

WHY HAS THE CHINESE MARKET BECOME MORE VULNERABLE IN THE 21ST CENTURY?

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Introduction

This paper explains the complex and dynamic behavior of the Chinese market from a multi-dimensional perspective. Initially, we assume that five global forces simultaneously exist and interact together to affect the Chinese market behavior. These five global forces are economic global forces (X1), social global forces (X2), political global forces (X3), technological global forces (X4) and natural global forces (X5). All these global forces always keep in a constant quantitative and qualitative transformation(s) across time and space.

Additionally, we also assume that the Chinese market has become much more vulnerable, and that it can suffer a crisis at any time, according to the advanced stages in the evolution of the Chinese market. Usually, the traditional explanation of the market behavior is based on the use of supply and demand forces. We argue that these forces can only give us a basic explanation about the dynamic and complex behavior of the market.

Moreover, the theoretical contribution by Adam Smith, David Ricardo, Augustin Cournot and Alfred Marshall¹ about the market behavior was very useful to explain how the market works and the failures of the market. If we analyze the points of view put forward about the market behavior by these four economists, we notice different conceptions and views, perhaps caused by the different historical times that each of these economists lived in.² This research concurs that all these economists were right, at their particular points of time, in the way that they interpreted and explained the dynamic and complex behavior of the Chinese market within its historical momentum. However, using the same logic, the theories of these economists are now insufficient and inadequate to explain the behavior of the Chinese market today.

In the study of the market, a common strategy is to use the *Ceteris Paribus* assumption. In our case, the application of the *Ceteris Paribus* assumption is wholly unnecessary because we argue that in studying the Chinese market, certain variables that are considered less important cannot be isolated from the analysis; they must be included in the study of the Chinese market behavior.

For this reason, we suggest the use of new assumptions and graphical modeling to explain more clearly the dynamicity and chaotic behavior that the Chinese market can experience across time and space. Firstly, this research assumes that the market

¹ W.J., Barber, "A History of Economic Thought", US, Wesleyan University Press, 2009.

² D.F., Gordon, "The Role of the History of Economic Thought in the Understanding of Modern Economic Theory", *The American Economic Review*, Vol. 55, No. 1/2, 1965, pp 119-127.

always experiences a state of dynamic imbalance. This is only made possible by the application of the *Omnia Mobilis* assumption (everything is moving). Using the *Omnia Mobilis*³ assumption helps to include more variables without any isolation in the study of the market.

Additionally, we suggest the application of multi-dimensional graphical modeling to facilitate the visualization of Chinese market behavior from a global perspective. Additionally, the market can be considered a complex and multi-dimensional system under the interaction of the private and public sector. In the end, both sectors become complementary and are effectively inseparable when it comes to keeping the economy of any country alive. In our opinion, the market is not a simple place to exchange goods and services.

On the contrary, the market is a dynamic multi-dimensional system that is affected by different global forces, all of which keep in constant quantitative and qualitative transformation(s) at all times. According to this research, the study of Chinese market behavior basically depends on the volatility of five global forces and the historical momentum of human experience in different phases.

Therefore, in the study of the Chinese market over the last past fifty years, we can observe the application of sophisticated and complex econometrics and mathematical models and techniques that try to represent the Chinese market in the most up-to-date way, as a whole, to show the dynamic and complex behavior of the Chinese market. But we can also observe that all these models and techniques cannot encompass a large number of variables or reduce the isolation of some variables that are considered not important enough to be taken into account when it comes to building the model.

Finally, we would like to propose an alternative multi-dimensional model to analyze and visualize the rapid changes of the Chinese market behavior based on the output of five global forces: global economic forces output (X_1), global social forces output (X_2), global political forces output (X_3), global technological forces output (X_4) and global natural forces output (X_5). Each global force output runs in real time and directly affects the Chinese market behavior simultaneously, without isolating some variable(s).

The Model

This model attempts to use a multi-dimensional mathematical and multi-dimensional graphical approach. We propose the use of the 6-dimensional coordinate space (vertical position)⁴. This specific coordinate space offers six axes to plot five exogenous variables and one endogenous variable; this makes it possible to observe the changes of each exogenous variable and the endogenous variable within its axis separately and simultaneously in the same graphical space.

We also suggest the application of the *Omnia Mobilis* assumption to generate the relaxation of the five global forces of the market. The main objective of this is to observe

³ M.A., Ruiz Estrada, S.F., Yap, and S. Nagaraj, "Beyond the Ceteris Paribus Assumption: Modeling Demand and Supply Assuming *Omnia Mobilis*", *International Journal of Economic Research (IJER)*, Vol 5, No. 2, 2008, pp 185-194.

