment, which is then upgraded during the life of the contract, on the basis of the agreed investment plan.

An MES contract can provide good value for money where maintenance costs are high (so that renewing the technologies of an entire hospital or department can be a relatively attractive option).

A key challenge is to define a precise banding system, within which to delineate the performance requirements of the technologies to be replaced. Each band must match a cost-effective target and every year or two, this must be updated to incorporate the most appropriate technologies available on the market. An accurate banding system is fundamental to determine the charge that the authority has to pay, in order to avoid unexpected costs, and to ensure that the equipment replacement will be done in a way to guarantee the access to the most appropriate technologies available during the period covered by the contract. Table 2.1 shows

Table 2.1 The banding system for an MES contract

Band	*Features*	*Description of the features*	*Corresponding equipment*
A-Level (Premier Equipment) Equipment at the cutting edge of the worldwide innovation, allowing advanced treatments/tests	A1 Fully loaded	Equipped with all the optional available for maximum flexibility of the equipment and clinical coverage	*Here, every 2 years, the parties have to update the corresponding equipment, providing specifications also of different options available from other producers in case of vendor independence.* *The constant update of the banding table is necessary to incorporate in the contract the most up-to-date equipment available with the described functionalities*
	A2 Mid	Equipped with the most common optional, to cover the most common treatments/tests	
	A3 Base	Basic functions; no clinically relevant optional available	
B-Level (Advanced Equipment) Equipment providing leading edge treatments/tests, aligned to those provided by comparable hospitals at national level (i.e. university hospital)	B1 Fully loaded	Equipped with all the optional available for maximum flexibility of the equipment and clinical coverage	
	B2 Mid	Equipped with the most common optional, to cover the most common treatments/tests	
	B3 Base	Basic functions; no clinically relevant optional available	
C-Level (Standard Equipment) Equipment providing standard treatments/tests, aligned to those provided by comparable hospitals at national level (i.e. hub hospital)	C2 Mid	Equipped with the most common optional, to cover the most common treatments/tests	

Source: Authors

a typical banding system for an MES contract. It is important, however, to carefully plan the periods in which the refresh must be done. A refresh that is too close to the end of the contract determines a too-high fee to be paid by the authority, due to the need to apply an accelerated depreciation mechanism, since authorities may prefer to avoid the application of a termination payment to buy back technologies. Therefore, the length of the contract must be defined also on the basis of the refreshment plan.

Vendor independence is also a relevant parameter. This represents the percentage (in terms of economic value or technological mix) of equipment that the healthcare organisation can choose, despite the brand offered by the contractor. The definition of this parameter is one of the most sensitive aspects of an MES contract. On the one hand, the operator that is also a manufacturer will be able to offer a more competitive price if the percentage of vendor independence is low because of economies of scale; on the other hand, the authority may be willing to offer its clinical staff the opportunity to get access to a wide array of solutions, produced also by other operators, reducing also the risk of vendor lock-in. In general, a vendor independence percentage of 20%–30% allows the authority to get the highest value from the contract.

The service provided is paid through an availability charge, which is subject to deductions if and when the economic operator is unable to meet the performance levels defined in the contract. The most commonly adopted performance criterion is the level of uptime of the equipment and the time necessary for solving the breakdowns. Table 2.2 shows an example of time-performance levels in an MES contract: below these levels no deduction is applied; above these levels an increasing deduction is applied. When the operator is not able to fulfil the agreed response and fixing times, diversified for category of equipment, deductions are applied on the basis of the extra time incurred.

It is of fundamental importance to determine the value of deductions in a way that creates a strong incentive for the economic operator to perform; otherwise the cost of the deduction will be lower than that of managing the breakdowns in the agreed timescale.

Even though the most used payment mechanism in MES contracts is the availability charge, it is also possible to pay the contractor on the basis of a fee for the service rendered, thus transferring full or partial demand risk and incentivising the maximisation of treatment volumes. The fee can

Table 2.2 Example of time-performance levels in an MES contract: below these levels no deduction is applied; above these levels an increasing deduction is applied

Category of area/equipment	*New equipment installed*		*Old equipment under management (already owned by the authority)*	
	Response time	*Fixing time*	*Response time*	*Fixing time*
Emergency	15 min	30 min	15 min	4 hours
Urgency	30 min	1 hour	30 min	8 hours
Routine	1 hour	2 hours	1 hour	1 day

Source: Authors

be calculated to get a saving from the standard fees paid applied in the health system (e.g. the DRG). This approach may be preferred when the MES also includes the provision of the staff necessary for service delivery to patients.

Case: The MES Contract for the University Hospital, Novara, Italy
The University Hospital of Novara is located in old facilities, some of them dating back to the late 1900s.

Novara is a medium-size city quite close to Milan, located in Piemonte Region, whose public and private hospitals serve local patients but also those coming from other regions and cities.

Starting in 2010, Piemonte Region drastically cut the healthcare budget, especially capital expense, in order to reduce its deficit. To cope with the resulting shortage of capital for medical equipment renewal, Novara University hospital decided to use the "unsolicited proposal procedure" to develop a concession – based MES contract for 11.5 million euros of new investments in diagnostic equipment and the maintenance of the old stock. The contract also incorporates the full management of the RMI service, including the provision of nurses and technicians.

In Italy, the unsolicited proposal procedure was introduced in 2002 in the Code of Public Contract, and the new Code, approved in 2016, extends the opportunity to use all the forms of PPP included in the Code itself. As explained in Chap. 3, under the EU law framework, a PPP is a concession contract and the concessionaire has the duty to bear the operative risk.

Under this procedure, a private operator can ask an authority to provide all relevant data to prepare a PPP proposal; the authority has to formally agree to provide these data and the exchange of information must happen in a transparent manner. Once the operator has prepared and submitted the proposal, consisting of a technical project, a PPP contract draft with all its annexes, and a financial model, the authority must assess it within a three month period. The assessment is aimed at analysing the consistency of the proposal with the authority's needs, value for money, and affordability.

In September 2016 the hospital authority received an unsolicited proposal by a consortium headed by Higea, now called Althea, a new company set up by a merger of several small independent vendors.

As the exchange of information was very intense in the prepratory phase, the changes requested by the authority during the assessment of the proposal were relatively minor, and in December 2016 the proposal was declared "of public interest". At this point, according to Italian law, the operator becomes "the promoter" and this status gives it the "right to match" a better offer received by other operators during the successive procurement step. The proposal approved by the authority, including the changes requested, was used to launch a competitive procedure (in May 2017) aimed at testing it on the market and possibly receiving better offers by other market operators. Due to the "right to match", which is regarded as an essential means of rewarding the operator for the effort and entrepreneurial risk involved in preparing an unsolicited proposal, the promoter had the right to decide to match the best offer received. It was not the case here, as the authority did not receive other offers, and the promoter's reconfirmed proposal was approved by the authority and the contract was formally signed in November 2017.

The lack of competitors was due to several factors. First of all, the market was and is highly concentrated and relatively few operators have the skills to perform all aspects of such contracts; among them, the multinational firms, which have rigid protocols and lengthy internal procedures to prepare an offer, and often struggle to do so in such a limited time (in this case 30 days between the publication

of the call and its deadline). Further, the prospect of other bidders being successful in the competition is limited given the "right to match" of the promoter. Clearly, this raises questions about the extent to which the process can be regarded as meaningfully competitive. But the procedure is considered in Italy the only way of securing new investments under PPP in a context of limited technical and project management skills within the public sector.

The MES contract is based on a concession contract and the concessionaire bears the full availability risk in respect of all the hospital's equipment—including more than 3000 machines, many of which are more than 10 years old. Furthermore, the concessionaire is paid on the basis of a tariff per RM-delivered exam, and, therefore, it retains the full demand risk for this service.

Although the absence of competition in procurement is undesirable, the MES contract is, in this case, nonetheless able to generate an acceptable solution for the authority, whose historic high maintenance costs relating to old equipment provide the budget required to fund the availability charge. The value-for-money (VfM) analysis showed that the net present cost of the PPP option was 80.3 million euros, compared to the PSC of 90.3 million euros (see Chap. 3 for the VfM analysis), with a saving of 10 million euros. Furthermore, the analysis highlighted the considerable operational efficiencies and clinical improvements that the presence of a single operator as system integrator over a 9-year period could generate in terms of optimizing the management and maintenance of the hospital's entire equipment portfolio.

Source: Authors

2.2.4 Availability-Based Contracts (DBFMO, DBFM)

In availability-based contracts the private sector takes the responsibility to design, build, finance, and maintain (DBFM) the asset and, in many cases, deliver/operate a range of non-core services (DBFMO), while the public authority retains the responsibility for the delivery of core services. The availability payment remunerates the private sector's original investment,

Table 2.3 Effect of availability charge indexation to inflation

Investment capex: 100 million euros	40% of the availability charged indexed to the RPI*	100% of the availability charged indexed to the RPI
Annual availability charge at the contract signature	17.5 million	16.2 million
Sum of the availability charges	445 million	460 million
Discounted sum of the availability charges	282 million	288 million

Source: Authors
* Retail Price Index

net of any public grant, plus the costs of operations, maintenance and facilities management. The availability payment should be only partially indexed to inflation, on the basis of the proportion of the costs that are affected by inflation (such as maintenance costs). A common mistake, however not only in DBFM/DBFMO contracts, is to link the entire availability charge to inflation. This "over-indexation" reduces the availability charge in the early years of the contract, but increases the total availability charge over the contract period (as shown in Table 2.3), and creates a risk for the public authority that inflation will be higher than expected at the point of contract signature/financial close.

The costs of ancillary services should be identifiable as specific fees for service, to avoid covering part of the capital costs with the margins generated by the special purpose vehicle (SPV) on the subcontracting of non-core services. This is a crucial point to ensure contract flexibility in the long term. In many markets, non-core services are subject to value testing exercises (market testing or benchmarking) or renegotiations every five to seven years to ensure continued value for money.

Contrary to other PPP models analysed earlier, namely turnkey, O&M and MES contracts, which are funded through a corporate finance approach, a DBFM/DBFMO is funded via project finance. Usually, DBFMO/DBFM PPP contracts in the health sector are structured following the model represented in Fig. 2.3. The contract is awarded to a consortium, usually led by an EPC and/or O&M company. Once the contract is signed the consortium members set up, and provide equity capital to, an SPV. The SPV, in turn, signs with its shareholder companies' EPC and O&M contracts for building/refurbishing the hospital, maintaining and upgrading it and operating the non-core services. If the SPV also supplies health technologies and IT services, it signs additional contracts with specialised companies. The O&M contractor may also outsource to other

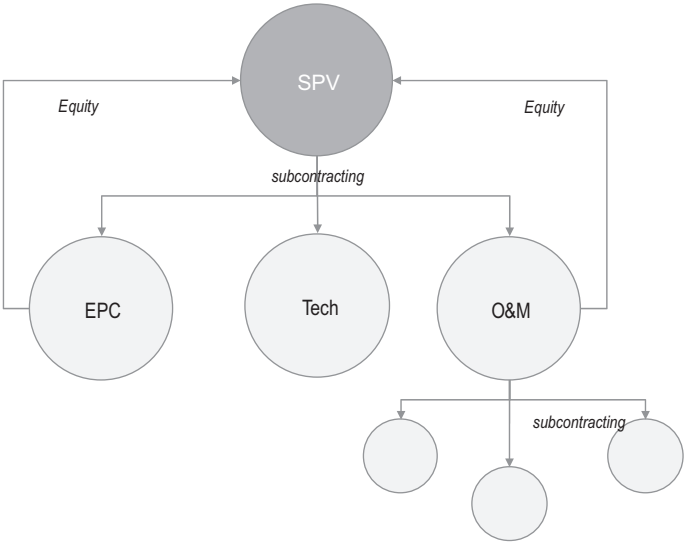

Fig. 2.3 DBFMO/DBFM structure (Source: Authors)

subcontractors specific services (like cleaning, waste collection and catering), thus generating a second-level subcontracting.

The DBFMO model has been widely used in the UK, Canada (where also turnkey and DBFM contracts have been used), Australia, Italy, Spain and Portugal. However, in recent years, both in the UK and in Italy, the trend is to make DBFMO contract less inclusive, or "lighter", and there is a new preference for the DBFM contract (HM Treasury 2012; Vecchi and Cusumano 2012). It means that when the PPP option is preferred to build or renew an hospital, the contract includes only those activities that relate directly to the availability of the facilities (maintenance and energy management, the so-called hard services in particular), thus leaving out the management of non-core services.

Most notably, HM Treasury (2012), in the guide for the implementation of PFI2 (the revised version of the original PFI model), divided services to be included into three categories:

- **services to be included:** scheduled maintenance, energy plant management and performance monitoring system;
- **services that can be included subject to evaluation:** small repairs, maintenances and extraordinary interventions; and

- **services not to be included:** catering, cleaning, paddle, energy and water supply, insurance, IT management system, supply and management of health technologies and booking system management.

Therefore, when an authority has to build a new hospital, it is recommended to opt for a "light" approach, limiting the range of services to those which generate economies of scope and are fundamental to the risk transfer economics of the deal. Services such as maintenance and energy management ought to be included in a DBFM contract; but the provision, management and refresh of medical equipment can be covered by a separate MES contract; while many "soft" FM services can be procured through simpler, more easily specified and more competitive tenders (or delivered in-house by the public authority). This requires the authority to develop adequate project management skills to coordinate this process; however, similar competencies are necessary to monitor the implementation of a complex DBFMO contract in any case. Further, the authority should not be worried by the coordination of the works with the installation of medical technologies. As the development of the new hospital may require a period of three to five years, the authority may decide to select an operator for the MES contract, to which to assign immediately the refresh and management of the medical technologies of the old hospital and the responsibility that the new spaces built are consistent with the instalment requirements and the transfer and/or provision of the technologies. In this case the MES contract is structured as a "bridge MES".

The shift towards "lighter" contracts has been dictated by the analysis of the drawbacks generated by DBFMO contracts, namely their (alleged) high cost, limited transparency and inflexibility (Hellowell and Vecchi 2015; Vecchi and Cusumano 2012; Vecchi and Leone 2016). Experience suggests that the savings resulting from the management of a single contract, including all services, tend to be lower than the transaction costs resulting from their complexity, including those related to the requirement to obtain adequate levels of transparency and accountability during the operational phase. Furthermore, in a context of limited competition due to the complexity of such contracts, the SPV can retain all the economic benefits from subcontracting services to small operators, thus increasing its actual return, forcing them to reduce their margins, which may result in suboptimal results for both the authority and taxpayers.

When some non-core services are included for some reasons, in order to get more transparency and flexibility in the contract management process, the investment should be remunerated only through the availability charge. In this way, it is more transparent to link the fee for the non-core services to the costs incurred by the SPV, and therefore the market/benchmark clauses can be applied more straightforwardly. However, if the investment, which is often the main policy priority for such contracts, is remunerated only through the availability charge, there is no need to include the management of soft-services and other ancillary outputs, which are likely to be subject to more changes over the contract period. Indeed, value testing procedures have rarely delivered lower costs for the contracting authorities, because they generate high transaction costs and opportunistic behaviours by the private operators, which are in a strong bargaining position to raise prices above marginal cost. (Vecchi and Leone 2016).

Case: Etlik Integrated Health Campus, Turkey (DBFMO)

The Project will be a large urban development on 1,071,885 m^2 (107 ha) of land in the Kecioren and Yenimahalle districts of the Ankara province. It will include a health complex, a medical hotel, two heliports, a university, a trigeneration power plant (a combined cooling, heat, and power system) and a commercial zone. The hospital itself will have 3,566 beds. Construction of the Project is expected to take 42 months and the campus will be transferred to the Ministry of Health (MoH) after 25 years of operation.

