Post-Epidemic Economic Risk Prevention and Public Management Suggestions Based on Supply Chain Analysis Model

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Abstract. This paper analyzes the main problems and difficulties faced by the economy of Fujian province after the epidemic, and probes into the effective countermeasures to accelerate the improvement of Fujian province's economy through many fields investigations inside and outside Fujian province. Team is the purpose of the investigation research in relevant factors of industrial development in Fujian Province, assist the governments at all levels to develop guidance and the support policy, optimize the business environment. The research team introduced an analysis model for the upstream and downstream of the supply chain, and with the help of the super computing power of the provincial Cloud Computing Engineering Center, based on industrial big data and artificial intelligence algorithm analysis, put forward several suggestions for the Fujian economy after the epidemic, and won the recognition of relevant government departments. This paper focuses on the Research on post-epidemic economic risk prevention and public management suggestions based on supply chain analysis model. After thorough investigation and analysis, the research group put forward several feasible schemes.

Keywords: Economic Risk Prevention · Public Management · Supply Chain Analysis

1 Introduction

In the first quarter of 2023, Fujian Province's economy gradually emerged from the impact of the epidemic, leading indicators recovered, positive factors gradually increased, and economic operation was generally stable.

In 2023, Fujian's economic structure will continue to be optimized and upgraded. First, Fujian industrial structure adjustment and optimization. From January to March 2023, the growth rate of the tertiary industry in Fujian province picked up and the proportion increased significantly, with the added value of the tertiary industry reaching 627.474 billion yuan, an increase of 5.5% year-on-year, 1.5 percentage points higher

than that of the previous year; It accounted for 52.0% of GDP, an increase of 2.3 percentage points over the same period last year. Second, upgrading the industrial economic structure. From January to March 2023, the added value of high-tech manufacturing industry above designated size in Fujian province accounted for 17.8% of all above designated industries, 1.5 percentage points higher than the same period last year; The value added of the equipment manufacturing industry accounted for 27.2% of the industry, an increase of 2.0 percentage points over the same period last year. Third, competitive industries are growing rapidly. From January to March 2023, the added value of the electrical machinery and equipment manufacturing industry above designated size in Fujian province increased by 31.0% year-on-year, the manufacturing industry of chemical raw materials and chemical products increased by 26.6%, the non-ferrous metal smelting and rolling processing industry increased by 17.4%, and the automobile manufacturing industry increased by 7.1%. Fourth, the proportion of private industry has increased. From January to March 2023, the added value of private industries above designated size in Fujian province accounted for 64.1% of the province's planned industries, an increase of 0.4 percentage points over the same period last year; The export delivery value of private industrial enterprises accounted for 50.0% of the export delivery value of industrial enterprises in the province, which was 5.6 percentage points higher than the same period of last year. However, the economic situation shows that Fujian is affected by factors such as insufficient market demand, rising enterprise operating costs, and the peak period of epidemic pressure in Fujian province is later than that of the country, and the growth rate of some indicators such as industry has declined. At present, the international environment is still complex and volatile, and there are obvious constraints from insufficient market demand. Some industries and sectors still face many difficulties, and there is still considerable pressure on steady growth.

Investment in large projects in Fujian will gain rapid growth in 2023. First, Fujian's infrastructure construction has made steady progress. The Xiamen New Airport Project, Fuzhou Binhai Express Line, Zhangzhou Energy Nuclear Power Phase I and other major infrastructure projects to stabilize investment, promote development, and benefit people's lives have been steadily advanced. In the first quarter, the province's infrastructure investment was 115.047 billion yuan, an increase of 2.4%. Among them, the investment in telecommunications, radio, television and satellite transmission services grew by 42.2%, that in transportation, warehousing and postal services by 5.2%, and that in water conservancy, environment and public facilities management by 3.1%. Second, Fujian's industrial investment has been significantly driven. In the first quarter, the province's industrial investment 168.275 billion yuan, an increase of 12.7%, industrial investment accounted for 36.0% of the province's investment, 3.9 percentage points higher than the same period last year, driving the province's investment growth of 4.1 percentage points. Among them, the investment in the manufacturing industry was 147.617 billion yuan, up by 14.8%. Third, investment in technological reform in Fujian has increased. In the first quarter, the province's industrial reconstruction and technological transformation investment 44.587 billion yuan, an increase of 22.0%, 9.3 percentage points higher than the province's industrial investment; The share of industrial investment increased to 26.5% from 24.5% in the same period last year. Fourth, Fujian has strong support for major projects. Under the influence of fiscal investment at all levels, the number of

projects and investment volume of 100 million yuan and above achieved double-digit growth, with 6,488 projects, up 24.7% year on year; The investment was 267.169 billion yuan, up 12.8%, driving the province's investment growth by 6.5 percentage points.

