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The impact of China's financial policy on economic resilience during the pandemic period

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Abstract
The COVID-19 has impacted the social economy of various provinces in China to varying degrees. How to quickly restore the social economy has become the most concerned issue of the Party, the country and all sectors of society. This paper combines the entropy weight method and TOPSIS method-technique for order performance by similarity to ideal solution, taking the financial policy transmission mechanism as the theoretical basis, and selects the data of 29 provinces in China to obtain the contribution of finance in the socio-economic resilience under the pandemic situation. The empirical analysis results show that the weights of financial policy, pandemic situation and financial basis are different. It can be clearly seen from the weight data that the financial basis is crucial to the socio-economic resilience. Although the COVID-19 pandemic will cause huge losses to the whole society and will also seriously hinder the socio-economic recovery, the effective implementation of financial policies and the good trend of the pandemic situation have a significant promoting effect on the socio-economic recovery.

Keywords COVID-19 · Financial policy · Socio-economic resilience · Entropy weight method · TOPSIS method

1 Introduction

The first case of COVID-19 in China was found in Wuhan in December 2019. With the arrival of the spring festival, the pandemic rapidly spread from Wuhan to the whole country in January 2020, and then cases appeared around the world in March, until it developed into a global health event. The international health organization defined the pandemic as an international public health emergency PHEIC (Public health emergencies of international concern) (Zhang 2020). In order to curb the

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development of the pandemic, our government has issued policies to control the flow of personnel, isolate treatment, "cloud office" and other policies to scrape the bones and heal the wounds. Although this policy can effectively control the spread of the pandemic, it has also caused a serious impact on the economy, especially on the physical service industry (Jia 2020). Two months of shutdown have made many small and medium-sized enterprises face bankruptcy liquidation. According to the National Bureau of Statistics, the national GDP in the first quarter of 2020 decreased by 6.8% year on year (Tang et al. 2020). By the beginning of May 2020, the domestic pandemic situation had been preliminarily controlled, and enterprises in many places were resuming production to varying degrees in an orderly manner. However, with the impact of global economic integration, it is difficult for domestic demand to recover in a short period of time. In addition, the pandemic situation in foreign countries is getting worse and worse, which will still have a lasting impact on the domestic economy (Huang et al. 2020a, b).

The COVID-19 came out of the blue, causing great impact on the world economy and China's economy. In China, many enterprises have stopped production and household consumption has shrunk, affecting the daily life of the people and the normal operation of the economy. First of all, there were uncertain expectations about the pandemic awareness, which directly affected all areas of economic activities. Then, economic activities in each area conducted and affected each other (Yin et al. 2020). The impact of the COVID-19 pandemic on the real economy must be transmitted to the financial sector, and the activities in the financial sector must also affect the operation of the real economy (Yoshino et al. 2021). In order to resolve and deal with the adverse impact of the COVID-19 pandemic on the economy and people's livelihood, the country has taken a series of measures, intensively introduced many fiscal and financial policies to restore social productivity, played a "combination punch" to support the resumption of work and production, increased financial support for enterprises affected by the pandemic, especially small and medium-sized enterprises, such as increasing loans, reducing loan interest rates, delaying repayment of principal and interest, and helping enterprises tide over difficulties, to restore normal economic and social operation (Mei 2020).

Then, the implementation of financial policies, how effective they are in improving social and economic resilience, how much performance they can produce, and the problems that may exist in the implementation need to be analyzed and studied in a timely manner, which will help to improve the social and economic resilience under the pandemic, and to adopt effective financial policies in the event of uncertain events in future. Therefore, based on the background of the COVID-19, this paper takes the province as a unit to evaluate the impact of the implementation of financial policies on social and economic resilience, summarize the importance of finance in social and economic recovery, and propose countermeasures on how to play financial policies to promote the comprehensive recovery of social and economic (Zheng et al. 2020). This study provides real data support for China's economic development after the pandemic and helps all industries to clearly understand the impact of China's policies on economic development under the pandemic. It is very important for the developing society and enterprises (Saboori et al. 2022).

According to He et al. (2021), the spread of COVID-19 in 2020 has a significant impact on all nations. This paper first looks at how the epidemic affected China's macroeconomic performance, which is one of the countries in the early stages of the epidemic and one of the countries in the rapid development stage. The paper then studies the relationship between the epidemic's development and the country's macroeconomic performance, as well as the development trend and macroeconomic performance of one of the most serious nations. Concerning the distinctions in scourge control measures among China and the US, China's markers are critical as far as opinion factors, and however, the effect of coronavirus on the feeling factors in the US is unique. The Chinese government has not implemented unrestricted easing or consistently implemented policies. At the moment, COVID-19 has a much larger economic impact on the United States than it does on China.

