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Realizing the Government Performance Evaluation Index Additivity in China: A Probe into the Aggregate Degree and Additivity of Evaluation Index

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Abstract. Studies and practices in China unanimously ignored the additivity of government performance evaluation index. In the present evaluation systems, the total score of government performance is added by simply putting the indexes values (numbers) together. Neither the researchers nor the practitioners pay any attention to the reality that the government performance evaluation indexes belong to high attribute dimensions, and they cannot be added directly. To process these high attribute indexes of government performance evaluation, we have to follow their clustering features and reduce dimensions to convert high attribute dimensions to low attribute dimensions. In this study, binary state variable was adopted to reduce dimensions. We reduce the dimension of the performance evaluation index by 4 steps: (1) separating the hazy description of into measurable sub-indexes; (2) treating each sub-index as a binary variable by judging it false or true; true and false are respectively indicated as 1 and 0 in the statistical software or mathematical language; (3) using the methods of aggregate degree, aggregate vector, and set theory to make the sub-indexes aggregate in a same class; (4) nondimensionalising the values of sub-indexes and realizing the additivity of all the sub-indexes.

1. Introduction

In the study of government management, performance management is an increasingly important theme (Mekonen, 2010; Sanderson, 2001). Performance management is essentially a kind of mechanism with strong operability that pays attention to tool, technology and method (Sanderson, 2001). Among those various tools of performance management, performance evaluation is an all-important meta-tool that plays an irreplaceable role in evaluating government capacity, supervising government actions, increasing government efficiency, improving relations between government and the public (Torres, Pina & Marti, 2012). Thank to influences of this information age, the democratization of public administration and the economic marketization, government performance evaluation has become a hot topic for most governments on an

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international scale (Wu, Tsai& Shih, 2010). High performance and responsibility for the public in government administration, which are focus targets of the international new public management movements, has become inexorable outcomes of economic globalization, marketization and political democratization (Dooren, De Caluwe & Lonti, 2012; Ingraham & Kneedler, 1997). Meeting to the needs of our decade, government performance evaluation rose all over the world (Gotoh, 2008; Halachmi, 2000).

Inview of the great successful experiences in other nations, governments of varied hierarchies in China have increased the introduction and promotion of government performance evaluation. According to the investigation of China Personnel News, one third of Chinese provinces have carried out government performance evaluation (Xu, 2007). In order to promote it nationwide, National Ministry of Personnel has set Hunan province, Liaoning province, Yangpu district Shanghai city, Nantong city Jiangsu province and Jingyang county Shanxi province as contact points of government performance evaluation. During the process of its introduction and promotion, Chinese scholars naturally undertook the task of providing governments with theoretical support. Government performance evaluation has quickly become an emphasis and hot spot in Chinas public administration studies in these years. In the fashion of government performance evaluation researches, the study of performance evaluation index designing that is the most important part of performance evaluation, has become the hottest of the hot spots (Shang, 2013; Chen & Xue, 2007).

Over the years, the studies on government performance evaluation index designing have made some achievements. A typical one is that a research team of China Ministry of Personnel (2004) developed an index system that includes 33 indexes. Zhuo (2004) conducted field researches in abundant project experiences and developed an evaluation system of local government performance including15 indexes.Tang (2004) designed an index system to measure Chinese provincial government efficiency, which had 47 indexes. Peng (2005) used AHP to find that public performance evaluation index system should include 13 indexes .Fan & Zhu (2005) made a systematic study on Chinese local government performance evaluation index system designing. By means of large sample survey and analysis on the survey results, he jumped to a conclusion that the performance of a local government could be efficiently evaluated by 37 indexes. Using sampling method, Ni (2007) identified 15 indexes. Besides, the research team in Lanzhou University (2005), Xu (2005), Shang (2011) have also developed government performance evaluation index systems by varied methods.

