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Modelling European Public Finance and Support for RDI Sector

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Abstract

In the present paper is introduced an econophysics model for the public finance and support in the European RDI sector, especially for EU15 respectively EU25.

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Keywords: Optimization Techniques; Programming Models; Dynamic Analysis; Measurement of Economic Growth; Public Economics; Financial Economics; Forecasting and Prediction Methods; Simulation Methods; Data Collection and Data Estimation Methodology; Model Construction and Estimation; Model Evaluation; Validation and Selection; Forecasting and Prediction Methods; Econophysics.

1. Introduction

Econophysics applies various models and concepts imported from condensed matter and statistical physics to analyze economic and financial phenomena. This new field of research has generated a lot of methodological debate (Schinckus, 2010a). It is often presented as a positivist discipline that provides a more empirical basis to economics .Despite the novelty of this new approach, more and more papers about econophysics have been published in journals devoted to Physics and Statistical Mechanics. Several meeting series1 dedicated to this topic are regularly organized and moreover, new Ph.D. programs in Econophysics recently appeared in some universities.2 Nowadays, Econophysics appears to be a new step3 in the history and the evolution of Physics Sciences and then the question about the disciplinary characteristics of Econophysics must then be asked (Schinckus, 2010; Gallegati et.al., 2006; McCauley, 2006). Present paper will present a new econophysics model to modelling the european finance and

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support for the European RDI sector, especially for EU15 respectively EU25. The new econophysics model will be a dynamical one.

For the 1970s, a new theoretical movement has been initiated by some physicists who began publishing articles devoted to the study of social phenomena, such as the formation of social groups (Weidlich,1971) or social mimetism (Callen& Shapiro, 1970). The next decade confirmed this new theoretical trend (labeled sociophysics), as the number of physicists publishing papers devoted to the explanation of social phenomena and the number of themes analyzed continued to increase. During the 1990s, physicists turned their attention to economics, and particularly financial economics, giving rise to econophysics. Although the movement's official birth for example announcement came in a 1996 article by Stanley et al. (Stanley et.al., 1996), econophysics was at that time still a young and ill-defined field. Econophysics can be defined as ''a quantitative approach using ideas, models, conceptual and computational methods of statistical physics''. Today, econophysics is an institutionalized field, with different journals proposing a prolific literature about the way of characterizing the evolution of financial prices. There is an ''extreme diversity'' of models recently developed by econophysicists and many theoretical frameworks still emerge. (Bucsa et.al., 2011; Stanley et.al., 1996)

Econophysics presents itself as a new way of thinking about the economic and financial systems through the ''lenses'' of physics (Schinckus, 2010b). As much as neoclassical economics imported models from classical physics as formulated by Lagrange (Mirowski,1989) and financial economics built on the model of Brownian motion also imported from physics, econophysics tries to model economic phenomena using analogies taken from modern condensed matter physics and its associated mathematical tools and concepts. Using the standard tools of statistical mechanics including microscopic models like Ising model and scaling laws, econophysicists aim at explaining how complex economic systems behave. Broadly speaking, econophysics is founded on general statistical properties that reappear across many and diverse phenomena.This statistical regularity can be characterized by scaling laws that are considered as the heart of econophysics(Bouchard , 2002; Staley et.al.2000). These scaling laws can take a variety of forms. The objective of the next section is to offer a generic formula characterizing the main distributions usually used by econophysicists (Bucsa et.al.,2011).

In the present paper it will be presented an econophysics model a dynamical model which is applyed to funding and support system from EU. The results will be discuss from this point of view: as evolution for EU15 and EU25 for RDI expenditure as a percentage of GDP. It is discussed : public expenditure on RDI as a percentage of GDP and venture capital. These discussions will be done for EU 15 and EU 25. It will be made comments on how these values are fitting on the dynamic model as an econophysics model.

2. The Econophysics Dynamic Model

In figure 1 we can see the point M, represented in a Cartesian coordinate system OXYZ by the position vector: $\vec{r}_M$. Each coordinate axis corresponds to a line unit vector called: $\vec{i}$, $\vec{j}$, $\vec{k}$ are the unit vectors of the coordinate axes and axes and property meaning: $|\vec{i}| = |\vec{j}| = |\vec{k}| = 1$(Nicolov, 2009).

Position vector of point M1 has analytical expression: $\vec{r}_1 = r_x.\vec{i} + r_y.\vec{j} + r_z.\vec{k}$

Since the coordinates rx, ry and rz can depend on time, you can write the following parametric equations: rx = rx (t), ry = ry (t), rz = rz (t). Elimination of parametric equations leads to the trajectory equation: z = z (x, y).

If a material point moves from point M1 to point M2 by using a path c, its position vector of time-varying r1 to r2, the analytical expression: $\vec{r}_2 = r'_x.\vec{i} + r'_y.\vec{j} + r'_z.\vec{k}$

Velocity of the material point in the Cartesian coordinate system by definition is expressed as:

$$v = dr/dt = \dot{r} = \dot{r}_x.i + \dot{r}_y.j + \dot{r}_z.k \quad (1)$$

So you can write the following relations: $v_x = \dot{r}_x = dx/dt; v_y = \dot{r}_y = dy/dt; v_z = \dot{r}_z = dz/dt$ (2)

According to the definition, the acceleration of the material point is given by: $a = dv/dt$