2 Construction of evaluation index system of financial policy on social and economic resilience

Generally speaking, earthquakes and other natural disasters are associated with local areas, while the COVID-19 involves all regions of the country (Li 2020). In order to implement a chess game of management and control, the state takes the province as the unit to implement administrative decisions on prevention and control and resumption of work. Therefore, based on the research of each province, this paper selects the differentiated socio-economic resilience indicators of each province and constructs an evaluation indicator system that can measure the socio-economic resilience of financial policies according to economic theories and existing data (Wang and Gao 2020).

According to Wang et al. (2021) estimated the monetary strength of 269 prefecture-level urban areas in China by building a marker assessment framework for the versatility, change, and responsiveness of the financial framework under outside shocks. A dynamic spatial Durbin model and a directing intercession model were utilized to examine observationally the effect of monetary strategy vulnerability and imaginative pioneering imperativeness on financial versatility utilizing prefecture-level board information and the factual outcomes uncovered that there were huge "snowball" impacts and spatial overflow qualities of financial flexibility. Innovative entrepreneurial vitality was found to have a significant positive effect on economic resilience under the moderating effect of economic policy uncertainty. Besides, creative enterprising imperativeness was found to improve financial versatility fundamentally by redesigning the modern design, reducing the pay hole, and directing monetary agglomeration with regard to monetary arrangement vulnerability (wang et al. 2022). In addition, significant regional and economic size differences were observed in the effects of innovative entrepreneurial vitality and economic policy uncertainty on economic resilience.

According to Man et al. (2021), urban economic resilience provides a novel perspective on sustainable urban and regional economy growth. This study aims to construct an index system using data collected in 2005, 2010, and 2016. It selects 37 prefecture-level cities in Northeast China, also known as the rest belt of China.

Compared to many other regions in China, this region has experienced significant growth decline and outmigration over the past 20 years. This study examines five socio-economic facets of urban economic resilience: openness, revenue and expenditure capabilities, innovation environment, development trends, and diversity. The researcher examines the spatial and fleeting development attributes of metropolitan financial versatility. He investigates the key elements contributing to metropolitan flexibility and subsequently gives dynamic ideas to improve it. These are our findings: Urban economic resilience in Northeast China has improved over time, but there was spatial heterogeneity. Particularly, coastal cities exhibited increased economic resilience than inland ones. Metropolitan monetary strength in upper East China is primarily contributed by the variety of a financial framework and the pattern of improvement. The prevailing variables relating to metropolitan financial versatility are different among metropolitan types and sizes of the economy. Comprehensive economic cities need to focus on increasing economic diversity to improve urban economic resilience. Old industrial and resource-based cities should improve the innovation environment. Beach front urban areas should focus on expanding their economic designs and making positive patterns of the financial and social turn of events. Agricultural cities should focus on economic and social growth.

2.1 Foundation of evaluation index system

In order to build an evaluation index system of financial policy on socio-economic resilience under the COVID-19, it is necessary to analyze the transmission mechanism of financial policy on socio-economic recovery, which is composed of pandemic situation, financial system and system elements (Yarovaya et al. 2022).

The pandemic is the cause of the decline of social and economic vitality. Financial support can prevent the adverse effects of the pandemic and is the driving force for social and economic recovery (Lu et al. 2020). The pandemic situation (the severity of the pandemic) is determined by the infection situation and the treatment effect. The infection situation reflects the infection of cases in each province and the transmission of infection of imported cases abroad, which will worsen the pandemic situation (Aw et al. 2021). The cure rate of each province and the treatment effect reflected by medical resources will improve the pandemic situation and turn for the better. Under the changeable and uncertain pandemic situation, the financial system must adapt to the needs of social and economic development and timely adjust or release financial policies such as credit and currency. China's fiscal and financial policies are jointly regulated by the upstream Ministry of Finance, the People's Bank of China and other financial departments. This paper is mainly based on the new financial policies on bank credit issued by various ministries and commissions after the pandemic, such as the difference in money supply and policy implementation. The implementation of financial policies is completed through the financial foundation (financial development level), which is composed of financial technology, financial scale and other elements. For example, the number of loans increased by the state is regulated by issuing policy documents to all commercial banks, which perform national policy regulation, and commercial banks become an aspect of the

