

Application of New Graphical Method to Analyze Macroeconomics Relationships

by

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1. Abstract

The present paper will suggest an alternative graphical analysis for Macroeconomics. The alternative graphical analysis is called Multi-Functional Cartesian Space (MF-Cartesian Space). The MF-Cartesian Space is an alternative analytical tool for observing the economic environment of any country from a general view. In the case in point here, the MF-Cartesian Space is applied to simultaneously study the effects of fiscal policy, monetary policy, trade policy, as well as the effects of investment policy. All IS-Curve, LM-Curve, Trade analysis and FDI effect is incorporated in to the same Cartesian Space.

2. Multi-Functional Cartesian Space Theoretical Framework

The multi-functional (MF) Cartesian Space (See Ruiz, 2005) has nine general axis are $[(x_{1-j}, x_{2-j}, x_{3-j}, x_{4-j}), (y_{1-j}, y_{2-j}, y_{3-j}, y_{4-j})]$. In the same Cartesian plane is also formed by two ratios of analysis, there are Ratio 1 (R_1) and Ratio 2 (R_2). Each Ratio "R" has four spaces (or quadrants). The R_1 function is equal to (x_{i-0}, y_{i-0}) and R_2 function is equal to (x_{i-j}, y_{i-j}) , where "i" has values from 1 to 4 and "j" has values from 1 to ∞ . The four spaces of R_1 spaces are $S_I = (x_{1-0}, y_{1-0})$; $S_{II} = (x_{2-0}, y_{2-0})$; $S_{III} = (x_{3-0}, y_{3-0})$; $S_{IV} = (x_{4-0}, y_{4-0})$ and the four spaces of R_2 spaces are $S_V = (x_{1-1}, y_{1-1})$; $S_{VI} = (x_{2-1}, y_{2-1})$; $S_{VII} = (x_{3-1}, y_{3-1})$; $S_{VIII} = (x_{4-1}, y_{4-1})$. The MF Ratios have strong relationship between the two levels R_1 and R_2 , for example first relationship between R_1 and R_2 is $[S_I = (x_{1-0}, y_{1-0}) : S_V = (x_{1-1}, y_{1-1})]$. The second relationship between R_1 and R_2 is $[S_{II} = (x_{2-0}, y_{2-0}) : S_{VI} = (x_{2-1}, y_{2-1})]$. The third relationship between R_1 and R_2 is $[S_{III} = (x_{3-0}, y_{3-0}) : S_{VII} = (x_{3-1}, y_{3-1})]$. The last relationship between R_1 and R_2 is $[S_{IV} = (x_{4-0}, y_{4-0}) : S_{VIII} = (x_{4-1}, y_{4-1})]$

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In the case of R_1 has four axis or independent variables are " $x_{1-0}, x_{2-0}, x_{3-0}, x_{4-0}$ " and one y-axis or one dependent variable that is equal to " y_{i-0} ". The " y_{i-0} " can be share by the four independent variables [$x_{1-0}, x_{2-0}, x_{3-0}$ and x_{4-0}]. Therefore, the R_1 function is equal to $S_i = (x_{i-0}, y_{i-0})$. The Difference between R_1 and R_2 is that R_2 has four x-axis or four independent variables ($x_{1-1}, x_{2-1}, x_{3-1}, x_{4-1}$) and four y-axis or four dependent variables ($y_{1-1}, y_{2-1}, y_{3-1}, y_{4-1}$).

RATIO I : RATIO II

$$S_I = (x_{1-0}, y_{1-0}) : S_V = (x_{1-1}, y_{1-1})$$

$$S_{II} = (x_{2-0}, y_{2-0}) : S_{VI} = (x_{2-1}, y_{2-1})$$

$$S_{III} = (x_{3-0}, y_{3-0}) : S_{VII} = (x_{3-1}, y_{3-1})$$

$$S_{IV} = (x_{4-0}, y_{4-0}) : S_{VIII} = (x_{4-1}, y_{4-1})$$

The functions are used by the Multi-Functional Cartesian Space, there are (see figure 1):