The project has been commissioned by the Turkish Ministry of Health (MoH) and awarded to a consortium led by Italian EPC Astaldi S.p.A. in 2011. The financial close was secured in 2015 with support, among others, of the European Bank for Reconstruction and Development. Under the terms of the contract the Project Company – participated by Astaldi (with a 51% stake) and a Turkish company, Türkeler (with a 49% stake) – is carrying out project works (over a period of approximately 42 months) and will take, once completed, the management of support services including imaging, laboratory services, housekeeping, security, catering, cleaning, maintenance, information management systems, car parking and waste management services, for 25 years.

The MoH will assign doctors, nurses and other clinical staff to the campus.

The MoH will pay annual availability charges to the Project Company for the 25 years operational term. In addition to this, the MoH will pay a fee for services, with a guaranteed demand of 70%. At the end of the operation period, the campus will be transferred to the MoH.

Source: EBRD (2014), Environmental and Social Impact Assessment (ESIA) Report

Case: The Second Wave of PPP Projects in Italy: the shift towards DBFM

In Italy, PPP has been used in the healthcare sector since financial year 2001–2002. Since then, it has supported the renewal of the entire network of hospitals in some regions, among them Lombardia, Veneto and Toscana. Overall, investments worth 3.2 billion euros have been secured under PPP contracts, thus contributing to the provision of almost 9,000 new beds by 2016–2017. In the same period, facilities providing a further 9,000 new beds were developed through traditional public finance procurement, mainly in smaller hospitals.

However, public capital has also played a major role within PPP contracts: on average, 40% of the capital investments developed through the PPP program was funded with public grants, allocated to regions by the Healthcare Minister.

A shift in the use of PPP in the healthcare sector was introduced in 2015–2016 by the Healthcare Minister Committee for the assessment of investments, which is in charge of assessing and supporting regions in the allocation of national funds. Drawing on the assessment of the main drawbacks experienced and the poor value for money achieved in the application of PPP in Italy and overseas, in 2016–2017 the Committee supported two regions, Abruzzo and Piemonte, to use the lighter DBFM model to match the national funds received to develop new hospitals. The national Committee provided evidence that the DBFMO would provide lower value for

money and compromise the affordability of the related investments. Many inexperienced regional and local healthcare organization managers still believe that the increased scope of the contract would help to absorb capital costs associated to building a new hospital. At the time of writing, the two state-region agreements have been approved. Their correct implementation, following the instructions given by the Healthcare Minister Committee, is vital to promote a new approach to the PPP model in Italy, a model that is likely to play a crucial role because of the lack of public resources and the need to develop 10 billion euros of new investments in the next years.

One of the two regions has, at the time of writing, decided to select a unique consultancy firm to assign the project management and legal and financial support in the preparation of the tender documents for the development of the two PPP contracts (for a combined capital value of almost 1 billion euros). The authors believe that this decision is both critical and risky for the following reasons.

(i) PPPs are very complex transactions and they require the best and most experienced technical competencies available in the market: a unique consultancy firm may not be able to gather together the full range of skills, and the best consultants may not be willing to share their knowledge under a sub-contracting agreement.
(ii) Assigning the preparation and delivery of two relevant projects to one single consultancy firm exposes the region to the risk of error and high dependency to one single player.
(iii) A PPP transaction is a long-term agreement, which requires competencies not only in the design-tender phase but also during the execution of the contract: outsourcing the project management of these contracts will expose the region to a "hollowing out" effect; that is, a lack of contract management competence in future to ensure the sustainability of the contract and the continuous allocation of risks (something that is required by the EU Directive on Concessions).

Source: Authors

2.2.5 Concession Contracts

In concession contracts (also known as build operate and transfer [BOT] contracts) the private partner has the full responsibility for the design, finance, build the hospital and the operation of clinical and non-clinical service, and generally retains (partially or fully) the demand risk. This model is particularly used in countries/regions with a low capacity to structure a public health system or it can be used to develop within a public hospital (as provider) a highly specialised unit (i.e. for cardiac pathologies or cancer treatment). BOT contracts can be structured similarly to DBFMO/DBFM contracts, with an SPV executing the contract.

BOT contracts, in which the private operator is in charge of the operation of the clinical services, may include different forms of payment: a capitation fee (as in the Alzira hospital in Spain, see below) or a fee for clinical services rendered (such as DRGs) or an availability charge (as in the Lesotho case, see below). Contrary to a fee for service, the capitation fee ensures, at least in principle, predictability of expenditure to the public payer, and leave to the private operator the risk of the demand and service mix. When the concessionaire bears the demand risk the public authority shall prevent opportunistic behaviour of the private partner, which may be tempted not to treat the most complex patients, or artificially curtail services by creating artificially long waiting times, or to deliver only those treatments for which high margins are ensured by the DRGs/tariff system.

Case: Alzira Hospital

This PPP model, comprising clinical services, was firstly applied by the Valencia Region, in Spain, following a new rule approved by the Spanish Government in 1997, in the city of Alzira as it had no hospital. The original 10 years (+5) contract was signed in 1997 between the Valencian Government and RSUTE, a joint venture special purpose vehicle (SPV) in charge of the construction of the facilities and management of clinical and non-clinical services.

The RSUTE (local) shareholders were:

- the medical insurance company Adeslas S.A. (51%); it was closely linked to the Spanish regional savings banks, its majority shareholder being Agbar S.A., who in turn had La Caixa, the leading Spanish savings bank, as one of its controlling shareholders;

- the regional savings banks Bancaja, CAM and Caixa-Carlet by means of a jointly-controlled entity – Ribera Salud S.A. – (45%), which was the financial partner for this project; and
- the construction companies Dragados and Lubasa each took a 2% holding.

The project was to be funded, on an ongoing basis, by a capitation fee (per resident, per annum) of 204 euros in the relevant health zone, payable by VDoH (Valencian Department of Health), and rising by the consumer prices index (CPI) each year, which is 43.6% less than the Valencian healthcare expenditure for hospital and specialist care of 362 euros.

This initial fee was very optimistic, even acknowledging that in the early years of the contract, the Alzira hospital might not carry out the most specialist and potentially most expensive treatments in comparison to Valencian public hospitals as a whole. In the first year the annual payment for the 230,000 residents of the catchment area was 47 million euros. Whilst the annual capitation fee rose from 204 euros to 233 euros between 1999 and 2003 based on the CPI, an increase of 14%, the comparable Valencian healthcare expenditure rose from 362 euros to 465 euros, an increase of 28%. The lack of popularity, as it was privately run and because of the lower salaries for doctors and clinicians compared to those paid by the public hospitals, the project gradually reduced the flow of patients and therefore the revenues.

The contract was early terminated in 2002 (after 5 years) and it was reassigned to a consortium controlled by the same equity investors. The Valencian Government paid RSUTE a sum of 69.3 million euros on termination, which consisted of 43.3 million euros for the purchase of the infrastructure assets at their written down value, and 26 million euros as compensation for lost profit.

RSUTE II (the newly formed SPV) was selected to step in the contract. It paid the Government a premium of 72 million euros for the new contract, which included taking over the infrastructure assets just bought back by the Government. It could afford to do this thanks to the payment of 69.3 million euros which the Government had just made to its predecessor, which had the same parent entities. Such a huge amount could be considered as a way of discouraging other bidders, therefore guaranteeing that the former investors would have won new contract.

The capitation fee for 2003 increased from 234 euros under the old contract to 379 euros for the new contract, an increase of 62%, to take account of the extra primary healthcare services coverage. More significantly, the annual increase was no longer linked to the CPI but to the much more generous percentage yearly increase in the Valencian health budget, making it much more beneficial to RSUTE II.

A number of conditions were stipulated in the new contract:

- Residents are able to choose their preferred hospital in the vicinity; if they choose to go to another hospital, then the Alzira hospital has to pay 100% of the cost.
- The annual internal rate of return is capped at 7.5%.
- A 12.5% discount on the capitation fee is applied when the portion of patients attending from outside the area exceeds 20% of the budgeted capitation, rising to a 25% discount when 40% is exceeded, thus serving to reduce the Alzira hospital's incentive to take out-of- area patients.
- If patients from other areas attended the Alzira hospital, this is only funded at 80% of the capitation fee.

Although the capitation fee is around 28% less than the budgeted cost per head for Valencian primary and specialist healthcare, these two figures are not comparable and it is impossible to make the necessary adjustments to make a like-for-like comparison.

Alzira does not have to pay for certain items, such as transport and out-patient costs, which are incurred overall by the VDoH: this can lead to savings that are not adequately reflected in the payment system. Furthermore, there are very profitable areas, such as some surgery and maternity cases, where Alzira seems to benefit from taking in additional cases. Given the apparent shortfall of medical staff in comparison to the regional average, there are also issues about appropriateness of care provided. As a concluding remark, it is apparent that risk transfer has not been fully achieved, given the readiness of the VDoH to bail out the first contract and the close political links between the regional savings banks and local and regional Governments.

Source: Acerete, Basilio, Anne Stafford and Pamela Stapleton. "Spanish healthcare public private partnerships: The 'Alzira model'." Critical Perspectives on Accounting 22.6 (2011): 533–549.

Case: Queen 'Mamohato Memorial Hospital, Lesotho
Written by Mark Hellowell

In January 2007, the Government of Lesotho initiated the tender for a contract to replace the ageing national referral hospital, the Queen Elizabeth II, and upgrade a network of primary care facilities. In October 2008, it signed a contract with Tšepong, a consortium led by Netcare Hospital Group, a South African healthcare provider, to design, build, finance and operate a 425-bed national referral facility (the Queen 'Mamohato Memorial Hospital—QMMH) and a gateway clinic adjacent to the hospital. The project would also refurbish and re-equip three urban 'filter' clinics: Qoaling, Mabote and Likotsi.

At financial close, the total capital expenditure requirement of the project was estimated by Tšepong at M1,164,541 million (approximately US$$134.98 million in 2017 dollars). Both the government and the operator contributed to this requirement. Direct government capital of M400 million was provided to co-finance construction, and a further M86 million was paid for improvements to the construction site itself. Private capital of M765 million financed the majority of capital expenditure—of which was financed by debt (at an interest rate of 11.62%) by the Development Bank of Southern Africa, while Netcare and its partners provided equity and subordinated debt, with expected rate of return of 25.5%. In return for delivering the specified assets and providing a comprehensive range of clinical services in the hospital, Tšepong has received a unitary fee from the government, covering interest payments and profits for the private operator and the cost of infrastructure-related and clinical services.

This is identified in the contract as M255,550,143 (or US$$29.61 million in 2017 dollars). In principle, this is payable as, when, and to the extent that the outputs specified in the contract are delivered at the agreed standard. Independent monitors were appointed to evaluate the quality of construction and operations, and structures were established in the contract for joint oversight by Tšepong and the government. Use of the facility is free to patients at the point of delivery, except for a small co-payment (for the 'non-poor') in respect of some services. These fees ultimately go to the government, though Tšepong retains 10% of the fees to cover its administration costs.

There is a minimum number of patients (the lower demand parameter) and a maximum number (the upper demand parameter) to be treated per year. These parameters are broken down into inpatients and outpatients (Vian et al. 2013). The contract dictates that additional fees are to be paid if there is 'over-performance' (i.e. the number of treatments > upper demand parameter). In addition, the contract defines the mechanism by which the fee is adjusted for inflation. The index is applied to the entire fee, so that the indexed proportion of the fee is greater than the proportion of Tšepong's costs, which vary with inflation. This 'over-indexation' reduces the fee in the early years of the contract, but increases the total payment over the contract period, and creates a risk for the government that inflation will be higher than expected at the point of contract signature/financial close.

Construction of the clinics was completed in 2010, and of the hospital in 2011, in both cases ahead of schedule. In each year of operation, the number of patients treated by Tšepong has been higher than the upper parameter in respect of both inpatients and outpatients. Early analyses of the performance of the hospital have indicated higher levels of utilisation, quality, and patient satisfaction in comparison to the previous national referral hospital, QE-II (Varyn et al. 2013). However, the basic unitary fee has increased substantially. For 2015–2016, expenditure was M431m—some 68% greater than the original M256m. However, this increase is due solely to inflation indexation because, while payments for additional services (those above the upper parameter) have been invoiced for by Tšepong, the government has, in recent years, been either unable or unwilling to pay these in full). From 2013 to 2014 the Tšepong payments have been around 30% of Ministry of Health's (MoH) expenditure, a similar proportion to the QEII (Unicef and World Bank 2017). However, the fact that there continue to be large differences between the amounts invoiced and paid (which equalled M124 million in 2015–16) could have significant financial implications for the MoH (ibid).

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CHAPTER 3

The Key Element of PPP: Risk

Veronica Vecchi

Abstract The amount of risk transferred to the private operator must be enough to create the incentives that enhance the efficiency of delivery. But transferring risk has a cost in terms of increased finance costs. These affect the scale of the unitary charge, and hence only those risks that can be identified, managed and mitigated by the private operator should be allocated to them. Risk is also, in some jurisdictions, a crucial variable in terms of contract qualification and accounting treatment, and it must therefore be assessed objectively in both financial and economic appraisals. In this chapter, the key dimensions of risk assessment in these contexts are analysed in detail.

Keywords Risk • cost • finance costs • rate of return • financial appraisal • economic appraisal

The future cannot be predicted with perfect certainty. In the delivery of infrastructure projects and services, many sources of uncertainty have the potential to cause additional costs or erode the benefits for the organisations involved. From the perspective of the public authority, the ability to

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transfer the risks posed by design, construction, maintenance and financing to a single project company is a key source of value from PPPs. Where the appropriate allocation is achieved, the private operator has strong incentives to provide an integrated package of infrastructure and services to the standard and timetable required under the contract. The amount of risk transferred must be sufficient to create the incentives to enhance the efficiency of delivery. But transferring risk is not costless. Increased risk usually means higher finance costs which, of course, affect the scale of the unitary charge to be paid by the public sector, and therefore only those risks that can be identified, managed and mitigated by private operators should be allocated to them.

Hence, objective and accurate risk assessment is fundamental to securing the economic promise of the PPP model. Risk is also, in some jurisdictions, a crucial variable in terms of contract qualification and accounting treatment. In this chapter, the key dimensions of risk assessment are analysed in detail (while we consider the issue of risk and the private sector's expected return in Chap. 5). We begin in the section below by considering how risks facing projects in the healthcare sector can be effectively analysed through a well-designed risk matrix.

3.1 Risks in PPP Contracts and the Risk Matrix

PPP risks can be classified on the basis of their origin: they may emerge from changes in political or regulatory variables, market or other external variables, or variables relating to the technical components of the project (Vecchi et al. 2017). Below, we deal with each in turn.

- Political and regulatory risks. These depend on the activities of the State at various levels of governance. They may arise, for example, from planning changes, legal changes or changes in Government policy that threaten the interests of project stakeholders in some way. Often, political risk relates to Government actions at the central or regional levels. In some cases, risk emerges from the behaviour of the contracting authority itself. As these risks are outside the control of the private operator, there is no economic benefit to transferring them (while there will be additional costs) and so, as far as possible, they should be retained by the contracting authority.
- Macroeconomic and market risks. These arise from the possibility that the economic environment is subject to variation over time.

These risks must be carefully analysed with reference to the specific context: in some cases they can be transferred to the private operator; in other cases they must be retained. In the case of an availability-based PPP (which is common in the healthcare sector, as written in Chap. 2), uncertainty about future use of infrastructure and facilities and the associated demand risk is borne by the public authority. Consequently, for an availability-based PPP, analysis of market risks by both public and private sector counterparties is likely to focus on economic variables, such as inflation and financing risk.