financial basis. The financial foundation in the middle reaches can determine the efficiency of financial policy transmission, and it is a bridge between financial policies and economic entities (Sun 2021). It can undertake upstream and downstream business. For example, commercial banks support the capital source of downstream economic entities through financial businesses such as loans with the help of financial technology. When the bank concentration is high, there is a positive change relationship between the bank concentration and the effectiveness of monetary policy credit transmission. Downstream economic entities get the benefit of financial policies through the support of financial foundation. Some economic entities are strong and may be less affected by the pandemic, so the funds they get through the policy can be self-recovered. The comprehensive evaluation of industrial losses shows the situation of economic entities, and the recovery of economic entities largely determines the recovery of social economy (Pei and Yang 2021). Therefore, the transmission mechanism of the whole chain has realized the recovery of social economy from financial policies. Due to the development and change of the pandemic, the whole society is in a state of suspension, which directly affects the upstream, midstream and downstream links of the financial policy transmission chain. The transmission mode of banking financial policy follows the mechanism of the most basic financial policy on social and economic recovery. At the same time, the transmission chain of financial policy will be negatively affected under the pandemic background (Gao 2020). Therefore, this paper mainly takes the effect of banking financial policies on social and economic resilience as the research object, deeply analyzes the system indicators in the transmission of banking financial policies, takes the determinants of the pandemic situation and the refined banking financial system as the evaluation factors of resilience, and constructs an evaluation indicator system.

2.2 Establishment of evaluation index system

Since the outbreak of the pandemic, China's main financial policies (as shown in Table 1) mainly include four measures: encouraging financial institutions to suspend the deadline requirements for repaying loans to enterprises in difficulty according to the application of enterprises, increasing the loan limit, and adjusting the guarantee rate and credit limit. Therefore, the financial support for the recovery and development of the real economy will be put in a more prominent position, and credit resources will be guided to support more enterprises that have been greatly impacted by the pandemic, especially small- and medium-sized enterprises and private enterprises (Liu 2020).

According to Jiang et al. (2022), the COVID-19 pandemic has had a significant impact on global economies as a major public health emergency. The experience of post-coronavirus financial recuperation is of extraordinary importance for accomplishing feasible and excellent monetary turn of events. This article selects five major indicators that are generally recognized as closely connected with economic resilience to construct a system of economic resilience indicators based on the theory of resilient economy and related measurement methods, using China's economic development as an example. In addition, in the absence of an epidemic,

Table 1 Evaluation index system of financial policy on social and economic resilience

	Level I indicators	Secondary indicators	Indicator description	Index nature
Financial policy	Credit support (A1)	Money supply (B)	Deposit balance of each province	Forward
		Loan balance (B2)	Balance of RMB loans by province	Forward
	Policy strength (A2)	Number of special pandemic policies (B3)	Number of policies issued by provincial and regional central banks	Forward
		Special policy measures for pandemic situation (B4)	Types of policy instruments of provincial and regional government offices	Forward
Pandemic situation	Infection (A3)	Maximum number of people infected with virus (B5)	The maximum number of people infected in each province before March 2020	Negative direction
		Opening degree (B6)	Total import and export per province/GDP	Negative direction
	Cure (A4)	Cure rate of infected persons (B7)	Number of cured people/maximum number of infected people in each province	Forward
		Designated hospital for medical treatment (B8)	Number of cured people/number of designated hospitals for medical treatment in each province	Negative direction
Financial basis	FinTech (A5)	Financial Technology index (B9)	Baidu financial technology index of all provinces	Forward
	Financial scale (A6)	Number of banks (B10)	Number of non-foreign banks in each province	Forward
		Number of bank employees (B11)	Number of non-foreign bank employees in each province	Forward
		Total banking assets (B12)	Total assets of non-foreign banks in all provinces	Forward

The sample data selected are mainly from the latest statistical data of the National Bureau of Statistics, the Health and Health Commission, the People's Bank of China at all levels, the financial departments at all levels, the China statistical yearbook, the China economic and social network, the wind database, the Guotai'an database and the Baidu index

the gross domestic product (GDP) prediction is made using the autoregressive integrated moving average model. The comparison of China's GDP's actual value to its predicted value in the absence of the epidemic demonstrates that the nation's economic response to major shocks is largely influenced by its high level of economic resilience. In view of the outcomes, strategy suggestions are made for nations to reinforce their financial flexibility in the postepidemic time.