In spite of the breakthroughs the Chinese scholars have made in government performance evaluation index designing, we have to face the fact that a primary problem was unanimously ignored (Shang & Chen, 2009). As we can see from table 1 that all the influential government performance evaluation index system in nowadays China have ignored to solve the problem of the additivity among different index sets in the same index class. During the process of index designing and selecting, aggregate degree and additivity among different index sets in the same index class should be settled in the first place. On the one hand, performance index system without aggregation might mix up indexes of different classes. On the other hand, index system without additivity suggests the mistake of index designing and selection (Johnston, 2004). If indexes cannot be added together to calculate, they cannot be further used in performance evaluation practice (Arellano-Gault, 2011; Lee & Whitford, 2013). As for the several most influential performance evaluation systems, none of them was undertaken from the point of view of aggregate degree (Shang, 2013). Moreover, studies on index additivity has always been lost topics because those indexes were curtly anddirectly added together (Shang & Chen, 2009). However, direct adding the index values is not rigorous or scientific in the study of evaluation (Johnston, 2004), for example, it might lead to a mess when add the performance indexes in China the effects of making two atomic bombs in the jurisdiction and the efficiency of producing 300 tons of potatoes in the jurisdiction together (Shang & Chen, 2009). Therefore, we should complement the lost studies of index additivity. Based on the current research situation, this paper aims at filling the gap by means of data mining and set theory. Specifically, this method involves aggregate degrees of high attribute dimensions after being reduce dimension and addition.

Table 1: Overview of the several influential local government performance evaluation index systems in China

proposer	First-class index	Second-class index	Study of index aggregation	Additive method
The Research team in Ministry of Personnel (2004)	Influence, function	Economy, society, population & environment, economic adjustment, market supervision, social management, public service, etc. (33 items)	No	Direct
Fan& Zhu (2005)	Public administration, economic development, social stability, education & science, living quality & ecological environment	proportion of government expenditure to GDP, proportion of civil servant number in total population, stability of policies, transparency of government affairs, etc. (37 items)	No	Direct
Ni (2007)	Input, management process, output and result	human resource, financial fund, government administrative capacity, government honesty, government service capability, economic development level, order and stability of society, ecological environment, etc. (15 items)	No	Direct
Zhuo (2004)	Basic index, evaluation method	ideological building, organizational construction, institutional construction, one-vote veto, administration by law, environmental specification, etc. (15 items)	No	Direct
The Research Teamof Lanzhou University (2005)	Duty fulfillment, administration by law, management efficiency, administrative diligence, innovation	Functioning, policy level, administrative licensing, organizational culture, quality of civil servants, efficiency of service, accountability system, fulfillment within specified time, etc. (14 items)	No	Direct
Peng (2005)	efficiency, cost, inner management	education management, science and technology management, cultural management, public health management, sports management, social insurance management, etc. (13 items)	No	Direct
Tang (2004)	government public service, public goods, government size, residents welfare	education, culture, health, public security, meteorology, social insurance, urban infrastructure, government size, residents welfare.	No	Direct
Xu (2005)	Economic situation, social development, sustainable development, comprehensive assessment	Growth rate of per capita income, growth rate of proportion of expense on education & health in whole fiscal expenditure, green coverage ratio, satisfaction degree of citizens.	No	Direct
Shang (2011)	Economic adjustment, market supervision, social management, public service	Growth rate of per capita GDP, evaluation of the value maintenance, evaluation of expense on education and science, food market supervision evaluation, proportion of administrative expense in whole fiscal expenditure, etc. (90 items)	No	Direct

2. Hierarchical Weighting and Clustering Problem in Government Performance Evaluation Index Designing

All the colleagues studying on government performance evaluation index designing may share this-experience: it is actually a process of weighting and clustering indexes layer by layer to develop, design or select index system (Shang & Chen, 2009; Shang, 2013). The three coordinate axes-government administrative input, administrative behavior and time spent on finishing administrative behavior (ordinary administrative behavior period, time limit, procrastination, etc.) form a variable space. Researchers or practitioners need to recognize explicit, semi- explicit, or implicit administrative phenomena, results of administrative behaviors, concomitant phenomena of administrative behaviors, concomitant results of administrative behaviors in the space, then cluster them layer by layer and set their common attribute as name of a new index (see figure 1) (Shang, 2013). Generally, government performance could be clustered and form several first-class indexes (a1, b1, c1, d1, e1 in figure 1) according to the distribution of explicit, semi-explicit, or implicit administrative phenomena, results of administrative behaviors, concomitant phenomena of administrative behaviors, concomitant results of administrative behaviors (scattering points in figure 1). All the first-class indexes should be put weight on the condition that the sum of their weights are equal to 1 (100%). In this way, government performance that needs to be evaluated is concentrated on five aspects, in other words, performance of these five aspects would represent all government behaviors, hence evaluation of these five aspects approximately equates with evaluation of government total performance. After the first-class clustering, we can continue to cluster the second-class, third-class indexes according to the accuracy of the evaluation or even fourth-class, fifth-class indexes. Indexes of each class should be weighted on the premise that the sum of their weights equals the weight of their corresponding first-class index. Theoretically, hierarchical clustering is endless; however, we generally cluster to the third class in practice (Hartigan, 1975). Figure1 just marks second-class and third-class indexes, namely a2, a3, b2, b3, etc.

