Research Article

Financial Security Risk Detection in Colleges and Universities Relying on Big Data Clustering Center Scheduling Algorithm

Chengjuan Xia

Finance Department, Jiangsu Vocational Institute of Commerce, Nanjing 210000, China

Correspondence should be addressed to Chengjuan Xia; 070025@jvic.edu.cn

Received 5 May 2022; Accepted 6 June 2022; Published 7 July 2022

Academic Editor: Qiangyi Li

Copyright © 2022 Chengjuan Xia. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

In order to improve the monitoring effect of financial security risk in colleges and universities, this paper studies the financial security risk control of colleges and universities combined with the big data clustering center scheduling algorithm and inverts the multilevel sampling algorithm of quantum potential support. Moreover, this paper considers that the multilevel sampling algorithm is applied to the potential backscattering problem of the stationary Schrödinger equation to invert the support of the potential in the equation. In addition, this paper uses far-field data to invert the generalized linear sampling method of potential support and builds a college financial security risk monitoring model that relies on the big data clustering center scheduling algorithm. The experimental study shows that the financial security risk monitoring system for colleges and universities based on the big data clustering center scheduling algorithm proposed in this paper has good risk clustering and risk identification effects.

1. Introduction

The institutional income of colleges and universities has the characteristics of seasonality, which is in contradiction with the rigid expenditure of school-running funds. Moreover, the funding for education is allocated on a monthly basis. At present, most colleges and universities have implemented a centralized treasury payment system, using “zero balance” accounts for fund settlement, and the budget and use of funds have become more and more strict. The income from education is basically the tuition and accommodation fees charged when freshmen register in September each year. At the end of September, this part of the extrabudgetary funds must be turned over to the special financial account in full and returned after a certain period of time, which makes the education income of colleges and universities have a strong seasonality. However, the expenditures of colleges and universities are rigid and balanced, with no seasonality, and are also affected by the local economic environment and economic policies. The contradiction between the seasonality of income and the rigidity of expenditure is more prominent, which undoubtedly aggravates the formation of financial risks in local colleges and universities.

At present, there are only two sources of income for colleges and universities: one is from the financial appropriation for education, and the other is the tuition income collected from students. Financial appropriations are mainly used to maintain the current expenditure of the school, so it is difficult to have a balance. Moreover, colleges and universities enrollment plans and student charging standards are determined by the government, and colleges and universities have no autonomy, so tuition income is subject to the scale and charging standards of the school, and the growth of career income is extremely limited [1]. In addition, the income that can be brought by school property, transfer of scientific research achievements, and the interest of precipitation funds is also very limited [2].

With the year-by-year expansion of college enrollment and the regional unbalanced expansion of national economic development, the phenomenon of college students’ arrears has become increasingly prominent and has been upgraded year by year, showing the characteristics of large arrears, a wide range of students, and a strong period of time. In particular, the high rate of arrears among juniors and seniors has led to a serious shortage of institutional income in colleges and universities, which has greatly weakened the
self-sufficiency of colleges and universities and increased the financial costs of colleges and universities. This has affected the school’s ability of repaying loans and daily operations to a certain extent and led to an imbalance in the financial situation of colleges and universities. As a public institution, colleges and universities have different financial situation from enterprise units. If an enterprise is insolvent and has an unbalanced financial situation, it can only go bankrupt. However, colleges and universities may have difficulties in daily operating capital turnover, such as arrears of faculty and staff wages, school quotas, quota reimbursements, and migrant workers blocking schools, which seriously affect daily financial payments and lead to failure of normal operation [3].

Budget management is an important part of financial management in colleges and universities, and it is the premise and basis for colleges and universities to carry out various financial works. The preparation of the budget should follow the basic principle of “man-made expenditure, balance of income, and expenditure,” so that the school’s career development plan can be adapted to the financial income and expenditure plan. At present, colleges and universities are in the critical period of construction and development, and the funds are seriously insufficient, and the budget revenue and expenditure cannot be balanced, which eventually leads to a deficit budget [4]. From the current point of view, the deficit budget of colleges and universities can be roughly divided into two situations [5]: one is the false deficit budget; that is, the balance of the year-end is reserved in advance when the budget is prepared, and the deficit budget is within its controllable range. Judging from the final implementation results, these colleges and universities eliminated the budget deficit at the end of the year or controlled the deficit within the range of the previous year’s balance by tapping their potential, increasing revenue, and reducing expenditure, but the potential risk of deficit budget cannot be ignored. The second is the real deficit budget; that is, the school is eager for development, and the investment expenditure in the annual budget is too large, which exceeds its own financial capacity. Judging from the final implementation results, the budget deficit has not been eliminated by spending a large portion of the income, which seriously violates the basic principle of “living within our means and balancing revenue and expenditures” [6]. In addition, due to the rush of time and the lack of understanding of the factors that need to be considered in budget preparation, the budget is inaccurate and incomplete, and it cannot objectively reflect the financial revenue and expenditure status and work priorities of colleges and universities. In the implementation of the budget, some department leaders do not use funds according to the budget, approve funds at will, or change the subsidy standards, etc., so that the departmental budget loses its binding force [7].

