An Empirical Study on the Bootstrap Effect of Guangdong Investment Funds Based on the Bootstrap Effect Measurement Model

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Abstract. This paper by constructing a mathematical model of guidance effect measurement, establishing a system simulation of Guangdong investment fund investment guidance effect, using computer simulation experiments to portray the characteristics of the system, so as to derive quantitative indicators, that is through computer simulation technology for Guangdong investment fund, the results of the simulation experiments on the bootstrap effect and the regression analysis of the econometric model of the bootstrap effect show that the Guangdong Province bootstrap fund has a positive bootstrap effect on the growth fund and a negative crowding-out effect on the venture fund and the fund investment amount. It provides a quantitative analysis of the investment effect process for decision makers of investment funds in Guangdong Province.

Keywords: econometric model of bootstrap effect · bootstrap effects · computer simulation · empirical studies

1 Introduction

Guangdong investment funds need to find more scientific and accurate decision-making methods to improve investment efficiency and risk control. Based on the econometric model of bootstrap effect is a method applicable to multi-factor decision analysis, which can quantify various uncertainty factors and help investors make more scientific and accurate decisions.

The use of computer simulation technology for the simulation of abstract mathematical models provides a clearer understanding of the essence of the research object, and scholars have conducted multi-dimensional studies using computer simulation technology and mathematical models. Lei Fei, Huang Mingxiu and Liu Jin (2021) constructed a

S. H. B. D. M. Zailani et al. (Eds.): ICMSEM 2023, 259, pp. 1662–1668, 2024.
https://doi.org/10.2991/978-94-6463-256-9_169

panel data model to explore the factors influencing the realization of high-quality development in the trade circulation industry [1]; Zhang Gui (2009) argued that the application of production function theory could demonstrate that the increase in the average education level of the labour force has the nature of an exponential growth function [2], Li Ruijun (2022) established certain mathematical models to reveal the quantitative relationships behind the laws [3], Liu Wei (2021) used mathematical model measurements to predict economic data [4], Su Yulei, Xue Fang and Liang Cheng (2022) used computer simulation techniques combined with medical testing techniques [5], Wang Yang (2022) believed that computer simulation technology is the direction of computer development in recent years [6], Fan Wenhui (2022) believed that computer simulation helps to effectively improve operational efficiency and reduce operational costs [7], Li Jing (2021) pointed out the advantages and disadvantages of simulation software Abaqus, Deform, Ansys, Comsol, MSC. Marc. [8], Journal (2023) used computer simulation to guide the size and positioning of THV related to clinical outcomes [9], Journal (2022) simulated its stochastic behavior in Visual SLAM and AweSim (version 3.o) software environments [10]. This paper uses computer by constructing a model of the investment measurement bootstrap effect of investment funds in Guangdong Province simulation to empirically investigate the investment bootstrap effect of investment funds in Guangdong Province, which is the innovation of this paper.

In terms of the level of government investment funds in Guangdong Province, the number of provincial-level funds accounts for only 13%, while the number of local and county-level funds accounts for 36% and 35%.

2 Constructing a Bootstrap Effects Econometric Model

The first step in analyzing a system using the mathematical modeling approach is to build a mathematical model of the investment fund bootstrap effect measurement system, abstracting information about the essential part of the investment fund bootstrap effect measurement mathematical model into a useful descriptive form.

2.1 Mathematical Model Assumptions for Bootstrap Effect Measurement

- Hypothesis H1: The -guided fund can leverage social capital to set up sub-funds to further expand the capital scale and achieve greater economic benefits.
- Hypothesis H2: The larger the target size of the -guided fund, the more attractive it is to social capital, the more conducive to promoting social capital investment.
- Hypothesis H3: The higher the level of wealth accumulation of people in the region.
- Hypothesis H4: The higher the level of interest rate, the higher the cost of social capital investment.

2.2 Mathematical Model Construction for Bootstrap Effect Measurement

The mathematical model of bootstrap effect measurement of bootstrap fund to venture fund.

$$\begin{aligned}\mathrm{LnGVCt} = {} & \alpha 0 + \alpha 1\mathrm{LnGFOFt} + \alpha 2\mathrm{LnGPBEt} \\ & + \alpha 3\mathrm{LnPCGDPt} + \alpha 4\mathrm{R} + \alpha 5\mathrm{LnLEQt} + \varepsilon 1 \end{aligned} \tag{1}$$

Econometric model of the bootstrap effect of bootstrap funds on growth funds.

$$\begin{aligned}\mathrm{LnGGFt} = {} & \beta 0 + \beta 1\mathrm{LnGFOFt} + \beta 2\mathrm{LnGPBEt} \\ & + \beta 3\mathrm{LnPCGDPt} + \beta 4\mathrm{R} + \beta 5\mathrm{LnLEQt} + \varepsilon 2 \end{aligned} \tag{2}$$

Mathematical model of the bootstrap effect of the bootstrap fund on the amount of fund investment.

$$\begin{aligned}\mathrm{LnGIt} = {} & \gamma 0 + \gamma 1\mathrm{LnGFOFt} + \gamma 2\mathrm{LnGPBEt} \\ & + \gamma 3\mathrm{LnPCGDPt} + \gamma 4\mathrm{R} + \gamma 5\mathrm{LnLEQt} + \varepsilon 3 \end{aligned} \tag{3}$$

In the above mathematical model of bootstrap effect measurement, the subscript t represents the year; GVC represents the scale of Guangdong venture fund, GGF represents the scale of Guangdong growth fund, GFOF represents the scale of Guangdong bootstrap fund, GI represents the investment fund participation investment amount, SI represents the scale of social capital investment, PCGDP represents the per capita GDP, R represents the benchmark interest rate of loans over five years, GPBE represents the local general public budget expenditure, LEQ represents the number of regional industrial enterprises above the scale; ε is the random error term.