Ratio 1

$$y_{i-0} = f(x_{1-0}, x_{2-0}, x_{3-0}, x_{4-0})$$

Ratio 2

$$y_{1-1} = f(x_{1-1})$$

$$y_{2-1} = f(x_{2-1})$$

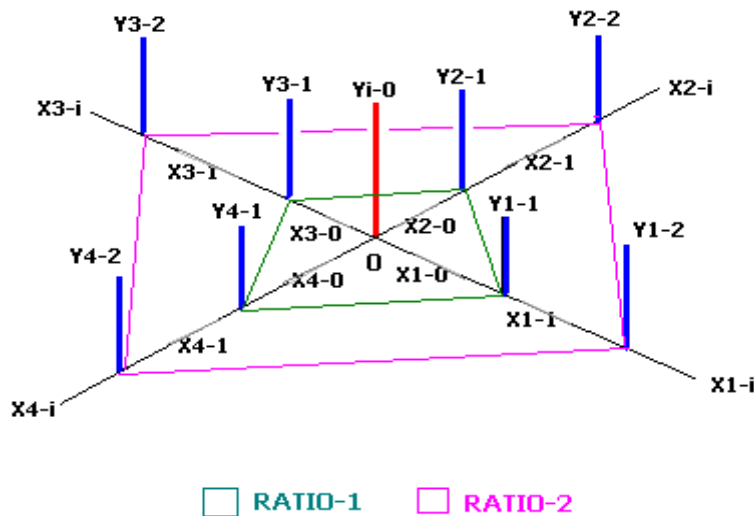
$$y_{3-1} = f(x_{3-1})$$

$$y_{4-1} = f(x_{4-1})$$

Characteristics:

1. Researchers can input eight independent variables and five dependent variables in the same Cartesian Space simultaneously.
2. The analysis of different scenarios in the same space and time. We can observe clearly how any change of all or some independent variable can affect all Cartesian Space from a general view.

Figure 1: Multi-Functional Cartesian Space



3. Application of Multi-Functional Cartesian Space on Monetary, Fiscal, Trade and Investment Policy

The MF-Cartesian Space is an alternative analytical tool for observing the economic environment of any country from a general perspective. In the case in point here, the MF-Cartesian Space is applied to simultaneously study the effects of fiscal policy, monetary policy, trade policy, as well as the effects of investment policy. All IS-curve, LM-curve, Trade analysis and FDI effect is incorporated into the same Cartesian Space. The MF-Cartesian Space consists of three perimeters. The first ratio surrounds the area (from Y_{0i} to X_{1-0} , from Y_{i-0} to X_{2-0} , from Y_{i-0} to X_{3-0} and from Y_{i-0} to X_{4-0} . The second ratio is represented by the area from Y_{1-1} to X_{1-1} ; from Y_{2-1} to X_{2-1} ; from Y_{3-1} to X_{3-1} and from Y_{4-1} to X_{4-1} . Additionally, the MF-Cartesian Space comprises four sections that accommodate four analyses sections. Each of these sections is formed by a two-window refraction space¹.

3.1. IS-Curve: Goods Markets

The first analysis section is the study of fiscal policy within the IS-Curve. The first window refraction space is the relationship between interest rate and investment. All possible scenarios in the first window refraction are following by (See figure 2):