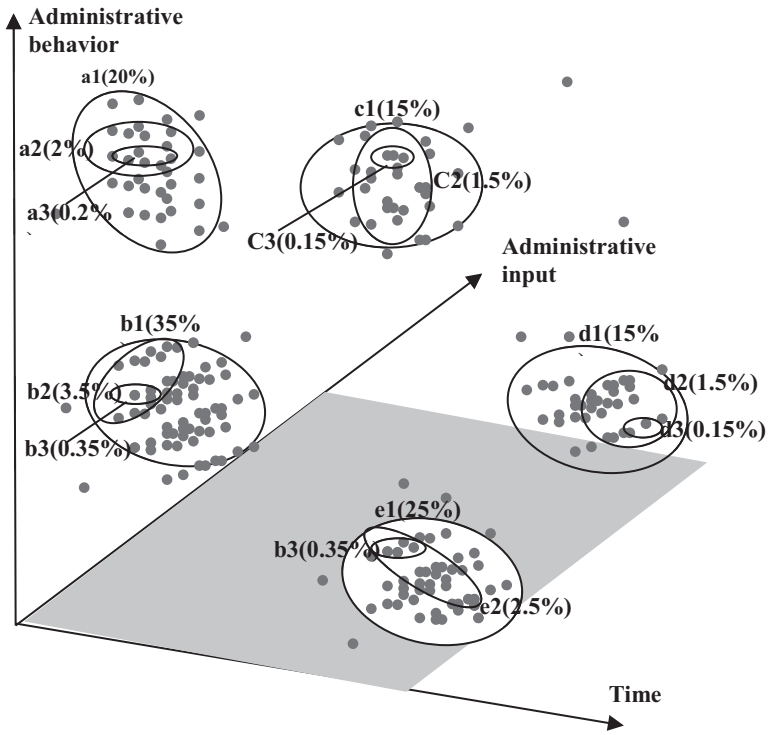

Figure 1: Hierarchical Weighting in Government Performance Evaluation Index Designing

In the light of data mining theory and set theory, hierarchical weighting and clustering in government

performance evaluation index designing is actually a process of reducing dimension, weighting and clustering from highattribute dimension to low dimension (Shang, 2013). Clustering of high attribute dimensional objects is an aporia in clustering study (Guha, et al., 1998), while government performance evaluation index designing just meets the aporia (Kostelecky & Patockova, 2006). During the index designing, many clustering methods work well in creating clustering results quality when those objects are low attribute dimension, but not when they are high attribute dimension (Guha, et al., 1999; Zhou & Jiao, 2004; Gao, Wu & Gao, 2005). The causes of this problem is that the computing method of indexes aggregate degrees of low attribute dimensional data objects cannot be directly used in the clustering of high attribute dimensional indexes (Ester, et al., 1996). In many cases, conventional computing methods used in diversity degree of low attribute dimensional indexes can neither really reflect the aggregate degree of high attribute dimensional indexes nor accurately reflect the similarities among indexes, and sometimes even reflect in error. If those inaccurate, low-correlated or even wrong indexes are added together, a tiny error may lead to a huge mistake (Kostelecky & Patockova, 2006). After all, it is ridiculous to add the efficiency of producing 1000 tea-eggs to the efficiency of producing a nuclear missile (in nowadays Chinas local government performance evaluation systems, there exist a series of Chinese-style indexes such as the efficiency of producing a boiled egg with tea and soy sauce and the efficiency of producing a nuclear missile). Evaluation result of this kind is totally unable to reflect the real performance of government administrative behaviors (Shang, 2013). Whats worse, it may bring about bad consequences like awarding indolence, punishing diligence, encouraging mediocrity or restraining talents, and finally government management may be trapped in a vicious circle (Shang, 2013). To solve the problem, we can turn to data mining theory and set theory. Specifically, in the designing of performance evaluation index, we should follow the rules to reduce the high tribute dimension of the performance evaluation index into measurable sub-indexes of low dimension; then we could use the method of binary state variable to reduce dimension layer by layer according to the aggregate degrees of those very vague high attribute dimensional indexes such as developing well and fast in the jurisdiction, social harmony in the jurisdiction, people affluence in the jurisdiction; on the basis of these work, we could nondimensionalise the values of sub-indexes and realize the additivity of all the sub-indexes. Thus the problem of non-additivity of vague indexes could be solved and the gap will be filled in the study of government performance evaluation index designing in China (Shang & Chen, 2009).

