Analysis on Risk System Policy of Higher Education Marketization

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Abstract: Education, as a producer of new knowledge, new concepts and new professionals, is closely related to high technology. The higher the scientific and technological level of society, the greater the role of higher education. Nowadays, higher education around the world is experiencing "marketization" to varying degrees in the context of globalization. As the name implies, governments relax control, add market logic in higher education, and guide the development path of higher education institutions through different price mechanisms and competition, so as to enhance the development of higher education, market flexibility and efficiency. At the same time, on the basis of the evaluation mechanism, while providing rich information to consumers of higher education, it can also promote higher education to pay more attention to performance and quality of education. However, in the process of marketization, there are certain problems with the risk control of education policy. Based on the theoretical basis of the marketization of higher education in neoliberal economics and the new public management theory, this paper uses systematic dynamics to analyze the risk factors of the state of the education market, establishes a vector autoregressive model, and gives constructive opinions.

Keywords: marketization of higher education, system dynamics, vector autoregressive model, risk control

1. Introduction

The central idea of higher education marketization is to take the market as the core, and to manage higher education through price and competition mechanism by using market resource allocation and the characteristics of market mechanism. After introducing such a market concept into the operation and management of higher education, it is convenient to make full use of the balance mechanism of supply and demand in the market and maximize the efficiency of higher education. The goal of the market-oriented reform of higher education is to establish a reasonable market regulation mechanism, so as to establish a higher education resource based allocation mechanism that meets the requirements of market economy development, and thus establishing a mechanism that combines plan and market organically. At present, the marketization of higher education in China is undergoing reform with corresponding problems.For example, in the process of reform, there are obstacles in system and mechanism and difficulties in operation and management, which are mainly manifested as imperfect organizational system of higher education, excessive centralized administrative intervention and unreasonable allocation of teaching resources. In the process of higher education operation, the cost of capital is high, and the mechanism is not perfect, and the reform of higher education industry competition barriers and other puzzles and problems.

2. Model and data

Adam Smith, a famous economist, as the enlightener of the concept of education marketization, put forward relevant educational concepts in the study of government functions. Although he strongly advocated the concept of "laissez-faire" and the exclusion of government intervention in related economic affairs, he always believed that the state must give support to the basic education of teenagers (he thought that school education was divided into basic education and university education).

Friedrich Hahavek and Milton Friedman of Chicago School are typical representatives of neoliberal theory — and advocates of education marketization. As early as in the 1960s, Hayek began to apply the relevant theories of market economics to the field of education. He believed that the basis and basis of educational activities is the market, and we should use the relevant competition mechanism of the market to carry out educational management.

Friedman argues that it should be determined by the market and the number of people for higher education, the national investment in the education sector size should not be influenced by non-economic various social or other factors. It should be determined by the eventual return on investment in education. Milton Friedmann advocated free market economy from 1950s and criticized the government's intervention in the market [1-3]. He believed that the economic liberalism he advocated was a kind of neoliberalism "and he held that the ideal model of market economy mechanism is under such economic mechanism, individuals produce behaviors by pursuing their own interests. Under such economic conditions, complex social structures under certain conditions can be formed through mutual cooperation between individuals and others while pursuing their own

interests.

In his study "The Role of Government in Education", he argues that unless education activities are market-oriented, without reasonable market competition, the energy and resources we expend will be in vain, and ordinary reform measures will be useless. Students should be charged by both private and public institutions of higher learning[4] and the government should subsidize public institutions of higher learning by means of education vouchers or loans, so that students can freely choose the institutions of higher learning they want to study and repay the loans after graduation or employment[4] and the government funding for public colleges and universities also need through the way of education by coupons or loans, to let the students choose to attend colleges and universities in receiving higher education or employment after graduation to repay the loan.