▼ Interest Rate => ▲ Investment

▲ Interest Rate => ▼ Investment

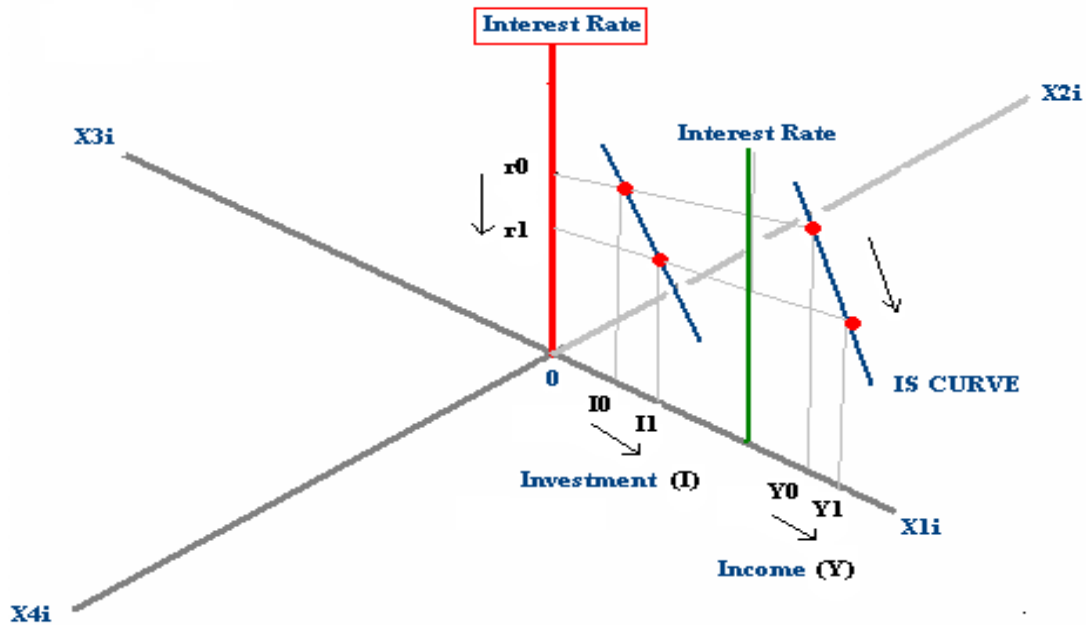
The second window refraction space is the construction of IS-Curve, the IS-Curve is based on the relationship between interest rate and income. All possible scenarios in the second window refraction are following by (See figure 2):

▲ Interest rate => ▼ Income (GDP)

▼ Interest rate => ▲ Income (GDP)

¹ *Window Refraction Space* is a concept based on the joining of different quadrants in the same vector address

Figure 2: Application of the MF-Cartesian Space in the Analysis of IS-Curve



3.2. LM-Curve: Money Market or Financial Market

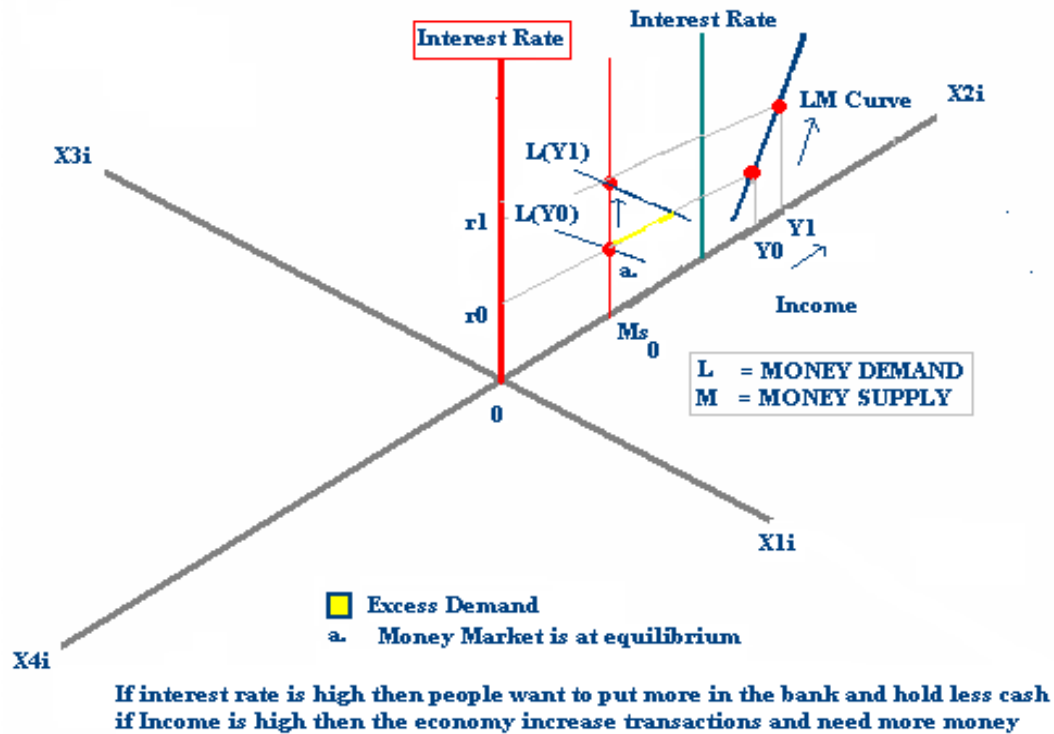
The second analysis is based on the application of the LM-Curve to study the monetary policy. The construction of the LM-Curve is based on two windows refraction spaces. The first window refraction space represents the relationship between interest rate and money demand/supply (See . All possible scenarios in the first window refraction are following by (See figure 3):

