Economic Order Quantity (EOQ)

The economic order quantity, or EOQ, is the order size that gives the lowest total cost of ordering and holding stock. Ford Whitman Harris, an American engineer, published the idea in 1913 in an article about how many parts to make at once. The formula is also commonly called the Wilson formula, after the consultant Wilson, who helped to popularise it in the 1930s. We follow Omar, who manages the phone cases in a small electronics shop.

1. The Two Costs

Every order has two kinds of cost that pull in opposite directions. The ordering cost is what it costs to place and receive one order, such as paperwork, transport and checking the delivery. It barely changes with the size of the order, so many small orders add up. The holding cost is what it costs to keep stock, such as storage space, insurance, spoilage and tied-up money, so large orders raise it.

Example: A family can shop for food every day or once a month. Daily trips cost fuel and time, which is the ordering cost, while a monthly shop needs fridge space and some food goes bad, which is the holding cost.

At work: Omar writes down the two costs for phone cases: each order costs 50 dollars to place and receive, and keeping one case for a year costs 12 dollars. He now sees why ordering every week and ordering once a year both look expensive.

2. The Formula

Harris's square root formula finds the order size where the two costs balance. In words, we multiply two times the yearly demand times the ordering cost, divide by the holding cost of one unit for a year, and take the square root. The result is the EOQ, in units per order.

Example: A café buys 400 bags of coffee a year, each order costs 20 dollars, and keeping one bag costs 2 dollars a year. Two times 400 times 20 is 16,000, divided by 2 is 8,000, and the square root is about 89 bags per order.

At work: Omar applies the formula to his own numbers: 1,200 cases a year, 50 dollars per order and 12 dollars per case. Two times 1,200 times 50 is 120,000, divided by 12 is 10,000, and the square root is exactly 100, so his EOQ is 100 cases.

3. Read the Result

Once we have the EOQ, yearly demand divided by it gives the number of orders per year. Stock falls from full to empty between deliveries, so the average stock is half the order size. At

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the best size, the yearly ordering cost and the yearly holding cost are equal, which is a handy check. The total cost is also quite flat near this point, so a nearby order size costs only a little more.

Example: The café divides 400 bags by about 89 and gets close to four and a half orders a year, roughly one every twelve weeks.

At work: Omar divides 1,200 by 100 and gets 12 orders a year: ordering costs 12 times 50, which is 600 dollars, and holding costs 50 cases on average times 12, which is also 600. When his supplier packs cases in 120s, ten orders cost 500 and holding costs 720, a total of 1,220 instead of 1,200.

4. Know the Limits

The EOQ rests on simple assumptions: steady and known demand, constant costs, complete and on-time deliveries, and no quantity discounts. Real life is messier, because demand changes with the seasons, deliveries arrive late and suppliers often cut prices for bigger orders. So businesses use the EOQ as a starting point, add safety stock for delays and compare total costs when a discount is offered. The formula supports judgement but does not replace it.

Example: An ice cream shop sells far more in summer than in winter, so it uses the EOQ as a starting point and works out a new order size for each season.

At work: Omar's supplier offers a 5 percent discount for orders of 300 cases. Instead of following the EOQ blindly, he compares the total yearly cost of both sizes, including the lower price, keeps a few spare cases for late deliveries and chooses the cheaper option.

Conclusion

In summary, the economic order quantity is the order size that balances ordering cost and holding cost. Four steps put it to work: know the two costs, apply the formula, read the result and know the limits. Used as a guide, not as a strict rule, it helps a business avoid both constant small orders and piles of unsold stock.

Sources

- Harris, F. W. (1913). How Many Parts to Make at Once. Factory, The Magazine of Management, 10(2); reprinted in Operations Research, 38(6), 1990 – https://ideas.repec.org/a/inm/oropre/v38y1990i6p947-950.html
- Economic order quantity - overview of the formula, assumptions and history (Wikipedia) – https://en.wikipedia.org/wiki/Economic_order_quantity
- Ford Whitman Harris - biography and the 1913 paper (Wikipedia) – https://en.wikipedia.org/wiki/Ford_Whitman_Harris

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