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Monkey Economics

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If a visitor from Mars had to descent to our planet one of the first observations it will make is that Homo sapiens is at the pinnacle of all forms of life on Earth. We truly have achieved amazing things with our cerebral powers. Every day we apply wonderful technology to simplify and enrich our lives. All the time we are improving on our best achievements and what did seem impossible before is not only becoming possible but also a reality.

Yet, if our visitor from outer space would have had the luxury to study the actions of man, it would notice some odd behaviour at times that are not consistent with their remarkable cerebral achievements. The visitor would have noticed some of mankind's decisions are not in their own best interest, or simply speaking, dumb. In fact, these errors in decision-making are actually persistent and quite predictable. Moreover, if man wants to overcome these error-prone tendencies, they actually need to take time-out and duly apply their minds instead of making important decisions hastily.

Those type of cognitive errors are better known as decision-making biases which I covered in previous letters (for example, October 2011 and available at http://www.indexinvestor.co.za/index_files/MyFiles/NewsletterOctober2011.pdf). Some of the most important biases in financial decision-making are *framing* (the context in which a situation is presented), *anchoring* (using reference points for relative evaluations, even if it is arbitrary), *loss-aversion* (preference for safe, sure gains, but when losses are a real possibility, people tend to take proportionally much bigger bets to avoid any losses), *over-confidence* (over-estimating one's ability to identify good opportunities, or to "read" the market) and *temporal*

discounting (giving greater preference for immediate, smaller rewards versus larger rewards, later).

This time around, however, I am interested in the origin of biases. Are they man-made or do they have an evolutionary basis? For example, do they exist because of the environment (systems) we created and designed that is perhaps too complicated to fully understand? Consider the complexity of financial markets, and the many variables that will affect the outcome of our decisions over time (uncertainties). Alternatively, think about the complexity of financial products and financial solutions that often do not live up to their full potential value as unexpected events often undermine their actual performances.

Yet, if the environment is solely to blame we should be able to develop better systems or designs, embrace technology and apply statistical inference that will enable us to improve our decision-making under uncertainty. Problem solved.

But a second possibility why biases persist may be more to do with how our brains are wired; i.e. how we instinctively think about things that are important to us. Thus, it is not something we necessarily learned from our immediate environment, but that we were born with those biases in the first place.

The question then is how to test the latter hypothesis. Human beings should be excluded and the next best thing is to use primates that on an evolutionary

scale are “close” to us. To this effect the studies on the behaviour of capuchin monkeys by Yale University researchers Laurie Santos and Alexandra Rosati are quite fascinating[1]. These primates spawn off the human species evolution branch about 35 million years ago. Thus while capuchin monkeys are very, very distant from human beings, they do share with us a common evolutionary path.

The Yale researchers had some serious challenges to overcome. Monkeys do not use markets to trade goods and obviously they do not use money to exchange goods! These things had to be introduced to them in very innovative ways so that the monkeys would attach an economic and emotional value to the concept of money. Only then it would be possible to establish whether the monkeys exhibit the same kind of biases.

For the remainder of the letter I quote from a transcript of Laurie Santos’ TED talk, titled “A monkey economy as irrational as ours” in which she explains how the researchers went about setting up their experiments and what their findings were.[2]

How are we actually going to ask monkeys about money if they don't actually use it? So we said, well, maybe we should just teach monkeys how to use money.

We weren't very creative at the time we started these studies, so we just called it (money) a token. But this is the unit of currency that we've taught our

monkeys at Yale to actually use with humans, to actually buy different pieces of food.

It was useless to the monkeys at first before they realized what they could do with it. When we first gave it to them in their enclosures, they actually kind of picked them up, looked at them. But very quickly, the monkeys realized that they could actually hand these tokens over to different humans in the lab for some food.

So the monkeys get really good at this. They're surprisingly good at this with very little training. The question is: is this anything like human money? Is this a market at all, or did we just do a weird psychologist's trick by getting monkeys to do something, looking smart, but not really being smart. And so we said, well, what would the monkeys spontaneously do if this was really their currency, if they were really using it like money? Well, you might actually imagine them to do all the kinds of smart things that humans do when they start exchanging money with each other. You might have them start paying attention to price, paying attention to how much they buy -- sort of keeping track of their monkey token, as it were. Do the monkeys do anything like this?

