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Non-authigenic Logic - Mathematical Reasoning of Statistical Intervening Principle Based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (I)

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Abstract— **Non-authigenic Logic is useful in understanding statistical disease. By using mathematical reasoning, this paper demonstrates the statistical intervening principle: "If some people want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can't come from their own, and should, from a third party, have nothing to do with themselves and their observation" (第三方标准). This is a logic which is similar to a group and has nothing to do with the research object, namely non-authigenic logic (不自生逻辑), based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (TCS). The philosophy meanings of five aspects of Non-authigenic Logic are defined and the five basic principles and their rules of non-authigenic logic are discussed. The kernel of this paper is the existence and reasoning of the non-compatibility relations, and it accords with the oriental thinking model. Hilbert's sixth mathematical conjecture of his 23 mathematical conjecture problems gets a negative answer. As an application, later based on a free-function model, study five balances of designs, get a basic design to ensure reproducibility, namely, generalized orthogonal arrays. By using the generalized orthogonal arrays, the reproducibility estimators in TCS have been obtained, and compared with the traditional average estimator by simulation. Simulation analysis of examples: the problem is very serious, because western often use the average estimate, for the most simple question of traditional mathematical expectation estimation is not applicable, without reproducibility.**

Index Terms—**Traditional Chinese Statistics (TCS), Yin Yang Wu Xing Theory, steady multilateral systems, incompatibility relations, a free function model,the generalized orthogonal arrays, reproducibility, the average estimate**

I. INTRODUCTION

Non-authigenic Logic is useful in understanding statistical disease. By using mathematical reasoning, this paper demonstrates the statistical intervening principle: "If some people want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can't come from their own, and should, from a third party, have nothing to do with themselves" (第三方标准). This is a logic which is similar to a group and has nothing to do with the research object, namely non-authigenic logic (不自生逻辑), based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (TCS).

People knowing the world is to understand the purpose of the scientific principles of the real world, the resulting real scientific theory. But different philosophy thoughts can produce different logic, different logic can produce different "scientific theories". Therefore, the TCS's meeting the first question is: what kind of logic is the reasonable logic?

In Western statistics, the word "statistics" comes from the English "statistics" etymology: German Statistik, political science; New Latin statisticus, state; Italian statista, experienced politicians; and the old Italian and Latin status, the situation, government. Originated in the national survey, the earliest learning means national conditions.

According to the understanding of the now in Western statistics, statistics is generally up calculation of sum, is a phenomenon of the relevant information or things for collecting, collating, calculation and analysis of the working process. The word "statistics" has three party statistics and meaning:

(1) The statistical work. Collecting, sorting and analyzing refers to the overall population objective things in the working process of the material, it is the foundation of statistics.

(2) Statistical data. Statistical data made all the digital information and relevant text material, generally reflected in statistics, statistical figure, statistical manual, statistical yearbook, statistics compiled and statistical analysis report.

(3) Statistical science. Research how to collect, sorting and analyzing the theory and method of statistical data.

The relationship among statistical work, statistics data and statistical science is: statistical work achievement is statistical data or statistics science, both statistical data and statistics science are the foundation of the statistical work, statistical science is both statistical work experience theoretical generalization and guidance of the statistical work principle, inference principle and method. The original statistical work that people collect data of the original form have several thousand years of history, and it as a science, or from 17-th century. Statistician and statistical work people in English is the same, but statistical science is not directly produced in the statistical work of experience. Each a science has the establishment, development and objective conditions. So statistical science is statistical work experience, statistical theory, measuring statistical method, and refine, development and fusion of a marginal subject. Its symbolic event is the establishment of mathematical statistics. Simply said, **Western statistics is data processing of science according to a mathematical Axiom system.**

Western statistics late nineteenth century was introduced into China, initially, "statistics" to be directly translated as "the government the actual data", "summary", "collect computation", "society statistics" words. But the ancient Chinese for this concept, in 3000 years ago, has been

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officially use “Tong-Ji” (统计) words. In the Yi-Jing (易经), this concept is defined as with the method of that unifies the volunteers all ideals (统一目标), comprehensive survey calculation without assumptions (计算), to know the world for the great thing (知象), to conclude that the question (算计). Statistical work has anciently in China, such as the Fuyi (伏羲) painting Eight-hexagram (八卦) and Dayu (大禹) curing water. It will be known that the Fuyi paints Eight-hexagram in the Yi-Jing.The story does't be talked about in this paper, and just talk about the big story of the Dayu curing water, in order to understand the traditional Chinese philosophy about the definition of statistics.

Dayu curing water took place in China is also at the end of the primitive society an extremely profound influence of a great thing. According to ancient records, about more than four thousand years ago in the Yellow River, there was a major flood disaster. Was in the primitive society the end, extreme low productivity, life is very difficult. Face is everywhere amid a sea of flood, the people had to flee to the mountains to avoid. Tribal alliance leader Yao (尧), in order to remove floods, held the tribal alliance meeting, presses the Gun (鲧) to finish the task. Because the using method by Gun is “stop up”, “barrier” jams around the cut method, the cure for nine years, costly, not only to live the flood, but the flood is more and more big.

After the death of Yao, the leader of the union or a horde was Shun (舜). He got the curing water tour, to see Gun stranded flood, delayed the great things, Gun was punished, put to death in the primaries. Tribal alliance and nominate Gun's son Dayu. Dayu was a shrewd and selfless man. He accepted the task of the curing water, just and TuShan's (涂山氏) a girl married, tough-minded Dayu, seeing the scene by water hazards, thought of his shoulder the great task, and resolutely determined to say goodbye to his wife, and came to the site of the positive.

Dayu water conservancy before beginning, he was **without his own assumptions and views**. Please came over the water Dayu elders and had with her father for a Gun had water hazards, sum up the past failure, looking for radical flood way. Some people thought that: “the flood comes very fierce, because flow out.” Someone suggested: “it seems, water is flows downwards. As long as we make it clear the current level of the terrain, the direction of the river, the water, excavation drawn to, is easy.” Dayu discussed in many ways, found only two recurring views: one was defense, another was guiding. **They had the reproducibility since they were objective and repeating**. These made Dayu greatly inspired, he was unable to determine which method was right. He passed through on-the-spot investigation, formulated the practical solutions: on one hand, they should continue to strengthen and building of defense against water systems, on the other hand, Dayu changed his father's practice, with opening canal drainage, dredging the river way and opening the way to channel, leads to the sea in the flood, using “guiding” measures to eradicate the floods.

In order to facilitate water, also the whole region into position for nine big state, that was, hebei, yan, green, xu, yang, thorns, henan, beam, harmony (冀、兖、青、徐、扬、荆、豫、梁、雍). **It was classified as technology.** From then on, a sweeping engineering and the positive spread out. In order to control flood, Dayu and people fought together for long times, the place with their family, a house but not into three time. Dayu led people to natural disasters of flood struggle, obtaining the final victory.

The story is the Chinese understand the statistical work of the early. Its meaning is to intervene a statistical complex system, without yourself hypothesis conditions, a comprehensive investigation. In other words, the “Tong” (统) and “Ji” (计) are two words in the first of the Yi-Jing (易经), appear. The “Tong” explanation is both “chieftain without himself hypothesis” and “administer in a unified way” (“Tong-Guan”(统 管)) that refers to administer the interconnected and complex system. The “Ji”(计) explanation is both “calculation of objective images without assumption” (计算) and “intervening to objective images in order to get own purpose”(图谋). The word “Suan-Ji” (算计), from thinking of a way to the whole someone based on the objective images, or do something based on the objective images, thus reach own purpose. Two words “Tong-Ji” (统计) of the act, the earliest concept is **the intervention through the comprehensive survey without hypothesis for own goal**. Original intention is to point “intervening a project”, and “controlling an engineering”, is also the engineering to intervene a meaning. Both the project and the engineering which are all complex systems are the research objects of statistical science, called intervening statistical complex systems in order to facilitate the narrative.

The ancients speaking of **“statistics”** in Chinese is a word to intervene a statistical complex system through the comprehensive survey without Axiom hypothesis for own goal. This and what people now understand the statistic completely different things. In other words, in TCS, both intervening and controlling of an engineering are believed to as a statistical complex system. It is because to intervene an engineering is difficult and complex in which there are the loving relation, the killing relation and the equivalent relation among many Axiom systems. The loving and killing relations are non-compatibility relations, which can compose the whole energy of the system greater than or less than the sum of each part energy of the system, respectively, rarely equal conditions. Statistics means managing or controlling or intervening for the complex system, and so on. Pursuing the goal is the harmonious sustainable or balance of the complex system in order to compose the complex system not outward expansion development. Used method is to look for its real image which is objective and repeating as reproducibility. In order to ensure reproducibility, inspection standard must come to as for a complicated system itself, rather than a scholar. Generally speaking, all the logic inference was conducted on the premise of no assumptions.The assumption involved the behavior of people is not needed since the system is complex, only need to balance the complex system and to ensure reproducibility. The logic reasoning of no assumptions is called **non-authigenic logic**. It is because if they want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can't come from their own, and should, from a third party, have nothing to do with themselves. Simple said, can't do the referee, and sportsman. This is the most basic logic of Chinese culture.

But, in Western statistics, statistics means first obtaining statistical data, then performing statistical inference from the statistical data under one Axiom system assumption. Both

obtaining and inference of data are believed to as a simple system, major statistical analysis method to analysis from simple assumptions or simple models. Data has everything. A lot of data can form a good statistical theory. It is because to obtain or analyze data is easy and simple in which there is only a compatibility relation or a generalized equivalent relation under One Axiom system assumption. The compatibility relation or generalized equivalent relation can compose the whole energy of the system equal to the sum of each part energy of the system, such as the recognition of adding Axiom system of probability theory. Thus to obtain or to analyze data under one Axiom system assumption can compose the simple system outward expansion development. Therefore, pursuing the goal is for obtaining or analyzing data in order to compose the simple system outward expansion development. Generally speaking, all the logic inference is carried out under the premise of certain assumptions. The various hypothetical models involve the behavior of people. The logic reasoning with hypothesis is called **authigenic logic**. It is because in their reasoning proof before, all standards from their own observational assumptions. This phenomenon in the TCS is not allowed since a statistical complex system cannot be supposed. Otherwise, can't guarantee the reproducibility.

Western statistics using simple assumptions or simple models treats directly statistical complex system from Microscopic point of view, always destroy the original statistical complex system's balance, and has none beneficial to a statistical complex system's immunity. Western statistical intervention method can produce imbalance of a statistical complex system, having strong side effects (副作用). Excessively using methods of statistical intervention for a statistical complex system can easily paralysis the statistical complex system's immunity, which the statistical school of the debate leading to the crisis is a product of Western statistics since there are a number of Axiom systems in nature which are different to the people of faith. Using the method of statistical intervention for a statistical complex system too little can easily produce the statistical intervention resistance problem (耐药性).

TCS studies the world from the Macroscopic point of view, and its target is in order to maintain the original balance of a statistical complex system and in order to enhance the statistical complex system's immunity. TCS believes that each statistical intervention has one-third of badness. She never encourage government to use statistical intervention in long term. The ideal way is Wu Wei Er Wu Bu Wu (无为而无不为)——by doing nothing, everything is done. TCS has over 5,000-year history. It has almost none side effects or statistical intervention resistance problem.

After long period of practicing, ancient statistical scientists in China use "Yin Yang Wu Xing" Theory extensively in TCS to explain the origin of a statistical complex system, the law of a statistical complex system, statistical changes, statistical diagnosis, statistical prevention, statistical self-protection and statistical intervening. It has become an important part of the TCS. "Yin Yang Wu Xing" Theory have a strong influence to the formation and development of TCS' theory. As is known to all, China in recent decades, both a statistical complex system and related statistical work have made great strides in development. Its reason is difficult to say the introduction of western statistics, the fact that the Chinese traditional culture is in all kinds of statistical decision plays a role. Her many statistical intervening methods come from the Traditional Chinese Medicine (TCM) since both human body and statistical research objects are all complex systems. But, many Chinese and foreign scholars still have some questions on the reasoning of TCS, such as, Image Mathematics, TCM, and so on, which are due to TCS. In this article, it will be started to introduce some mathematical and logic analysis concept of Statistics for the western world on the presentation of TCS.

There is a lot of examples to prove the above viewpoint. One of the most famous is Hilbert's sixth mathematical conjecture of hid 23 mathematical conjecture problems. Hilbert's sixth mathematical conjecture problem said, "play an important role in mathematics the axiomatization of physics". In 1933, the Soviet union mathematician cole-monk-rove will probability axiomatic. Later, in quantum mechanics, quantum field theory of success. But the branches of physics can completely axiomatization, many people have suspected. Zhang [1] tried to adopt the traditional Chinese logic of Yin and Yang to prove answer Hilbert's sixth mathematical conjecture. Instead simplify the problem, but he has in the at the same time, to solve the problem of partial axiomatic 11 guess is introduced, the problem becomes more complicated. In this paper, the Hilbert's sixth mathematical conjecture will be answered from the negative. That is to say: could not establish an axiomatic system of all branches of physics. Not to mention the axiomatic system of the statistical complex system is established.

The western theory of axiomatic system has complicated trend recently. Guillaume [2] put forward to the concepts of both an Intricate Axioms and an Interaction Axioms. In epistemic logic, some axioms dealing with the notion of knowledge are rather convoluted and difficult to interpret intuitively, even though some of them, such as the axioms 2 and 3, are considered to be key axioms by some epistemic logicians. He shows that they can be characterized in terms of understandable interaction axioms relating knowledge and belief or knowledge and conditional belief. In order to show it, He first sketch a theory dealing with the characterization of axioms in terms of interaction axioms in modal logic. He then apply the main results and methods of this theory to obtain specific results related to epistemic and doxastic logics. In addition, many scholars tried to use the Chinese theory of Yin and Yang to establish axiomatic systems in the west. These scholars are including Zhang etc [3], Zhang etc [4], Zhang [5], Zhang [6], Chen etc [7], Zhang etc [8], Fang [9], Kim etc [10], Fang etc [11], and so on. Also some scholars, for example, Zhang etc [12], tried to use the concept of Yin Yang Wu Xing in Chinese traditional philosophy to improve the axiomatic system in the west. However, in this paper to explain is: the mathematics of trying to cannot be completely successful, could only partial success.

In fact, at present a lot of many concepts in Chinese traditional culture, has been accepted by many scholars. In Chinese traditional culture, for example, there is a very important concept - analysis of contribution rate (ANOCR), is accepted by many scholars as global sensitivity indices to. The scholar Sobol [13] [14] is the most prominent.

The philosophy meaning of five aspects of Non-authigenic Logic is an impotent concept of TCS. And discussed the five basic principles and their rules of non-authigenic logic is necessary. According to the Yin Yang Wu Xing philosophy meaning, known the world of logic, should have the meaning

of the five aspects. That is to say: taking the research object is divided into five categories, i.e., **obtaining image from classification** or **classification taking image** (比类取象), to achieve real purpose of learning about the world.

As an application, later based on a free-function model, study five balances of designs, get a basic design to ensure reproducibility, namely, generalized orthogonal arrays. By using the generalized orthogonal arrays, the reproducibility estimators in TCS have been obtained, and compared with the traditional statistical estimators by simulation. The kernel of this paper is the existence and reasoning of the non-compatibility relations, and it accords with the oriental thinking model. Simulation analysis of examples: the problem is very serious, because western often use the average estimate, for the most simple question is not applicable.

Zhang etc [15-49] have started a great interest and admired works for TCS, where, through mathematical reasoning, they demonstrate the presence of incompatibility relations, which are predominant in daily life, yet absent in traditional Aristotelian Western logic.

Many people as Western persons are beyond all doubt the Yin Yang Wu Xing theory is superior to the traditional true-false logic, which does not contemplate incompatibility relations, which Zhang [19] has expertly explained from a mathematical standpoint.

The work Zhang [15,16] has started, allows many people like Western person to think of a true re-foundation of mathematical language, to make it a better suited tool for the needs of statistical complex system system and the environment. Although so doing, Zhang [18] also brings to light the difficulty of establishing the values of both the intervention reaction coefficients ρ_1, ρ_2 and the self-protection coefficient ρ_3 as parameters with due accuracy.

The article proceeds as follows. Section 2 contains the philosophy meaning of Five Aspects of Non-authigenic Logic and the negative answer of Hilbert's sixth mathematical conjecture, while a free function model of non-authigenic logic is demonstrated in Section 3. Simulation comparison of reproducibility is given in Section 4. And conclusions are drawn in Section 5.

II. Philosophy Meaning of Five Aspects of Non-authigenic Logic

The principle for balance, reproducibility and that by doing nothing, everything is done (automation), is the pursuit of the overall goal of non-authigenic logic. For any a statistical complex system, the first question is to determine the philosophical meaning of the five subsets, determine the corresponding collection category.This is the key to the technology of classification taking images.

2.1Five Aspects of Non-authigenic Logic

In order to apply the reasoning to other fields than a statistical complex system's health, Zhang etc [21] have started a steady multilateral system imitating a statistical complex system. A most basic steady multilateral system is as follows.

Theorem 2.1 [20] For each element x in a steady multilateral system V with two incompatibility relations, there exist five equivalence classes below:

$$X=\{y\in V\mid y\sim x\}, X_S=\{y\in V\mid x\to y\}, X_K=\{y\in V\mid x\Rightarrow y\},$$

$$K_X=\{y\in V\mid y\Rightarrow x\}, S_X=\{y\in V\mid y\to x\},$$

which the five equivalence classes have relations in Figure 1.#

It can be proved that the steady multilateral system in Theorem **2.1** is the reasoning model of Yin Yang Wu Xing in TCM if there is an energy function $\varphi(*)$ satisfying

$$\varphi(X_K)\geq\varphi(X_S)\geq\varphi(X)\geq\varphi(K_X)\geq\varphi(S_X)$$

which is called Yin Yang Wu Xing model, denoted by V^5.

The Yin Yang Wu Xing model can be written as follows: Define $V_0=X, V_1=X_S, V_2=X_K, V_3=K_X, V_4=S_X$, corresponding to wood, fire, earth, metal, water, respectively, and assume $V=V_0+V_1+V_2+V_3+V_4$ where $V_i\cap V_j=\varnothing, \forall i\neq j$.

And take $\mathfrak{R}=\{R_0, R_1, \cdots, R_4\}$ satisfying

$$R_r=\sum_{i=0}^{4}V_i\times V_{mod(i+r,5)}, \forall r\in\{0,1,\cdots,4\}, R_i*R_j\subseteq R_{mod(i+j,5)},$$

where $V_i\times V_j=\{(x,y): x\in V_i, y\in V_j\}$ is the Descartes product in set theory and $R_i*R_j=\{(x,y):\exists u\in V$ such that $(x,u)\in R_i,(u,y)\in R_j\}$ is the **relation multiplication operation**. The relation multiplication of $*$ is isomorphic to the addition of module 5. Then V^5 is a steady multilateral system with one equivalent relation R_0 and two incompatibility relations $R_1=R_4^{-1}$ and $R_2=R_3^{-1}$ where $R_i^{-1}=\{(x,y):(y,x)\in R_i\}$ is the **relation inverse operation**. The Yin and Yang means the two incompatibility relations and the Wu Xing means the collection of five disjoint classification of $V=V_0+V_1+V_2+V_3+V_4$.

Figure 1 in Theorem **2.1** is the figure of Yin Yang Wu Xing theory in Ancient China. The steady multilateral system V with two incompatibility relations is equivalent to the logic architecture of reasoning model of Yin Yang Wu Xing theory in Ancient China. What describes the general method of a statistical complex system can be used in statistical complex systems.