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This paper studies the prevention of economic risk after the epidemic, and puts forward public management suggestions based on the analysis model of industrial supply chain. The overall organization of the paper is as follows. The introduces the economic status of Fujian in Section I. In Section II, we analyzes the relevant factors affecting the industry in Fujian in recent years. In Section III, the industrial supply chain model used in our analysis is introduced. The Section IV puts forward the instability factor of Fujian economy and the relevant countermeasures. Finally, Section V concludes the paper.

2   Analysis on Characteristics of Fujian Economy in Recent Years

First, the importance of private enterprises in the industrial supply chain is very high. Fujian is one of the earliest places where private economy originated in China, and private enterprises are an important support for the province's economic development, an important subject of innovation, entrepreneurship and creation, and an important force for improving people's well-being. Private economy is stable, Fujian economy is stable; Private economy is strong, Fujian economy is strong; Every bit of the development of the province, the clothing, food, housing and transportation of the people are closely related to the vast number of private enterprises, benefiting from the development and growth of the private economy. In 2022, with a growth rate of 4.7%, Fujian's GDP ranks eighth in the country.

According to the data released by the Fujian Provincial Bureau of Statistics, in 2022, the added value of private industries above designated size in the province increased by 9.3% over the previous year, 3.6 percentage points higher than that of those above designated size in the province, and the added value of private industries accounted for 63.7% of those above designated size. The export delivery value reached 464.778 billion yuan, an increase of 8.5%, 3.7 percentage points higher than the provincial average. In Fujian province, private industries above designated size frequently show bright spots in the two data indicators of added value and export delivery value, which is the data projection of the continuous improvement of the industrial development quality of private economy in Fujian province. According to released data, Fujian's private economy contributes more than 70 percent of the province's tax revenue and about 70 percent of

its gross regional product. In Fujian province, 95% of high-tech enterprises are private enterprises, 80% of national and 90% of provincial enterprise technology centers are located in private enterprises, and 70% of scientific and technological achievements are created by private enterprises.

Second, the real estate industry seriously affects the capital chain of the supply chain. In 2022, the sales activity of the real estate industry almost stopped during the epidemic, coupled with the new mode of remote working of enterprises is quietly taking shape, the closure of some small and medium-sized enterprises with poor anti-risk ability, and the increasing caution of investors under the current economic situation will lead to the contraction of real estate demand. The risk of capital chain rupture in the real estate industry is extremely high, which has a negative impact on the financial industry [1].

The epidemic has hit consumption hard, with negative growth in 2022, and offline consumption is constrained. For three consecutive years, the epidemic has severely restricted residents' consumption scenario and consumption radius, and residents' worries about income uncertainty and rising unemployment rate have led to a continuous decline in residents' consumption and confidence. Investment such as housing purchases decreased, and new deposits increased year-on-year. After an obvious turning point of the epidemic prevention and control policy in November and December, the negative impact of the epidemic prevention and control policy on the economy is gradually decreasing, but it also ushered in the first surge in the number of infections, the consumer side is still under certain pressure in the short term, and the epidemic has a greater impact on the real estate-related industrial chain and service industry.

The release of epidemic prevention policies is an important turning point, and future consumption is expected to be gradually repaired. As the peak of the epidemic recedes, population flows have begun to recover, but there is still some uncertainty about the length of time it will take to return to pre-pandemic conditions. Judging from the repair of other countries' relaxed epidemic prevention policies, it usually takes about three to five months. China's GDP growth in the first quarter of 2023 came under pressure, but the Spring Festival accelerated population flow and offline consumption repair, and offline consumption is expected to usher in a clear rebound in the second quarter. From the perspective of traffic and consumption scenario data, the epidemic in first-tier cities has reached its peak and turned better faster, and the expected recovery rate of consumption is also overall faster. After the epidemic in 3 years, the first policy level has been opened up, and the demand for business and travel is expected to meet the explosive growth. However, there is still a risk of secondary infection, and if the spread is large, it may impact the repair slope of demand.

Third, PPI and CPI affect the industrial supply chain. PPI showed a continuous downward trend in 2022. Impacted by the Russia-Ukraine conflict in February, energy prices such as crude oil and natural gas rose rapidly, and the PPI decline slowed down in the second quarter. Since the second half of the year, the price of coal has remained stable, and the real estate industry has rapidly adjusted, and the prices of corresponding domestic priced commodities have dropped significantly; Under the influence of geopolitics, the high price of crude oil fell, superimposed a high base effect, PPI showed a rapid downward trend, and the fourth quarter turned negative year-on-year. On the whole, with the gradual easing of supply chain problems, shipping prices have fallen, European

and American economies have aggressively raised interest rates, overseas demand has fallen, and commodity prices have fallen [2].

