
Capital Budgeting: The Role of Cost Allocations

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1 Introduction

A common issue for firms is how to allocate capital resources to various investment alternatives. An extensive literature in finance has examined various aspects of capital budgeting, including capital constraints, the determination of discount rates, and alternative approaches to estimating cash flows and handling risk, such as real options techniques. In terms of organizational structure, a central feature of the capital budgeting process in large firms is that relevant information about the profitability of potential investment projects resides with one or several managers. It is generally accepted that preferences of these managers may not coincide with those of the firm's owners (the principal). Consequences of asymmetric information include strategic reporting by better-informed managers (for example, "sandbagging" or "creative optimism") and a need to measure performance *ex post*. Surveys consistently find that internal rate of return (IRR) criteria remain prevalent in capital budgeting decisions. Furthermore the use of artificially high hurdle rates suggests widespread capital rationing [15, 20].

Academic researchers and consultants have suggested that firms could create internal markets, perhaps using auction mechanisms, to solve capital budgeting problems [19, 11]. Beginning with the original work of Harris, Kriebel and Raviv (1982) and Antle and Eppen (1985), a literature in accounting and economics has examined capital budgeting with hidden information issues as the focus. This article provides a selective examination of the capital budgeting literature in accounting with a view to distilling what we now know, what we do not know and what issues seem promising for further research in this area.

2 Delegated Investment Decisions

Beginning with Rogerson's (1997) study, one branch of the recent literature on capital budgeting has focuses on a single manager who is given authority to conduct a single project that spans T periods. *Goal congruence* requires that the manager have an incentive to accept all positive NPV projects, and only those, for a broad class of managerial preferences and compensation structures. If undertaken, the

initial investment of b creates an asset with a useful life of T and operating cash flows $\tilde{c}_t = \theta \cdot x_t$ and expected net present value equal to $\text{NPV}(\theta) = \sum_{t=1}^T \gamma^t \cdot \theta \cdot x_t - b$, where $\gamma = (1 + r)^{-1}$ and r is the firm's discount rate. The parameter θ represents the private information of the manager, while the other parameters (b , $\{x_t\}$) are known to the designer of the performance measure.

The *residual income* performance measure has a long tradition in the accounting literature and has received renewed attention as part of the recent practitioner-driven movement towards economic profit plans; see, for instance Young and O'Byrne (2001). Residual income in period t is calculated as: $\pi_t = I_t - \hat{r} \cdot A_{t-1}$, where in our simplified setting accounting income is given $I_t = c_t - d_t \cdot b$ and book value evolves as $A_t = A_{t-1} - d_t b$.

Initially, book value is set equal to the investment ($A_0 = b$) and the depreciation scheme is required to be "tidy" ($\sum_t d_t = 1$). Under the *relative benefit depreciation rule*, the capital charge rate \hat{r} is set equal to r and the sum of depreciation and capital charges, per dollar of initial investment, is calculated so that:

$$d_t + r \cdot AV_{t-1} = \frac{x_t \cdot b}{\sum_{i=1}^T x_i \cdot \gamma_i}.$$

The resulting performance measure π_t is goal-congruent regardless of the manager's planning horizon and intertemporal preferences, because the overall project NPV is effectively "annuitized" over the useful life of the project:

$$\pi_t = \frac{x_t}{\sum_{i=1}^T x_i \cdot \gamma^i} \text{NPV}(\theta).$$

It can be shown [16] that the combination of the residual income performance measure, the relative benefit depreciation rule and a capital charge rate equal to the owner's cost of capital is the (essentially) unique way of achieving goal congruence for a wide class of accounting-based performance measures. Clearly, the basic goal congruence scenario and its solution described here can be extended in various directions, including uncertain cash flows and the presence of multiple, temporally overlapping projects.

From a second-best contracting perspective, the natural question is whether goal-congruent performance measures can also be the basis of an optimal incentive contract in the presence of hidden action problems. Dutta and Reichelstein (2002) show that a second-best investment policy can be implemented by setting the capital charge rate equal to a *hurdle rate* which exceeds the firm's cost of capital.¹ If the depreciation charges again conform to the relative benefit rule, the residual income performance measure will result in proper matching of cash revenues and depreciation expenses so as to reflect value creation in a temporally consistent fashion. As a consequence, the choice of bonus payments in different periods has no impact on the manager's investment incentives. Put differently, accrual accounting allows the

¹ This characterization applies to a risk-neutral manager. Dutta and Reichelstein (2002) and Christensen, Feltham and Wu (2002) examine how to set the capital charge rate for a risk-averse manager who can decide on the acceptance of a risky project. In particular, these studies call into question the usual textbook recommendation of setting the capital charge rate equal to the firm's weighted-average cost of capital (WACC).