- Technical risks are influenced by the know-how of the operators and the features of the project and technology. They include:
  - the risk that design/engineering processes may fail to perform as expected;
  - the risk of faulty building techniques or cost escalation in construction;
  - the risk that maintenance/service costs may be higher than projected; and
  - the risk that maintenance/service delivery may not be up to the standard required under the contract.

Table 3.1 shows the reclassification of the main project risks in the three categories, grouped according to the project development phases in which they are most likely to be salient. The table is known as a *risk matrix*, which is the main tool applied in practice to:

- identify the project's risks;
- assess their economic significance;
- understand the appropriate allocation; and
- define mitigation strategies and tools.

The risk matrix shown in Table 3.1 has general applicability, but has been built to reflect the healthcare sector market for technologies in particular. It should be noted, however, that each contract has its peculiarities and therefore it is fundamental to shape the analysis to the specific contract being considered.

The risk matrix is an useful means of understanding the nature and allocation of the major risks to the contractual parties. In practice, the risk matrix should be structured in a more detailed way, in order to support all necessary evaluation tasks. As it is a tool to support the evaluation of the project's risks, it is important that it is structured and used in a flexible way. Table 3.2 summarises some additional information that needs to be included in the risk matrix.

Table 3.1 Risk classification

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Development phase				
Project coherence with the investment needs	x			
Project affordability	x			
Quality of project development			x	This risk is normally transferred by the SPV to project designers and the construction company subcontractor
Longer bidding phase and consequent change of market conditions	x			In mature economies it can also be (partially) transferred to the SPV
Construction phase				
Land availability	x	(x)		In general, in the healthcare sector, the land is provided/owned by the public sector. In some cases it could be searched for and purchased by the SPV, which could then be exposed to market risks
Social acceptance	x	(x)		When the SPV retains demand risk, the social acceptance risk can influence the profitability of the project; however, in general, the reputation of private investors may be a more immediate concern related to this risk

(*continued*)

Table 3.1 (continued)

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Archaeology	x		(x)	In countries with many archaeological sites and associated regulations, this could be retained by the public authority, or split, so that the authority bears the costs over a certain monetary amount
Environment	x			This risk is associated with land pollution; in general it is retained by the public authority, which provides the land to the SPV
Technology availability and consistency			x	This risk is transferred by the SPV to the subcontracting construction company; it is generally quite low in the healthcare sector
Reliability of forecasts for construction costs and delivery time			x	This risk is transferred by the SPV to the subcontracting construction company
Authorisations	(x)		x	Authorisations depend on the quality of the project; in general it is transferred to the SPV, though the public authority can cooperate with the SPV to make the process leaner and faster
Project changes requested by the authority	x			This risk is relevant in countries with political and administrative instability; when project changes imply a different level of funding, this risk may require changes to the financial contract; this risk may then affect the project's bankability

(*continued*)

Table 3.1 (continued)

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Medical equipment suitability			x	This risk is related to the suitability of the built facilities with the medical equipment's installation features. It is transferred by the SPV to the subcontracting construction company
Medical equipment obsolescence		x		This risk can be relevant when the equipment's specification is defined at the point of contract close, and then becomes obsolete and the agreed price too high. If the authority wants to transfer this risk, the contract may define only functional specifications
Operation phase				
Change in service tariff, defined by the regulator/ authority	x			In general, this risk affects the contracting authority; if the SPV also manages clinical services and is paid via DRG/tariffs, it may be affected by this risk
Volatility of demand		x		In general, this risk affects the public authority; if the SPV manages clinical services also, it may be affected by this risk but this depends on the payment mechanism (i.e. volume-based or availability-based)
Underperformance of facilities, causing increases in life cycle costs or the need for additional investment			x	This risk is transferred by the SPV to the subcontracting construction company

(*continued*)

Table 3.1 (continued)

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Authority does not comply with payment obligations		x		This risk is retained by the SPV and it can be significant in some emerging-market countries, especially if the PPP contract absorbs a non-trivial part of the Authority's budget
Change in the level of service	x			In the healthcare sector the change in the level of services is requested by the public authority or by the regulator. Therefore, the costs associated are, or should be, borne by the authority
Underperformance of energy technologies			x	This risk is retained by the SPV and transferred to the subcontracting O&M company
Underperformance of medical equipment or faster obsolescence			x	This risk is retained by the SPV and transferred to the subcontracting company
Underperformance or failure of subcontractors		x		This risk is retained by the SPV
Funding				
Availability of affordable funding		x		This risk is retained by the SPV

(*continued*)

Table 3.1 (continued)

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Refinancing risk		x		Loans may mature before the end of the contract period, at which point the majority of the loan is still outstanding and the project sponsor will default if the loan is not refinanced. If the result is that interest costs increase, this can reduce cash flow above debt service. This risk is typically retained by the SPV. In some countries it may be retained by the public authority
Other risks, across the whole life cycle				
Inflation		x		The real value of payments and revenues may be higher or lower than expected at financial close depending on the changes in the relevant price index. As a result, it is typical for payments to be linked to an inflation index (such as the Retail Prices Index—RPI) by some ratio. Hence, both parties bear some degree of inflation risk
Exchange rate fluctuation		x		This risk is retained by the SPV and, while hedging instruments normally exist, it can be problematic in some emerging-market countries
Force majeure		x		Normally this risk is retained by the public authority
Change in taxation	x			Normally this risk is retained by the public authority
Change in law	x			Normally this risk is retained by the public authority

(*continued*)

Table 3.1 (continued)

Risks	*Political and regulatory and other risks retained by the public authority*	*Macroeconomic and market risks*	*Technical risks transferred to the private counterpart*	*Comments*
Stability of business, political and legal environment	x	x		This risk affects the execution of the contract and the SPV. It can be problematic in emerging market countries and can be hedged with guarantees issued by multilateral banks or other development institutions
Default of SPV		x		This risk affects the SPV's equity shareholders and the public authority. In the healthcare sector it is quite limited as the PPP contract is not affected by demand risk and the main source of default risk is therefore related to the possibility of extreme delays in construction or other construction failures
Termination value different from expected		x		In general, the straight-line depreciation is applied and there is no terminal value. Therefore, this risk is generally not significant

Source: Authors

Table 3.2 Information to be included in the risk matrix

Risks' description	Each risk should be described with specific reference to the features it exhibits in the specific project
Relevance of the risks	Since each project is different, the impact of each risk changes. It is therefore important to understand its specific relevance in the context of project execution. The relevance can be expressed in a qualitative way (e.g. very high, high, medium, low, very low not relevant) or in a quantitative way, through a probability (ρ) or probability range. Probability ranges can be: not relevant (ρ = 0%–4%), very low (ρ = 5%–15%), low (ρ = 16%–30%), medium (ρ = 31%–50%), high (ρ = 51%–70%), very high (ρ > 71%)
Risk allocation	This shows if the risk is retained by the public authority or if it is transferred to the SPV
Reference to the contract	Since the risk allocation is regulated by the PPP contract, it can be useful to include also the articles of the contract or its annexes that determine the allocation of the specific risk
Economic value of the risk	This shows the economic quantification of the risk or, in financial terms, the impact that the risk can have on the project. The economic value may be different in case the same risk is managed by the public authority or by the SPV or any of its subcontractors
Risks mitigation strategies and tools	Especially for private investors, it is useful to understand the mitigation strategies and tools that the SPV can use for each risk, in order to limit its impact. Only risks that are retained by the SPV and that are not transferred to subcontractors or hedged through insurance or other financial products should command a risk premium in the calculation of the expected return on the equity invested (see Chap. 5)

Source: Authors

3.2 Contract Qualification and Accounting

In the European Union, the risk assessment is fundamental to quality of the contract.

From a legal point of view, a contract can be structured as a traditional procurement or a concession. According to the European Directive on Concessions (2014/23/UE), a contract is a concession when it transfers to the counterpart the so-called operating risk.

The definition of operational risk provided by the Directive is included in the considerandum n. 19:

> An operating risk should stem from factors which are outside the control of the parties. Risks such as those linked to bad management, contractual defaults by the economic operator or to instances of force majeure are not decisive for the purpose of classification as a concession, since those risks are inherent in every contract, whether it be a public procurement contract or a concession. An operating risk should be understood as the risk of exposure to the vagaries of the market, which may consist of either a demand risk or a supply risk, or both a demand and supply risk. Demand risk is to be understood as the risk on actual demand for the works or services which are the object of the contract. Supply risk is to be understood as the risk on the provision of the works or services which are the object of the contract, in particular the risk that the provision of the services will not match demand. For the purpose of assessment of the operating risk the net present value of all the investment, costs and revenues of the concessionaire should be taken into account in a consistent and uniform manner.

Therefore, the EU Directive on Concessions clearly incorporates within European public contract law the principle of risk transfer. Since the risk transfer is a fundamental principle beyond a PPP contract, the legal basis for a PPP contract is the concession, at least within the European Union. If the risks faced by the operator are related only to the execution of the contract, this is a normal procurement.

In the healthcare sector, even when the operator is paid on the basis of the services, or treatments delivered, the volume of treatments is relatively predictable (compared to, say, a toll road, in which macroeconomic change and other exogenous variation leads to volatility of demand). Therefore, the main exposure to operating risk comes from construction and availability risk. Unlike a traditional procurement, in PPP this risk usually does, and certainly should, have a non-trivial financial impact for the private operator; otherwise there is limited incentive to monitor, mitigate or take steps to avoid risks. When demand risk is absent or limited, the contract should foresee the application of meaningful deductions to the availability charge, or penalties in cases where the operators are unable to deliver the investment on time and to guarantee its availability during the life of the contract.

An example can be useful to understand the principle. In the case of non-availability of the operating theatre for unplanned maintenance, the availability payment (or also the payment by tariff) should be reduced by an amount that is consistent with the associated loss generated for the public authority, e.g. the tariff associated with the operation planned and not executed due to the operator's performance failure. In this way, the

losses for the operator generate a strong incentive to execute the preventive maintenance activities necessary to avoid the crystallisation of the risk.

The use of the risk matrix and the calculation of the operative risk are also essential to qualify the contract as a *concession* under the EU framework. Especially in the field of service outsourcing, public authorities are generally used to qualifying the contract as a traditional procurement, despite the level of risk transferred to the economic operator. The use of the risk matrix can be beneficial to understand the risks that the contract would allocate to the private operator and assess if these can, in combination, enable the possibility of accounting for this as a concession.

In addition, *Eurostat*, the statistical office of the European Union, which dictates the rules for the calculation of debt and deficit of all Member States, has a dedicated chapter of the *Manual on Government Debt and Deficit* on the accounting treatment of PPP contracts. This clarifies that a PPP contract—which is, according to Eurostat, a contract where the public authority is the main payer[1]—can be accounted as off-balance sheet transaction, without associating a debt liability to the new investment amount, only if risks are demonstrably transferred to the private sector such that there is a meaningful threat to its profitability. In particular, there are three relevant categories of risk under the Eurostat rules: construction, demand and availability. At least two of these must be allocated to the operator for off-balance sheet treatment to be justified.

These risks are defined as follows in the 2016 edition of the Manual (page 340):

- *Construction risk* covers events related to possible difficulties faced during the construction phase and to the state of the involved asset(s) at the moment in which the services start to be provided. In practice, it is related to events such as late delivery, non-respect of specified standards, significant additional costs, legal and environmental issues, technical deficiency and external negative effects (including environmental risk) triggering compensation payments to third parties.
- *Availability risk* covers cases where, during the operation of the asset, the responsibility of the partner is called upon, because of faulty management ("bad performance"), resulting in a volume of

services lower than the one which was contractually agreed, or in services not meeting the quality standards specified in the contract.

- *Demand risk* covers the variability of demand (higher or lower than expected at the moment in which the contract was signed) irrespective of the performance of the partner. In other words, a shift of demand cannot be directly and totally linked to an insufficient quality of the services provided by the partner, although quantitative and qualitative shortfalls in this matter are likely to have an impact on the effective use of the service and, in some cases, exert an eviction effect. Instead, the demand risk may also result from other factors, such as the business cycle, new market trends, a change in final users' preferences or technological obsolescence. This must be seen as part of the usual "economic risk" borne by private entities in a market economy.

It should be noted that the bulk of the demand risk may be borne by the operator even in cases where the payment is made by the authority: in this case the authority pays on the basis of the use of the facilities or the amount of clinical activity undertaken. Further, according to Eurostat, off-balance sheet treatment is possible when the grant or debt guarantee awarded by the authority to the SPV is less than 50% of the capital value of the project. In case of riskier financial tools used by the authority to support the project, such as junior or subordinated debt, the amount invested must be multiplied by a factor of 2.5 to assess compliance with the 50% threshold. This means that in the case of subordinated debt invested in the project by the public authority, a maximum amount of 20% is allowed to retain the off-balance sheet treatment.

Even though the definition of risk to be transferred to the private counterpart differs between the Directive and Eurostat, in substance, the construction, availability and demand risks, together with the fact the economic operator must be responsible for the majority of financing, represent the main broad categories of risks that substantiate the operating risk.

In light of the Directive on Concessions and the Eurostat rules, it is therefore clear that a PPP contract in the EU must be structured as a concession. Traditionally, and not only in the EU, a concession contract was characterised by direct payments by users to the private concessionaire. However, this is not a necessary condition for a contract to be regarded as a concession. Indeed, in recent years, and especially since the economic

crisis when market appetite for demand risk diminished markedly (Hellowell et al. 2015), the availability-based model has been more frequently used, also outside the healthcare sector.

3.3 Risk and Value for Money

There is general acceptance among international institutions, scholars and policymakers that the decision to undertake a PPP project should be based on a formal value-for-money (VfM) analysis (Farquharson et al. 2011). This computes the present value of the total whole-of-life costs incurred by Government (or, where relevant, service users) for different contractual alternatives. The cost of a PPP is compared to an equivalent and usually hypothetical project that is assumed to be financed and managed by the public sector according to a traditional approach, which is often called the public sector comparator (PSC).

This analysis is very complex and there is considerable variation across jurisdictions (Boardman and Hellowell 2016). Generally, this is applied for availability-based PPP contracts, in which the public sector budget is the ultimate source of funds for the investment under either procurement approach.

In general, the VfM analysis is a compulsory part of the PPP process in countries where the model is a routinised form of procurement. It may be carried out by PPP units or by individual procuring authorities, and usually follows standardised procedures laid down by central or regional Government authorities.

The VfM analysis begins by measuring the financial costs to Government associated with the two procurement options, and includes the following:

- base cost (design and construction; facilities management and operations and maintenance costs);
- finance costs (cost of the debt and the equity for the private operator and, in some cases, the cost of borrowing for the public authority);
- competitive neutrality adjustments (e.g. in relation to taxes, which are based on an assumption that tax receipts will differ between the two options, an assumption which normally favours the PPP option); and
- the value of risks retained by the public sector.

A key issue is how to account for implicit finance costs in the PSC. According to some methodologies, these are calculated as the cost of the public borrowing (this is the case for Ontario, Canada and Italy); while in British Columbia the forecast or actual weighted average cost of capital for the private sector is used. However, the UK applies a different theoretical framework. The UK Treasury dictates that individual project appraisals must focus on decisions about resource allocation within the Authority's predetermined budget—and, unlike in some other jurisdictions there is no assumption that the marginal source of funds is public borrowing.

In some cases the cost of the investment is charged upfront, during the construction phases, thus generating an increased value of the discounted cost of the PSC option. In other cases, for example Italy, where the most realistic financial alternative to the PPP is to borrow money from the national development bank, the PSC's cash flow does not consider the upfront disbursement during the construction phase but rather the cost of the debt repayment.

