Research on internal control of accounting information in enterprises based on OPM model

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Abstract

OMP model is an important computing model in the data field, which is broadly applied in in the field of physics, mathematics, etc. In fact, OMP can be adopted in enterprises as well. In this paper, through in-depth analysis on the calculation method and content of OMP, the application principles, specific application methods of OMP in internal control of enterprise accounting information and existing problems was analysed in accordance with its effect, so as to establish an OPM model software evaluation system from the practical perspective and ultimately propose corresponding countermeasures for the application of OMP model in internal control of accounting information in enterprises.

Keywords: SOFC, OMP, accounting information, internal control, evaluation

1 Introduction

Internal control of enterprises is a basic measure aiming at keeping the security of corporate assets in order to enhance the operational efficiency of materials. There are a lot of methods and measures of internal control, all of which contain the accounting information section. During the construction and improvement of internal control system, all enterprises should first strengthen internal mutual restraint and supervision of accounting organization, improve the quality of accounting, and realize supervision of enterprises through accounting supervision, so as to avoid moral risks in employee behaviours. Although enterprises are constantly strengthening internal control of accounting department, financial information leaking, accounting officers advancing private interests for themselves or other employees by irregularities are often the case, which are difficult to control. To this end, in December 2013, the Ministry of Finance issued <Working Rules for Enterprise Accounting Information>, of which major purpose is to protect the security of corporate accounting information. Accounting information is one of the core secrets of business that will directly affect their competitiveness, therefore is crucial to enterprises. This is also the practical significance of using OPM model to analyse the internal control and evaluation system of enterprise accounting information in this paper.

2 Relevant theories and researches

There are more researches on the corporate internal control, which mainly focus on the problems and countermeasures. Liu Xiaodong believed that internal control plays the role of internal factor during corporate developing process. Internal factors determine the potential for development of enterprises, which are important criteria for the measurement of enterprise performance. However, imperfect legal person governance structure, inadequate risk assessment, weak awareness for enterprise risks and other issues exist in many enterprises. Zou Hui [1] analysed the problems of internal wage deduction with specific enterprise as an example, and argued that many enterprises in China have vigorous performance in internal control but with low effectiveness, mainly because of a lack of continuity in internal control of domestic enterprise internal control as well as a long-term and effective internal control system. Yang Xiaoling [2] analysed the environmental changes of enterprise internal control in the information environment and believed that enterprises in the information environment should pay more attention to the security of electronic information. Yao Feng [3] analysed the internal problems to be solved in enterprise, first of which is the internal control issue of finance. Li Youhua analysed the effectiveness of internal control of domestic enterprises from the perspective of validity control, and proposed suggestions for the evaluation of internal control. Zhai Yuechun [4] believed that in the process of enterprise informatization, information technology has impact on internal control in control environment, control object, objective setting, risk evaluation, control activities, information and communication, as well as supervision aspects. Zhang Xianzhi [5] believed that the publishing of supporting guidelines for basic norms of internal control of domestic enterprises has laid a foundation for the construction of enterprise, CPA, and relevant regulatory authorities three in one in the internal control system of enterprise. Taking into account the system background in China, limitations

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and reliability of enterprise internal audit and other factors, on the basis of enterprise internal control disclosure and CPA internal control audit disclosure, indicators for the evaluation result of enterprise internal control reflecting comprehensive status and level of enterprise internal control is established. Wang Yu [7] argued that untrue accounting information quality has serious economic results. The key of ensuring information quality lies in external supervision and internal control, where internal control is the most important affecting factor. Wang Chen [8] believed that internal control system is designed for satisfying the organizational, business demand for management objective in modern enterprises, institutions and other related organizations. Internal control cannot offer certain helps for the management personnel to reach their objectives, but cannot provide absolute assurance [9]. As can be seen from the above, these analysis are mainly conducted from theoretical perspectives, which have defects in the application of model and data.

In order to effectively improve the capacity of internal control for accounting information of enterprises, a new model and method – OPM model and computing method is introduced here with in-depth analysis on its application of internal control for accounting information as well as evaluation on application.

3 Application of OPM model in internal control of accounting information

3.1 CONNOTATION OF OPM MODEL

OPM model and computing method is one of the sparse decomposition methods which decompose the signals. The computing method is as follows:

Suppose the signal to be represented is y, and its length is *n*. Assume that H refers to space. In space H, dictionary matrix D is composed by a set of vectors $\{X_1, X_2, X_3, ..., X_n\}$, in which each vector can be called a vector with the length same as the length n of signal y to be represented. And these vectors are normalized, namely $\|X_i\| = 1$, which means the length of unit vector is 1.