By non-authigenic logic of TCS, i.e., a logic which is similar to a group has nothing to do with the research object [20], in order to ensure the reproducibility such that the analysis conclusion can be applicable to any a statistical complex system, a logical analysis model which has nothing to do with the object of study should be chosen. The *Tao* model of Yin and Yang is a generalized one which means that two is basic. But the *Tao* model of Yin Yang is simple in which there is not incompatibility relation. The analysis conclusion of *Tao* model of Yin Yang cannot be applied to an incompatibility relation model. Thus the Yin Yang Wu Xing model with two incompatibility relations of Theorem **2.1** will be selected as the logic analysis model in this paper.

Western Statistics is different from TCS because the TCS has a concept of *Chi or Qi* (气) as a form of energy of steady multilateral systems. It is believed that this energy exists in all things of steady multilateral systems (living and non-living) including air, water, food and sunlight. *Chi* is said to be the unseen vital force that nourishes steady multilateral systems' body and sustains steady multilateral systems' life. It is also believed that an individual is born with an original amount of *Chi* at the beginning of steady multilateral systems' life and as a steady multilateral system grows and lives, the steady multilateral system acquires or attains *Chi* or energy from

"eating" and "drinking", from "breathing" the surrounding "air" and also from living in its environment. The steady multilateral system having an energy is called **the anatomy system** or **the first physiological system**. And the first physiological system also affords *Chi* or energy for the steady multilateral system's meridian system (*Zang Xiang* (藏象) and *Jing-Luo* (经络)) which forms a parasitic system of the steady multilateral system, called **the second physiological system** of the steady multilateral system. The second physiological system of the steady multilateral system controls the first physiological system of the steady multilateral system. A steady multilateral system would become ill or dies if the *Chi* or energy in the steady multilateral system is imbalanced or exhausted, which means that $\rho_1 = \rho(x) \to 0, \rho_2 = \rho(x)^2 \to 0$ and $\rho_3 = c\rho(x) \to 0$.

For example, in TCS, a statistical complex system as the first physiological system of the steady multilateral system following the Yin Yang Wu Xing theory was classified into five equivalence classes as follows:

wood(X)={industry, PPI (the Producer Price Index) or RPI (Retail Price Index) , liver, bravery, soul, ribs, sour, east, spring, birth};

xiang-fire(X_S^x)={agriculture, AAF (the total output value of Agriculture forestry Animal husbandry and Fishery) , pericardium, the triple energizer, nerve, the blood, bitter taste, the south, summer, growth};

earth(X_K)={ commerce, CPI (the Consumer Price Index), spleen, stomach, willing, meat, sweetness, center, long summer, combined};

metal(K_X)={science, education, public facilities, GBR (the General Budget Revenue), lung, large intestine, boldness, fur, spicy, west, autumn, accept};

water(S_X)={army, economics, GDP (the Gross Domestic Product), kidney, bladder, ambition, bone, salty, the north, winter, hiding};

jun-fire(X_S^j)={President or Governor, Finance (right of making money), heart, small intestine, bitter taste, whole economy, throughout the year, overall growth}.

fire(X_S)= xiang-fire(X_S^x) $\bigcup$ jun-fire(X_S^j).

There is only one of both loving and killing relations between every two classes. General close is loving, alternate is killing.

In every category of internal, think that they are with an equivalent relationship, between each two of their elements there is a force of similar material accumulation of each other. It is because their pursuit of the goal is the same, i.e., follows the same "Axiom system". It can increase the energy of the class at low cost near to zero if they accumulate together. any a nature material activity follows the principle of maximizing so energy or minimizing the cost. In general, the size of the force of similar material accumulation of each other is smaller than the size of the loving force or the killing force in a stable complex system. The stability of any a statistical complex system first needs to maintain the equilibrium of the killing force and the loving force. The key is the killing force. For a stable complex system, if the killing force is large, i.e., $\rho_3 = c\rho(x)$ becomes larger, which needs positive **exercise**, then the loving force is also large such that the force of similar material accumulation of each other is also large. They can make the complex system more stable. If the killing force is small, i.e., $\rho_3 = c\rho(x)$ becomes smaller , which means little **exercise**, then the loving force is also small such that the force of similar material accumulation of each other is also small. They can make the complex system becoming unstable.

People know the world's purpose is to find corresponding complex systems in five categories:
wood(X), fire(X_S), earth(X_K), metal(K_X), water(S_X).

Five types of the statistical complex system how to find the corresponding research object? This becomes the crux of the problem. Also said: the philosophical meaning of the five classification is what? In other words, looking for every kind of problem, how should the idea? How to do? How to keep continuously to develop?

2.2 Philosophy Meaning of Each of Five Aspects of Non-authigenic Logic

The following cognitive logic of five aspects philosophy meaning is due to *Taoism*, called **cognitive logic of non-authigenic** or **cognitive logic of automation** or **cognitive logic of "Wu Xing"**, etc., it applies to any a statistical complex cognitive system. The basic idea is divided into five steps, called wood, fire, earth, metal, water. Every step has a principle and three rules. Principle provide basic idea.The rules provide specific practices. Specific practices, including how to thinking, how to do, how to keep continuously to develop.

(a) Wood(X): No assumptions principles (无假设原则)

"No suppose principle" has another name: Don't assume that teaching (不言施教). It means that without a priori axiom hypothesis conditions, only there are cognition, reasoning and analysis on the relationship of the complex system. In the traditional Chinese saying is: not afraid not perceive afraid goods than goods (不怕不识货就怕货比货).

The ideology includes three aspects of content: one is how to thinking as non- authigenic thinking rule (不自生思维规则). All assumptions and inspection standard must come from the actual problem itself, it is not relevant to the analysis methods or the analysis scholars (忘我能力) or the third party standard (第三方标准，或者说，双方比较的标准来自于第三方). Not according to the observed data and the hypothesized research object itself, is the core of non-authigenic thinking rules. Use put forward the assumption of non-authigenic thinking rules, can guarantee the processing method is a general problem. According to the rules of non-authigenic thinking, any a non-authigenic hypothesis, principle of no violation, no assumptions.

Even with the assumptions and inspection standards, so they are not able to be determined in the field of Statistics, both the western Statistics and the oriental Statistics cannot define these assumptions and inspection standards in the areas themselves, they must be determined by unrelated third parties to statistical fields.

Second is how to do as the resources limited rule (资源有限规则). It is recognized that resources are limited, not admit unlimited resources, all the way to solve the problem that must be solved within limited resources (有限能力).Within the scope of the limited resources to solve the problem, and guarantee that things will be successful. According to the

rules of limited resources, any a resources hypothesis, principle of no violation, no assumptions.

Resources limited rules are due to that one doesn't have to look at the research object $V=\{x_1,\cdots,x_n\}$, but to focus on how the cognition of the basic elements of a statistical complex system exist happen? First of all, don't think that the ability of researchers is infinite, infinite resources are not available. any a statistical complex system just can be understood only to rely on very small limited resources to solve the problem. This is the basic point of non-authigenic logic.

Third is how to keep continuously to develop as the fault-tolerant rule (容错规则). It is to allow the people to solve the problem within a certain range to make mistakes, including the assumption error (容错能力). Only permissible maximum human to make mistakes, what to do can continue. According to the rules of fault tolerance, any a fault tolerant hypothesis, principle of no violation, no assumptions.

The researchers themselves, to solve the problem of a statistical complex system, also have many insufficiency, cannot assume the ability of these people is very high, can make no mistake. It is understood only under the condition of assuming that these people often make mistakes, to try to solve the problem of a statistical complex system. The basic conclusion of non-authigenic logic, therefore, cannot has too strong dependence with resources and hypothesis.

No assumptions rule is the thinking way for the "wood" properties of a statistical complex system, and to consider the beginning problem of the complex systems. It belongs to the Wood(X) subsystem of the complex system since it cognizes the structure of the complex system which is the beginning observation or birth stage of all things, just like in the Spring of a year. In the initial stages of a statistical complex system, and in the absence of birth assumptions, the purpose of both the greatest possible to restrict the behavior of the researchers and achieving the preliminary cognition of the complex system is to make a statistical complex system can be able to generate. In order to explain the occurrence state of all things, must be in the absence of cognitive assumptions, with the above ways of thinking, to cognize the structure of the complex system first. The structure has nothing to do with the observer behavior, and only related to the birth state of the complex system. Only in this way, can understand the birth cause of a statistical complex system, get real Wood(X) properties of a statistical complex system, and get the most cognitive goals.

Under the principles of no assumption articles, see [15-21].

(b) Fire(X_S): Preconceptions Principle (先入为主原则)

The principle of that "first impressions are strongest" is also namely Preconceptions. Preconceptions, spelling for "Xian Ru Wei Zhu"(先入为主) in TCS, useful refers to listen or to get the first impression often dominant in your mind, later to meet different opinions, is not easy to accept.

This principle contains three aspects: one is how to thinking as the objective consistency rule (客观一致性规则). The objective consistency (客观一致性), i.e.,what you observed the conclusions and the objective facts are consistent? Respect for the objective facts is the core of the human mind. Only to respect the objective facts as the idea, can assure to observe it is correct. According to the objective rules of consistency, any an objective method to deal with problems, do not violate the principle of "first impressions are most lasting".

The preconceptions principle is also due to that one doesn't have to look at the research object $V=\{x_1,\cdots,x_n\}$, but to focus on how to accelerate the development of a statistical complex system to eliminate interference? First of all, don't think that you observed the conclusions and the objective facts are consistent if you do not know the objective facts. But under the condition of objective conclusion assume that you know that, you can simulate test with your observation analysis method to the conclusions and the objective facts are consistent? In many simulation test under the condition of reasonable, can think of your observation analysis method is reasonable, with the objective consistency. Simulation is not proof, but at least it means that you used in the method has certain rationality. In TCS, the simulation method is considered to be the key method of statistical analysis for determining the reproducibility. This is the basic point of non-authigenic logic.

Second is how to do as the repeatability rule (重复性规则). That is, what the relationship between the observed conclusions, which are obtained by different observers and different reasonable ways, are consistent? Observations of the fact that is objective, regardless of the observer, no matter what observation method, after fully observed, the conclusion there will be no big changes. This is because the objective conclusion is only one. Adhere to the repetitive rules, can guarantee that can do things correctly, because people's doing things is difficult to know the objective conclusion. According to the rules of repeatability, any a repeatability method to deal with problems, do not violate the principle of "first impressions are most lasting".

The repeatability means under the condition of the same work, measured in the same input values in the same direction between the continuous measurement of the output value consistent with each other. Although you don't check that all observed conclusions, obtained by different observers, different reasonable ways and different the objective facts, are consistent if you do not know the objective facts, you can at least check whether all observed conclusions obtained by both different observers and different ways are consistent or not. Some of them will be not the the objective facts if they are not consistent. In other words, the repeatability can be checked. In order to check the objective consistency, if you do not know the objective facts, you have to check whether the way you deal with data being objective consistency or not. The way is reasonable if you check a lot of times by simulation, according to the third party standard. Reproducibility also make the mean smaller between statistical measuring system and statistical measuring conditions if the reasonable ways include many environmental conditions.

The analysis conclusion of non-authigenic logic is not relevant to the statistical scholars. That is to say, no matter what statistical scholars, according to the similar statistical data, adopted with the reproducibility of statistical methods, analysis of the conclusion must be the similar to each other. This is because, the problem of statistical study has nothing to do with statistical scholars, just is the only objective of law science.

Both the objective consistency and the repeatability are called reproducibility (再现性).

Third is how to keep continuously to develop as the default rules (默认规则). This is the implied terms of the rules before there is not new information are legal and can ensure the normal operation of a statistical complex system. In other words, always respect the original hypothesis (尊重原假设). Everything is right in the world (存在的就是合理的)! The default rules is the fact that is one of the most reproducibility methods. Respect the default rules, can guarantee the things on the basis of the reproducibility is to keep continuously to develop. According to the rules of the default, any a default method to deal with problems, do not violate the principle of "first impressions are most lasting".

The default rules should be as complete as possible. In no other intervention conditions, the default rules can make the complex system running normally. For the complete default rules, you should strictly abide by as much as possible. If a researcher first has obtained the observations of some data of the object of study, non-authigenic logic will think that this data is a true reflection of the research object, the other data should be repeated observations of these data, so with the same type and form (reproducibility). The analysis conclusion of non-authigenic logic, in the data to the form of a limited number, will stabilize. At this time, must ensure no relationship between the analysis conclusion and the number of data of a small amount of increase and decrease.

What the first impressions are strongest is the thinking way for the"fire" properties of a statistical complex system, and to consider the controlling-development problems. It belongs to the Fire(X_S) subsystem of the complex system since it controls the fluctuations of the complex system under the condition of a lot of unknown disturbances, which is the development and growth stage of all things, just like in the Summer of a year. In the initial stage of development of a statistical complex system, under the condition of maintaining the status quo, the greatest possible to control interference, stable and free development, the purpose is to make a statistical complex system can quickly grow. In order to explain the growth state of all things, must be in the absence of disturbance assumptions, with the above ways of thinking, to control the fluctuations of the complex system first. The fluctuations have nothing to do with the observer behavior, and only related to the growth state of the complex system. Only in this way, can understand the growth cause of a statistical complex system, get real Fire(X_S) properties of a statistical complex system, and get the most development goals.

Under the principles of preconceptions articles, see [22-27].

***(c)Earth(X_K): Integration coordination combining principle* (整体协调化合原则)**

The integration coordination combining principle is based on the overall nature of the problem, highlighting the overall structure of the analysis of a problem and transform, found that the problem of overall structural characteristics, is good at from the view of "integration", put some formula or graph as a whole, grasp the correlation between them, purposeful and conscious processing as a whole. For example, overall thought method in the algebraic expression of reduction and evaluated, equation (group), geometric solution certificate, etc, are widely used. Overall substitution, the superimposed fold by processing, the overall operation, assumes that the argument as a whole, fill in the whole processing, geometry shape, and so on, all is the whole idea concrete application of the method in solving statistical complex system problems.

The integration coordination combining principle contains three aspects: one is how to thinking as the searching-null-composition rule (零成分搜索规则). This is able to find the composition which has nothing to do with a statistical complex system as a whole, also called searching-null-composition capability(零成分搜索能力). In the affairs of human knowledge as a whole, it is difficult to realize the internal structure of things as a whole, can't distinguish who good who bad internal things. However, the human is able to distinguish between what has nothing to do with the whole thing? These things which have nothing to do with the things as a whole are called things zero composition as a whole. Adhere to the zero component search thinking, can ensure that the observation of the whole is correct and objective. Follow zero component search rules, the proposed any an observation of knowledge and the method of doing things, is not in violation of the principle of overall coordination compound.

Holistic thinking in TCS allows us to deal with a statistical complex system is not managed to seize the main factors of it, but tried to find itself has nothing to do with this complex system of interference factors, and try to clear them out of the complex system itself. This is because any internal factors of the complex system, in some cases, is likely to be important factors. When complex systems run by balance and stability, any a way of strengthening some factors or degradation of some factors by researchers may be harmful for complex systems. For a statistical complex social system, for example, if you eliminate all the criminals ("evil"), then the police system (" the vital chi") will not exist, because the police system (" the vital chi") is by eliminating the criminal system (the "evil") to survival. Again for a cancer patient, for example, if you eliminate all of the cancer cells (the "evil"), then all the white blood cells ("the vital chi") will not exist, because in TCM's concept, white blood cells ("the vital chi") are by eating cancer cells (the "evil") to live. It can be done only to run the complex system of various energy channels, makes the harmful energy (" evil") can't gather together and make good energy (" the vital chi") to eliminate harmful energy (the "evil") to survival. To increase the ability of the police system or to acupuncture a cancer patient, for example, is suitable method of integration, and is to get rid of the interference factors. People can bear a little significant factor as a significant factor to deal with, but can't bear a significant factor for processing as non-significant factors. This method is called "zero component search" in the TCS.

Second is how to do as the integration rule (整合规则). This is able to integrate many small problems into a handful of a big problem, also called integration capability (整合能力). Humans observe things as a whole, can do, is to put the small overall combination into a larger whole. Only adhere to the integration rule, can guarantee to have something done as a whole. Follow the integration rule, any an integration method of doing things, is not in violation of the principle of overall coordination compound.

The integration coordination combining principle is also due to that one doesn't have to look at the research object $V=\{x_1,\cdots,x_n\}$, but to focus on how to promote the

overall coordination of the scale rapid combined complex system? First of all, the integration capability will guarantee that is able to integrate many small problems into a handful of a big problem. Integration job in the integration theory plays an extremely important role in the position. If there is no integration, so the global idea will not be able to be gotten, complex system capacity will not be able to realize overall understanding of, which will cause the integration work is not for a whole.

Third is how to keep continuously to develop as the decomposition rule (分解规则). This is able to have a big problem into several small problems, also called the decomposition capability (分解能力). Only one had the capacity to the overall decomposition of the things, he can continue in-depth development of the whole things gradually. Follow the rules of decomposition, the proposed any a decomposition method and the understanding of details are not in violation of the principle of overall coordination compound.

The decomposition capability will guarantee that is able to break down into several parts of a whole. The decomposition job in the integration theory plays an extremely important role in the position. If there is no decomposition, so the integration work will not be able to restore, a statistical complex system capacity will not be able to realize automation, which will cause the integration work is not for a long time.

The principle of overall coordination compound is the thinking way for the "earth" properties of a statistical complex system, and to consider the problems of combining to produce results. It belongs to the Earth(X_K) subsystem of the complex system since it makes the coordination of the center and fluctuation in the complex system which is the scale development continuously and combined stage of all things, just like in the Long-Summer of a year. In the long-term combined development stages of a statistical complex system, the purpose of both eliminating irrelevant factors interference and realizing the coordinated development is to make a statistical complex system can realize the balanced development of the most stable and can combine to produce results. In order to explain the combined stage of all things, people must be in the absence of combined assumptions, with the above ways of thinking, to make the coordination of the center and fluctuation of all subsystems in the complex system first. The coordination has nothing to do with the observer behavior, and only related to the combined state of the complex system. Only in this way, can people understand the combining cause of a statistical complex system, get real Earth(X_K) properties of a statistical complex system, and get the most combined goals.

Under the principles of overall coordination compound, see [28-30].

***(d) Metal(K_X):Logical layering principle*(逻辑分层原则)**

"Logical layering principle" has another name is: Heaven and People as a whole (天人合一). Heaven, is the nature; People, is human; Nature and humanity as a whole, is the mutual understanding, friendship, by using the same logic-analysis structure in a different level of.

This logical layering principle contains three aspects: one is how to thinking as the Global-Local thinking rule (从整体到局部思维). There are both the Global logic for a large system and the Local logic for its subsystems. Their logic structures are the same. However the Local subjects and is restrained by the Global logic, and the Global logic contains and restrains the Local logic; the Global logic can solve the problems for the Local logic, not always the Local logic solves the problems for the Global logic. The idea is also called logic downward compatibility (逻辑向下兼容能力). Only keep from Global to Local thinking, can guarantee to the thing won't appear a large deviation of the understanding of the way, can logically guarantee to realize the objective laws of things. Follow from the Global to Local thinking, any one of the proposed knowledge of things as a whole and local, is not in violation of the principle of logical layering.

