

**“*Constructive Skepticism*” Volume 3 – Notebook #I:
*Model Risk in Retirement Planning***

***Chapter 7: What Can Longbow Meditative Archery Do for Hypothesis Testing?*
*Part A: The Analogy***

Previous chapters showed the presence of “*Spinach*” [*Things we think unquestionably true but look ambiguously false after asking a few questions*] in research, and its organic growth from Model Risks such as (i) “*Statistical Illusions*” associated with the Measurement Problem, (ii) the “*Roughness*” associated with the Preference Problem, and (iii) the “*False Reconstructions*” associated with “*Dimension Reduction*” & “*Scaling Bias*”. This chapter moves the discussion from model description to model testing. Following *Ole Peters*’ frequent observations that one should look for concrete analogies in order to explain abstract “*Processes*”, this chapter starts by observing Hypothesis Testing through the lens of Longbow Meditative Archery, and ends by showing the presence of “*Invisible Gorillas*” in research papers, as well as their logical integration in model testing with the ideas of “*Spinach*”, “*Sensitivity*”, and “*Specificity*”.

Meditative Archery as an Analogy for Hypothesis Testing

A benefit of getting old, and retired comes from developing a “*Perspective*” that only comes into focus over time. At some point, you realize that you no longer live in the world of your own youth and prime, but that you live in the world of your children’s youth and prime. While the young set new goals, and run for it in their new world, the old can add value by seeing analogies, and asking questions that come for survival and experience in the old world. The analogy of Longbow Meditative Archery, and its matching questions comes to mind as an example.

Longbow Meditative Archery focuses on “*Form*” [A consistent and repeatable sequence of steps] in order to achieve consistent “*True Shots*” [A shot that differs from a bad shot, and a lucky shot because it displays the intentionality of the Archer, the skillful work of the Bow, and the reproducible “*Precision & Accuracy*” of Arrows hitting the Target]. Good “*Form*” differentiates “*True Shots*” from bad shots, and lucky shots. Practicing Longbow Meditative Archery means experiencing a metaphor in action, and the lessons from this experience transfer to reading research papers.

This translation comes from reflecting on the questions that define the “*Purpose*” of the “*Process*”. In research, as in meditative archery we can use similar, yet different “*Processes*” to answer related but different questions. Firing a shot in archery matches performing a statistical test in research. It answers a question, and it can answer a range of questions. These questions about “*Purpose*” in Longbow Meditative Archery include:

- How does this shot change my belief in skill vs. luck?
- What does this shot reveal about my inadequacies, and uncertainty in facing the target?

- What decisions can I make based on this shot, from improving a specific step in the “*Form*”, to choosing a different bow, switching to arrows with a different spine, or using points with a different weight?
- Does this shot provide sufficient strength of evidence to update beliefs, measure uncertainty, or to make a decision between alternatives, and instead do I need a set of three shots, or a series of sets over a period of time?

Archers have a choice of schools for Longbow Meditative Archery including several Japanese schools of Kyudo, British Longbow clubs, American Flatbow hunters, and home-made Selfbow craftsmanship. These schools have different levels of formalization ranging from the ceremonial, to the competitive, and the practical such as hunting for food. These choices differ in the list of steps that define their “*Form*” as readers can “*See for Yourself*” by contrasting **Deborah Klens-Bigman & Raymond A. Sosnowski**’s 2008 book titled “*The Way of the Bow: The kyudo path to a disciplined mind*”, with **Brian Sorrells**’ 2014 book titled “*Guide to the Longbow: Tips, Advice, and History for Target Shooting and Hunting*”.

Fortunately, a common pattern runs through the practice of meditative archery:

- Build-up consistent “*Form*” from the ground-up, starting with the feet
- Continue to build-up consistent “*Form*” my moving from the feet to rest of the body in order to focus on “*Presence in the Moment*” as feet, knees, hips, spine, shoulders, neck, and head fall in alignment
- Set the arrow on the string, and focus the “*Courage to Face the Target*”
- Draw the bow and arrow to sense the skillful action from the tension in the bow, and the strength of insight in the arrow as it faces the target: What will it reveal?
- Feel the separate elements unite to come together as a “*True Shot*”, focus on the archer’s “*Compassionate Intentionality*” about the target, and let it go
- Watch the arrow fly to the target to shatter the archer’s as well as the target’s inadequacies, and feel the lingering self-awareness of the combined skillful action of the bow, the intentionality of the archer, in order to perceive the insight that comes from the placement of the arrow on the target.

