Dynamics of real financial markets: A reply to Frank's comment

Kevin E. Bassler[a,b,*], Gemunu H. Gunaratne[a,c], Joseph L. McCauley[a,d]

[a] *Department of Physics, University of Houston, Houston, TX 77204-5005, USA*
[b] *Texas Center for Superconductivity, University of Houston, Houston, TX 77204-5002, USA*
[c] *Institute of Fundamental Studies, Kandy, Sri Lanka*
[d] *COBERA, Department of Economics, J.E. Cairnes Graduate School of Business and Public Policy, NUI Galway, Ireland*

Received 8 November 2007; received in revised form 24 December 2007
Available online 9 February 2008

Abstract

This reply addresses the assertion in the comment of T.D. Frank [T.D. Frank, Physica A 387 (2008) 773] on our paper [K.E. Bassler, G.H. Gunaratne, J.L. McCauley, Physica A 369 (2006) 343] that the approach to modeling financial markets that we propose is unrealistic. In our paper, we considered variable diffusion processes that have a diffusion coefficient that varies with both position (return in finance) and time, and used them to show that measuring a Hurst exponent $H \neq 1/2$ in a time series does not necessarily imply correlations between increments. We also proposed that such a variable diffusion process is the underlying stochastic process governing the dynamics of financial markets. Frank asserts that this is unrealistic because variable diffusion processes with $H \neq 1/2$ are driven with a "force" that varies in time as a power law. He claims, instead, that markets obey nonextensive thermostatistics. We discuss evidence from a recently published empirical study of the Euro–Dollar exchange rate [K.E. Bassler, J.L. McCauley, G.H. Gunaratne, PNAS 104 (2007) 17287] that shows that the market can be described with a variable diffusion process, but is inconsistent with nonextensive thermostatistics. This evidence demonstrates that our modeling approach is realistic and accurate.

PACS: 89.65.Gh; 05.40.-a; 05.45.Tp; 05.10.Gg