A few useful ideas in economics

Free markets are somehow "natural". Of course politically, we argue for the natural fallacy. But as scientists, we might see the likeness in economics and finance from both a biological standpoint and a physics-mathematical standpoint. Capitalism is also about people, and to understand people in some way (very multifaceted) can be key.

The Power Law

Kärt barn har många namn: AKA The Matthew Principle, and the 80/20 rule – 20% of the people will contribute 80% of the work. It holds for the number of stars in galaxies, for the sizes of trees in the rain forest and so on. This makes picking the winners extremely important. In a game of monopoly, it is life or death. Anytime you get discretization – a binary bottleneck, this is the case. It is a natural phenomenon, and free markets allow it. This also makes sense of "striving for monopoly". It shines a light on opportunity cost. In learning, it explains the "Jack of all trades".

Theorizing in Markets

The efficient market hypothesis: Asset prices reflect available information $\implies$ trading (making money) becomes impossible. Available information that is not yet reflected in the price will be traded on.

$$P_t = E_t[M_{t+1}(P_{t+1} + D_{t+1})] \implies P_t = M(E_t[P_{t+1}])$$

Samuelson: If a market is efficient, it follows a random walk. This has been thoroughly discredited, and the critique is often grounded in seeing that bias affects the market. One's stance on this opens up how one can theorize about the market. If you accept it, the only way to make money becomes a time-lag, assuming the market is not perfectly efficient. Arbitrage is in this way always an arms race, fighting over nanoseconds.

Refuting EMH invites other theories: If you does not accept the EMH, you have to have some knowledge or theory of the dynamics of the market, or how actors in it act, that other actors have not yet acted on. You can either be "fundamental" in your approach, then often with some theory of human psychology – or you are quantitative in your approach, and you formulate mathematical models in describing how markets move. Either way, you're invited to in some way to be scientific – with theory (mathematics and psychology) and experimentation (empiricism, Bayesian updating).

Underdetermined XOR overdetermined It might all be a game of chance $\implies$ eventually concentration of a few players, who then strongly believe in their theory, and yet we can never know. If we where to find some commonality across these actors "recipe for

success", it will have been traded on already. *You have to have a secret, and it cannot be formulaic.* At the same time, we cannot even know if success and failure is underdetermined or overdetermined. It might be overdetermined, especially in the failure case, since there are seemingly very easy to fail but harder to succeed.

Game Theory

Games and Geometry Nash equilibrium and their existence Fitness landscapes: Optimization problems and convexity Differential games living on manifolds **Good heuristics**

- Actors locked in defect, and forgiveness as a way out
- Zero-sum vs non-zero sum games
- Infinite games
- Zug-zwang

Optimal Control & Game Theory vs. Markov Decision Processes