

Statistics 434: Bullet Points for Day 24

Look Back and Forward — Accomplishment and Anticipation

The mission statement for the course has been at the top of the course home page for the whole semester. One may see it at first, but after a while it surely becomes invisible. Nevertheless, the simple statement is where we begin and where we end:

*“A statistics course
committed to honest data analysis,
focused on mastery of best-practice models,
and obsessed with the dynamics of financial markets.”*

- What is honest data analysis?
 1. Not stumbling out of the starting block — dealing with data errors
 2. Maintaining a keen awareness of seductive language. For example, what is volatility?
 3. Keeping a clear focus on the object of interest — and understanding all of the attending definitions
 4. Finding the questions that “hurt” and answering them
 5. Becoming comfortable with ambiguity — while working hard to scrape together at least some “news you can use”
 6. Never over stepping the bounds of the evidence, yet giving a clear statement of what you believe to be your discoveries — or indications
- What have we found about best practice models?
 1. Returns are dramatically non-normal — big fat tails, some modest skew, typically positive mean, large or perhaps non-existent normalized fourth moments (evidenced by moment estimates, JB tests, WS tests, QQ Plots)
 2. The preceding assertions (and most succeeding assertions) are all slyly predicated on the prevailing assumption of stationary and ergodicity *which we cannot honestly tests*.
 3. Returns have a small signal to noise ratio — about $.0004/.01$ or $1/25$
 4. One typically finds only modest linear forecastability in returns — e.g. non-significant Ljung-Box statistics for returns (under conventional model). Still, there are instances of forecastability.
 5. Returns are not independent. One finds huge dependence in squared returns via Ljung-Box tests.
 6. Stationarity: Logically the “whole banana” yet logically untestable (per the cycle construction)

7. Stationarity in the restricted “no Unit Root” sense: Common for returns, vanishingly rare for price (ADF tests)
 8. Conditional Heteroscedasticity: Rampant and very important
 9. Leverage Effect: Common but perhaps not so important
 10. Acceptable off-the shelf model: AR(1) in mean, Garch(1,1) in noise, driven by t-noise with 5 d.f.
 11. Next Level? Deal with Leverage effect, say by replacing Garch(1,1) with the simplest EGarch model.
 12. Our Two Key Conceptual Frames: Stationary Ergodic processes and Martingales.
 13. Utility Theory — guide to α , guide to Kelly bet sizing, guide to WSOP — yet abstract and most useful when we only need monotonicity and concavity
 14. Prospect Theory — an explanation for observed risky behavior when “stuck”
- Obsession with Market Dynamics