One of the basic requirements of logical reasoning must be compatible with down, it's like computer high version of the software must be able to handle it the low version of the software problems. That is the current level of logic of a statistical complex system must apply to the logic of its subsystems. Otherwise, the entire logical structure will be chaos. Low level logic, of course, can't deal with some high-level logic problems. The rules requiring people's mind should be from Global to Local, rather than the opposite. Because from the Global to Local thinking is unique, its uniqueness can guarantee the reproducibility of reasoning conclusion. But from the Local to Global thinking, the way may be varied. Because there is no uniqueness of thinking, the reproducibility can not be guaranteed. By the Global to Local thinking, the main problem of Statistics is not dimension reduction analysis, but improve dimensional analysis. Because only increase dimensional analysis, possible to master a Global logic, with the conclusion of Global reproducibility.

Second is how to do as the logical causal cycle rule (逻辑因果圈). It is also called the logical causal chain (逻辑因果链). That is, any a logic makes some logic, and is made by some logic; any a logic restrains some logic, and is restrained by some logic: i.e.,one logic overcomes another logic and one logic is overcome by another logic. In other words, any a logic is a certain logic analysis of cognitive level or watching layer by researchers. Only adhere to the rules of logic causal circle, can guarantee to any an understanding of things, people have done some things. Follow the rules of logic causal circle, any one of the proposed causal problems and the methods of dealing with the causal are not in violation of the principle of logical layering.

Logical layering principle is also due to that one doesn't have to look at the research object $V=\{x_1,\cdots,x_n\}$, but to focus on how to get the biggest reward for complex systems? First of all, anyone's ability is limited, he used a logic can only apply to his observes corresponding to a level of a statistical complex system. To believe in it the logical conclusion of also only applies to the corresponding level, in big ways, he always is conditioned by a large system of logic, in small ways, it also can't take any a small system logic completely clear. In general, a large system logical subject is a logic coarsening of its some small systems. Absolutely don't put any a logic as The king, and admits it is used in a certain level, it is the basic ways of dealing with problems of non-authigenic logic.

Third is how to keep continuously to develop as the seriousness of logical rules (逻辑的严肃性规则). It is that any a logic must at least satisfy the uniqueness, hereditary, reversibility, reasoning ability and associative law. In other

words, any a logical system must be of a multilateral system (多边系统). Only adhere to the seriousness of logic rules, can trust to ensure that the correct logic reasoning conclusion, make the logic reasoning method and the conclusion, continue to exist for a long time. Follow the seriousness of logic rules, any a proposed by logical reasoning method and the conclusion, is not in violation of the principle of logical layering.

A logic is the law of thinking, a logic theory is the theory about law of thinking. Sometimes both logic and logic theory are same. As the law of thinking, the uniqueness, hereditary, reversibility, reasoning ability and associative law are the basic conditions of a reasoning logic. The reasoning ability can make the logic workable. The uniqueness and associative law of logic are to ensure that the inference conclusion by different logic reasoning has the reproducibility. The hereditary of logic is to ensure that the reasoning conclusion by different logic reasoning in the corresponding logical analysis level can be long-term survival and genetic. The reversibility of logic is to ensure that the reasoning conclusion by different logic reasoning conforms to the cultural characteristics of human beings. For example, the statements of both "A can launch B" and "B can be launched from A" are completely equivalent description in human culture. But from the point of relation theory, these are the two reversible relations to each other. The reversibility of logic is to ensure that the two relations reasoning are equivalent. From Appendix, it is found that any a logical system must be of a multilateral system.

The logical layering principle is the thinking way for the "metal" properties of a statistical complex system, and to consider the problems of getting-results as far as possible. It belongs to the Metal(K_X) subsystem of the statistical complex system since it makes the deviation between the real center of a statistical complex system and the expected goal of researchers smaller, which is the getting-results and accepted stage of all things, just like in the Autumn of a year. Receiving phase in a statistical complex system, namely, a preliminary systematic risk, the complex system is to obtain the biggest harvest in order to make it can realize the biggest function ability. In order to explain the accepted stage of all things, people must be in the absence of accepted assumptions, with the above ways of thinking, to make the deviation between the real center of a statistical complex system and the expected goal of researchers smaller first. The deviation has nothing to do with the observer behavior, and only related to the accepted state of the complex system. Only in this way, can people understand the accepted cause of a statistical complex system, get real Metal(K_X) properties of a statistical complex system, and get the most accepted goals.

Under the principles of logical layering articles, see [31-41].

(e)Water(S_X):Automation principle(自动化原则)

"Automation principle" has another name: by doing nothing, everything is done (无为而无不为). It means to believe that complex systems have their own long-term survival genetic ability, as far as possible to protect and use this ability to achieve the purpose of people needs.

This principle contains three aspects: one is how to thinking as the intervention reaction rule (干预响应规则). This is to believe any a statistical complex system having intervention reaction ability(干预响应能力). with an automation ability, there must be a kind of force, this force for the intervention of the outside world, can produce an internal reaction. This internal reaction is: the system, which has a loving relationship with the intervention system, and intervention force same direction of change, the system, which has a killing relationship with the intervention, and intervention of external force changes in the opposite direction. Only by insisting on intervention reaction of thought premise, to ensure the intervention has the possibility of an automatic operation.Following the intervention reaction rules, any one of the proposed method to deal with problems related to the intervention reaction and knowledge, is not in violation of the principle of automation.

The automation principle is also due to that one doesn't have to look at the research object $V=\{x_1,\cdots,x_n\}$, but to focus on how to protect the long-term genetic survival of a statistical complex system's ability to fight the biggest risk? First of all, in order to allow us to get TCS' goal, only a statistical complex system must be able to response us intervention, so people can make the complicated system to intervene. It is believed that a statistical complex system has the ability to response TCS' intervention, otherwise the system will be a simple system. The scope of simple system is not TCS' study. As a statistical complex system is intervened by an external force, the complex system able to take advantage of the external force to change itself, this ability is called the intervention reaction ability. Generally speaking, the intervention reaction ability is more stronger if more use it. As far as possible the intervention reaction ability of a statistical complex system is used to solve TCS' problems, it is one of the basic ideas of non-authigenic.

Second is how to do as the self-protection rule (自保护规则). any a statistical complex system is believed having self-protection ability (自保护能力). Self-protection ability is believed that by the intervention system has the ability to make the worst-hit subsystem restorable ability. Only insist on the self-protection rules, believe the intervention system can protect themselves, all things as far as possible let the intervention system on their own to do. In this way, to ensure that TCS has something done in the automatic operation. Follow the rules of self-protection, have put forward anything related to the self-protection and the method to deal with problems, is not in violation of the principle of automation.

A statistical complex system is able to exist because it already exists. A statistical complex system has been believed in it's ability to maintain its existence or to restore, this ability is called the self-protection ability. When a statistical complex system appears crisis or unstable, the complex system can use its self-protection ability to maintain the balance of its existence or to make the complex system restorable. If a statistical complex system can response the human statistical intervention, TCS should make full use of this intervention in the complex system to increase its self-protection ability. Generally speaking, the self-protection ability is more stronger if more use it. As far as possible the self-protection ability of a statistical complex system is used to solve TCS' problems, it is one of the basic ideas of non-authigenic.

Third is how to keep continuously to develop as the second physiological system rule (第二生理系统规则). In order to

ensure the operation of the whole can be automated, things must make it in the first physiological system, there is a physiological system in the second run. The second physiological systems control the first circadian system. In the system the first physiological system during a normal operation, it attains the energy from the first physiological systems. When the first physiological system is during an abnormal operation, the second physiological system is to afford the energy for the first physiological system, in order to ensure the normal operation of the first physiological systems. The second physiological system to effectively control the first physiological system, it must have a great strength. The macro in the first physiological systems is a generic and must be variable, called a macro variable. Any a statistical complex system has relatively constants or macro variables, it can carry out the macro substitution of macro variables. A statistical complex system can change the macro variable values, and achieve the purpose of the programming in order to maintain its system balance. The idea is called the macro substitution ability (宏替换能力) or the genetic ability (遗传能力). Only by insisting on the second physiological system rules, to ensure that system can run normally, and continue to genetic. Follow the rules of physiological system, any a proposed and the second physiological systems related knowledge and processing the second physiological system related method, are not in violation of the principle of automation.

An intervention response ability or a self-protection ability of a statistical complex system is how to implement? Within it must have a kind of parameters, these parameters are constants in a state, by changing the constants, complex systems will be arrived in another state. The parameters in the field of computer artificial intelligence logic are called macro variables. The complex system can automatically change the macro variable values, making it automatically to the next state. The meaning of automation ability is to complex system can change by itself, it can increase its intervention response ability by itself, and it can realize its self-protection ability by itself. Macro variables are important factors of resistance biggest risk such that the complex system can survive long genetic automatically. In order to control the complex system service for human, the key is to find the corresponding macro variables.

Automation principle is the thinking way for the "water" properties of a statistical complex system, and to consider the problems of the biggest risk resistance making genetic survive for a long time. It belongs to the Water(S_X) subsystem of the complex system since it makes the risk loss between each observed data of a statistical complex system and the expected goal of researchers smaller, which is the risk and hiding stage of all things, just like in the Winter of a year. The purpose of both against the biggest risk and achieving long-term hidden is to make a statistical complex system can genetic survive for a long time. In order to explain the hiding stage of all things, TCS must be in the absence of hiding assumptions, with the above ways of thinking, to make the risk loss between each observed data of a statistical complex system and the expected goal of researchers smaller first. The risk loss has nothing to do with the observer behavior first, and only related to the hiding state of the complex system. Only in this way, can TCS understand the hiding cause of a statistical complex system, get real Water(S_X) properties of a statistical complex system, and get the most hiding goals.

Under the principles of automated articles, see [42-47].

All in all, the five subsets V_j's of a Wu-Xing Model do not mean the five elements (metal,wood,water,fire and earth), but with the philosophy meaning of five aspects corresponding to the five subsets V_j's. In above philosophy meaning of all five aspects (wood(X), fire(X_S), earth(X_K), metal(K_X),water(S_X)) of non-authigenic Logic, both wood (X) and earth(X_K) are the most basic aspects since they can at least ensure that the complex system exist in and combine to produce results. All these conclusions can be summarized in Table 1.

2.3 The negative answer for Hilbert sixth mathematical conjecture

One of the most famous isHilbert's sixth mathematical conjecture of his 23 mathematical conjecture problems. Hilbert's sixth mathematical conjecture problem said, "play an important role in mathematics the axiomatization of physics".

Theorem 2.2 *There is no an axiomatic system which makes that all branches of physics can be axiomatic.* #

Remark 1. People build an Axiom system, first of all, to observe the research object, found some real objective facts. And put these a few real objective facts, summarizes become generally accepted an axiom system. Which violate the principle of no assumption is the non authigenic thinking rules. This is because TCS' logic can not be related to the research object. Human beings are unable to determine the objective facts of true and false, only through a relationship is to identify the objective fact is good for human.

Remark 2. Humans build an Axiom system, first observed the objective facts of different due to different people, can put forward different axiom hypothesis. This violated the principle of preconceptions reproducibility rules. Rules of the reproducibility contains objective rules of consistency and repeatability. If you allow different people use different an Axiom system, there are the rules of repetitive problems. There is only one objective facts, two different processing methods of the axiom system of at least one is not reasonable. If you don't allow different people use different an Axiom system, so objective consistency checking can be a problem. Because the human is unable to determine the objective facts of true and false, whether can only judge for themselves.

Remark 3. Humans build an Axiom system, cannot be in fully understand the whole details of the research object, to establish a basic right of an Axiom system. This is because the human cannot understand the whole details of a statistical complex system, can only be observed whether things related to the research object, and only confirm the thing has nothing to do with the whole. For things related to the overall level, but it is difficult to identify. So that to establish a system of axioms, is in violation of the principle of overall coordination combining as the searching-null-composition rules of thinking.

Remark 4. To establish an axiomatic system is the logical foundation of western science. Had the axiomatic system, human have to distinguish the standard proposition and theorem of true and false. And an axiomatic system has compatibility relation proposition and the theorem is true proposition, do not have compatibility relation proposition is false propositions. Judge true and false proposition logic is

the logical foundation of western science. This logic is called **the formal logic**.

In accordance with the logic seriousness rules of the principle of logical layering, any a logic must at least satisfy the uniqueness, hereditary, reversibility, reasoning ability and associative law. But, Zhang etc [21] show that true or false proposition logic is can not meet the needs of associative law. That is to say: three reasoning can not meet the needs of associative law between false propositions. In addition, it also can be proved that the formal logic does not meet the uniqueness of reasoning, reversibility, can push the rational, hereditary, and so on. This shows that: the logical basis of formal logic problems. Only in a formal logic Axiom system, carries on the compatibility between true proposition reasoning.

People build an Axiom system, to serve the formal logic reasoning. If the formal logic reasoning needs to change, people building the Axiom system itself is not necessary.

Remark 5. Once an Axiom system is established, then axiom system is not changed. That can't change things may be true, but complex things are in change forever, in changing, the Axiom system is not the same. Human is the best way of doing things, is not set up any an Axiom system, should make a statistical complex system of the second physiological systems manage themselves. By itself, so say: building an Axiom system violators the automation principle of both the self-protection and the second physiological system rules.

III. A Free Function Model of Non-authigenic Logic

3.1 Actual Background Model of Non-authigenic Logic

In image mathematics of TCS, a general statistical analysis model has nothing to do with statistical area and is not the model produced from their own.

Statistical scholars first of all to learn is the data y and $x=(x_0,\cdots,x_m,\omega)^T$ of a statistical complex system, it is the actual background of an unknown multivariate function f of the independent variable x and the dependent variable y .They have nothing to do with statistical area (See [20]) but there was always conditional expectation $E(f(x_0,\cdots,x_m,\omega)\,|\,x_0,\cdots,x_m)$.

Consider a statistical complex system, its inputs $x_0,\cdots,x_m,\omega$ and output y can be written as

$$y=f(x_0,\cdots,x_m,\omega)=g(x_0,\cdots,x_m)+\varepsilon_g,$$
$$g(x_0,\cdots,x_m)=E(f(x_0,\cdots,x_m,\omega)\,|\,x_0,\cdots,x_m),$$
$$\varepsilon_g=f(x_0,\cdots,x_m,\omega)-E(f(x_0,\cdots,x_m,\omega)\,|\,x_0,\cdots,x_m), \qquad (1)$$

where not only all output functions f,g,ε_g are not known, but also the input variables $x_0,\cdots,x_m,\omega$ are not known. The problem is called **a free function model**.

The input x_0 is called the known interference factor or or the observable interference factor or the block factor if it can be observed but cannot be controlled by researchers. Corresponding to the known the disturbance factor, if its conditions are the similar, its observation data are referred to as a block data. The known disturbance factor x_0 can't be design, only can be observed.

The inputs $x_1,\cdots,x_m$ are called the controllable factors or the treatment factors or the experiment factors if they are observed and controlled by researchers. So the system function g can be observed if the input x_0 can be observed and the inputs $x_1,\cdots,x_m$ can be chosen freely. The system function g is called **an observation function**.

The input ω is called the uncontrolled and unknown or unobservable interference factor if it cannot be observed and also cannot be controlled by researchers. So the free-function model error ε_g can not be assumed. But the following properties can be shown

$$E(\varepsilon_g\,|\,x_0,\cdots,x_m)=E(f\,|\,x_0,\cdots,x_m)-E[E(f\,|\,x_0,\cdots,x_m)]=0,$$
$$Var(\varepsilon_g\,|\,x_0,\cdots,x_m)=E(\varepsilon_g^2\,|\,x_0,\cdots,x_m)=\sigma^2_{x_0,\cdots,x_m}\geq 0,$$
$$Cov((g,\varepsilon_g)\,|\,x_0,\cdots,x_m)=E[(g-Eg)(\varepsilon_g-E\varepsilon_g)\,|\,x_0,\cdots,x_m]=0.$$

These conditions are not hypothesis since they can be obtained if f makes the calculation meaningful,such as, if f is square integrable.

In general, the inputs $x_0,\cdots,x_m,\omega$ can be considered as independent random variables with continuous distributions $F_0(x_0),\cdots,F_m(x_m),F_\omega(\omega)$, respectively, since the inputs $x_0,x_1,\ldots,x_m$ are observable or controllable which can be observed and selected independent by researchers under some similar conditions. If the inputs $x_0,x_1,\cdots,x_m$ are not independent, by factor analysis can select orthogonal factors $factor_1-factor_k$. The orthogonal factors can be treated as independent random variables instead of $x_0,x_1,\ldots,x_m$ to implementation of other statistical analysis. This is due to the orthogonality and independence to some extent are equivalent [34]. Thus the operation of experiment that the inputs $x_0,x_1,\ldots,x_m$ can be observed and selected independently by researchers is equivalent to the assuming that the inputs $x_0,x_1,\ldots,x_m$ are independent random variables one another. These independent conditions are also not hypothesis, only the operation of experiment. For example, take $x_0,x_1,\cdots,x_m$ based on an orthogonal array. There are two reasons: one is that the orthogonality is equivalent to independence for discrete random variables [34], another is that any continuous random variables can be in discrete random variables approximation [34]. On the other hand, this operation of experiment under some similar conditions is equivalent to the fact that the uncontrolled input ω is independent of the controllable inputs $x_0,x_1,\cdots,x_m$, since $Cov(g,\varepsilon_g)=E[Cov((g,\varepsilon_g)\,|\,x_0,\cdots,x_m)]=0$.

In this case, it is well known that the inputs $u_0=F_0(x_0),\cdots,u_m=F_m(x_m),u_\omega=F_\omega(\omega)$ are independent random variables with the same continuous distribution $U(0,1)$. Assume

$$v_0=a_0+u_0(b_0-a_0),\cdots,v_m=a_m+u_m(b_m-a_m),v_\omega=a_\omega+u_\omega(b_\omega-a_\omega),$$

where $b_t>a_t,t=0,\cdots,m,b_\omega>a_\omega.$ Then the inputs $v_0,\cdots,v_m,v_\omega$ are independent random variables with continuous distributions

$$U(a_0,b_0),\cdots,U(a_m,b_m),U(a_\omega,b_\omega).$$

In this case, the function

$$h(v_0,\cdots,v_m,v_\omega)=f(F_0^{-1}(\frac{v_0-a_0}{b_0-a_0}),\cdots,F_m^{-1}(\frac{v_m-a_m}{b_m-a_m}),F_\omega^{-1}(\frac{v_\omega-a_\omega}{b_\omega-a_\omega}))$$

can replace f as a new system function since each of both h and f are all not known. Therefore, without loss of

generality, the inputs $x_0,\cdots,x_m,\omega$ are always considered as independent random variables with continuous distributions $U(a_0,b_0),\cdots,U(a_m,b_m),U(a_\omega,b_\omega)$.

To the statistical complex system f, it is needed to decide an energy goal t_0, make y more close to target t_0, the greater the energy function f of the complex system. In general, the target t_0 is the maximum energy of y.

In TCS, the image mathematics considers the complex system stability problem, because the core problem of any a statistical complex system is stability. The stability can only be through the fixed program to observe to do a test or experiment since the function f is not known.