In many methodologies, the VfM analysis takes into consideration the so-called *competitive neutrality*, which corrects the cost estimate for the PPP option for the higher taxation that a PPP project faces, which contributes to the payment of the public authority, but is recycled within the public sector (Fig. 3.1).

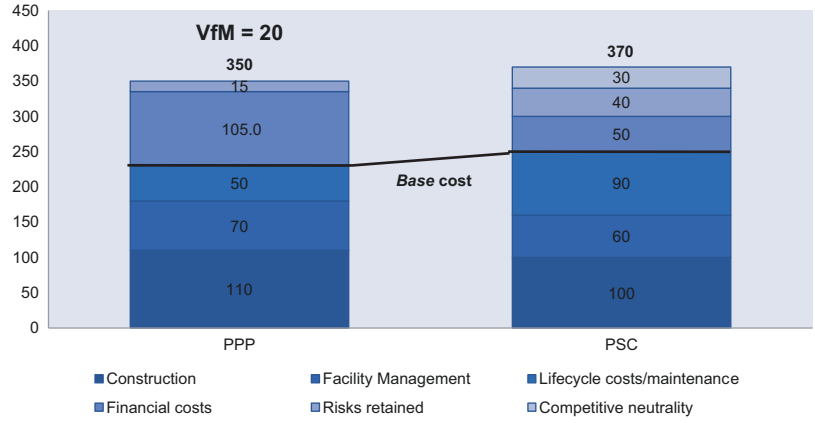

Fig. 3.1 The main cost inputs in the VfM analysis (Source: Authors)

There are two main approaches to calculate the PPP and the PSC options.

- One is based on a "build up approach" and consists in discounting each of the factors listed in the figure.
- Another common approach is based on a cash-flow statement: one to calculate the unitary charge that the private operator is most likely to offer within the procurement process (the so called shadow bid), which is the cost for the authority of the PPP option; and one to calculate the net present value of the overall disbursements that the authority would face under the PSC option. As noted by the supreme audit institution of the UK (National Audit Office 2013), the calculation of the shadow bid represents a more complex approach, though more realistic, as it normally estimates a PPP cost higher than that calculated through the so-called "building up" approach.

To calculate the unitary payment under the shadow bid approach it is possible to refer to the cash-flow statement in Chap. 4.

Often, when the VfM is based on a shadow bid, the unitary payment calculated is also used as an implicit ceiling in the PPP procurement process, in order to make sure that the offers received by bidders will be ensure the value for money.

An issue that has been subject to intense debate is the value of risks retained by the public sector in the two options. Several authors have argued that the value of risks associated with the traditional option has been overestimated to support the predetermined decision to undertake a PPP. For example, in Canada, the value of retained risks in PSC has on average been 49% of the base cost (Siemiatycki and Farooqi 2012). In general, it is difficult to analyse the value of the risks associated with traditional procurements, due to the absence of data. It must be said, also, that for public authorities it is difficult to estimate the full costs associated with the development and management of a facility, especially those related to the maintenance and operations. In fact, the traditional procurement approach is often a "pay as you go" system, in which the capital cost is funded by central Government through successive lump sums, and operations and maintenance costs are rarely planned in advance.

Therefore, what is true is that in a PPP contract all the costs associated with the project's development and management are considered, while the financial rules and operations' approaches traditionally in place in the public sector do not take into account all the costs, generating a bias in favour of the PSC. In this sense, the VfM analysis also represents a way to

stimulate the contracting authority to understand and assess all the costs related to an infrastructure project over its full life.

A final element in the VfM calculation is the selection of the discount rate, to be used to bringing the cash flows of the two options to present values. The option with the highest VfM is that with the lowest PV of Government cash costs.

Again, different jurisdictions do this differently. In the UK, HM Treasury applies the social time preference rate, which reflects social preferences in relation to spending now as opposed to in the future. As this rate (3.5% in real terms) is typically above the cost of public borrowing, the UK model arguably understates the additional cost of using private finance compared to Government borrowing (National Audit Office 2013). In British Columbia, in contrast, the discount rate applied is the internal rate of return (IRR) of the shadow bid and for this reason the approach has been criticized as underestimating the cost of the PPP option (i.e. by discounting away its additional finance costs) (Boardman and Hellowell 2016).

In Ontario, in France and in Italy, the discount rate applied is the cost of public borrowing. A full description of the discounting approaches used by these, and other jurisdictions, and an evaluation of these can be found in Boardman and Hellowell (2016).

Table 3.3 shows an example for the calculation of VfM and the effect of the discounting rate used.

It is also important to note that the concept of VfM is different from that of affordability, such that it is possible for a PPP to represent VfM but still be unaffordable. Many authors have argued that PPP projects, especially those paid for by the public sector through availability charges, have often turned out to be unaffordable for the Governments that procured them (Hellowell and Pollock 2009; Pollitt 2005; Pollock et al. 1999). Although "affordability" has no precise economic meaning (and is not explicitly defined by any of these authors), the implication is that the obligations entered into through PPP contracts have often left public authorities with insufficient financial resources to meet their socially defined objectives (Hellowell and Vecchi 2015).

The unaffordability of many PPP contracts has been linked to excessive private sector returns (Hellowell and Vecchi 2012; Vecchi et al. 2013). These super-normal returns analysed in the literature are related to market concentration and procurement mechanisms, such as long periods of exclusive negotiation, which increase the negotiating power of the private sector (Lonsdale 2005; Carrillo et al. 2008; Shaoul et al. 2008). Often, the procurement process includes a final preferred bidder phase in which exclusive negotiation takes place between a single bidder and a single pur-

Table 3.3 The effect of the discounting rate used in the calculation of VfM

Inflation 2%	*Construction phase*			*Management phase* ---------->			
	1	*2*	*3*	*1*	*2*	*19*	*20*
PSC							
Construction	4.00	4.00	4.00				
Facility management				4	4.08	5.71	5.83
Maintenance				0.5	0.51	0.71	0.73
Risk retained during construction	12	12	12				
Risk retained during management				1.5	1.53	2.14	2.19
Competitive neutrality	3	3	3	3	3	3	3
Total cash flows	19.00	19.00	19.00	9.00	9.12	11.57	11.74
PPP							
Unitary charge (shadow bid)	0	0	0	19	19.38	27.14	27.68
Cost of public borrowing	4%						
Expected project IRR (@WACC*)	6.50%						
Expected PSC (@public borrowing)	256.21						
Expected PPP (@public borrowing)	271.80						
Expected PSC (@WACC)	219.21						
Expected PPP (@WACC)	202.13						

Source: Authors
*Weighted average cost of capital

chaser, and it is likely that the private counterpart is in an advantageous position vis-à-vis the public authority, knowing that it is virtually guaranteed to secure the contract at this point. Due to high transaction costs, and a fiscal environment in which public authorities have incentives to make heroic forecasts in their future income and production costs when making the business case for new PPP projects, it is little surprise that unaffordable PPP projects have been regularly observed.

In this sense, it is important to note that the VfM analysis does not represent a complete appraisal of the economic and financial merits of the PPP contract. For example, when the value of risks transferred has been overestimated, the public sector may face unexpected costs during the execution of the contract. Similarly, the concept of competitive neutrality, though it has clear relevance since, in principle, the two procurement options should

Table 3.4 Value-for-money analysis for a project with a capital value of 350,000,000 euros, including design, build and maintenance

Base cost factors	*PSC (€)*	*PPP (€)*	*Differences (€)*
Cost for the authority (sum)	1,136,662,407.01	1,393,746,861.10	**257,084,454.09**
Corporate taxation	–	77,438,554.55	77,438,554.55
VAT	135,093,014.89	177,728,736.68	42,635,721.79
Margins for O&M	29,764,278.00	42,520,397.15	12,756,119.14
Cost of the debt	168,303,642.63	140,355,847.15	–27,947,795.48
Rolled up interests	28,297,500.00	22,050,000.00	–6,247,500.00
Dividends	–	158,449,354.09	158,449,354.09
Total cost of capital	48.086.755,04	106.656.303,95	58.569.548,91

Source: Authors

be considered from the point of view of the public sector as a whole, may hide the real costs of taxation that can have a dramatic influence on the availability charge faced by the individual public authority.

For instance, in Italy, Value-Added Tax (VAT) is not recoverable by healthcare organisations. However, the same VAT percentage is applied on the capital component of the availability charge and on the construction costs related to a traditional procurement.

Table 3.4 shows the main components of the VfM analysis, without considering the impact of risk. It is referred to a simple PPP contract which includes a hospital design, construction and maintenance, with a capital value of 350,000,000 euros. The example does not consider the differences in the value of the base cost for the two options, in order to better understand the effect of taxation, apart from a different margin charged by the O&M subcontractors to take into consideration the costs associated with the management of the PPP contracts during the operational period.

As can be readily noticed, the overall difference (considering the sum of the different factors of the base cost for the two options and not the discounting value for eliminating the impact of the time value of money) is 257 million euros, of which almost 120 million euros are related to the extra taxation that is included in the availability charge.

Figure 3.2 shows the different contractual features between traditional procurement and PPP that are at the basis of a higher taxation of the latter option. The presence of the SPV, as a further corporate vehicle, is the main cause of the extra taxation of PPP compared to a traditional approach (characterised by two contracts, one for building the hospital and one for its maintenance).

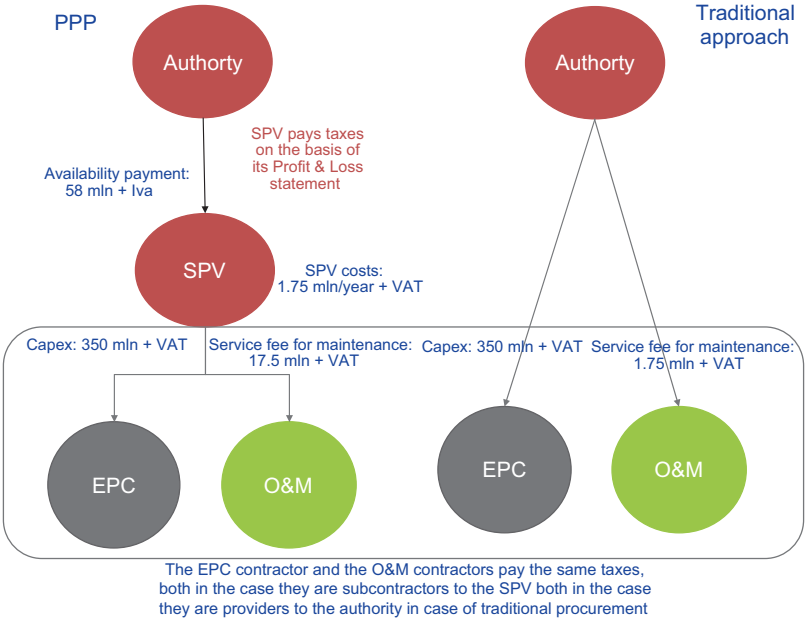

Fig. 3.2 The tax flows in the PPP and in the traditional option (Source: Authors)

Notes

1. According to Eurostat, the term PPPs "will be exclusively used to describe those long-term contracts in which government pays to a non-government partner all or a majority of the fees under a specific contractual arrangement, thus covering most of the total cost of the service provided (including the amortisation of the assets). In national accounts, this feature distinguishes PPPs from concessions. In a concession contract, government makes no regular payments to the partner, or such payments, if they exist, do not constitute a majority of fees received by the partner. In a PPP contract the final users do not pay directly (i.e. in a way proportional to the use of the asset and clearly identified only for this use), or only for a minor part (and generally for some specific uses of the asset), for the use of the assets for which a service will be provided".

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CHAPTER 4

Principles of Capital Budgeting for the Assessment of PPP Projects

Veronica Vecchi and Francesca Casalini

Abstract Capital budgeting, or investment appraisal, is the planning process used to determine whether a long-term investment in tangible assets, such as a new hospital building or item of medical equipment, is worth the deployment of cash through the capitalisation structure (debt and equity). Traditional capital budgeting/finance textbooks focus their attention on private investment. However, capital budgeting can also be used by public authorities when planning and appraising PPP projects. In this case, the goal is to find the point of economic and financial equilibrium, which means that project cash flows are affordable to the public authority while also remunerating private investors adequately for their costs. This chapter offers an overview of the essentials of capital budgeting, providing guiding principles for public managers, investors and financial analysts.

Keywords Capital budgeting • cost of capital • Internal Rate of Return • equity • debt • weighted average cost of capital

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4.1 Introduction

Capital budgeting, or investment appraisal, is the planning process used to determine whether a long-term investment in tangible assets, that is a new hospital building or item of medical equipment, is worth the deployment of cash through the capitalisation structure (debt and equity).

Traditional capital budgeting/finance textbooks focus their attention on private investment. However, capital budgeting can also be used by public authorities when planning and appraising PPP projects. In this case, the goal is to find the point of economic and financial equilibrium, which means that project cash flows are affordable to the public authority while also remunerating private investors adequately for their costs.

From a public sector perspective, capital budgeting is fundamental to understanding the most feasible and appropriate investment among alternatives (e.g. renovation—i.e. "brownfield" investment—or a brand new construction—i.e. "greenfield" investment); to calculate the PSC and the shadow bid; the latter represents the maximum amount of fees/availability charge that the project can pay to the private counterpart and set the affordability threshold for the procurement phase.

When the public authority develops sound financial analysis for the project, it is able to better craft the contract to extract the maximum value from the market and reduce the extent of information asymmetry during the procurement and implementation phases. As shown by Vecchi et al. (2017), stronger shadow bids, based on robust economic and financial analysis, can dramatically reduce problems of adverse selection and moral hazard.

The shadow bid must incorporate the requirements of both financial and industrial investors. While it is sometimes difficult to disentangle the perspectives of the EPC and O&M contractors from those of financial investors, it is useful to do so to achieve a better understanding of project dynamics.

Typically, industrial investors are primarily interested in a PPP project for the margins that accrue to the construction and the operational activities. Lenders look for a reasonable fee and interest rate on the debt, while equity investors seek to secure an adequate flow of the dividends from the free cash flow that the project is expected to generate. Therefore, the analysis of the appropriate cash flows should be based on an assessment of what the market requires in terms of bankability and profitability.

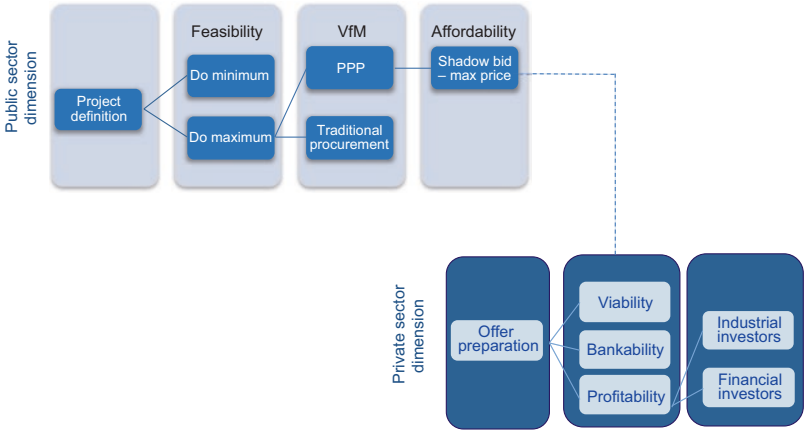

Fig. 4.1 The application of capital budgeting analysis, public and private dimensions (Source: Authors)

Many of the drawbacks of existing PPP contracts can be explained by weak economic and financial analysis carried out by the public sector. These weaknesses generate, on the one hand, the need to renegotiate the contract *ex post* to restore the required level of profitability for the private operator, and, on the other hand, financial challenges for the public sector and excess profit ability for one or more parts of the private sector.