With the emergence of new businesses such as promotion, enrollment expansion, and evaluation of school-running levels, the economic activities of colleges and universities are constantly expanding, and the original work process can no longer adapt to the business of colleges and universities under the new situation. The management system compiled in the year has not been updated in time with business changes [8]. For example, a complete set of internal control system have not been established in the aspects of foreign investment, engineering projects, large capital payment, and external financing, resulting in frequent decision-making mistakes. The performance is particularly prominent in the blind investment in infrastructure projects, without a rigorous and scientific feasibility study in advance, indiscriminately engaging in infrastructure construction without sufficient financial support and without control over loan projects and quotas, exceeding colleges and universities. The normal capital load aggravates the investment risk [9].

The investment risk of colleges and universities is mainly the risk generated in the process of investment in infrastructure and school-run enterprises. The investment risk of infrastructure mainly arises from the procurement of building materials and construction specifications, which is temporary and not the daily investment behavior of colleges and universities [10]. School-run enterprises are long-term investment behaviors in colleges and universities, but, unless the colleges have obvious technological advantages or talent advantages, the school-run enterprises of colleges and universities generally will not have obvious economic benefits [11]. At the same time, school-run enterprises have a series of problems such as unclear property rights, no separation of business and enterprise, and poor ability of responding to market changes in the fierce market competition, which makes them hide more risk points in the process of management and operation. School-run enterprises, like social enterprises, have default risks, operational risks, and bankruptcy risks. As the most important investor, colleges and universities become the major shareholders of such enterprises, which will inevitably make colleges and universities bear related joint risks [12].

Operational risk, including internal risks, policy risks, and market risks, mainly refers to the risk that may be caused by factors such as the unbalanced income and expenditure of colleges and universities in the allocation of funds, the imperfect communication mechanism and financial system between colleges and higher authorities, and the level of social market prices [13]. Universities themselves should guard against internal risks, and their risk control should focus on the management of budget and final accounts, improve the internal and external environment of internal control, improve the control of key positions and processes, and establish and improve their own internal control system. At the same time, policy risks and market risks cannot be controlled by colleges and universities and can only be passively accepted, but colleges and universities should keep abreast of policy and market dynamics in order to avoid risks [14].

Consciousness is not strong. Considering the actual situation of the university itself, as a nonprofit institution, the leaders of the university lack the awareness of risk prevention and legal subject awareness. When there is a financial crisis and the university cannot solve it by itself, it will ask the government to come forward for assistance [15].
Staff are busy with daily financial work other than risk management, ignore financial risks, and do not pay attention to learning about financial risks. They only focus on specific financial work such as budget management, financial reimbursement, and tax planning; on the other hand, financial risk prevention work is not integrated into the daily financial work but only depends on the financial staff’s own quality and personal ability. Before the large-scale expansion of enrollment in colleges and universities, the financial risks were low, which reduced the risk willingness to identify financial work to a certain extent. However, the financial work of colleges and universities is inherited and consistent, resulting in the ability of identifying financial risks that have not been improved. Furthermore, the identification of financial risks at this stage has not played its due role in the daily management and operation of colleges and universities and cannot change the determination of the decision-making level of colleges and universities [16].

The financial risk assessment mechanism is weak, mainly manifested in inadequate risk assessment and lack of comprehensive risk monitoring in all aspects, such as identification, assessment, analysis, and early warning of risks. The first step in risk identification is to understand the type of risk. The financial risks faced by local public universities mainly include daily business risks, loan risks, and investment risks [17]. Due to the lack of overall planning, the imbalance of revenue and expenditure caused by seasonal differences in revenue and expenditure is a daily business risk, the capital gap caused by the continuous expansion of infrastructure projects is an investment risk, and the inability of repaying due to blind loans is a financing risk. On the basis of identifying risks, without scientific and perfect evaluation indicators and evaluation methods, accurate evaluation results cannot be obtained. As for the performance of the weak evaluation mechanism, it can be seen from the establishment of new disciplines by local public universities. Some universities are eager to enter new disciplines, but they have not predicted and evaluated the market prospects of new disciplines in advance [18].

Due to its own development needs, it vigorously promotes infrastructure projects, education expenditures, talent introduction, and other businesses but lacks necessary internal control over potential financial risks. Most colleges and universities have not established specific financial risk identification, early warning, control, supervision, evaluation, and crisis response systems, resulting in their inability of properly dealing with financial risks before and during the implementation of the project. First, colleges and universities lack a good internal control environment [19]. Secondly, according to the principles of "receipt and payment realization" in the financial accounting of colleges and universities, the current financial work of colleges and universities cannot truly reflect financial risks, and it is impossible to estimate the timeliness of government funding, which leads to colleges overestimating their own financial status and unscientific control of loan scale. Finally, the internal control system and measures of colleges and universities are insufficient, and the budget execution and financial process have not been effectively evaluated. Due to the lack of independence and disposal power of the internal audit department, its supervisory role is limited [20].