Basic ideas of MP model: select the best matching atom with signal y from dictionary matrix D (also known as over-complete dictionary of atoms), build a sparse approximation and obtain the signal residual. Then continue to choose the best matching atom with signal residual with reiteration. Linear approximation of signal y can be done by these atoms, which are represented by the final residuals. Obviously, if the residual value is within the range that can be ignored, then signal y is a linear combination of these atoms. Specific steps are as follows:

1) Calculate the inner product of signal y and each column of matrix dictionary, select the atom with maximum absolute value, and it will be the most matching one with signal y in this iteration. Describe with jargon: let the signal $Y \in H$, and select a most matching atom from the dictionary matrix satisfying $\left|\langle y, X_{r0}\rangle\right| = \sup_{i\in(1,2,.....k)}\left|\langle y, X_i\rangle\right|$, r_0 refers to a column index in the matrix dictionary. Thus, signal y is decomposed as the vertical projection and residual two parts of the most matching atom X_{r0}, namely $y == \langle y, X_{r0}\rangle X_{r0} + R_1 f$;

2) Residual $R_1 f$ is decomposed in the same way, then it can obtain in step K: $R_k f = \langle R_k f, X_{r_{k+1}}\rangle X_{r_{k+1}}$, where $X_{r_{k+1}}$ meets $\left|\langle R_k f, X_{r_{k+1}}\rangle\right| = \sup_{i\in(1,2,3,.....k)}\left|\langle R_k f, X_i\rangle\right|$. As can be seen, after K steps of decomposition, signal y is decomposed as: $y = \sum_{n=0}^{k}\langle R_n f, X_{rn}\rangle R_k f + R_{k+1} f$, where $y = R_k f$.

OMP is the improvement of OM method which conducts orthogonal processing for all selected atoms in each step of decomposition. Therefore the convergence rate of OMP algorithm is faster.

For example, a *k*-order model indicating situation of signal *f* after *k* steps of decomposition:

$$f = \sum_{n=1}^{k} a_n^k X_n + R_k f, with\langle R_k f, X_n\rangle = 0, n = 1, 2, ...K+1. \quad (1)$$

k+1-order model is as follows:

$$f = \sum_{n=1}^{k} a_n^{k+1} X_n + R_{k+1} f, with\langle R_{k+1} f, X_n\rangle = 0, n = 1, 2, ...K+1, \quad (2)$$

Apply *k*+1-order model minus k-order and obtain as follows:

$$f = \sum_{n=1}^{k}(a_n^{k+1} - a_n^{+1})X_n + a_n^{k+1} X_{k+1} + R_{k+1} f - R_k f. \quad (3)$$

Atoms in dictionary matrix D are non-orthogonal. An auxiliary model indicating the independence of X_{k+1} on the former k entries $X_n(1, 2, ...n)$ is introduced, as described below:

$$\sum_{n=1}^{k} b_n^k X_n + \gamma_k, with\langle \gamma_k, X_n\rangle, n = 1, 2, ...k. \quad (4)$$

Conduct orthogonal projection on the one of the span $(X_1, X_2, ..., X_k)$, and the latter entry is residual. This relationship is described by mathematical symbol as:

$$\sum_{n=1}^{k} b_n^k X_n = P_{V_k} X_{k+1}, and \quad \gamma_k = P_{V_k}^{X_{k+1}}.$$

Note that the subscripts *a* and *b* here refer to the value of *k* step.

Substitute Equation (4) into Equation (3) and get:

$$\sum_{n=1}^{k}(a_n^{k+1} - a_n^k + a_n^{k+1} b_n^k)X_n + a_n^{k+1}\gamma_k + R_{k+1} f - R_k f = 0. \quad (5)$$

If the two equations are true, then Equation (5) must be true.

$$a_n^{k+1} - a_n^k + a_n^{k+1} b_n^k = 0\,, \tag{6}$$

$$a_n^{k+1} \gamma_k + R_{k+1} f - R_k f = 0\,. \tag{7}$$

Let $a_n^{k+1} = a_n^k$, then:

$$a_n^k = \frac{\langle R_k f, X_{k+1} \rangle}{\langle \gamma_k, X_{k+1} \rangle} = \frac{\langle R_k f, X_{k+1} \rangle}{\|\gamma_k\|^2}\,. \tag{8}$$

