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Should We Maximize Expected Profits or Maximize the Probability of Realizing Profit Targets? Summary of a Discussion on How to Reconcile these Objectives

Bardia Kamrad[1], Keith Ord[1]* and Glen M. Schmidt[2]

[1]Georgetown University, McDonough School of Business, Washington D.C., USA
[2]The David Eccles School of Business, University of Utah, Salt Lake City, UT, USA

Abstract

It is generally accepted in the operations literature that a firm should strive to maximize its expected profit. However, in practice it is not uncommon for a firm to offer a bonus to managers for achieving some pre-established target profit, possibly yielding managerial actions that differ from the profit-maximizing approach (given a profit target, we assume managers will maximize the probability of reaching that target). We use the Newsvendor framework to illustrate how the firm's shareholders (e.g., through its board of directors) can align these two seemingly different decision approaches: maximizing expected profit *vs.* maximizing the probability of reaching a target profit. Alignment is achieved by setting what we call an "Aligned Profit Target" (APT) – a target profit that yields the same managerial action namely: contextually, the same stocking quantity across both decision approaches. We find that the APT should typically be an aggressive profit target, one that is significantly higher than the maximum expected profit, with a corresponding low probability of achievement – this result is consistent across demand distributions with light tails (uniform), moderate tails (normal) and heavy tails (lognormal). Notably, the aggressive APT target should be distinguished from any target that the firm might set to signal future profit expectations to financial analysts.

Keywords: Newsvendor model • Profit maximization • Probability maximization • Agency problem • Yield Uncertainty

Introduction

Motivation

Most operations literature assumes that a firm operates in such a way as to maximize its expected profit. However, this view is not held universally. Chen L, et al. [1] reference a number of studies providing evidence that organizations focus on meeting the earnings forecast, rather than maximizing expected profits. Chapman, CJ and Steenburgh TJ [2] report on earnings management in the context of marketing. Further, Kabak, WI and Schiff AI [3] presented this exact argument in the context of inventory decisions in the face of demand uncertainty. They reasoned that for many firms, establishing and realizing financial targets is perhaps a more precise portrayal of their decision-making process. They further contended that while many decision rules are based on well-developed and theoretically sound models, they do not adequately capture actual (managerial) behavior and this inconsistency may result in distorted consequences; that is the firm has an agency problem. Empirical evidence for this view is provided in the survey conducted by Deloitte Consulting [4].

Publicly traded firms typically announce expected earnings to market analysts in advance of the official end-of-quarter or end-of-year results. That target needs to be realistic but also eminently achievable as failure to achieve the expected earnings target typically has a negative impact on the stock price. Thus, the probability of meeting or exceeding the announced figure should be high. By contrast, we define the expected profit to be the best estimate that the board of directors has of earnings for the period. It follows that the expected earnings figure is likely to be lower than the expected profit. However, if the expected earnings figure is used to set the bonus level for management, there is an agency problem: management will seek to maximize the chances of meeting the target and so is likely to make unduly conservative decisions. In turn, this may lead to lower than optimal profits [5].

The implication of these findings is that the firm must set the internal target for management at a sufficiently high level to ensure that the managerial decision-making process leads to the maximization of expected profits. We explore this requirement with the additional complication that output yields may be uncertain [6].

***Address for Correspondence:** Keith Ord, Department of Business Statistics, Georgetown University, McDonough School of Business, Washington D.C., USA; E-mail: ordk@georgetown.edu*

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Description

We consider the News vendor model, wherein the objective framework is to establish the amount to be ordered, Q, say. The probability distribution of demand, D, is assumed to be known, but the amount ordered must take into account that less than 100 percent of the amount ordered may be usable (yield uncertainty). We provide general results for each case: (i) maximizing the expected profit and (ii) maximizing the probability of achieving the target. We consider light, moderate and heavy tailed demand and yield distributions represented respectively by the three distributions: uniform, normal and lognormal. Results are not available in explicit form, but solutions may be obtained by straightforward numerical methods.

Conclusion

Results

Numerical results are provided for a range of parameter values for the three distributions mentioned. The general picture across the different cases remains remarkably consistent. The internal "aligned profit target" or APT needs to be set much higher than the financial target that would be announced

to financial analysts and, quite possibly, higher than the target required to maximize expected profit. Thus, our results confirm the qualitative analysis offered by Zoltners A, et al. [5].

Conflict of Interest

None.

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