

# Human Brain and Decision-Making

## *Factors behind Investor Choices*

August, 2011

Dear Friends,

The age old phrase: “*You Reap What You Sow*” emphasizes the fact that it is very important to make the right choices now to reap the desired benefits later. But making a choice is not always easy. Today’s world offers so many options in everything that a simple decision--like ordering from a menu at a new restaurant--becomes a time and effort consuming process.

Every available choice in a decision making process offers a level of utility to us. *Utility (or expected utility) can be defined as the level of relative satisfaction that can be achieved from the outcome (or expected outcome) of a decision.*

There are many factors that can affect the utility associated with an option. But one of the main factors that affect the utility of an option is the *time delay between making a decision and receiving its outcome or benefit*. The research that we cover in this newsletter deals precisely with how utility varies with time differences and how our brain makes decisions based on it. We first discuss some ground breaking experiments and results in decision-making, then we link those results to making investment decisions and finally, based on the research, we suggest some best practices to improve financial decision-making.

**‘Tonight I want to have fun; Next week I want things that are good for me’**

In research conducted by Loewenstein & Kalyanaraman (1999), a group of people were asked to pick one movie (out of 24 titles) for the same night, one week later and two weeks later. These movies were broadly classified into two segments:

- *Highbrow (e.g. Schindler’s List)*
- *Lowbrow (e.g. Four Weddings and a Funeral)*

About 66% of the group picked a lowbrow movie title to watch on the same night. While choosing a movie for next week, *only* 34% picked a lowbrow movie. When they were asked to pick a movie to watch two weeks later, 29% of the group chose from the lowbrow titles.

The results indicate that **people appear to have a preference towards immediate rewards and discount the value of all delayed benefits.**

To get a clearer understanding of how the increase or decrease in time affects the utility of a choice, let’s take a look at another experiment by McClure, Ericson, Laibson, Loewenstein and Cohen, 2007.

## The Effect of Time Delay on Decision Making:

In this experiment a group of extremely thirsty people, were presented with the choice of two options:

- *One cup of orange juice immediately.*
- *Two cups of orange juice after 5 minutes.*

Although the common notion may be that a greater quantity is preferable, the results strikingly differed from this expectation.. About 60% of the group chose to immediately have just one cup of orange juice. In this situation, the 5 minute time gap played a huge role in diminishing the utility of two cups of orange juice relative to just one cup--even though the quantity possible was plainly greater in the second option. In another round of a similar experiment, the thirsty subjects were given a different set of options:

- *One cup of orange juice after 20 minutes*
- *Two cups of orange juice after 25 minutes.*

When given the above set of choices, approximately 70% of the people chose the second option. In this scenario the utility of higher quantity of juice was *not* diminished by a 5 minute difference. Remarkable! Isn't it? This experiment helped establish the relationship between the delay in the reward and discounting of its utility. There were two important observations from this experiment:

a) The first observation was that the **human brain discounts the utility of a delayed reward.**

- b) The second observation was that short term discounting was greater than long term discounting. In other words, a delay of 5 minutes between now and receiving actual benefit was a bigger factor in deteriorating the utility of a choice than the same difference 20 minutes into the future.\*
- c) **A choice that appears to be rewarding to the brain may not necessarily be a result of analytical thinking.** It could also be a result of emotions. For example, the decision to have a slice of chocolate cake instead of fruit salad, when following a low calorie diet is not a logical decision but is based on feelings of temptation.

