

Predictably Irrational

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‘We have to learn to live with uncertainty’- Gerd Gigerenzer

It is incredible to be living in an era where the economy is pullulating; spilling over its horizons and preening its opulence more fervently than ever. The limpid realization of a profit centric impetus has become nearly irrevocable and only indelible with the passing years. To strengthen it, economists worldwide have been trying, incessantly, to remove the vagaries by comprehending the minutiae. But something that infamously has invisible hands, how do you lead it towards a path of your choice? Its volition is its only ruling will. The leit motif of running an economy has undergone several changes- profits to growth to sustainable development- and is still being chaperoned by new ideas and approaches which attempt to not only understand it in a better way but also enhance the lives of the people living in it. One such remarkable contribution has been by Milton Friedman and Edmund Phelps through their natural rate hypothesis. This hypothesis – which is no longer controversial and is now supported by a large body of empirical evidence – challenged the belief underlying the so-called Keynesian policies that policy-makers could permanently and systematically exploit a trade-off between inflation and unemployment. Expectations lie not only at the heart of this hypothesis but also form the core of modern day economics. Economists define "expectations" as the set of assumptions

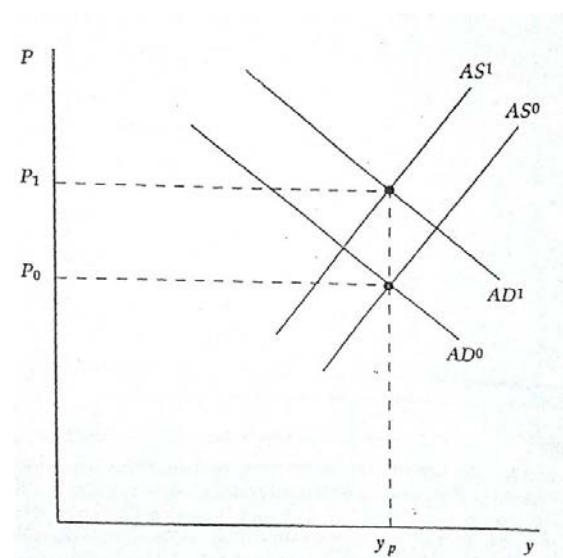
people make about what will occur in the future. These assumptions guide individuals, businesses and governments through their decision-making processes, making the study of expectations central to the study of economics. A restaurant manager's prediction about how many customers he can expect over summer may prompt him to hire more staff, or reduce orders for fresh produce. A bond trader's expectation of how the Federal Reserve will change interest rates will alter her trading strategy. A CEO of a publicly traded company's guess about how regulators in Washington will behave may change his expansion plans. In a very real sense, economics is the study of how people make decisions. Expectations about what will happen in the future lie at heart of every choice, so they are the heart of economics as a discipline.

Post the financial crisis of 2008, the economic advisers assured everyone that recovery would be quick and there was real revival until 2010, when the economy stalled again. A lot of economic attention and discourse turned to the relationship between fiscal deficit and the economic expansion. The governments were faced with a twofold dilemma- whether to deliberately incur spending to offset the fall in household and investment demand or to cut down spending to free money for private spending- and depending on the

macroeconomic view one held, both are pro-growth policies. Keynes propagated the first kind of policy; the governments unanimously put their faith in the second. The effect of their decision was that developed countries witnessed a drop off 5 to 8 percentage point in their GDP. Cutting public spending, it turned out, was not the same as cutting the deficit, because it cut the economy at the same time. Some economists also claimed that the governments faced risk in 2010; cutting deficit but not committing to cut it was problematic. The Keynesian remedy, the argument went, ignored the effect of fiscal policy on expectations. If public opinion believed that cutting the deficit was the right thing to do, then allowing the deficit to grow would annul any of its hoped-for stimulatory effect. Expecting that taxes would have to rise to “pay for” the extra spending, households and companies would increase their saving. Fearing sovereign defaults, bond markets would charge governments punitive interest rates on their borrowing. And here was the clincher: By committing themselves to fiscal tightening, finance ministers gave themselves scope for some fiscal loosening. Proclaiming fiscal virtue enabled them to practice fiscal vice. They could create a fiscal illusion by cutting less than they promised. Most finance ministers did exactly that. This is part of the mess into which macroeconomics has gotten itself. Once beliefs and expectations are introduced into economics, as is surely reasonable, the results of fiscal policy become indeterminate. Too much depends on what people think the results of the policy will be. In the economists’ lingo, policy results are

“model-dependent.” The Nobel laureate economist Paul Krugman has poured scorn on what he calls the “confidence fairy,” the claim that fiscal policy must command the support of the bond markets. But to show that policy made things worse does not mean that a better policy was actually available. The right policy’s success may depend on the public’s expectations of its effects.

The rational expectations theory and the adaptive expectations theory both are intriguing in the sense that they explore the idea of expectations. The former professes that on an average, expectations are zero while the latter makes expectations dependent on past experiences. But the one that has garnered the most attention is Lucas’s critique which has transformed post 1970’s, the macroeconomic theory. Lucas argues that any monetary policy can only be effective if people aren’t expecting the outcome of the policy.



If the money supply is increased to AD₁, and people were expecting prices to raise, the AS curve shifts to AS₁ and thereby the output remains at the original level. Quoting Sheffrin, any anticipated change in the stock of money will affect only nominal magnitudes but not real variables such as output. In the absence of any surprise in the price level, the economy will remain at the full employment level. One of the possible factors that drive this analysis is cited by Lucas as that people do not possess economy wide or global information but only local information.