In 2022, the CPI remained below 3% for the whole year, and the internal sub-trend was differentiated. In 2022, the year-on-year growth rate of China's food CPI increased steadily, the first quarter was negative, the second quarter turned positive, and since the third quarter has remained above 6%, pork prices under the influence of a low base, the upward pressure of the pig cycle amplified, and The State Council released pork reserves in a timely manner, ensuring the smooth operation of pork market supply and prices. Non-food CPI growth slowed down, excluding crude oil and food items, the core CPI has continued to fall since the second half of 2022, affected by changes in epidemic prevention and control policies and the real estate cycle, education, cultural and entertainment projects and housing items, CPI continued to fall. Under the global inflation pressure, domestic and foreign driving factors are different. Overseas high inflation in 2022 is high, while being influenced by multiple factors such as a large number of fiscal subsidies in the early period, the fading impact of the epidemic and the high economic cycle. China's domestic demand is relatively weak, under the constraints of the epidemic and prevention and control policies, service inflation continues to be low, and China's fiscal policy is appropriate, domestic core inflation pressure is less than overseas.

The pressure of core CPI is less than overseas, and the driving effect of service inflation expectations is strengthened. CPI inflation is expected to rise, but the height is still much lower than Europe and the United States. In 2023, the impact of the epidemic will gradually weaken, the inflation expectation of the service industry will marginal rise, and the residential consumption will warm up, and the real estate sales will repair or promote the overall rise of core inflation. The rise in overseas inflation has been driven by social welfare policies, which have boosted new consumer demand but constrained labor supply. China's fiscal policy is reasonable and appropriate, and the overall inflation of services is under control. Rental housing is affected by the downward cycle of housing prices, and the upward pressure is small, but the second half of the year may be driven by the repair of the real estate cycle, and there is a slight upward trend.

Fourth, the industrial supply chain is experiencing a wave of machine replacement. Machines for people refers to the trend of replacing workers who perform simple, repetitive and intensive labor on production lines with robots. At present, the CNC machine tool is the trend, in the CNC machine tool, the machining center accounts for the highest proportion, the machining center is a CNC machine tool with a tool library and automatic tool changing device. After one clamping, most of the surface of the workpiece can be processed, and it has two or more cutting functions. It not only improves the machining accuracy of the workpiece, but also is the comprehensive machine tool with the highest productivity and automation degree in CNC machine tools. In terms of batch workpieces with medium processing difficulty, its efficiency is 5 to 10 times that of ordinary equipment, especially it can complete many processing that ordinary equipment can not complete, and it is more suitable for single-piece processing with complex shapes and high precision requirements or small and medium-sized batch multi-variety production. The machine replacement cycle is about 10 years, the last round of demand peak in

2011–2012, nearly three years of the epidemic has extended this round of replacement cycle.

According to the forecast of Guangfa Securities, it is expected that China will usher in a round of replacement peak in 2023, based on the output data released by the National Bureau of Statistics, the annual theoretical update demand for metal cutting machine tools in 2023–2025 is expected to reach 800,000 units, assuming an average unit price of 150,000 / set, the annual update scale will reach 120 billion yuan. Specifically, the forecast 2023–2025: metal cutting machine tool demand is 714,700 units, 764,300 units, 798,300 units, year-on-year growth rates of 28%, 8%, 6%; The demand for metal forming machine tools was 151,700 units, 233,900 units and 212,800 units, with a year-on-year growth rate of 0, 58% and -9% respectively. Overall, the composite growth rate of the industry is about 13%.

In the short term, China's metal cutting machine tool production growth has been declining since 2022, inventory pressure has gradually released, and the cumulative production of 520,000 units from January to November 2022, down 12.50% year-on-year, but the decline has continued to narrow in the past half year, showing that the boom has rebounded.

Fifth, food and agricultural products affect the industrial investment environment. The 2023 government work report proposes to improve the comprehensive agricultural production capacity, stabilize and expand the grain sown area, expand the soybean oil, and optimize the production structure. China has a large population and a huge demand for food. Food conservation requires the upgrading of the whole food industry chain, and the "six improvement actions" accelerate the construction of a food security system. In addition to the multiple challenges facing food security, in the whole food industry chain, China's food post-production loss problem is obvious, it is estimated that China's annual food storage, transportation, processing loss of more than 70 billion jin, the total loss rate of the whole food industry chain is about 12%. It can be seen that in order to better ensure national food security, the whole food industry chain needs to be upgraded. China's grain output reached a new high, and remained above 1.3 trillion jin for eight consecutive years. With the introduction of various national policies, the degree of food marketization in China has been significantly improved, the price game degree of various market entities has deepened, and the purchase and sale of grain are active and the market is improving. In the future, in the case of continuous favorable national policies, China's food industry will further develop, and the market prospects are good. The upgrading of grain consumption has become an important engine to promote the high-quality economic development of the grain industry. At present, China has entered a stage of sustained growth of consumption demand, accelerated upgrading of consumption structure, and obvious enhancement of the consumption-driven economic role. In order to meet the needs of consumption upgrading, China vigorously promotes the high-quality development of the grain industry economy, improves the supply quality and circulation efficiency of grain and oil products, better meets the diversified needs of the people for grain and oil products, and promotes the "double upgrading" of the grain industry and consumption. Consumption upgrading has led to high-quality development of the grain industry, and the grain industry has ushered in new opportunities [3].

