

At the crossroads: Where EMH meets behavioural finance

Sanjoy Bhattacharyya

Flame Investment Lab

12th July 2017

Efficient markets hypothesis

- An “efficient” market is defined as one where large numbers of rational profit maximisers actively compete with each other trying to predict the future market value of an individual security, and where important current information is almost freely available to all participants.
- In other words, “in an efficient market, prices fully reflect all available information”.

Efficient markets hypothesis

- Rational expectations vs bounded rationality.
- Rational expectations based on 3 premises:
 - information is scarce, and the economic system generally does not waste it.
 - The way expectations are formed depends specifically on the structure of the relevant system describing the economy.
 - A public prediction will have no substantial effect on the operation of the economic system (unless it is based on inside information).

Efficient markets in action

- EMH is a hypothesis about (1) what information is available to market participants, and (2) how prices fully reflect the information.
- Based on the assumption that market participants are rational economic beings, always acting in self-interest and making optimal decisions by trading off costs and benefits weighted by statistically correct probabilities and marginal utilities.
- Prediction markets.
- The random walk hypothesis.
- Criticize behavioural financial as primarily observational and lacking a set of unifying principles.

Homo economicus ≠ Homo sapiens

- Risk and regret aversion
- Overconfidence and over-reaction
- Representativeness
- Anchoring
- Herding
- Mental accounting
- Probability matching
- Wisdom of crowds / madness of mobs
- The Ellsberg paradox

Quirky Markets & Super-investors

- Dutch Tulip Mania (1634-1636)
- South Sea Bubble of 1720
- US stock market crashes of October 1929, October 1987 & October 2008.
- Japanese real-estate bubble of the 1990's and US technology bubble of 2000
- Collapse of LTCM
- Buffett, Soros, Klarman, Howard Marks, Greenblatt, Edward Thorp and Jim Simmons

Why emotions matter

- Basis for reward and punishment system that facilitates the selection of advantageous behaviour.
- Provides a mental yardstick to measure cost and benefits for various actions open to an individual.
- Even fear and greed are the product of evolutionary forces, adaptive trades that increase the likelihood of survival.
- Emotion is a powerful tool for improving the efficiency with which humans learn from their environment and their past.
- If the ability to experience emotion is eliminated, an important feedback loop is severed which leads to the decision making process getting impaired.

Looking under the hood

- The human brain is not a homogenous mass of nerve cells but rather a collection of specialized components with specific functions.
- The **brain stem** controls basic functions such as breathing and the beating of the heart.
- The **limbic system** is responsible for emotions, instincts and social behaviour such as feeding, fight or flight responses and sexuality.
- The **cerebral cortex** allows us to think complex and abstract thoughts which enhance language and musical ability, learning logical reasoning, long term planning and sentience.
- Neural circuitry geared towards survival.
- Behaviour may be viewed as the observable manifestation of interaction among several components of the brain, sometimes competitively and other times cooperatively.
- The point of specialization in brain function is increased fitness in the evolutionary sense.
- Humans adapt to fit environmental conditions, leading to changes in individual preference.
- The competitiveness of global financial markets suggests that Darwinian selection plays a major role.

An evolutionary perspective on market dynamics

- Behaviour typically evolves by natural selection and depends on the environment through which selection occurs.
- Natural selection operates not only on genetic material but also on biology, social behaviour and cultural norms for human beings.
- Given the limited computational abilities of human beings, and the high cost of optimization individuals typically make choices that are satisfactory but not necessarily optimal – “satisficing”.
- Supporters of EMH question at what point an individual stop optimizing and reaches a satisfactory solution? Clearly this point is determined not analytically but more by trial and error and, of course, natural selection.
- Choices are typically based on past experience and a best guess of what might be optimal. Learning is reinforced by feedback from outcomes. Individuals develop heuristics to tackle economic challenges and refine them as long as the challenges remain stable. Eventually, heuristics = approx. optimal solution.
- Heuristics break down when the environment changes leading to strange behaviour (a case of mal-adaptive rather than irrational behaviour).

The new EMH – adaptive markets hypothesis (AMH)

The primary components of the AMH consist of the following ideas:

- ❖ Individuals act in their own self-interest.
- ❖ Individuals make mistakes.
- ❖ Individuals learn and adapt.
- ❖ Competition drives adaptation and innovation.
- ❖ Natural selection shapes market ecology.
- ❖ Evolution determines market dynamics.

The implications of AMH

- Market efficiency cannot be evaluated in a vacuum because it is highly context dependent and dynamic.
- Profit opportunities in any given market are akin to the amount of natural resources in a particular local ecology.
- Prices reflect as much information as dictated by the combination of environmental condition and the number and natural of species in the economy.
- Convergence to equilibrium is neither guaranteed nor likely to occur at any point in time.
- Changes in ecology are driven by
 - ✓ Increased competition
 - ✓ Resource depletion
 - ✓ Decline in population
 - ✓ Extinction of species

Preferences Matter

- Need to be aware of heuristics and biases that lead to or influence individual preferences.
- Based on an understanding of an individual's personality and temperament, need to calibrate attitude to risk taking and investment allocations/decision making.
- Need to proactively manage preferences to achieve superior outcomes.
- Vital role for investment consultants in matching investor and manager preferences.
- The consultant needs to have familiarity with a wide spectrum of investment products/services and continuously seek education with regard to advances in financial technology, neuroscience and quantitative methods.

Revisiting Asset Allocation

- To the extent that a relationship exists between risk and reward, it is unlikely to be stable overtime.
- Such a relationship is determined by the regulatory framework, the relative sizes and preferences of various species and tax laws.
- Arbitrage opportunities do exist from time to time but disappear as they are exploited. New opportunities are being continuously created by the evolution of species and changes in business condition and institutional behaviour. These dynamics provide the motivation for active management.
- Any specific investment strategy is also unlikely to enjoy consistent outperformance.
- The main determinants of any factor risk premium revolve around the preferences of market participants and how they deal with opportunity in a given environment.
- This sets a research agenda that focuses on identifying and measuring factor premiums and how they are currently priced in the current ecosystem.

AMH - the way forward

- The AMH framework for investment management clearly suggests that innovation is the key to survival.
- EMH suggests that certain levels of expected returns can be achieved simply by bearing a sufficient degree of risk.
- AMH implies that the risk/reward relation varies through time and that a better way of achieving a consistent level of expected returns is to adapt to changing market conditions.

AMH - the new mantra

- Survival is ultimately the only objective that matters.
- Profit maximization, utility maximization, and general equilibrium are certainly relevant aspects of market ecology.
- The organizing principle in determining the evolution of markets and financial technology is simply survival.