The marketization of higher education of new public administration is an extension of managerialism in university management, especially in the field of public university management. At the macro level, it advocates that in the relationship among government, market and university, the government needs to reorganize the way, that is to program the form of indirect regulation in the former direct management way, discard the previous rigid administrative orders, and choose the way of economic stimulus to open the market.

For example, to bring competition mechanism and evaluation mechanism into the market, promote the informatization development of higher education, strengthen social supervision and evaluation of intermediary organizations and other means. In dealing with the relationship between public and private universities and the government, the government should make adjustments from the perspective of policy, cancel all kinds of restrictions on private higher education, try to make public and private universities in a fair position in the market, encourage public universities to learn from the management experience of private universities. At the micro level, the author holds that universities should have the consciousness of independent decision-making and responsibility in their internal management and decision-making, and dare to make decisions and take responsibility. In the management concept, it should have the management consciousness of input and output or cost and benefit, and strengthen the enterprise concept and spirit of university operation. In the source of funds, wide open channels, fully tap the market potential;

In the goal of running school, we should have the characteristic consciousness of adapting to market demand and the quality consciousness of pursuing reputation. In terms of specialty, discipline and curriculum setting and teaching, marketing consciousness should be developed from seller's market to buyer's market. In terms of management efficiency, quantitative assessment is adopted as the main means of objective management, rewards and punishments are combined, and an internal accountability mechanism of rewarding the good and punishing the bad, rewarding the diligent and punishing the lazy is established [5].

In view of the above analysis, the current research on marketization theory of domestic higher education is given the problem of single method selection.The research data failed to contain the latest real-time data and the selection of research objects was not comprehensive. Scholars at home and abroad use different research methods to analyze and judge the characteristics of the risk factors of higher education marketization through the combination of system dynamics, and carry out the stationarity test empirical analysis, so as to provide a reference for the construction of higher education market and the improvement of related systems.

2.1 Construction of marketization risk index system of higher education

This paper introduces the method of dynamics, analyzes the principle of risk formation in the process of higher education marketization, and establishes the risk system model of higher education marketization.

As shown in the above table, the five risk categories are classified and further refined by analytic hierarchy process, and the risk factors at a deeper level are decomposed, and the risk level is determined by the relevant weight coefficients.

2.2 Analysis on vector autocorrelation regression

2.2.1 Index selection

The indicators selected in this paper are operation, education quality, evaluation system, legal risk and macro environmental risk. The data are annual data of Beijing from 2010 to 2022. To natural logarithm difference in this paper, the data processing, in the process of analysis, the variables will be using the natural logarithm difference sequence for analysis (with a capital letter to replace), which can effectively overcome the variable sequence of heteroscedasticity problems, on the other hand the regression coefficient has the very good economic meaning, to a certain extent, can be understood as a variable elasticity coefficient.

2.2.2 Sequence test

Unit root test. Vector autocorrelation regression and its analysis are conducted based on stable series, but most time

Table 1. Risk incentives and weights of higher education marketization

risk type	The primary factor	The secondary factors	risk type	The primary factor	The secondary factors
business risks 0.31	financial index Risks 0.74	solvency 0.65	legal risk 0.03	Legal adequacy0.86	Clarity of ownership0.73
		profitability 0.23			Non-standardized laws 0.16
		operation capacity 0.12			Collateral disposal risk 0.10
	market risk 0.25	Industrial competition 0.33		Law enforcement 0.14	Disordered registration 0.11
		Development perspective of the industry0.66			High cost of rights protection 0.67
Education based quality risk 0.28	teaching result	Online courses 0.23			Long judicial process 0.21
		Less teachers-students interaction 0.55	Macro environment Risk 0.21	Risk of macro-economy 0.73	GDP growth rate 0.23
	Improvement level 0.66	Unrecognized academic degree0.28			excessive cost 0.69
	Teachers Improvement level 0.33	Teacher effect 0.77			Great degree of variation 0.07
		Quality of teachers 0.22		Industry Development 0.11	Market competition 0.16
evaluation system Risk 0.26	System stringency Deficiency 0.73	System Vulnerability risk 0.48			Development perspective 0.47
		Hardware risk 0.36			Market demand 0.36
		Failure in identification of false information 0.15		policy risk 0.15	Unstable policy 0.73
	evaluation criteria Non-standardized 0.22	Lack of industry standards 0.64			Excessive government intervention 0.27
		Not supported by laws and regulations 0.35			