3. AggregateDegree and Aggregate Vector of Government Performance Evaluation Indexes

Aggregate degrees of government performance evaluation indexes mean the concentricity of those indexes features (Howard, et al., 1994). For example, as for the first-class index economic situation in the jurisdiction, second-class indexes like growth rate of per capita income in the jurisdiction, growth rate of proportion of expense on education & health in the whole fiscal expenditure in the jurisdiction apparently possess concentricity. Whereas, second-class indexes like green coverage ratio in the jurisdiction, literacy rate in the jurisdiction and petition rate in the jurisdiction obviously have no concentricity, indexes like satisfaction degree of citizens on jobs of county government and satisfaction degree of poll may have some concentricity or may have no concentricity (Shang, 2013). Aggregate degree is a significant measure of index systems rationality, and only those indexes of high aggregate degree can be added together (Soobader, LeClere, Hadden & Maury, 2001; Howard, et al., 1994). Otherwise, we may face dilemmas like how to add up 30 potatoes to 8 atomic bombs.

3.1. Aggregate Degree of Government Performance Indexes

In the process of government performance evaluationindex designing, lets assume there are x classes of indexes, and every class has y measurable sub- indexes which are expressed as binary state variables. For example, the index social harmony in the jurisdiction has several measurable sub- indexes, which can also be called as attributes, such as employment rate of those over 18 and are willing to work in the jurisdiction (true/false), beggar number per hundred square meters in the jurisdiction (true/false), number of times of petition per month in the jurisdiction (true/false), number of times of mass incidents per month in the jurisdiction (true/false). In this study, we uniformly use true and false as the values of binary state variables

to signify whether an attribute belongs to an index. Specifically, if an attribute can really describe the index social harmony in the jurisdiction, it will be one of its sub-indexes and should be marked as true instead of false. True means this clear measurable low dimension attribute had high aggregate degree here. If put into computer language, true and false can be converted into 1 and 0 and set as dummy variables in statistical software like SPSS, STATA or SAS. Suppose I has a sub-index subset Φ and the number of attributes (sub-indexes) therein is denoted as $|\Phi|$. The number of attributes that belong to sets whose whole attributes are concurrently marked true, i.e., they are all indicated as 1 in binary state variable or computer language, is α. For example, in the mentioned index social harmony in the jurisdiction, the clear measurable low dimension attributes of employment rate of those over 18 and are willing to work in the jurisdiction (true), beggar number per hundred square meters in the jurisdiction (true), number of times of petition per month in the jurisdiction (true) are sub-indexes and each binary state variable value is 1, so they consist α. On the contrary, the sub-index number of times of mass incidents per month in the jurisdiction (false) is not α. In addition, there exist a few of sub-indexes whose attributes are partly false or partly true to the indexes, and their attributes values are not completely equivalent. The number of such attribute is β. And then the *aggregate degree (AD)* of the index subsetΦ can be formulated as follow.

$$AD(\Phi) = \frac{\beta}{|\Phi| * \alpha} \tag{1}$$

Aggregate degree measures the internal consistency and internal concentricity among all objects in an index set, in other words, it assures all the sub-indexes in the set pertain to their corresponding higher index (index class). For example, the sub-indexes number of people being admitted to the Chinese Communist Party each year in the jurisdiction , number of people withdrawing from the Chinese Communist Party each year (no paying party membership dues, not taking part in party activities for three years, joining unlawful parties or organizations) in the jurisdiction times propagating the Three Represent Thoughts of Chinese Communist Party into citizens households all indeed belong to the higher index (class) construction of Chinese Communist Party in the jurisdiction because they all have concentricity and aggregate degree.