This chapter provides an overview of the essentials of capital budgeting, explaining guiding principles for public managers, investors and financial analysts.

Figure 4.1 compares how capital budgeting analysis is used within the public and private sectors.

4.2 Capital Budgeting Tools

When appraising an investment, there are two relevant dimensions: the economic and the financial.

The *economic analysis* provides information about the ability of the project to create or destroy value: its aim is to appraise the balance between the resources drawn and the resources generated by the project. The *financial* analysis looks at the financial sustainability of the project, and

examines whether the resources generated are sufficient to pay back the financial resources, both debt and equity, that are used to fund it.

The two dimensions of capital budgeting mentioned above are assessed on the basis of a standard methodology, which consists of the following inter-linked types of calculation, which will be explored in more depth in the following sections:

- a pro-forma financial statements calculation, which includes a projected profit and loss account, a balance sheet and a cash flow statement;
- a profitability ratios calculation, mainly consisting of net present value (NPV) and internal rate of return (IRR) estimates, which must be matched with the calculation of the most appropriate cost of capital for private investors; and
- a cover ratios calculation, which are essential indicators of financial sustainability, that is the ability of the project to meet lenders' requirements for the term and payment profile of the debt.

4.2.1 Pro-forma Financial Statements

As mentioned above, the pro-forma financial statements of a PPP project consist of a profit and loss account, a balance sheet and a cash flow statement.

Briefly, the profit and loss account provides an overview of project revenues and expenses and shows the net income incurred over a specific accounting period; the balance sheet illustrates a company's financial position (i.e. the assets owned, shareholders' funds and liabilities owed) at a specific point in time; and the cash flow statement demonstrates the difference between money inflows and outflows of the project.

While the profit and loss account and balance sheet are important, the cash flow statement is the most critical tool when assessing an investment project. Commonly, income flows are calculated on the basis of the accrual method of accounting, under which revenues and expenses are recorded when they are earned, regardless of when the money is actually received or paid. But even profitable projects, as measured by their net incomes, can become insolvent if they do not have the cash to settle short-term liabilities.

Conversely, the cash method recognises inflows when money is received, and outflows when money is paid. For industrial investors and subcontractors, the cash flow statement proves the project's ability to meet the pay-

ment terms of their suppliers during both the construction and management phase. For financial investors, the cash flow statement ensures that the project will generate enough cash to pay an adequate return on investment. For bank loan officers, the cash flow statement offers evidence that the project has a good credit risk and that there will be enough cash on hand to repay on schedule the capital and interest.

Put simply, a project can be considered economically and financially sound only if the sum of cash outflows is lower than the sum of cash inflows. For this reason, the following paragraphs put the emphasis on the concept of cash flow and how it is determined.

4.2.1.1 Cash Flow Calculation

An investment project is characterised by a sequence of cash *in*- and *out*-flows. Figure 4.2 shows the distribution of cash outflows and inflows for a typical investment project. In general, cash outflows happen during the construction/installation phase and cash inflows during the management/operation phase.

From an operational standpoint, to come up with the estimation of expected future cash flow of a PPP project, a set of input variables is to be defined, such as:

- the timing of the investment: in general the length of a PPP contract in the healthcare sector is about 25 years, during which time the payments must remunerate a highly capital-intensive project (or about 10/15 years, in case of PPP projects regarding the provision and management of medical equipment);
- initial investment costs (capex): this is spread across the investment period (variable between 1 to 5 years, depending on the scale of the project); and normally its value is fixed and includes adjustments to the forecasted inflation (though in emerging market countries, the contract may allow for an adjustment to capex to account for changes in inflation during the construction phase);
- public grant (if available): normally, to optimise its impact on the project and to reduce the costs associated with rolled up interest, this will be drawn down during the construction phase;
- operating costs: these are referred to the management phase and adjusted according to expected inflation;

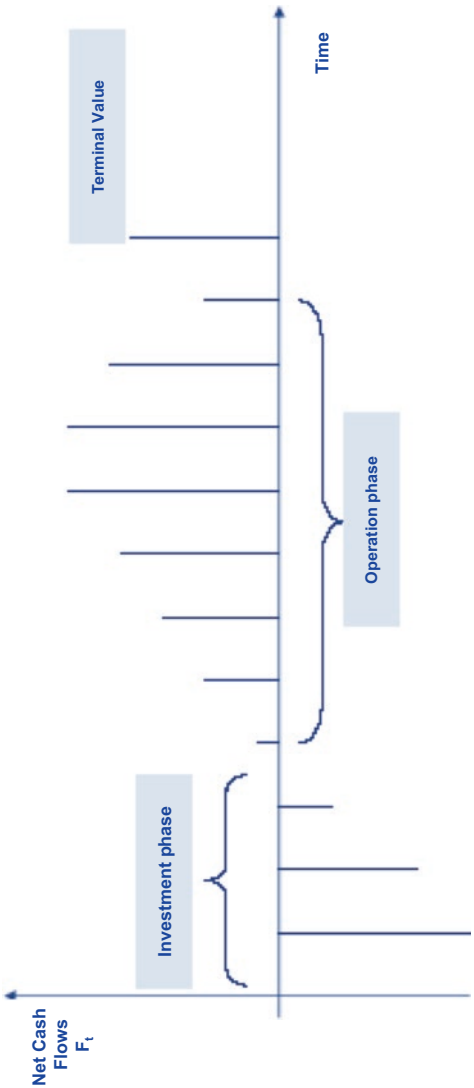

Fig. 4.2 Typical distribution of cash flows for investment projects (Source: Authors)

- changes in working capital: these can be negligible when the assessment is done for a long-term project;
- corporate taxes;
- VAT, related to the construction and management phases;
- depreciation: this should be calculated by considering not only the cost of the investment but also rolled up interest and senior debt fees (the agency fee and the commitment fee); generally, the depreciation is calculated by adopting the straight-line approach, that is, by depreciating the entire investment across the life of the contract; and
- financial structure: this consists principally of senior debt and equity but may include other forms of financing, such as junior debt (such as "mezzanine" debt) or a junior shareholder loan; the financial structure should be designed to optimise the cost of finance for the project and is usually high-leveraged; the debt repayment profile can be flat or, more frequently, designed to meet the lender's covenants, as explained below.

Project revenues, such as the availability charge or the tariffs, are calculated using the "goal seek function", in order to define the level of revenues that allow the economic and financial equilibrium (as defined below). With reference to the estimate of the project costs, such as the operating and capital costs and the interest rate on debt, it must be noted that if these are fully adjusted for the risks that may accrue to the project, the incentive of the investors to ensure that costs are minimised may be reduced.

Since the PPP market is concentrated and competition in procurement is limited, the authority must be careful in the definition of the shadow bid to be used as the basis of the selection process. Forecasted figures should help the assessment of feasibility, bankability and profitability, leaving, however, the appropriate incentive to the investors to identify, monitor and manage risks.

Once all the input variables have been identified, the cash flow calculation can take two configurations, on the basis of the method—*direct* or *indirect*—used to calculate it.

The main difference between the *direct* method and the *indirect* method involves the cash flows from operating activities, which is the first section of cash flow statement. When using the *direct* method, cash receipts and cash payments from operating activities are listed in the operations

Table 4.1 Cash flow calculation

	Direct method	*Indirect method*
Cash flow from operating activities	(+) Revenues from sales/ Availability payments	(=) Net Income (from P/L statement)
	(−) Raw materials and other operating costs	(+) Depreciation/Amortisation
	(−) O&M fees	(+/−) Increase/Decrease in working capital
	(−) Insurance costs	
	(=) EBITDA	
	(−) Depreciation/Amortisation	
	(=) EBIT	
	(−) Taxes	
	(+) Depreciation/Amortisation	
	(+/−) Increase/Decrease in working capital	
	(=) Cash flow from operation—Gross	**(=) Cash flow from operation—Gross**
Cash flow from investing activities	(−) Capital expenditures (capex)	(−) Capital expenditures (capex)
	(+) Public grants	(+) Public grants
	(=) FCFO	**(=) FCFO**
Cash flow from financing activities	(+) Financing	(+) Financing
	(−) Debt service	(−) Debt service
	(+) Tax benefit	
	(=) FCFE	**(=) FCFE**

Source: Authors

section of the cash flow statement. In contrast, in the *indirect* method, the net income is derived from the income statement and is adjusted to convert it from an accrual to a cash basis. In the direct method, taxes are calculated without taking into consideration the interests on debt, therefore, an adjustment is required to calculate the FCFE (tax benefit).

The calculation of cash flows, either with the direct or indirect method, takes on the configuration shown in Table 4.1 in every year or every period of the project's life, according to the timing of the cash flows.

By determining the difference between money inflows and outflows, the projected cash flow calculation values the ability of the project to generate enough cash that can be used to cover the debt service and to pay sponsors dividends that are in line with expected returns. These differences are called, respectively, *free cash flows to operations* (FCFO) and *free cash flows to equity* (FCFE).

4.2.1.2 The Time Distribution and Value of Cash Flows

As shown in Fig. 4.2, a project's cash flows occur at different times. For this reason, it is necessary to calculate the cash flows generated during the entire life of the project, because the time dimension of money outflows and inflows is closely related to the risk of the project.

The longer the period necessary to generate the cash inflows to repay the cash outflows, the higher the risk of the project. The risk is related to the likelihood of the project failing to generate the expected cash flows in the long term. Such risk arises from uncertainty in future cash flow estimates.

The risk associated with cash flows in the future reduces their value. Cash flows at different points in time cannot be compared and aggregated, as the immediate availability of money is preferred to a future availability and, therefore, a cash flow in the future is worth less than a similar cash flow at present time.

The principle of *present value* (*PV*), which we first encountered in Chap. 3, enables us to calculate exactly how much a cash flow sometime in the future is worth in today's money and to move cash flows across time, as shown by the formula below. The process of converting future cash flows into cash flows in PV terms is called *discounting*. This process allows bringing all cash flows at the same point in time, conventionally at period 0, before comparing and aggregating them.

$$PV_0 = \frac{CF_t}{(1+K)^t}$$

where

CF_t is the cash flow at the end of time period t
K is the relevant interest rate

4.2.2 Profitability Ratios: NPV, IRR and the Appropriate Cost of Capital

The main ratios used to assess a project's profitability are the NPV and the IRR.

NPV

The NPV expresses the net value generated by a project and it is based on the discounted cash flow calculation.

The NPV is the sum of the PVs of all the future cash flows generated by the project. As it considers not only the positive cash flows (usually generated during the management phase) but also the outflows (generated during the construction/installation phase), the NPV shows the difference between the project's financial benefits and costs, expressed in current money terms.

A positive NPV means that the project is able to generate enough resources to pay the investment carried out and the cost of financial resources, while leaving free cash flow for further investments or the remuneration of shareholders. Therefore, the NPV rule implies that a project with an NPV ≥ 0 is worth undertaking, while one with an NPV < 0 is not.

The formula to calculate the NPV is as follows:

$$NPV = \sum_{n}^{t=0} \frac{CF_t}{(1+k)^t} - CF_0$$

where

CF_0 is the project outflows generated during the construction/installation phase at time 0
CF_t is the project cash flows
K is the relevant interest rate, that is the cost of capital used to finance the project

The choice of discount rate is crucial in determining the value of the project as an investment: the higher the rate the lower the NPV, and vice versa.

Figure 4.3 shows the NPV function, where k* is the discount rate that makes the NPV equal to zero. k* is the maximum cost of financial resources that the project, with a certain distribution of cash flows, can afford.

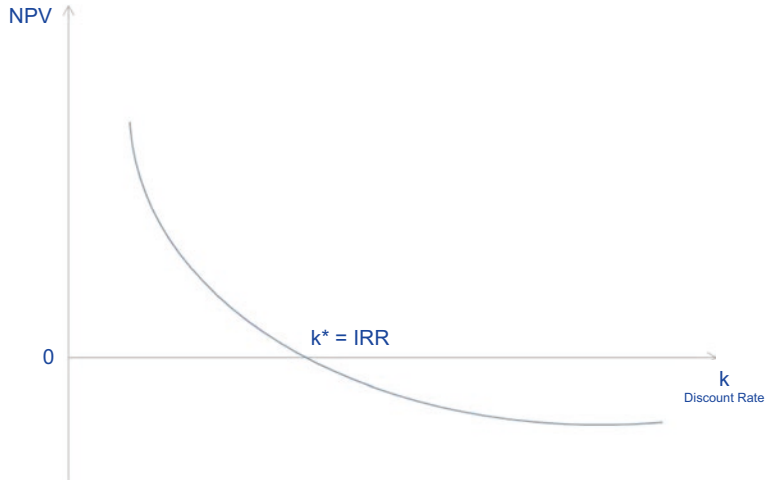

Fig. 4.3 The NPV and discount rate function (Source: Authors)

IRR

The IRR measures the return, expressed as a percentage, on the investment over its life. The NPV and the IRR are related to each other, as the IRR is the discount rate at which the NPV of the cash flow is 0.

The formula to calculate the IRR is as follows:

$$NPV = \sum_{n}^{t=0} \frac{CF_t}{(1+\mathrm{IRR})^t} - CF_0 = 0$$

The IRR is, then, equal to the discount rate k* shown in Fig. 4.3 and it expresses the maximum cost of the financial resources that the project, with a certain distribution of cash flows, can afford.

Therefore, if the IRR generated by the project is higher than *k*, the project generates incremental value. In contrast, if the IRR is lower than *k*, the development of the project faces financial costs that are higher than those it can afford.

It must be noted that the use of IRR for investment appraisal has three main pitfalls, namely:

- *multiple rate of return*: in the case of positive cash flows followed by negative ones and then by positive ones, the IRR may have multiple values;
- *mutually exclusive projects*: IRR should not be used to rate mutually exclusive projects as it ignores the magnitude of the project and for certain cash flows, in a comparison of investments, the higher IRR does not represent the higher NPV; and
- *term structure assumption*: the use of IRR falsely assumes that discount rates are stable during the term of the project; this assumption implies that all interim cash flows are reinvested at the same IRR.

In general, NPV and IRR produce the same investment decision, but this is not always the case, and NPV is generally regarded as more robust, by consequence of the IRR's weaknesses.

4.2.2.1 The Appropriate Cost of Capital

As explored in Chap. 5, the assessment of the opportunity cost of capital is essential to set the appropriate level of profitability and avoid overpayment. Furthermore, when calculating the NPV and IRR, the most appropriate discount rate must be matched with the correct choice of cash flows to be discounted. Considering the cash flow configuration shown in Table 4.1, two calculations are usually made (Fig. 4.4):

- at the project level—NPV and IRR are calculated on the FCFO; the discount rate used is the *weighted average cost of capital* (WACC), and
- for equity investors—NPV and IRR are calculated on the FCFE; the discount rate used is the *cost of equity* (*ke*).

It must be noted that often, in practice, bidders in PPP transactions refer to the Dividend Discount Model approach to calculate the equity NPV and IRR by considering only the equity invested during the development stage and the dividends paid by the project during the operation. This approach is not appropriate from the point of view of the public authority as it includes the periodicity of dividends' distribution.

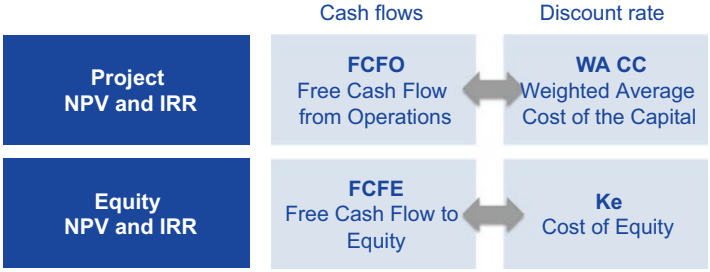

Fig. 4.4 The choice of the right discount rate for each type of cash flow (Source: Authors)

This is a particularly salient issue in project finance transactions as the standard "back-ending" of dividends results in NPV and IRR estimates that are much lower than those that would be estimated using the FCFE (such that the project will look far less profitable than is, in fact, the case).