2.2.1 Financial policy indicators

From the perspective of the orientation of all financial policies, they are mainly credit support and monetary regulation. In terms of credit, the deposit reserve ratio and loan interest are all implemented under the unified standards of the Ministry of Finance and the People's Bank of China. They fluctuate within the national standard range, and there is no regional heterogeneity, so they are not used as evaluation indicators in this paper. However, the difference in regional economic development makes China's unified monetary policy operation form a regional asymmetric money supply (Chien et al. 2022). This paper estimates the regional broad money supply based on the deposit balance of regional financial institutions and selects the deposit balance of financial institutions in February 2020. As the monthly growth rate of the loan balance in each province changes little, the RMB loan balance in February 2020 can represent the regional credit resources as an evaluation indicator. In terms of regulation and control, the number of special financial policies issued by regional central banks on pandemic situation before March 2020 and the types of regional policy instruments are selected as secondary indicators. The data are derived from the work dynamics of regional central banks and the documents of provincial government offices. This paper puts forward the hypothesis H_1: financial policies will improve social and economic resilience.

The macro-level relationship between economic policy uncertainty (EPU) and housing prices in China as a developing nation is the focus of this study. Empirical evidence suggests that EPU has a significant impact on China's housing market. As a general rule, the real estate market is prosperous when monetary strategy is steady. There is a positive connection between lodging cost variety and EPU, and that implies real estate market risk develops under shaky financial approaches in this creating economy. Additionally, financial strategy variety influences low-sufficiency lodging costs changes. A variety of strategy vulnerabilities improve the risk premium of the real estate market. Paradoxically, the degree of EPU impacts high-plentifulness changes in lodging costs, which mirrors the pattern of EPU overwhelming China's real estate market (Huang et al. 2020a, b).

2.2.2 Pandemic situation indicators

The impact of the COVID-19 pandemic on the social economy is comprehensive, increasing the operational pressure on the banking industry, and comprehensively affecting the transmission of financial policies (Khambule 2021). The evaluation indicators of the pandemic situation are determined according to the data statistics method officially released by the National Health Commission and the analysis of

Zhong Nanshan, a member of the School of Virology, Chinese Academy of Sciences. The main indicators of official data statistics are cumulative confirmed cases and cumulative cured cases (Zhu and Tian 2020). Therefore, the number of people most infected with the virus and the cure rate of infected people before March 8, 2020 (more newly cured people per day) are taken as the secondary indicators under the pandemic situation. In addition, medical resources are related to the pandemic situation in a region. Select designated hospitals for medical treatment as a secondary indicator. The more each hospital carries, the greater the negative effect. On March 9, 2020, Zhong Nanshan said at the expert symposium on pandemic prevention and control in Guangdong Province that the focus of pandemic prevention and control will shift from output to input. Then, the degree of regional opening to the outside world has become a factor affecting the pandemic situation. The degree of opening to the outside world is equal to the ratio of regional total imports and exports to GDP (Wang and Wang 2020). This paper proposes the hypothesis H_2: The worsening pandemic situation will hinder the implementation of financial policies, and the effect of financial policies on improving social and economic resilience in areas with relatively severe pandemic situation is relatively weak.

2.2.3 Basic financial indicators

Credit and monetary financial policies must play a role through a certain banking financial foundation. The basic financial indicators in this paper are set from the financial scale of financial institutions and financial technology, both as primary indicators. Financial scale will affect the effectiveness of financial policies, which is mainly measured by the number of banks in the banking financial institutions, the number of bank employees and the total assets of the banking industry (Ma and Hao 2022). From the perspective of financial reform and development, Internet finance is bound to be an important supplement to China's traditional banking operation model and play a supportive role in economic development. Therefore, financial technology is widely used in every link of financial business, which can promote the implementation of credit and monetary policies. The higher the level of financial science and technology, the higher the efficiency of banks, and the positive effect of financial policy will be generated. Based on relevant research, the overall average daily search volume in 2019 in the "text mining method" was used to establish the financial technology index. This paper puts forward the assumption that H_3: financial base will significantly affect the implementation of financial policies and will have a more significant impact on the effect of social and economic recovery than financial policies and pandemic situation. The effect of social and economic recovery in areas with relatively weak financial base is also relatively weak.