The analogy with Hypothesis Testing comes together when you look at the steps in a “*Form*” of Longbow Meditative Archery as a series of random variables, and the target as a data generating process for sample values. The “*Form*” seeks to reduce the variance implicit in every steps. Skillful archery turns the steps in a “*Form*” from a sequence of high variance distributions to a sequence of low variance distributions. The “*Precision*”, and “*Accuracy*” of the results make the archer’s intentionality visible on the target.

- Good “*Form*” sums up a succession of peaked probability distributions, thus resulting in a final peaked probability distribution that reveals the focused reproducibility of the intentionality of the archer, the “*Accuracy*” of the bow, and over time the “*Precision*” of the arrows on the target.
- Bad “*Form*” introduces “*Randomness*” through “*Variance*” in some of the steps, thus resulting in a final flatter probability distribution that reveals the noisy “*Bias*”

of the archer, the inaccuracy of the bow, and over time the imprecision of the arrows.

The value of this analogy deepens when one considers the role of new technology on both “*Form*” and “*Process*”:

- New technologies such as the modularization of the one-piece Longbow into a riser and two limbs, the complex changes to the string in the Compound Bow, and the short-shooting scopes on Crossbows help archers automate the creation, and consistency of peaked probability distributions for many steps in their “*Form*”.
- New technology such as software applications that automate the “*Process*” of Hypothesis Testing, help researchers in a similar way.

However, when technology replaces skill, it makes “*Form*” and “*Process*” available to practitioners with less training, less understanding, and less awareness of the questions asked by a specific “*Process*”, and the meaning of the answers. Interestingly, this analogy also illuminates the use of Large Language Models (“LLMs”). Leveraging low skill broadly may reduce variance from steps in a “*Process*” but at the cost of hidden “*Biases*”, and as contrasted with focusing high skill and intentionality for “*Precision*” and “*Accuracy*”. In the case of Hypothesis Testing, this leads to a Problem of Irreproducibility based on a frequent intentional or un-intentional mismatching questions and “*Processes*”:

- Hypothesis Testing focuses on a “*Process*” with a consistent and repeatable sequence of steps, in order to validate reproducible results.
- An appropriate “*Process*” matches the specific questions asked of the observations.
- A good “*Process*” produces reproducible answers (results) to the questions asked.

Reading **Richard Royall**’s 1997 book titled “*Statistical Evidence, A likelihood paradigm*” inspired the connection between Longbow Meditative Archery and Hypothesis Testing: **Royall** quantifies questions about “*Purpose*” in order to differentiate “*True Shots*” from bad shots, and lucky shots when it comes to determining the validity of research results. This leads to questions that differentiate good from bad Hypothesis Testing “*Form*”, and thus good from bad results in a research paper. These quantified questions about “*Purpose*” include:

- What specific Hypothesis Testing “*Process*” should I use to change my subjective belief about validated vs. random results based on specific observations?
 - o Updating “*Belief*” with **Bayesian** Hypothesis Testing
- What specific Hypothesis Testing “*Process*” should I use to reveal the pros-&-cons for a single hypothesis?
 - o Measuring “*Uncertainty*” with **Fisherian** Hypothesis Testing (“*p-values*”)
- What specific Hypothesis Testing “*Process*” should I use to support a selection between two or more hypotheses?
 - o Making a Decision with **Neyman-Pearson** Hypothesis Testing

- What specific Hypothesis Testing “*Process*” should I use to evaluate the strength of the evidence in order to update beliefs, measure pros-&-cons against a single hypothesis, or make a decision between alternatives?
 - o Measuring Strength of Evidence with *Likelihood Ratios*

Royall's highlights several structural mismatches between the “*Purpose*” of research papers, and the use of statistical “*Methodology, Methods & Models*” for Hypothesis Testing. These mismatches include the widespread use of “*p-values*” to make a choice between hypotheses. No wonder *John Ioannidis*' 2005 paper was titled “*Why Most Published Research Findings Are False*”. Most research papers may use the Hypothesis Testing equivalent of hammers when they need screwdrivers.

As you read a research paper, can you tell the type of question that was, or should have been asked? Can you also tell if it uses a “*Process*” for Hypothesis Testing that matches the question? The next post, Chapter 7 – Part B, will start with *Royall*'s questions to show the presence of “*Invisible Gorillas*” in research papers, as well as their logical integration in model testing with the ideas of “*Spinach*”, “*Sensitivity*”, and “*Specificity*”.