1. Money supply is fixed by the National Bank
2. Money Demand depend on the interest rate

The second window refraction space, on the other hand, it is based on the relationship between interest rate and income that LM-Curve is constructed. All possible scenarios in the second window refraction are following by (See figure 3):

- ▲ Income => ▲ Interest Rate
- ▼ Income => ▼ Interest Rate

Figure 3: Application of the MF-Cartesian Space in the Analysis of LM-Curve



3.3. Trade Policy: Trade Analysis

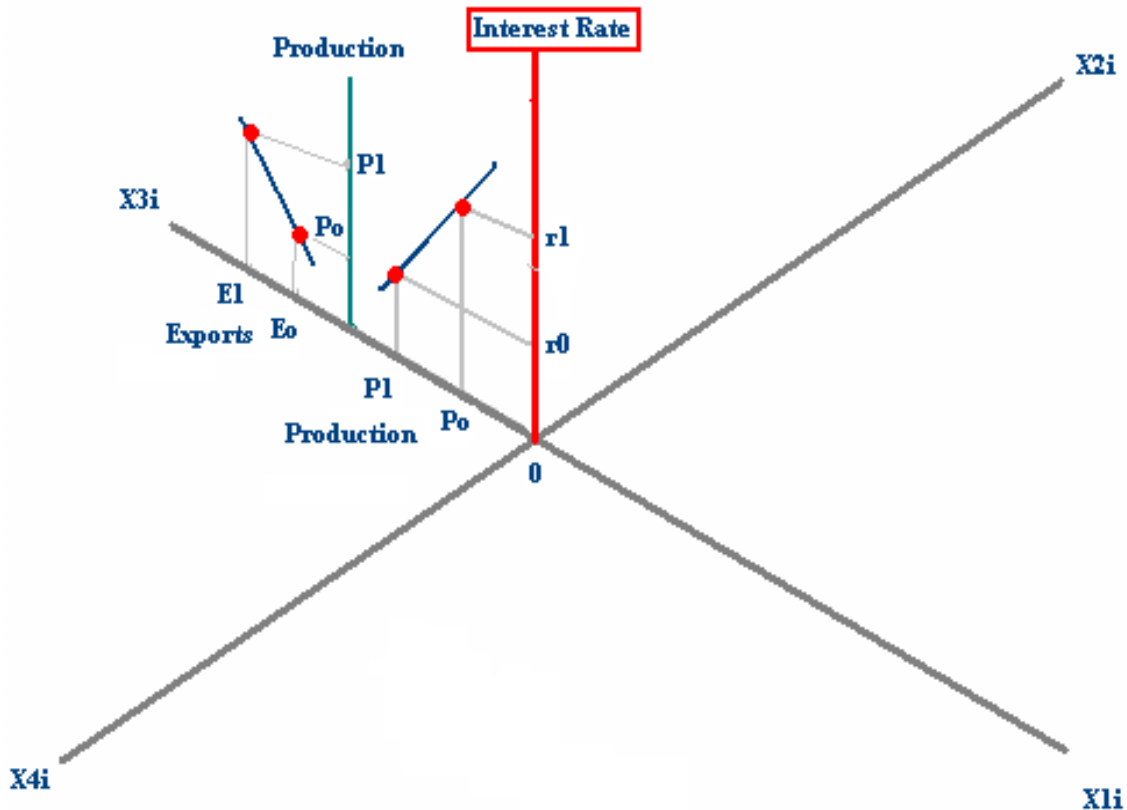
The third section of the MF-Cartesian Space is for the analysis of trade policy. The first window refraction space pictures shows the relationship between interest rate and production or GDP output is equal to the sum of all production sectors: Agriculture, Manufacturing, Industry and Services. All possible scenarios in the first window refraction are following by (See figure 4):