The calculation of WACC must take into consideration both the cost of equity (*ke*) and the cost of debt (*kd*), with weights represented by the project debt-to-equity (or gearing) ratio, as shown in the formula below:

$$WACC = \frac{D}{D+E} \times Kd \times (1-T) + \frac{E}{D+E} \times Ke$$

where

kd is the cost of debt applied by banks lender
ke is the cost of equity
D is the amount of debt
E is the amount of equity
D + *E* is the sum of debt and equity, and in general it is equal to the total amount of financial resources necessary to implement the project (excluding public grants, when available)
T is the corporate tax rate
(1−T) expresses the tax shield that may be applied in certain jurisdiction in case of highly geared projects; (1–T) must be applied only when FCFO are calculated by using the direct approach

It must be noted that, in the context of project finance, the debt-to-equity ratio is not stable over the entire life of the project, but rapidly decreases as the debt is reimbursed. Therefore, the WACC changes and should be computed in every period. However, conventionally, the project WACC can be calculated using the project average debt-to-equity ratio.

The cost of debt (*kd*) is typically the sum of a reference rate (e.g. federal funds rate in the United States, Euribor and Eurirs in the European Union) plus a floating spread, which reflects the financial market's perception of the project's inherent risk as well as the intensity of competition on the financial markets. Therefore, this cost depends on project features, such as the economic/financial soundness of the initiative, the level of risk coverage provided by the contractual network surrounding the deal, and the standing of the counterparties to these contracts.

The cost of equity (*ke*) is the expected return by equity providers. While *kd* is a market value and therefore easily known, *ke* is more difficult to calculate. It expresses, in theory, the average return that could have been earned by putting the same amount of money into a different investment with equal risk (Sharpe 1964; Lintner 1965).

For listed companies, *ke* is defined, according to the Capital Asset Pricing Model (CAPM) theory—a method commonly used by firms to determine the minimum acceptable return on investment—as the sum of (i) the rate of return available on risk-free investments (the risk-free rate), and (ii) a premium for the amount of systematic risk that is involved in the equity investment (the Equity Risk Premium) (Graham and Harvey 2002).

For PPP transactions, even if there are no comparable projects listed on the stock market to take into consideration, the CAPM forms the basic framework for the analysis of the cost of equity for investors, as we examine in more detail in Chap. 5.

4.2.3 Cover Ratios: DSCR

Along with profitability, any initiative should also be valued in terms of financial sustainability. In other words, a project can reach economic equilibrium, but might not be bankable if the timing of the operating cash flows does not match the needs of lenders for debt service payment.

Cover ratios are indicators of financial sustainability and are the most important examples of financial covenants included in the credit agree-

ment. Cover ratios are indices that can show the extent to which a project's operating flows match those linked to the dynamic of financial items.

A number of cover ratios are currently in use; among them, the Debt Service Cover Ratio (DSCR) is commonly used.

The DSCR is calculated annually and expresses the relation between the FCFO and the debt service on the principal and interest. In other words, the ratio expresses whether in any given year of operations, the financial resources generated by the project are able to cover the debt service to lenders.

If the DSCR is higher than 1 it means that the cash flows of the project are sufficient to pay back the debt service; if it is lower than 1 it means that the resources generated by the project are not able to repay the debt.

The formula of DSCR is the following and can be calculated for each year or each period, according to the timing of the cash flows:

$$DSCR_t = \frac{FCFO_t}{(P+I)_t}$$

where

$FCFO_t$ is the free cash flow to operation at the end of a given period
P_t is the principal of debt service
I_t is the interest of the debt service

Observed levels of DSCR depend on the deal—that is the risk inherent to the project as perceived by lenders. However, in general, the material breach of covenants is frequently associated with DSCR close to 1.3x–1.5x.

It must be noted that, in the case of a project financing, the debt repayment obligations are typically calculated to ensure that the principal and interests are appropriately matched to achieve a desired target DSCR, which is usually referred to as *debt sculpting*.

4.2.4 Sensitivities

The financial model also needs to be sufficiently flexible to allow both investors and lenders to calculate a series of "sensitivities" showing the effects of variations in the key input assumptions. Such sensitivities may

include calculating the effect on Cover Ratios and the Equity IRR and NPV of:

- construction-cost overrun;
- delay in completion;
- deductions or penalties for failure to meet availability or service requirements;
- reduced usage of the project (where private investors assume demand risk);
- higher opex and maintenance costs;
- higher interest rates (where these are not fixed); and
- changes in inflation.

In summary, the sensitivities look at the financial effect of the commercial and financial risk aspects of the project not working out as originally expected. This calculation of several different adverse events happening at once is also called "scenario analysis".

Sensitivities are very important to assess the capacity of the project to bear risk. Investors must be aware of the impact of risks on the project profitability; at the same time the public sector must check that the project cash flow are not fully adjusted to the risk, otherwise the private investors have no incentive to manage the project in a way to avoid risk appearance and therefore to successfully execute it, in order to generate value per se and for the taxpayers.

In the context of the EU, these calculations are very important in order to demonstrate the transfer to the concessionaire of an operating risk, as discussed in Chapter 3.

Box 4.1 shows an example of how to calculate the value of the operating risk within a PPP contract.

Box 4.1. Calculating the Value of Operating Risk: An Example

Within a PPP contract for the management of medical equipment services, the value of the operating risk borne by the concessionaire is shown in Table 4.2.

We defined four different risk scenarios and their relative probability of occurrence. Then we calculated the value of the operating risk by multiplying the deductions and penalties that would have been applied to the daily availability charge for such risks by their probability of occurrence.

Table 4.2 Value of the operating risk of a PPP contract for the management of medical equipment services

Scenario	*Probability of occurrence*	*Description of risk*	*Value of the risk in € (effect on the Equity NPV)*
1	40%	1 equipment non-available for 2 days per week	−359.114
2	30%	1 equipment non-available for 3 days per week	−736.941
3	20%	2 equipment non-available for 2 days per week	−1.133.942
4	10%	2 equipment non-available for 3 days per week	−2.087.764
Expected value of the equity NPV as a consequence of the risks occurrence			−800.293

Source: Authors

4.3 The Economic and Financial Equilibrium in PPP Transactions

As discussed above, when considering an investment, private investors generally use NPV and IRR to assess the general financial viability of a project, and use the discount rate as a "hurdle rate", choosing those investments whose IRR is at least equal or above the discount rate, in which case the NPV is also positive.

However, PPP projects are based on agreements signed with a public authority according to which the risk is limited, as some risks are retained by the contracting authority (i.e. part of the environmental risk; the regulation risk; the political risk; part of the force majeure risk, as shown in Chap. 3). Therefore, at the time of contract signature, project revenues (tariffs or the availability charge) must be enough to cover:

- operating and capital costs, including also the industrial investors' margins;
- interest on debt;
- taxes; and
- dividends, forecasted on the basis of the expected return for equity investors.

If the project generates a higher profitability, in other words if the project or equity NPV is higher than 0, it means that the project generates

Table 4.3 Key indicators used in capital budgeting and common decision rules used to calculate economic and financial equilibrium

Dimension	*Measure*	*Economic and financial equilibrium set when*	*Meaning*
Profitability of the project	NPV Project IRR Project	NPV = 0 IRR = WACC	Forecasted project revenues covers forecasted project costs (opex and capex, including also the industrial margins, charged by subcontractors) and remunerate debt and equity investors Forecasted return rate delivered by the project is equal to the overall cost of the capital
Profitability for equity investors	NPV Equity IRR Equity	NPV = 0 IRR = *Ke*	The forecasted net amount of money after the senior debt repayment is enough to pay the expected dividends to the sponsors The forecasted return rate delivered to the sponsors is equal to what is expected
Bankability/ Financial Sustainability	DSCR	DSCR > 1.0	Ability of annual project cash flows to cover the annual debt service on the principal and interest

Source: Authors

more value than the expected (fair) level. The extra value generated represents a shield against financial losses, which may reduce the incentives to monitor and manage project risks (Table 4.3).

4.4 The Renegotiation of the Contract and the Restoration of Economic and Financial Equilibrium

Many PPP contracts are renegotiated during the operational phase. This is more likely than in other contract types because of the length and complexity of such deals. In general, such renegotiations pose a threat to the public sector's financial interests. Yet a renegotiation may be necessary when *factors outside the responsibility of the SPV* occur that generate financial losses. In this case the renegotiation is called by the SPV itself. It is also possible that the authority asks for a renegotiation when exogenous factors lead to excess profits for the SPV.

In the healthcare sector, renegotiations most frequently occur as a consequence of the need to change the outputs specification. For example, when contracts include services and the SPV does not bear demand risk, renegotiations may happen due to changes in demand (number of patients), and therefore the output requirements of the contract. In this case, a new financial model must be prepared, with new data regarding capital or operating costs, in order to define the necessary changes to restore economic and financial equilibrium.

Generally, the result of the renegotiation is a change in the level of revenues (e.g. a higher or lower availability charge); sometimes, the contract length is changed. When the reason for the renegotiation is a change in the output specification, leading to the needed capital expenditure value to be increased, the authority can opt to cover this with a capital grant or an increased amount of the grant already incorporated in the contract, instead of increasing the availability charge. Although this would compromise the risk transfer features of the deal, an increased grant may be a cheaper solution than a corresponding increase in the amount of the privately financed capital expenditure, and ultimately the availability charge.

These is because: (i) the grant is allocated immediately to the project, while the availability charge is spread across the life of the contract; (ii) if the increased capital cost is not covered with a grant, the SPV has to borrow extra money, thus increasing the amount of interest to be charged to the project cash flow. Therefore, it is not unusual, when fiscal constraints enable it, for public authorities to borrow money to pay for any increased capital cost, rather than increasing the level of the debt needed to fund the project.

Changes to the financial model made through a renegotiation process must be done in order to restore the original economic and financial conditions. This means that the changes should be undertaken so as to reach the same project and equity NPV and IRR as set at the time of contract signature. Also the DSCR should be kept at the same level to assure the project's ongoing bankability.

The contract renegotiation process becomes challenging when the original pro-forma financial statements lack transparency or are not clearly developed, or when the circumstances that have led to the renegotiation are multiple and accumulated over time.

However, in order to avoid a situation in which the renegotiation compromises the original, desired, risk allocation between parties, it is essential to insulate the elements that require adjustment from the rest of the deal. This is best achieved by developing the new financial model as an iteration of the original model, making changes to the relevant parameters as necessary.

So, for example, if the overall increase in the capital costs is 2 million euros, of which only 500,000 euros are the consequence of a request from the authority to modify the project as originally approved, the renegotiation of the financial values must be focused exclusively on the 500,000 euros. The other 1,500,000 euros relate to activities and risks under the responsibility of the SPV and they will be covered by the SPV itself, thus generating reduced profitability, or by subcontractors, to leave the SPV profitability and the project's bankability unchanged.

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CHAPTER 5

Assessing the Cost of Capital for PPP Contracts

Mark Hellowell and Veronica Vecchi

Abstract This chapter outlines the theoretical frameworks and practices used by firms to estimate the appropriate rate of return on their investments in healthcare PPP projects. Our aim is to outline the appropriate method for assessing the "reasonableness" of returns, drawing on capital budgeting theory. We focuse on estimates of the cost of capital for the *direct investor of primary equity* in the SPV. In other words, we are interested in the rate of return that directly affects the bid and contract price, because this is the price that is ultimately be paid for by the users of the infrastructure or technologies to which the project relates. The cost of equity is, in this sense, an important variable in the financial appraisal and value-for-money analysis for the PPP.

Keywords Capital budgeting • IRR • economic efficiency • cost of capital • value-for-money • market psychology

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5.1 Introduction

This chapter outlines the theoretical frameworks and practices that are used by firms to estimate the appropriate rate of return on their investments in healthcare PPP projects. Its aim is to outline the appropriate method for assessing the "reasonableness" of returns, drawing on capital budgeting theory, as outlined in Chap. 4 (and briefly summarised below). Investors are not obliged to invest in a given PPP, or a given PPP market. In general, investors will be interested in a PPP only if the expected return equals or exceeds the market price of the risk they will bear.

In this chapter, we are focused on estimates of the cost of capital for the *direct investor of primary equity* in the SPV. In other words, we are interested in the rate of return that directly affects the bid and contract price, because this is the price that is ultimately paid by the users of the infrastructure or technologies to which the project relates. The cost of equity is, in this sense, an important variable in the financial appraisal and value-for-money analysis for the PPP.

5.2 The Cost of Equity: A Conceptual Framework

The degree of risk involved in an investment determines the cost of capital. Finance theory refers to two main categories of risk which require distinct analysis: these are specific (or idiosyncratic) risk and *systematic* (or market) risk. Specific risks are associated with events that affect the cash flows of the individual project considered, but not the cash flows of other assets in the portfolio, such that the effect is spread across the portfolio and overall portfolio returns are unaffected. Most of the technical risks associated with PPPs are of this type, and include:

- the risk that design or engineering processes may fail to perform as expected;
- the risk that faulty building techniques or poor project management lead to cost escalation during construction;
- the risk that operations and maintenance costs may be higher than projected; and
- the risk that performance may not be up to the standard expected at financial close, giving rise to deductions or penalties, and reduced income for the private sector operator.

In contrast, systematic risks are those that are correlated with the performance of the stock market, or the general economy, and affect many or most assets and have a direct effect on portfolio returns. Risks in this category include the costs of inputs (especially those sold on international markets), regional or global political instability, demand risk and various types of financing risk.

The theoretical literature dictates that the cost of equity is unaffected by specific risks. These have impacts on individual investments, but these impacts are offset, and ultimately reduced to a value of zero, across a portfolio so long *as the portfolio is adequately diversified*. Standard theory acknowledges that specific risks can impact on the project, and must be carefully taken into account by investors, but requires that these are modelled in the expected cash flows, not as a premium on the expected return.

In contrast, systematic risks cannot be eliminated by diversification, since they affect all investments to some degree. This view of the risk is reflected in much of the previous theoretical literature on PPPs (e.g. Klein 1997; Grout 1997; Currie 2000; Grout 2003; Boyer et al. 2013) and is known to be widely understood and applied in real-life capital markets (Graham and Harvey 2002).

The view is formalised in the CAPM, of Sharpe (1964) and Lintner (1965), much the most common theoretical framework used by investors in equity markets globally. It has been found to be the most frequently used model in estimating an appropriate rate of return for infrastructure projects in emerging markets, including Africa (PricewaterhouseCoopers 2015). The CAPM determines that the return required on any given project—that is the return that it must generate in order to attract capital from the markets—is a function of the return available on a risk-free investment (the risk-free rate) plus a premium for the amount of systematic risk in the investment being considered (the equity risk premium).

In corporate finance, the risk-free rate is normally referenced to the return on fixed income securities issued by Governments. This is taken to be a benchmark for the return required by the market on a riskless asset. In principle, a risk-free security involves no uncertainty about the solvency of the sovereign counterparty and its willingness to make scheduled debt payments (Damodaran 2009). Thus, bonds issued by corporations are not risk free, as even the largest firm may declare bankruptcy and fail to meet its debt obligations. In contrast, securities issued by a Government in a jurisdiction with its own currency and central bank are considered to involve zero default risk. As Governments have the power to print money

to pay off debt, holders of these securities can be confident that they will receive the expected return on their investment (at least in nominal terms).