2.2.4 Economic entity indicators

The recovery of economic entities is mainly reflected in changes in industrial losses. The industry loss mainly comes from the reduction of social investment caused by the pandemic, the decline of production and the decline of household social consumption caused by the shutdown, which represents the negative impact

of the whole society (Jia et al. 2021). Due to the needs of pandemic prevention and control, various regions have taken measures such as delayed resumption of work and traffic control, resulting in labor mobility and logistics transport delays. Enterprises are facing difficulties in employment, raw material transport and other issues in the short term. This paper selects two indicators with data, namely the cumulative negative growth rate of industrial added value and the cumulative negative growth of completed fixed asset investment, to evaluate the loss of industrial and social investment, respectively.

Based on the analysis of different dimensions of the above aspects, the indicator settings of the evaluation system are shown in Table 1.

3 Research methods and data sources

There are many methods to evaluate social and economic resilience, mainly including comprehensive scoring method, analytic hierarchy process (AHP), entropy weight method, TOPSIS method and gray correlation method. The comprehensive scoring method and the analytic hierarchy process are subjective. Relatively speaking, the evaluation conclusion is not convincing to some extent. The other three methods are relatively objective and convincing. The disadvantage of the gray correlation method is that it needs to determine the optimal value of each index currently, which is highly subjective, and it is difficult to determine the optimal value of some indicators. The evaluation index obtained by combining entropy weight method with TOPSIS method is more objective and is a commonly used evaluation method. Under the COVID-19, all sectors of society need a relatively objective evaluation of the effect of financial policies on social and economic resilience and eliminate the irrationality and error caused by subjective evaluation. Therefore, this paper uses entropy weight method and TOPSIS method to measure and evaluate the impact of financial policies on social and economic resilience during the pandemic.

The sample data collected from 29 provinces, municipalities directly under the Central Government and autonomous regions (excluding Hong Kong, Macao and Taiwan) in Chinese Mainland except Tibet (only one case at most) and Qinghai (only 18 cases at most), the two least affected provinces. The sample data selected are mainly from the latest National Bureau of Statistics, the Health Commission, People's Bank of China at all levels, financial departments at all levels, China Statistical Yearbook, China Economic Network, wind database According to the statistical data of Guotai'an database and Baidu Index, the relevant data of pandemic situation come from the real-time updates of the National Health Commission and Guotai'an database. Due to the availability of data, the data of 2019 are used to analyze the problems in February 2020. The data related to FinTech come from Baidu Search Index in 2019, the data related to financial scale come from the regional annual data of Wind database in 2019, and the data related to industrial strength come from the annual data of Zhongjing in 2019. February–March 2020 is the most severe period of pandemic situation, and the losses of all industries basically

occurred in this period. Therefore, the relevant data of industrial losses are all from the National Bureau of Statistics.

4 Empirical analysis

Using the combination of entropy weight method and TOPSIS method, we empirically obtained the overall comprehensive score and the score of financial policy, pandemic situation form and financial basis, analyzed the data of various scores, and summarized the effect of financial policy on social and economic resilience.

4.1 Comprehensive evaluation of financial policy on social and economic resilience

First, the entropy value and weight are calculated. The results in Table 2 are obtained through the entropy weight method.

Then, the scores of financial policy, pandemic situation and financial basis of each province are calculated, as shown in Table 3.

It can be seen from the entropy weight values of various indicators in Table 2 that the financial policy has the largest weight, accounting for about 50% ($B1+B2+B3+B4$), followed by the financial technology index, the number of banks, the number of bank employees and the total assets of the banking industry, whose combined weight accounts for about 35% ($B9+B10+B11+B12$), indicating that the financial policy will greatly affect the social and economic resilience. It can be seen from the comprehensive scores in Table 3 with score results of financial policy, pandemic situation and financial basis in each province (for the needs of statistical analysis in the following text, Ningxia's financial basis calculation score is 0, and the table shows that it is 1). The regions with high financial

Table 2 Entropy value and entropy weight of each index

Level I indicators	Secondary indicators	Entropy value	Entropy weight
A1	B1	0.8913	0.137
	B2	0.9047	0.12
A2	B3	0.8969	0.1299
	B4	0.9036	0.1215
A3	B5	0.9896	0.0131
	B6	0.9773	0.0286
A4	B7	0.9348	0.0821
	B8	0.9884	0.0146
A5	B9	0.9508	0.0619
A6	B10	0.9338	0.0833
	B11	0.9281	0.0906
	B12	0.9069	0.1173

Table 3 Score results of financial policy, pandemic situation and financial basis in each province