In general, the researcher wants to find a testing or experimental center $x^0=(x_0^0,\cdots,x_m^0)$ and testing or experimental tolerance

$$\Delta x=(\Delta x_0,\cdots,\Delta x_m),\Delta_{max}=\max_{0\le t\le m}\Delta x_t,$$

for the **observed function** $g(x_0,\cdots,x_m)=E(f\mid x_0,\cdots,x_m)$ under some similar conditions, such that

(1). $(Eg(x_0,\cdots,x_m)-t_0)^2=(g(x_0^0,\cdots,x_m^0)-t_0)^2+o(\Delta_{max}^2)\to min,$

(2). $E(y-t_0)^2\to min,$

where the observable or controllable inputs $x_0,x_1,\cdots,x_m$ are independent random variables and $x_t\sim U(x_t^0-\Delta x_t,x_t^0+\Delta x_t),t=0,\cdots,m.$

On the other hand, the function f is assumed thus function which makes the following mathematics method having significance, for example, to ensure that condition expectations and partial derivative of existence. In order to solve the stability problem, the following theorem can be easily gotten [31]:

Theorem 3.1 Suppose that f is square integrable under model (**1**). Then

$$E(y-t_0)^2=(Eg(x_0,\cdots,x_m)-t_0)^2+Var(g(x_0,\cdots,x_m))+Var(\varepsilon_g);$$

$$g(x_0,\cdots,x_m)=\sum_{M\subseteq\Omega}\tau_{x_M};$$

$$E\tau_{x_\varnothing}=Eg=Ef,E\tau_{x_M}=0,\forall M\neq\varnothing;$$

$$Var(g(x_0,\cdots,x_m))=\sum_{\varnothing\neq M\subseteq\Omega}Var(\tau_{x_M});$$

$$Var(\varepsilon_g)=E(\sigma^2_{x_0,\cdots,x_m});$$

where

$$\tau_{x_M}=\sum_{N:N\subseteq M}(-1)^{|M|-|N|}E(g\mid x_N),$$

$$x_M=(x_{j_1},\cdots,x_{j_t}),\forall M=\{j_1,\cdots,j_t\}\subseteq\Omega=\{0,\cdots,m\},|M|=t,$$

and $\sigma^2_{x_0,\cdots,x_m}=E(\varepsilon_g^2\mid x_0,\cdots,x_m).$ #

The proof of Theorem **3.1** can be found in Zhang [16].

According to the above conclusions, can put forward many problems has nothing to do with Statistics. Such as

Total average $Ef=Eg=\tau_\varnothing=?$

Mainly effect function values

$$\tau_{x_t=x_t(i)}=E(f\mid x_t=x_t(i))-Ef=E(g\mid x_t=x_t(i))-Eg=?$$

Interaction effects of function values:

$$\tau_{x_s=x_s(i),x_t=x_t(j)}=E[f\mid x_s=x_s(i),x_t=x_t(j)]-E(f\mid x_s=x_s(i))$$
$$-E(f\mid x_t=x_t(j))+Ef$$
$$=E[g\mid x_s=x_s(i),x_t=x_t(j)]-E(g\mid x_s=x_s(i))$$
$$-E(g\mid x_t=x_t(j))+Eg$$
$$=?$$

Variance

$$Var(\tau_{x_M})=?\forall M\subset\{0,1,\cdots,m\},$$
$$Var(g)=?Var(f)=?$$

Contributed rate

$$r^g_{x_M}=\frac{Var(\tau_{x_M})}{Var(g)}=?$$

$$r^f_{x_M}=\frac{Var(\tau_{x_M})}{Var(f)}=?\forall M\subset\{0,1,\cdots,m\}.$$

These problems, if the system function f is known, of course, can use mathematical methods to solve. But when the system function f is unknown, so the observation function g is also unknown, thus the usual mathematical methods cannot be used to solve these problems, normally only use statistical methods to solve.

The following five indices are often considered by Zhang etc [20] in TCS:

(1).Distortion Degree:

$$U_g^2=Var(g(x_0,\cdots,x_m))$$
$$=\sum_{t=0}^m\left(\frac{\partial g(x^0)}{\partial x_t}\right)^2Var(x_t)+o(\Delta_{max}^2)$$
$$=U_g^2(\Delta_{max});$$

(2). Disturb Degree:

$$\gamma_f^2=Var(f(x_0,\cdots,x_m,\omega))$$
$$=\sum_{t=0}^m\left(\frac{\partial g(x^0)}{\partial x_t}\right)^2Var(x_t)+E\sigma^2_{x_0,\cdots,x_m}+o(\Delta_{max}^2)$$
$$=\gamma_g^2(\Delta_{max});$$

(3).Information Decomposition Ratio (or **Signal to Noise Ratio**):

$$\eta_f=(Ef)^2/Var(f)$$
$$=\frac{(Eg_{x_0,\cdots,x_m})^2}{\sum_{t=0}^m\left(\frac{\partial g(x^0)}{\partial x_t}\right)^2Var(x_t)+E\sigma^2_{x_0,\cdots,x_m}+o(\Delta_{max}^2)}$$
$$=\eta_g(\Delta_{max});$$

(4).Deviation Degree:

$$\rho_f^2=(Ey-t_0)^2=(Ef-t_0)^2$$
$$=(E(g(x_0,\cdots,x_m))-t_0)^2$$
$$=(g(x^0)-t_0)^2+o(\Delta_{max}^2)=\rho_g^2(\Delta_{max});$$

(5).Risk Function(or **Risk**, or **Loss Function**):

$$R_f^2=E(y-t_0)^2$$
$$=\rho_g^2(\Delta_{max})+U_g^2(\Delta_{max})+E\sigma^2_{x_0,\cdots,x_m}+o(\Delta_{max}^2)$$
$$=R_g^2(\Delta_{max});$$

where the maximum observable or controllable experimental tolerance $\Delta_{max}=\max_{0\le t\le m}\Delta x_t$ and the observed function $g(x_0,\cdots,x_m)$ can be chosen by researchers. The smaller the value Δ_{max}, above indices' values are more accurate.

In TCS firstly use the verifying relationship method of "Yin Yang Wu Xing" Theory to explain the relationship between a statistical complex system and environment. Secondly, based on "Yin Yang Wu Xing" Theory, the relations of development processes of the statistical complex system can be shown by the neighboring relation and the alternate relation of five subsets. Then a normal statistical complex

system can be shown as a steady multilateral system in which there are the loving relation and the killing relation and the liking relation. The loving relation in TCS can be explained as the neighboring relation, called "Sheng(生)". The killing relation in TCS can be explained as the alternate relation, called "Ke(克)". The liking relation can be explained as the equivalent relation, called "Tong-Lei(同类)". Constraints and conversion between five subsets are equivalent to the two kinds of the triangle reasoning in Figure 2. So a normal statistical complex system can be classified into five equivalence classes with five statistical indexes.

For example, in TCS, a statistical complex system is similar to a human body. A normal statistical complex system following the "Yin Yang Wu Xing" Theory was classified into five equivalence classes by Zhang etc [24][31] as follows :

(1).The wood(X)={ causal analysis, collect data, cognition structure, distortion degree, spring, birth}, with an energy function $\varphi(X)=U_g^{-2}$;

(2).The fire(X_S)={fiducial analysis, data variance, control fluctuations, local or whole development, local or whole disturb, summer or whole year, local or whole growth}, with an energy function $\varphi(X_S)=\gamma_g^{-2}$;

(3).The earth(X_K)={ Bayes analytical,prior information collection, coordination, information decomposition ratio, long summer, combined}, with an energy function $\varphi(X_K)=\eta_g$;

(4).The metal(K_X)={ frequency analysis, quality,data center and the expected goal deviation,system function characteristics, deviation degree,autumn,accept}, with an energy function $\varphi(K_X)=\rho_g^{-2}$;

(5).The water(S_X)={ economic analysis, cost,data and the expected goal deviation, utility function, risk function, winter, hiding}, with an energy function $\varphi(S_X)=R_g^{-2}$.

There are the loving and killing (or hating) relations among all five classes.Generally speaking, "neighbor is friend" and "alternate is foe".

In every category of internal, think that they are equivalent relationship, between each two of their elements there is a force of similar material accumulation of each other. It is because their pursuit of the goal is the same,i.e., follows the same "Axiom system". It can increase the energy of the class if they accumulate together.All of nature material activity follows the principle of maximizing so energy or minimizing so cost. In general, the force of similar material accumulation of each other is smaller than the loving force or the killing force in a stable complex system. In other words, both the intervention reaction coefficients $\rho_2' \le \rho_1'$ and the self-protection coefficient ρ_3' in subsystems are smaller than the ones: $\rho_2 \le \rho_1$ and ρ_3 in the large system, respectively, since the subsystems are controlled by the big system from the logical layering principle.

The stability of any a statistical complex system first needs to maintain the equilibrium of the killing force and the loving force. For a stable complex system,if the killing force is large, i.e.,the intervention reaction coefficients $\rho_2 \le \rho_1$ (see [20]) becomes larger, then the loving force is large and the force of similar material accumulation of each other is also large. They can make the complex system more stable. If the killing force is small, i.e., the intervention reaction coefficient $\rho_2 \le \rho_1$ (see [20]) becomes smaller, then the loving force is small and the force of similar material accumulation of each other is also small. They can make the complex system becoming unstable.

It has been shown in Lemmas **5.2**-**5.5** that the classification of five subsets is quite possible based on the mathematical logic. As for the characteristics of the five subsets is rational or not, it is need more research work for a specific project. It has been also shown in [20] that the logical basis of TCS is a steady multilateral system.

The vigor energy (or, *Chi,Qi*) of TCS means the energy function in a steady multilateral system.

There are two kinds of statistical diseases in TCS: Statistical real disease and statistical virtual disease. They generally means the subsystem is abnormal, its energy is too high for statistical real disease or too low for statistical virtual disease.

The intervening method of TCS is to "xie Chi" *(泻气)* which means to rush down the energy if a statistical real disease is treated, or to "bu Chi"*(补气)* which means to fill the energy if a statistical virtual disease is treated. Like intervening the subsystem, decrease when the energy is too high, increase when the energy is too low.

Both the capability of intervention reaction and the capability of self-protection of the multilateral system are equivalent to the Immunization of TCS. This capability is really existence for a statistical complex system. Its target is to protect other statistical subsystem **without both the side effects issue and the medical and drug resistance problems while treating one statistical subsystem** [21]. It is because if the capability is not existence, then the intervention reaction coefficients ρ_1 and ρ_2 and the self-protection coefficient ρ_3 (see [20]) satisfying $\rho_1=\rho_2=\rho_3=0$. In this time, the energy of the system will be the sum of energy of each part. Thus the statistical system will be a simple statistical system which is not what is considered range in this article.

3.2 A Derived Model and Estimates of Non-authigenic Logic

By the idea of non-authigenic logic thoughts, statistical hypothesis cannot be arbitrarily selected, must be derived by actual background model (**1**). Not ourselves hypothesis, then reasoning to solve problems by ourselves. The stand or fall of any a statistical method, cannot only demonstrated by statistical scholars themselves, should be "simulation tests" in model (**1**). The simulation tests of statistical methods will be able to ensure the statistically analysis reproducibility.

To standards of statistical model in the east and west, reasonable derivation model should be:

Suppose that the output variable data of a statistical complex system are for $Y=(y_{ij})$, an available model in experiment design is represented as follows:

$$y_{ij}=\mu+\alpha_i+\beta_{1b_{ij}^1}+\cdots+\beta_{mb_{ij}^m}+\varepsilon_{ij},$$
$$i=1,\cdots,b,\ j=1,\cdots,k_i,\ n=k_1+\cdots+k_b, \qquad (2)$$

where n is the run number of experiment and $n=k_1+\cdots+k_b$ is its associated decomposition.

The observation function values:

$\mu = Ef = Eg, \alpha_i = \tau_{x_0=x_0(i)}, \beta_{tx} = \tau_{x_t=x_t(x)},$

$\forall t = 1,2,\cdots,m, i = 1,2,\cdots,b, x = 1,2,\cdots,v_t,$

satisfy the following constraints, which nothing to do with statistical scholars

$$\frac{1}{b}\sum_{i=1}^{b}\alpha_i = \frac{1}{b}\sum_{i=1}^{b}\tau_{x_0=x_0(i)} \approx E\tau_{x_0} = 0,$$

$$\frac{1}{v_t}\sum_{x=1}^{v_t}\beta_{tx} = \frac{1}{v_t}\sum_{x=1}^{v_t}\tau_{x_t=x_t(x)} \approx E\tau_{x_t} = 0, \forall t = 1,2,\cdots,m,$$

where the block design of x_0 is shown in array:

$$D^0_{b\times k}(v_0) = (b^0_{ij}) = [1 1_{k_1},\cdots,b 1_{k_b}]^T, v_0 = b, b^0_{ij} = i.$$

The design $D^0_{b\times k}(v_0)$ cannot be projected since the block factor x_0 only can be observed. Thus $n = k_1 + \cdots + k_b$ is related to the behavior of the participants. And for any a given $t \geq 1$, the block design of x_0 is shown in arrays:

$$D^t_{b\times k}(v_t) = (b^t_{ij}), b^t_{ij} \in \{1,2,\cdots,v_t\}, t = 1,\cdots,m,$$

where $k = (k_1,\cdots,k_b)^T$. All digital b^t_{ij}'s of design arrays $D^t_{b\times k}(v_t)$'s must be no size qualitative class variables, otherwise, the statistical analysis of the conclusion will not be reproducibility, since the size of the independent variables $x_0, x_1,\cdots,x_m$ associated with the choice of statistical scholars.

In order to ensure the reproducibility, all the designs

$D^t_{b\times k}(v_t) = (b^t_{ij}), b^t_{ij} \in \{1,2,\cdots,v_t\}, t = 1,\cdots,m$

should have multiple balances between them. By the non-authigenic logic in Section **2.2**, there are five balances, namely, the meeting balance, the level-external balance, the orthogonal balance, the level-internal balance and the overall balance. Of course, two of the most important balances are the meeting balance and the orthogonal balance from the five principles of the non-authigenic logic. If all the designs

$D^t_{b\times k}(v_t) = (b^t_{ij}), b^t_{ij} \in \{1,2,\cdots,v_t\}, t = 1,\cdots,m$

satisfy the meeting balance and orthogonal balance, then the following run-column array is called a generalized orthogonal array:

$GL_n(v_0,...,v_m) = [Vec(D^0_{b\times k}(v_0)),...,Vec(D^m_{b\times k}(v_m))]$ wh ere

$Vec(D^t_{b\times k}(v_t)) = Vec(b^t_{ij})$

$= (b^t_{11},...,b^t_{1k_1},...,b^t_{m1},...,b^t_{mk_m})^T, t = 0,...,m.$

By non-authigenic logic in (a) of Section **2.2**, the philosophical meaning of **the meeting balance** is the ability to guarantee a fair comparison of contribution between all levels of each of experimental factors $x_1,\cdots,x_m$ because it is conducive to the recognition of both the observation function values $\beta_{tx} = \tau_{x_t=x_t(x)}$'s and the system structure U_g^2. The idea belongs to the wood(X) since it is the beginning of experimental design. Using mathematical language, it is to guarantee that the following meeting degree function $\lambda_t(x,y), x \neq y$, is constant [35]

$$\lambda_t(x,y) = \sum_{i=1}^{b}\frac{r^t_i(x)r^t_i(y)}{k_i} = \lambda_t > 0,$$

$\forall x \neq y, x, y \in \{1,\cdots,v_t\}, \forall t \in \{1,\cdots,m\},$

where $r^t_i(x) = |\{j : b^t_{ij} = x\}|$ means times of repeating occurrences of the level x of the factor x_t in the i block $B^t_i = (b^t_{i1},\cdots,b^t_{ik_i})^T$. The balance is called **the meeting balance** since $\lambda_t(x,y)$ is the meeting degree for any $x \neq y$ in $D^t_{b\times k}(v_t) = (b^t_{ij})$, which is a balance among meeting-combining levels $(x,y), x \neq y$.

The reproducibility estimates for $\beta_{tx} = \tau_{x_t=x_t(x)}$ and $Var(\tau_{x_t})$'s in TCS are as follows:

$$\hat{\beta}_{tx} = \frac{1}{\lambda_t v_t}\sum_{i=1}^{b} r^t_i(x)(\bar{y}^t_{i*}(x) - \bar{y}_{i*}), x = 1,\cdots,v_t, t = 1,\cdots,m,$$

$$\hat{Var}(\tau_{x_t}) = \frac{1}{v_t}\sum_{x=1}^{v_t}\hat{\beta}^2_{tx} \approx \frac{1}{v_t}\sum_{x=1}^{v_t}\beta^2_{tx} \approx E\tau^2_{x_t} = Var(\tau_{x_t}), t = 1,\cdots,m, \quad (3)$$

where $\bar{y}_{i*} = \frac{1}{k_i}\sum_{j=1}^{k_i} y_{ij}$ and $\bar{y}^t_{i*}(x) = \frac{1}{r^t_i(x)}\sum_{j:b^t_{ij}=x} y_{ij}$.

The meeting balance can make the reproducibility estimates for each of $\beta_{tx} = \tau_{x_t=x_t(x)}$'s and $Var(\tau_{x_t})$'s workable since $\lambda_t > 0$ is existence.

If consider the distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0,\sigma^2)$, there are

$$\hat{\beta}_t = (\hat{\beta}_{t1},\cdots,\hat{\beta}_{tv_t})^T \sim N_{v_t}((\beta_{t1},\cdots,\beta_{tv_t})^T, \frac{1}{\lambda_t v_t}\tau_{v_t}\sigma^2) = N_{v_t}(\beta_t, \frac{1}{\lambda_t v_t}\tau_{v_t}\sigma^2),$$

$$\hat{Var}(\tau_{x_t}) \sim \frac{\sigma^2}{\lambda_t v_t^2}\chi^2(v_t - 1, \frac{\lambda_t v_t \beta_t^T \beta_t}{\sigma^2}) \approx \frac{\sigma^2}{\lambda_t v_t^2}\chi^2(v_t - 1, \frac{\lambda_t v_t^2 Var(\tau_{x_t})}{\sigma^2})$$

where

$$\tau_{v_t} = I_{v_t} - P_{v_t}, P_{v_t} = \frac{1}{v_t}1_{v_t}1_{v_t}^T, rank(\tau_{v_t}) = v_t - 1, t = 1,\cdots,m.$$

Similarly, by non-authigenic logic in (b) of Section **2.2**, the philosophical meaning of **the level-external balance** is to ensure the accuracy of the estimate of the total average or the data center $\mu = Ef = Eg$ of system model because it is conducive to the recognition of both the system center $\mu = Ef = Eg$ and the system fluctuation γ_g^2. The idea belongs to the fire(X_S) since it is the developmental stage of experiment design. Using mathematical language, it is to guarantee that the following repeating degree function $r^t(x)$ is constant [35]

$$r^t(x) = \sum_{i=1}^{b}\frac{r^t_i(x)}{k_i} = \frac{b}{v_t} = r^t > 0,$$

$\forall x \in \{1,\cdots,v_t\}, \forall t \in \{1,\cdots,m\},$

where $r^t_i(x) = |\{j : b^t_{ij} = x\}|$ is the same above. The balance is called **the level-external balance** since $r^t(x) = \sum_{i=1}^{b}\frac{r^t_i(x)}{k_i}$ is the repeating degree for any x in $D^t_{b\times k}(v_t) = (b^t_{ij})$, which is a balance among levels $1,\cdots,v_t$.

