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Retraction

Retracted: Analysis of Green Financial Policy Utility: A Policy Incentive Financial Mechanism Based on State Space Model Theory Algorithm

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Q. Wan, J. Qian, and M. Yu, "Analysis of Green Financial Policy Utility: A Policy Incentive Financial Mechanism Based on State Space Model Theory Algorithm," *Journal of Sensors*, vol. 2022, Article ID 5978122, 13 pages, 2022.

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Research Article

Analysis of Green Financial Policy Utility: A Policy Incentive Financial Mechanism Based on State Space Model Theory Algorithm

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In recent years, in the context of "double carbon" and innovation-driven synthesis, the volume of green finance has been growing year by year, and the intensity of environmental regulation has been stabilizing. As green financial technology innovation cannot be separated from the support of financial market and government policies, how to promote green financial technology innovation with green finance and environmental regulation has become a hot issue. How to control the appropriate strength of environmental regulations to promote green financial technology innovation is a matter of continuous exploration by local governments. The research of this paper is about the utility analysis of green finance policy: a policy incentive financial mechanism based on the state space model theory algorithm. Therefore, this paper introduces the theory of green finance based on the state space model algorithm and neural network model algorithm to study China's green finance policy incentive mechanism, profoundly study the current situation of domestic green finance development, and put forward further strengthen the leading role of the government in green financial innovation. At the same time, suggestions for achieving coordinated regional development were made in terms of giving full play to the role of financial markets in promoting green technology innovation.

1. Introduction

At present, under the comprehensive background of carbon neutrality and carbon peaking, China has stepped into a path of economic development from the early rough development to the transformation to a new high-quality economy. In terms of ecological protection, China has experienced a transition from pollution to green development, with economic development and ecological protection complementing each other. The "14th Five-Year Plan" as China's old economic system to a high-quality new economic system of green transformation of an important period, green technology innovation is the key to the transformation of the old and new dynamic energy. The report of the 19th Party Congress and the latest 14th Five-Year Plan of China have clearly instructed to escort the transformation of China's high-quality development and green development from two aspects: laws and regulations and government policies. Since the ecological environment is the most important resource endowment in China, the integration of environmental protection into the intervening financial market system is the basis and prerequisite for the transformation of green development and is also the main trend of future technological innovation development. Nowadays, how to establish a green technology innovation system stimulated by the market is attracting the attention of the society. However, China's green technology investment is still seriously insufficient, the relatively single financing channel for environmental protection enterprises is a major obstacle to the development of green technology, and the green financial market has not fully played a positive role in promoting green technology innovation. The lack of

green technology innovation has led environmental companies to rely on government policy support, a situation that limits the sustainability of green technology innovation. How to synergize green finance, environmental regulation, and green technology innovation to promote the green transformation of the economy has become a key issue.

Green finance is the foundation and condition of green innovation. Along with the policy idea of carbon peaking and carbon neutral, low-carbon development has become the funding orientation of financial market. Green finance has played a key role in supporting the green development of various industries in various regions of China. In the first half of 2021, China's green finance policy made a leap forward: first, China became the first country in the world to label "carbon neutral" green bonds and successfully issue carbon neutral bonds; secondly, government departments involved in green bonds unified the criteria for green projects for the first time; the People's Bank of China (PBOC) issued the "Green Financial Assessment Program for Banking and Financial Institutions" again. The People's Bank of China has once again released the "Green Financial Assessment Program for Banking and Financial Institutions," which has set a complete evaluation standard for the entire green financial system. As China's green financial system becomes more complete, the scale of China's green financial market continues to grow at an accelerated pace. By the end of 2020, our green foreign currency loan balance will be about 12 trillion yuan, jumping to the first place in the world; the stock of green bonds will be about 800 billion yuan, ranking second in the world. The volume of green finance is growing rapidly. By the end of June 2021, China's domestic and foreign currency green loan balances had reached 14 trillion yuan, up 26.5% from the same period last year. In the first eight months of 2021, it exceeded the total emissions of green credits in 2020. Green debt issuance exceeded 350 billion yuan, an increase of 152% compared to the same period last year, with a total of 180.1 billion yuan of carbon neutral bonds issued [1].

Green technology innovation is inseparable from the support of environmental regulation. The development path of environmental regulation in China started from zero and has experienced the initial exploration of "prevention-oriented," then the medium-term development of "prevention and control," and finally, to the present "priority of ecological protection." The environmental regulation policy system has also undergone a series of changes. The environmental regulation policy system has also undergone several strategic reforms. The policy thinking has changed from the "pollution prevention view" to the "ecological development view," and now, it is on the way to the "green development view." As the tools for environmental protection mature, they range from direct government involvement to market-driven environmental regulation, and finally, to voluntary environmental regulation involving all Chinese people and businesses. The overall system of environmental regulation in this new era has been gradually improved from top to bottom and from the inside out. In order to meet the latest national goal of "double carbon" to complete the transformation of China's green development, we should further build a synergistic system of China's environmental, financial, and innovation policies to jointly complete the construction of China's ecological civilization.

2. Research Background

Compared with the revolution of domestic green finance research, foreign processes have begun earlier. Salazar [2] believes that green finance includes multiple disciplines, focusing on combining finance with the environment, and can better protect the ecological environment. In addition, he also said that in the development of green finance different, the former focuses on the impact of its future environmental changes, while the latter focuses on its impact on all aspects of society and economy [3]. Cowan [4] believes that green finance is produced by the integration of financial industry and environmental protection. The development of green finance has promoted in-depth cross-integration between environmental economics and finance [5]. Labatt and White [6] pointed out that green finance is a new type of innovation tool that can effectively disperse environmental risks and improve environmental quality [7]. On the basis of further exploring the conduction mechanism between sustainable development and finance, it analyzes the positive impact of green finance on the raised funds of financial institutions from cross-disciplinary levels and pointed out that green finance is to coordinate finance and environmental protection. What is produced by common development, green finance refers to the optimal solution to financial institutions that can clear resource and environmental problems based on integration of various financial instruments [8]. Andarson [9] believes that the most important purpose of developing green finance is to invest in environmental protection. At present, banks will also inspect whether the loan owner will consider environmental factors [10]. Sachs et al. [11] believe that green finance is committed to sustainable development goals and run through innovative financial instruments and policies to increase investment intensity of environmental protection projects and increase environmental benefits [12].