⁴ M.A., Ruiz Estrada, "Econographicology", *International Journal of Economics Research (IJER)*, Vol. 4. No.1, 2007, pp 93-104.

in real time the behavior of the market without any isolated variables. In this case, each market force is fixed into its axis.

These global forces are: economic global forces (X_1) (see Expression 1), social global forces (X_2) (see Expression 2), political global forces (X_3) (see Expression 3), technological global forces (X_4) (see Expression 4) and natural global forces (X_5) (see Expression 5). Each global force has its specific function with a large number of factors (i) that always keep changing in real time (\otimes). All these factors (i) in our model can be considered independent sub-variables. At the same time, we also suggest that each global force applies an infinite number of partial derivatives⁵ (∂), everything is running in real time (\otimes) and everything directly affects the final market vulnerability trend index $/\otimes Y^*/$.

$$\begin{aligned} X_1 &= f(\otimes f_{11}, \otimes f_{12}, \dots, \otimes f_{1n}) \text{ and } n = \infty \\ X_2 &= f(\otimes f_{21}, \otimes f_{22}, \dots, \otimes f_{2n}) \text{ and } n = \infty \\ X_3 &= f(\otimes f_{31}, \otimes f_{32}, \dots, \otimes f_{3n}) \text{ and } n = \infty \\ X_4 &= f(\otimes f_{41}, \otimes f_{42}, \dots, \otimes f_{4n}) \text{ and } n = \infty \\ X_5 &= f(\otimes f_{51}, \otimes f_{52}, \dots, \otimes f_{5n}) \text{ and } n = \infty \end{aligned}$$

The measurement of each global force is based on Equation 6, where several partial derivatives (∂) are running in real time (\otimes) between different periods of time: past time $\langle t-1 \rangle$ and future time $\langle t+1 \rangle$.

$$\otimes X_i = \otimes [\partial X_{i\langle t+1 \rangle} / \partial X_{i\langle t-1 \rangle}] \Rightarrow i = \{1,2,3,4,5\}$$

Each global force in our model can be measured by Expression 7, 8, 9, 10 and 11. Later, each of the five global forces will be plotted directly onto its respective axis in the 6-dimensional coordinate space:

$$\begin{aligned} (7.) \otimes X_1 &= \otimes [\partial X_{1\langle t \rangle} / \partial X_{1\langle t-1 \rangle}] \\ (8.) \otimes X_2 &= \otimes [\partial X_{2\langle t \rangle} / \partial X_{2\langle t-1 \rangle}] \\ (9.) \otimes X_3 &= \otimes [\partial X_{3\langle t \rangle} / \partial X_{3\langle t-1 \rangle}] \\ (10.) \otimes X_4 &= \otimes [\partial X_{4\langle t \rangle} / \partial X_{4\langle t-1 \rangle}] \\ (11.) \otimes X_5 &= \otimes [\partial X_{5\langle t \rangle} / \partial X_{5\langle t-1 \rangle}] \end{aligned}$$

The market vulnerability trend index $/\otimes Y^*/$ can be calculated using Equation 12. The final result of the market vulnerability trend index $/\otimes Y^*/$ is always represented by an absolute value.

$$(12.) / \otimes Y^* / = \prod_{i=1}^5 \otimes [\partial X_{i\langle t \rangle} / \partial X_{i\langle t-1 \rangle}] \Rightarrow i = \{1,2,3,4,5\}$$

However, the final measurement of the market vulnerability trend index ($/\otimes Y^*/$) (see Expression 13) continues to apply an infinite number of partial derivatives (∂) running in real time (\otimes) (see Appendix 1).

⁵ M.A., Ruiz Estrada, "The Multi-Dimensional Partial Differentiation", *FEA-Working Paper*, No.2009-30, 2009, pp 1-15.

All these global forces mentioned before are interconnected by a common variable called “the market vulnerability trend index $/\otimes Y^*/$ ”. At the same time, this index requires the application of the interconnectivity principle ($\#$).

$$(13.) \quad / \otimes Y^* / = \otimes [\partial X_{1<t+1>} / \partial X_{1<t-1>}] \# \otimes [\partial X_{2<t+1>} / \partial X_{2<t-1>}] \# \otimes [\partial X_{3<t+1>} / \partial X_{3<t-1>}] \# \otimes [\partial X_{4<t+1>} / \partial X_{4<t-1>}] \# \otimes [\partial X_{5<t+1>} / \partial X_{5<t-1>}]$$

The final analysis of this model depends on the final output from global economic forces, global social forces, global political forces, global technological forces and global natural forces, as well as the market vulnerability trend index $/\otimes Y^*/$.

Once we find the final output for all global forces and the market vulnerability trend index, then we can plot each final output into its respective axis in the 6-dimensional coordinate space (see Figure 1).