This paper uses the big data clustering center scheduling algorithm to study the financial security risk control in colleges and universities, constructs a financial risk control model for colleges and universities, and improves the financial management effect of colleges and universities.

2. Cluster Center Scheduling Algorithm

2.1. Backpropagation Function. Near-field data of the scattered field are considered to invert the support of the potential. The corresponding forward scattering model is shown in Figure 1. The purpose of this work is to propose a fast and convenient algorithm that can help locate all components of the potential support and provide a good initial guess for some more computationally demanding iterative algorithms.

We set \( w = q(x)u(x), x \in D, D \) as a sampling domain containing potential support \( \Omega \). Since \( q = 0 \) outside the support, the integral region is replaced by \( D \), and (2–4) still holds. \( w \) is substituted into separately to get

\[
q(x)u(x) = q(x)(G_D w)(x), \quad x \in D.
\]

And

\[
q(x) = -(G_S w)(x), \quad x \in S.
\]

Among them, the integral operators \( G_D \) and \( G_S \) are defined as follows:

\[
(G_D w)(x) = \int_D G(x, y)w(y)dy, \quad \forall x \in D,
\]

\[
(G_S w)(x) = \int_D G(x, y)w(y)dy, \quad \forall x \in S, \forall x \in S.
\]

Formulas (1) and (2) are the two basic equations of the multilevel sampling algorithm that we will propose. This algorithm will rely on the approximate function \( w \) obtained by backpropagation, because the function \( w = qu \) supports describing the geometry of the potential support. We first explain mathematically the principle of approximating the function \( w \) by backpropagation. We set \((\cdot, \cdot)_{L^2(S)}\) and \((\cdot, \cdot)_{L^2(D)}\) which are the inner products on the spaces \( L^2(S) \) and \( L^2(D) \), respectively, and the operator \( G_S : L^2(S) \rightarrow L^2(D) \) is the conjugate
of the operator $G_S: L^2(D) \longrightarrow L^2(S)$. Obviously, $G_S^*$ has the following representation:

\[
(G_S^* w)(x) = \int_S G(x, y) w(y) dy, \forall x \in D. \tag{4}
\]

$G_S^*$ is called the backpropagation operator. A subspace of $L^2(D)$ is defined

\[
V_b = \text{span}\{G_S^* u^i\}. \tag{5}
\]

It is called the backpropagation subspace. $w_b$ is set as the best approximate solution of formula (2) on space $V_b$; that is,

\[
\left\|u^i + G_S w_b\right\|_{L^2(S)}^2 = \min_{v_b \in V_b} \left\|u^i + G_S v_b\right\|_{L^2(S)}^2 \tag{6}
\]

The variational form of the above formula is

\[
\Re \left(u^i + G_S w_b, G_S v_b\right)_{L^2(S)} = 0, \forall v_b \in V_b. \tag{7}
\]

Equivalently, it is

\[
\Re \left(G_S w_b, G_S v_b\right)_{L^2(S)} = -\Re \left(G_S^* u^i, v_b\right)_{L^2(S)}, \forall v_b \in V_b. \tag{8}
\]

Because of $w_b, v_b \in V_b$, we set

\[
w_b = \lambda G_S^* u^i, \quad v_b = \mu G_S^* u^i. \tag{9}
\]

Among them, $\lambda$ and $\mu$ are real constants. Formula (6) is brought into formula (5); we have

\[
\Re \left(G_S w_b, G_S v_b\right)_{L^2(S)} = -\Re \left(G_S^* u^i, \mu G_S^* u^i\right)_{L^2(D)}. \tag{10}
\]

That is,

\[
\lambda \left\|G_S^* u^i\right\|_{L^2(S)}^2 = -\left\|G_S^* u^i\right\|_{L^2(D)}^2, \tag{11}
\]

\[
\lambda = -\frac{\left\|G_S^* u^i\right\|_{L^2(D)}^2}{\left\|G_S^* u^i\right\|_{L^2(S)}^2}
\]

Therefore, there is

\[
w_b = -\frac{\left\|G_S^* u^i\right\|_{L^2(D)}^2}{\left\|G_S^* u^i\right\|_{L^2(S)}^2} G_S^* u^i. \tag{12}
\]

$w_b$ is called the backpropagation function.

2.2. Multilevel Sampling Algorithm. The multilevel sampling algorithm is given below, which is an iterative algorithm. Each iteration is based on state equation (1) and field equation (2). If it is assumed that there are $N_i$ groups of incident directions; according to formula (8), for each incident wave $u_j^i (j = 1, 2, \ldots, N_i)$, $w_j$ is calculated; that is [21],

\[
w_j = -\frac{\left\|G_S^* u^i\right\|_{L^2(D)}^2}{\left\|G_S^* u^i\right\|_{L^2(S)}^2} G_S^* u_j^i, \tag{13}
\]

\[
j = 1, 2, \ldots, N_i.
\]

