

Investment policies in advanced defense R&D programs

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Abstract

Investment in advanced defense technologies is a common characteristic of modern age armed forces. The operational benefit of such technologies is an S-shaped function of their technological progress, which is highly uncertain. We model investment problem facing a defense decision maker, aiming to maximize the value of a military system, by choosing its target technological level and the quantity to be procured. We show that the optimal investment is a discontinuous function of the available budget. Under a certain threshold, no investment is optimal. Above this budget, a sizable investment is optimal. Very low budgets prohibit investments in advanced R&D, but somewhat larger ones require investments in highly-uncertain advanced technologies. Yet higher budgets allow for investment in advanced R&D, but with preference towards low-risk programs. With very high budget levels highly uncertain technologies are allocated a larger share of the budget. We further show that maintaining the flexibility to adjust investments along the R&D program is beneficial, in accordance with standard "real options" results. This flexibility may, however, lead decision makers to invest more in earlier periods, in order to enjoy better control over the results of the latter parts of the program.