3.2. Measuring Government Performance Evaluation Indexes Aggregate Degree Aggregate Vector

Both data mining theory and set theory emphasize that vector should be set as a measure of aggregate degree of a whole set and clustering objects (Han & Kamber, 2001). In terms of the aggregate degree of government performance evaluation index, we adopt aggregate vector (AV) to express the measurement of it.

In the process of designing the government performance evaluation index system, there are x classes of indexes, and every index I has y descriptive attributes (measurable sub-indexes of low dimension) that are binary state variables as mentioned above, Φ is an object set (sub-index set) of I, and the number of sub-indexes insideΦ is$|\Phi|$. There are α secondary indexes belong to sets whose whole sub-indexes are marked yes, i.e., all the sub-indexes inside these sets are marked as mathematical language value 1, and these sub-indexes are encoded as $i_{a1}, i_{a2}, , i_{a\alpha}$. Correspondingly, there are β sub-indexes belong to sets whose sub-indexes have different values, and these sub-indexes are encoded as $i_{n1a1}, i_{n2a2}, , i_{n\beta a\beta}$. In this way, aggregate vector can be expressed as formula (2).

$$AV(\Phi) = (|\Phi|, T(\Phi), NA(\Phi), AD(\Phi)) \tag{2}$$

Formula (2) shows the aggregatevector of government performance evaluation index setΦ. $|\Phi|$is the number of objects (sub-indexes) inΦ. T means all the attributes whose object values are true inΦ, i.e., the set $\{i_{a1}, i_{a2}, , i_{a\alpha}\}$ in which all attributes share the mathematical language value 1. NA means the set $\{i_{n1a1}, i_{n2a2}, , i_{n\beta a\beta}\}$ in which attributes have different values. AD (Φ) is the aggregate degree of index setΦ.

Aggregatevector reflects the aggregate degree among objects (sub-indexes) in an object (sub-secondary index) set. Therefore, in order to get, store, analyze, data-mine, or even on-line process the government performance evaluation index set, we can just store its aggregate vectors and use them to describe the aggregate situation of it without store all information of those objects (secondary and sub-secondary

indexes) in the set. So, aggregate vector decreases data size. It has a superior mathematical trait of additivity when two index sets need to be added together. In nowadays China, neither theorists nor practitioners think additivity in Chinas government performance evaluation index system designing is needed, and this makes all the evaluation indexes have the non-scientific shortcomings. The mathematical trait could help to fill the gap of additivity in Chinas government performance evaluation index system designing.

3.3. Additivity ofAggregate Vectors in Government Performance Evaluation

In the view of designing a government performance evaluation index system, additivity is the most valuable trait of aggregate vector. Suppose there are$x$ classes of indexes in government performance evaluation index designing, each class has y sub-indexes that further describe its attribute, andΦ and Δ are two non-overlapping sub-index sets, then their aggregate vectors can be respectively expressed as $AV(\Phi) = (|\Phi|, T(\Phi), NA(\Phi), AD(\Phi))$ and $AV(\Delta) = (|\Delta|, T(\Delta), NA(\Delta), AD(\Delta))$. According to set theory, their addition rule will be:

$$AV(\Phi) + AV(\Delta) = (\Omega, T, NA, AD) \tag{3}$$

$$\text{Then,}\Omega = |\Phi| + |\Delta|; T = T(\Phi) \cap T(\Delta);$$
$$NA = \frac{NA(\Phi) \cup NA(\Delta) \cup T(\Phi) \cup T(\Delta)}{T(\Phi) \cap T(\Delta)}$$
$$AD = \frac{|NA|}{\Omega * |T|}$$

On the basis of addition rule of aggregate vectors shown in formula (2), we can move forward to realize the additivity of indexes of the same class, in other words, two index sets of the same class can be combined.

