

Metaphors and their Limits

Sleep is the interest we have to pay on the capital which is called in at death; and the higher the rate of interest and the more regularly it is paid, the further the date of redemption is postponed. So wrote Artur Schopenhauer, comparing life to finance in a universe that must ultimately balance its books.

Schopenhauer's metaphor is striking, but less obvious metaphors are everywhere. Our description of the world relies on language, which consists of a near invisible nested tower of metaphors, each new one resting on the older ones below. Our scientific understanding of the universe advances via nested metaphors too. And metaphors, often masquerading as reality, dominate the social sciences, in particular the theory of financial valuation. Though metaphors are rich, there are limits to the accuracy of their description.

Language

Most words are metaphors. Consider, for example, news reports that economists now fear the onset of a new depression. What's depressing about a *depression*? Taken literally, to depress means to push down, from the Latin prefix *de-* (down) and the verb *premere* (to push). *Pushing* is a physical act, and *down* is a physical direction. But economic depression is a state of society, and spiritual depression is a state of mind. Both these 'depressions' are metaphors that compare societal or mental states to physical situations. The word *metaphor* is metaphorical itself, originating in the Greek word for *carrying across*, the physical act transposed to a mental one.

Not every word can be a metaphor, circularly defined in terms of other words, or else language would be meaningless. *Push* and *down* are two of the nonmetaphorical words and concepts on which the tower of metaphors rests; *push* and *down* are understood by humans because they have lived and experienced these words through their bodily senses and the consciousness of their sensations. You cannot have lived without knowing what it to have struggled against gravity, and hence to know that down is bad and up is good. Had life arisen in gravityless outer space, there would be no *down* or *up*, and hence no *depression*. You could be disheartened perhaps, but not depressed.

Science

Like language, science rests on a base of nonmetaphors – position, time, mass, electric charge, and so on – that cannot (so far) be understood by comparison to simpler qualities. Science also consists of fundamental laws relating these qualities: Newton's laws or Maxwell's equations of electromagnetism or quantum mechanics or general relativity or maybe string theory.

But, like language, science uses metaphors too. Scientific models are a tower of metaphors built atop the fundamental nonmetaphorical qualities and the laws. Each new model or theory newly compares some mysterious part of the physical world with some previously demystified and well understood feature. An example: the nucleus of the atom, a tightly bound collection of protons and neutrons, can be usefully compared to a

drop of water that can fission by splitting in two. This analogy is the basis of the “liquid drop” nuclear model of Aage Bohr and Ben Mottelson, for which they shared the 1975 Nobel prize with the aptly named James Rainwater. Of course, the atomic nucleus isn’t a liquid drop at all. In a limited range of circumstances, though, it’s an apt analogy and a successfully predictive model. But it’s not reality, and it doesn’t work outside its regime of applicability.

Finance

What about financial models and theories? Financial theory is a tower of metaphors too, but, as practitioners soon learn, the sad truth is that there are no fundamental laws analogous to Newton’s or Maxwell’s. The only broadly useful principle is that the values of securities with similar payoffs should be equal. To value a security whose price is unknown, you must therefore compare it to a security to which it is similar and whose market price you already know. All financial valuation models are therefore attempts to establish similarity via comparisons. The closer the similarity, the better the metaphor, the more accurate the model.

To model the value of a can of fruit salad, you compare the can to a recipe for creating the salad out of a mixture of fruits. You can then estimate the approximate value of the can from the known market prices of fruits and the cost of canning. The model is approximate; cans of fruits salad don’t have to sell for the price you estimated; there may be price distorting gluts or shortages.

Similarly, to value a complex financial security, a tranche of a subprime collateralized default obligation (CDO) for example, you can compare the CDO to a recipe for approximately creating it from subprime mortgages, and then estimate the present value of the future mortgage cashflows. Those cashflows are themselves estimated from another model via assumptions about the rate at which homeowners will default on their mortgage payments. This model of models or recipe of recipes, one for the value of the CDO and another for the subprime mortgages, is valid only in a limited range of circumstances. In extreme times, the omissions and flaws which were always there become more apparent.

All models are metaphors and all metaphors are man-made. The greatest danger in financial modeling and the modeling of all human activities is therefore the age-old sin of idolatry. Financial markets are alive but a metaphor is a limited human work of art, entrancing perhaps, but inanimate. To confuse the model with the world is to embrace a potential future disaster. All metaphors have their limits.

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