In 2023, China's grain, oil and cotton production structure will be further optimized, the output of meat, poultry, egg, milk and aquatic products will generally increase steadily, the overall fluctuation of agricultural products and food prices will be small, the agricultural and rural economy will strongly support the national economy, and the per capita disposable income of rural residents will grow faster than the economic growth rate. On May 4, the "Rural Green Book: Analysis and Forecast of China's Rural Economic Situation (2022–2023)" was released, predicting that China's total grain production will exceed 690 million tons in 2023. In 2022, the added value of China's primary industry will reach 8,834.5 billion yuan, an increase of 4.1 percent over 2021, and its contribution rate to GDP growth will be 9.9 percent, an increase of 3.2 percent over 2021. The real growth of the primary industry contributed to the real GDP growth of 0.7%, an increase of 0.2% over the previous year. At the same time, the total import and export of agricultural products in 2022 continued to expand, the import volume of most agricultural products was significantly reduced, and the overall fluctuation of agricultural products and food prices was small. The quality and quality of China's agricultural products have been further improved, and models such as direct procurement and customized production of agricultural products by e-commerce and new industries and new business forms such as rural tourism have been emerging. However, the green Paper indicates that while the high-quality development of agriculture and rural areas continues to make new progress, the aging and aging of rural areas are becoming more serious, the structural fluctuations of agricultural products and food prices are intensifying, the income of rural residents is becoming more difficult to increase, and the income distribution gap among rural residents is widening, which needs to be paid great attention to and actively addressed [4].

3   Quantitative Management Analysis Model of Supply Chain in Crisis

The research group has constructed a supply chain model based on the characteristics of Taiwanese manufacturing enterprises in Fujian, with the aim of helping them adapt to the crisis as soon as possible during the epidemic or other crises.

The production planning model itself is very complex. Here we focus on the case that there is no process crossing between the upstream production lines, and all the processes of a finished product are only completed in one production line [5]. This is a more suitable model for the actual situation of the clothing industry. An integrated infrastructure for an industry agile enterprise for the garment industry was one of the focuses of our first few research projects. Assuming that the downstream demand for upstream production lines is known, the mathematical model of upstream production planning can be established according to the downstream demand [6].

Assume that the upstream consists of M production lines, and the downstream planning interval consists of N cycles. The demand for the main finished products of the upstream production line i is n_i, the total demand for each finished product is $\tilde{z}_{ni}(N)$, and the demand in the j cycle is $z_{ni}(j)$; The user's demand for by-products of upstream production line i is m_i, and the demand in cycle j is $z_{mi}(j)$. The goal of this production plan is to make the production line i equipment utilization rate as high as possible, try

not to work overtime, fully meet the needs of the downstream production line, and make the production cost and products in process the least.

Assume the output constraints of finished products:

$$y_i(k) = u_i(k) \tag{1}$$

$$u_i(k) = [\, u_{ni}^T(k)\ u_{mi}^T(k)\,]^T \tag{2}$$

$y_i(k)$ is the quantity of finished products output by upstream production line i in cycle k, and is the n_{gi} dimensional column vector. $u_{ni}(k)$ is the storage of the main finished parts planned to be processed by the upstream production line i in cycle k, and is the column vector of dimension n_i; $u_{mi}(k)$ is the dimensional column vector of upstream production line i in cycle m_i;

There are balance constraints:

$$x_i(k+1) = x_i(k) - u_i(k) + r_i(k) \tag{3}$$

Initial conditions: $x_i(i) = x_{i0}\ i = 1, 2, \cdots k\ k = 1, 2, \cdots, N$; Where: $r_i(k)$ is the raw material input of upstream production line i in cycle k, and is the column vector of n_{gi} dimension;

Downstream input buffer constraints:

$$\tilde{y}_i(k) - \tilde{z}_i(k) \le B_{Zi} \tag{4}$$

$$B_{zi} = [\, B_{nzi}^T\ B_{mzi}^T\,]^T \tag{5}$$

where, $\tilde{z}_{ni}(k)$ is the sum of the main finished product demand of the downstream production line from cycle 1 to cycle k, and that is a n_i-dimensional column vector. $\tilde{z}_{mi}(k)$ is the sum of the user's demand for secondary products from cycle 1 to cycle k, and that is a m_i-dimensional column vector. B_{zi} is the size of the downstream input buffer and that is the n_{gi}-dimensional column vector. B_{nzi} is the size of the input buffer of the downstream production line, which is a n_i-dimensional column vector. B_{mzi} is the size of the user by-product input buffer, which is the m_i-dimensional column vector;

Constraints on output cumulative total:

$$\tilde{y}_i(k) = \sum_{j=1}^{k} y_i(j) \tag{6}$$

where, $y_i(j) = [\, y_{ni}^T(j)\ y_{mi}^T(j)\,]^T$, $\tilde{y}_i(k) = [\, \tilde{y}_{ni}^T(k)\ \tilde{y}_{mi}^T(k)\,]^T$

and $\tilde{y}_{ni}(k)$ are the sum of the quantity of main finished products output by the upstream production line i from cycle 1 to cycle k, and that is m_i-dimensional column vector; $\tilde{y}_{mi}(k)$ is the sum of the quantity of main finished products output by the upstream production line i from period 1 to period k, and that it is a m_i-dimensional column vector.