And so our monkey marketplace was born. The way this works is that our monkeys normally live in a kind of big zoo social enclosure. When they get a hankering for some treats, we actually allowed them a way out into a little smaller enclosure where they could enter the market. Upon entering the market -- it was actually a much more fun market for the monkeys than most

human markets because, as the monkeys entered the door of the market, a human would give them a big wallet full of tokens so they could actually trade the tokens with two different human salesmen that they could actually buy stuff from. The salesmen were students from my lab. They dressed differently; they were different people. And over time, they did basically the same thing so the monkeys could learn who sold what at what price -- who was reliable, who wasn't, and so on.

So I'll show you a quick video of what this marketplace actually looks like. But here's Honey. She's waiting for the market to open a little impatiently. All of a sudden the market opens. Here's her choice: one grapes or two grapes. You can see Honey, very good market economist, goes with the guy who gives more. So not just Honey, most of the monkeys went with guys who had more. Most of the monkeys went with guys who had better food. When we introduced sales, we saw the monkeys paid attention to that. They really cared about their monkey token dollar. The more surprising thing was that when we collaborated with economists to actually look at the monkeys' data, they basically matched, not just qualitatively, but quantitatively with what we saw humans doing in a real market.

And what we'd really thought we'd done is like we'd actually introduced something that, at least for the monkeys and us, works like a real financial currency. Question is: do the monkeys start messing up in the same ways we do? One thing we never saw in the monkey marketplace was any evidence of saving -- you know, just like our own species. The monkeys entered the

market, spent their entire budget and then went back to everyone else. The other thing we also spontaneously saw, embarrassingly enough, is spontaneous evidence of larceny. The monkeys would rip-off the tokens at every available opportunity -- from each other, often from us -- things we didn't necessarily think we were introducing, but things we spontaneously saw.

Can we actually see if the monkeys are doing exactly the same dumb things as humans do? So we said, let's actually give the monkeys the same kinds of problems that humans tend to get wrong in certain kinds of economic challenges, or certain kinds of economic experiments. And so, since the best way to see how people go wrong is to actually do it yourself, I'm going to give you a quick experiment to sort of watch your own financial intuitions in action.

So imagine that right now I handed you a thousand U.S. dollars. Sounds great, but you get one more choice to earn a little bit more money. And here's your choice: you can either be risky, in which case I'm going to flip one of these monkey tokens. If it comes up heads, you're going to get a thousand dollars more. If it comes up tails, you get nothing. So it's a chance to get more, but it's pretty risky. Your other option is safe. I'm just going to give you 500 bucks. You can stick it in your wallet and use it immediately. So see what your intuition is here. Most people actually go with the play-it-safe option. Most people say, why should I be risky when I can get 1,500 dollars for sure? This seems like a good bet. I'm going to go with that. You might say, eh, that's not really irrational. People are a little risk-averse. So what?

Well, the "so what?" comes when start thinking about the same problem set up just a little bit differently. So now imagine that I give each and every one of you 2,000 dollars. Now you can buy double the stuff you were going to get before. Think about how you'd feel sticking it in your wallet. And now imagine that I have you make another choice. Now, you're going to be deciding how you're going to lose money, but you're going to get the same choice. You can either take a risky loss -- so I'll flip a coin. If it comes up heads, you're going to actually lose a lot. If it comes up tails, you lose nothing, you're fine, get to keep the whole thing -- or you could play it safe, which means you have to reach back into your wallet and give me five of those $100 bills, for certain.

So maybe you're having the same intuitions as the subjects that were actually tested in this, which is when presented with these options, people don't choose to play it safe. They actually tend to go a little risky. The reason this is irrational is that we've given people in both situations the same choice. It's a 50/50 shot of a thousand or 2,000, or just 1,500 dollars with certainty. But people's intuitions about how much risk to take varies depending on where they started with.