Province	Financial policy	Pandemic situation	Financial basis
Jiangsu	63.145 (1)	86.008 (10)	75.311 (2)
Guangdong	59.124 (3)	72.117 (20)	98.970 (1)
Zhejiang	59.896 (2)	84.307 (14)	69.745 (3)
Shandong	41.690 (5)	58.257 (25)	63.915 (4)
Anhui	43.505 (4)	96.622 (1)	34.994 (14)
Beijing	40.054 (7)	24.215 (29)	56.095 (6)
Sichuan	31.687 (9)	61.530 (24)	59.533 (5)
Henan	30.524 (10)	94.550 (3)	50.147 (7)
Jiangxi	40.995 (6)	95.522 (2)	27.344 (16)
Shanghai	30.140 (11)	63.017 (22)	44.713 (9)
Fujian	22.733 (17)	90.751 (6)	38.408 (11)
Chongqing	33.933 (8)	75.001 (18)	22.887 (19)
Hebei	21.337 (20)	90.529 (7)	46.133 (8)
Hunan	18.224 (23)	89.577 (8)	36.451 (12)
Shaanxi	26.766 (13)	79.176 (17)	27.773 (15)
Shanxi	27.236 (12)	85.463 (11)	26.870 (17)
Liaoning	21.704 (19)	62.842 (23)	42.811 (10)
Hubei	25.314 (15)	24.239 (28)	35.919 (13)
Guangxi	22.849 (16)	74.840 (19)	22.256 (20)
Tianjin	14.312 (26)	80.857 (16)	18.118 (24)
Xinjiang	20.339 (21)	89.101 (9)	11.934 (27)
Yunnan	14.689 (24)	93.114 (4)	19.761 (22)
Hainan	18.919 (22)	84.518 (13)	2.867 (28)
Inner Mongolia	11.711 (27)	81.532 (15)	22.168 (21)
Ningxia	22.696 (18)	85.302 (12)	1.000 (29)
Jilin	5.775 (29)	91.294 (5)	19.213 (23)
Gansu	25.841 (14)	30.779 (27)	14.625 (26)
Guizhou	14.632 (25)	57.065 (26)	17.129 (25)
Heilongjiang	9.325 (28)	65.148 (21)	24.260 (18)

The values in parentheses are the serial numbers sorted from largest to smallest

policy evaluation index values are Jiangsu, Zhejiang, Guangdong, Anhui, Shandong, Jiangxi and Beijing.

4.2 An empirical analysis of the effect of financial policy on social and economic resilience

In order to further verify the impact of financial policy, pandemic situation and financial foundation on social and economic recovery, a multiple regression model was established to confirm that the financial policy obtained by combining entropy weight method and TOPSIS method can improve the robustness of the conclusion

of social and economic recovery. In addition, multiple regression analysis can also test the effect of the pandemic situation and financial foundation on socio-economic recovery relative to financial policies, and strive to comprehensively analyze the effect of financial policies on improving socio-economic recovery under the COVID-19 pandemic.

4.2.1 Model setting and data analysis

Based on the financial policy, pandemic situation and financial basis evaluation indicators obtained by combining entropy weight method and TOPSIS method, this paper constructs an econometric model to measure and empirically analyze the effects of financial policies on socio-economic resilience:

$$\mathrm{Rec}_t = \beta_0 + \beta_1 \mathrm{Fin\_policy}_1 + \beta_2 \mathrm{Epe}_t + \beta_3 \mathrm{Fin\_bas}_t + \beta_4 \mathrm{Control}_t + \varepsilon_t \quad (1)$$

According to Eq. 1, Rec_t is the explained variable, representing the social and economic recovery. The entropy weight method is used to calculate the weight of the two secondary indicators of industrial losses, namely the cumulative negative growth rate reduction of industrial added value in each province from February to March and the cumulative negative growth reduction of fixed asset investment completed in each province from February to March, and to obtain the comprehensive reduction value. If the negative growth value in March 2020 is greater than the negative growth value in February 2020, it will be recorded as 0, the data are from the National Bureau of Statistics. $\mathrm{Fin\_policy}_1$, Epe_t and $\mathrm{Fin\_bas}_t$ are an explanatory variable, representing financial policy, pandemic situation and financial basis, respectively. The data are financial policy indicator value, pandemic situation indicator value and financial basis indicator value shown in Table 3. The $\mathrm{Control}_t$ contains three control variables, in which Eco_t represents the macroeconomic situation and is calculated using the regional per capita GDP (unit: yuan), $\mathrm{Fis\_str}_t$ represents the financial revenue and expenditure structure and macroeconomic situation. It is calculated by using the local general budget revenue/local general budget expenditure, $\mathrm{Fin\_str}_t$ refers to the financing structure, which is calculated by regional direct