$y_{ni}(j)$ is the quantity of main finished products output by the upstream production line i in cycle j, and that is a n_i-dimensional column vector.

$y_{mi}(j)$ is the quantity of main finished products output by the upstream production line i in cycle j, and that is a m_i dimensional column vector.

The cumulative demand constraint is:

$$\tilde{z}_i(k) = \sum_{j=1}^{k} z_i(j) = [\tilde{z}_{ni}^T(j)\ \tilde{z}_{mi}^T(j)]^T \tag{7}$$

$$\tilde{z}_i(k) = [\tilde{z}_{ni}^T(k)\ \tilde{z}_{mi}^T(k)]^T \tag{8}$$

$$z_i(j) = [z_{ni}^T(j)\ z_{mi}^T(j)]^T \tag{9}$$

$\tilde{z}_{ni}(k)$ are the sum of the main finished product demand output of the downstream production line i from cycle 1 to cycle k, and are the n_i dimensional column vector; $\tilde{z}_{mi}(k)$ is the sum of the demand for by-products output by users from cycle 1 to cycle k, and is the m_i dimensional column vector. $z_i(j)$ is the required quantity of finished products of the upstream production line i by cycle j, and is the n_{gi} dimensional column vector. $z_{ni}(j)$ cycle j's demand quantity of the main finished products of the upstream production line i, is the n_i dimensional column vector; The demand quantity of i by-product of upstream production line by cycle j of $y_{mi}(j)$ is the m_i dimensional column vector; Constraints on finished product demand of downstream production lines:

$$\tilde{y}_{ni}(k) = H_{ni}\tilde{y}_i(k) \geq H_{ni}\tilde{z}_i(k) \tag{10}$$

$$y_i(k) = [y_{ni}^T(k)\ y_{mi}^T(k)]^T \tag{11}$$

In the formula, the output matrix of H_{ni} main finished product is a $n_i \times (n_i + m_i)$ dimensional vector; There are also non negative constraints: $u_i(k) \geq 0$, $x_i(k) \geq 0$. Therefore, the upstream production line production planning model with the lowest limited cost in the downstream input buffer can be described as follows:

$$J = \min \left\{ \begin{array}{l} \displaystyle\sum_{i=1}^{M}\sum_{k=1}^{N} \left(\begin{array}{l} a_i^T x_i(k) + b_i^T [T_i u_i(k) - \rho_i(k)]^+ + \bar{b}_i^T [\rho_i(k) - T_i u_i(k)]^+ \\ +c_i^T [\tilde{y}_i(k) - \tilde{z}_i(k)]^+ + \bar{c}_i^T [\tilde{z}_i(k) - \tilde{y}_i(k)]^+ \end{array} \right) \\ \quad + \displaystyle\sum_{i=1}^{M} a_i^T x_i(N+1) \end{array} \right\} \tag{12}$$

where M represents the number of upstream production lines; N represents the number of production cycles of the upstream production line within the planned interval; $u_i(k)$ represents the quantity of all parts planned to be processed in cycle k of upstream production line i, and is a $n_{gi} = n_i + m_i$ dimensional column vector; Among them, n_i is the number of types of main finished parts processed by the production line within the planned interval, and m_i is the number of types of by-product parts processed by the production line i within the planned interval; $\tilde{y}_i(k)$ represents the sum of the quantities of all finished products of production line i from period 1 to the beginning of period k, and is

an n_{gi} dimensional column vector; $x_i(k)$ represents the storage capacity of all in-process products of upstream production line i at the beginning of cycle k, and is a n_{gi} dimensional column vector; $\tilde{z}_i(k)$ represents the sum of the demands of downstream production line and by-product users on the finished products of upstream production line i from cycle 1 to cycle k, which is a n_{gi} dimensional column vector; $\rho_i(k)$ represents the available processing time of each work center of the upstream production line i in cycle k, and is an f_i dimensional column vector. f_i is the number of workstations in production line i; a_i represents the cost coefficient related to WIP in the upstream production line i, and is a f_i dimensional column vector; b_i represents the cost coefficient related to overtime pay in the upstream production line i, which is an f_i dimensional column vector; $\bar{b}_i$ represents the cost coefficient related to idle equipment in the upstream production line i, and is a f_i dimensional column vector; c_i represents the cost coefficient related to storage caused by the excess of the main finished products and by-products output in the upstream production line i, which is a $n_i + m_i$ dimensional column vector; $\bar{c}_i$ represents the cost coefficient related to the penalty caused by the failure of the main finished products and by-products output from the upstream production line i to meet the demand, and is a $n_i + m_i$ dimensional column vector; T_i represents the time required for each workstation of the upstream production line i to process n_{gi} type of part in cycle k, which is a $f_i \times n_{gi}$ dimensional matrix; $[\bullet]^+$ represents $max(0, \bullet)$.

