



Tom Connor's Thinking Forward:

***Ceteris Paribus*¹ (or, All Things Being Equal)**

"The three questions I invited you to answer are handled by different parts of the brain."²

What is this all about? "questions ... handled by different parts of the brain."? And does this have anything to do with business, finance, economics, or what? Well, the short answer is "It's all about us, and it's a very big deal that matters a lot."

Ceteris paribus what?

Traditionally, economics is the study of how we *choose* to allocate scarce resources among alternative uses. Attention is often on complex processes as it is with other areas of human study. To create useful analysis where human intelligence can gain understanding we abstract, that is we simplify and hold constant elements not considered critical to the analysis. The Latin, *ceteris paribus* indicates these assumptions. Recently, much has been learned about human thought processes and the neural system, resulting in new perceptions of human thought and the decision making process. The assumptions about choice are changing.

For about 400 years there has been a perception, dominant in Western philosophy that the mind and body function best when independent, each functioning without interaction with the other. René Descartes³, (1596-1650) was among the first to set out this belief. His famous quote "Cogito, ergo sum" (In English: "I think, therefore I am.") summarizes the view and that of many who followed him that the acquisition of knowledge and the decision-making process are best when devoid of emotion, following reason and logic only. This established a tradition of 'rationalism' that has been the foundation of much thought since and continues today.

We see it in Adam Smith's "The Wealth of Nations", published in 1776. There, Smith assumes that the decisions of the actors in his exposition of a market economy are rational, behave according to their own interests and have the knowledge and capacity to do so. Herbert A. Simon, the 1978 Nobel laureate economist, reflected concern with Smith's view when he questioned the cognitive capacity of people in modern economies as the amount and complexity of information expands.

¹ - Latin phrase that translates approximately to "holding other things constant" and is usually rendered in English as "all other things being equal". In economics and finance, the term is used as a shorthand for indicating the effect of one economic variable on another, holding constant all other variables that may affect the second variable. http://dictionary.reference.com/search?r=2&q=ceteris_paribus

² - Utilizing Visitor "Goal-Seeking" in eCommerce; Joseph Carrabis;
<http://nextstageglobal.com/pdfdownload.cfm?thisone=nsagsb.pdf>

³ - Descartes, Rene (1596-1650); <http://www.meta-library.net/gengloss/descart-body.html>

According to Simon, people in the institutions he studied developed methods (short cuts)⁴ to simplify decision-making due to limits, or bounds⁵ put on rational decision-making by limitations of human capacity. It's doubtful the trend of rapid economic change and complex information flows today is reducing these bounds.

John von Neumann also refined the view with his contributions to Game Theory when he recognized that interactions between people alter the outcome of decisions⁶. In Adam Smith's world each participant was a small part of the total, as a result the terms of an exchange were not negotiable, they were static, take it or leave it. In von Neumann's world players are aware of each other and each tries to anticipate the actions of the other.

How do we make choices?

More recently medical technology has aided our understanding of decision-making by revealing the location in the brain of different processes, challenging the assumption that emotion and feelings have no role in the brain/mind process. Antonio Damasio, one of the leaders looking into what has been the 'black box' of the human brain, documents some of his research in his book "Descartes' Error"⁷, where he hypothesizes that emotions have a central role in effective decision making.

It's Damasio's belief, and that of many others studying neuroscience that the brain is a complex organ made up not of a homogenous substance, ('gray matter'), but of many different parts interconnected and with different roles to play. Some of these roles are unconscious, others not. When our blood sugar begins to fall our bodies set off a number of responses that we are not aware of, except we begin to feel hungry. Our awareness of the particular body processes is low, but we begin to think about eating. Other responses are probably learned. Once we see something falling toward us and don't move, next time we duck. A fast moving car comes around a corner, we jump, and we don't consciously think about that. We think about a career, who to date or marry, where to go to church and we are probably using other, more methodical, deliberate parts of the conscious brain.

What is important in Damasio's hypothesis is the role of emotion and affective responses. Unlike Descartes where emotion had no role, Damasio sees a critical function for emotion; where there are unconscious behaviors and where behaviors are learned, and also where processes are more deliberative but limited to the ability of the human brain set boundaries on its capability. Here, affective regions of the brain can assist by providing a 'gut feeling' or a 'somatic marker'⁸ that assists the brain to a response.

⁴ - CMU's Simon reflects on how computers will continue to shape the world;

<http://www.post-gazette.com/regionstate/20001016simon2.asp>

⁵ - 'Bounded rationality'; http://en.wikipedia.org/wiki/Bounded_rationality

Bounded Rationality: A Response to Rational Analysis;

<http://ai.eecs.umich.edu/cogarch0/common/theory/boundrat.html>

⁶ - *Game theory* deals with the analysis of "games" (i.e., situations which involve conflicts of interests). As well as simple games, which can be analysed completely, the theory has applications in "real games" like poker, chess, etc as well as in areas like politics, economics etc.

von Neumann, John *Theory of Games and Economic Behaviour* (1944).