The reproducibility estimate for the center $\mu = Ef = Eg$ in TCS is as follows:

$$\hat{\mu}^w = \bar{y}^w_{**} - \sum_{t=1}^{m}\sum_{x=1}^{v_t}\left(\frac{r^t(x)}{b} - \frac{1}{v_t}\right)\hat{\beta}_{tx} \quad (4)$$

where $\bar{y}^w_{**} = \frac{1}{b}\sum_{i=1}^{b}\bar{y}_{i*}, \bar{y}_{i*} = \frac{1}{k_i}\sum_{j=1}^{k_i} y_{ij}$. If consider the distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0,\sigma^2)$, there is

$$\hat{\mu}^w \sim N(\mu, \sigma^2/\lambda_\mu),$$

where

$$\lambda_\mu = 1/\left(\frac{\bar{W}}{b}+\sum_{t=1}^{m}\frac{1}{\lambda_t v_t}\sum_{x=1}^{v_t}\left(\frac{r^t(x)}{b}-\frac{1}{v_t}\right)^2\right), \bar{W}=\frac{1}{b}\sum_{i=1}^{b}\frac{1}{k_i}.$$

The meeting balance can make the reproducibility estimate for $\mu = Ef = Eg$ workable, while further the level-external balance can make the reproducibility estimate for $\mu = Ef = Eg$ simple, independent and optimal. In other words, the reproducibility estimate $\hat{\mu}^w = \bar{y}_{**}^w$ is simple whose distribution is independent of all $\hat{\beta}_{tx}$'s and all $\hat{\alpha}_i$'s. On the other hand, the variance $Var(\hat{\mu}^w) = \frac{\sigma^2}{\lambda_\mu}$ is minimum, where

$$\lambda_\mu = \frac{b}{\bar{W}}.$$

Similarly, by non-authigenic logic in (c) of Section 2.2, **the orthogonal balance** philosophy meaning is to ensure a fair comparison of contribution between all experimental factors $x_1, x_2, \cdots, x_m$ because it is conducive to the recognition of both the observation function values $\beta_{tx} = \tau_{x_t = x_t(x)}$ and the system coordination η_g. The idea belongs to the earth(X_K) since it is the coordination compound phase of experiment design for all experimental factors $x_1, x_2, \cdots, x_m$. Using mathematical language, speaking is the following properties [35]

$$\sum_{i=1}^{b} r_i^{s,t}(x,y) = \sum_{i=1}^{b}\frac{r_i^s(x)r_i^t(y)}{k_i}, \quad \text{wh}$$

$\forall x \in \{1,\cdots,v_s\}, \forall y \in \{1,\cdots,v_t\}, \forall s \neq t, s,t \in \{1,\cdots,m\}$,

ere $r_i^{s,t}(x,y) = |\{j : (b_{ij}^s, b_{ij}^t) = (x,y)\}|$ means the number of repeating occurrences of the level combination (x,y) of two factors x_s and x_t in the i block $(\boldsymbol{B}_i^s, \boldsymbol{B}_i^t) = ((b_{i1}^s, b_{i1}^t), \cdots, (b_{ik_i}^s, b_{ik_i}^t))^T$.

In other words, the orthogonal balance is equivalent to the fact that for each level combination (x,y) of two factors x_s and x_t, both the times of repetition

$$r_*^{s,t}(x,y) = \sum_{i=1}^{b} r_i^{s,t}(x,y)$$

and the meeting degree $\lambda^{s,t}(x,y) = \sum_{i=1}^{b}\frac{r_i^s(x)r_i^t(y)}{k_i}$

are the same.

The balance is called **the orthogonal balance** since it make all matrix images of $a_j = Vec(D_{b\times k}^t(v_t) = (b_{ij}^t))$'s [36] are orthogonal.

Although **the meeting balance** can make the reproducibility estimates for each of $\beta_{tx} = \tau_{x_t = x_t(x)}$'s and $Var(\tau_{x_t})$'s workable, the orthogonal balance can make the reproducibility estimates $\hat{\beta}_t = (\hat{\beta}_{t1}, \cdots, \hat{\beta}_{tv_t})^T$'s distribution independent if consider the distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0, \sigma^2)$.

Furthermore, by non-authigenic logic in (d) of Section **2.2**, the philosophical meaning of **the level-internal balance** is to ensure the accuracy of the estimate of each level $\alpha_i = \tau_{x_0 = x_0(i)}$ of block factor x_0 because it is conducive to the recognition of both the observation function values $\alpha_i = \tau_{x_0 = x_0(i)}$'s and the system deviation ρ_g^2. The idea belongs to the metal(K_X) since it is the harvesting stage of experiment design for maximum results. Using mathematical language, speaking is the following properties [35]

$$\frac{r_i^t(x)}{k_i} = \frac{r^t(x)}{b} = \frac{1}{b}\sum_{i=1}^{b}\frac{r_i^t(x)}{k_i} > 0, \quad \text{w}$$

$\forall x \in \{1,2,\cdots,v_t\}, \forall t \in \{1,2,\cdots,m\}, \forall i \in \{1,2,\cdots,b\}$,

here $r_i^t(x) = |\{j : b_{ij}^t = x\}|$ and $r^t(x) = \sum_{i=1}^{b}\frac{r_i^t(x)}{k_i}$ are the same above. The balance is called **the level-external balance** since $\frac{r_i^t(x)}{k_i}, i = 1,\cdots,b,$ is the repeating degree for any x in $\boldsymbol{B}_i^t = (b_{i1}^t, \cdots, b_{iv_t}^t)^T$, which is a balance among repeating degrees $\frac{r_i^t(x)}{k_i}, i = 1,\cdots,b,$ for fixed level x and fixed design $D_{b\times k}^t(v_t) = (b_{ij}^t)$.

The reproducibility estimates for $\alpha_i = \tau_{x_0 = x_0(i)}$'s and $Var(\tau_{x_0})$ in TCS are as follows:

$$\hat{\alpha}_i = \bar{y}_{i*} - \bar{y}_{**}^w - \sum_{t=1}^{m}\sum_{x=1}^{v_t}\left(\frac{r_i^t(x)}{k_i}-\frac{r^t(x)}{b}\right)\hat{\beta}_{tx}, i = 1,\cdots,m, \quad \text{wh}$$

$$\hat{Var}(\tau_{x_0}) = \frac{1}{b}\sum_{i=1}^{b}\hat{\alpha}_i^2 \approx \frac{1}{b}\sum_{i=1}^{b}\alpha_i^2 \approx E\tau_{x_0}^2 = Var(\tau_{x_0}), \quad (5)$$

ere all,

$$\bar{y}_{**}^w = \frac{1}{b}\sum_{i=1}^{b}\bar{y}_{i*}, \bar{y}_{i*} = \frac{1}{k_i}\sum_{j=1}^{k_i} y_{ij}, r^t(x) = \sum_{i=1}^{b}\frac{r_i^t(x)}{k_i}, \text{ etc.,are}$$

the same above.

If consider the distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0,\sigma^2)$ under the condition of the overall balance below, there are

$$\hat{\alpha} = (\hat{\alpha}_1, \cdots, \hat{\alpha}_b)^T \sim N_b((\alpha_1,\cdots,\alpha_b)^T, \frac{1}{\lambda_\alpha b}\tau_b\sigma^2) = N_b(\alpha, \frac{1}{\lambda_\alpha b}\tau_b\sigma^2),$$

$$\hat{Var}(\tau_{x_0}) \sim \frac{\sigma^2}{\lambda_\alpha b^2}\chi^2(b-1, \frac{\lambda_\alpha b\alpha^T\alpha}{\sigma^2}) \approx \frac{\sigma^2}{\lambda_\alpha b^2}\chi^2(b-1, \frac{\lambda_\alpha b^2 Var(\tau_{x_0})}{\sigma^2}), \quad (6)$$

where

$$\lambda_\alpha = 1/\left[b\bar{W} + \sum_{t=1}^{m}\sum_{x=1}^{v_t}\sum_{i=1}^{b}\frac{b}{(b-1)\lambda_t v_t}\left(\frac{r_i^t(x)}{k_i}-\frac{r^t(x)}{b}\right)^2\right], \bar{W} = \frac{1}{b}\sum_{i=1}^{b}\frac{1}{k_i}, \text{ and}$$

$\tau_b = I_b - P_b$.

The meeting balance can make the reproducibility estimates $\hat{\alpha}_i = \hat{\tau}_{x_0 = x_0(i)}$'s and $\hat{Var}(\tau_{x_0})$ workable, while further the completely level-internal balance can make the reproducibility estimates $\hat{\alpha} = \hat{\tau}_{x_0}$ simple,independent and optimal, under the condition of the overall balance below. In other words, each of the reproducibility estimates $\hat{\alpha}_i = \bar{y}_{i*} - \bar{y}_{**}^w$'s is simple whose distribution is independent of all $\hat{\beta}_{tx}$'s and the center estimate μ. On the other hand, the variance $Var(\hat{\alpha}) = \frac{\sigma^2}{\lambda_\alpha}$ is minimum, where $\lambda_\alpha = \frac{1}{b\bar{W}}$.

Finally, by non-authigenic logic in (e) of Section **2.2**, the philosophical meaning of **the overall balance** is to ensure that significant can be fair to compare among model blocking factor x_0 or α, all experimental factors $x_1,\cdots,x_m$ or β_j's, and the unknown disturbance factor ω or ε_{ij} because it is conducive to the recognition of both the error variance $\sigma^2 = Var(\varepsilon_g)$ and system risk function R_g^2. The idea belongs to the Water(X) since it is the hidden stage of

experiment design for against overall risks. Using mathematical language, speaking is the following properties [35]

$$\Sigma =: \tau_b \left[block(\frac{1}{k_1},\cdots,\frac{1}{k_b}) + \sum_{t=1}^{m} \frac{1}{\lambda_t v_t} \sum_{x=1}^{v_t} \begin{pmatrix} \frac{r_1^t(x)}{k_1} \\ \vdots \\ \frac{r_b^t(x)}{k_b} \end{pmatrix} \begin{pmatrix} \frac{r_1^t(x)}{k_1} \\ \vdots \\ \frac{r_b^t(x)}{k_b} \end{pmatrix}^T \right] \tau_b$$

$$= \frac{1}{\lambda_\alpha b} \tau_b,$$

where the matrix Σ on the left side of above equation is the variance $Var(\hat{\alpha} / \sigma)$ of the estimate $\hat{\alpha} / \sigma$ if the condition of the overall balance doesn't be satisfied. The balance is called the overall balance since it is an overall balance thinking among all inputs $x_0, x_1, \cdots x_m, \omega$, the center μ and the error variance σ^2.

The reproducibility estimate for the error variance $\sigma^2 = Var(\varepsilon_g)$ in TCS is as follows:

$$\hat{\varepsilon}_{ij} = y_{ij} - \hat{\mu}^w - \hat{\alpha}_i - \sum_{t=1}^{m} \hat{\beta}_{tb_{ij}^t}, \quad \text{wh}$$

$$\hat{Var}(\varepsilon_g) = \hat{\sigma}^2 = \frac{1}{f_e} \sum_{i=1}^{b} \sum_{j=1}^{k_i} \hat{\varepsilon}_{ij}^2, \qquad (7)$$

ere $f_e = (n-1) - (b-1) - \sum_{t=1}^{m} (v_t - 1) > 0.$

If consider the distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0, \sigma^2)$, there is $\hat{\sigma}^2 \sim \frac{\sigma^2}{f_e} \chi^2(f_e).$

The meeting balance also can make the estimate $\hat{\sigma}^2 = \hat{Var}(\varepsilon_g)$ and all $\hat{\mu}, \hat{\alpha}_i, \hat{\beta}_{tx} = \tau_{x_t = x_t(x)}$ or $\hat{Var}(\tau_{x_t})$ distribution independent. But the meeting balance cannot make the estimates $\hat{\alpha}_i$'s having the reproducibility since the variances $Var(\hat{\alpha}_i)$'s are different from each other, which are related to the decomposition type $n = k_1 + \cdots + k_b$. Thus, it will lead to σ^2 no reproducibility estimates.

The overall balance further can make the estimates $\hat{\alpha} = (\hat{\alpha}_1, \cdots, \hat{\alpha}_b)^T$ and $\hat{Var}(\tau_{x_0})$ distribution simple and having the reproducibility. It will lead to σ^2 estimates also having reproducibility. In other words, the estimates $\hat{\alpha} = (\hat{\alpha}_1, \cdots, \hat{\alpha}_b)^T$ and $\hat{Var}(\tau_{x_0})$ in Eq.(**6**) is simple. And the distributions of them are independent of the decomposition type $n = k_1 + \cdots + k_b$. The property can make the estimates $\hat{\alpha} = (\hat{\alpha}_1, \cdots, \hat{\alpha}_b)^T$ and $\hat{Var}(\tau_{x_0})$ having the reproducibility. Thus the estimates $\hat{\varepsilon}_{ij} = y_{ij} - \hat{\mu}^w - \hat{\alpha}_i - \sum_{t=1}^{m} \hat{\beta}_{tb_{ij}^t}$'s have the reproducibility. In the end, the estimate $\hat{\sigma}^2 = \frac{1}{f_e} \sum_{i=1}^{b} \sum_{j=1}^{k_i} \hat{\varepsilon}_{ij}^2$ also have the reproducibility.

In the absence of distribution assumption $\varepsilon_{ij} \overset{i.i.d}{\sim} N(0, \sigma^2)$, under the condition of the overall balance, the estimates $\hat{\alpha}_i$'s have the reproducibility, and the estimate $\hat{\sigma}^2$ is also appropriate since

$$\min_{x_0,\cdots,x_m} \sigma^2_{x_0,\cdots,x_m} \le \min_{i,j} \sigma^2_{i,j}$$

$$\le E\hat{\sigma}^2 = \sigma^2 = E\varepsilon_g^2 = E\sigma^2_{x_0,\cdots,x_m}$$

$$\le \max_{i,j} \sigma^2_{i,j} \le \max_{x_0,\cdots,x_m} \sigma^2_{x_0,\cdots,x_m},$$

where $\sigma^2_{i,j} = E\varepsilon^2_{ij}$. If you want to further study the accuracy and reproducibility of $\hat{\sigma}^2 = \hat{E}\varepsilon_g^2 = \hat{E}\sigma^2_{x_0,\cdots,x_m}$, consider the new test data $y_{ij}^{\sigma^2} = \hat{\sigma}^2_{x_0=x_0(i),\cdots,x_m=x_m(b_m^m)} = \hat{\varepsilon}_{ij}^2$ in the model (**2**). Continue to use all of the above method, can get on the various reproducibility estimates for $\mu^{\sigma^2}, \alpha_i^{\sigma^2}, \beta_{tx}^{\sigma^2}, (\sigma^2)^{\sigma^2}$ of function $\sigma^2_{x_0,\cdots,x_m}$. And the corresponding μ^{σ^2} is $E\sigma^2_{x_0,\cdots,x_m}$. By the logical layering principle, the ideal reproducibility estimates can be gotten if the above operation has been proceed by looping execution based on any generalized orthogonal arrays with the overall balance.

All of all, a generalized orthogonal array is the most basic reproducibility design. The reproducibility of the corresponding estimation method is reasonable. It has been simulated test for thousands of years in China. A reasonable design of experiment, not only should design planning at least into a generalized orthogonal array, and to select the corresponding data analysis method. In this way can the preliminary guarantee reproducibility analysis conclusion.

On the other hand, in TCS, in order to the pursuit of the overall goal of non-authigenic logic: the principle for balance, reproducibility and that by doing nothing,everything is done, only a few indices, such as both unbiased and its variance minimum in Statistics, are not completely solve the problems of a statistical complex system. Under the model (**2**) of the non-authigenic logic, the image mathematics has been to consider the following five indices which have reproducibility:

$$\hat{U}_g^2 = \hat{Var}(g) = \hat{Var}(\tau_{x_0}) + \sum_{t=1}^{m} \hat{Var}(\tau_{x_m}) \approx \frac{1}{b} \sum_{i=1}^{b} \hat{\alpha}_i^2 + \sum_{t=1}^{m} \frac{1}{v_t} \sum_{x=1}^{v_t} \hat{\beta}_{tx}^2 \to min,$$

$$\hat{\gamma}_g^2 = \hat{Var}(f) = \hat{Var}(g) + \hat{Var}(\varepsilon_g) \approx \frac{1}{b} \sum_{i=1}^{b} \hat{\alpha}_i^2 + \sum_{t=1}^{m} \frac{1}{v_t} \sum_{x=1}^{v_t} \hat{\beta}_{tx}^2 + \hat{\sigma}_g^2 \to min,$$

$$\hat{\eta}_g^2 = \frac{(\hat{\mu}^w)^2}{\hat{\gamma}_g^2} \to max,$$

$$\hat{\rho}_g^2 = (\hat{E}g - t_0)^2 = (\hat{\mu}^w - t_0)^2 \to min,$$

$$\hat{R}_g^2 = \hat{\sigma}_g^2 + \hat{U}_g^2 + \hat{\rho}_g^2 \to min,$$

where the reproducibility estimates $\hat{\mu}, \hat{\alpha}_i$'s and the $\hat{\beta}_{tx}$'s are the same above.

In TCS, in order to control the Distortion Degree $U_g^2 = Var(g(x_0, \cdots, x_m))$, also study contribution indicators $r^g_{\tau_{x_t}} = \frac{Var(\tau_{x_t})}{Var(g)}$ by using above the reproducibility estimates $\hat{Var}(\tau_{x_t})$ and $\hat{U}_g^2$; in order to control the Disturb Degree $\gamma_f^2 = Var(f(x_0, \cdots, x_m, \omega))$, also study contribution indicators $r^f_{\tau_{x_t}} = \frac{Var(\tau_{x_t})}{Var(f)}$ by using above the reproducibility estimates $\hat{Var}(\tau_{x_t})$ and $\hat{\gamma}_f^2$. These indicators are also called global sensitivity indicators by Sobol [13] [14].

IV. REPRODUCIBILITY SIMULATION COMPARISON

Because non-authigenic logic model is different from the western general authigenic logic model, so their statistical analysis conclusion is often not the same.

For example, the total average $Ef = Eg = \tau_{\varnothing} = ?$

It is well known in West that

$$\hat{\mu} = \bar{y}_{**} = \frac{1}{n}\sum_{i=1}^{b}\sum_{j=1}^{k_i} y_{ij} = \frac{1}{n}\sum_{i=1}^{b} k_i \bar{y}_{i*}, \quad \bar{y}_{i*} = \frac{1}{k_i}\sum_{j=1}^{k_i} y_{ij}.$$

But by non-authigenic logical point of view, and this conclusion is not correct, because it is dependent to the number n of data and its associated decomposition type $n = k_1 + \cdots + k_b$, this makes statistical conclusion without reproducibility for different statistical scholars.

In TCS, the reproducibility estimate for the total average $Ef = Eg = \tau_{\varnothing}$ is the following in Eq.(**4**).

$$\hat{\mu}^w = \frac{1}{b}\sum_{i=1}^{b}\bar{y}_{i*} - \sum_{t=1}^{m}\sum_{x=1}^{v_t}\left(\frac{r^t(x)}{b} - \frac{1}{v_t}\right)\hat{\beta}_{tx}$$

When $k_1 = \cdots = k_b, \lambda_{\mu} = \frac{b}{\bar{W}} = n,$ east and west both is the same conclusion. Problem is, in the $k_1, \ldots, k_b$ not all equal, estimates of the two, which one is closer to real?

To answer this question, separately from the perspective of Statistics, is difficult to answer this question. Here's why. By authigenic logical models and standards, the estimator $\hat{\mu} = \bar{y}_{**}$ is unbiased and its variance $Var(\hat{\mu}) = Var(\bar{y}_{**}) = \frac{\sigma^2}{n}$ is minimum, but the estimator $\hat{\mu}^w = \bar{y}^w_{**}$ is biased, and its variance $Var(\hat{\mu}^w) = Var(\bar{y}^w_{**}) = \frac{\sigma^2}{b^2}\sum_{i=1}^{b}\frac{1}{k_i} = \frac{\bar{W}}{b}\sigma^2$ is not least, it is not permitted.