The potential $q(x)$ at point $x$ is approximated by minimizing the residual equation corresponding to the state equation (1), that is, to find

\[
J(q) = \min_{q(x) \in \mathbb{R}} \sum_{j=1}^{N} \left( q u_j^i - w_j - q G_D w_j \right)(x)^2. \tag{14}
\]

There is

\[
J(q) = \sum_{j=1}^{N} \left( q u_j^i - w_j - q G_D w_j \right)(x)^2
\]

\[
= \sum_{j=1}^{N} \left( q u_j^i - G_D w_j \right)(x)^2
\]

\[
= \sum_{j=1}^{N} \left( \left| q u_j^i - G_D w_j \right|^2 - 2q \Re \left( w_j, u_j^i - G_D w_j \right) \right) + \left| w_j \right|^2. \tag{15}
\]

Formula $J(q)$ is derived; knowing $dJ(q)/dq = 0$, we get

\[
\sum_{j=1}^{N} \left( 2q \left| u_j^i - G_D w_j \right|^2 - 2\Re \left( u_j^i - G_D w_j \right) \right) = 0. \tag{16}
\]

Therefore, the minimum point $q(x)$ of (10) has the following expression:

\[
q(x) = \Re \left( \sum_{j=1}^{N} w_j(x) \right) \overline{\left( q u_j^i - G_D w_j \right)(x)} \overline{\sum_{j=1}^{N} \left| u_j^i - G_D w_j \right|^2}. \tag{17}
\]

Among them, $\Re$ represents the real part of the complex number, and the horizontal line represents the complex conjugate. For each sampling point $x$, $q(x)$ is computed. In theory, if there is $q(x) \neq 0$, $x$ is in the support $\Omega$ of $q(x)$. If there is $q(x) = 0$, $x$ is outside $\Omega$. Obviously, the calculations of (9) and (11) are relatively rough; that is, the approximation errors for $u$ and $q$ are relatively large. However, combined with the multilevel sampling algorithm, the position and shape of the potential support can be approximated more efficiently.

To describe the multilevel sampling algorithm, two concepts are first introduced, namely, "minimum distance" and "first gap interval with index $M$." A finite nondecreasing sequence $\{q_1, q_2, \ldots, q_m\}$ is given. All adjacent elements in the sequence are used for difference, which is represented by $\text{dist}(q_i, q_{i+1})$, $i = 1, 2, \ldots, m - 1$, and the smallest positive difference is found, which is called "minimum distance." For all $m - 1$ distances, if $j$ exists, we get $2 \leq j \leq m - 1$, and distance $\text{dist}(q_j, q_{j-1})$ is at least $M$ times the minimum distance of sequence $\{q_1, q_2, \ldots, q_m\}$. Therefore, $(q_j, q_{j+1})$ is called a "gap interval," and the first such "gap interval" is called "the first gap interval with index $M$.

The multilevel sampling algorithm is described as follows:

(1) A sampling domain $D$ is chosen such that it contains the scatterer $\Omega$. On $D$, a uniform (coarse) grid is chosen, consisting of squares (2D) or cubes (3D),
denoted by \( D_0 \). An error \( \varepsilon \) and indicator \( M \) are chosen, and initial thresholds \( c_0 = 0 \) and \( k = 1 \) are set.

(2) For any grid point \( x \in D_{k-1} \), formulas (9) and (11) are utilized to calculate the approximate value of \( q(x) \). Then, the following steps are performed:

(i) The values of \( q_k \) satisfying \( q_k(x) \geq c_{k-1} \) are sorted in increasing order, and the first gap interval with index \( M \) is found in this sequence. The right endpoint of this interval is chosen as the threshold \( c_k \) for the next iteration.

(ii) If the value at a grid point \( x \) is \( q_k(x) \geq c_k \), all grid points with this \( x \) as vertex are selected, \( D_{k-1} \) is updated to all selected grid points, and all the unselected grid points in \( D_{k-1} \) are deleted grid points.

(3) If there is \( |c_k - c_{k-1}| \leq \varepsilon \), we set \( D_k = D_{k-1} \) and perform step (4). Otherwise, the mesh in \( D_{k-1} \) is refined and denoted by \( D_k \). We set \( k = k + 1 \) and go back to step (2).

(4) All grid points in \( D_k \) are output to determine the support of the potential.

2.3. Two Factorizations of Far-Field Operators. We still consider the model problem; the far-field data \( u^∞(\theta, x) \) is given. First, similar to the backscattering case of the acoustic medium, we define the far-field operator \( F: L^2(\mathbb{S}^{d-1}) \rightarrow L^2(\mathbb{S}^{d-1}) \) as follows:

\[
Fg(\bar{x}) := \int_{\mathbb{S}^{d-1}} u^∞(\theta, \bar{x}) g(\theta) d\theta. \tag{18}
\]

We set \( \psi \in L^2(\Omega) \); there exists a unique \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \) that satisfies

\[
\begin{aligned}
\Delta \omega + k^2 \omega - q(x) \omega &= q(x)\psi, \\
\lim_{|\theta| \to \infty} \int_{|\theta|=1} |\frac{\partial \omega}{\partial r} - i k \omega|^2 d\theta &= 0.
\end{aligned} \tag{19}
\]