As participants of a growing economy, we all take very consequential, important, economic decisions as we go about making trade-offs and maximizing our satisfaction and benefits. Wherever trade takes place, we're told that human beings behave rationally, efficiently. Therefore, the concept of homo economicus, or the rational consumer has widely been used in economic models, theories and studies.

However, as discussed by economists for decades now, we seem to fall prey to pre-existing "biases" and employ certain short cuts while processing information, known as "heuristics" (Tversky & Kahneman, 1974). Over the years, the working of these biases and heuristics has gained structure - the concept of making effective approximations by using a representative case instead of a specific one i.e. representativeness, making us work with whatever first comes to mind i.e. availability; and based on our first thoughts, the limitation of the subsequent mental search process, known as adjustment and anchoring. Our mind, a result of

biological evolution, does not strive for theoretical optimization, but simply for a competitive degree of "fitness" in a specific environment (Hilbert, 2011). Therefore, when humans make decisions, they essentially make a choice among several (yet limited) alternatives (Edwards, 1954). These choices that humans make turn out to be "predictably irrational" (Ariely, 2008). The pattern of consistency of biased decisions is useful for predicting individual behavior and can also have disastrous consequences for the society as a whole (Hilbert, 2011). The consistency of leaning towards one side say, over-estimating or under-estimating risks by majority of investors has been concretely evidenced by the worldwide economic crisis of 2008 (Ariely, 2008). Therefore, one can effectively conclude that complete rationality of market participants is quite uncommon.

As mentioned above, it is nearly impossible for humans to analyse big data which is large, complicated, unstructured and widely inaccessible and come up with decisions that are devoid of biases and heuristics.

What can help us attain "rationality" then?

Impressively, research in computer science and statistics has enabled computers to obtain insights from large disparate data sets, recognizing patterns & images, predicting and learning from experience; thus leveraging the ability of computers. This application of computational tools to address tasks traditionally requiring human sophistication is broadly termed as "Artificial Intelligence" (AI) (Financial Stability Board, 2017)

However it's the process of Machine Learning (ML) under AI that carries this out. ML is the method of designing algorithms, or sequence of actions, to optimize through experience with bare minimum human intervention. It consists of techniques such as statistical tools, probability, and linear algebra which work to optimize, predict, categorize and search for patterns or "correlations" which might go unnoticed to the human eye.

Real world processes, like trading at the stock exchange, might seem random to the untrained eye, but are rather chaotic processes. Chaotic processes are generally, and specifically in stock markets, controlled by 3 paradigms: stability, which is increase or decrease in stock trend; memory, the experience of past events and drastic changes, characterized by the reversal of trends without warning.

These properties of financial time series like stock markets make it possible to make informed decisions, using machine learning algorithms selected on the basis of desired task; time available and precision required in achieving relevant results.

"I Know First", a FinTech company, uses genetic algorithms (local search algorithms using simulated annealing*), which track current market data and add it to the database of historical time series data. Based on their database of 15 years of stock share prices, the algorithms make predictions over six different time horizons. As the input data increases, the algorithm is able to learn from its successes and failures and improve subsequent results. The algorithm identifies waves in the stock market, analyses raw data

and generates updated forecasts for each market.

The forecast is narrowed down to 2 indicators - signal and predictability. Signal conveys the predicted movement and direction for each asset, the strength of which shows the level of deviation from the "fair price". Predictability shows the historical correlation between past algorithmic predictions and the actual market movement for each asset, in which more weight is given to more recent performances.

The algorithm tracks various assets like Gold, Stocks, World Indices, Interest Rates, Currencies and Billionaire's portfolios. It predicts the flow of money between 7,000 markets from 3-days to a year, where longer the time period, more accurate the prediction. The behavior of traders (individual, non-specialized and specialized institutions) is affected as the predicted number influences their entry and exit in the market hence helping them make more rational decisions with near-accurate results. The accuracy of the predictions can be ascertained by facts. I Know First's 2015 portfolio outperformed the S&P 500 picks by 96.4%. The overall returns in the period of Jan 2016-Jan 2017 range between 20.1 % and 77.3% while the S&P 500 has increased by a mere 12.5%.

Speaking at the Deep Learning Financial Summit 2017 Singapore, the founders stated that the future can see AI actively being used in Health Care.

Nudging, the idea of influencing one's compliance with indirect suggestions has

direct relations with machine learning and prediction. The idea of nudging through e-commerce websites rests primarily on the idea of the machine learning one's preferences, previous purchases, behavior of similar consumers etc. and then predicting what the consumer wants. This is further customized and shown as recommendations on every user's account adding a variety of choice for the product. The consumer ends up choosing one of the many alternatives which contribute in providing him more knowledge and also analyses what he truly wants by eliminating the choices, making a more "rational" decision than he would without these recommendations.

The total sales of Amazon have risen by 34% which amounts to \$43.7 billion (as of Oct 26 2017). This comes with their recommendation system becoming exceedingly more accurate, proving to be extremely beneficial for the profits of the company. Understandably, the e-commerce giant has an investment of \$227.8 million (as in 2016-17) in Artificial Intelligence.

"Rationality" can be argued in various contexts, but the fact that technology can improve this aspect of human decision-making cannot be challenged. The future of Behavioral Economics is intricately tied with Artificial Intelligence, and together, it can help the individual, the company, the government, the society and the economy towards levels of efficiency previously unheard of.

*Simulated Annealing: A technique based on probability theory for approximating the global optimum of a given function.

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