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Cost of capital, discounting and relational contracting: endogenous optimal return and duration for joint investment projects

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Abstract

Concession, project financing and public–private partnership schemes are investment projects that are generally submitted to valuation criteria based on discounted cash flow analysis. The theoretical basis of these valuation criteria are now at issue. Pursuant to recent advances in relational contracting economics and behavioural finance, joint investment projects can be considered as special relational environments where the project's returns improve on alternative replacement opportunities. This article seeks to bridge the gap between new theories and widely used valuation techniques by providing a generalized approach to investment valuation. This article suggests reasonable valuation criteria that fit these new theoretical developments, including an endogenous optimal duration function that may be integrated into the project's contractual agreement.

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Notes

[1] See also HM Treasury (2004, pp. A145–8, pp. 38–9).

[2] Further critical insights are provided by behavioural finance (Kahneman and Tversky, 1979; Kahneman and Riepe, 1998; Frankfurter and McGoun, 1999; Marzo, 2002), and by other influential theoretical works (Laibson, 1997; Loewenstein and Thaler, 1989; Loewenstein and Drazen, 1992; Cropper and Laibson, 1999; Weitzman, 2001). Ainslie (1992) stressed hyperbolic (simple interest) computation for inter-temporal valuation, referring to the seminal work of Herrnstein (1961) that Mazur (1986) and Ainslie (1992) further refine and formalize. Shane et al. (2002) provided a review of the economic literature on the matter.

[3] They may be steady-increasing pursuant to revenue inflation indexation.

[4] Biondi (2005) applies this reasoning to the business firm.

[5] Baker et al. (2001, 2002) apply this reasoning to the business firm.

[6] For example, in a study commissioned by the Office of Government Commerce (OGC), PriceWaterhouseCoopers (2002) reports a significant superior return of PFI projects relative to the cost of capital based on the market-based Weighted Average Cost of Capital (WACC) based on Capital Asset Pricing Model (CAPM), even after inclusion of the swap cost, and of an eventual provision for bidder's costs for failed bids on other projects.

[7] That is, the discount rate for NPV, the IRR for IRR. See note 8.

[8] NPV and IRR differ from each other with regard to different replacement rate assumptions. The NPV supposes that the replacement rate is the discount rate, while

the IRR approach assumes that it is the same rate as in IRR. Thus, the generalized approach vindicates the return-based measures like IRR and theoretically unifies discounted values and discounted rates of return.

[9] For instance, Rubinstein (2000) suggests a function where the discount factor f_t is decreasing in t, and increasing in a_t (the larger the sum of money at stake, the higher (closer to 1) the discount factor). He suggests a procedural rationality approach, framed with nonexpected utility theory. See also the references provided by the note 2. A framework for this kind of normative economics is suggested by Sugden (2004).

[10] We assume here that the rate of reference for discounting is the investment rate. IRR over (under) evaluates investment projects with high (low) rates of return.

[11] Usual relation between GIRR, Generalized Net Future Value (GNFV) and Generalized Net Present Value (GNPV) applies: GIRR is the discount rate that makes both GNFV and GNPV equal to zero.

[12] Of course, a change in the replacement rate modifies the project's GIRR, but it does not modify its comparative ranking.

[13] Drawing upon Biondi (2006), Sampaio Filho (2008) and Kierulff (2008) provide further reviews of literature.

[14] The EOD relates to the temporal evolution of the GIRRs period by period. Sufficient conditions for the existence of at least one optimal value may be easily found in the case of steady or steady-increasing positive inflows following strictly initial negative outflows. In the case of steady inflows, a unique optimal value might exist if each annual inflow is greater than the alternative benchmark return provided by .

[15] Reference is especially made to Engel–Fischer–Galetovic (1997). Guriev and Kvasov (2005) modelled relational contracting with termination or renegotiation clauses through time.

[16] That are project-financing schemes.

[17] At the same time, this could be justified by the opportunity for the procuring public authority to enter the construction arrangement on the same basis (including insurance and security devices), but not to enter the financing arrangement, providing liabilities to service PFI Contracts are as binding as the servicing of conventional government debt.

[18] In general, a replacement rate of 4.5% will reduce the optimal duration of 1–2 years under GIRR and SIRR, while it obviously does not affect the optimal duration under the BIRR.

[19] This document refers to the IRRs as part of those processes and negotiations.

[20] That is accrued income and cumulated inflows from replacement.

[21] According to the sole replacement structure, the weights attributed to preceding inflows are more relevant under IRR than GIRR, than SIRR, than finally BIRR.

[22] Each score makes the compound cumulated returns of the initial outflow (investment) equal to the cumulated cash flows including replacements.

[23] We assume here that the generalized future value from the project (cash earnings) and the cash outflows for the project (investment) are discounted at the same compound rate i. This assumption may be released by taking three different rates: one for financing (related to cash outflows), one for investing (the risk-adjusted discount rate of the investment), one for replacement (related to cash inflows). In fact, concerning the discounting of sources of financing, we should consider a Generalized Weighted Average Cost of Capital (G-WACC) based on the target capital and target financial temporal structures, since equity finances (compound interest as reference) usually have not the same temporal structure as debt finances (simple interest as reference).

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