According to the linear relationship, when there is \( \psi = v_g \), \( Fg \) is the far-field mode of the solution \( \omega \) of (12); among them, there is

\[
v_g := \int_{\mathbb{S}^{d-1}} e^{ikx \cdot \theta} g(\theta) d\theta, g \in L^2(\mathbb{S}^{d-1}), x \in \mathbb{R}^d. \tag{20}
\]

We assume that operator \( H: L^2(\mathbb{S}^{d-1}) \rightarrow L^2(\Omega) \) and operator \( G: \mathcal{R}(H) \subset L^2(\mathbb{S}^{d-1}) \rightarrow L^2(\mathbb{S}^{d-1}) \) are, respectively, defined as follows:

\[
Hg = v_g 1_{\Omega} \tag{21},
\]

\[
G\psi = \omega^∞. \tag{22}
\]

Among them, \( \omega^∞ \) is the far field of the solution \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \) of (12), and \( \mathcal{R}(H) \) represents the closure of the range of \( H \). Obviously, there are

\[
F = GH. \tag{23}
\]

For a given \( f \in H^{1/2}(\partial \Omega), g \in H^{-1/2}(\partial \Omega) \), the inner transport problem is considered

\[
\begin{aligned}
\Delta u + k^2 u - q(x)u &= 0, & x \in \Omega, \\
\Delta v + k^2 v &= 0, & x \in \Omega, \\
u - v &= f, & x \in \partial \Omega, \\
\frac{\partial}{\partial n}(u - v) &= g, & x \in \partial \Omega.
\end{aligned} \tag{24}
\]

Suppose that we set \( k^2 \in \mathbb{R}_+, q(x) \in L^{∞}(\Omega) \), and \( q(x) > 0 \) such that, for any \( f \in H^{1/2}(\partial \Omega), g \in H^{-1/2}(\partial \Omega) \), there is a unique solution \( (u, v) \in L^2(\Omega) \times L^2(\Omega) \) and there is \( u - v \in H^2(\Omega) \).

If there is \( 1/q \in L^{∞}(\Omega) \), except for a countable set, we assume that \( 1 \) holds for any \( k \in \mathbb{R} \) and the operator \( F \) has a dense range at this time. \( k^2 \in \mathbb{R}_+ \) such that assumption 1 does not hold and is called an intratransport eigenvalue. We still define

\[
\phi_z(\bar{x}) := r_d e^{-ik\bar{x} \cdot z}. \tag{25}
\]

Among them, \( r_d \) is easy to obtain the following theorems and lemmas.

**Theorem 1.** Assumption 1 is true: \( \phi_z \in R(G) \) holds if and only if \( z \in \Omega \).

**Lemma 1.** \( \mathcal{R}(H) = \{v \in L^2(\Omega); \Delta v + k^2 v = 0, x \in \Omega\} \).

**Theorem 2.** In the case of assumption 1, the operator \( F \) is injective and has a dense range, and we get the following:

(1) If there is \( z \in \Omega \), there is \( g_z^∞ \in L^2(\mathbb{S}^{d-1}) \) such that \( \|Fg_z^∞ - \phi_z\|_{L^2(\mathbb{S}^{d-1})} \leq \varepsilon, \) and there is \( \lim_{\varepsilon \to 0} \|Hg_z^∞\|_{L^2(\Omega)} < \infty \).

(2) If there is \( z \notin \Omega \), for all \( \|Fg_z^∞ - \phi_z\|_{L^2(\mathbb{S}^{d-1})} \leq \varepsilon \) satisfying \( g_z^∞ \in L^2(\mathbb{S}^{d-1}) \), \( \lim_{\varepsilon \to 0} \|Hg_z^∞\|_{L^2(\Omega)} = \infty \).

GLSM is an improvement on the linear sampling method. First, a standard least squares functional is constructed with a penalty term that can control \( \|Hg_z^∞\|_{L^2(\Omega)} \). The far field of \( \omega \) has the following expression:

\[
\omega^∞(\bar{x}) = \int_{\Omega} e^{-ik\bar{x} \cdot \gamma} \tilde{q}(y)(\psi(y) + \omega(y)) dy. \tag{26}
\]

Therefore, there is \( G = H^*T\psi \). Among them, \( H^*: L^2(\Omega) \rightarrow L^2(\mathbb{S}^{d-1}) \) is the adjoint operator of \( H \), which satisfies

\[
H^* \varphi(\bar{x}) = \int_{\Omega} e^{-ik\bar{x} \cdot \gamma} \varphi(y) dy, \varphi \in L^2(\Omega), \bar{x} \in \mathbb{S}^{d-1}. \tag{27}
\]
Operator \( T: L^2(\Omega) \rightarrow L^2(\Omega) \) has the following definition:

\[
T\psi := -q(\psi + \omega).
\]  

(28)

Here, \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \) is the solution of (1). Ultimately, we get

\[
F = H^*TH.
\]  

(29)

This factorization means \( (Fg, g)_{L^2(\mathbb{S}^{d-1})} = (T(Hg), Hg)_{L^2(\Omega)} \). If the operator \( T \) satisfies the mandatory, the boundedness of \( (Fg, g)_{L^2(\mathbb{S}^{d-1})} \) is equivalent to the boundedness of \( \|Hg\|_{L^2(\Omega)}^2 \). Therefore, \( \|Fg\|_{L^2(\mathbb{S}^{d-1})} \) can be used as a penalty term and as a criterion for the final construction of the indicative function, which will be the basis of GLSM.