series in reality is an unstable data generation process, so when analyzing the relationship between the marketization of higher education and risk factors and other major variables, it is necessary to conduct correlation tests on time series. In metrology, this judgment method is mainly carried out through the unit root test, in which the Dickey-Fuller test (DF test), and Augmented Dickey-Fuller test (ADF test) and Phillips-perron (pp) test are the most common. In this paper, Phillips-perron (pp test) method is used to test the stationary process of unit.

Table 2. Results of unit root test

Variable	pp test statistics	Critical value		Variable	pp test statistics	Critical value	
JY	-2.1392	1%	-3.8574	DJY	-4.1401	1%	-3.8868
		5%	-3.0404			5%	-3.0522
JYZL	-2.0056	1%	-3.8574	DJYZL	-3.5455	1%	-3.8868
		5%	-3.0404			5%	-3.0522
PJ	-1.3453	1%	-3.8574	DPJ	-2.6694	1%	-3.8868
		5%	-3.0404			5%	-3.0522
FL	-0.4175	1%	-3.8868	DFL	-2.3229	1%	-3.9204
		5%	-3.0516			5%	-3.0655
HGHJ	-3.3453	1%	-3.8868	DHGHJ	-2.5654	1%	-3.9204
		5%	-3.0516			5%	-3.0605

2.2.3 VAR model and related methods

(1) Vector autoregression Model (VAR Model)

Vector autoregressive model (vectorautoregressivemodel) is put forward in 1980 by Sims used to prediction of time series

of variable dynamic effect, after the study has become one of the important reference standards of modern macroeconomic analysis. In a vector autoregressive model, the t stage in any changes occurred in the interval of the disturbance. Through the dynamic influence between variables, a series of chain reactions are generated for each variable after the t period, which is usually used to describe the prediction of the time series system. It can also be used to express the dynamic effect of the random disturbance term on the variable system, and its general mathematical expression is as:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B_1 x_t + \ldots + B_r x_{t-r} + \varepsilon_t \ . \ t = 1, 2, \ldots, T \tag{1.1}$$

Where, y_t is as the endogenous variable vector, whilefalserepresents exogenous variable vector, and the two belong to different dimensions. $A_1 \ldots A_p$ and. $B_1 \ldots B_r$ are the parameter matrix in the model, ε_t is the random disturbance term used to detect the dynamic influence on the variable system, this model is a VAR(P) model.

(2) Impulse response function (IRF)

As the VAR model is not a simplified model, rather a structured model, and every variable in the model can be interpreted as: as a single parameter of the endogenous dimension, the estimated value of the variable itself has some deviation, and finally the interpretation of the vector autoregression model is meaningless. Impulse response Function (IRF) is generally used to describe the dynamic response of the system to the impact disturbance term [6], so as to judge the time-delay relationship between variables. The autoregression model of a p-order vector can be expressed as follows:

$$y_t = \beta + \alpha_1 y_{t-1} + \ldots + \alpha_p y_{t-p} + \varepsilon_t \tag{1.2}$$

In the above formula, y_t is the endogenous variable vector of k dimension, β signifies a constant vector, α_1 is the coefficient matrix, but ε_t is the error vector, and the corresponding covariance matrix in the model is Ω. If y_t is assumed to represent a stationary random process, then:

$$y_t = C + \sum \psi_s \varepsilon_{t-s} \tag{1.3}$$

It can be obtained through the constant vector β and coefficient matrix α_1 in Formula (1.2). In Formula (1.3), C is the constant vector and ψ_s is the coefficient matrix.