On the other hand, by non-authigenic logical models and standards, the estimator $\hat{\mu}^w = \bar{y}^w_{**}$ is unbiased and its variance $Var(\hat{\mu}^w) = Var(\bar{y}^w_{**}) = \frac{\sigma^2}{b^2}\sum_{i=1}^{b}\frac{1}{k_i} = \frac{\bar{W}}{b}\sigma^2$ is minimum, but the estimator $\hat{\mu} = \bar{y}_{**}$ is biased, in this case, consider the variance $Var(\hat{\mu}) = Var(\bar{y}_{**}) = \frac{\sigma^2}{n}$ being meaningless.

In order to accurately determine the conclusion of the problem, a third party standard (第三方标准) must be used. That is to say, the best way to solve this problem is to use specific function to verify under the free function model (**1**) since it has nothing to the Statistics.

Take $g(x_0, \cdots, x_m) = x_0,\ x_t \overset{i.i.d.}{\sim} U(0,1), t = 0, \cdots, m$, in model (**1**), then

$$\mu = Eg = \frac{1}{2}, \tau_{x_0} = E(g \mid x_0) - Eg = x_0 - \frac{1}{2}.$$

Let the experimental center be for $x^0 = (x_0^0, \cdots, x_m^0) = (\frac{1}{2}, \cdots, \frac{1}{2})$, and let the experimental tolerance be

$$\Delta x = (\Delta x_0, \cdots, \Delta x_m) = (\frac{1}{2}, \cdots, \frac{1}{2}).$$

The level number of test factor x_0 is for $b = 3$:

$$x_0(i) = x_0^1 - \Delta x_0 + (i-1)\frac{2\Delta x_0}{3-1} = 0, \frac{1}{2}, 1.$$

In this case, there are

$$\mu = \frac{1}{2}, \quad \alpha_1 = \tau_{x_0 = x_0(1)} = -\frac{1}{2},$$

$\alpha_2 = \tau_{x_0 = x_0(2)} = \frac{1}{2} - \frac{1}{2} = 0, \alpha_3 = \tau_{x_0 = x_0(3)} = 1 - \frac{1}{2} = \frac{1}{2}.$ If the test is sufficiently accurate, i.e., ε_{ij} sufficiently small, such as zero, then

$$\begin{aligned} y_{ij} &= g_{ij} + \varepsilon_{ij} \\ &= g(x_0 = x_0(i), x_1 = x_1(b_{ij}^1), \cdots, x_m = x_m(b_{ij}^m)) + \varepsilon_{ij} \\ &= x_0(i) + \varepsilon_{ij}, \\ i &= 1,2,3, \varepsilon_{ij} \overset{i.i.d}{\sim} N(0, \sigma^2) \end{aligned}$$

where σ^2 can be very small, even can be 0.

Select $n = k_1 + k_2 + k_3 = 1 + 1 + (n-2)$, so for the traditional western general average $\mu = Ef = Eg = \frac{1}{2}$, the point estimation $\hat{\mu} = \bar{y}_{**}$ of $\mu = Ef = Eg = \frac{1}{2}$ is expected

$$\begin{aligned} E\hat{\mu} &= E\bar{y}_{**} = \frac{1}{n}\sum_{i=1}^{3} k_i E\bar{y}_{i*} \\ &= \frac{1}{n}[x_0(1) + x_0(2) + (n-2)x_0(3)] \\ &= \frac{1}{n}[0 + (1/2) + (n-2)(1)] \\ &= \frac{1/2}{n} + \frac{n-2}{n} \\ &= \frac{n - 3/2}{n} \\ &\underset{n\to\infty}{\longrightarrow} 1 \neq \frac{1}{2} = Eg. \end{aligned}$$

The point estimation $\hat{\mu} = \bar{y}_{**}$ of the total mean μ is not the unbiased estimation of $\mu = Ef = Eg = \frac{1}{2}$. Its selection is dependent to the decomposition of experimental run $n : n = k_1 + k_2 + k_3 = 1 + 1 + (n-2).$ This makes statistical conclusion without reproducibility for different statistical scholars.

If the point estimation of the eastern population mean $\mu = Ef = Eg = \frac{1}{2}$ is taken as the $\hat{\mu}^w = \bar{y}^w_{**}$, calculation expectations of point estimates, the following result can be gotten

$$\begin{aligned} E\hat{\mu}^w &= E\bar{y}^w_{**} = \frac{1}{b}\sum_{i=1}^{3} E\bar{y}_{i*} \\ &= \frac{1}{3}[x_0(1) + x_0(2) + x_0(3)] \\ &= \frac{1}{3}[0 + (1/2) + 1] \\ &= \frac{1}{2} = Eg = Ef. \end{aligned}$$

This point estimation $\hat{\mu}^w = \bar{y}^w_{**}$ is indeed the unbiased estimation of a total average $\mu = Ef = Eg = \frac{1}{2}$, and its selection is independent of the decomposition of experimental run $n : n = k_1 + k_2 + k_3 = 1 + 1 + (n-2).$ This makes statistical conclusion with reproducibility for different statistical scholars.

Although the traditional single-factor design theory also says $\hat{\mu} = \bar{y}_{**}$ is the unbiased estimation of unknown parameters μ , traditional unbiasedness is dependent to the experimental constraint $\sum_{i=1}^{b} k_i \alpha_i = 0$, not on the

unbiasedness of the total average $\mu = Eg = Ef$ under the actual problem model (**1**).

So people say: statistical intervening methods to evaluate reproducibility cannot be defined by statistical workers, cannot themself assumptions, and superiority of argument by themselves, but should with ones unrelated to Statistics, such as the actual background model in Eq.(**1**). The reproducibility of statistical methods can be tested by simulation based on the assumptions of the third party. Otherwise, there is no guarantee that statistical conclusion has reproducibility. Both unbiased and its variance minimum in Statistics are not the reproducibility standard since they come from Statistics and related to the statistical distribution hypothesis.

V. Conclusions

This work has introduced the basic concepts and Philosophy principles of non-authigenic logic. Hilbert's sixth mathematical conjecture of his 23 mathematical conjecture problems gets the negative answer.

The basic concepts consist of the generalized relations, generalized reasoning, the steady multilateral systems, Yin Yang Wu Xing model, and so on. Mainly to illustrate: in solving the problem of a statistical complex system, cannot arbitrary assumptions, and cannot develop optimal guidelines by ourself before proof of reasoning. And should be under the condition of no assumption for logical reasoning. This reasoning requires at least satisfying the uniqueness, hereditary, reversibility, reasoning ability and associative law of steady multilateral systems. In order to ensure the reproducibility, the basic principles of non-authigenic logic consist of the philosophy meanings of five aspects: no assumption principle, preconceptions principle, integration coordination combining principle, logical layering principle and automation principle. Both no assumption principle and integration coordination combining principle are the most basic.

As an application, a free function model of it and its the reproducibility estimators have been obtained and compared with the traditional statistical estimators by using the simulation method. The basic models consist of both the actual background model and the derived model as the free-function model. From the five basic philosophy principles of non-authigenic, in order to ensure the reproducibility, based on the free-function model, an optimal design needs to satisfy the five kinds of balances: the meeting balance, the level-external balance, the orthogonal balance, the level-internal balance and the overall balance. Both the meeting balance and the orthogonal balance are the most basic balances. The design with both the meeting balance and the orthogonal balance is called a generalized orthogonal array. In other words, the generalized orthogonal array is the most basic design to ensure the reproducibility by the five basic philosophy principles of non-authigenic.

Based on the generalized orthogonal array, under the free-function model of the non-authigenic logic, the reproducibility estimators have been obtained and compared with the traditional average estimator $\overline{y}$ by simulation. Illustrates the traditional commonly used average estimate $\overline{y}$ having its disadvantages if consider the reproducibility. Both unbiased and minimum variance in Statistics are not the reproducibility standard since they only come from Statistics and are related to the statistical distribution hypothesis.

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Appendix

Before to prove Theorem **2.2**, it is needed to prove a few lemmas.

(A)Generalized Relations and Reasoning of Non-authigenic Logic

Suppose all of the research objects is a collection $V = \{x_1, \cdots, x_n\}$. The **authigenic logic** is first to look at the collection $V = \{x_1, \cdots, x_n\}$ by observation, and discovered some research objects which constitute of a sub-collection $V_0 = \{y_1, \cdots, y_m\} \subset V$, then according to the nature of the sub-set V_0 of axioms and assumptions, and according to the assumption to judge a certain proposition true or false. If a logical reasoning is based on the observations where V_0, then the corresponding logic are called **authigenic logic**.

But the **non-authigenic logic** is not to look at the collection $V = \{x_1, \cdots, x_n\}$ of the research objects, just according to their own needs, put forward and want to know what are the relations between the research objects by themselves? If a logical reasoning has nothing to do with the collection $V = \{x_1, \cdots, x_n\}$ of the research objects, then the corresponding logic is called **non-authigenic logic**. From Eastern Philosophy thought, if a person will go to solve an objective problem of a statistical complex system, and if this person can get some analysis conclusion only by using non-authigenic logical reasoning or analysis, then the analysis conclusion can ensure to conform to the objective facts and to be reproduced by all others because the logical reasoning has nothing to do with the collection $V = \{x_1, \cdots, x_n\}$ of the research objects. This property is known as the **reproducibility** (see Section **2.2**). Reproducibility is the fundamental meaning of balanced measurement if the real conclusion of objects cannot be known. In general, the reproducibility was defined in a stable environment, the same object is measured by a lot of operators and only by using the similar measuring instruments and methods, the measured values of average variation should be similar to each other, and should be similar to the objective facts. Reproducibility also refers to the average variation is smaller between measuring system and measuring conditions.

Reproducibility is the most basic requirements for statistical scholars. If there is no reproducibility, so there would be no Chinese classical traditional Statistics.Because statistical scholars is to use the data to study the science law behind the data, the law has nothing to do with statistical scholars, and has nothing to do with how much data observed by statistical scholars, and has nothing to do with how what reasonable methods used by statistical scholars. The

statistical method is reasonable if the method can at least ensure the reproducibility of the statistical analysis conclusion. As long as scholars using statistical method has reproducibility, so the analysis of the conclusions should be unique based on similar data.

In mathematics, let $V=\{x_1,\cdots,x_n\}$ be a non-empty set (the collection $V=\{x_1,\cdots,x_n\}$ of the research objects). Then there is a non-empty Descartes set

$$V\times V=\{(x,y):x\in V,y\in V\}.$$

The non-empty subset $R\subset V\times V$ is called a **relation** of $V=\{x_1,\cdots,x_n\}$. TCS mainly researches general relation rules for a general $V=\{x_1,\cdots,x_n\}$ rather than for a special $V=\{x_1,\cdots,x_n\}$. So the general $V=\{x_1,\cdots,x_n\}$ cannot be supposed. The thing can only be done to research the structure of the set of relations $\mathfrak{R}=\{R_0,\cdots,R_{m-1}\}$ because the structure has nothing to do with the collection $V=\{x_1,\cdots,x_n\}$ of the research objects and without considering the specific content of the research object.

For a relation set $\mathfrak{R}=\{R_0,\cdots,R_{m-1}\}$, define both an **inverse relationship** $^{*-1}$ of $R_i\in\mathfrak{R}$ and a **relation multiplication** * between $R_i\in\mathfrak{R}$ and $R_j\in\mathfrak{R}$ as follows:

$R_i^{-1}=\{(x,y):(y,x)\in R_i\}$ and

$R_i*R_j=\{(x,y):\text{There is a } u\in V \text{ suth that } (x,u)\in R_i \text{ and } (u,y)\in R_j\}.$

The relation R_i is called a **reasonable relation** if $R_i^{-1}\in\mathfrak{R}$.

A **generalized reasoning** of general $V=\{x_1,\cdots,x_n\}$ is defined as for $R_i*R_j\neq\varnothing$ there is a relation $R_k\in\mathfrak{R}$ such that $R_i*R_j\subset R_k$.

Lemma 5.1 For any a set of relations $\mathfrak{R}=\{R_0,\cdots,R_{m-1}\}$, there are

(1) The associative law is formed naturally, i.e.,
$(R_i*R_j)*R_l=R_i*(R_j*R_l)$,
$\forall i,j,l\in\{0,1,\cdots,m-1\}$.

(2) Inverse operation is similar to matrix , i.e.,
$(R_i*R_j)^{-1}=R_j^{-1}*R_i^{-1},\forall i,j\in\{0,1,\cdots,m-1\}$.

(3)Maintain collections subordinate relations, i.e.,

$R_j^{-1}*R_i^{-1}\subset R_k^{-1}$,

$R_l*(R_i*R_j)\subset R_l*R_k$,

$(R_i*R_j)*R_l\subset R_k*R_l$,

$(R_j^{-1}*R_i^{-1})*R_l^{-1}\subset R_k^{-1}*R_l^{-1}$,

$R_l^{-1}*(R_j^{-1}*R_i^{-1})\subset R_l^{-1}*R_k^{-1}$,

if $R_i*R_j\subset R_k,\forall i,j,k,l\in\{0,1,\cdots,m-1\}$. #

Proof. (1). For any one $(x,y)\in(R_i*R_j)*R_l\neq\varnothing$, by the definition of the relation multiplication *, there is a $u\in V$ such that $(x,u)\in R_i*R_j,(u,y)\in R_l$.

Thus, there is a $v\in V$ such that $(x,v)\in R_i,(v,u)\in R_j,(u,y)\in R_l$.

Hence, there is a $v\in V$ such that $(x,v)\in R_i,(v,y)\in R_j*R_l$.

Therefore, $(x,y)\in R_i*(R_j*R_l)$. This means that $\varnothing\neq(R_i*R_j)*R_l\subset R_i*(R_j*R_l)\neq\varnothing$.

Similarly to prove:
$\varnothing\neq R_i*(R_j*R_l)\subset(R_i*R_j)*R_l\neq\varnothing$.

If $(R_i*R_j)*R_l=\varnothing$, then must be $R_i*(R_j*R_l)=\varnothing$. Otherwise, there is
$\varnothing\neq R_i*(R_j*R_l)\subset(R_i*R_j)*R_l\neq\varnothing$.
This is a contradiction. Thus, the following result can be obtained $R_i*(R_j*R_l)=(R_i*R_j)*R_l$.

(2) For any one $(x,y)\in(R_i*R_j)^{-1}$, by the definition of the inverse relationship $^{*-1}$, there is $(y,x)\in R_i*R_j$

By the definition of the **relation multiplication** *, there is a $u\in V$ such that $(y,u)\in R_i,(u,x)\in R_j$.

Thus, by the definition of the **inverse relationship** $^{*-1}$ again, there are
$(u,y)\in R_i^{-1},(x,u)\in R_j^{-1}$ or, $(x,u)\in R_j^{-1},(u,y)\in R_i^{-1}$,
Hence, by the definition of the **relation multiplication** *, the following result can be obtained
$(x,y)\in R_j^{-1}*R_i^{-1}$.
Therefore,
$(R_i*R_j)^{-1}\subset R_j^{-1}*R_i^{-1},\forall i,j\in\{0,1,\cdots,m-1\}$.

Similarly, for any one $(x,y)\in R_j^{-1}*R_i^{-1}$, by the definition of the relation multiplication *, there is a $u\in V$ such that $(x,u)\in R_j^{-1},(u,x)\in R_i^{-1}$.

Thus, by the definition of the inverse relationship $^{*-1}$ again, there are
$(u,x)\in R_j,(y,u)\in R_i$ or, $(y,u)\in R_i,(u,x)\in R_j$,
Hence, by the definition of the relation multiplication *, the following result can be obtained $(y,x)\in R_i*R_j$.

Then, by the definition of the inverse relationship $^{*-1}$ again, the following result can be gotten $(x,y)\in(R_i*R_j)^{-1}$.

Therefore,
$(R_i*R_j)^{-1}\supset R_j^{-1}*R_i^{-1},\forall i,j\in\{0,1,\cdots,m-1\}$.
Comprehensive above, the desired conclusion can be achieved:
$(R_i*R_j)^{-1}=R_j^{-1}*R_i^{-1},\forall i,j\in\{0,1,\cdots,m-1\}$.

(3) Assume that
$R_i*R_j\subset R_k,R_l,\forall i,j,k,l\in\{0,1,\cdots,m-1\}$.
By the definition of the inverse relationship $^{*-1}$, there is
$(R_i*R_j)^{-1}\subset R_k^{-1},\forall i,j,k\in\{0,1,\cdots,m-1\}$.

By 2., the following result can be gotten
$R_j^{-1}*R_i^{-1}=(R_i*R_j)^{-1}\subset R_k^{-1},\forall i,j,k\in\{0,1,\cdots,m-1\}$.

By the definition of the relation multiplication *, the following results can be gotten
$R_l*(R_i*R_j)\subset R_l*R_k,(R_i*R_j)*R_l\subset R_k*R_l,\forall i,j,k,l\in\{0,1,\cdots,m-1\}$.
With above conclusion:
$(R_j^{-1}*R_i^{-1})*R_l^{-1}=(R_i*R_j)^{-1}*R_i^{-1}=(R_i*(R_i*R_j))^{-1}\subset(R_i*R_k)^{-1}=R_k^{-1}*R_i^{-1}$,
$R_l^{-1}*(R_j^{-1}*R_i^{-1})=R_l^{-1}*(R_i*R_j)^{-1}=((R_i*R_j)*R_l)^{-1}\subset(R_k*R_l)^{-1}=R_l^{-1}*R_k^{-1}$, It $\forall i,j,k,l\in\{0,1,\cdots,m-1\}$.
completes the proof. #

By Lemma **5.1**, the generalized reasoning satisfies the associative law of reasoning, i.e., $(R_i*R_j)*R_l=R_i*(R_j*R_l)$. This is the basic requirement of reasoning in TCS. But there are a lot of reasoning forms which do not satisfy the associative law of reasoning in Western Statistics.

For example, in the true and false binary of proposition logic, the associative law of reasoning does not hold since

$$(false * false) * false = true * false = false$$
$$\neq true = false * true = false * (false * false).$$

(B)Equivalence Relations of Non-authigenic Logic

Let $V = \{x_1, \cdots, x_n\}$ be a non empty set (the collection $V = \{x_1, \cdots, x_n\}$ of the research objects) and R_0 be its a relation. It is called an **equivalence relation**, denoted by ~ , if the following 3 conditions are all true:

(1) Reflexive: $(x, x) \in R_0$ for all $x \in V$; i.e., $x \sim x$;

(2) Symmetric: if $(x, y) \in R_0$, then $(y, x) \in R_0$; i.e., if $x \sim y$, then $y \sim x$;

(3) Conveyable(Transitivity): if $(x, y) \in R_0, (y, z) \in R_0$, then $(x, z) \in R_0$; i.e., if $x \sim y$ and $y \sim z$, then $x \sim z$.

A relation $R \subset V \times V$ is called **a compatibility relation** if there is a non empty subset $R_1 \subset R$ such that the non empty subset R_1 satisfies at least one of the conditions above.

A relation $R \subset V \times V$ is called **a non-compatibility relation** if there is not any a non empty subset $R_1 \subset R$ such that the non empty subset R_1 satisfies at least one of the conditions above.

Any one of compatibility relations can be expanded into an equivalence relation to some extent.That is to say, in a certain logic analysis macro or global level, any a compatible relation R can be handled as an equivalence relation R_0.

