Stock Market Neurodynamics

Armando Freitas da Rocha
Rani – Research on Natural and Artificial Intelligence
www.braineconomicc.com – armando@braineconomics.com

Stock price volatility constrasts with the sure gain on bank certificates and governmental bonds and influences not only investor decisions but also economy in large scale. From time to time, the market noise increases significantly and investors promote large price fluctuations. Exaggerated optimism induces unjustified prices increases, while pessimism guides reasoning during economical crises. Figure 1 shows price variation in the Brazilian Stock Market (Bovespa) and New York (Dow Jones) from January, 2007 to the present that illustrates the above.

This kind of price fluctuations is in sharply contrast with the most popular academic models, such as the Efficient Market, Modern Portfolio, Capital Asset Pricing, etc. Theories, that cannot model them, because they assume that stock prices cannot be predicted from know their previous history.
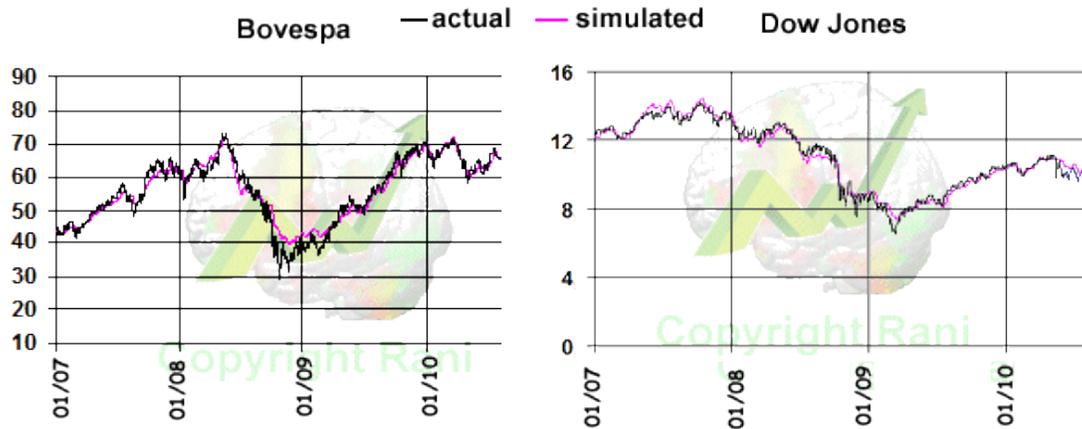
Figure 1 – Indices evolution at São Paulo and New York from January, 2007 to present. Actual: real indices Simulated: indices calculated by the neuroeconomic model proposed by Rocha.

Neuroeconomy is a new research area combining knowledge and theories from neurosciences and economy to better study and comprehend human decision making in both normal conditions and during crisis. Neurofinances proposes that benefits and risks as psychologically assessed by the neural circuits involved with pleasure and fear evaluation. In this approach, the expected return and calculated risk of an asset, no matter the model supporting their economical calculations, are psychologically encoded by the activation of the above neural circuits, following the rules discovered by psychophysics in the beginning of the last century. In this approach, reason and emotion are both used to support decision-making, in a clear contrast with the classic economies about the Homo Economicus.

Behavioral Finances and Economic Psychology are disclosing data showing the investors did not follow the rules of the Efficient Market or Asset Pricing theories, but behave as irrational beings concerning the classic economic theories. For instances, prices are always anchored on those experienced in previous trading or negotiation, instead of follow an unpredictable random walk. Rocha et al (2009) developed a neuroeconomic model for decision making that has been successful in

modeling the commodities, stock and derivative markets of around 20 different countries. The results of figure 1 illustrates some of these results.
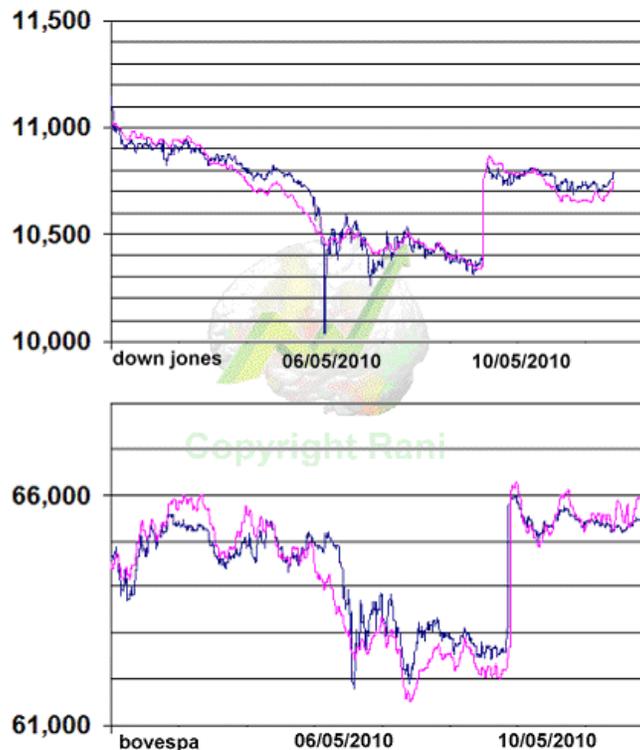

Figure 2 – Ibov and Down Jones indices in May, 2010

The Financial Market panic the last May, 6, when an error on automatic trading provoked huges losses:

" What appeared to be a bad day for the bourses around the world, turned a nightmare. Around 3pm (Brasilia time) the Dow Jones lost more than 1000 points in minutes. In fifteen minutes the index lost 7% of its value besides the losses being experienced during the day.".

Figure 2 shows the IBov and Dow Jones indices evolution during May, 3 to May, 14 and illustrates the above.

Although, it seems that a typing error by an employee of a big bank was blamed to be the responsible for the crash, the neuroeconomic modeling proposed in this site was already pointing for existence an unstable model state subjected to anomalous index movements for that period, 180 minutes before the incident took place. During this period the current indices were decreasing at New York and stable at São Paulo, but the simulated indices were already decreasing at both places. In addition, the simulated prices were converging for those values that actually observed after the 15 minutes panic.   It seems that error triggered the crash because the system state was unstable, otherwise the error could not provoke important results.