Ultimately, the convergence is obtained by computing matrix *a*. As a result, verification of two convergences exist here, one is basic data *X*, second is calculation of data *a*. If matrix *X* changes, then matrix a will change as well. If the final result is that both are converged, it indicates that the causes of change are internal. If not converged, then it means that the motivation of change comes from external force, namely abnormal effect. OPM is a static model, but can be applied to dynamic data, which is the process of continuous development for enterprises. Therefore issues of short-term convergence and relative convergence exist here. When the enterprise is very slow in short-term growth, a short-term positive relationship exists in various data of its production, which means the original matrix is multiplied or divided by a specific value. The current enterprise is not absolute rest. Even the enterprise does not develop, there are still differences in specific data, and so relative convergence exists. It means that if there are many data in enterprises which are all very large, a slight change in data will not affect its convergence value.

3.2 APPLICATION OF OPM IN THE APPLICATION OF INTERNAL CONTAL

Principles of OPM application: data information of enterprises is the most comprehensive, so the application of equation and model should be more convenient. But this must rely on a certain history to derive certain data law. OPM is to measure the operational conditions of enterprises through historical data and reach to a state of equilibrium. For example, for the production department, certain material costs, wages, and manufacturing costs of workshop form a certain amount of yield. If the production technology has not been significantly improved, then all data formed matrix should be converged without significant increasing trend. Changes in various costs of production can be designed as a set of vectors, and vectors in each time form the matrix. If the finally obtained value is converged, it indicates that there is no fluctuation in production and operation of enterprises. If matrixes *X* and *a* are unskilled, it means that fluctuations exist in corporate accounting information. The reason may come from the following aspects: first, the improvement of technology. For example, for the production department, the improvement of technology may lead to reduction in a part of costs, raw materials, labor costs, etc.; second, improvement of management level, and the outcome of management will eventually be presented as costs; third, personnel issues - the financial personnel doing account may result in the increase of costs or decrease of efficiency. Therefore, it can be seen that OPM model ultimately conducts analysis on whether financial officer has violations through changes in costs and efficiency. The basis of its implementation it that corporate costs and efficiency will not have drastic changes in a short time.

Analysis on specific application methods of OPM model. Based on the above analysis, OPM calculation process is very complicated, but actually, it can be simplified by using computer even without additional manual operation. Specific steps of application are as follows. First, according to the accounting process and data situation calculation methods and enterprise accounting, OPM calculation software is compiled which should be able to connect with accounting software, in which data can be automatically input to the OPM accounting software. The calculation software should have the alarm function, which can rapidly alerts once there is a problem in calculation result and remind the accounting information managers to pay attention. Second, conduct normal accounting operation. The application of OPM model in accounting model is simple, but its effect is significant. Its calculation process is more complicated, but the operation is simple, as long as the manager conducts accounting in accordance with specific data regularly, the results will be remarkable, while the equation complexity and software confidentiality can effectively prevent violations of law issues within the enterprise. In general, manager of the software should be the executives of enterprises rather than accounting personnel, so that they can supervise from the accounting department. For accounting personnel who do not know the accounting process of software, they are not able to estimate whether entering untrue data will result in changes of software results.

Problems existing in OPM model. Separate OPM application model software development is relatively simple but requiring dock with the accounting software, which is more difficult. So whether OPM can be implemented also needs analysis by software programming experts, it is just assumed that it can obtain here. Second, changes in costs may come from many aspects. Employee turnover rate will change the operating level of corporate employees, thus affecting costs. The increase in prices of raw materials will lead to changes in corporate costs. Failure of strategies will also change the production costs of enterprises. Therefore, if cost increases but the OPM calculation result does not converge, there may be lots of reasons which are difficult to analyse specifically. So OPM can only alert the problem but is not able to discover specific problems. Third, software design is fixed, which may have adaptive issues over time. Fourth, the software should be first on the basis of a lot of past data, therefore only enterprises with longer years of development can use. The scope of application for the software is limited, which can only discover problems by trial for a longer time, therefore cannot have an effect

immediately. It is different from system control

4 Application of OPM model in the evaluation system of accounting information

OPM model application in internal accounting information mainly involves three aspects: first, correctness; second, sensitivity; third, time of persistence. Specific analysis is as follows:

First, evaluate the correctness of OPM model reaction through several commissioning. For medium-sized enterprises, corporate accounting division is very clear. There are many types of data, so the evaluation on its correctness must start from the possible risks of each position in the enterprise and debug the effect of all data changing. For example, turn the data of a position up or down while inputting to see whether it will alarm. If it alarms for all data commissioning, then the model calculation is correct. If there are 10 times failing to alarm among 1000 commissioning, then it indicates the presence of the correct rate is 99%; if there are 100 times failing to alarm, the correct rate is only 90%. The percentage of failure in commissioning may reflect the effect of OPM model.