2.4. Properties of Correlation Operators. Two factorizations of the far-field operator are given, and the properties of the proposed correlation operator are given in this section. We know that \( H \) and \( G \) are compact operators, and we will prove that the operator \( T \) is coercive.

Suppose 2 that we set \( q(x) \in L^\infty(\Omega) \), \( \text{supp}(q) = \Omega \), and there is a constant \( q_0 > 0 \) such that, in the sense of almost everywhere, when there is \( x \in \Omega \), there is \( q(x) \geq q_0 \).

**Theorem 3.** We assume that hypothesis 2 holds and \( k^2 \in \mathbb{R}_+ \) is not the inner transmission eigenvalue of (4). Then, the operator \( T \) defined by (5) satisfies the mandatory condition

\[
|\{T\phi, \varphi\}| \geq \mu \|\varphi \|^2, \forall \varphi \in R(H).
\]  

(30)

\((\cdot, \cdot)\) represents the inner product in \( L^2(\Omega) \), where the operator \( H \) is defined by (2).

We prove that, for \( \psi \in L^2(\Omega) \) and \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \) as the solution of (1), we have

\[
(T\psi, \psi) = -\int_\Omega q(\psi + \omega)\overline{\psi}d\text{dx}.
\]  

(31)

According to elliptic regularization theory, there is \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \). Both sides of (12) are multiplied by \( \overline{\omega} \), and we integrate over a sufficiently large sphere containing \( \Omega \) and radius \( R \); we have

\[
\int_{B_R}(\Delta \omega + k^2 \omega - q(x)\omega)\overline{\omega}d\text{dx} = \int_{B_R}q(x)\psi\overline{\psi}d\text{dx}.
\]  

(32)

According to Green’s formula, there is

\[
\int_{B_R}(q(x)(\psi + \omega)\overline{\psi})d\text{dx} = \int_{B_R}\Delta \omega\overline{\psi}d\text{dx} + \int_{B_R}k^2 \omega \overline{\psi}d\text{dx}.
\]

\[
= -\int_{B_R}|\Delta \omega|^2d\text{dx} + \int_{B_R}k^2 \omega \overline{\psi}d\text{dx} + \int_{\partial B_R}\frac{\partial \omega}{\partial r} \overline{\psi}d\text{ds}.
\]

\[
= -\int_{B_R}|\Delta \omega|^2 + k^2|\omega|^2)\overline{\psi}d\text{dx} + \int_{\partial B_R}\frac{\partial \omega}{\partial r} \overline{\psi}d\text{ds}.
\]  

(33)

Therefore, according to the Sommerfeld radial condition, we have

\[
\lim_{r \rightarrow \infty} \int_{|x|=r} \frac{\partial \omega}{\partial r} \overline{\psi}d\text{ds} = k\int_{S^{d-1}}|\omega|^2d\text{ds}.
\]  

(34)

Therefore, both sides of the equal sign of (18) are taken as imaginary parts; when there is \( R \rightarrow \infty \), there is

\[
\lim_{R \rightarrow \infty} \int_{B_R}(q(x)(\psi + \omega)\overline{\psi})d\text{dx} = \int_{S^{d-1}}|\omega|^2d\text{ds}.
\]  

(35)

Since there is \( (\psi + \omega)\overline{\psi} = |\psi + \omega|^2 - (\psi + \omega)\overline{\omega} \), we have

\[
\langle T\psi, \psi \rangle = -\int_{\Omega} q(x)(\psi + \omega)\overline{\psi}d\text{dx}
\]

\[
= -\int_{\Omega} q(x)(|\psi + \omega|^2 - (\psi + \omega)\overline{\omega})d\text{dx}
\]

\[
= \int_{\Omega} q(x)(\psi + \omega)\overline{\omega}d\text{dx}.
\]  

(36)

Therefore, there is

\[
\langle T\psi, \psi \rangle = k\int_{S^{d-1}}|\omega|^2d\text{ds}.
\]  

(37)

Now, we prove coercivity by contradiction. If it is assumed that there is \( \psi_l \in R(H) \) such that \( \|\psi_l\|_{L^2(\Omega)} = 1 \) and when there is \( l \rightarrow \infty \), there is \( \langle T\psi_l, \psi_l \rangle \rightarrow 0 \). When there is \( \psi = \psi_l \), we use \( \omega_l \in H^1_{\text{loc}}(\mathbb{R}^d) \) to denote the solution of (12). According to elliptic regularization theory, \( \|\omega_l\|_{H^1(\Omega)} \) is uniformly bounded with respect to \( l \). In the sense of subsequence (for convenience, we still use the original subscript), \( \psi_l \) weakly converges to some \( \psi \) in \( L^2(\Omega) \) and \( \omega_l \) weakly converges in \( H^1_{\text{loc}}(\mathbb{R}^d) \) and strongly converges to a certain \( \omega \in H^1_{\text{loc}}(\mathbb{R}^d) \) in \( L^2(\Omega) \). Obviously, \( \psi, \omega \) satisfies (12). Since there is \( \psi_l \in R(H) \), there is

\[
\Delta \psi + k^2 \psi = 0, x \in \Omega.
\]  