Although domestic scholars started later in the research of green finance, they also formed some achievements. Gao [13] pointed out that green finance emphasizes that financial institutions must consider environmental issues when making major strategic decisions and advocate the combination of economic development and ecological environmental protection to promote sustainable economic growth [14]. An Wei [15] believes that green finance combines the development of the traditional financial industry with environmental protection and promotes the sustainable economic development through energy conservation and emission reduction [16]. Tang [17] summarizes the theoretical basis of developing green finance and the current development status of green finance in my country. It is concluded that the development of green finance requires scientific and reasonable use of financial instruments such as green bonds, green credit, and green funds to promote the construction of ecological civilization [18]. Yu [19] believes that the so-called green finance is to use scientific and technological

innovation to use some products or services of the traditional financial industry to develop more environmentally friendly causes to promote the sustainable development of the financial industry [20]. Qin and Wang [21] summarize the existing definitions. In general, the fundamental essence of green finance is a series of green financial product portfolios under the guidance of the government [22]. Wang [23] pointed out that green finance can drive green environmental protection-related enterprises and the overall industrial development, thereby driving more economic growth benefits [24]. He [25] sorted out the origin of green finance, connotation, and theoretical development context and summarized the purpose of green finance to lead social capital to the green industry.

3. Materials and Methods

3.1. Basic Theory

3.1.1. Green Finance. As early as 1990, environmental protection was introduced into the financial field by foreign scholars. The initial purpose is to clarify the connection between environmental protection issues and financial development, so the initial green finance is also called environmental finance or sustainable development finance. According to the connotation of early environmental finance, Chinese scholars took the lead in proposing the concept of "green finance," which refers to the activities of investing funds into environmental protection and energy-saving activities. This article will use Anwei [26], Ma [27], and others to define green finance: with the guidance of coordinating the economy, resources to protect the environment, and through environmental protection policies to allow financial services to enter environmental protection, energy conservation, emission reduction, etc. [28]. Provide corresponding financial policy support for environmental protection to achieve green financial operations. Further, analyze from the perspective of regulation. Ye [29] and others believe that market-type regulatory tools must have price attributes, such as taxation, charging, investment, and credit to affect the company's decision-making through price signals. Its connotation incorporates green finance into the market-oriented tools [30].

Although domestic and foreign scholars are not consistent with the concept of green finance, they are included in the financial system standards. Green finance is essentially the purpose of protecting the environment and energy conservation through financial and environmental policies to standardize the financing behavior of enterprises. On the one hand, it encourages the environment-friendly behavior of enterprises, on the other hand, limits the development of high pollution and high energy consumption enterprises and adjust the industrial structure to optimize the allocation of resource allocation with the purpose of green development. This article will outline the component of green finance from the following five parts:

(1) *Green Credit*. Green credit is a unique concept of my country. Foreign scholars usually call green credit as environmental protection financing. Scholtens [31] argues that green credit is the act of commercial banks that grant loans based on the environmental friendly performance disclosed by companies and their social responsibility [32]. Anderson [33], on the other hand, argues that the lending behavior that uses the environmental friendly performance of a company as a basis for review is green credit [34].

Chen [35] proposed that green credit incorporates the responsibility of environmental protection into bank lending policies based on the traditional credit model and is an economic instrument to achieve environmental protection through the financial market [36]. Chen [37] argue that green credit does not only work in the field of environmental protection but also in pollution-intensive industries such as traditional manufacturing [38]. Hu et al. [39] argue that green credit is a new type of credit policy adopted by banks from the perspective of bank revenue, which changes the traditional business model and aims to enhance profitability and public reputation, and that green credit can channel funds into state-supported energy-saving and environmental protection industries and curb the emissions of highly polluting enterprises. Sun et al. [40] argue that green credit has a double meaning: one, it is the act of helping to finance environmentally friendly industries according to bank lending guidelines. Second, it is the act of loans granted by banks to achieve sustainable development. The green credit referred to in this paper is proposed by He and Zhang [41], and Chen [42]: the act of banks to reallocate their lending resources to meet the environmental policies issued by the state. Highly polluting enterprises are given interest rates with penalties to discourage their emission behavior, and industries in the environmental protection field are given lower interest rates and audit thresholds to encourage their development [43].

(2) *Green Insurance*. The connotation of green insurance is divided into broad and narrow: green insurance in the narrow sense refers only to environmental pollution liability insurance. The insurance takes effect after the pollution act has occurred, the insurance company pays for the pollution act on behalf of the polluter, and compulsory purchase is an important feature of the insurance

(3) *Green Securities*. This security should be accurately described as an environmental audit of the company during the listing process, which usually includes environmental audits of the listed company, environmental information omissions, or environmental performance assessment. Usually, the audit can improve the public reputation to obtain broadened financing channels

(4) *Green Investment*. Green investment is also called environmental protection investment, and Zhang [44] believes that environmental protection investment is the government-led investment behavior, which is an important part of China's national

economy. Peng [45] believes that the government, enterprises, and individuals can become the main body of investment in environmental protection investment. The role of environmental protection investment is to increase the capital stock of environmental protection to achieve the purpose of continuous environmental improvement. Environmental protection investment is an important part of green finance, which can usually form fixed assets greater than one year

(5) *Carbon Finance*. The definition of carbon finance is still controversial in academic circles, but at present, it can be basically determined that carbon finance is divided into two definitions: broad and narrow. Chen [46] believes that the broad definition of carbon finance should be restricted to the process of carbon emission, and the government uses financial instruments to reduce carbon emissions as a financial market instrument, while the narrow definition is the process of trading carbon emission rights by enterprises at the micro level (World Bank, 2011)

Green finance in essence is to regulate the financing behavior of enterprises through financial and environmental policies to achieve the purpose of environmental protection and energy conservation. On the one hand, it encourages the environment-friendly behavior of enterprises, and on the other hand, it restricts the development of high pollution and high energy consumption enterprises to adjust the industrial structure to optimize resource allocation with the purpose of green development. The specific 5 types of classification are shown in Figure 1.