Table 4 Descriptive statistics of samples

Variable name	Observations	Maximum	Minimum	median	Mean	Standard deviation	Skewness
Rec	29	20.90901	0.048214	7.351847	7.469055	4.820378	0.63144
Fin_policy	29	63.14475	5.775392	25.3139	28.24467	14.74734	0.904262
Epe	29	96.62183	24.21532	81.53242	74.73367	20.40908	-1.28475
Fin_bas	29	98.90712	1	27.77333	35.56382	22.60611	0.880513
Eco	29	164,200	33,100	57,100	70,820.69	33,438.09	1.472652
Fis_str	29	0.87601	0.19615	0.42526	0.46016	0.1788	0.67575
Fin_str	29	0.23365	0.00403	0.01667	0.02867	0.04375	3.785393

financing/indirect financing. The data are from the National Bureau of Statistics and the People's Bank of China.

Table 4 is the sample descriptive statistics of variables. From the skewness of descriptive statistics of the samples in the table, it can be seen that the model will have heteroscedasticity, leading to the stability of the results and errors. In this regard, in order to eliminate heteroscedasticity, all data are logarithmic.

4.2.2 Estimation results and analysis

The estimation results of the model using the ordinary least squares method are shown in Table 5.

4.2.3 Empirical results analysis

It can be seen from the regression estimation results of the model in Table 5 that the estimated value of the financial policy parameter is 1.159, which is significantly positive at the 5% significant level. In a statistical sense, it shows that financial policy can significantly promote the enhancement of social and economic resilience and supports the hypothesis H_1 that financial policy will improve social and economic resilience. The estimated value of the pandemic situation parameter is 1.337, which is significantly not zero at the 5% significant level, indicating that the better the pandemic situation develops, the more conducive to the recovery of social economy. It also reflects that the changes in the pandemic situation will have an impact on the effect of financial policies on social and economic resilience. The deterioration of the pandemic situation will hinder the implementation of financial policies, and the effect of social and economic resilience in areas with relatively severe pandemics is relatively weak, Support assumption H_2. The estimated value of the financial basis parameter is 0.026, but it is not significant in the statistical sense, and the assumption H_3 is not valid. The parameter estimation value of the macroeconomic situation Eco is 1.782, which is not significant in the statistical sense. The macroeconomic

Table 5 Model estimation results

	Regression coefficient	Standard deviation	*T* test value	*p* value
Constant	− 32,720*	16.632	− 1.97	0.062
Fin_policy	1.159**	0.583	2.52	0.019
Epe	1.337**	0.332	2.29	0.032
Fin_bas	0.026	0.332	0.08	0.937
Eco	1.782	1.287	1.38	0.18
Fis_str	− 2.722**	1.373	− 1.98	0.06
Fin_str	− 0.378**	0.305	− 2.22	0.037
Judgment coefficient *R2*	0.468			
F inspection value	3.23			
Number of samples	29			

***, ** and * are significant at the level of 1%, 5% and 10%, respectively

situation has no impact on the socio-economic resilience. The estimated value of financial structure Fis_str parameter is −1.711, which is significantly negative at the 5% significant level, indicating that the more fiscal expenditure is relative to fiscal revenue, the more conducive to the promotion of socio-economic resilience. The estimated value of the financing structure parameter is −0.378, which is significantly negative at the 5% significant level. It shows that compared with direct financing, the larger the amount of indirect financing, the more conducive to the promotion of socio-economic resilience.

By comparing the method of combining entropy weight method and TOPSIS with the method of quantitative empirical analysis, it is obvious that financial policy has a significant effect on the recovery of social economy. In the method of combining entropy weight method and TOPSIS method, it is difficult to explain the effect of pandemic situation on social and economic recovery. The results of multiple regression analysis show that the improvement of pandemic situation has obvious effect on promoting economic and social development. The reason may be that China was the first country to take and implement comprehensive pandemic prevention measures. As long as the pandemic situation occurred, spread or deteriorated, it was necessary to implement comprehensive pandemic prevention management. In the process of entropy TOPSIS analysis, it was difficult to comprehensively analyze the intensity of pandemic prevention and control.

