Report of the paper Emotion and reasoning in human decision-making

The article of *Edmund T. Rolls* considers a typical dual-system model of the brain and discusses how the two systems interact to generate economic decision. As it is common in this literature it is assumed that:
   a) one system is intuitive and driven by emotions
   b) the other system involves logical reasoning and calculations.
In addition, Rolls emphasizes that:
   c) There is "*noise introduced into the system by the random firing times of neurons for a given mean firing rate*".
Decisions result from the interaction of a), b) and c).

Another original element of Rolls' article is the characterization of the link between genetic evolution and development of the intuitive system (listed sub point a). In this way many, if not all, the commonly observed *biases* in the economic behavioral literature (like loss aversion, social preferences, time inconsistency) can be explained by the *genes' interests* which often conflict with individuals' interests. The typical example is the decision of not having children to dedicate more time to science, medicine, music or literature. Edmund Rolls portrays this conflict as *The Selfish Gene vs The Selfish Phene*.

In general, the characterization of the intuitive-emotional system of the brain as an outcome of genetic selection is a potentially powerful model of thinking about the dual brain structure and could deliver a much-needed unified model for economic decision. But, how can the model outlined in the paper inform macroeconomics?

Let me first define what I think it is *Behavioral Macroeconomics*

   1) In the *Dynamic stochastic general equilibrium models* --still dominant in mainstream macroeconomics--, the usual mainstream hypothesis of individual rationality holds (rationality in the language of the economist corresponds to some primary and simple requirement of consistency in the choices). Usually, in an environment where individuals are fully rational, economic cycles can only be the outcome of an external shock.
   2) Behavioral economics' studies so far progressed without a model by identifying *biases*. Biases generates behaviors that violate the consistency of economic choices and are able to explain phenomenon like additions or impatience. So, basically everything is not *rational* is behavioral.

Bridging together 1) and 2), Behavioral Macroeconomics is progressing by identifying violations of economic rationality that are able to explain burst and booms.

The paper can certainly provide insights into *behavioral macroeconomics* (as defined above) and I would invite the author of the paper to elaborate on these:

1) The first, and in my view more straightforward, application comes from the fact that the noise defined sub point c) above should be less of a concern in macroeconomics – where the object of study is the aggregate behavior-- than in microeconomics. A very interesting theoretical analysis would be to define when the noise due to the random neurons' firing time can be attenuated or eliminated by aggregating individuals' observation.

2) To which extent emotions can be related to pessimism and optimism? In a very recent survey, Hommes (2018) identifies the *bounded rationality* as the main departure from the set of hypotheses of the dynamic stochastic general equilibrium models. Bounded rationality, which naturally leads to optimism and pessimism, allows to endogenously generate booms and bursts in the economy. More specifically Hommes writes: "*A general finding is that under positive expectations feedback (strategic complementarity) where optimistic (pessimistic) expectations can cause a boom (bust) coordination failures are quite common. The economy is then rather unstable and persistent aggregate fluctuations arise strongly amplified by coordination on trend-following behavior leading to (almost-) self-fulfilling equilibria*". The analysis in current paper can take this point further by linking optimism and pessimism to the emotions, in the way they are characterized.

3) In the paper it is explicitly stated that individuals switch to the emotional system "*…when there may be too many factors to be taken into account easily by the explicit, rational, planning, system, when the implicit system may be used to guide action*". If the aim of a policy is to avoid strong fluctuations, there are at least two possible corollaries that naturally follow: firstly, a policy should be aimed to simplify the environments providing easy rules to follow and information to reduce uncertainty (and common knowledge that this policy is in force) this would avoid that actors use their intuitive systems; secondly, making people aware that their intuitive system is not always utility maximizing and often it is quite the opposite as the current article argues. Awareness can then improve self-control and mitigates the effect of joint emotionally-driven actions.

References

Hommes, Cars H. "Behavioral & experimental macroeconomics and policy analysis: a complex systems approach." (2018). Forthcoming JEL