3.1.2. Green Financial Technology Innovation. Green financial technology innovation is derived from Schumpeterian innovation theory. Schumpeter's innovation theory emphasizes the crowding-out effect of environmental regulation on technological innovation and believes that environmental regulation will eventually hinder technological innovation. In addition to the crowding-out effect, the uncertainty of technological innovation is another major factor that hinders technological innovation in Schumpeter's innovation theory, and environmental regulation will also increase the risk brought by the uncertainty of technological innovation. Therefore, this paper splits the impact of environmental regulation on technological innovation in Schumpeter's innovation theory into the crowding-out effect and the risk-averse effect. This paper categorizes firms' motivation to obtain compensation as the pushback effect and the technology barrier effect.

In summary, the theoretical framework of the overall impact of environmental regulation on green financial technology innovation is shown below, and the analysis of the transmission path of the impact of environmental regulation on green financial technology innovation should be analyzed from the above four paths to determine its hindering and incentive effects, as shown in Figure 2.

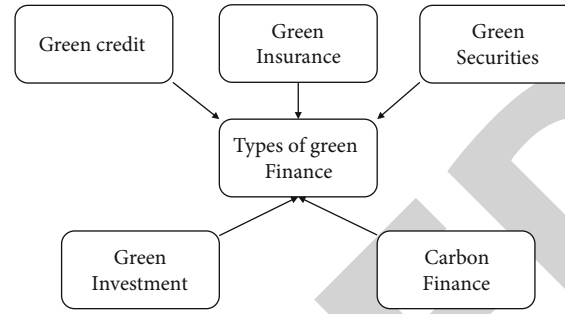

Figure 1: Types of green finance.

3.2. Research Methodology

3.2.1. State-Space Model Theory Research Method. The state space model is a dynamic time-domain model with implicit time as the independent variable. State space models are increasingly used in economic time series analysis. The typical correlation model, proposed by Akuchi and further developed by Mehra, is the most widely used state space model. The models are specifically classified into two major categories and four subcategories, as shown in Figure 3.

The state space models are based on the steganalysis of time series. To analyze a (nonsmooth) time series, the (trend) components should be divided into arbitrary, low, and low values. A time series containing random mapping components is also an integrated time series, since the random walk is a sum or integration of weak stable components. When the linear sequence (continuous power connection) of some sequences is reduced, the rotation sequence is called a parallel process. The idea of creating linear sequences of unstable time series can be traced back to regression analysis. The coordinate proposed by Granger has been scientifically proved. Studies by Aoki, Cochran, and others have shown that in many nonfixed and unpredictable time series, arbitrary velocities are much smaller than previously thought, or have disappeared altogether.

3.2.2. Research Method of Neural Network Model. RBF neural network (radial basis function neural network, RBFNN) is one of the most typical three layer forward neural network structure, in addition to the traditional neural network of information processing way, the underlying layer using radial basis function to the nonlinear mapping the input data, and then it goes to the next layer through a linear calculation. The structure of RBF neural network is shown in Figure 4.

RBF neural network is mainly from the two parts of the input data for processing, the two parts, respectively, for supervised learning and unsupervised learning, in unsupervised learning section, by using clustering algorithms such as K-means for data clustering, to obtain the center of the hidden layer radial basis function, and then make use of information center of the width of the radial basis function

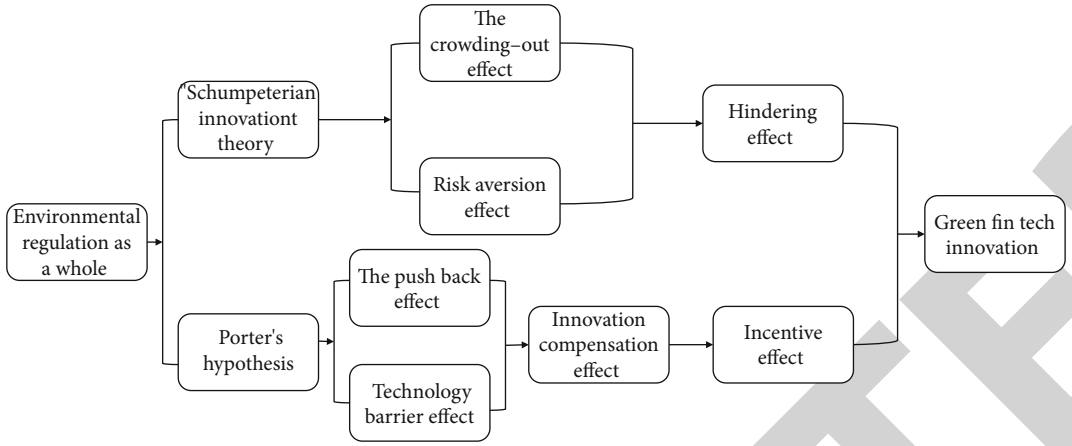

Figure 2: Mechanism of green financial technology innovation.

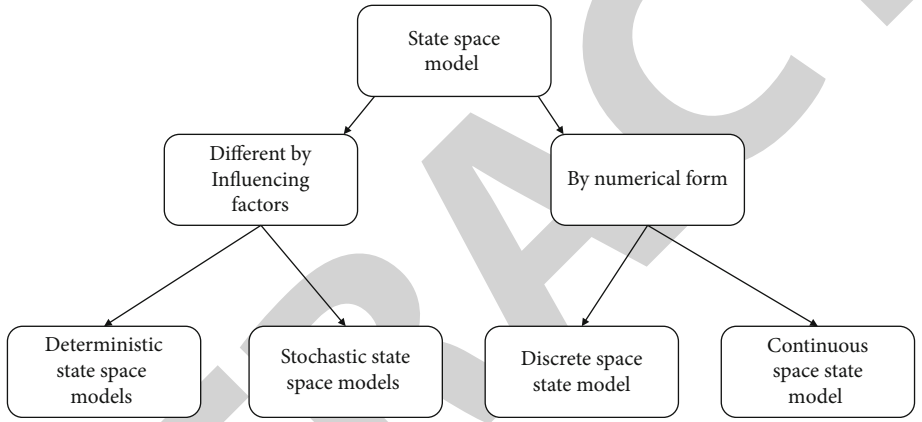

Figure 3: Classification of state space models.