Where, the first row i and j column element of the coefficient matrix ψ_s is the dynamic response of the impulse response, specifically the result of the periodic impulse response s generated by the i variable against the j variable. Since the covariance matrix is positive, there is a non-singular matrix P, so that $PP' = \Omega$, Equation (1.3) can be expressed as:

$$y_t = C + \sum (\psi_s p)(p^{-1} \varepsilon_{t-s}) = C + (\psi_s p)\overline{\omega}_{t-s} \tag{1.4}$$

After formula (1.4) is substituted and transformed, the original error vector is transformed into a standard vector white noise $\overline{\omega}$. The impulse response function is used to compare the change of the impulse response at different lag periods to determine the lag when the relevant variables are acting. For this study, impulse response analysis can accurately know the dynamic characteristics of various variables and moderating variables, and provide reference for vector autoregressive model.

(3) Variance decomposition (VD)

Variance decomposition is decomposed into the impact of the impact of each variable in the system by using the predicted mean square error of the system, and its role is to analyze the contribution degree of each variable factor [7]. The s step prediction error of the model VAR is:

$$Var\left[y_{t+s} - E\left(y_{t+s} \mid y_t, y_{t-1}, y_{t-2}, \ldots \right) \right] = \varepsilon_{t+s} + \psi_1 \varepsilon_{t+s-1} + \psi_2 \varepsilon_{t+s-1} + \ldots + \psi_{s-1} \varepsilon_{t+1} \tag{1.5}$$

The mean square error is：

$$MSE = \Omega + \psi_1 \Omega \psi'_1 + \ldots + \psi_{s-1} \Omega \psi'_{s-1} = \sum_{j=1}^{k} (p_j p'_j + \psi_1 p_j p'_j \psi'_1 + \ldots + \psi_{s-1} p_j p'_j \psi'_{s-1}) \tag{1.6}$$

Among them, the content expression in parentheses represents the contribution degree. The contribution by j

orthogonalization shock to the *s* mean square error of step prediction, and P_j is the *j* column vector in the matrix *j*. In this study, the variance decomposition method is mainly used to estimate the time delay of variables and the magnitude of effects between variables.

3. Results and discussion

Variance decomposition analysis of the present results (table 3) showed that the (legal risk factors before) operating risk based factors on the marketization of college education is a process of gradually reducing the education quality factors effect on university education marketization operation is relatively stable, among them, the evaluation system and gradually increase the macro environmental risk factors, is a gradual process from weak to strong and the marketization of higher education itself explains most of the changes and its short-term contribution rate is about 70%.

Table 3. Variance decomposition

P	S.E.	JY	JYZL	PJTX	HGHJ
1	0.0369	59.8359	29.8543	10.3098	0.0000
2	0.0441	59.0670	27.9271	12.7106	0.2953
3	0.0448	56.8330	28.5447	11.7648	2.8575
4	0.0458	55.9314	28.4799	12.6367	2.9520
5	0.0463	53.7024	27.3525	15.1963	3.7487
6	0.0464	53.6236	27.2777	15.1424	3.9563
7	0.0466	52.7142	26.6864	15.4521	5.1473
8	0.0468	52.3543	27.1477	15.3362	5.1618
9	0.0469	52.3144	27.1710	15.3608	5.1539
10	0.0471	52.2111	27.3144	15.3322	5.1423

However, in the long run, the marketization of higher education has the greatest impact on business risk factors, with its contribution rate reaching 52.2111%. This result accords with that of impulse response function. The macro-economic regulation in the marketization of higher education also plays an important role in the macro-environment.