The makers of production plans often need to face rapidly changing markets and comprehensively consider adjustments or changes in the production and operation activities of the entire supply chain to avoid losses due to changes in production plans. For example, when the total demand of the entire supply chain increases, node enterprises may lose opportunities to deliver on time due to difficulties in adjusting production capacity and insufficient supply; When the total demand of the entire supply chain decreases or changes, node enterprises may suffer losses due to an increase in inventory costs. Therefore, decision-makers and node enterprises in agile enterprise alliances must be able to adapt to the rapid changes in demand, determine the output per unit production cycle, in order to minimize losses and maximize profits. Combining Hopfield neural networks in program design to seek local extremum, and then selecting effective solutions from multiple results. The main code for the specific algorithm is as follows:

Step1. Let minCost = maxnumber; parameter_number = {};
Step2. For(int i = 1;i <= M; i++){
    For(int k = 1;k < = N; k++){

$$Costpartone = a_i^T * x_i(k) + b_i^T * max[T_i u_i(k) - \rho_i(k)]$$
$$+ \bar{b}_i^T * max[\rho_i(k) - T_i u_i(k)] + c_i^T * max[\tilde{y}_i(k) - \tilde{z}_i(k)]$$
$$+ \bar{c}_i^T * max[\tilde{z}_i(k) - \tilde{y}_i(k)];$$

}}.
Step3. For(int i = 1; i <= M; i++){
    $Costparttwo = a_i^T * x_i * (N + 1);$}
    Costx = Costpartone + Costparttwo
Step4 Get new Costx by change the plan by Hopfield Neuron network, then go to Step1, until no new extreme value in five circles, and let R to be the number of Costx;

Step5. For (int x = 1; x <= R; x++){
    if minCost > Costx{ parameter_number = x;
    minCost = costx;};
Step5. Output(minCost, correlation_parameter)

4 Factors of Instability in Fujian Economy and Relevant Suggestions

First, Fujian should beware of domino bankruptcy of private enterprises. Data from the Fujian Provincial Development and Reform Commission show that at the beginning of 2023, the total investment of newly started major projects across the province is 394.8 billion yuan, and the annual planned investment is 87.7 billion yuan. Among them, private capital actively participated in the construction of major projects in the social and livelihood fields such as industry, service industry and health care, with an annual planned investment of more than 60 billion yuan. It can be seen from the data that private capital accounts for a high proportion of investment in major projects in Fujian Province. Private capital is active in major project investment in Fujian Province, which is due to the scale effect of the development of private economy in Fujian Province. Fujian in the national influence of textile shoes and clothing, food, metallurgy, building materials and other industrial clusters, many are from private enterprises. When enterprises and industries in Fujian have reached a certain economic scale, the integrity of industrial chain, resource allocation and regeneration efficiency will be improved, which will drive the increase of enterprise efficiency and show the scale effect.

China's private enterprises are distributed in various sectors of people's livelihood, contributing more than 50% of China's tax revenue, solving nearly 300 million jobs, accounting for more than 80% of China's urban employment population, accounting for more than 90% of the new employment population. If the wave of private enterprise closures in the post-epidemic period comes, it will have a serious negative impact on all levels of society [7].

Therefore, the research group recommends: (1) As soon as possible to introduce more powerful and more sustainable support policies for tax reduction and loan increase and interest rate reduction for private small and medium-sized enterprises, effectively reduce the pressure on small and medium-sized enterprises, and boost the confidence of the industry. (2) Appropriately relax the control over the operation of private individual traders, increase the forms of employment, and guide the unemployed to disperse employment [8].

Second, Fujian should prevent the impact of real estate and cause the capital chain of the industrial chain to break. At the beginning of 2023, the central bank and the Banking and Insurance Regulatory Commission announced the establishment of a dynamic adjustment mechanism for the first housing loan interest rate policy, allowing cities that have met the decline in new home prices for three consecutive months to explore reducing the first mortgage interest rate. "Because of the city policy" is still expected to be the main direction, for non-first-tier cities, restrictions on purchase, loan, price, sale, provident fund loans and other restrictive measures are expected to be relaxed. Real estate sales in first-tier cities are still strong compared to other cities, and if real estate sales continue to be depressed, restrictive policies in first-tier cities may also be relaxed

to support reasonable housing demand. The real estate demand-side stimulus policy is expected to continue to open, and the market wait-and-see mood is still to be changed. Real estate market sales are still sluggish, the future for rigid and improved housing is expected to introduce more encouragement policies.