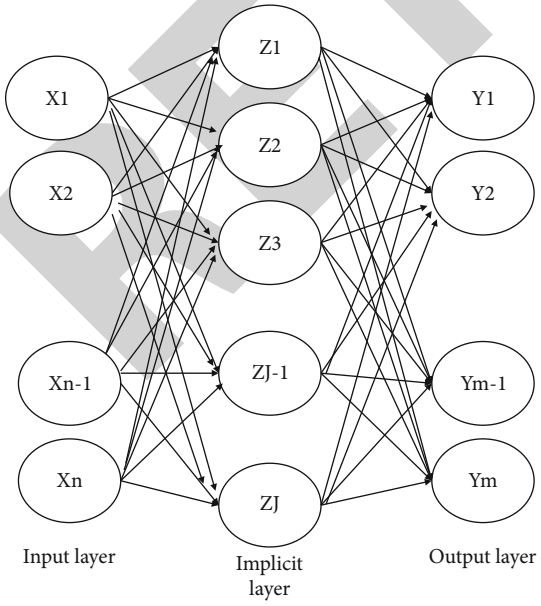

Figure 4: Structure diagram of radial basis neural network.

vector is calculated. The width vector can be calculated as calculated. The width vector can be calculated as follows:

$$\sigma_j = \frac{c_{xy}}{\sqrt{2h}}, \tag{1}$$

where c_{Xy} is the maximum distance before the center point, and h is the number of nodes.

Then, the input data are correlated and dispersed through the hidden layer and output layer, respectively, and the output of the x_i input sample at the j first node of the hidden layer can be calculated by the following formula:

$$\phi(x_i, j) = \exp\left(-\frac{1}{2\sigma_j^2} x_i - c_i\right), \tag{2}$$

where c_j and σ_j are the center point and m width vector of the first node in the hidden layer, respectively.

The output of x_i the input sample at j the first node of the output layer can be calculated by the following formula:

$$y_m = \varphi(\phi(x_i, j) * w_m), \tag{3}$$

where w_m is the node weight φ and is the activation function.

In supervised learning part, mainly on the process of modifying the parameter of each level, mainly through the process error function to calculate the gradient value of each parameter, and then use the traditional gradient descent method such as stochastic gradient descent method (SGD) is used to adjust the parameters, and in terms of output layer is used for linear weight, for example, the update formula is as follows:

$$w_t = w_{t-1} - u * \frac{\sigma E}{\sigma w_{t-1}}, \tag{4}$$

where E is the error function, and u is the learning rate.

In addition to the above methods, the center point and width vectors of hidden layers can be generated randomly and then updated according to the gradient correction formula of supervised learning process.

4. Results and Discussion

4.1. Status Quo of Green Finance. Because green finance is extensive, data is not easy to obtain. Based on the collation of existing literature, this paper finds that various measurement methods of green finance all cover green credit and green investment, and the coefficient accounts for a high proportion. Therefore, green credit and green investment can more easily reflect the status quo of green finance.

4.1.1. Green Credit Status. Under the high-pressure influence of a series of national environmental policies and the continuous attention of all walks of life to ecological issues, major commercial banks have launched green credit projects in succession to cater to national policies. Green credit balance and its proportion in China's banking industry are from 2010 to 2017. It can be seen that since the easing of the international financial crisis in 2010, the balance of green credit has shown a trend of steady growth every year. In recent years, compared with 2010, there is a significant improvement, among which, the green credit balance issued in China in 2020 has a growth rate of 700% compared with the beginning, see Figure 5.

4.1.2. The State of Green Investment. In terms of green investment, this paper uses the total investment in environmental pollution control from 2003 to 2017 and the proportion of GDP to describe the current situation of green investment. According to the chart, China's green investment showed a steady growth before 2014 and then ushered in a slight decline.

From the total investment in environmental pollution control to the total proportion of the national economy, the value fluctuated between 1% and 1.6% over the years and showed a downward trend in recent years after reaching the peak value. This phenomenon shows that the growth rate of green investment in China is much less than that of national economy, see Figure 6.

4.2. Current Situation of Green Financial Technology Innovation

4.2.1. Investment Status of Green Financial Technology Innovation. The R&D investment of green technology innovation mainly includes research funds and researchers, both of which showed a trend of steady growth from 2000 to 2018. In terms of the data of scientific research expenditure, based on the scientific research expenditure in 2000, the increase of scientific research expenditure in 2018 was 2,196%, and the increase of scientific research personnel was 476%. The research expenditure and the research personnel both increased exponentially, see Figure 7.

4.2.2. The Output Status of Green Technology Innovation. The output of green technology innovation is divided into two aspects: patent authorization and patent application, as shown in the Figure, the number of green patent authorization and green application increased slowly year by year before 2010. Due to the implementation of the Amendment of the Patent Law on October 1, 2009, the number of green patent grants and applications rose step by step. In 2015, the number of green patents granted and applied again showed a step increase, but the increase of patent granted was much less than the number of patent applications, see Figure 8.

To sum up, it can be seen from the data in recent years that green finance has a good momentum of development. Green credit data and green investment data both show an increasing trend, and their fluctuations are mostly caused by market shocks. Although green investment shows an overall growth trend, its growth rate is far less than China's economic growth rate. Fee-based environmental regulations are regulated by national policies, and sewage charges float within a certain range every year. Influenced by the policy of replacing sewage charges with taxes, the amount of sewage charges collected has decreased in recent years. The data related to green technology innovation and green finance both show an increasing trend. Among them, the scientific research funds and scientific research personnel showed a steady increase every year, while the number of patent applications and the number of grants showed a step increase. This asymmetry of input and output may be due to the fact that the growth of innovation output is more dependent on the macrocontrol of policy and the protection of intellectual property rights by law.