3 An Empirical Analysis of the Bootstrap Effect of Computer Simulation

In the field of investment funds, computer simulation helps investment decision makers to evaluate different investment strategies and determine the optimal portfolio. This paper uses panel data from the Guangdong Statistical Yearbook 2014–2022 and the Qingke Private Equity Fund Database to determine the optimal portfolio using computer simulation of the bootstrap effect of different investments and compare it with the bootstrap effect of the actual portfolio to evaluate the bootstrap effect on investment decisions. As shown in Table 1.

3.1 Computer Simulation Experiments to Characterize the Fund Investment Bootstrap Effect System

The data in Tables 2 and 3 are obtained, which shows that although the fit of the regression equation is good.

After processing the data through computer simulation, the data in Tables 4 and 5 are obtained, that is, every 1% increase in the government-guided fund will lead to a 3.456% increase in the growth fund.

Table 1. Time series data of regression model

Year	GI	GVC	GGF	GFOF	GPBE	PCGDP	R	IEQ	FI
	Million yuan					Yuan	%	Pcs	%
2022	6483.15		2000	10630	1731412	94898	4.85	55000	14.34
2021	4633.22	8000	32050	110952	1572926	86412	5.15	47456	13.34
2020	7606.32	140	81200	188228	1503748	80932	5.15	47203	14.25
2019	3525.23	7340	22000	346400	1344609	73844	5.15	42688	14.57
2018	3516.04	10618	6650	201695	1282780	68490	5.53	42113	15.62
2017	710.65	920	15000	4700	915264	64374	6.15	41133	13.39
2016	816.24	2620		420	841100	59665	6.55	41184	12.51
2015	488.51	1000		2000	738786	54908	6.68	37790	11.96
2014	395.94				67124	51474	6.82	38305	12.10

Data source: Guangdong Statistical Yearbook 2014–2022, Qingke Private Equity Database

Table 2. Model summary1

Model	R	R-squared	Adjusted R-squared	Standard Error of estimation
1	.999a	.997	.984	.19813

a. Predictor variables: (constant), IEQ, GFOF, PCGDP, R, GPBE

Table 3. Coefficients A1

Coefficient A1					
Model1	Non-standardized coefficient		Standardized coefficient	t	Sig.
	B	Standard error	Trial version		
Constant	700.866	52.777		13.280	.048
GFOF	-2.939	.225	-5.068	-13.05	.049
GPBE	57.604	3.359	11.146	17.149	.037
PCGDP	23.324	3.659	2.448	6.375	.099
R	28.861	6.885	2.164	4.192	.149
IEQ	-141.751	7.903	-7.332	-17.937	.035

a. Dependent variable: GVC

Table 4. Model summary2

Model	R	R-squared	Adjusted R-squared	Standard Error of estimation
2	1.000a	1.000	.	.

a. Predictor variables: (constant), IEQ, GFOF, R, PCGDP, GPBE

Table 5. Coefficients A2

Coefficients A2					
Model2	Non-standardized coefficient		Standardized coefficient	t	Sig.
	B	Standard error	Trial version		
Constant	-578.124	.000		.	.
GFOF	3.456	.000	4.750	.	.
GPBE	-43.911	.000	-7.636	.	.
PCGDP	30.233	.000	3.467	.	.
R	21.078	.000	1.367	.	.
IEQ	55.173	.000	4.769	.	.

a. Dependent variable: GVC

Table 6. Model Summary3

Model	R	R-squared	Adjusted R-squared	Standard Error of estimation
3	.992a	.983	.967	.40469

a. Predictor variables: (Constant), IEQ, GFOF, PCGDP, R, GPBE

After processing the data through computer simulation simulations, the data in Table 6 and Table 7 are obtained, the model coefficients indicate that the government-guided fund in Guangdong Province has a crowding-out effect on the amount of investment in government funds.

Table 7. Coefficients A3

Coefficients A3					
Model3	Non standardized coefficient		Standardized coefficient	t	Sig.
	B	Standard error	Trial version		
Constant	76.223	39.163		1.946	.109
GFOF	-.194	.137	-.220	-1.416	.216
GPBE	3.930	2.777	.952	1.415	.216
PCGDP	-2.482	4.268	-.346	-.582	.586
R	-9.767	4.289	-.549	-2.277	.072
IEQ	-5.500	2.017	-.322	-2.727	.041

a. Dependent variable: GI

4 Conclusion

The regression results of the bootstrap effect measurement mathematical model (1) (2) (3) after simulation experiments by computer simulation technology show that Guangdong bootstrap fund has a positive bootstrap effect on growth funds and a negative crowding out effect on venture capital funds and fund investment amount. The results of this paper on the quantitative analysis of the process of investment bootstrap effect of Guangdong investment funds can be used as a theoretical basis for decision making by Guangdong investment fund decision makers, and also provide some reference for investment fund decision making in other provinces in China.

Acknowledgment. This paper is sponsored by the project: Guangdong Higher Education Association Private Higher Education Professional Committee" Market Opportunity Choice under the Coupling of Industry-Education Integration Factor Innovation and -Enterprise-School Mechanism: A Study Based on "Private Universities in Guangdong Province" (2022MBGJ018); 2022 "Innovation and Strong School Project" - Digital Economy and Trade Innovation Team (GKY-2022CQTD-9); Research on the Countermeasures of Science-Industry-Education Integration in Private Universities Based on Multi-dimensional Dynamic Model: Guangdong Institute of Science and Technology as an Example (GKY-2022KYYBW-2).

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