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The Minimum Food Security Quota (MFS-Quota) in Food Security Policy Modelling

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Abstract: This paper proposes the construction of the Minimum Food Security Quota (MFS-Quota) using mathematical economic modelling in real time. The MFS-Quota fixes a certain amount of annual food storage to prepare a country for any natural or social disasters. Any country can construct its own MFS-Quota for "food security policy".

Keywords: econographicology, food security, economic development

JEL classifications: C63, C65, C69, Q18

1. Introduction

This paper introduces the Minimum Food Security quota (MFS-Quota) for "food security policy". The purpose is to find the annual percentage of food storage (from the agricultural sector) that can prepare a country for natural or social disasters. Any country can construct its own MFS-Quota under a "food security policy". The "food security policy" is defined in this paper as an integral national strategy in monitoring the production, storage and distribution of agricultural goods that are commonly consumed among the population of a country.

It is suggested in this paper that the MFS-Quota can be an alternative index in the analysis of food security policy. A large number of variables need to be included in the process of constructing the MFS-Quota. All the variables have the same level of importance and are integrated into the same model and graphical space. From the mathematical perspective, the MFS-Quota is not a simple relationship between two variables (such as the endogenous variable and the exogenous variable) that are fixed into a specific period of time and space. Hence, the MFS-Quota requires a multi-dimensional variable analytical framework. In this framework no variable is isolated in the mathematical and graphical modelling.

A multi-dimensional mathematical economics modelling in real time is used in the construction of the MFS-Quota. This is in order to avoid isolation of any variables in the construction of the MFS-Quota. The multi-dimensional mathematical economics modelling in real time is an alternative mathematical and geometrical approach to observe the behaviour of a large number of variables that move within the same graphical space. This type of modelling requires simultaneous application of a multi-dimensional graphical modelling conceptualized under "Econographicology" (Ruiz Estrada, 2007).

The multi-dimensional mathematical economics modelling in real time enables observation of all changes in different variables in the same graphical space. All these variables are changing constantly with time (years, months, weeks or days) in different parts within the same space. The application of the multi-dimensional mathematical economics modelling in real time opens up the possibility to formulate a food security policy for a country from a multi-dimensional perspective.

The construction of the MFS-Quota varies from one country to another country. It varies according to the diet of the population, population size, geographical location, probabilities of suffering any time from a natural or social disaster and finally, the statistical resources available in the country. In the construction of the MFS-Quota, the presumption is that it is impossible to predict or forecast any natural or social disaster with accuracy.

Usually, the food security policy modelling is studied by using a specific historical-period-of time framework in a frozen 2-Dimensions (X, Y) graph. This framework shows the single relationship between a single exogenous variable and a single endogenous variable. It leaves the rest of the variables isolated under the "*Ceteris Paribus Assumption*". Unexpected scenarios cannot be accounted for in this analysis at the same time.

The *Ceteris Paribus* assumption, translated from Latin, means "all other things [being] the same". In fact, the *Ceteris Paribus* assumption can facilitate the understanding of how a single dependent variable responds to any change from a single independent variable; at the same time, we can keep constant the rest of the independent variables momentarily. Alfred Marshall supports the understanding of the application of *Ceteris Paribus* assumption in economic models by asserting the following (Marshall, 1890: v.v.10):

> The element of time is a chief cause of those difficulties in economic investigations which make it necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle. In breaking it up, he segregates those disturbing causes, whose wanderings happen to be inconvenient, for the time in a pound called *Ceteris Paribus*. The study of some group of tendencies is isolated by the assumption *other things being equal*: the existence of other tendencies is not denied, but their disturbing effect is neglected for a time. The more the issue is thus narrowed, the more exactly can it be handled: but also the less closely does it correspond to real life. Each exact and firm handling of a narrow issue, however, helps towards treating

broader issues, in which that narrow issue is contained, more exactly than would otherwise have been possible.

Marshall's approach allows the analyses of complex economic phenomena by parts, where each part of the economic model can be joined to generate an approximation of the real world. Such analyses are possible through the application of the isolation approach. The isolation approach features the substantive isolation and hypothetical isolation. First, the substantive isolation allows some variables to be considered unimportant. The substantive isolation considers that some unimportant variables cannot significantly affect the final result of the economic model. Second, the hypothetical isolation allows the influence of some important factors to be disregarded. The application of the *Ceteris Paribus* assumption in this case is purely hypothetical. It allows parts of the model to be managed more easily.

