Nelson Guitars, Inc.: The Risk-Reward Trade-Off from Operating Leverage

Gia Chevis   John T. Rose

Abstract

This fictional case illustrates the risk-reward trade-off implicit in an operating leverage decision by incorporating sales-level probabilities into the discussion. After performing standard degree of operating leverage (DOL) calculations, students must use basic statistical analysis to explain to the company's management the risk-reward implications of a change in the production process to one of relatively greater fixed costs and lower variable costs. By incorporating these additional skills into the decision-making process, students should achieve a better understanding of the risk-reward implications of operating leverage.

I.   Introduction
A. The Confrontation

C. J. sighed in frustration. As the newest analyst to join the finance team at Nelson Guitars, Inc. she was assigned the job of reviewing proposals for improving the firm's manufacturing process. Tanya Cline, the production manager, had recently come to her with a proposal to adopt a new technology for steaming and shaping the sides of the guitars in preparation for final assembly. The current steaming and shaping process was excessively time consuming and had become a bottleneck in production. Thus, for the past several months the sales department had claimed that Nelson was missing out on additional sales because the production line could not keep up with demand.

"C. J., I don't know what's taking you so long to approve this purchase," Tanya had said yesterday. "Look, I know the fixed costs of operations will be higher with the new production method, but the variable costs will be lower, giving us a higher margin per guitar. With the projected increase in sales volume, we should have no trouble covering the higher fixed expenses and still generate higher net operating income. The new production line can be installed by a friend of mine, and he has assured me that he will give us a great deal if we act soon; he'll even help us to dismantle the old production line and give us a good trade-in value on the existing equipment."

"I'm not trying to be difficult, Tanya," C. J. had replied. "But you know as well as I do that what a sales department promises and what they actually deliver are not always the same. Increasing our fixed costs is a risky move, especially with the current softness in the economy. If the additional sales were to fail to materialize, the firm could be in serious financial trouble. Our lenders are keeping an eagle eye on us, so we really can't afford to have an operating loss in this environment."

After a few more tense exchanges, Tanya had stormed out of C. J.'s office. On the way, she loudly proclaimed her intention to discuss the issue personally with senior management if C. J. was too obtuse to see the obvious benefits to the company and approve the project.

B. Preparing the Presentation

C. J. was left struggling with how to present this information to Nelson's senior management at their next meeting. She wanted to be fair to Tanya's proposal, as it would likely relieve the production bottleneck and allow Nelson to increase sales considerably if the demand materialized. At the same time, she wanted to be sure that Toby Pride and Charley Keith, the CEO and CFO of Nelson, respectively, really understood the additional risk the company would be taking on by making this change. She didn't think a simple discussion of differences in break-even points would be sufficiently convincing, not with the sales chief, Wynona Hill, supporting Tanya and expounding on how much more in sales volume the company could potentially generate. C. J. settled in to review yet again what she knew about the company and its competitive environment, the sales projections from Wynona, and the operating information from Tanya.

II.   Background

Nelson Guitars, Inc. was founded in 1976 with the mission of producing hand-crafted acoustic guitars for both the professional musician and the serious hobbyist. Owner-founder W. H. Nelson, an independent musician with an enthusiastic following, decided early on to keep his company small, opening only four store locations—one each in Austin, Luckenbach, and San Antonio, Texas, and one in Memphis, Tennessee. He also opted to forego sales through other retail vendors and, in contrast with many of his competitors, to eschew online sales. Company headquarters and manufacturing operations are located in the small town of Abbott, Texas, and the firm is by far the largest employer in the immediate area.

To purchase a Nelson guitar, a musician must travel to a Nelson store. Still, the quality of the guitars and the uniqueness of the store environment are such that many guitar enthusiasts make the pilgrimage, some even from overseas. All of the salespersons are musicians themselves and so are well qualified to discuss with customers the merits of the different options offered. A small stage area with an open microphone is set up in each store, allowing customers to try out the floor models, and employees are encouraged to make use of the equipment as their workload allows. The friendliness and creative atmosphere of the stores serve to bring in a host of patrons each year—most to shop but some just to observe the mix of professional and amateur guitarists honing their skills.

Nelson produces three types of acoustic guitars, though the company occasionally does minor customization. The manufacturing process for each guitar style is the same; the differences among them reflect variations in materials. Different woods contribute to the different sound and lifespan of each model. The "Songwriter" model is the most expensive, with a top made of redwood. Mid-range in price, the "Tribute" has a top constructed from Western red cedar. Nelson's entry-level model, the "Strummer," boasts a top made from spruce. The rest of the inputs are similar in all major respects.

III.   Current and Projected Sales and Operating Costs

Exhibit 1 presents a memo from Wynona Hill, reporting pricing information, current sales of the three guitar models manufactured by Nelson, and projected sales if the new technology recommended by Tanya Cline were adopted. Exhibit 2 gives an accompanying memo from Ms.

Cline, outlining current operating cost data and projected cost information associated with the new production process. Price and variable cost information are weighted averages based on the historical sales mix of the three models.