The relaxation of the real estate policy in 2023 will help boost residents' confidence, and it is also necessary to focus on the gradual stability of housing prices, which has an important supporting role for the rebound of residents' confidence in buying homes. The improvement of real estate sales helps to stimulate the long-term loan growth of residents, and is also one of the landing points of wide credit. Therefore, the research group suggests: (1) Continue to significantly adjust the real estate repayment interest rate by adjusting the loan pricing benchmark (LPR), appropriately extend the repayment period of small credit loans and other measures to reduce the pressure on the wage earners. (2) Appropriately halt the demolition and reconstruction projects of small and medium-sized cities, and increase state-owned infrastructure construction projects such as highways, high-speed railways, energy and water conservancy hubs as soon as possible to drive the domestic demand industry chain [9].

Third, Fujian should prevent the industrial chain shock restructuring caused by manufacturing costs and price shocks. It is expected that in 2023, the imported inflation pressure will be suspended. Under the trend of declining external demand, the weak overseas economy is difficult to form a strong push up of commodity prices, and the prices of industrial products will be suppressed to a certain extent. The demand side of crude oil is expected to fall, but OPEC+ production cuts will still bring a certain supply bottleneck. With the gradual decline of the inflation rate in Europe and the United States, the imported inflation pressure is not large on the whole. Real estate is expected to drive steel, cement and other demand, coal prices are relatively stable. With the support of real estate policies, domestic real estate investment is expected to slowly repair, and the demand for steel, cement and other varieties may gradually pick up, or will drive the relevant prices to steadily increase. Under the guidance of domestic policies, coal prices are expected to stabilize, but the spending of coal enterprises remains cautious, and there is still a certain gap between supply and demand for coal in the process of economic recovery. China's economy is gradually recovering, and under the carbon neutral policy, China's demand for non-ferrous metals such as copper and aluminum is still strong, and the weak cycle of the US dollar will partly affect the upward price of commodities with financial attributes such as copper and gold.

2023 Food, energy price fluctuations continue, pork price pressure is limited. Referring to the price trend of overseas economies after the opening up, food and core commodities are less affected, energy is mainly affected by geopolitical factors, and the upward elasticity of labor and optional commodity prices is relatively greater. The overall impact of inflation brought by pork prices is controllable, from the leading indicator of the number of breeding sows, pork prices in the second half of 2023 or a downward cycle, and The State Council investment and storage will also help prevent prices from rising beyond expectations. The overall upward pressure on CPI in 2023 is expected to be small, which will have limited constraints on policy. After the epidemic, the inflation of services has picked up, but domestic inflation does not pose a core risk. Overall, the impact on monetary policy is limited, and inflation is not an imminent problem. Future

CPI trends mainly focus on pork prices and service price pressure, core CPI in the fourth quarter or there is a certain upward pressure.

Therefore, it is suggested that: (1) strengthen price supervision, investigate and punish malicious speculation, collusive price increase, price gouging and other illegal acts to maintain market order. (2) Give play to the role of the subsidy system, and implement a linkage mechanism between social assistance and social security standards and price increases for low-income groups. (3) Digital consumption vouchers should be issued to civil servants, state-owned enterprises and career personnel in a timely manner to drive the expansion of the supply side and production end, stimulate enterprises to expand reproduction, and then provide more jobs, increase residents' disposable income under the chain reaction, and form a benign closed loop to increase consumption power.

Fourth, Fujian should avoid the industrial chain risk of machine replacement and large-scale graduate employment in colleges and universities. China is the world's largest machine tool market, according to the German machine tool manufacturers Association on the world machine tool industry statistical survey data, the global machine tool consumption in 2020 is 57.28 billion euros, of which, China's machine tool consumption is 18.61 billion euros (about 140 billion yuan), the global proportion is 32.49%.

The tide of machine for people has prompted continuous changes and adjustments in industrial supply chains across the country, and some of the original employed people may leave their posts and re-choose their jobs, which may lead to turbulence and time lag in the human resources market of the whole society. Wang Xiaoping, Minister of Human Resources and Social Security, said on March 2, 2023, China's college graduates will reach 11.58 million in 2023, and the structural contradiction of recruitment and employment difficulties is still prominent.

Therefore, the research group recommends: (1) formulate policies, state-owned enterprises to take the lead and attract social hot capital, invest in blockchain-based online services and unmanned intelligent manufacturing equipment, as an emerging key industry support, large-scale development and production of unmanned equipment, export to the global epidemic area, expand and guide the employment of domestic practitioners. (2) Formulate policies to encourage enterprises to introduce virtual enterprise management forms and promote remote working, which on the one hand can reduce enterprise operating costs and on the other hand can maintain remote employment of white-collar workers. The launch, popularity and utilization rate of remote office software represented by Ali Dingding, Tencent enterprise wechat, ByteDance Flybook, etc., shows that collaborative documents, online meetings, cloud disk, customer management, contract management, staff training and other fields of products and services are now fully able to achieve remote office.