4.3. Promote the Development of Green Finance Incentive Mechanism

4.3.1. Further Strengthen the Leading Role of the Government in Green Financial Innovation. The impulse response analysis shows that the effect of environmental regulation on green technology innovation is stronger than that of green finance. Therefore, it is particularly important to play the role of government policy in encouraging green technology innovation. Based on the empirical analysis and mechanism analysis, this paper puts forward several suggestions as follows: first, the impulse response results of the whole country and the eastern and central regions have a short-term

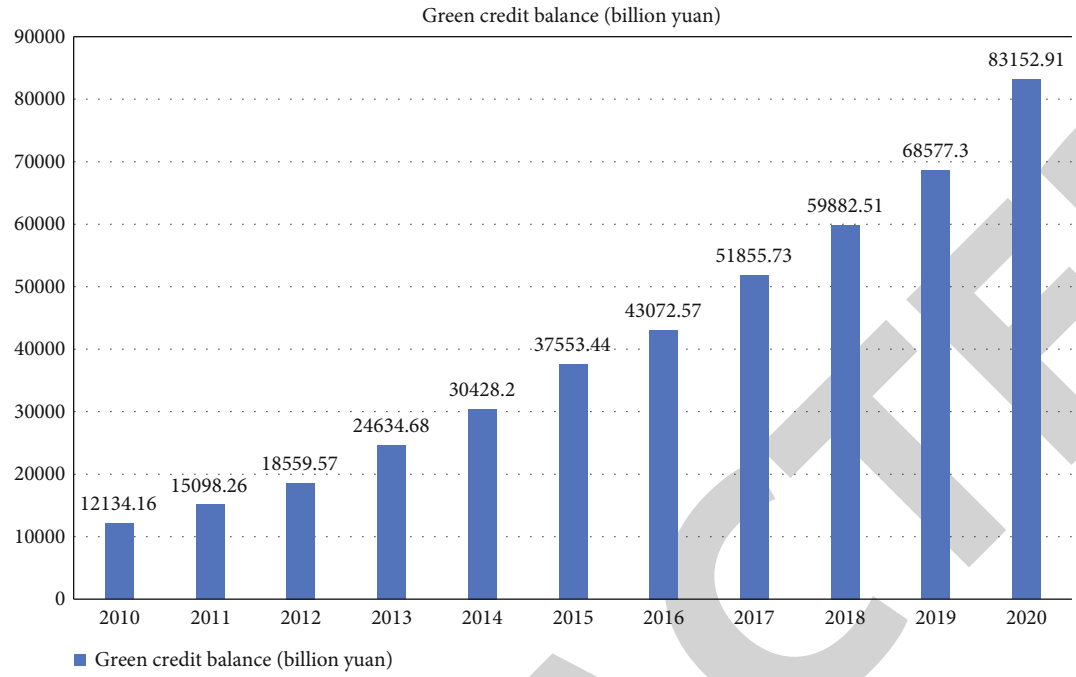

Figure 5: China's green credit balance from 2010 to 2020.

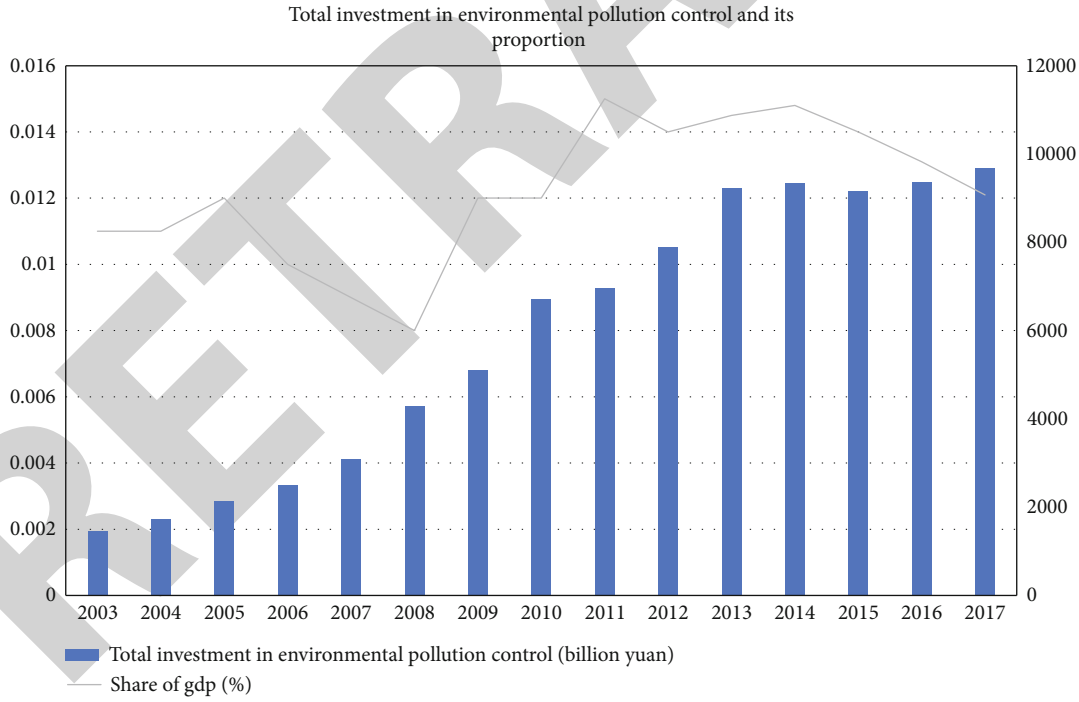

Figure 6: Total investment in environmental pollution control and its proportion in GDP from 2003 to 2017.

positive impact on green technology innovation while a long-term negative impact, which may be due to the deviation in the process of policy implementation. The government should further implement the supervision during the implementation of policies and strengthen the control after the implementation of policies to avoid the "distortion phenomenon" of policies. At the same time, government management departments need to popularize the relevant knowledge of environmental protection policies and green financial system to all enterprises and individuals, so that public participation becomes an important part of policy supervision. Second, on the basis of regional analysis, the obvious regional impact of environmental management on financial innovation in China is analyzed. In view of the