Western Statistics only considers the reasoning under one Axiom system such that only compatibility relation reasoning is researched. However there are many Axiom systems in Nature. TCS mainly researches the relation reasoning among many Axiom systems in Nature. Of course, she also considers the relation reasoning under one Axiom system but she only expands the reasoning as the equivalence relation reasoning.

(B)Two kinds of opposite non-compatibility relations of Non-authigenic Logic

Equivalence relations,even compatibility relations, can not portray the structure of the complex systems clearly. In the following, two non-compatibility relations can be considered.

In TCS, the non-authigenic logic having other name:image mathematics [20], any an Axiom system is not considered, but should first consider to use a logic system. Believe that the rules of Heaven and the behavior of Human can follow the same logic system (天人合一). This logic system is equivalent to a group of computation. The method is to abide by the selected logic system to the research object classification, without considering the specific content of the research object, namely, **classification taking images** (比类取象). Analysis of the relationship between research object, make relationships with a computational reasoning comply with the selected logic system operation. And then in considering the research object of the specific content of the conditions, according to the logic of the selected system operation to solve specific problems. In mathematics, the method of classification taking images is explained in the following Definition **5.1**.

Definition 5.1 Suppose that there exists a finite group $G^m = \{g_0, g_1, \cdots, g_{m-1}\}$ of order m where g_0 is identity. Let $V = \{x_1, \cdots, x_n\}$ be a none empty set satisfying that $V = V_{g_0} + \cdots + V_{g_{m-1}}$ where the notation means that $V = V_{g_0} \cup \cdots \cup V_{g_{m-1}}, V_{g_i} \cap V_{g_j} = \varnothing, \forall i \neq j$ (the following the same).

In image mathematics, the V_{g_j} is first called a **factor** of group element g_j for any j , and $V = V_{g_0} + \cdots + V_{g_{m-1}}$ is called a **factor space**(all "Hexagram"(卦)). People do not consider the factor size (as class variables) and only consider it as mathematical symbols ("Hexagram"(卦)), such as, -1 or 1, because the size is defined by a human behavior for $V = \{x_1, \cdots, x_n\}$, but people have no assumption of $V = \{x_1, \cdots, x_n\}$.

A mathematical index of the unknown multivariate function $f(x_{g_0}, \cdots, x_{g_{m-1}}), \forall x_{g_i} \in V_{g_i}, i = 0, \cdots, m-1,$ is called a **function image** of V . All mathematical indexes of the unknown multivariate function f compose of the formation of a new set, namely, **the image space** $F(V) = F_{\omega_0}(V) + \cdots + F_{\omega_{q-1}}(V)$ where $G^q = \{\omega_0, \omega_1, \cdots, \omega_{q-1}\}$ is also a finite group of order q where ω_0 is identity. The $F_{\omega_j}(V)$ is also called an **Axiom system** for any j if at least $F_{\omega_j}(V) \neq \varnothing$ because any an Axiom system is the assumption of $F(V)$ in which there is only the compatibility relations, i.e., pursuing the same mathematics index $h(F_{\omega_j}(V))$.

The special multivariate function f (i.e.,special function image) is not considered and only the calculation way of the general mathematical indexes of f is considered from the factor space $V = V_{g_0} + \cdots + V_{g_{m-1}}$ in order to know some causal relations, because of no assumption of f . But the size of the data image should be considered if specific issues are studied by the general rules of data images.

In other words, on one hand, a study of the hexagrams ("Hexagram"(卦)) in image mathematics is to learn the generalized properties of the inputs $x_{g_0}, \cdots, x_{g_{m-1}}$ of any a multivariate function f for the given factor space $V = V_{g_0} + \cdots + V_{g_{m-1}}$, such as all inputs $x_{g_0}, \cdots, x_{g_{m-1}}$ are the non-size and non-order relations, but there are orthogonal relations among some inputs $x_{g_0}, \cdots, x_{g_{m-1}}$, there are also symmetrical relations among some inputs $x_{g_0}, \cdots, x_{g_{m-1}}$, and only there is an equivalence relation among all inputs $x_{g_j} \in V_{g_j}$ for any j , and so on.

On the other hand, a study of the image ("Xiang"(象)) in image mathematics is to learn the generalized properties of all outputs inputs $f_{\omega_0}, \cdots, f_{\omega_{q-1}}$ for the image space $F(V) = F_{\omega_0}(V) + \cdots + F_{\omega_{q-1}}(V)$, such as all outputs $f_{\omega_0}, \cdots, f_{\omega_{q-1}}$ are size specific meaning and a sequence of relationship, but there are killing relations among some outputs $f_{\omega_0}, \cdots, f_{\omega_{q-1}}$, and there are also loving relations among some outputs $f_{\omega_0}, \cdots, f_{\omega_{q-1}}$, and only there is a liking relation among all outputs $f_{\omega_j} \in F_{\omega_j}(V)$ for any j , and so on.

Without loss of generality, the function image space $F(V)$ and the factor space V are putted, still keep for V because of no assumption of V . In order to study the generalized relations and generalized reasoning, image mathematics researches the following relations.

Denoted $V_{g_i} \times V_{g_j} = \{(x, y) : x \in V_{g_i}, y \in V_{g_j}\}$, where the note $\times$ is the usual Decartes product or cross join. Define relations where

$$R_{g_r} = \sum_{g \in G} V_g \times V_{gg_r}, r = \quad \cdots 0m -,$$

$R_{g_0} = R_{g_0}^{-1} = R_{g_0^{-1}}$ is called an **equivalence relation** of V if g_0 is identity; denoted by ~ ;

$R_{g_s} = R_{g_s}^{-1} = R_{g_s^{-1}} \neq R_{g_0}$ is called a **symmetrical relation** of V if $g_s = g_s^{-1}, s \neq 0$; denoted by $\overset{R_{g_s}}{\leftrightarrow}$ or $\leftrightarrow$;

$R_{g_1} = R_{g_1^{-1}}^{-1} \neq R_{g_1^{-1}}$ is called a **neighboring relation** of V if $g_1 \neq g_1^{-1}$; denoted by $\overset{R_{g_1}}{\rightarrow}$ or $\rightarrow$;

$R_{g_a} = R_{g_a^{-1}}^{-1} \neq R_{g_a^{-1}}, R_{g_1}, R_{g_1^{-1}}$ is called an **alternate (or atavism) relation** of V if $g_a \neq g_a^{-1}, g_1, g_1^{-1}, a > 1$; denoted by $\overset{R_{g_a}}{\Rightarrow}$ or $\Rightarrow$. #

In this case, the equivalence relations and symmetrical relations are compatibility relations but both neighboring relations and alternate relations are non-compatibility relations. These relations are all reasoning relations since the relation $R_{g_i}^{-1} = R_{g_i^{-1}} \in \Re = \{R_{g_0}, \cdots, R_{g_{m-1}}\}$ if $R_{g_i} \in \Re$.

The equivalence relation R_{g_0}, symmetrical relations R_{g_s}'s, neighboring relation R_{g_1} and alternate relations R_{g_a}'s are all the possible relations for the method of classification taking images. In the following, the equivalence relation R_{g_0}, the neighboring relation R_{g_1} and the alternate relations R_{g_a} are mainly considered.

Assume there is an energy function on V (see [20]). In the future, the equivalence relation R_{g_0} will be the liking relation, the symmetrical relations R_{g_s}'s will be the reciprocal causation relations, the neighboring relation R_{g_1} will be the loving relation and the alternate relations R_{g_a}'s will be the killing relations. In the following, the liking relation R_{g_0}, the loving relation R_{g_1} and the killing relations R_{g_a} are mainly considered.

For example, there is an unique generalized logic reasoning model between the two kinds of opposite non-compatibility relations for case $m = 5$. Let V be a none empty set, there are two kinds of opposite relations: the neighboring relation R_1, denoted $\rightarrow$ and the alternate(or atavism) relation R_2, denoted $\Rightarrow$, having the property:

(1)If $x \rightarrow y, y \rightarrow z$, then $x \Rightarrow z$, i.e., if $(x, y) \in R_1, (y, z) \in R_1$, then $(x, z) \in R_2$, or, $R_1 * R_1 \subset R_2$;

$\Leftrightarrow$ If $x \rightarrow y, x \Rightarrow z$, then $y \rightarrow z$, i.e., if $(x, y) \in R_1, (x, z) \in R_2$, then $(y, z) \in R_1$, or, $R_1^{-1} * R_2 \subset R_1$;

$\Leftrightarrow$ If $x \Rightarrow z, y \rightarrow z$, then $x \rightarrow y$, i.e., if $(x, z) \in R_2, (y, z) \in R_1$, then $(x, y) \in R_1$, or, $R_2 * R_1^{-1} \subset R_1$.

(2)If $x \Rightarrow y, y \Rightarrow z$, then $z \rightarrow x$, i.e., if $(x, y) \in R_2, (y, z) \in R_2$, then $(z, x) \in R_1$, or, $R_2 * R_2 \subset R_1^{-1}$;

$\Leftrightarrow$ If $z \rightarrow x, y \Rightarrow z$, then $x \Rightarrow y$, i.e., if $(z, x) \in R_1, (y, z) \in R_2$, then $(x, y) \in R_2$, or, $R_2 * R_1 \subset R_2^{-1}$;

$\Leftrightarrow$ If $x \Rightarrow y, z \rightarrow x$, then $y \Rightarrow z$, i.e., if $(x, y) \in R_2, (z, x) \in R_1$, then $(y, z) \in R_2$, or, $R_1 * R_2 \subset R_2^{-1}$.

Let $R_3 = R_2^{-1}$ and $R_4 = R_1^{-1}$. Then above reasoning is equivalent to the calculating as follows:

$R_i * R_j \subset R_{mod(i+j,5)}, \forall i, j \in \{1, 2, 3, 4\}$,

where the $mod(i + j, 5)$ is the addition of module 5.

Two kinds of opposite relations can not be exist separately. Such reasoning can be expressed in Figure 2. The first triangle reasoning is known as **a jumping-transition reasoning**, while the second triangle reasoning is known as **an atavism reasoning**.

Reasoning method is a triangle on both sides decided to any a third side. Both neighboring relations and alternate relations are not compatibility relations, of course, not equivalence relations, called **non-compatibility relations**.

(C)Genetic reasoning of Non-authigenic Logic

Let $V = \{x_1, \cdots, x_n\}$ be a none empty set (the collection $V = \{x_1, \cdots, x_n\}$ of the research objects) with the equivalent relation R_0, the neighboring relation R_1 and the alternate relations $R_a \neq R_1^{-1}, a > 1$. Then a **genetic reasoning** is defined as follows:

(1) if $x \sim y, y \rightarrow z$, then $x \rightarrow z$, i.e., if $(x, y) \in R_0, (y, z) \in R_1$, then $(x, z) \in R_1$,or, $R_0 * R_1 = R_1$;

(2) if $x \sim y, y \Rightarrow z$, then $x \Rightarrow z$, i.e., if $(x, y) \in R_0, (y, z) \in R_a$, then $(x, z) \in R_a$,or, $R_0 * R_a = R_a$;

(3) if $x \rightarrow y, y \square z$, then $x \rightarrow z$, i.e., if $(x, y) \in R_1, (y, z) \in R_0$, then $(x, z) \in R_1$,or, $R_1 * R_0 = R_1$;

(4) if $x \Rightarrow y, y \sim z$, then $x \Rightarrow z$, i.e., if $(x, y) \in R_a, (y, z) \in R_0$, then $(x, z) \in R_a$,or, $R_a * R_0 = R_a$.

The genetic reasoning is equivalent to that there is a group $G_0^g = \{0, 1, \cdots, g-1\}$ with the operation $*$ such that $V = \{x_1, \cdots, x_n\}$ can be cut into $V_0 + \cdots + V_{g-1}$ where V_i may be an empty set and $R_r = \sum_{i=0}^{q-1} V_i \times V_{i*r}, \forall r \in G_0^g = \{0, 1, \cdots, g-1\}$, satisfying $R_0 * R_j = R_j * R_0 = R_j, \forall j \in G_0^g$.

(D)Steady multilateral systems of Non-authigenic Logic

For a none empty set $V = \{x_1, \cdots, x_n\}$ (the collection $V = \{x_1, \cdots, x_n\}$ of the research objects) and its some relations

$R_0, \cdots, R_{m-1} \subset V \times V = \{(x, y) : x \in V, y \in V\}, \Re = \{R_0, \cdots, R_{m-1}\}$

the form $(V, \Re)$ (or simply, V) is called a multilateral system, if $(V, \Re)$ satisfies the following properties:

(a) (uniqueness) $R_0 + \cdots + R_{m-1} = V \times V$.

(b) (hereditary, or identity, or macro) $R_0 * R_j = R_j * R_0 = R_j, \forall j$.

(c) (invertibility) For any $R_i \in \Re = \{R_0, \cdots, R_{m-1}\}$, there is $R_i^{-1} \in \Re$.

(d) (generalized reasoning) For any $R_i * R_j \neq \varnothing$, there exists $R_k \in \Re$ such that $R_i * R_j \subset R_k$.

The (d) is called **the generalized reasoning**, the (a) the **uniqueness** of the generalized reasoning, the (b) the

hereditary (pass on from generation to generation) of the generalized reasoning (or **genetic reasoning**) and the (c) the **equivalent property** of the generalized reasoning of both relations R_i and R_i^{-1}, i.e., the reasoning of R_i is equivalent to the reasoning of R_i^{-1}. In this case, the two-relation set $\{R_i, R_i^{-1}\}$ is *a lateral relation* of V.

Furthermore, the V and $\Re$ are called the state space and relationship set of $(V,\Re)$ considered, respectively. The system $(V,\Re)$ can be written as $(V_0+\cdots+V_{n-1},\{R_0,\cdots,R_{m-1}\})$ where R_0 is called the **equivalent relation** or **identity** or **macro-variable** of $(V,\Re)$.

For a multilateral system $(V,\Re)$, it is called complete (or, perfect) if "$\subset$" changes into "=". And it is called complex if there exists at least a non-compatibility relation $R_i \in \Re$. In this case, the multilateral system is also called a logic analysis model of a statistical complex system [22].

Let R_1 be a non-compatibility relation. The multilateral system $(V,\Re)=(V_0+\cdots+V_{n-1},\{R_0,\cdots,R_{m-1}\})$ is said as **a steady multilateral system** (or, **a stable multilateral system**) if there exists a number n such that $R_1^{*n}=R_0\neq\varnothing$ where $R_1^{*n}=R_1*\overset{n}{\cdots}*R_1$.

The condition is equivalent to there is a the chain $x_1,\cdots,x_n\in V$ such that $(x_1,x_2),\cdots,(x_n,x_1)\in R_1$, i.e., $x_1\to x_2\to\cdots\to x_n\to x_1$.

The steady multilateral system is equivalent to the complete multilateral system. The stability definition given above, for a relatively stable system, is most essential. If there is not the chain or cycle, then there will be some elements without causes or some elements without results in a system. Thus, this system is to be in the persistent state of finding its results or causes, i.e., this system will fall into an unstable state, and there is not any stability to say.

Lemma 5.2 The system $(V,\Re)$ is a multilateral system if and only if there exists a group $G=\{g_0,\cdots,g_{m-1}\}$ of order m where g_0 is identity such that $\Re=\{R_{g_0},\cdots,R_{g_{m-1}}\}$ satisfying $R_{g_i}*R_{g_j}\subset R_{g_ig_j},\forall i,j\in\{0,\cdots,m-1\}$.

Proof. Let a multilateral system

$$(V,\Re)=(V_0+\cdots+V_{n-1},\{R_0,\cdots,R_{m-1}\}).$$

Because only the relations of the group of order m is considered, so can the serial number of the relationship with a group of Numbers to remember.

Let the group of order m is $G=\{g_0,\cdots,g_{m-1}\}$ where g_0 is identity. Then the all relations $R_{g_i}=\sum_{g\in G}V_g\times V_{gg_i},\forall i\in\{0,\cdots,m-1\}$.

So, the classification of the space at least there should be a group of number. In other words, n is greater then or equal to m. In the following, it is proved that n is not greater then m. It is proved by using the reduction to absurdity .

If $n>m$, there is a space V_{m+1} such that

$$V=V_{g_0}+\cdots+V_{g_{m-1}}+V_{m+1}+\cdots$$

Thus $V\times V=(V_{g_0}+\cdots+V_{g_{m-1}})\times(V_{g_0}+\cdots+V_{g_{m-1}})+V_{m+1}\times V+\cdots$.

Because by the definition of the relations, there is

$$R_{g_0}+\cdots+R_{g_{m+1}}\subset(V_{g_0}+\cdots+V_{g_{m-1}})\times(V_{g_0}+\cdots+V_{g_{m-1}}),$$

so the condition (a) of the multilateral system is not true, i.e., $R_{g_0}+\cdots+R_{g_{m+1}}\neq V\times V$.

This is a contradiction. Thus $n\le m$.

But there is also the case $n<m$.

For example, let

$$V=V_0+V_1,V_2=\varnothing.$$

Take

$$R_0=V_0\times V_0+V_1\times V_1+V_2\times V_2=V_0\times V_0+V_1\times V_1,$$
$$R_1=V_0\times V_1+V_1\times V_2+V_2\times V_0=V_0\times V_1,$$
$$R_2=V_0\times V_2+V_1\times V_0+V_2\times V_1=V_1\times V_0.$$

It satisfy the condition (a) of the multilateral system: $R_0+R_1+R_2=(V_0+V_1)\times(V_0+V_1)=V\times V$.

Therefore, if $n<m$, people can add some empty set made the multilateral system for state space satisfying $V=V_{g_0}+\cdots+V_{g_{m-1}},R_{g_0}+\cdots+R_{g_{m+1}}=V\times V$.

On the other hand, the definition of directly using the relationship between operation shows the following conclusions:

$$R_{g_i}*R_{g_j}=(\sum_{g\in G}V_g\times V_{gg_i})*(\sum_{g\in G}V_g\times V_{gg_j})$$
$$=(\sum_{g\in G}V_g\times V_{gg_i})*(\sum_{gg_i\in G}V_{gg_i}\times V_{gg_ig_j})$$
$$\subset(\sum_{g\in G}V_g\times V_{gg_ig_j})=R_{g_ig_j}.$$

Therefore, the system $(V,\Re)$ is a multilateral system if and only if there exists a group $G=\{g_0,\cdots,g_{m-1}\}$ of order m where g_0 is identity such that $\Re=\{R_{g_0},\cdots,R_{g_{m-1}}\}$ satisfying $R_{g_i}*R_{g_j}\subset R_{g_ig_j},\forall i,j\in\{0,\cdots,m-1\}$. It completes the proof. #

In this case, the multilateral system $(V,\Re)$ can be written as $(V_{g_0}+\cdots+V_{g_{m-1}},\{R_{g_0},\cdots,R_{g_{m-1}}\})$ satisfying

$$R_{g_i}=\sum_{g\in G}V_g\times V_{gg_i},\forall g_i\in G=\{g_0,\cdots,g_{m-1}\},$$
$$R_{g_i}*R_{g_j}\subset R_{g_ig_j},\forall g_i,g_j\in G=\{g_0,\cdots,g_{m-1}\}.$$

Here V_{g_i} may be an empty set. There is an Axiom system V_{g_i} if at least $V_{g_i}\neq\varnothing$. #

Lemma 5.3 If the following multilateral system is a steady multilateral system:

$$(V,\Re)=(V_0+\cdots+V_{n-1},\{R_0,\cdots,R_{m-1}\}),$$

then $n=m$ and $\Re$ is a group of order m about multiplication $R_k*R_l=R_i$ where V_i must be at least a non empty set for any i. #

Proof. By Lemma 5.2, there is

$$(V,\Re)=(V_{g_0}+\cdots+V_{g_{m-1}},\{R_{g_0},\cdots,R_{g_{m-1}}\}).$$

If the following multilateral system is a steady multilateral system:

$$(V,\Re)=(V_0+\cdots+V_{n-1},\{R_0,\cdots,R_{m-1}\})=(V_{g_0}+\cdots+V_{g_{m-1}},\{R_{g_0},\cdots,R_{g_{m-1}}\})$$

then

(a) (uniqueness) $R_{g_0}+\cdots+R_{g_{m-1}}=V\times V$.

