

Financial Economic Foundations of Financial Engineering

The theoretical foundation of computational finance and financial engineering is provided by financial economics. This is similar to how the physical sciences provide the foundation for the traditional engineering disciplines. One of the main differences between financial economics and financial engineering is that the former has a positive focus, whereas the latter has a normative focus. In financial engineering we seek to solve real world financial problems with quantitative and computational tools and an engineering mindset.

Our focus in this course is more on financial engineering than financial economics, but we need the foundation that financial economics provides us. We will simply take these principles for granted. But it behooves us to remind ourselves what these essential building blocks are.

The Nobel-Prize-Winning Economist James M. Buchanan provided a helpful summary of the main principles of *good* economics in his book *What Should Economists Do?* in the last chapter titled *Retrospect and Prospect*. In that chapter he outlines the following eight fundamental principles of economics:

1. *Economics is a very peculiar “science”*
2. *Economics is about choice*
3. *Economics involves actors*
4. *Economics is about arbitrage*
5. *Economics is about a game within rules*
6. *Economics is political*
7. *Economics has a didactic role*
8. *Economics is elementary*

We will take these each in turn. The following paragraphs are taken from Buchanan in the source cited above. Buchanan called them “a series of cryptic statements or assertions . . . to challenge thought.”

Economics is a Very Peculiar Science

There is a “science” of economics, but it bears little or no similarity to the physical-biological sciences, as the latter are normally conceived. Economics is “predictive” in a totally different sense, and the indirect implications for “control” are not comparable. The problems in economics are not amenable to scientific solutions, and progress is not to be expected by pushing back the frontiers of science. The strictures of both Frank Knight and F.A. Hayek against scientism require continued repetition.

Economics is About Choice

If economics were scientific in the strict sense, it could not be concerned with choice at all, as G.L.S. Shackle should have taught us all. Choice is necessarily made among imagined “possibles,” and choice-making under certainty becomes internally contradictory. The equilibrium constructions are useful only if their limitations are appreciated. These allow us to discuss directions of adjustment rather than states of potential attainability.

Economics Involves Actors

Without actors, there is no play. This truism has been overlooked by modern economists whose universe is peopled with passive responders to stimuli. If all are price-takers, who sets price? If all behavior is rationally responsive, how can change occur? How can entrepreneurship be modeled? Increasingly, I have come to view that the role of entrepreneurship has been the most neglected area of economic inquiry, with significant normative implications for the general understanding of how the whole economy works.

Economics is About Arbitrage

The behavioral paradigm central to economics is that of the trader whose Smithean propensity to truck and barter locates and creates opportunities for mutual gains. This paradigm is contrasted with that of the maximizing engineer who allocates scarce resources among alternatives. As several of the essays in the volume have suggested, the maximization paradigm is the fatal methodological flaw in modern economics.

Economics is About a Game Within Rules

Choices are made by actors, by traders, constrained within specifically determined “laws and institutions,” a central emphasis of Adam Smith and one that has been lost to modern minds. Institutions matter. The libertarian anarchists who dream of markets without states are romantic fools, who have read neither Hobbes nor history.

Economics is Political

Choices are also made among rules and sets of rules. The “social contract” also offers mutuality of gains, and indeed, the “social miracle” must remain central to man’s consciousness. Passive acquiescence in the developing events of history, by scholars and non-scholars, must produce the natural reversion to the jungle.

Economics Has a Didactic Role

As a discipline or area of inquiry, economics has social value in offering an understanding of the principle of order emergent from decentralized processes, of spontaneous coordination. (The market is the classic example.) Such an understanding is necessarily prior to an informed decision on alternative forms of social order, or even on alternative directions of marginal extension. The principle of order that economics teaches is in no way “natural” to the human mind which, in innocence, is biased toward simplistic collectivism.

Economics is Elementary

Despite the attempts by modern scholars to cloak their own insecurity in complexity, the central principles of economics are elementary. We do not need the excess baggage of modern mathematics to grasp and to convey the basic wisdom that Adam Smith discovered and that his successors emphasized.