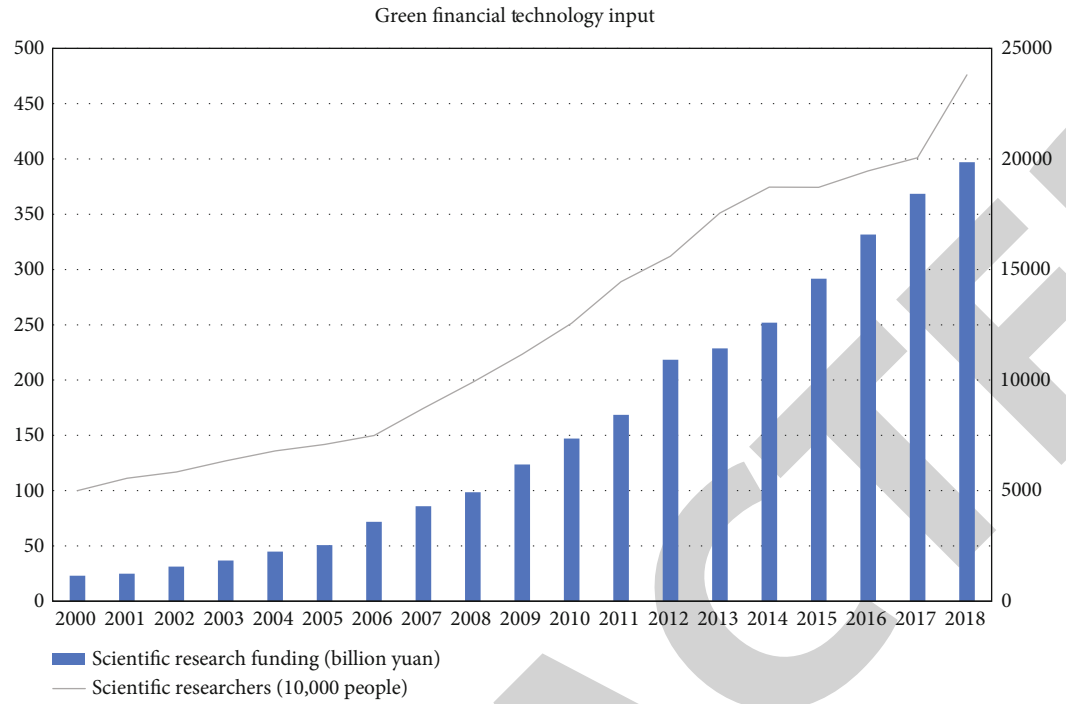

Figure 7: 2000–2018 research funds and researchers.

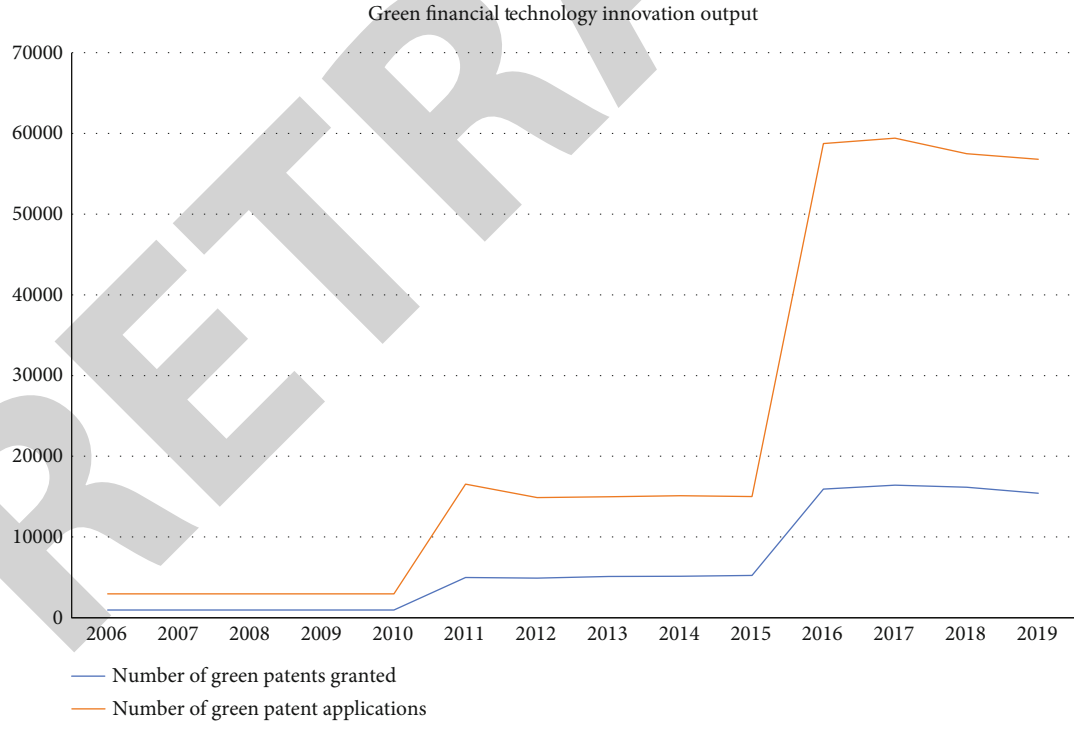

Figure 8: Number of green finance patents granted and green patent applications from 2006 to 2019.

difficulty of implementing regional cost-based environmental regulation policies, each regional government should formulate corresponding supporting policies according to local conditions. In eastern and central regions, environmental regulation rack costs have a greater impact on green technology innovation, should continue to increase on its effect and promote technological innovation, and local authorities in heavily polluted areas should meet access barriers for highly polluting enterprises. In less developed parts of the West, cost-based environmental regulations are holding back

green technology. Local governments in the region should accelerate their own economic development by stimulating investment, helping high-polluting cities share the share of polluting enterprises, and strengthening the impact of environmental regulations on green technology innovation. Second, fee-based environmental regulation and green finance can inhibit and encourage green technology innovation. Therefore, it is very important to grasp the intensity of cost-based environmental regulations and green financial policies. Environmental regulations should not only play a role in promoting energy conservation and emission reduction of enterprises but also allow enterprises to have enough funds for research and development of green technology, so as to improve the production and operation environment of enterprises in the long term.