(38)

From formula (19) and \( \|T\psi_l, \psi_l\| \rightarrow 0 \), it can be known that in \( L^2(\mathbb{S}^{d-1}) \) there is \( \psi_l^{\infty} \rightarrow 0 \), so there is \( \psi_l^{\infty} = 0 \). By Rellich’s theorem and the unique extension principle, outside \( \Omega \), there is \( \omega = 0 \), so there is \( \omega \in H^1_{\text{loc}}(\Omega) \). From (20), \( u = \omega + \psi \in L^2(\Omega) \) and \( v = \psi \in L^2(\Omega) \), which satisfy \( u - v \in H^2(\Omega) \). At the same time, when there is \( f = g = 0 \), \( u \) and \( v \) are the solutions of the inner transmission problem (15), so there is \( \omega = \psi = 0 \). \( \psi_l \) and \( \omega_l \) are brought into (17); we have

\[
\lim_{l \rightarrow \infty} \|T\psi_l, \psi_l\| = \int_{\Omega} q(x)(\psi_l + \omega_l)\overline{\psi_l}d\text{dx}
\]

\[
= \int_{\Omega} q(x)(\psi_l\overline{\psi_l}d\text{dx} - \int_{\Omega} q(x)\omega_l\overline{\psi_l}d\text{dx}
\]

\[
\geq \int_{\Omega} q(x)|\psi_l|^2d\text{dx} - \int_{\Omega} q(x)\omega_l\overline{\psi_l}d\text{dx}.
\]  

(39)

Therefore, when there is \( \int_{\Omega} q(x)\omega_l\overline{\psi_l}d\text{dx} \rightarrow 0 \), there is

\[
\lim_{l \rightarrow \infty} \|T\psi_l, \psi_l\| \geq \int_{\Omega} q(x)|\psi_l|^2d\text{dx} > 0.
\]  

(40)

When there is \( l \rightarrow \infty \), \( \|T\psi_l, \psi_l\| \rightarrow 0 \) is contradictory; then \( T \) is mandatory.
3. Financial Security Risk Detection in Colleges and Universities

With the passage of time, enterprises will also interact with other enterprises in the complex and changeable market environment, which constitutes the dynamic evolution of the entire market economy. On the other hand, schools participate in and carry out financial activities such as day-to-day operations, fundraising, and investment in the market and have various financial relationships with shareholders, suppliers, customers, creditors, and the government. Therefore, the financial risk of colleges and universities will show the “spatiotemporal,” characteristics as shown in Figure 2.

Through effective operation, a steady stream of cash flow can be generated, and providing long-term cash flow is the essence of enhancing the value of colleges and universities. The three-dimensional financial risk analysis is shown in Figure 3.

When colleges and universities choose to adopt a strategy that deviates from the industry’s conventional strategies, it will increase their operational risks. However,
Figure 4: 3D risk warning sign identification.

Figure 5: Logical framework of selection of three-dimensional financial risk monitoring indicators.
when colleges and universities adopt a strategy close to the industry’s conventional strategy, their operational risks will be reduced, and the performance of colleges and universities will be relatively moderate accordingly. In addition, the execution of a university’s strategy also affects its financial risk. When the financial status and operating results recorded on the accrual basis do not match the operating cash flows, investing cash flows and financing cash flows recorded on the cash basis, corresponding to three-dimensional financial risks, will arise. The three-dimensional financial risk identification of colleges and universities is shown in Figure 4.

Scientific and effective design and selection of three-dimensional financial risk monitoring indicators in colleges and universities are not only the key to financial risk early warning, but also the premise of financial risk control. The design of three-dimensional financial risk monitoring indicators for colleges and universities is mainly based on the Harvard analysis framework of “strategic structure → strategic execution.” The logical framework for the selection of three-dimensional financial risk monitoring indicators in colleges and universities is shown in Figure 5.

The financial risk early warning index system of colleges and universities is shown in Figure 6.

In the process of implementing this theory, it is necessary to formulate a strategy as a guideline, comprehensively control and improve the operation of colleges and universities, and effectively assess risks. Moreover, colleges and universities must have an overall view, so that every employee has the awareness of risk management and control and consciously assumes the risk responsibility that they should take. In addition, colleges and universities start from high short-term goals, combine long-term goals, exert the comprehensive effect of the two, and formulate measures to control financial risks, thereby effectively avoiding risks. Figure 7 shows the risk management flow chart of this paper.