⁷ - Damasio, Antonio R. *Descartes' Error, Emotion, Reason, and the Human Brain*. New York, New York: Avon Books, 1994

⁸ - Ibid, p 173

These are complex and intricate processes where the range of alternatives are unknown and the outcomes of each uncertain, and, according to Damasio, the consequences of a 'purely' rational approach are severe and overwhelming.

"Now, let me submit that if this strategy is the *only* one you have available, rationality, as described above, is not going to work. At best, your decision will take an inordinately long time, far more than acceptable if you are to get anything else done that day. At worst, you may not even end up with a decision at all because you will get lost in the byways of your calculation."⁹

Research on the interaction and role of affective responses continues. A study of choices at Princeton University provides further evidence that emotion has a role in decision-making. In the study subjects receive 10 \$1.00 bills and are allowed to keep part of the money if a second subject is offered and accepts some part of the original \$10.00. Called the 'ultimatum game', it tests how the brain works and whether rational assumptions are justified. According to a 'rational' process the 2nd subject would accept \$1.00 if offered since that would be a net benefit, and the subject setting the terms would recognize that and offer the \$1.00, keeping the greatest benefit to themselves - \$9.00.

"In their study, the Princeton researchers asked people to play the ultimatum game while the receiver's brain was scanned using functional magnetic resonance imaging (fMRI), a technology that allows researchers to see what brain areas are active at all moments during the study. They found that the more unfair¹⁰ the offer, the more activity they saw in an area called the anterior insula, which is associated with disgust and other negative emotions.

"Another brain area, the dorsolateral prefrontal cortex, which is associated with working memory and deliberative thought, also responded to unfair offers. When the researchers averaged the results from 19 subjects, who each played 10 rounds of the game with different proposers, they found that the activity of the emotion area exceeded that of the deliberative area in cases when the subjects rejected the offers. The reverse was true when they accepted offers.

"It is not only telling us that there is an emotional response but that there seems to be a competition between these different considerations or ways of processing the situation," said Jonathan Cohen, who directs Princeton's Center for the Study of Brain, Mind and Behavior and is a co-author of the study."¹¹

In a private test the author asked his mother-in-law if she would accept an offer of \$1.00. She thought a few moments and said "Sure". Then, after presenting the two people scenario above, she was asked if she would accept \$1.00 under those conditions. The response was immediate, "Oh no Tom, 50 – 50, fair is fair."

Where do we go from here?

⁹ - Ibid, p 172

¹⁰ - Unfair in a social context, not a probabilistic one.

¹¹ - Take it or leave it? Brain imaging study reveals interplay of thought and emotion in economic decisions; <http://www.princeton.edu/pr/pwb/03/1208/7a.shtml>

The 'ultimatum game' study has demonstrated that both affective and deliberative areas of the brain are active when decisions are made. Rejected offers demonstrated more activity in regions where disgust and negative emotions are active while accepted offers demonstrated more activity in areas of working memory and deliberation.

It is important to recognize that activities in different areas are dependent; there is interplay or collaboration between affective and cognitive areas of the brain. Damasio: "There is still room for a cost/benefit analysis and proper deductive competence, but only after the automated step drastically reduced the number of options."¹² When the collaboration works well it can either reinforce or correct affective responses, when it does not work well unsatisfactory decisions will continue.

For anyone curious about the decisions people make, as well as decision makers, adjustments to our perception and understanding of the process is warranted. This does not reject earlier efforts to understand choices, but, *ceteris paribus*, improves our understanding.

Already making some changes

During the past several decades our understanding of choices and decision-making has moved well beyond the insight provided by the rational model. In particular, emotions are frequent catalysts to decisions. It's already recognized that emotions such as trust are important during exchanges. Since most decision makers have imperfect information, as pointed out by Damasio, they frequently rely on affective responses to make a decision without becoming incapacitated by details. The degree of trust felt by the party receiving an offer can well provide the switch between acceptance and rejection.

A recent conversation with someone who was buying a new computer over the telephone illustrates that role. The buyer has good computer knowledge and asked the salesperson's opinion in areas where his knowledge was less. Listening to the description of the process it is clear there came a point where the buyer crossed a threshold and decided to trust the salesperson and make the purchase. The purchase decision was based on the interaction with the salesperson and a previous relationship with the company, and future decisions will likely depend on this experience.

Today we are beginning to recognize and identify the role of affective processes in our decisions. While the rational, neo-classical economic model has been extraordinarily successful providing useful information on consumer choice, they are mostly macroeconomic and built on large collections of aggregated data, losing differences between individuals in the process. Methodologies which include affective processes have the potential to provide more insight into individual differences and individual choices.

This is changing the way decision-making behaviors are modeled. The neo-classical approach has been built on mathematical structures which best represent rational choice, methods that build on knowledge developed by including affective responses are creating new insight into individual choice.

And that is learning more about us, and that's a very big deal that matters a lot.

¹² - Ibid, p173

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