

Do Random Errors Explain Newsvendor Behavior?

1. Instructions

The instructions are translated from German.

OPERATIONS

You are about to participate in an experiment in the economics of individual decision making. Your task will involve making a number of decisions in a particular situation. Please note that the questions are designed not to test your knowledge, but to learn more about your personal preferences. If you have any questions, feel free to raise your hand. Moreover, all individual responses are completely confidential and anonymous.

Task description

Your task is to make a number of decisions under uncertainty.

You are a retailer who sells a single (fictional) item at a market price p . Products must be ordered from the supplier at a unit cost c before you know for certain what quantity your customers will demand. However, at the time of your order decision, you have some knowledge regarding the demand distribution. Specifically, you know that each of a number of possible demand realizations is equally likely. Your decision concerns the choice of an order quantity.

The profit (in €) from your chosen order quantity depends on the realization of random demand. If demand exceeds your order quantity you lose the margin (price-cost) for those units of demand you cannot satisfy. If demand is lower than your order quantity, you have incurred costs for some units bought, without being able to earn revenue with these units. You do not have to calculate the prospective profits for each possible combination of order quantity and demand. They are provided to you by means of decision matrices:

Order	Demand						
	100	200	300	400	500	600	700
	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
100	7.8	7.8	7.8	7.8	7.8	7.8	7.8
200	4.9	8.6	8.6	8.6	8.6	8.6	8.6
300	2.1	5.7	9.4	9.4	9.4	9.4	9.4
400	-0.8	2.9	6.5	10.1	10.1	10.1	10.1
500	-3.6	0.0	3.6	7.3	10.9	10.9	10.9
600	-6.5	-2.9	0.8	4.4	8.1	11.7	11.7
700	-9.4	-5.7	-2.1	1.6	5.2	8.8	12.5

For this example, possible demand realizations are 100, 200, 300, 400, 500, 600, or 700 units, each with equal probability. For example, if you order 300 units, your realized profits will be €2.10 (with probability 1/7), €5.70 (with probability 1/7), or €9.40 (with probability 5/7). If realized demand is 200, your profit is €8.60 if you ordered 200 units, or €2.90 if you ordered 400 units.

Experimental protocol

The computer-based part of the experiment starts with some test questions to make sure you have understood the task. Then you have to make order decisions in a number of rounds. In each round, you have the choice among a set of possible order quantities. After your decision, the computer randomly determines a demand realization. The profit resulting from your order quantity and the realized demand is displayed, and you are asked to indicate how satisfied you are with your order decision. Then the computer guides you to the next decision round. Note that after a certain number of rounds, the parameters of the problem (demand distribution, prices, costs) will change. The computer will make you aware of this.

Please take sufficient time to make sound decisions. Throughout the experiment, do not communicate with other participants, and raise your hand if you have questions for the instructor.

Payment determination

To determine your actual payoff, the computer will randomly pick two of the decision rounds you have played, with equal probability for each round and independent for each participant. Your payoff is the average of these randomly determined decision rounds. In addition, you receive a fixed payment of €1 for your participation in this experiment. Your expected payoff is €8.50.

If the computer randomly picks a decision round you realized a loss in, this loss will be deducted from your fixed payment. Note that each decision situation you will face contains at least one alternative that avoids losses!

The experiment will now start with a number of training rounds.

NEUTRAL

You are about to participate in an experiment in the economics of individual decision making. Your task will involve making a number of decisions in a particular situation. Please note that the questions are designed not to test your knowledge, but to learn more about your personal preferences. If you have any questions, feel free to raise your hand. Moreover, all individual responses are completely confidential and anonymous.

Task description

Your task is to make a number of decisions under uncertainty.

In each decision round you have a choice among alternatives: **A**, **B**, **C**...**G**. Each alternative represents a lottery, the payoff of which is uncertain at the time of your choice and depends on the realization of a random number. Each of these random numbers is equally likely and describes one state of the world. For 100 possible states of the world, the following decision matrix gives an example of your decision problem: For the seven choice alternatives **A**, **B**, **C**...**G** involved in the task, and seven possible states of the world, the following decision matrix gives an example of your decision problem:

	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
A	7.8	7.8	7.8	7.8	7.8	7.8	7.8
B	4.9	8.6	8.6	8.6	8.6	8.6	8.6
C	2.1	5.7	9.4	9.4	9.4	9.4	9.4
D	-0.8	2.9	6.5	10.1	10.1	10.1	10.1
E	-3.6	0.0	3.6	7.3	10.9	10.9	10.9
F	-6.5	-2.9	0.8	4.4	8.1	11.7	11.7
G	-9.4	-5.7	-2.1	1.6	5.2	8.8	12.5

For example, if you choose alternative **C**, your payoff will be either €2.10 (with probability 1/7), €5.70 (with probability 1/7), or €9.40 (with probability 5/7). Some further examples:

- If the random number is between 1 and 14 (with probability 1/7), your payoff is €7.80 if you chose alternative **A**. If you chose alternative **B**, your payoff is €4.90. If you chose alternative **E**, you *lose* €3.60.
- If the random number is between 43 and 56 (with probability 1/7), your payoff is €8.60 if you chose alternative **B**. If you had chosen alternative **F**, your payoff is €4.40. If you chose alternative **G**, you receive €1.60.
- If the random number is between 85 and 100 (with probability 1/7), your payoff is €9.40 if you chose alternative **C**. If you chose alternative **D**, your payoff is €10.10. If you chose alternative **E**, you receive €10.90.

Experimental protocol

The computer-based part of the experiment starts with some test questions to make sure you have understood the task. Then you have to make order decisions in a number of rounds. In each round, you have the choice among a set of alternatives **A**, **B**, **C**.... After your decision, the computer randomly determines a number between 1 and 100. The profit resulting from your decision and the realized random number is displayed, and you are asked to indicate how satisfied you are with the decision you made. Then the computer guides you to the next decision round. Note that after a certain number of rounds, the entries in the choice matrix will change. The computer will make you aware of this.

Please take sufficient time to make sound decisions. Throughout the experiment, do not communicate with other participants, and raise your hand if you have questions for the instructor.

Payment determination

To determine your actual payoff, the computer will randomly pick two of the decision rounds you have played, with equal probability for each round and independent for each participant. Your payoff is the average of these randomly determined decision rounds. In addition, you receive a fixed payment of €1 for your participation in this experiment. Your expected payoff is €8.50.

If the computer randomly picks a decision round you realized a loss in, this loss will be deducted from your fixed payment. Note that each decision situation you will face contains at least one alternative that avoids losses!

The experiment will now start with a number of training rounds.