Finally, we proceed by joining all final outputs within each axis by applying straight lines until a single surface is built. This surface will be called “the market surface”. The market surface can show three possible results (see Figure 2):

1. If the market surface is located on a high level within the 6-dimensional coordinate space, we refer to it as a “high-vulnerability intensity”
2. If the market surface is located between a high and low level within the 6-dimensional coordinate space, we refer to it as an “unstable-vulnerability intensity”
3. If the market surface is located at a low level in the 6-dimensional coordinate space, then we refer to it as a “low-vulnerability intensity”

Analysis of the Final Results

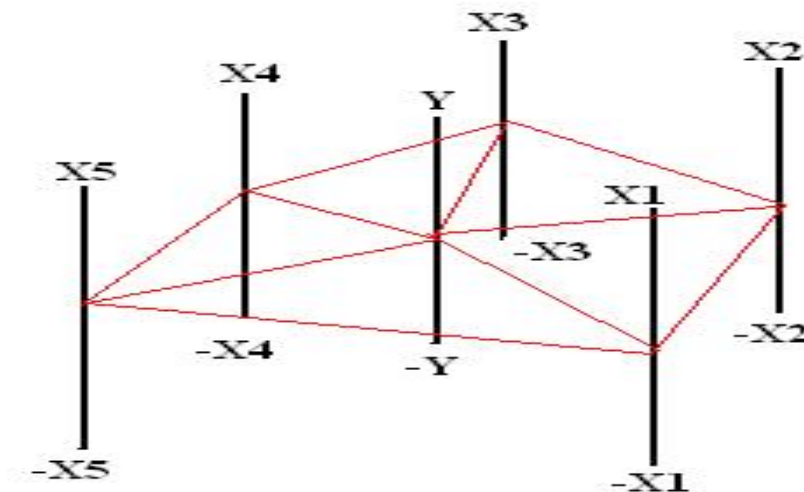


Figure 1: The 6-Dimensional Coordinate Space

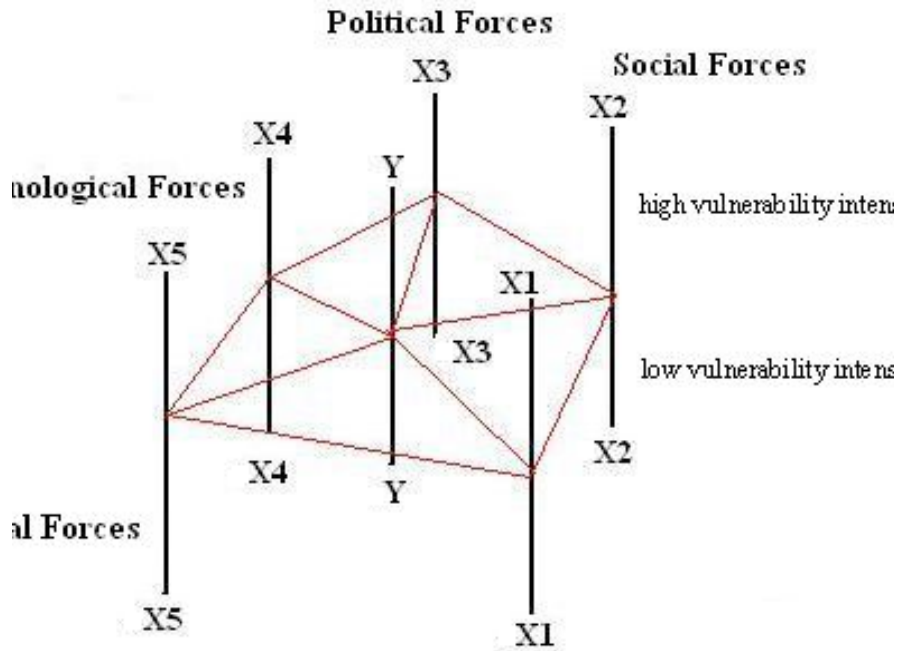


Figure 2: The Graphical Modeling of the Market Surface

The case study for this paper is the vulnerability of the Chinese market between the 20th and 21st century. We use 1500 variables (exogenous sub-variables) distributed into the five general exogenous variables (five global forces) which are fixed as economic global forces ($X_1 = 500$ variables), social global forces ($X_2 = 300$ variables), political global forces ($X_3 = 400$ variables), technological global forces ($X_4 = 200$ variables) and natural global forces ($X_5 = 100$ variables) respectively.

Our final target is to measure the market vulnerability trend index $/\text{Y}^*/$ (general endogenous variable). This is to compare the vulnerability of the Chinese market between these two centuries. This model applies partial derivatives in real time under the use of average values per decade from the same century (see Table 1).