4.3.2. Play the Role of Financial Market in Promoting Green Technology Innovation. Through mechanism analysis and empirical analysis, this paper finds that when green finance is used as a regulatory tool, it has more hindrance than incentive effect on green technology innovation. Therefore, two policy suggestions are given as follows: first, through comparative analysis of variance decomposition of cost-based environmental regulation, it is found that green finance has weak impact on technological innovation and cost-based environmental regulation. The reason for this phenomenon may be that some green financial products are "non-mandatory" and "fungible" compared with government policies. Therefore, commercial banks should increase marketing efforts to play its role in solving the problem of "preferential treatment" for environmental protection enterprises and "punishment" for polluting enterprises. Second, according to the impulse response results of different regions, the impact of green finance on green technology innovation in western China is weak and negative, which may be due to the lack of environmental protection enterprises in western China. Therefore, city firms in different regions should adopt green financial rules and regulations adapted to the regional environment. For example, the entry threshold of financing should be relaxed in the western regions where pollution is relatively weak. The eastern and central regions with strong pollution should adopt different green credit interest rate benchmark, green insurance coverage, carbon quota, and so on for cities with high pollution enterprises and other cities according to local conditions.

4.3.3. Give Play to the Principal Role of Enterprises in Green Financial Innovation. Through mechanism analysis, it is found that whether enterprises are willing to invest in green technology innovation plays a decisive role in the overall transmission path of environmental regulation on green technology innovation. Based on this, the following suggestions are summarized: first, from the analysis of the current situation, it is found that the asymmetry of R&D input and output of enterprises may be due to the changes in the protection of intellectual property rights by policies and regulations. Therefore, both the government and the public continue to deepen the awareness of intellectual property protection, so as to improve the efficiency of technological output and reduce the risk aversion consciousness of enterprises caused by the uncertainty of technological innovation. Second, give more preferential policies to enterprises that reach the green "threshold." When enterprises reach the technical barrier, they can get rich innovation compensation, so as to stimulate enterprises' investment in green technology research and development.

The green financial system should also continue to improve and develop. First of all, we should establish and improve the performance assessment system of financial institutions, add ESG-related indicators to the assessment indicators, and promote financial institutions to optimize the direction of resource allocation through financial innovation. Second, strengthen supervision to prevent and defuse financial risks. When the old regulatory regime fails to effectively identify new financial risks, it increases systemic risk in the market, leading to financial panic. Therefore, regulatory authorities should effectively prevent potential risks such as idle funds, high leverage, and related transactions in the green financial system through functional supervision and macro and microprudential supervision tools, so as to ensure the steady development of the green financial system. At the same time, when providing financial products and services, financial institutions should establish a self-discipline mechanism for green finance, carry out relevant stress tests, and strengthen risk management. For accounting firms and credit rating agencies, the independence and objectivity of audit and rating should be adhered to, and suspicious risk points should be revealed in a timely manner, so as to achieve the purpose of supervision. Finally, improve green finance laws and regulations to ensure that there are laws to follow. On the one hand, relevant laws and regulations have been formulated to ensure that financial institutions are legal and compliant in their business exhibitions. At the same time, strict restrictions have been imposed on the flow of funds of financial institutions to ensure the standardized development of green finance business. On the other hand, through the publicity and interpretation of green finance laws and regulations, improve the environmental awareness of various enterprises and institutions.

4.3.4. Improve the Strength of Green Finance and Strengthen the Support for Green Economy. For high-risk green credit projects, commercial banks can focus on supporting the development of green industry by optimizing loan approval, mortgage, and other processes. At the same time, commercial banks can also reduce the problems of insufficient liquidity and increased risk of bad debts caused by green credit business through asset securitization and other ways to ensure the soundness of commercial banks' operations. Second, the development of green securities will be the focus of green financial product innovation. Therefore, on the one hand, China should accelerate the improvement of the current capital market system, give full play to the function of the capital market, and put social capital into the development of green economy more accurately. On the other hand, green enterprises should continue to strengthen scientific and technological innovation, form core competitiveness, and constantly improve their own business capabilities, so

as to reach the listing threshold of each exchange and enrich the source of funds. Third, PPP model is an effective way for social capital and government finance to cooperate in investment projects. On the one hand, after the introduction of social capital, PPP model can solve the problem of government financial strain; on the other hand, PPP model can also bring a perfect investment management mechanism, so that project funds can be invested in a market-oriented way. Therefore, PPP model can be introduced to support the development of local green industry. In addition, China's current green insurance varieties are relatively single, unable to meet the risk management needs of enterprises. Therefore, insurance institutions should innovate insurance varieties for customers with different risk types and give full play to their role in reducing environmental risks. Finally, strengthen the combination of green finance and fintech, make full use of digital technologies such as big data and block chain, strengthen the risk assessment of small and microenvironmental protection enterprises, and alleviate the problem of insufficient funds for small and microenvironmental protection enterprises.

4.3.5. Increase the Proportion of Green Industry and Promote the Optimization and Upgrading of Industrial Structure. After decades of rapid development, China's economy has entered the second half of reform. Both the external environment and internal growth drivers are in urgent need of transformation. From the perspective of production, China's previous industrial structure was dominated by traditional industries such as energy and infrastructure, and the inherent economic development mode only focused on quantity rather than quality, resulting in serious overcapacity in traditional industries and serious environmental pollution and resource loss. From the perspective of consumption, the Internet industry has brought about the reconstruction of consumption mode and the consumption upgrade brought by the rise of the middle class, and ecological and environmental problems are increasingly valued. And the green economy transformation program can not only solve the environmental risk of production end but also meet people's consumption demand. Therefore, it is imperative to optimize and upgrade the industrial structure in the direction of greening.