Another experiment quoted in research by Choi, Laibson, Madrian, Metrick (2002) demonstrates a similar behavior where the subjects of the experiment do not make logical choices even when it concerns their own savings. In a survey that was conducted amongst 590 employees of a company, each employee was asked the following two questions:

- *Do they feel they are saving too little?*
- *If yes, then would they raise their savings rate in the next 2 months?*

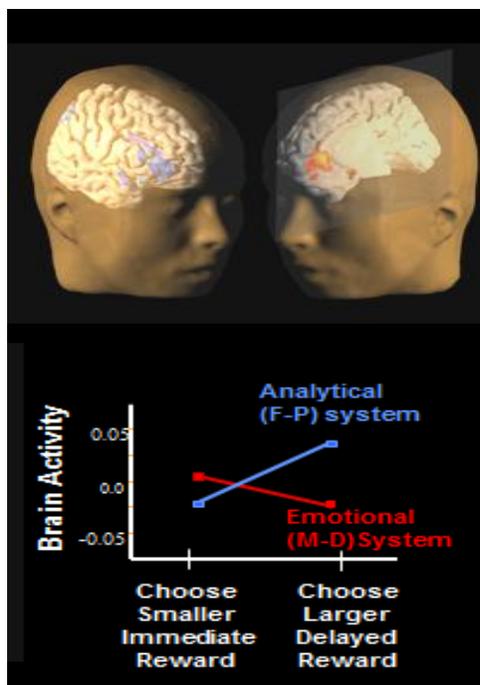
68% of all the 590 employees thought that they were saving too little. Despite this initial answer, of 590 people surveyed, **only 24%** planned to raise their savings rate. After two months, administrative data on their savings was collected to find out how many people actually increased their savings. Surprisingly, only 3 percent of all those who were surveyed, actually followed through on their thoughts.

The result defied logic. Even though 68% of the group felt their savings were low, only 3% took measures to increase their savings.

**This behavioral phenomenon suggests that decision making by a human mind is affected by many other factors and not just for analytical reasons.**

*\*Ramsey (1930s), Strotz (1950s), & Herrnstein (1960s) were the first to understand that discount rates are higher in the short run than in the long run.*

### Decisions: Products of Analytical & Emotional Brains



Researchers are beginning to measure how people perceive time and discount value with fMRI scans. In a scientific study of human brain activity (McClure, Laibson, Loewenstein, and Cohen Science, 2004), it was found that there

are two separate neural systems in the brain, the Mesolimbic dopamine (M-D) system and the Fronto-parietal (F-P) system.

The M-D neural system was found to be involved with emotional activities and was more active when the subjects chose smaller and immediate rewards.

The F-P neural system was more active when larger, delayed rewards were chosen which required analytical thinking.

These two systems operate in conflict with each other. The brain then makes a decision based on the combined effect of the activity in these two systems

For 14 female thirsty test subjects presented with delayed juice and water rewards, McClure, et al. observed neural activity which implied that brain areas produced a discount factor of 0.96/minute. Referring to our earlier example then, a discount rate of  $0.96^{25} = 0.36$ ;  $0.96^{20} = 0.44$ ; and  $0.96^{05} = 0.82$ . (An 18% loss from the zero to 5<sup>th</sup> minute, versus a am 8% loss from the 20<sup>th</sup> to the 25<sup>th</sup> minute.) Perceived value declines steeply in the near term, but soon levels off to an analytical value.

Or, in simpler words, all decisions, choices and actions are affected by both of these neural systems.

A question that may come to the mind at this point is: *How does all that scientific jazz relate to financial decision making?*

Well, at BFM, we want our clients to be very careful, patient, analytical and logical when it comes to making important investment decisions.

The recent times of economic slowdown and highly volatile market activities have tested investors' patience to a great extent. But a majority of those investors who believe in

principles like mean reversion, long term investing and market efficiency have either benefitted from such market movements or have been able to avoid major losses to their investments.

## Our Advice

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We can point to some general practices that can help investors improve their investment decision making:

- **Thinking more analytically** when making important financial decisions.
- **Being pro-active, curious and non-assumptive** at all times and spending time to evaluate investments, possible risks and benefits.
- Continuously striving towards **improving self-control and avoiding hastiness**.
- Avoiding making any important investment decision while being in a passive state of mind.
- Creating a **balance between being patient and being dynamic about investment choices**.

Weigh your choices carefully!

*"In the short run, the market is a voting machine. In the long run, it's a weighing machine."* –  
*Benjamin Graham*