2. Introduction to the Mathematical Economic Modelling in Real Time

Multi-dimensional mathematical economics modelling in real time requires the application of the *Omnia Mobilis Assumption* (Ruiz Estrada, Nagaraj and Yap, 2008) which, translated from Latin, means "everything is moving". The *Omnia Mobilis* assumption enables the location of different variables simultaneously in the same multi-dimensional physical space, showing different dimensions and movements in real time.

The multi-dimensional mathematical economics modelling in real time also assumes that the market is formed by many sub-markets. These sub-markets are: goods sub-market, money sub-market, financial and real-estate sub-market, international trade sub-market, social welfare sub-market, labour sub-market, government sub-market and technological sub-market. All these sub-markets are always in a "*Constant Dynamic Imbalanced State*" (Ruiz Estrada, 2008). The concept of equilibrium in the multi-dimensional mathematical economics modelling in real time is considered as a leak momentum of balance among all sub-markets. It can appear any time, but when exactly this synchronized balance takes place cannot be predicted.

From a graphical perspective, the multi-dimensional mathematical economics modelling in real time assumes that a single dependent variable and a single independent variable are non-existent. We only can observe the display of a large, single surface (see Figure 1). This single surface that is formed by a large number of independent variables are joined together in the multi-dimensional physical space. This single and large surface alerts us in case of any positive or negative changes among all variables in the same graphical space.

3. Method to Construct the Minimum Food Security Quota (MFS-Quota)

The construction of the Minimum Food Security Quota (MFS-Quota) requires multi-dimensional mathematical economics modelling in real time that is conceptualized under "Econographicology" (Ruiz Estrada, 2007). The multi-dimensional mathematical economics modelling in real time is possible with the use of a large general matrix. The following are the steps to construct the MFS-Quota:

✓ First Step: input data (v) collected daily on the agriculture production by regions using a standard format.
✓ Second Step: transfer the data (v) to different databases (DB) that are connected to a unique information data centre.
✓ Third Step: plot all data immediately onto different co-ordinates in the multi-dimensional physical space. One database is created for each of the sources. Some examples of the sources are: the central bank, ministry of agriculture, farms, national statistics departments, and public and private research institutes.

The plotting on each co-ordinate is constantly changing. It is based on the use of multi-dimensional graphical modelling in real time (See Expression 3). Basically, the data is changing in real time. The plotting compares the data between two periods of time: the past period of time (t-1) and the present period of time (t).

4. Model

The construction of the Minimum Food Security Quota (MFS-Quota) starts with the construction of a matrix i x j represented by Expression (1).

$$\Delta I_{ij:v} = \begin{pmatrix} X_{11:v} & X_{12:v} & \cdots & X_{1\infty:v} \\ X_{21:v} & X_{22:v} & \cdots & X_{2\infty:v} \\ . & . & & . \\ X_{\infty 1:v} & X_{\infty 2:v} & \cdots & X_{\infty\infty:v} \end{pmatrix} \tag{1}$$

where **v** = Input data, **X** = Variable(s), **j** = Column and **i** = Row.

It is suggested that 16 variables represented by a matrix 4x4 are used. These variables are the large and medium farms productivity (in tons) growth rate by regions ($X_{11:v1}$), imports of capital goods/agriculture growth rate ($X_{12:v2}$), exports/agriculture goods growth rate ($X_{13:v3}$), probability of civil or world war growth rate ($X_{14:v4}$), probability of natural disasters by water, air and under-ground growth rate ($X_{21:v5}$), R&D in the agro-industry growth rate ($X_{22:v6}$), FDI/agro-industry growth rate ($X_{23:v7}$), income distribution by rural and urban area growth rate ($X_{24:v9}$), labour demand and supply in the agriculture sector growth rate ($X_{31:v10}$), raining seasons growth rate ($X_{32:v11}$), land demand and supply growth rate ($X_{33:v12}$), agriculture border (km^2) growth rate ($X_{34:v13}$), inflation growth rate ($X_{41:v14}$), banking interest rate for the agriculture sector growth rate ($X_{42:v15}$) and subsidies to the agriculture sector growth rate ($X_{43:v16}$). Each variable should be based on the use of growth rates (Δ).