As mentioned above, environment, as a public good, has externalities. In the face of market failure, the government needs to strengthen policy guidance and support the development of green industry. Therefore, on the one hand, the government can support the development of green environmental protection industry through tax and fee reduction policies, such as the mature tax subsidy policy for new energy vehicles, the government can promote and upgrade this policy, which is widely used in solid waste treatment, building energy conservation, garbage power generation and other fields, and give tax incentives. First, policy guidance should be adopted to help enterprises extend industrial chains, build ecosystems, upgrade manufacturing business models, and transform traditional industries into green ones. Second, on the one hand, real enterprises should keep up with the trend of national economic development, improve their core competitiveness through scientific and technological innovation, eliminate backward production capacity in time, and improve industrial added value. Second, all kinds of enterprises should consciously abide by relevant laws and regulations, take the initiative to disclose environmental information in a timely manner, and take the initiative to bear the environmental costs caused by their own operations. Third, to establish residents' awareness of environmental protection, and force relevant enterprises to carry out supply-side structural reform from the consumption side to reduce environmental damage. Fourth, the majority of universities and research institutions can jointly train relevant high-tech talents with enterprises, accumulate high-quality human capital through the integration of industry and education, and provide impetus for the transformation and development of the corresponding structure.

4.3.6. Strengthen Regional Economic and Financial Cooperation to Achieve Coordinated Regional Development. According to the above analysis, it can be seen that there are large differences in the development of green finance and green economy in the eastern economic belt of China. Among them, the overall level of green finance and green economy development in Yangtze River Delta and Pearl River Delta is higher; the overall level of green finance and green economy development in Beijing, Tianjin, and Hebei is lower. And specific to the provinces, the northern region of Liaoning Province green finance, green economy development level as a whole is low, and Beijing-Tianjin-Hebei region has not yet formed a good synergy effect, so the regions should strengthen economic and financial cooperation to achieve the coordinated development of regional green economy, green finance. First of all, we should strengthen the exchange and learning of experience. On the one hand, the backward regions can learn advanced governance experience from the developed regions and actively introduce relevant policies and measures to promote the transformation of industrial structure in the region; on the other hand, the developed regions can strengthen the talent assistance to the backward regions and help the backward regions to establish and improve the green finance and green economy system. Second, a sound regional coordination and linkage mechanism should be established. Provinces should not only establish consistent principles of ecological protection and green economy development standards, so that provinces (cities) within the region can complete industrialization transformation according to unified regulations, but also establish and improve the command and coordination mechanism of financial, environmental protection, and financial institutions in each province to solve the problems of regulatory arbitrage and regulatory loopholes, so as to realize the overall improvement of regional green economy development level. Finally, when the development of green economy in developed regions tends to be saturated, social capital and leading green environmental protection enterprises in the region can be guided to invest in green industries in backward regions, which not only improves the utilization rate of resources but also helps backward regions to achieve rapid development.

5. Conclusion

China's general policy basically requires that the transformation of China's high-quality development and green development should be escorted from two aspects: laws and regulations and government policies. Between the ecological environment is the most important resource endowment in China, to include environmental protection into the intervention financial market system is the basis and prerequisite for the transformation of green development. Therefore, this paper introduces the theory of green finance based on the study of China's green financial policy incentive mechanism through the state space model and other algorithms, deeply studied the current situation of domestic green financial development, and put forward relevant suggestions on the current situation of China in the financial policy incentive mechanism.

(1) Further strengthen the leading role of the government in green financial innovation. The national impulse response comparison analysis shows that the intensity of cost-based environmental regulation on green technology innovation is greater than that of green finance on green technology innovation. Therefore, it is particularly important to play the role of government policies in stimulating green technology innovation. Based on the empirical and mechanistic analyses, this paper makes the following recommendations: first, the impulse response results for the whole country and the east-central region have a short-lived positive effect on green technology innovation and a long-term negative effect, which may be due to the bias in the policy implementation process. The government should further implement the supervision during the policy implementation and strengthen the control after the policy implementation to avoid the "distortion" of the policy

(2) To play the role of financial market to promote green technology innovation. City banks in different regions should adopt green financial regulations that are compatible with the environmental conditions of their regions. For example, the weaker polluted western region should relax the access threshold of financing for enterprises; the stronger polluted eastern and central regions should also adopt different green credit interest rate benchmarks, green insurance coverage, carbon rights quota, etc. for cities with high polluting enterprises and other cities according to local conditions

(3) Play the main role of enterprises in green financial innovation. The willingness of enterprises to invest in technological innovation plays a decisive role in the transmission path of environmental regulations affecting green technological innovation as a whole. Accordingly, the following policy recommendations are made: the asymmetry of enterprises' R&D inputs and outputs found from the analysis of the current situation may be due to the changes in policies and regulations for the protection of intellectual property rights. Therefore, both the government and the public continue to deepen their awareness of intellectual property protection as a way to improve the efficiency of technological output and reduce enterprises' awareness of risk avoidance due to the uncertainty of technological innovation

(4) Improve the strength of green finance and strengthen support for the green economy. For high-risk green credit projects, commercial banks can focus on supporting the development of green industries by optimizing the process of loan approval and mortgage pledge. At the same time, commercial banks can also reduce the problems of insufficient liquidity and increased risk of bad debts brought by green credit business through asset securitization and other means to guarantee the soundness of commercial banks' operation. Second, the development of green securities will be the focus of green financial product innovation. China should accelerate the improvement of the current capital market system and give full play to the functions of the capital market to invest social capital more precisely in the development of green economy

(5) Increase the proportion of green industries. Now that we have entered the second half of reform, both the external environment and internal growth drivers are in urgent need of transformation. From the production side, China's previous industrial structure is mostly based on traditional industries such as energy and infrastructure, and the inherent way of economic development only focuses on quantity rather than quality, which leads to serious overcapacity in traditional industries and brings serious problems of environmental pollution and resource depletion. From the consumption side, the Internet industry has brought about a reconfiguration of consumption patterns, superimposed on the upgrading of consumption brought about by the rise of the middle class, and ecological and environmental issues are receiving increasing attention

(6) Strengthen regional economic and financial cooperation to achieve coordinated regional development. All regions should strengthen economic and financial cooperation to realize the coordinated development of regional green economy and green finance. First, we should strengthen the exchange and learning of experience. On the one hand, the backward regions can learn advanced governance experience from the developed regions and actively introduce relevant policies and measures to promote the transformation of industrial structure in the region; on the other hand, the developed regions can strengthen the talent assistance to the backward regions and help the backward regions to establish and improve the green finance and green economy system

Data Availability

The dataset can be accessed upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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