



## Neural Networks: Where the Future *Is* Like the Past

Will the future be like the past? This harmless looking question is at the heart of predictive models used by economists, engineers, policy analysts, et al. Seems simple enough doesn't it? Alas, this troublesome question has the power to undo many, many predictive models. It begs the question: what was the past like? Think you know? Read on. Let's take a peek into the modeler's world. Whether you start with historic data and create conventional equations or do it the other way around using, say, regression, at some point the modeler adopts a set of equations, algorithms, etc. that comprise the model. At that point, the general shape of the past is fixed. Did the modeler describe the past accurately? How do you know? How does he/she know?

In my another post, I described a model as a map from the exogenous variables to the endogenous variables – from input to output. The equations are the map's outline and the parameter values fill in the picture. Take a very simple example, a demand function (or model) that predicts how much of some good, e.g. coffee, is purchase per month based on the price of coffee and the buyer's income. A common equation for demand is this:

$$Q = c P^a I^b$$

Where Q is the amount of coffee purchased, P is price and I is income. The parameters, c, a and b, are usually estimated by statistical methods like regression. Once the parameter values are estimated, their significance – or confidence in their value – can be determined. But how do you measure how much confidence you can place in the original equation? Doesn't it remain an untestable assumption? Doesn't this equation assume what the past was like? Will this equation persist? Was it ever valid?

Neural networks do not use equations in this way. In fact, they do not use equations at all! Instead, they learn the relationship between input and output directly from the data themselves.

Neural networks may not be your cup of tea but they do side-step the issue underlying choice of equation. Even if you wish to use statistical methods to estimate your model, please bear in mind that the equations you choose may control the results you get more than we all like to admit.