It can be seen from the above analysis of impulse response function and variance decomposition between business risk, education quality, evaluation system, macro environment and higher education that: From the perspective of marketization of higher education, changes of marketization have the greatest and direct impact on enterprise operation with the longest effect. In the short term, the largest contribution to the overall operation is 59.84%, and in the long term, it reaches 52.21%. The relatively small impact on the evaluation system and macro environment indicates that the marketization of higher education has the most direct and significant impact on the market operation in both the long term and the short term.

4. Conclusions and recommendations

Generally speaking, the relevant issues that are controversial in the industry are not fully conceptualized, such is the existence of higher education marketization. The industry and academia have not reached consensus on relevant systems and policies. The mainstream of the academic community tends to hold that marketization of higher education means "introducing market mechanism into higher education to make higher education marketable" [8]. As for this definition, it is not particularly clear in terms of connotation and extension direction. The existence of market mechanism itself needs to be explained, and it seems unreasonable if the concept explanation fails to clarify the problem [9].

There are some representative views of scholars in the world, among which Smith D., as a representative scholar of relevant schools, believes that marketization may lead to the transformation of higher education through such an organizational orientation and taking customers as the center of decision-making. On the one hand, this definition emphasizes the organization of marketization and indicates that marketization is not a specific problem faced by individuals. At the same time, the viewpoint also highlights the customer-centered education market should be guided by a certain demand of customers to carry out specific operations; Finally, to the cultural level, it is also the transformation of the cultural form of higher education and the remodeling of higher education culture. The meaning behind it is not only the transformation of knowledge form, but also the change of the relationship between the government, the market and the educated.

The Organization for Economic Cooperation and Development (OECD) put forward views on the marketization of higher education in its report on restructuring higher education. The report pointed out that if the market mechanism is

embedded in higher education, it should follow the rules of market economy operation and at least have significant market characteristics, such as competitive price and other concepts At the same time, the marketization of higher education needs to exclude absolute privatization or public ownership mechanism.

In the author's opinion, compared with the concepts proposed by other scholars, this definition more deeply explains the fundamental nature of the marketization of higher education. This attribute emphasizes the influence of market-oriented operation of higher education, rather than the attributes of higher education itself. This point is extremely important, which is conducive to the society and scholars to clearly understand the nature of marketization of higher education. At the same time, it can also help the relevant people in the society and scholars to understand that marketization of higher education is a problem of operation and means, rather than the value pursuit of higher education. Only on this basis can the efficiency of higher education marketization be produced.

Through the above part of the analysis of the fundamental attributes of higher education marketization and the confusion of higher education in China today, the author believes that the marketization reform of higher education in China needs to play a relevant role in the relationship between the government and universities, society and universities as well as within universities. Based on the above research contents, the following suggestions are proposed.

(1) Reduce government input in public finance and appropriately increase market-based input

Through effective means, to guide the universities to develop based on the society with transfer from relying on the government to relying on the society.At the same time, to increase the evaluation of social service performance and output. Due to the continuous increase of public financial expenditure, the proportion of environmental resources and teacher resources continues to expand, but the final output quality is not ideal. Education is a sacred undertaking. The primary task is to cultivate talents. But at the same time, the survival of education also needs diversified forms to develop, on the basis of survival, surplus labor and surplus value can have a virtuous cycle process. In order to develop the marketization operation of higher education, we must follow the law of market operation and cannot blindly oppose the profit of universities.

(2) Strengthen the interaction, exchange and cooperation between higher education and the private sector

With the change of economic market form, the integration of industry and education is in line with the trend of social economy. Under such economic background, just like the concept of community of common destiny and economic globalization, the cooperative orientation can break down barriers, and then the healthy and sustainable development and educational output can be achieved; In terms of means, we should also encourage and support the development of private higher education, so that private education can become the backbone of education reform.

(3) Attach importance to the influence of education quality and evaluation system

The essence of marketization of higher education is still education. As a means, marketization cannot ignore the essence of education in pursuit of excessive economic interests. At the same time, we also need to use market management methods to control the education process. Ensure the quality of higher education and promote stratified mobility.

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