

## Solitonic curvature sets in n-spaces providing a framework for predictive modeling of socioeconomic and geopolitical events

M J Dudziak, PhD <sup>1</sup>

22.June.2014

### Abstract

A re-examination of Ricci calculus methods employed in general relativity and an investigation into n-dimensional soliton dynamics, deriving from both optics and particle physics, shows promise for applications in modeling and forecasting of highly complex system indicators such as are critical for understanding capital market performance and global economic development. Behaviors of individual securities and classes of financial securities are subject to many low-probability and high-impact effects, particularly with cascade effects driven by social and political dynamics that accompany catalytic and catastrophic events. Particularly during sequences of rapid and locally unpredictable fluctuation for a given class of financial securities, there will often manifest opportunities for positive capital growth as well as severe inhibitions and “singularity” events that can devastate a particular financial institution or economic sector. Ability to achieve more accurate and timely (pre-emptive, early-stage) forecasting with higher degrees of certainty is a key to possessing a commanding lead in both economic and sociopolitical actions.

The application of n-D solitonic structures within an n-dimensional phase space in which observed entities interact and affect the underlying geometry of the embedding space provides the basis for development of reliable algorithms that will be resilient under even severe “geometric distortion.” The ability to manipulate such mathematical models has dramatic implications for many areas of application in modeling and forecasting. The social and economic sectors are examined as being among the more tangible and also the most practical in terms of conducting further research and refinement of derived algorithms.

A central component of the current work is based upon several underlying mathematical conjectures and hypotheses regarding stability of topological structures and relationships among entities that are modeled using fundamentals of differential geometry and nonlinear dynamics. Fundamentals include the preservation of curvature and volume over identifiably similar regions of the n-dimensional “spacetime” in which entities such as social and economic structures operate and interact. The concept of a soliton is extended from that of wave dynamics to that of multi-component, multi-agent inhabited spaces in which the entities operating within such spaces also modify the geometry and “physics” of the space itself.

The general model is particularly relevant for addressing the economic life cycles of entities operating within markets whose social and political environments are characterized by highly nonlinear dynamics and emergent critical-state and phase-transition events such as rapid and unpredictable-outcome social and political disruptions, civil and military conflict, and the introduction of large-population events such as pandemics, catastrophic weather and geological events, refugee migration, and critical infrastructure disruption.

---

<sup>1</sup>Contact Information: Martin Dudziak, [martin@instinnovstudy.org](mailto:martin@instinnovstudy.org), Institute for Innovative Study <http://instinnovstudy.org>