- ▲ Interest Rate => ▼ Production
- ▼ Interest Rate => ▲ Production

In the second window refraction space is the relationship between production and exports are shown. All possible scenarios in the second window refraction are following by (See figure 4):

- ▲ Production => ▲ Exports
- ▼ Production => ▼ Exports

Figure 4: Application of the MF-Cartesian Space in the Trade Analysis



3.4. Investment Policy: FDI Effect

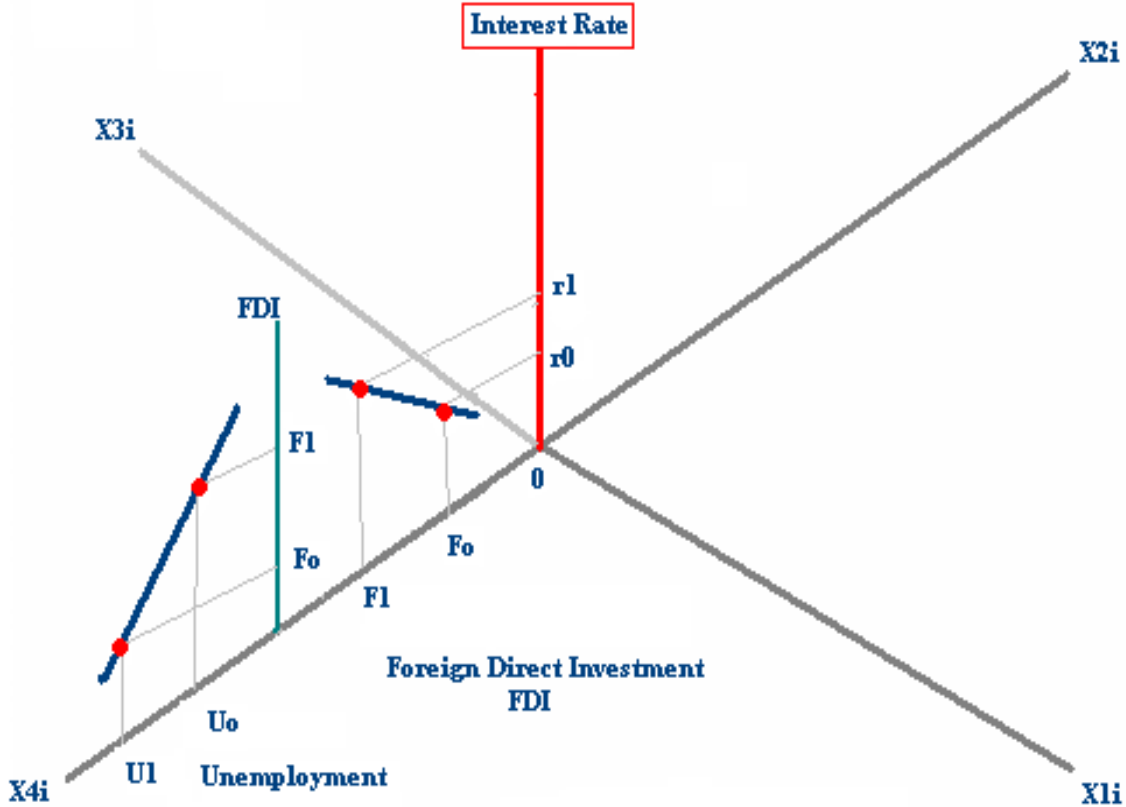
Lastly, the two window refraction space is where the relationship between Foreign Direct Investment (FDI) and interest rate is shown. In the last section of the Cartesian Space, the first window refraction space is a depiction of the relationship between interest rate and FDI. All possible scenarios in the first window refraction are following by (See figure 5):

