On the Relevancy of Future Sunk Costs

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Any sunk costs associated with specific investment proposals by firms should not be included in NPV estimates of those projects. However, in certain instances, expected sunk costs associated with future investment proposals should be included in NPV estimates of current projects. If the future expected sunk costs, where appropriate, are not considered, there will be a bias toward rejecting the current investment proposals. This paper develops the appropriate decision rule for the inclusion or exclusion of future sunk costs.

INTRODUCTION

Corporate finance theory dictates that any sunk costs associated with a particular project should not be considered when estimating that project's net present value (NPV). This paper suggests that, in certain instances, sunk costs associated with future project proposals should be included in the NPV analysis of current project proposals. The failure to do so will result in NPV estimates that are systematically undervalued.

INCREMENTAL CASH FLOWS

Capital budgeting theory suggests that only the future incremental cash flows associated with a particular project should be included in that project's NPV analysis. In general, corporate finance texts suggest that the relevant cash flow components for a particular project could include any or all of the following: net operating cash flow, changes in net working capital, additional capital expenditures, salvage value, opportunity costs, option value, positive externalities or side effects related to synergy and negative externalities related to sales erosion for existing products (see, for example (Ross, Westerfield and Jordan, 2008), (Brealey and Myers, 2006), (Gitman, 2009), (Berk and DeMarzo 2011)). Sunk costs that already have been incurred should not be included in the NPV estimation because they are not part of the future incremental cash flow associated with the acceptance of the project.

While the concept of sunk costs may seem obvious, some interesting questions arise in practice. For instance, the timing of the NPV decision relative to the timing of any developmental project costs will affect the estimated NPV of the project. The later the NPV analysis is conducted, the greater is the portion of developmental costs that will be considered a sunk cost. If the NPV analysis is conducted earlier, more of the developmental costs will be included in the NPV analysis since they have not yet been incurred.

The relevant point for this discussion is that there will almost always be some level of developmental costs that are sunk costs when a project's NPV estimate is conducted. More importantly, the acceptance or rejection of current investment proposals will, in some situations, determine whether or not specific future developmental costs will be incurred. In these situations then, the future developmental costs affect the incremental cash flows associated with the current project proposal and therefore should be considered in the current project's NPV estimate.

POTENTIAL NON-OPTIMALITY OF CURRENT PRACTICE

We have suggested that the failure to include future sunk costs in a current project's NPV estimate will, in certain specific instances, understate the NPV estimate. We now develop a simple example to illustrate the NPV undervaluation. To begin, we first must differentiate between two types of firms based on the firm's ability to take on new investment. We label the first type of firm a resource-constrained corporation (RC). An RC corporation is a firm that has some constraint that effectively limits the amount of new investment that the firm is able to take on. The particular constraint that limits investment may come from a variety of sources. For example, firms with limited access to capital markets may be subject to some degree of capital rationing that limits total investment by the firm in any particular period. Other constraints might be related to limited managerial or other labor resources that would make it inefficient for the firm to expand more significantly. Other factors such as a limited demand for the firm's products may also constrain new investment to some extent.

The second type of firm has greater investment mobility and has no effective investment constraints. In general, this would be a larger firm with more fluid access to capital and labor markets as well as a broader market demand. These types of firms would be actively seeking new investment on a continual basis. These firms can be labeled non-resource-constrained corporations (NRC).

We make this distinction based upon a firm's investment resources because it determines, at least in part, the level of future developmental costs that a firm will incur. While firms in the aggregate probably have variable levels of resource constraints, for this example let's consider two firms, one at each extreme. For purposes of simplicity, assume that the RC firm can invest in only one project, either now or at some point in the future. If the RC firm's NPV estimate of the current project is positive, it will accept this investment and will not seek future investment. However, it the NPV estimate is negative, the firm will seek new investment in the next period. As it seeks new investment, it will incur additional developmental costs in the next period. Contrast this with a NRC firm. Regardless of whether or not the NRC firm takes on investment in the current period, it will continue to seek new investment opportunities in the future and will continue to incur new developmental costs. The important distinction to be made is that the RC firm's level of future developmental costs are dependent on the current NPV accept/reject decision while the NRC firm's level of future developmental costs are independent of the current NPV accept/reject decision. In order to correctly implement capital budgeting theory regarding incremental cash flows then, future developmental costs (future sunk costs) must be included in the NPV estimate for the RC firm but not included in the NPV estimate of the NRC firm.