Under the CAPM, the equity risk premium is arrived at by multiplying:

- the Beta (β) of the investment—that is the weighted covariance of the projected excess return on the investment—with the average excess return on the market as a whole; and
- the Equity Market Risk Premium (EMRP)—that is the average excess return on the equity market, reflecting the market's view of the risk inherent in the equity market as a whole.

To clarify, if the variance (i.e. the risk) of a given investment is perfectly correlated with that of market portfolio (e.g. the FTSE 500), Beta is 1 and the required return on an asset valued using the CAPM is equal to the required return on the equity market as a whole (the market portfolio). Conversely, if there is no correlation between the risk of an investment and that of the market portfolio, Beta is 0 and the required return is the observed market rate on a risk-free security. It should be noted that an investment with a Beta of 0 may still involve a substantial magnitude of project-specific risk (i.e. actual returns may vary significantly from those projected at the time of the investment analysis). However, as long as the expected variance is uncorrelated with the expected variance of the market portfolio, the probability of such variation will not (or should not) attract a premium under CAPM (Brealey et al. 2008).

As the CAPM is the most popular method for estimating the cost of equity (and due to its common usage among regulators and investors, including in the infrastructure sector), it forms a basis for the analysis of the cost of capital here. However, the method needs to take account of a number of key issues and complexities, on which the evidence is limited, and for which we have sought the input of the market to better understand dominant perceptions and practices.

These include the following:

1. Estimating the risk-free rate. In emerging markets, the assumption that the Internal Rate of Return on fixed income securities issued by Government can be regarded as risk-free is questionable. The market may, for instance, perceive such securities (where they exist) to

have exposure to a non-negligible amount of risk, including currency volatility and sovereign risk.

2. Estimating the EMRP. Estimates of the EMRP are not uniform across global equity markets, as they depend on (a) the period over which returns are calculated; (b) the method chosen for computing the average rates of return; and (c) whether they are designed to reflect current or expected market conditions (Vivian 2007). A further complication relates to emerging markets specifically, in which historical data is either non-existent or is perceived to be unreliable, and where a few large companies (many of them unlisted) may be dominant.
3. Deriving β. Equity on a PPP project is provided by the owners of the SPV. This is usually a completely new business that has been established with the sole remit of delivering the contracted infrastructure and related services (and earn an income from doing so). As a result, there are no historical data regarding dividends or share price movements and, therefore, no directly observable market data on which to base Beta. Adapting the CAPM to cope with businesses with no historical performance data is a complex process, and requires data from industries or companies that undertake activities generating a similar level of risk to those of PPP projects.
4. Identifying the degree of portfolio diversification. The CAPM assumes that the investor has a well-diversified portfolio, such that variation in the return on individual assets has a negligible impact on returns. However, where markets are segmented and investors have small or concentrated portfolios, an additional premium for specific risk may be required (see Merton 1987).

Given these areas of uncertainty, it is apparent that the application of the CAPM is not straightforward in the context of healthcare PPP projects. A simple application of the CAPM approach may not be feasible on many projects and, even where it is, may lead to estimates of the cost of capital that vary considerably from those considered reasonable in the market. A method for estimating the cost of capital that can command broad support among stakeholders must take account of actual market perceptions and behaviours in relation to these areas of uncertainty. It is to these perceptions and behaviours that we now turn.

5.3 How the Market Really "Thinks"

Theories of how markets behave are often imperfect. In the case of finance theories as related to healthcare PPPs, a number of key assumptions are not borne out in practice.

Crucially, direct investors of primary equity in SPVs do not, in general, consider themselves to be well diversified. The majority of investors in PPPs are *operational investors*—for example construction groups, civil engineering firms and concession companies—which not only invest in the equity of the SPV but also deliver the operational components of the contract. For these entities, portfolios are naturally concentrated in the infrastructure sector. Even those that have been successful in large mature markets, such as Australia, Canada and the UK, are unlikely to have portfolios of more than 25–50 investments, resulting in limited diversification, which may also include very concentrated exposures (i.e. a small number of very large deals).

In addition, many purely *financial investors* also have concentrated portfolios—often as a matter of design. There are, for instance, a growing number of infrastructure funds in the international PPP market that are established to be specialised, with a mandate to target particular sectors and particular geographies, and set up teams of experts that understand those assets and attempt to diversify risk across them. While there are investors in the market that have portfolios that approximate the level of diversification assumed in the orthodox CAPM approach (see Chap. 3), they rarely act as direct investors of primary equity in any market, and almost never do so in emerging markets.

As a result, investors in PPP markets generally perceive that projects in this market involved a higher degree of risk than their own corporate portfolios. For example, for an operational investor, a return above their own corporate WACC will often be seen as necessary to ensure that the investment is accretive to the value of the business—that is to be worth making the investment. Even in the case of well-diversified investors (a small minority of those in the primary market), agency problems may play a role in ensuring that specific risks are carefully considered and priced in the analysis. It is widely understood that a management team responsible for allocating capital may be rewarded if the project exceeds expectations, but more than proportionally penalised if it falls short. Thus, returns on specific investments, and the risks that relate to them, may matter greatly for an individual's career and income.

The specifics of the pricing method will often vary according to the type of investor—that is whether they take an operational interest in the deal or do not. In the former case, company boards will typically set minimum rates of return for projects which reflect the WACC of the business, including a cost of equity determined by the degree of systematic risk faced by the

business, and consider specific premiums for individual risk factors, adding these according to a "building blocks" approach (see below). For financial investors, the equivalent of the corporate WACC is the cost of funds—that is the yield the institution must achieve for it to retain investment. This ratio sets the minimum threshold that the expected rate of return on each project must surpass for investment to be approved. Again, specific premiums for individual risk factors may be added on a case-by-case basis.

Alternatively, some financial investors adopt a comparative approach, where returns are priced according to equivalent projects in mature markets (where markets norms in terms of pricing are relatively stable and well known [see Colla et al. 2015]) before taking account of the higher probability of policy reversals and the enforceability of contractual claims in some markets. For direct investors focusing on emerging markets, these risks are already built into the cost of funds threshold, and the magnitude of any additional adjustment may be modest. In effect, a qualitative approach is applied: a *binary decision* about whether to invest in a given country and project for the market return or not, rather than accounting for risk via a significant adjustment to the premium.

From our qualitative research, we conclude that investors in the PPP market are only moderately diversified. In the case of operational investors, expected returns are derived using corporate WACCs, based on the level of systematic risk faced by the firm across all areas of its business activities, adjusted according to a building blocks approach that takes into consideration the risks of the project under consideration. As the magnitude and potential impact of such risks are, in general, perceived to surpass those borne on the corporate portfolio, this approach will generally lead to an expected rate of return that is *higher* than the corporate WACC.

The key point to note is this: investors are willing to take on risk, both specific and systematic—that is their role in the economy. But both forms of risk will be charged for; increasing the cost of equity, and beyond a certain point additional risk (which may relate to the project or the market in general) is likely to result in non-investment rather than merely positive adjustments to the return.

5.4 Applying the CAPM to PPPs in Real-World Markets

In this section, we explain how the CAPM can be revised to address the issues described above. We outline the approach according to the three main variables—the risk-free rate, Beta and the Equity Market Risk Premium—and then summarise the approach according to a series of logical steps.

5.4.1 *Estimating the Risk-Free Interest Rate*

As already noted, the risk-free rate is the return on an investment with no variance around the expected return. It is standard practice to use the interest rate on Government securities as a proxy for a risk-free security, and the selection of the appropriate maturity is a function of the expected holding period for the investment to which the discount rate is to be applied (Damodaran 2008). In PPPs, because of their long-time horizon, the weighted average yield on long-dated Government bonds—for example, 15-year, 20-year or 25-year bonds issued in the relevant year—may be used.

The geographical location of the project does not determine the choice of the risk-free interest rate. Rather, this is determined by the currency in which the cash flows are to be estimated (Damodaran 2008). Thus, if cash flows are estimated in nominal US dollar terms, the risk-free rate is referenced to the appropriate US Treasury bond rate. While this may be counter-intuitive, given the higher risk in emerging market countries, it is consistent with standard theory (and our survey and interview findings) since the risk-free rate is not the appropriate variable for considering the pricing of risks.

In emerging markets, local currency bond rates include a credit default spread and do not, therefore, express a "pure" risk-free rate. Therefore, if the investor chooses to use local currency bond rates, the default spread of the country is subtracted from the market interest rate on the local bond to determine the risk-free rate in the local currency.

Box 5.1 The Risk-Free Interest Rate: An Illustration

Using the Turkish Lira bond as an illustration, we subtract the credit default spread of Turkey (based on Moody's rating, Ba1 in 2017) from the 10y Government bond yield as shown in the formula below.

$$\begin{aligned}\text{riskfree rate in Turkish Liras} &= \text{10y rate on Liras bond} - \text{default spread}_{\text{Turkey}} \\ &= 10.22\% - 2.89\% = 7.33\%\end{aligned}$$

Source: Bloomberg and Moody's 2017

5.4.2 Estimating Beta

As noted above, Beta is the key measure of systematic risk. It gauges the tendency of the return of a financial security to move in parallel with the return of the stock market as a whole. Betas are available for listed companies. However, equity capital on a PPP project is provided by the owners of the SPV, which is a non-listed company, with no historical data regarding dividends or share price movements, since it is a brand-new business that has been established with the sole remit of delivering infrastructure and services and earn an income from doing so. As a result, there are no data on which to base the Beta estimates.

However, it is generally believed that CAPM can be adapted to cope with unlisted businesses (Mitenko and Okleshen 1998; Bowman and Bush 2006). In such cases, Beta can be derived from industries or firms with similar activities to those undertaken in the PPP project and are thus exposed to the similar risks (see Box 5.2). However, in emerging markets, where data comparable industries or firms may be limited or non-existent, it is possible to use sectoral beta calculated with reference to wider geographical areas, the most inclusive of which is to use the sectoral beta of the emerging markets as a whole.

For example, relevant betas for healthcare projects may be those relating to construction, healthcare support services, utilities and other infrastructure-related sectors with long-term planning horizons, such as transportation. To better mirror the sectoral composition in the project Beta, it is also possible to weight the sectoral Betas, by referring to the relative dimensions of each sector against the overall economic value of the project.

To get a reliable Beta, data should be sourced from a past period of at least 10–15 years. This data can be sourced from a range of commercial databases, such as *Bloomberg*, *Thomson Datastream* and *OneBanker*. It should be noted that the form of Beta available on such databases is the Equity Beta. This form of Beta reflects the level of systematic risk that company shareholders face in addition to the risks related to the firm's financial leverage (which will be different to the leverage of the specific project under consideration), implying a different level of risk borne by equity.

Therefore, an adjustment needs to be made. To calculate the average Asset Beta for a specific PPP project, the equity Beta is deleveraged, according to the following formula:

$$\text{Asset Beta} = \text{Equity Beta} \div \left[1 + (1 - \text{tax rate}) \times \begin{pmatrix} \text{amount of debt} \div \\ \text{amount of equity} \end{pmatrix}\right].$$

Box 5.2 Estimating Asset Betas: An Illustration

The table below shows average asset *Beta* for five comparable industries in emerging market countries over the period 2007–2017.

Industry	*Number of listed companies*	*Equity beta*	*D/E ratio*	*Average sector tax rate*	*Asset beta*
Construction	694	1.15	84.42%	14.92%	0.67
Healthcare support services	109	1.22	21.78%	18.14%	1.04
Transportation	141	1.14	65.66%	18.74%	0.74
Utility (General)	13	0.81	215.44%	16.52%	0.29
Utility (Water)	56	1.29	44.17%	17.37%	0.94

Source: Bloomberg 2017

For example, in the case of a hospital PPP project, the beta can be calculated with reference to the beta of the construction and healthcare support sectors in emerging markets. To weight the betas, the value of supporting services compared to value of the investment (construction component) must be calculated. The value of supporting services is the discount value of the revenues for the SPV related to supporting services.

If the value of healthcare supporting services is 50% and the value of the investment is 50%, the average beta is 0.85.

The average asset beta is then re-leveraged by referring to the average project's financial leverage. Finally, beta should be also adjusted according to Blume theory (Blume 1971), which reflects the fact that estimated betas have a tendency to revert to the market mean (i.e. 1) over time.[1]

Damodaran suggests that, if Betas are missing for the relevant businesses and sectors in a specific country, which will often be the case for the emerging market context, it is possible to utilise data from advanced economies, adjusting them by adding a factor to compute the country risk.

Box 5.3 Estimating Re-levered Betas: An Illustration

Using, again, the case of Turkey and a PPP in the healthcare sector, we assume an average project D/E of 60%. We calculate levered beta, and then the adjusted Beta, as follows.

$$\begin{aligned}\text{Re–levered beta (Turkey)} &= \text{Asset beta} \times \left[1 + \left(1 - \text{tax rate}_{\text{Turkey}}\right) \times \left(\text{D / E}_{\text{Project}}\right)\right] \\ &= 0.85 \times \left[1 + \left(1 - 20.00\%\right) \times 60.00\%\right] \\ &= 1.258\end{aligned}$$

$$\begin{aligned}\text{(Bloome) Adjusted beta (Turkey)} &= \left(1.258 \times 0.67\right) + \left(1 \times 0.33\right) \\ &= 1.173\end{aligned}$$

Source: Bloomberg 2017

Betas measure systematic risk—that is the risk added by an investment to a perfectly diversified portfolio. However, direct investors of primary equity do not consider themselves to be well diversified, as we have seen. Most market players that participated in our research perceived the risks faced by primary equity to exceed those faced on their corporate portfolios. Therefore, it is likely that betas derived in a conventional way will understate the investor's exposure to risk.

In this case, a fairly simple adjustment should allow this non-diversifiable risk to be factored into the Beta computation, at least where relevant data exists (Damodaran 2009). This adjustment is based on the calculation of the standard deviation in a private firm's equity value and the standard deviation in the market index, where the standard deviation of the firm's equity value is scaled against the market index's standard deviation to yield what is called *total beta*. However, this approach cannot be applied to PPP transactions as SPVs are new companies for which no historical data related to the equity value is available. Therefore, as reflected in our qualitative research findings, additional risks must be added in the estimate of the risk premium, according to a "building blocks" approach.

5.4.3 *Estimating the Equity Market Risk Premium*

As stated in Part 1, estimates of the formal EMRP are not uniform across global equity markets, as they depend on the period over which returns are calculated, the method chosen for computing the average rates of return and whether they are set to reflect current or expected market conditions (Damodaran 2016a; Vivian 2007). Nevertheless, the most widely used methodology to estimate the EMRP is the so-called *historical risk premium approach* (Damodaran 2016a), in which the average return earned on equities over a long time period is estimated and compared to the average return on a risk-free security. The difference, on an annual basis, between the two returns is computed, using the arithmetic or geometric mean. This difference represents the historical risk premium.

This is a relatively straightforward process for mature markets, but presents a number of challenges when the focus is an emerging market, in which historical data is either non-existent or unreliable, and where a few large companies (many of them unlisted) are usually dominant. Therefore, the *historical premium plus* is generally applied (Damodaran 2016b).

More generally, over the last three decades several studies have cast some doubt on the efficacy of the CAPM model, finding that it understates the expected returns of stocks with specific characteristics. As normally calculated, the equity risk premium is referred to the risk for all stocks within a market, regardless of their differences in terms of market capitalisation and growth potential. In effect, it is assumed that Betas capture differences in risk across companies (Damodaran 2016b).