The next step is the storing of information in the database (DB) represented by a matrix (see Expression 2). The matrix consists of information saved in real time (☼) and the application of the interlink database condition (╬).

$$DB_{ij:v} = \begin{pmatrix} ☼X_{11:v} ╬ ☼X_{12:v} \ldots ╬ ☼X_{1\infty:v} \\ ☼X_{21:v} ╬ ☼X_{22:v} \ldots ╬ ☼X_{2\infty:v} \\ . \quad . \quad . \\ ☼X_{\infty 1:v} ╬ ☼X_{\infty 2:v} \ldots ╬ ☼X_{\infty\infty:v} \end{pmatrix} \tag{2}$$

In the case of the data changes in real time (☼Δ), we are comparing the data we obtained a day before (**t-1** = past period of time) and the information of today (**t** = actual period of time) (see Expression 3).

$$☼\Delta X_{ij:v} = ☼X_{ij:v}(t) - ☼X_{ij:v}(t\text{-}1)/☼X_{ij:v}(t\text{-}1) \tag{3}$$

The calculation of the final determinant is based on the Expression (4) below:

$$\Delta I_{ij:v} = \begin{vmatrix} ☼\Delta X_{11:v} & ☼\Delta X_{12:v} & \ldots & ☼\Delta X_{1\infty:v} \\ ☼\Delta X_{21:v} & ☼\Delta X_{22:v} & \ldots & ☼\Delta X_{2\infty:v} \\ . & . & & . \\ ☼\Delta X_{\infty 1:v} & ☼\Delta X_{\infty 2:v} & \ldots & ☼\Delta X_{\infty\infty:v} \end{vmatrix} \tag{4}$$

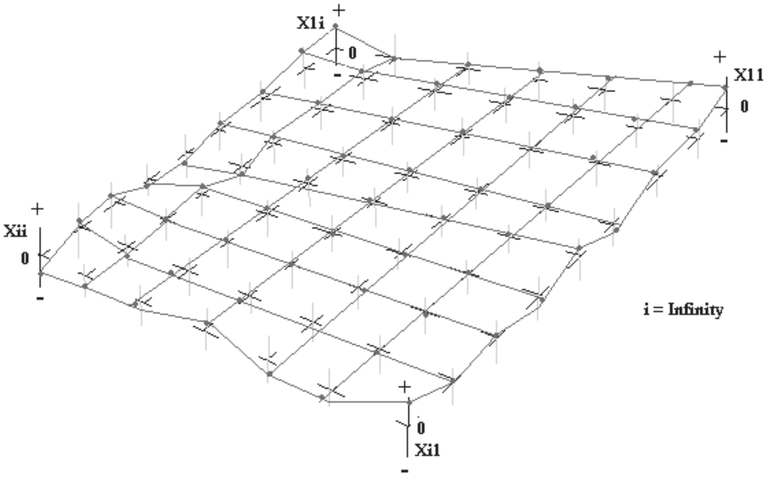
The next step is to measure the MFS-Quota by year. Firstly, we need to find the Minimum Food Security Quota rate (MFS-Quota%).To get the MFS-Quota%, multiply the final determinant of the matrix ($\Delta I_{ij:v}$) by the total of population growth rate (ΔPop%), then divide the outcome by time (T) such as months or days (see Expression 5).

$$\text{MFS-Quota\%} = (\Delta I_{ij:v}) \times (\Delta\text{Pop\%})/T \tag{5}$$

The final step is to measure the Minimum Food Security Quota (MFS-Quota) volume: multiply the total annual agriculture production ($GDP_{annual\text{-}agriculture\text{-}Sector}$) by the MFS-Quota% (see Expression 6).

$$MFS_{Volume} = GDP_{Agriculture\text{-}Sector} \text{ x MFS-Quota\%} \tag{6}$$

Figure 1: MFS-Quota surface



Source: Econographicology.

5. Conclusion

The construction of the MFS-Quota requires multi-dimensional mathematical economics modelling in real time, together with the application of multi-dimensional graphical modelling conceptualized under "Econographicology". The MFS-Quota can be constructed for any country and region around the world to prepare for any natural or social disaster.

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