4. Realization ofAdditivity in Government Performance Evaluation Index Designing

In government performance evaluation index designing, additivity of aggregate vectors lays a realistic foundation for the combination and addition of different index sets among indexes of the same class. In this way, we can solve the problem of additivity in index designing, and then make the study process of index designing more complete and scientific.

On the basis of aggregate vectors additivity, we suppose there are$x$ classes of indexes in government performance evaluation index designing, and each class has y secondary indexes that further describe its attribute. If Φ and Δ are two non-overlapping sub-index sets, their sub-index set will be $\Phi \cup \Delta$ after combination. In view of these conditions, the existence of the additive principle $AD(\Phi \cup \Delta) = AV(\Phi) + AV(\Delta)$ can be easily proved according to set theory and clustering algorithm.

Sub-index sets Φ and Δ are not overlapping and the numbers of objects (sub-secondary indexes) in them are $|\Phi|$ and $|\Delta|$, so the number of objects (sub-secondary indexes) in the sub-index set $\Phi \cup \Delta$ is $|\Phi| + |\Delta|$, i.e., $|\Phi \cup \Delta| = |\Phi| + |\Delta| = \Omega$. As long as $T(\Phi \cup \Delta) \subseteq T(\Phi) \cap T(\Delta)$ (This means that putting the government performance evaluation sub-index in the two different sets together could be included in the sub-indexes in the set of the intersection of the two different sets. Under this condition, different government performance evaluation Sub-indexes could be aggregated), $T(\Phi \cup \Delta) \cup NA(\Phi \cup \Delta) = NA(\Phi) \cup NA(\Delta) \cup T(\Phi) \cup T(\Delta)$ can be proved, we can prove the existence of additivity.

(1) For a random sub-index $i \in T(\Phi \cup \Delta)$, the i^{th} aggregate values of all the objects (sub-secondary indexes) in the set $\Phi \cup \Delta$ share the affirmative value true in binary state variable and are denoted as 1 in mathematical language. Because $\Phi \subseteq \Phi \cup \Delta$, the i^{th} attribute sparse features of all the objects (sub-secondary indexes) in the set Φ share the affirmative value true, i.e., 1. Therefore, $T(\Phi \cup \Delta) \subseteq T(\Phi) \cap T(\Delta)$.

Besides, fora random index $i \in T(\Phi) \cap T(\Delta)$, the i^{th} aggregate values of all the objects (sub-secondary indexes) in both set Φ and set Δ share the affirmative value true and are denoted as 1 in mathematical

language, so $i \in T(\Phi \cup \Delta)$.Then the i^{th} aggregate values of all the sub-secondary indexes in index set $\Phi \cup \Delta$ must be true or 1, i.e., $i \in T(\Phi \cup \Delta)$. So, we can get $T(\Phi) \cap T(\Delta) \subseteq T(\Phi \cup \Delta)$ and $T(\Phi \cup \Delta) \subseteq T(\Phi) \cap T(\Delta) = T$.

(2) $T(\Phi \cup \Delta)$ and $NA(\Phi \cup \Delta)$ do not overlap by reason of aggregate vectors trait mentioned above. $NA(\Phi) \cup NA(\Delta) \cup T(\Phi) \cup T(\Delta)$ is the index universal set, then $T(\Phi \cup \Delta)$ and $NA(\Phi \cup \Delta)$ would be the complementary set of each other. Thus we can get $NA(\Phi \cup \Delta) = \dfrac{NA(\Phi) \cup NA(\Delta) \cup T(\Phi) \cup T(\Delta)}{T(\Phi \cup \Delta)}$. Because of $T(\Phi \cup \Delta) = T(\Phi) \cap T(\Delta)$, we can further get $NA(\Phi \cup \Delta) = \dfrac{NA(\Phi) \cup NA(\Delta) \cup T(\Phi) \cup T(\Delta)}{T(\Phi \cup \Delta)} = T$.