Table 1: Levels of Vulnerability in the Global Economic, Global Social, Global Political, Global Technological and Global Natural Forces and The Market Vulnerability Trend Index $/\text{Y}^*/$: The Case of Chinese Market

Variable Century	Global Economic Forces (X_1)	Global Social Forces (X_2)	Global Political Forces (X_3)	Global Technological Forces (X_4)	Global Natural Forces (X_5)	$/\text{Y}^*/$
20 th Century	0.58114	0.39143	0.41253	0.34687	0.35871	0.41813
21 st Century	0.75227	0.41254	0.52584	0.75244	0.85985	0.66058

The final results from this model show that, between the 20th century and 21st century, the Chinese market became more vulnerable according to the market

vulnerability trend index $/\odot Y^*/$ which moved from 0.41813 to 0.66058 (see Table 1). When it comes to economic global forces (X_1), the Chinese market shows a level of vulnerability of 0.58114 in the 21st century compared to 0.75227 in the 20th century. Both the global social forces (X_2) component and the global political forces component of the Chinese market experienced a small growth expansion in its rates of vulnerability compared to the economic global. The global social forces (X_2) component of the Chinese market showed a vulnerability rate from 0.39143 to 0.41254 according to Table 1. Subsequently, the political global forces (X_3) vulnerability rate of the U.S. market experienced a move from 0.41253 to 0.52584 (see Table 1).

The technological global forces (X_4) component of the Chinese market shows the largest rate of vulnerability in these two centuries; this changed from 0.34687 to 0.75244. Something similar happened to the natural global forces (X_5) rate for the Chinese market, which can be observed by a considerable expansion of its vulnerability rate from 0.35871 to 0.85985 (see Figure 3). Hence, we can conclude that the market behavior of the Chinese has become more vulnerable due to the rapidly advancing stages that the Chinese market can experience. Figure 3 demonstrates clearly that the market surface of the Chinese during the 20th century is lower than the market surface of the Chinese in the 21st century.

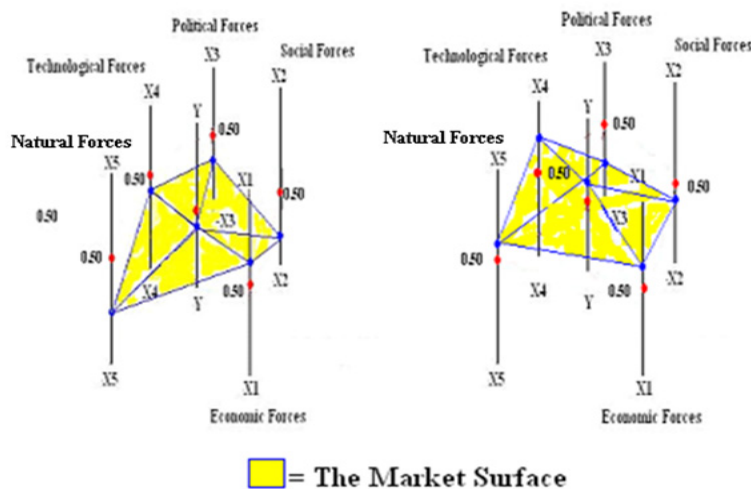


Figure 3: The Market Surface of the Chinese Market in the 20th and 21st Century⁶

⁶ Source: various Green Peace: <http://www.greenpeace.org>; Haya Court: <http://www.wpc-in.org>; Human Rights Watch: <http://www.hrw.org>; International Federation of Production Rights Organization: <http://www.ifpro.org>; International Monetary Fund: <http://www.imf.org>; NATO: <http://www.nato.int>; North America Free Trade Area (NAFTA): <http://www.nafta-sec-alena.org/>; Oil Producers Organization (OPEC): <http://www.opec.org>; The Federal Reserves System: <http://www.federalreserve.gov/pf/pf.html> 8; The Library of Congress U.S.: <http://www.loc.gov>; Transparency International: <http://www.transparency.org>; United Nations: <http://www.un.org>; World Bank: <http://www.worldbank.org>; World Health Organization: <http://www.who.int>.

Concluding Remarks

This paper concludes that the vulnerability of the Chinese market behavior basically depends on five global forces: economic global forces, social global forces, political global forces, technological global forces and natural global forces. All these five global forces interact and keep constantly changing across time and space. □ At the same time, the application of multi-dimensional graphical modeling in real time is required in order to observe the complex and dynamic behavior of the Chinese market as a whole. Finally, we conclude that the analysis of the Chinese market has become more vulnerable according to the advanced stages of humanity's evolution and the rapid changes within each global force. This can be observed in the final results of our model.