Second, check the sensitivity of the verifier reaction by fine-tuning the data. Fine-tuning means to conduct several adjustments for a data with the same magnitude of each adjustment which is very small, like the number 10000 plus or minus 1 each time to test the sensitivity of the model. If it alarms when increasing by 10, the sensitivity on data is 99%; if it alarms when increasing by 100, its sensitivity on data is 90%. Sensitivity will not be higher with the increase, if it alarms for a little change, then it will alarm when using the model. However, the enterprise is developing, of which data is bound to change. Thus, over high sensitivity cannot play the genuine role of internal control. The sensitivity is appropriate by reacting only when the magnitude of changing is abnormal.

Third, regularly commission to ensure is use persistence. Enterprises are constantly evolving, so OPM may fail to adapt which needs regular commissioning. The regular basis can be one year, two years or three years according to the development of enterprises. Content of regular commissioning should include correctness commissioning and sensitivity commissioning. In addition, when major changes occur in the organizational structure, market strategy, production technology, and management modes and so on, tests should also be done on the model. Any model has certain adaptability, whether it is able to adapt to all the enterprise development process is yet to be explored. Regular commissioning is an important measure to guarantee the long-term correctness and appropriate sensitivity of the model.

5 Countermeasures for the OPM model application

On the basis of the assumption that the software can be developed, in order to ensure the internal control role on accounting organizations, it should be conducted from the following aspects when enterprise is applying OPM model:

First of all, user of the OPM application software must not be the personnel of accounting agency, but should the executives or supervising department of enterprises. The data of the software comes from accounting, but the parts not belonging to accounting software can be used by non-accounting personnel. In order to ensure the effectiveness of supervision, relevant personnel of accounting agency can be informed that the software is operating, but they cannot be the manager, so as to safeguard the independence of supervision. Executives of corporate shall not be in charge of accounting, whom should be irrelevant with accounting in order to avoid the presence of conflict of interest. If independent supervision department exists in the corporate, then it can be implemented by supervision department, but can only be special personnel, which then accept the supervision of their superiors.

Second, OPM application model software should experience a longer probationary period like a year. This is because seasonal issues usually exist in the operation of enterprises. Only when the software adapts to all time including busy and off seasons and various periods with high or low staff turnover rate can the software be determined as applicable. If other time limits are discovered, then it cannot further be implemented.

Third, evaluation should be conducted regularly for OPM application model software during the trial, including evaluation of correctness and sensitivity. Through evaluation, the adaptability of all production in the enterprise can be fully understood and know whether it can accurately measure abnormal changes in corporate accounting information as well. If it can be satisfied in any time, then the adaptability is good.

References

[1] Liu X 2009 Problems and Countermeasures of enterprise internal control in China *Journal of Insurance professional College* **05** 55-7 *(in Chinese)*
[2] Zou H 2008 Research of application of enterprise internal control *Master degree thesis of Southwestern University of Finance and Economics* 26-7
[3] Yang X, Yang H 2010 The construction of enterprise internal control mechanism in information environment. *The ninth national accounting information annual meeting proceedings (down)* **9** 7 *(in Chinese)*
[4] Yao F 2006 Problem should be solved in enterprise inner control and its countermeasures *Special Zone Economy* **05** 308-9 *(in Chinese)*
[5] Li Y 2006 How to evaluate the enterprise internal control *Chinese financial newspaper* **03** 8 *(in Chinese)*
[6] Zhai Y 2010 Research on internal control in the process of the enterprise *HLJ Foreign Economic Relations & Trade* **06** 101-2 *(in Chinese)*
[7] Zhang X, Dai W 2011 Study on internal control evaluation system for Chinese enterprises *Auditing Research* **01** 69-78 *(in Chinese)*
[8] Wang Y, Hu R 2008 Under the environment of accounting information government research supervision and internal control of

accounting information *The international accounting and business conference set* **7** 287-9 *(in Chinese)*

[9] Wang C 2008 Study on the relationship between internal control system and accounting information quality *Journal of Shandong Youth Administrative Cadres College* **05** 99-103 *(in Chinese)*

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