According to Graham and Harvey (2002), the most important additional risk factors to the EMRP that are considered by investors are as follows: exchange rate risk, business cycle risk, interest rate risk and inflation risk. In a PPP contract, the last three risks are less relevant, as returns on infrastructure are relatively insensitive to the economic cycle, interest rates are either fixed or hedged against and revenues are usually adjusted for inflation. Where that adjustment creates risks to the nominal return, those risks are normally hedged in the derivatives markets, via inflation swaps. However, our qualitative findings suggest currency risk is carefully considered in pricing decisions.[2]

The magnitude of country risk, especially when portfolios are not diversified across geographies, may be underestimated in the standard EMRP approach. Especially when estimated using local indices, Betas do

not adequately capture differences in country risks. This risk is difficult to assess in the adjustment of the cash flow and therefore the risk premium is generally adjusted (Damodaran 2016a).

There are two approaches to calculate the country-specific EMRP (Damodaran 2016b) and they are based on the "Mature Market Plus" approach, which adds to the base premium for mature equity market a country risk premium, defined on the basis of the following two approaches:

- Default spread
- The relative equity market standard deviation

According to the first approach, the default spread that investors charge for buying bonds is used as a proxy to calculate the country-specific risk premium. The premium calculated must be added to the expected return on equity for a mature market. However, this approach takes into consideration only the risk of default and is unaffected by other risks. According to the second approach, the equity risk premium of markets should reflect the differences in equity risk, as measured by the volatilities of these markets. As a conventional measure of equity risk is the standard deviation in stock prices, higher standard deviations are associated with more risk (Damodaran 2016b). Therefore, the relative standard deviation for a country$_x$ is as follows:

$$\text{Relative standard deviation}_{\text{country x}} = \sigma_{\text{country x}} / \sigma_{\text{US}}$$

This enables the equity risk premium and the risk premium for country$_x$ to be calculated, as follows:

$$\text{Equity risk premium}_{\text{country x}} = \left(\begin{array}{l} \text{Risk premium}_{\text{US}}^{*} \\ \text{Relative standard deviation}_{\text{country x}} \end{array} \right)$$

$$\begin{aligned} \text{Country}_{\text{X}}\text{Risk premium} &= \text{Risk premium}_{\text{US*}} \left(\sigma_{\text{country x}} / \sigma_{\text{US}} \right) \\ &\quad - \text{Equity risk premium}_{\text{US}} \end{aligned}$$

There is also a third, combined approach. As the country risk premiums are larger than those captured by the country default risk spread, the volatility of the equity market relative to the volatility of the bond market used

to estimate the spread can be taken into consideration, according to the following formula:

$$\text{Country}_x\text{Risk premium} = \text{Country}_x\text{Default spread}^{*}\left(\sigma_{\text{equity}} / \sigma_{\text{country bond}}\right)$$

A complication is that many emerging market countries do not have a sovereign rating, which does not allow the calculation of a credit default spread in this way. However, Damodaran and Harvey (2005) found that the country risk score from the Political Risk Services (PRS) group[3] is correlated with the cost of the capital for emerging market companies. Therefore, when an emerging country does not have a sovereign rating but is rated by the PRS group, data for countries that have a similar PRS score can be used to assign the default spreads that these countries face.

In addition, inflation must be taken into consideration in the estimation of the EMRP. The risk-free rate in a currency should, in theory, incorporate both the expected inflation and the real return for investors. Using the free-risk rate of a certain Government may be the solution, but in an emerging market the Government bond market (where it exists) may be illiquid and volatile. Therefore, an alternative approach is to use the differential inflation with the US market, according to the following formula:

$$\begin{aligned}\text{Cost of capital in a country}_x &= \left(1 + \text{Cost of capital in USD}\right) \\ &+ \left(\frac{\left(1 + \text{expected inflation rate in country}_x\text{currency}\right)/}{\left(1 + \text{expected inflation rate in USD}\right)}\right) - 1\end{aligned}$$

Finally, a point noted in our interviews by several respondents is that, when country risk is well computed in the estimation of the cost of the equity, there is no need to compute the currency risk, which is correlated to the country risk (Damodaran 2016a).

In the following table, we provide some examples about how to calculate the EMRP for some emerging countries, by using the third melted approach.

Box 5.4 The EMRP for a Selection of Emerging Markets, by Applying the Melted Approach

Factors	*Algeria*	*Turkey*	*Indonesia*	*Colombia*	*India*
Base risk premium (US ERPM)	5.69%	5.69%	5.69%	5.69%	5.69%
Country sovereign rating (Moody's)	N/A	Ba1	Baa3	Baa2	Baa3
Country default spread	3.12%[a]	2.89%	2.54%	2.20%	2.54%
Relative volatility (equity/bond)	1.3	1.3	1.3	1.3	1.3
Country risk premium	4.06%	3.75%	3.31%	2.86%	3.31%
Total ERPM	9.75%	9.44%	9.00%	8.55%	9.00%

Source: Bloomberg, PRS Group and Damodaran 2017

[a]Algeria does not have a sovereign rating, so we calculated the country default spread using the PRS score of the country. Algeria is rated 63.00 by PRS group, thus we applied the average default spread of countries falling in the range 62.00–64.00 according to PRS score

Box 5.5 The Cost of Equity for a PPP Project in the Healthcare Sector for a Selection of Emerging Markets

By using all the factors calculated above, we calculated the cost of the equity, with and without the illiquidity premium.

Factors	*Algeria*	*Turkey*	*Indonesia*	*Colombia*	*India*
10y Government bond yield	4.75%	10.22%	6.83%	6.21%	6.49%
Country default spread	3.12%	2.89%	2.54%	2.20%	2.54%
Risk-free rate	1.63%	7.33%	4.29%	4.01%	3.95%
Asset beta	0.85	0.85	0.85	0.85	0.85
Tax rate	26.00%	20.00%	25.00%	25.00%	34.61%
Average project D/E	60.00%	60.00%	60.00%	60.00%	60.00%
Re-levered beta	1.23	1.26	1.23	1.23	1.18

Factors	*Algeria*	*Turkey*	*Indonesia*	*Colombia*	*India*
Adjusted beta	1.15	1.17	1.16	1.16	1.12
EMRP	9.75%	9.44%	9.00%	8.55%	9.00%
Total cost of equity	**12.85%**	**18.40%**	**14.68%**	**13.88%**	**14.05%**
Total cost of equity with illiquidity premium (3%)	**15.85%**	**21.40%**	**17.68%**	**16.88%**	**17.05%**

Source: Bloomberg, PRS Group and Damodaran 2017

5.5 Risks in PPP Transactions and Determining the Cost of Equity

As primary equity investors are generally not well (let alone perfectly) diversified, it is crucial to understand what risks are retained by the investor in each transaction and how these should be priced. The methodology suggested below is based on the understanding of the risks retained by equity investors through the market—the risk matrix (as presented in Chap. 3).

Once risks retained by equity investors have been identified, a second step must be conducted in order to understand how to price them according to the adjusted CAPM methodology.

As explained in Chap. 3, project-specific political risks are generally retained by the public authority and are therefore not borne by primary equity investors. Consequently, they should not be priced in cash flows or the cost of equity. However, by applying the adjusted CAPM approach we have recommended above, the country risk can be taken into consideration as a proxy of the risk (legal and political) of doing business in a certain country.

Technical risks are allocated to the SPV and are generally passed to specialised subcontractors, through separate EPC and O&M contracts. Therefore, they should not command a risk premium on the equity. Even in cases where some element of this risk is retained by the equity investor, it is unlikely that an additional premium is unwarranted, as these technical risks are generally sector specific, and generally incorporated in the Beta.

In practice, the Beta of the project is calculated by using the "comparable approach", as explained above, paying attention to the selection of the most appropriate comparable sectors. In some cases, when it is believed that the SPV's retained technical risks are non-negligible, further steps may be taken, that is:

- they may be separately priced and added, through a "bottom-up" approach (added to the equity risk premium as separate factors) to the cost of equity capital; and/or
- they may be considered in the cash flows; for example if part of the archaeological risk is retained by the SPV, this may (and should, in theory) be captured in the expected values of capex cash flows.

Since investors in this market are not well diversified, they retain many market-related risks. Many of these are, however, systematic, and should be substantially captured in the Beta of the project, derived via the comparable approach, as outlined in Sect. 5.4.2. Among these risks there are demand, inflation, currency, availability of funds and failure of subcontractors. Some of these are also mirrored in the country risk, which can be estimated by following the approaches explained above.

The assessment of these risks and how they can be considered in the evaluation of the cost of the equity is explained in Table 5.1, which is based on the risk matrix explained in Chap. 3. Further, in the application of the CAPM, we would also suggest that an illiquidity premium should be considered and eventually priced as per Sect. 5.4.3.

5.5.1 Estimating the Cost of Equity, Step by Step

Following the above, it is possible to outline the key steps, in logical order, that must be undertaken in order to estimate the appropriate cost of equity:

Step 1: Identify the risks via the risk matrix.
Step 2: Identify the allocation of risks to primary equity investors in the SPV.
Step 3: Identify those that are retained by equity investors after transfer to subcontractors or providers of insurance/hedging instruments.
Step 4: By following the matrix in Table 5.1, identify those risks that can be captured in the Beta and those that can be captured in the EMRP.

Table 5.1 Project-specific risks: classification by allocation

Risks	*Procuring authority*	*SPV*	*If allocated to the SPV*
Development phase			
Project coherence with the investment needs	x		
Project affordability	x		
Quality of project development		x	Transferred to subcontractors
Longer bidding phase and consequent change of market conditions	x	x	Partially retained by equity investors, generally captured in the sector Beta and in the Country risk premium
Construction phase			
Land availability	x		If retained by the SPV as explained in Ch. 3 it can be captured by the Country risk premium
Social acceptance	x	x	Partially retained by equity investors, generally captured in the Country risk premium
Archaeological	x	x	Transferred to subcontractors; or if partially retained it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows (capex adjustment)
Environmental	x	x	

(*continued*)

Table 5.1 (continued)

Risks	*Procuring authority*	*SPV*	*If allocated to the SPV*
Technology availability and consistency		x	Transferred to subcontractors; or if partially retained it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows (refreshment value adjustment)
Reliability of forecasts for construction costs and delivery time		x	Transferred to subcontractors
Authorisations			Transferred to subcontractors; or if partially retained it can be captured by the Country risk premium, or, if the severity is high, considered through an adjustment of cash flows (capex adjustment)
Project changes requested by the authority	x		
Medical equipment suitability		x	Transferred to subcontractors
Medical equipment obsolescence in case of longer bidding phase	x		If retained by the SPV as explained in Ch. 3 it can be captured by Beta or, if the severity is high, considered through an adjustment of cash flows (capex adjustment)
Operation phase			
Change in service tariff, defined by the regulator/authority	x		

(*continued*)

Table 5.1 (continued)

Risks	*Procuring authority*	*SPV*	*If allocated to the SPV*
Volatility of demand	x	x	If retained by the SPV as explained in Ch. 3 it can be captured by Beta or, if the severity is high, considered through an adjustment of cash flows
Underperformance/Unavailability of the infrastructure, which may cause increase of life cycle costs or further investments		x	Transferred to subcontractors
authority does not comply with payment obligations		x	Retained by the equity investors, it can be captured by Beta and EMRP, or, if the severity is high, considered through an adjustment of cash flows or through an additional factor by adjusting the CAPM formula (bottom-up approach)
Change in the level of service requested by the authority	x		
Underperformance of energy technologies		x	Transferred to subcontractors
Underperformance of medical equipment or faster obsolescence		x	Transferred to subcontractors
Funding			
Availability of affordable funding		x	Retained by the equity investors, it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows

(*continued*)

Table 5.1 (continued)

Risks	*Procuring authority*	*SPV*	*If allocated to the SPV*
Refinancing risk		x	Retained by the equity investors, it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows
Other risks, across the whole life cycle			
Inflation		x	Retained by the equity investors, it is captured in the EMRP; it can command an extra Country risk
Exchange rate fluctuation		x	
Force majeure	x	x	If partially retained by the equity investors, it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows
Change in taxation	x	x	If partially retained by the equity investors, it is captured in the EMRP; it can command an extra Country risk
Change in law	x	x	
Stability of business and legal environment	x	x	
Default of subcontractors		x	Retained by the equity investors, it can be captured by Beta, or, if the severity is high, considered through an adjustment of cash flows
Default of SPV		x	Retained by the equity investors, it can be captured by Beta

(*continued*)

Table 5.1 (continued)

Risks	*Procuring authority*	*SPV*	*If allocated to the SPV*
Termination value different from expected		x	Generally in PPP the straight-line depreciation is applied and this risk is not relevant. If retained by the equity investors, it can be captured by Beta

Source: Authors

Step 5: To calculate Beta, choose comparable industries in which equity providers are exposed to similar risks, and calculate the project Beta, as per Boxes 5.2 and 5.3.

Step 6: Calculate the EMRP, as per the example reported in Box 5.4.

Step 7: Consider if there are any other retained risks that are not adequately captured in the Equity Risk Premium (Beta and EMRP), for example a liquidity premium, to be added to the EMRP.

Step 8: Consider if there are any other residual risks, including specific risks that are not adequately captured in the Beta and EMRP, and make appropriate adjustments to cash flows.

Step 9: Calculate the risk-free rate, as per the examples reported in Box 5.1.

Step 10: Apply the CAPM formula to derive the appropriate rate of return on primary equity.

5.6 Conclusion

This chapter has outlined a theoretical framework for assessing the "reasonableness" of the rates of returns charged by investors of equity. Formal assessment of how risks affect the cost of equity, using a method such as we have described here, is fundamental to the financial and economic value of the deal for the public authority and other payers. It is apparent that formal mathematical models for the analysis are a useful starting point, but their operationalisation in the context of the PPP market is not straightforward. It has to incorporate a realistic appraisal of how the market is structured

and the practices that flow from that. Investors are not always sophisticated financial firms, nor are they usually well diversified. Standard finance theory would suggest that the systematic risk of PPP projects is typically low, and therefore risk premiums will be correspondingly modest. This position is rejected, however, by the vast majority of primary equity investors.

Hence, where risk is borne by equity, investors may charge a high price for it, and expected returns will be higher than those seen on corporate portfolios or other equity assets. Decision-makers on the public sector side need to incorporate this into their plans and forecasts, and be prepared to negotiate for reasonable bid and contract prices with confidence, but also with realism around the appropriate cost of capital and market expectations.

Notes

1. The effect of the Blume adjustment is to reduce the difference between the Beta and the market average (i.e. 1). Blume (1971) found that adjusting estimated *Equity Betas* towards unity improved their ability to forecast subsequent period stock returns. The most widely held explanation for this is that unusually low or high *Betas* are subject to measurement error. Blume adjustment is standard in the calculation of *Equity Betas* by regulators in respect of the UK, USA and Australian utilities in determining the appropriate rate of return to investors, and is recommended in the most prominent corporate finance textbooks (e.g. Brealey et al. 2008). Blume-adjusted Betas are available from most commercial databases, such as Bloomberg and the London Business School Risk Management Service. The formula is: Blume-adjusted *Equity Beta* = (0.67)* βOLS + (0.33)*1.
2. In addition, our interviews and survey data suggest liquidity risk is carefully considered an adjustment of the EMRP, for the market capitalisation is a common approach, and is done by adding a premium to the expected return (from the CAPM) of small cap stocks (Damodaran 2016b). For example, to take into consideration illiquidity, an extra premium of 3–3.5% is added, reflecting the excess returns earned by smaller cap companies over very long periods (Damodaran 2016b).
3. The PRS group considers political, financial and economic risk indicators to come up with a composite measure of risk for each country that ranks from 0 to 100, with 0 being highest risk and 100 being the lowest risk. http://www.prsgroup.com.

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