Well, it turns out that this seems to be the result of at least two biases that we have at the psychological level. One is that we have a really hard time thinking in absolute terms. You really have to do work to figure out. Instead, we find it very easy to think in very relative terms as options change from one time to another. So we think of things as, "Oh, I'm going to get more," or "Oh, I'm going to get less." This is all well and good, except that changes in

different directions actually effect whether or not we think options are good or not. And this leads to the second bias, which economists have called loss-aversion.

We really hate it when we have to lose out on some money. And this means that sometimes we'll actually switch our preferences to avoid this. What you saw in that last scenario is that subjects get risky because they want the small shot that there won't be any loss. That means when we're in in a loss mind-set, we actually become more risky, which can actually be really worrying.

The question we were interested in is whether the monkeys show the same biases. If we set up those same scenarios in our little monkey market, would they do the same thing as people? And so this is what we did, we gave the monkeys choices between guys who were safe -- they did the same thing every time -- or guys who were risky -- they did things differently half the time.

Then we gave them options that were bonuses. And so this is what this looks like. We introduced the monkeys to two new monkey salesmen. They start with one piece of grape, so it looks pretty good. But they're going to give the monkeys bonuses. The guy on the left is a safe bonus. All the time, he adds one, to give the monkeys two. The guy on the right is actually a risky bonus. Sometimes the monkeys get no bonus -- so this is a bonus of zero. Sometimes the monkeys get two extra. For a big bonus, now they get three. Do the monkeys actually want to play it safe and then go with the guy who's going to do the same thing on every trial, or do they want to be risky and try to

get a risky, but big, bonus, but risk the possibility of getting no bonus. People here played it safe. Turns out, the monkeys play it safe too. Qualitatively and quantitatively, they choose exactly the same way as people, when tested in the same thing.

You might say, well, maybe the monkeys just don't like risk. Maybe we should see how they do with losses. And so we ran a second version of this. Now, the monkeys meet two guys who aren't giving them bonuses; they're actually giving them less than they expect. So they look like they're starting out with a big amount. These are three grapes; but now they learn these guys are going to give them less than they expect. They guy on the left is a safe loss. Every single time, he's going to take one of these away and give the monkeys just two. The guy on the right is the risky loss. Sometimes he gives no loss, but sometimes he actually gives a big loss, taking away two to give the monkeys only one.

And so what do the monkeys do? Again, same choice; they can play it safe for always getting two grapes every single time, or they can take a risky bet and choose between one and three. The remarkable thing to us is that, when you give monkeys this choice, they do the same irrational thing that people do. They actually become more risky depending on how the experimenters started. This suggests that the monkeys too are evaluating things in relative terms and actually treating losses differently than they treat gains.

So what does all of this mean? Well, what we've shown is that, first of all, we can actually give the monkeys a financial currency, and they do very similar things with it. They do some of the smart things we do, some of the kind of not so nice things we do, like steal it and so on. But they also do some of the irrational things we do. They systematically get things wrong and in the same ways that we do.

We've answered the question we started out with. We wanted to know where these kinds of errors came from. And we started with the hope that maybe we can sort of tweak our financial institutions, tweak our technologies to make ourselves better. But what we've learn is that these biases might be a deeper part of us than that. In fact, they might be due to the very nature of our evolutionary history.

Well, one thing we know is that they tend to be really hard to overcome. When you're watching your stocks plummet into the red, when you're watching your house price go down, you're not going to be able to see that in anything but old evolutionary terms.

Well, the good news is we're so good at overcoming our biological limitations. We actually have all of these cases where we overcome our biological limitations through technology and other means, seemingly pretty easily. But we have to recognize that we have those limitations.

It was Camus who once said that, "Man is the only species who refuses to be what he really is." But the irony is that it might only be in recognizing our limitations that we can really actually overcome them. The hope is that you all will think about your limitations, to recognize them, accept them and then use the world of design to actually figure them out.

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[1]Laurie R. Santos and Alexandra G. Rosati, 2015. "The Evolutionary Roots of Human Decision Making". The Annual Review of Psychology, 66: 321-47.

[2] Link: http://www.ted.com/talks/laurie_santos?language=en