# Modeling: A Perspective from a 2x2 Table

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In trying to classify the philosophy underlying modeling, one can use a simple 2x2 cross-classification table. The first dimension is divided into two categories, Simple and Complex (Green and Armstrong, 2015).

Arguably the best-known forecaster in the world today is J. Scott Armstrong. With Kesten Green, he wrote "Simple versus Complex Forecasting: The Evidence (Green and Armstrong, 2015), an article that suggests complex models remain popular among: (1) researchers, because they are rewarded for publishing in highly-ranked journals, which favor complexity; (2) methodologists, because complex models can be manipulated to provide support for the plans of decision-makers; and (3) clients, who may be reassured by incomprehensibility. Green and Armstrong (2015) also found no evidence that complex models are more accurate than simple ones.

The second dimension requires a bit more verbiage to describe. One category is called "The data modelling culture" by which Breiman means all of the statisticians and others who follow the theoretical specifications as found in the literature have unquestioning adherence to established methodologies. He likened this to a religious cult. The other category is comprised of those more inclined to follow nature's mechanisms rather than that specified by the data modeling culture. Breiman refers to this culture as one of "problem solving." See, Raper, 2020). Given this, here is a 'blank template" for this 2x2 representation

| | Simple | Complex | |
|---|---|---|---|
| problem solving culture | % | % | % |
| modeling culture | % | % | % |
| | % | % | 100% |

I have been producing county level forecasts that employing simple methods and concepts that need no more than the sparse data available in the U.S. (Swanson (2020a,

2020b, 2020c). With a simple geometric model using only the cumulative daily count of confirmed cases, and the "impact analysis" framework (Swanson et al., 2009), I have developed forecasts for Whatcom County, Washington (population ≈225,000, with one university, Western Washington University, located in the county seat, Bellingham), which is north of Seattle and on the southern border of British Columbia, Canada. The "impact analysis" framework looks at how an event might unfold if it was left to run its course relative to interventions designed to alter that course. It is not perfect in that it is not a controlled experiment. However, to paraphrase George P. Box (Box and Draper, 1987: 426), while it may be an approximation, it is useful (Swanson et al. 2009). Where would I place my work in the 2x2 table resulting from the 2 dimensional, dichotomous set up?

| | Simple | Complex | |
|---|---|---|---|
| problem solving culture | 65% | 15% | 80% |
| modeling culture | 10% | 10% | 20% |
| | 75% | 25% | 100% |

On April 17th, I published the third update (Swanson 2020d). This one used a three-parameter logistic model, which was selected from the curve fitting choices offered by the NCSS Statistical Software System (https://www.ncss.com/software/ncss/). This model was selected because it was clear the initial explosive growth indicated by the baseline forecast had been brought sufficiently under control by the containment measures that the surge was near its peak and on the verge of plateauing. In addition, there was a sufficient set of observations to support this model. Like the earlier updates, this third update brought welcome news, particularly in light of the sacrifices made by the many people who strove to adhere to the containment measures, which included foregoing work and income. These sacrifices paid a huge dividend in cases averted and lives saved. Per the third update, by April 25th, these sacrifices were expected to bring about a 95 percent reduction in the initial expected number of confirmed cases as shown in the baseline forecast. I noted that it was a tremendous achievement that had done a lot to reduce the risk to the first responders, healthcare, grocery, and other workers who had put themselves at higher levels of risk by staying at essential jobs.

A very different philosophy underlies the IHME model (http://www.healthdata.org/covid; Jewell, Lewnard, and Jewell, 2020). Someone might place it in the same 2x2 table as follows

IHME

| | Simple | Complex | |
|---|---|---|---|
| problem solving culture | 0% | 20% | 20% |
| modeling culture | 0% | 80% | 80% |
| | 0% | 100% | 100% |

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