According to the definition of aggregate degree in government performance evaluation index designing, with the addition of known conditions $T(\Phi \cup \Delta) = T$ and $NA(\Phi \cup \Delta) = T$, we can get $AD(\Phi \cup \Delta) = \dfrac{|NA(\Phi \cup \Delta)|}{|\Omega(\Phi \cup \Delta)| \times |T(\Phi \cup \Delta)|} = \dfrac{|NA|}{\Omega \times |T|} = AD$. According to index aggregate vectors traits mentioned above, it is obvious to get this result:

$$\begin{aligned} AV(\Phi \cup \Delta) &= (|\Phi \cup \Delta|, T(\Phi \cup \Delta), NA(\Phi \cup \Delta), AD(\Phi \cup \Delta)) \\ &= (\Omega, T, NA, AD) \\ &= AV(\Phi) + AV(\Delta) \end{aligned}$$

This is the additivity of indexes of the same class in performance evaluation index designing, which theoretically solve the problem of addition of indexes. It tells us that aggregate vectors can be added together when two sub-index sets are to be combined if the two sets that belong to the same index do not overlap. Thank to the additivity of aggregate vector, government performance evaluation index can be accurately added or subtracted to get the final sum of performance evaluated by the performance evaluation index. In the study of index designing, additivity not only decreases the amount of data storage and computation in index clustering, but also ensures the accuracy of calculation of aggregate degrees (Tversky, 1967).

In fact, theadditivity we realized above is the aggregating additivity. But in the government performance evaluation reality, we need to add up all the values of sub-indexes. More often than not, the values of the sub-indexes are of varied dimensions, and we could use the nondimensionalising tools developed by mathematicians to nondimensionalise the values. After the nondimensionalising work, we could add up a total score of all sub-index values. Thus, we finally realize the additivity in the process of government performance evaluation.

For instance, we could reduce the dimension of the performance evaluation index social harmony by 4 steps: (1) separating the hazy description of social harmony into measurable sub-indexes of employment rate of those over 18 and are willing to work in the jurisdiction, beggar number per hundred square meters in the jurisdiction, the rising rate of mass incidents in the jurisdiction, and the rising rate of social cases in the jurisdiction; (2) treating each sub-index as a binary variable by judging it false or true; true and false are respectively indicated as 1 and 0 in the statistical software or mathematical language; (3) using the methods of aggregate degree, aggregate vector, and set theory to make the sub-indexes aggregate in a same class; (4) nondimensionalising the values of sub-indexes and realizing the additivity of all the sub-indexes.

Although the additivity is atraditional research field in mathematics, data mining, and set theories, it is unanimously neglected by the theorists and practitioners in government performance evaluation process in China. If we cannot resolve the problem of additivity, we may add the efficiency of producing 1000 tea-eggs to the efficiency of producing a nuclear missile directly. In spite of the ridiculousness, such evaluation occurs frequently. This study tries to solve this problem. In this sense, the study could bridges the gap between theory and practice.

5. Discussion

The greatest problem in Government performance evaluation index designing has been unanimously ignored in Chinas study, which is the non-additivity of high attribute dimensional object. The problem of how to add the condition of grasping the theory of Three Represent in the jurisdiction and potato production of 1500kg/acre in the jurisdiction together is a concrete example. As for those high attribute

dimensional indexes of government performance evaluation, we should firstly reduce dimension to convert high attribute dimensions to low attribute dimensions according to their clustering trait, so that they can be added together. In this study, we reduce the dimension of the performance evaluation index by 4 steps: separating the hazy description of into measurable sub-indexes; treating each sub-index as a binary variable by judging it false or true; true and false are respectively indicated as 1 and 0 in the statistical software or mathematical language; using the methods of aggregate degree, aggregate vector, and set theory to make the sub-indexes aggregate in a same class; nondimensionalising the values of sub-indexes and realizing the additivity of all the sub-indexes. By the data mining theory and set theory, we realized the additivity of indexes of the same class by the means of aggregate degree and aggregate vector of indexes. Thus, this study filled a gap of existing research on performance evaluation. Its worth noting that this is just an exploratory study. We realized the additivity of indexes with the method of binary state variable, but further studies are needed to find whether better methods or algorithms can be adopted. This study applied some research achievements on high attribute by pioneers like Guha (1999), Gao, Wu & Gao (2005) to solve the problem of additivity of government performance evaluation indexes. However, it needs to be clarified in future studies whether this application is appropriate or do solve the problem completely, and it also needs to be clarified whether the additivity of government performance indexes in other nations such as the USA, the UK, and Germany follow the same rules as it has been realized in China.

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