The non-optimality of current practice relates to RC firms only, so we further develop the example by considering an RC firm that is estimating the NPV of a current project proposal. Assume that the RC firm follows current suggested practice (ignoring future developmental costs) and estimates the NPV of the current proposal (period t=0) to be -$1. The firm declines the proposal and continues to search for new proposals. Assume that the expected developmental costs of the next proposal, incurred at period t=1, are $100. After the firm has incurred this expense, assume that it estimates the NPV of this new proposal at $1. It then chooses to accept this investment and in doing so reaches its investment capacity, so no additional investment is considered at this time. Now, while the firm has followed accepted capital budgeting methodology to make their decisions, let's examine the optimality of their investment decisions. For simplicity, let's assume a discount rate equal to 0. Accepting a proposed investment with positive NPV of $1 suggest that firm value should increase by $1, yet, because of the additional $100 in sunk costs, firm value has actually declined by $99.

Let's return to the original proposal with the NPV estimate of -$1. Because the firm did not consider the future sunk costs, the true NPV of this proposal has been underestimated. To more correctly estimate this proposal's NPV, the firm should add the present value of the expected future sunk costs that would be incurred if the proposal is not accepted. The correct NPV estimate, assuming a discount rate equal to 0, should be (-$1 + $100) = $99. As a result, the original project should be accepted and the firm value is maximized with respect to the current investment decision.

CONSIDERATIONS RELATING TO FUTURE PROJECTS

Having illustrated the nature of the problem, we now discuss implementation problems regarding i) the estimation of the relevant future sunk costs and ii) other cash flow effects from potential future projects. For clarity, we begin with a discussion of other cash flow effects.

This paper suggests that we need to consider potential effects of future projects when we make current NPV decisions. Not all of those effects concern future sunk costs. For example, there is always the chance that future projects that the firm will consider in subsequent periods will have high positive NPV's. Continuing with the example from the previous section, assume that the RC firm would have a potential project in period t=1 with an NPV of $1,000. In period t=0, as the firm is determining the NPV estimate of the initial project, any information pertaining to the NPV of the project in period t=1 is unknown. We define this unknown amount, in general, as the potential future incremental NPV.

Now, assume that the RC firm, because of some constraint, can invest in only one project in periods t=0 and t=1. Without considering the potential future incremental NPV, the firm would estimate the NPV of the initial project to be $99. The acceptance of this project would then prevent the acceptance of the higher value project in period t=1. In this situation, if the firm had been able to estimate correctly the future incremental NPV, the correct NPV estimate for the initial project would be -$901 ($99 - $1,000). Clearly, by accepting the initial project, firm value would not be maximized.

Note that this potential future incremental NPV effect is always a concern for RC firms. By ignoring this effect in current capital budgeting practices, we are implicitly assuming that future acceptable projects will have NPV's close to 0. Obviously, this may be problematic, but if product markets are competitive, the severity of the problem should be lessened because we would expect "high" NPV projects to be infrequent. Alternatively, if there is less competition, "high" NPV projects might be developed more often.

At this point, it seems helpful to consider the significance of the potential future incremental NPV effect relative to the future sunk costs effect. While we are almost certain to incur developmental costs in the future, we are probably much less likely to develop "high" NPV projects and, if we do, we may be able to shed any practical resource constraints. If the estimated NPV is significant enough, it is likely that any capital rationing constraints due to imperfect information transfer in financial markets could be overcome. Similarly, if there was a managerial resource constraint, the high value of the project generally would be expected to outweigh the increased cost of attracting new additional management. Note also that firms could, in practice, attempt to estimate the effects of the potential future incremental NPV using a real options valuation approach. This would involve a somewhat similar approach, though with different estimation problems, as that developed for the option to delay investment (Berk and DeMarzo, 2011).

Finally, we must note that the estimation of the future sunk cost effect is certainly not without problems. There may be some instances where the firm might have some limited information about what future developmental costs might be; in other instances, they might not. Also, the higher the number of future projects (each requiring some level of developmental costs) that the firm rejects, the higher will be the magnitude of this effect. However, any NPV estimation always deals with uncertain future cash flows and this is only more component of that. While it is likely that some firms may utilize option valuation models to estimate this effect, others will certainly choose much more naive models or subjective estimates. We leave those questions for future research.

CONCLUSION

Capital budgeting theory suggests that only the incremental cash flows to the firm should be considered in the estimate of a project's NPV. While this is correct, current practice, at least as specified by existing corporate finance texts, has failed to consider the incremental nature of future developmental costs for those firms with some type of investment resource constraint. By not considering the incremental nature of the expected future developmental costs (where applicable to RC firms), the NPV estimate of the current project is biased downward, creating the potential for valuable projects to be rejected.

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