What is Business Math?

a long answer

Anyone trying to run a business or understand economics needs to know some math. How much money did we take in? Total revenue is price times quantity sold. How much did we make? Profit is total revenue minus total costs. Math arises naturally in business, and often in simple and commonsense ways like these. Using math, we can get a better understanding of the relationships between quantities, and using this understanding we can make better business decisions.

Simple math is useful, but complicated math is also useful. The danger in using complicated math to model business and economic systems is that models are just models, and have a limited range of applicability. The recent economic crisis, fueled by unregulated and poorly understood financial products, has underscored the need for both mathematical facility and mathematical humility in the financial sector.

An intro to business math course lays the groundwork for using math in business. You learn basic relationships (equations) between quantities that arise in business models. You learn how to interpret data to make basic business decisions. But you also learn about the limitations of such models, their ranges of applicability and the assumptions on which they are built.

For example, if you have a graph of total revenue and a graph of total costs, both as a function of quantity sold/made, the vertical gap between the graphs represents profit. One way to maximize profit is to aim to sell the quantity that corresponds to the largest vertical gap between the graphs - but make sure that revenue is greater than costs, or else you'll be maximizing your loss, not your profit!

But suppose instead you have a graph of marginal revenue (MR; the additional amount taken in by selling one more unit) and marginal cost (MC; the additional cost of producing one more unit), both as a function of quantity made/sold. If MR is greater than MC, then you want to sell more; if MR is less than MC than by selling more you'll lose money. So you find the point where the graphs transition from MR being *greater* than MC to MR being *less* than MC - in other words, you find where the MR and MC graphs cross. Selling this quantity will maximize profit.

The connection between these two approaches to maximizing profit comes from calculus; the marginal revenue is the derivative of total revenue! Calculus, and more complicated math, thus arise naturally in business models.

When I teach this course, I like to tell the following joke:

> An economist, a physicist, and a mathematician are driving through the country. They pass a field of sheep. One sheep appears to have black wool, and the rest are white. The economist exclaims, "Well, look at that! All the sheep are black!" The physicist says coolly, "What are you talking about? Only one sheep is black." The mathematicians remarks, "Actually, all we can say for sure is that one side of one sheep is black."

The point of the joke is that, while physicists are grounded in reality, mathematicians have an obsession with precision and logical rigor. Economists, on the other hand, occasionally take a model such as "That sheep is black" and extrapolate it to draw unrealistic conclusions.

The economists and mathematicians can learn from each other. An Introduction to Business Math, then, goes beyond mathematical content to also encompass an introduction to the mathematical way of thinking.

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