- ▲ Interest Rate => ▲ FDI
- ▼ Interest Rate => ▼ FDI

In the last space where the correlation between FDI and Unemployment becomes obvious. All possible scenarios in the first window refraction are following by (See figure 5):

- ▲ FDI => ▼ Unemployment
- ▼ FDI => ▲ Unemployment

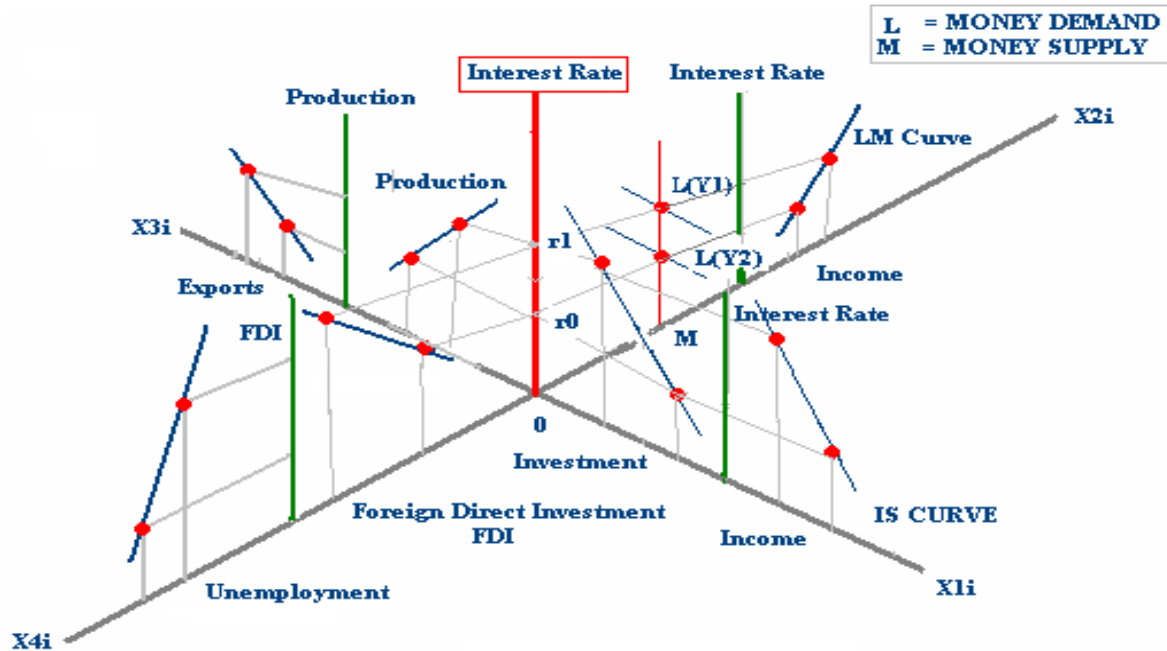
Figure 5: Application of the MF-Cartesian Space in the FDI Effect



3.5. General View

In broad terms, the MF-Cartesian Space provides a platform for analyses in four areas in economics through the four different curves that are incorporated in the same Cartesian space: fiscal policy (through its IS-Curve), monetary policy (through its LM-Curve), trade policy (through trade analysis based on Trade/Production relationship) and investment through its FDI (See figure 6). It is assumed that all analyses are operational simultaneously and in the same space, thereby presenting a Computational General Equilibrium (CGE) that showcase a general scenario of the economic environment under study (See Ruiz, 2005)

Figure 6: The MF-Cartesian Space Apply in the Fiscal, Monetary, Trade and Investment Policy



4. Conclusion

The Multi-Functional Cartesian Space (MD-Cartesian Space) attempts to be a new graphical method of analysis to support the study of macroeconomics and economic policy, as well as finance and economic growth. The main idea to build MD-Cartesian Space is to offer a new graphical technique that can facilitate to study any economy (country) behavior in the short and long run. In summation, the MF-Cartesian Space is an alternative analytical tool for observing the economic environment of any country from a general view.

5. References

Ruiz Estrada, M. A. (2005) "Introduction to Econographication", FEA-Working Paper No.2005-9, pp.1-15