5 Conclusion and policy recommendations

The empirical analysis results show that the weights of financial policy, pandemic situation and financial basis are different. From the weight data, it can be clearly seen that the financial basis is crucial to the socio-economic resilience. Although the COVID-19 pandemic will cause huge losses to the whole society and will also seriously hinder the socio-economic recovery, the effective implementation of financial policies and the good trend of the pandemic situation have a significant promoting effect on the socio-economic recovery.

From the effect of regional socio-economic resilience, some provinces have relatively good socio-economic resilience, while others have relatively weak resilience. However, whether the method of index evaluation or the method of econometric regression empirical analysis is used, the analysis results can prove that the financial policy has played a good role in the recovery of social economy in the context of the pandemic. It can be seen that in the process of resuming work and production to restore the social economy after the COVID-19 pandemic, not only the pandemic prevention work is very important, but also the financial policy plays a vital role in the socio-economic recovery. Each province, in combination with its pandemic situation and financial infrastructure, made appropriate adjustments to financial policies to rationalize them, so as to promote the rapid recovery of the province's economy from the pandemic.

In China's previous response to the impact of the crisis, coordination between fiscal policy and monetary policy is generally an inevitable choice. In addition, compared with the characteristics of monetary policy that focuses on providing liquidity

and adjusting demand, fiscal policy is characterized by precise orientation, fast timeliness and increased structural supply.

From the perspective of monetary policy, the central bank can provide sufficient liquidity to ensure the stable operation of the economy by reducing deposit reserves, providing medium-term and short-term lending facilities and other measures. At the same time, the central bank can continue to take some targeted credit support measures, such as improving differentiated preferential financial services for regions, industries and enterprises that are greatly affected by the pandemic, but also prevent the abuse of financial easing measures such as preferential interest rates and online financing.

From the perspective of fiscal policy, China had sufficient economic space at that time to ensure China's economy could survive the crisis when necessary. The central government will rely more on targeted fiscal policies to stimulate economic growth, making positive fiscal policies more active and promising. In addition to reducing value-added tax and personal income tax, it can also provide corresponding tax relief for some small- and medium-sized enterprises that are difficult to establish.

Macroeconomists refer to investment, consumption and export as the "troika" that drives GDP growth. If you want to drive the country's economic growth, there are three ways according to the national conditions: The first is to do foreign trade, the second is government investment and consumption, and the third is to expand domestic demand. Although China was under the ravage of the pandemic at that time, the pandemic abroad was also in an outbreak period, and it was difficult for their countries to resume work immediately. Therefore, China alone could not form foreign trade transactions, so it was unrealistic to promote China's economic growth through foreign trade. In addition, over the years, the government has taken the lead in investment, construction, and construction of various expressways. The projects that can be built are almost completed, and they have become saturated. However, such huge projects are becoming less and less. A small amount of old city reconstruction and old area reconstruction are not enough to support economic productivity. Although it is possible to print more money and save the economy with quantitative easing, too much money printing will lead to inflation and currency devaluation, this is not the result we want to see. Therefore, it is not realistic to promote economic growth through government investment and consumption. Therefore, there is only a third way, namely expanding domestic demand to stimulate economic growth. The expansion of domestic demand has also proved to be an effective measure. Since our citizens have good saving habits since ancient times, there is a lot of room for expanding domestic demand in China, mainly through stimulating consumption. There are also some measures to stimulate consumption. At that time, after the pandemic situation was effectively controlled, China should earnestly do a good job in promoting the resumption of work and production, business and market, so as to promote the recovery of consumption, expand residents' consumption, and appropriately increase public consumption. We should also steadily promote the reform of income distribution, steadily increase residents' income, and let the majority of residents dare to consume, be willing to consume, and have a place to consume. The impact of the pandemic will increase the support for research and development of reagents, drugs and vaccines and accelerate the development of emerging economies

and digital economy industries such as biomedicine, medical equipment, 5G communication, cloud computing, artificial intelligence, robots, and industrial Internet. In the medical industry, actively promote the development of rapid intelligent medical treatment and telemedicine. Remote work promotes the rise of online office software, such as nail software. Affected by the pandemic, online education and online teaching platforms have also played an important role in the education industry. The technological infrastructure related to 5G, the combination of traditional manufacturing industry, Internet and industrial Internet will bring opportunities for industrial upgrading and transformation. The state should give incentives or financial support to the corresponding industries and promote the development of telemedicine, smart cities and emerging industries through preferential credit policies, equity financing, and the establishment of local special funds to drive social capital.

Declarations

Conflict of interest The author declares that there are no competing interests.

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