Fifth, Fujian has greater stable pressure in food security and agricultural product prices. China's grain storage and logistics security is still facing problems and challenges, and the national policy supports the construction of storage and logistics facilities. The white paper "China's Food Security" proposes that a modern grain storage and logistics system can prevent regional grain supply shortages. However, there are still some problems in grain storage in China, such as insufficient grain storage capacity in some areas, old facilities, difficult to improve the quality control of stored grain, and unbalanced distribution of grain storage facilities and equipment structure [10].

Therefore, the research group suggests: (1) to take the opportunity of migrant workers to return, as soon as possible to introduce policies to encourage migrant workers to actively participate in hometown agricultural production, and vigorously develop food, agricultural and sideline products, livestock production. (2) Vigorously develop rural e-commerce, promote local policy support, reward technology empowerment, and guide capital boost, promote modern agriculture will have a chain reaction, and guide the entire agricultural industry to accelerate development toward diversification, quality, service, standardization, intelligence, commercialization and other trends. (3) The current grain logistics system in our province is still facing some challenges, the systematization and integration level of grain logistics need to be improved, the development of channels is unbalanced, the infrastructure network is not perfect, and the degree of informatization and standardization is low [11].

5   Conclusion

The main content of this paper is the post-epidemic economic risk prevention and public management suggestions based on the emergency supply chain analysis model. By collecting the economic operation of Fujian from 2022 to January-March 2023, this paper discusses the key factors of Fujian industrial chain operation, including the survival of private enterprises, real estate development, PPI and CPI, employment under the influence of machine replacement, and the price of food and agricultural products. By using the high-speed computing equipment of the cloud computing center and based on the industrial supply chain analysis model constructed by the research group, the main weak links of Fujian economy are found. We should guard against the domino bankruptcy of private enterprises, the disruption of industrial capital chain caused by the impact of real estate, the disruption of manufacturing costs and price shocks caused by industrial chain shock and restructuring, and the risk of industrial chain superimposed by the tide of machine replacement and large-scale employment of college graduates, and put forward corresponding countermeasures.

According to the data analysis, we found that we should insist on seeking progress while maintaining stability, and strive to promote the high-quality development of industrial supply chain in the next few years; We will adhere to a systematic approach, maintain integrity and make innovations, promote overall economic improvement, effectively control risks, maintain overall social stability, and vigorously boost market confidence.

References

1. Adner R, Levinthal D. Technology speciation and the path of emerging technologies[J]. Wharton on managing emerging technologies, 2000, 55–74.
2. Agarwal R, Audretsch D B. Does entry size matter? The impact of the life cycle and technology on firm survival[J]. The Journal of Industrial Economics, 2001, 49(1): 21–43.
3. Aldrich H, Ruef M. Organizations Evolving[M]. 2nd ed. London: Sage Publications, 2006. [68]Allarakhia M, Walsh S. Managing knowledge assets under conditions of radical change: The case of the pharmaceutical industry[J]. Technovation, 2011, 31(2): 105–117.

4. Andergassen R, Nardini F, Ricottilli M. Innovation waves, self-organized criticality and technological convergence[J]. Journal of Economic Behavior & Organization, 2006, 61(4): 710–728.
5. Anderson R C, Reeb D M. Founding-family ownership and firm performance: evidence from the S&P 500[J]. The journal of finance, 2003, 58(3): 1301–1327.
6. Antonelli C. The microeconomics of technological systems[M]. OUP Catalogue, 2001. [73]Baer M. Kooperationen und Konvergenz, vol. 26 of Controlling und Management[J]. Peter Lang, Frankfurt a. M, 2004.
7. Bally N. Deriving managerial implications from technological convergence along the innovation process: a case study on the telecommunications industry[J]. MEMO-STENCIL, Preliminära Forskingsrapporter, Åbo, Finnland: Åbo Akademi School of Business, 2005.
8. Bauer J M, Weijnen M P, Tuk A L, et al. Delineating the Scope of Convergence in Infrastructures[M]//Critical Infrastructures State of the Art in Research and Application. Springer US, 2003: 209–231.
9. Bengisu M, Nekhili R. Forecasting emerging technologies with the aid of science and technology databases[J]. Technological Forecasting and Social Change, 2006, 73(7): 835–844.
10. Borés C, Saurina C, Torres R. Technological convergence: a strategic perspective[J]. Technovation, 2003, 23(1): 1–13.
11. Bottazzi G, Dosi G, Lippi M, et al. Innovation and corporate growth in the evolution of the drug industry[J]. International Journal of Industrial Organization, 2001, 19(7): 1161–1187.