Exhibit 1: Memo from Wynona Hill, sales manager

Hi, C. J.:

Here is the information you requested about our current and future sales projections:

Our annual production and sales volume has held relatively steady over the last few years at about 3,800 units based on an average price per guitar of $800 (calculated as a weighted average based on the mix of sales of the three models). However, I expect future sales could increase significantly if we expand our throughput as Tanya believes we could with the proposed new technology.

You asked me to do a probability assessment of various sales scenarios. I'll admit it's been a while since I had a statistics class, but my staff and I gave it our best shot. At this time we figure that 5,000 units is a reasonable expected sales level, with a standard deviation of about 1,100 units. You might think 5,000 units is an overly optimistic sales forecast, but with our large and growing backlog of orders we have every confidence that we'll make or exceed that 5,000 unit target. It's not really a stretch for us.

I strongly encourage you to consider Tanya's proposal. I know I'm just the sales manager and not an analyst, but my calculations indicate that with the new production method and the associated cost data provided by Tanya (and no change in either our pricing or relative mix of model sales) we should have annual net operating income of $560,000 on 5,000 units. By contrast, with the current technology and continuing sales of 3,800 units per year we should be generating NOI of only $96,000. And the difference in income only gets larger the more we increase production and sales.

Thanks,
Wynona

B. Exhibit 2: Memo from Tanya Cline, production manager

C.J.—

Thank you for your diligent work analyzing the need for the new production technology. You asked me to provide cost information on the current production process and expected cost data if the firm were to adopt the new technology.

With the existing technology our variable cost per unit is $480 and annual fixed costs, including maintenance expenses, total $1,120,000. However, with the proposed new technology variable costs are projected to be cut in half to $240 per unit while fixed costs are expected to double to $2,240,000. Given the anticipated new cost structure and no change in the pricing structure of our guitars, the breakeven level of sales is expected to increase from 3,500 units currently to 4,000 units with the new production method.

As Wynona has reported, current sales are 3,800 units, modestly above the breakeven level of 3,500 units. And, certainly, with no increase in sales there would be no reason to trade out the current production process for a newer, more advanced technology since the breakeven level of

sales with the new technology (4,000 units) would exceed current sales. However, given the backlog of orders and growing demand for Nelson guitars, as reflected in Wynona's sales projections, there is ample justification for adopting the new technology and breaking the current logjam in production.

Again, thank you for your analytical work on this project. Though I obviously feel very strongly that we should move forward with the installation of the new production method, I appreciate your genuine concern for the firm and its financial stability going forward.

All the best,

Tanya

IV.   Case Requirements

Acting in the role of C. J., answer each of the following questions as the talking points for your presentation to senior management:

1. Verify the current and projected (with the new technology) breakeven levels of sales reported by Wynona Hill. Calculate the degree of operating leverage (DOL) at the projected annual sales level of 5,000 units, first with the current technology (assuming the firm could, in fact, produce 5,000 units with the existing technology) and then with the proposed new technology. Interpret the calculated DOL figures and explain the significance of the higher DOL at the expected sales level with the proposed new technology.

2. Create a graph illustrating Nelson's total revenue curve and the two total cost curves that C. J. is considering. Identify the two breakeven sales levels (calculated for Question 1 above) on the graph.

3. Calculate the sales volume at which NOI for Nelson is the same under both production methods and show that sales level on the graph.

4. Assume that Wynona's sales projections come from a normal distribution and the weighted average price of the mix of guitars sold by Nelson is $800 per guitar. Superimpose onto the graph created for Question 2 a probability distribution of sales with an expected sales level, $E(Q)$, of 5,000 units and a standard deviation of 1,100 units. (Be sure the left tail of the probability distribution extends beyond the breakeven level of output for the current production method.) What is the expected net operating income, $E(NOI)$, and the probability of an operating loss with the current technology? With the proposed technology? Identify the areas of operating loss with each technology under the probability distribution.

5. Discuss how you would use your graph to explain the risk-reward implications of the greater operating leverage inherent in the cost structure expected with the proposed new production process.

6. Assume that, upon further investigation, Wynona and her team conclude that the correct standard deviation of the sales distribution is only 600 units rather than 1,100 units. What are the recalculated loss probabilities associated with the current and proposed technologies? How would this new information affect your explanation of the risk-reward implications of the greater operating leverage inherent in the cost structure expected with the proposed new technology?

7. Do you think C. J. has sufficient information to make her final recommendation to Toby and Charley? If so, what do you think her recommendation should be? And if not, what other information or analysis does she need to present to the two officers?

Authors
Gia Chevis
PricewaterhouseCoopers Fellow for Teaching Excellence, Department of Accounting and Business Law, Hankamer School of Business, Baylor University, Waco, Texas 76798
gia_chevis@baylor.edu

John T. Rose
Professor Emeritus of Finance, Insurance, and Real Estate, Hankamer School of Business, Baylor University, Waco, Texas 76798, jt_rose@baylor.edu