The most important thing in the evaluation index system of financial risk in colleges and universities is to select key indicators with high sensitivity, so that the index evaluation system can fully and truly reflect the financial risk situation faced by colleges and universities. According to the characteristics of financial activities of colleges and universities, its evaluation index system can generally be divided into four categories: solvency index, operation performance index, profitability index, and development potential index. Considering that the main source of financial risk is liabilities, the evaluation index system is mainly based on solvency indexes, supplemented by operational performance indexes, and supplemented by profitability indexes and development potential indexes. The detailed composition of each part is shown in Figure 8.

If financial problems are found in the project implementation process, they should be analyzed in time, the
<table>
<thead>
<tr>
<th>Financial Risk Evaluation Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset-liability ratio</strong></td>
</tr>
<tr>
<td><strong>Current ratio</strong></td>
</tr>
<tr>
<td><strong>Interest-bearing liability ratio</strong></td>
</tr>
<tr>
<td>The ratio of long-term liabilities to total liabilities</td>
</tr>
<tr>
<td><strong>Debt repayment rate</strong></td>
</tr>
<tr>
<td><strong>Cash liability ratio</strong></td>
</tr>
<tr>
<td>The ratio of new liabilities for the current year</td>
</tr>
<tr>
<td>The ratio of the principal and interest of the returned liabilities in the current year</td>
</tr>
<tr>
<td>Interest multiple has been obtained</td>
</tr>
<tr>
<td><strong>Debt equity ratio</strong></td>
</tr>
<tr>
<td><strong>School annual income and expenditure ratio</strong></td>
</tr>
<tr>
<td>Percentage of tuition and income per student</td>
</tr>
<tr>
<td><strong>Public expenditure ratio</strong></td>
</tr>
<tr>
<td><strong>Growth ratio of fixed assets</strong></td>
</tr>
<tr>
<td><strong>Self-raised income capacity ratio</strong></td>
</tr>
<tr>
<td>The proportion of receivables and provisional payments to the current assets at the end of the year</td>
</tr>
<tr>
<td><strong>Income ability index</strong></td>
</tr>
<tr>
<td><strong>Assets income ratio</strong></td>
</tr>
<tr>
<td><strong>Net assets income ratio</strong></td>
</tr>
<tr>
<td><strong>Investment income ratio</strong></td>
</tr>
<tr>
<td><strong>Pure contribution per capita of the staff</strong></td>
</tr>
<tr>
<td><strong>Education cost per student</strong></td>
</tr>
<tr>
<td><strong>Assets equity ratio</strong></td>
</tr>
<tr>
<td><strong>Use ratio of its own funds</strong></td>
</tr>
<tr>
<td>The proportion of the balance of self-owned funds in the monetary funds at the end of the year</td>
</tr>
<tr>
<td><strong>Net cash growth rate</strong></td>
</tr>
<tr>
<td><strong>Net asset growth rate</strong></td>
</tr>
</tbody>
</table>

**Figure 8:** Comprehensive evaluation index system of financial risk in colleges and universities.
reasons for the financial problems should be found out in

time, and emergency plans should be implemented in time.
At the same time, through a sound and timely and effective
implementation of the financial management system, fi-
nancial risks can be discovered in time, and the losses caused
by financial risks can be reduced without risk accumulation.

The project company should improve the financial risk
management system and ensure strong execution. More-
over, the Municipal Education Bureau should make re-
quirements or suggestions from a regulatory perspective.

On the basis of the above research, the effect evaluation
of the college financial security risk monitoring system
relying on the big data clustering center scheduling algo-

rithm proposed in this paper is carried out, and the financial
risk clustering and risk identification effects are counted, as
shown in Tables 1 and 2.

Through the above research, it can be seen that the fi-
nancial security risk monitoring system for colleges and
universities based on the big data clustering center sched-
uling algorithm proposed in this paper has good risk
clustering and risk identification effects.

4. Conclusion

At present, the contradiction between the educational in-
vestment and educational demand of colleges and univer-
sities is very prominent. Moreover, in order to accelerate the
process of self-development, colleges and universities ac-
tively broaden the sources of funds, raise construction funds,
and use bank loans to improve the conditions of running
schools, solve the practical difficulties in the development of
education, and make up for the funding gap in the develop-
ment of higher education at this stage. In a short period of
time, such a large investment has not been found in the
history of colleges and universities. However, borrowing can
bring benefits to colleges and universities, but borrowing
also brings risks to colleges and universities. This paper
studies the financial security risk control of colleges and
universities combined with the big data clustering center
scheduling algorithm and constructs a financial risk control
model for colleges and universities. The experimental study
shows that the financial security risk control system for
colleges and universities based on the big data clustering
center scheduling algorithm proposed in this paper has good
risk clustering and risk identification effects.

Data Availability

The labeled dataset used to support the findings of this study
are available from the author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

Acknowledgments

This study was sponsored by Jiangsu Vocational and
Technical College of Economy and trade key topic: Con-
struction of University Budget Performance Indicator Sys-
tem-Jiangsu Economy and Trade as an Example (project no.
JSJM20001).
References