(b) (hereditary, or identity,or macro) $R_{g_0}*R_{g_j}=R_{g_j}*R_{g_0}=R_{g_j},\forall j$.

(c) (invertibility) For any $R_{g_i}\in\Re=\{R_{g_0},\cdots,R_{g_{m-1}}\}$, there is $R_{g_i}^{-1}\in\Re$.

(d) (generalized reasoning) For any $R_{g_i}*R_{g_j}$, there exists $R_{g_ig_j}\in\Re$ such that $R_{g_i}*R_{g_j}=R_{g_ig_j}$.

By the definition of group, the $\Re$ is a group of order m about multiplication $R_{g_i} * R_{g_j} = R_{g_i g_j}$.

Here, R_{g_0} is identity of the group $\Re$ and $R_{g_i}^{-1}$ is the inverse of R_{g_i} of the group $\Re$ for any i.

In the following, it just need to be proved that if the multilateral system
$(V,\Re) = (V_0 + \cdots + V_{n-1}, \{R_0, \cdots, R_{m-1}\}) = (V_{g_0} + \cdots + V_{g_{m-1}}, \{R_{g_0}, \cdots, R_{g_{m-1}}\})$
is a steady multilateral system, then $V_{g_i} \neq \varnothing$ must be at least a non empty set for any i.It is because, if $V_{g_i} \neq \varnothing$ is a non empty set for any i, then $n = m$. It is proved by using the reduction to absurdity.

In fact, if $V_{g_k} = \varnothing$,the definition of directly using the relationship between operation shows the following conclusions:

$$R_{g_i} * R_{g_j} = (\sum_{g\in G} V_g \times V_{gg_i}) * (\sum_{g\in G} V_g \times V_{gg_j})$$

$$= (\sum_{g\in G} V_g \times V_{gg_i}) * (\sum_{gg_i\in G} V_{gg_i} \times V_{gg_ig_j})$$

$$\subset \sum_{g\neq g_k g_i^{-1}, g\in G} V_g \times V_{gg_ig_j}$$

$$\neq \sum_{g\in G} V_g \times V_{gg_ig_j} = R_{g_ig_j}.$$

This is a contradiction to the definition of the steady multilateral system. It is because the definition of the steady multilateral system should be $R_{g_i} * R_{g_j} = R_{g_ig_j}$. It completes the proof. #

Definition 5.2 Let the multilateral system $(V,\Re)$ can be written as
$(V,\Re) = (V_{g_0} + \cdots + V_{g_{m-1}}, \{R_{g_0}, \cdots, R_{g_{m-1}}\})$
satisfying

$$R_{g_i} = \sum_{g\in G} V_g \times V_{gg_i}, \forall g_i \in G = \{g_0, \cdots, g_{m-1}\},$$

$$R_{g_i} * R_{g_j} \subset R_{g_ig_j}, \forall g_i, g_j \in G = \{g_0, \cdots, g_{m-1}\}.$$

The group $G^m = \{g_0, \cdots, g_{m-1}\}$ of order m where g_0 is identity is called the **representation group** of the multilateral system $(V,\Re)$.

Denoted the generalized difference [41] , set $I(R_{g_i}) = \{(x,y) : x^{-1}y = g_i, x, y \in G\}$ based on the group G, called the **representing function** of relation R_{g_i}. The representing function has nothing to do with the collection $V = \{x_1, \cdots, x_n\}$ of the research objects.

Let multilateral systems $(V^i, \Re^i), i = 1,2$ be with two representation groups $G^i, i = 1,2$, respectively. Both multilateral systems $(V^i, \Re^i), i = 1,2$ are called isomorphic if the two representation groups $G^i, i = 1,2$ are isomorphic. #

Lemmas **5.2** and **5.3** and Definitions **5.1** and **5.2** are key concepts in multilateral system theory because they show the classification taking images as the basic method. In the following, introduce two basic models to illustrate the method.

Lemma 5.4 Suppose that $G_0^2 = \{0,1\}$ with multiplication table

V^2	0	1
0	0	1
1	1	0

i.e., the multiplication of G_0^2 is the addition of module 2. In other words, $i * r = mod(i + r, 2)$.

And assume that $V = V_0 + V_1, \Re = \{R_0, R_1\}$, where $R_r = \sum_{i=0}^{1} V_i \times V_{mod(i+r,2)}, r = 0,1,$ satisfying $R_i * R_j = R_{mod(i+j,2)}, \forall i, j \in G_0^2$.

Then $(V,\Re) = (V_0 + V_1, \{R_0, R_1\})$ is a steady multilateral system with one equivalent relation R_0 and one symmetrical relation R_1. The system is simple since there is not any a non-compatibility relation. In other words, the relations R_i's are the simple forms as follows:
$I(R_0) = \{(0,0),(1,1)\}, I(R_1) = \{(0,1),(1,0)\}$,
where (i,j) is corresponding to $V_i \times V_j$. #

Proof. Because in the sense of isomorphism, dual group only Lemma **5.4** defined in a structure, so Definition **5.2**, up to isomorphism only Lemma **5.4** defined in this a multilateral system.

In fact, the steady multilateral system in Lemma **5.4** is the reasoning model of *"Tao"* (道) or "Yin-Yang" (阴阳) in TCS if there are two energy functions $\varphi(V_0)$ and $\varphi(V_1)$ satisfying $\varphi(V_0) < \varphi(V_1)$, called *Tao* model, denoted by
$V^2 = V_0 + V_1, R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1 + V_1 \times V_0$,
where V_0 is called Yin(阴) state of V^2 and V_1 is called Yang(阳) state of V^2. It completes the proof. #

Lemma 5.5 For each element x in a steady multilateral system V with two non-compatibility relations, there exist five equivalence classes below:
$X = \{y \in V \mid y \sim x\}, X_S = \{y \in V \mid x \to y\}, X_K = \{y \in V \mid x \Rightarrow y\}$,
$K_X = \{y \in V \mid y \Rightarrow x\}, S_X = \{y \in V \mid y \to x\}$,
which the five equivalence classes have relations in Figure 1.#

Proof. Because in the sense of isomorphism, dual group only Lemma **5.5** defined in a structure, so Definition **5.2**, up to isomorphism only Lemma **5.5** defined in this a multilateral system.

In fact, the steady multilateral system in Lemma **5.5** is the reasoning model of Yin Yang Wu Xing in TCM if there is an energy function $\varphi(*)$ satisfying

$$\varphi(X_K) \geq \varphi(X_S) \geq \varphi(X) \geq \varphi(K_X) \geq \varphi(S_X)$$

which is called Yin Yang Wu Xing model, denoted by V^5.

The Yin Yang Wu Xing model can be written as follows:
Define $V_0 = X, V_1 = X_S, V_2 = X_K, V_3 = K_X, V_4 = S_X$,
corresponding to wood, fire, earth, metal, water, respectively, and assume $V = V_0 + V_1 + V_2 + V_3 + V_4$ where $V_i \cap V_j = \varnothing, \forall i \neq j$.

And take $\Re = \{R_0, R_1, \cdots, R_4\}$ satisfying

$$R_r = \sum_{i=0}^{4} V_i \times V_{mod(i+r,5)}, \forall r \in \{0,1,\cdots,4\}, R_i * R_j \subseteq R_{mod(i+j,5)},$$

where $V_i \times V_j = \{(x,y) : x \in V_i, y \in V_j\}$ is the Descartes product in set theory and $R_i * R_j = \{(x,y) : \exists u \in V$ such that $(x,u) \in R_i, (u,y) \in R_j\}$ is the **relation multiplication operation**. The relation multiplication of $*$ is isomorphic to the addition of module 5. Then V^5 is a steady multilateral system with one equivalent relation R_0 and two incompatibility relations $R_1 = R_4^{-1}$ and $R_2 = R_3^{-1}$ where the **relation inverse operation** $R_i^{-1} = \{(x,y) : (y,x) \in R_i\}$.

The Yin and Yang means the two incompatibility relations and the Wu Xing means the collection of five disjoint classification of $V = V_0 + V_1 + V_2 + V_3 + V_4$. It completes the proof. #

For the reasoning model of Yin Yang Wu Xing in TCS the words "Yin Yang" means there are two non-compatibility relations $R_1 = R_4^{-1}$ and $R_2 = R_3^{-1}$, where the neighboring relation $R_1 = R_4^{-1}$ is the loving relation, also called **Yang relation** or **interpromoting relation** (相生) among five subsets V_j's, and the alternate relation $R_2 = R_3^{-1}$ is the killing relation, also called **Yin relation** or **restriction relation** (相克) among five subsets V_j's; the words "Wu Xing" means there are five subsets V_j's such that $V = V_0 + V_1 + V_2 + V_3 + V_4$, where there is only the equivalence relation R_0 among interior for each of five subsets V_j's, and there are Yin or Yang relations among exterior for all five subsets V_j's. The five subsets V_j's do not means the five elements (metal,wood,water,fire and earth), but with philosophy meaning of five aspects corresponding to the five subsets V_j's.

Study of a statistical complex system is the key to pathological diagnosis and treatment of a statistical complex system, also known as interference. any a steady multilateral system with an energy function, an intervention response capacity and self-protection capacity, is a logic to study the specific object of non-authigenic logic. According to non-authigenic logic thought, the stand or fall of intervention method for complex systems depends on a complex system's both side effects issue and medical and drug resistance problem from the intervention. Whether it can promote the health of the complex system without side effects issue ? Whether it can promote the response ability to the intervention of the complex systems and self-protection ability without medical and drug resistance problem? These standards have nothing to do with interveners. The **intervention methods** of this complex system are in [17]-[21][48] [49], in general, as follows:

(1)"Virtual disease with a healthy complex system is to fill its mother but real disease with a healthy complex system rushes down its son" (虚则补其母,实则泻其子) if only one subsystem of the statistical complex system fall ill or if only two subsystems with the loving relation of a statistical complex system encounter usual sick for a healthy statistical complex system.

(2)"Virtual disease with an unhealthy complex system is to fill itself but real disease with an unhealthy complex system rushes down itself" (虚则补之,实则泻之) if only one subsystem of the statistical complex system fall ill or if only two subsystems with the killing relation of a statistical complex system encounter usual sick for an unhealthy statistical complex system.

(3)"Strong inhibition of the same time, support the weak" (抑强补弱,或者,泻南补北) if only two subsystems with a killing relation of a statistical complex system encounter usual sick, which destroyed the killing relation of the complex system.

(4)"Do not treat a disease after it has occurred. But treat the disease before it will occur" (不治已病治未病) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(5)"Searching for the primary cause of disease in treatment, cure both symptoms and root-cause at the same time" (治病求本,标本兼治) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(6)"Even if all changed, it is hard to change one's nature" (江山易改,本性难移) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(7)"seize the momentum of development，hasten lucky avoids disaster" (顺势而为,趋吉避凶) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

Proof of Theorem 2.2. It is proved by using the reduction to absurdity.

If there is an axiom system which allows for all branches of the physical system being established, so, for the justice system, the relationship between the proposition and justice can only be compatible and incompatible relations. Write the compatible proposition is 0, write the incompatible proposition 1. The axiom system of all research propositions space can be written for

$$V = V_0 + V_1,$$

where V_0 is all compatible proposition space and V_1 is all incompatible proposition space.

According to the relationship between the true and false logic, the reasoning model can only be the evolution of the *Tao* model. For the *Tao* model in lemma **5.4**, the relationships between all propositions should be:

$$R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1 + V_1 \times V_0,$$

where R_0 is the relation between all compatible proposition space or between all incompatible proposition space as the true proposition of space 0, R_1 is the relation between all compatible proposition space and all incompatible proposition space or between all incompatible proposition space and all compatible proposition space as the false proposition space 1. Not consistent with the formal logic reasoning model.

Formal logic reasoning model is:

$$R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1, R_2 = V_1 \times V_0,$$

where R_0 is the relation between all compatible proposition space or between all incompatible proposition space as a true proposition of space 0, R_1 the relation between all compatible proposition space and all incompatible proposition space as a false proposition of space 1. But R_2 is the relation between all incompatible proposition space and all compatible proposition space as a true proposition of space 0.

Formal logic reasoning in violation of the multilateral system reasoning mode. This is because according to lemma **5.1**, the following results can be gotten

$$R_1 * R_2 = V_0 \times V_0 \subseteq R_0, R_2 * R_1 = V_1 \times V_1 \subseteq R_0.$$

That is to say: the combination of a true proposition and a false proposition reasoning should be a true proposition, or the combination of a false proposition and a true proposition is a true proposition. In other words, there are

$$false * true = true, true * false = true.$$

This, of course, does not conform to the reason of the fact.

Considering the converse proposition of the formal logic reasoning. Because

$$R_1 = R_2^{-1}, R_2 = R_1^{-1},$$

That is to say: a true proposition's converse proposition is a false proposition, a false proposition's converse proposition is a true proposition. In other words, there are

$$false = true^{-1}, true = false^{-1}.$$

This, of course, does not conform and reason of the fact.

Considering the converse proposition of the formal logic reasoning. Follow the same lemma **5.1**, the following results can be gotten

$$R_1^{-1} * R_2^{-1} = V_1 \times V_1 \subseteq R_0, R_2^{-1} * R_1^{-1} = V_0 \times V_0 \subseteq R_0.$$

That is to say: the combination of a true inverse proposition and a false inverse proposition reasoning should be a true proposition, or the combination of a false inverse proposition and a true inverse proposition is a true proposition. In other words, there are

$$true * false = true, \ false * true = true.$$

This, of course, does not conform and reason of the fact.

Considering the proposition and its converse proposition of formal logic reasoning. Follow the same lemma **5.1**, the following results can be gotten

$$R_1 * R_1^{-1} = V_0 \times V_0 \subseteq R_0, R_2 * R_2^{-1} = V_1 \times V_1 \subseteq R_0.$$

That is to say: the combination of a true proposition and its inverse proposition reasoning should be a true proposition, or the combination of a false proposition and its inverse propositions is a true proposition.

In other words, there are

$$false * true = true \text{ , } true * false = true.$$

This, of course, does not conform and reason of the fact.

Consider three elements inference problem. Direct calculation, can get

$$R_1 * R_2 * R_1 = R_1, R_2 * R_1 * R_2 = R_2.$$

In other words, there are

$$false * true * false = false, true * false * true = true.$$ Ac cording to the definition of the formal logic, there are

$$true * false = false, \ false * true = true.$$

Thus

$$false = false * true * false = false * (true * false) = false * false.$$

This is a contradiction with the definition of formal logic. Because, according to the definition of formal logic, there should be

$$true = false * false.$$

This contradictory results show that: the proposition of true and false of the formal logic reasoning model exist serious problems. Must to change its reasoning model.

For only two kinds of space elements of reasoning, there is only one model of reasoning mode, ability won't produce a reasoning contradictory. This reasoning model is the *Tao* model in lemma **5.4**. This is because the isomorphism of binary group there is a only. By Lemmas **5.2** and **5.3** and Definition **5.2**, in the sense of isomorphism, only the reasoning of the *Tao* model is correct.

Therefore, only according to the *Tao* model of reasoning model, the formal logic reasoning model is not a contradictory reasoning model. That is to say: a true proposition should launch a true proposition, a false proposition should launch a false proposition; While a true proposition cannot launch a false proposition, a false propositions also cannot launch a true proposition.

Even if the formal logic reasoning model is changed into a *Tao* model of reasoning model, can improve the Axiomatic system, but also can't solve the problem of the Axiomatic system. This is because the *Tao* model of reasoning mode, only used the equivalence relation and the symmetric relation. Symmetric relation reasoning, the reasoning is compatibility relation, can be used in an Axiomatic system. But,by Definition **5.1**, of (among) all the reasoning relationship, in addition to the equivalence relation reasoning and symmetric relation reasoning, also has two kinds of non compatibility relation reasoning. Loving is a kind of incompatibility relation reasoning, one is the killing relation reasoning of incompatibility. And with two incompatible relation model is the Yin Yang Wu Xing of reasoning model in Lemma **5.5** by Zhang etc [21].

Even if the Yin Yang Wu Xing model in Lemma **5.5** by Zhang etc [21] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Yin Yang Wu Xing model, only equivalence relation and the relations between the two kinds of non compatible, the lack of a symmetric relation reasoning. In order to exert symmetrical composition, model under the action of the *Tao*, can produce the Zangxing or ten heavenly stems model in Zhang [48].

Even if the Zangxiang or ten heavenly stems model in Zhang [48] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Zangxiang or ten heavenly stems model, only the equivalence or liking relation and the relations between the two kinds of non compatible, the still lack of a symmetric relation reasoning. And, the elements of model is very difficult to actually observed. In order to increase the observation components, using three to generate models, the model under the action of the *Tao*, the meridian or Jingluo or twelve earthly branches model in Zhang [48] was introduced.

Even if the meridian or Jingluo or twelve earthly branches model in Zhang [48] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the meridian or Jingluo or twelve earthly branches model, only the equivalence or liking relation, the symmetric relation reasoning, and the relation between one kinds of non compatible as the loving relation, the lack of the killing relation. Due to the meridian or Jingluo or twelve earthly branches model can be divided into six classes with similar equivalent, the equivalence class of the bipolar poles as observation, Eight palace or Eight veins or Eight extra meridians model in Zhang [49] form.

Even if the Eight palace or Eight veins or Eight extra meridians model in Zhang [49] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Eight palace or Eight veins or Eight extra meridians model, only equivalence or liking relation and symmetric relation reasoning, the lack of both the loving relation and the killing relation. And so on.

By Lemmas **5.2** and **5.3** and Definition **5.2**, there are an infinite number of reasoning model can be introduced into the pattern of formal logic reasoning, to further improve the Axiomatic system, but also is unable to complete the Axiomatic system. So, the Axiomatic system of the road is blocked. People don't need to the Axiomatic system, using the logic of the multilateral system is non authigenic, can achieve the goal that to know the world.#

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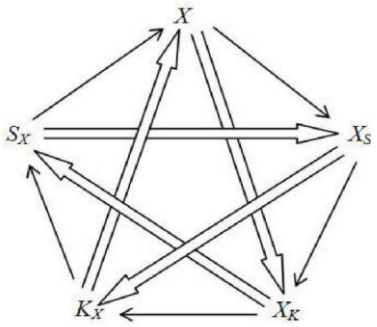

Figure 1. Finding Yin Yang Wu Xing Model

Figure 2. The first and second triangle reasoning

Table 1. Non-authigenic Logic

No assumption principle	Non-authigenic thinking rule	Resources limited rule	Fault tolerant rule
Preconceptions principle	Objective consistency rule	Repeatability rule	Default rule
Integration coordination combining principle	Searching-null composition rule	Integration rule	Decomposition rule
Logical layering principle	Global-Local thinking rule	Logical causal cycle rule	Seriousness of logical rule
Automation principle	Intervention reaction rule	Self-protection rule	Second physiological system rule