

Retraction

Retracted: An Empirical Study of a Mathematical Model for Influence of Government Tax on the Price Behavior and the Stability of Market Price

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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) Peer-review manipulation

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] F. Wang, C. Wu, and S. Tsai, "An Empirical Study of a Mathematical Model for Influence of Government Tax on the Price Behavior and the Stability of Market Price," *Mathematical Problems in Engineering*, vol. 2020, Article ID 8097402, 9 pages, 2020.

Research Article

An Empirical Study of a Mathematical Model for Influence of Government Tax on the Price Behavior and the Stability of Market Price

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The fierce competition among enterprises and disordered market price competition have affected the development of the whole regional economy. Government tax subsidies have always been regarded as the advantages of enterprise development, but the mechanism of the influence of government tax on regional economic development, especially the impact on market price, has not been explored. Based on the Bertrand competition, applying chaos control theory, considering the government revenue rate, the influence of government tax on the price behavior and market price stability is analyzed, and then the numerical simulation is carried out. The research shows that the price adjustment of enterprises is a complicated process and government tax is helpful to the stability of market price. The government tax rate increasing can increase the stable region of price equilibrium and reduce the bifurcation and chaos of the price game system.

1. Introduction

China's economy is developing rapidly. However, in the process of the development, some problems have also been exposed [1]. One concern is the plight. That is, enterprise cluster competition is bad and the price disorder is serious, which reduces the profit of the whole economy, weakens the innovation ability of the enterprise, reduces the loyalty of the consumer, and then affects the development of economy [1]. The market price mechanism is the soul of the market. It can maintain the stability of the market price, help to curb inflation, impact the real economy, stabilize the market order, and maintain the stability of the whole market. So, market price stability is a major goal of macroeconomic policy. Therefore, it is imperative to study the price competition behavior and establish the market price stability mechanism.

The phenomenon of economy has always been the focus of various economic schools. However, the theoretical

research on the price behavior and the price stability of market is still weak. The current research results mainly focus on the price level and influencing factors of the market [2–4], the behavioral characteristics of price monopoly [5, 6, 7], and the chaotic state of price competition behavior in enterprises [8–12]. Related studies suggest that, in the price competition, the enterprise starts the game based on the product differentiation, the complex market environment, and the unpredictable strategy of competitors often lead to the unstable evolution in the price adjustment process and eventually leads to the chaos of the price market. Chaos theory is an important theory and method to study the complex changes of economic evolution. Some scholars use this theory to explore the price competition behavior and price stability mechanism of enterprises. The dynamic property and chaotic complexity of the price competition model under different backgrounds are studied from the aspects of price adjustment mechanism, cost function, price function, price expectation method, and so on.

At present, there are mainly two aspects in this field. The first aspect is the study of price competition behavior of enterprises of equal status. For example, Zhang et al. [13] studied two using the same finite rational price adjustment strategies of oligopoly enterprises price competition process and pointed out that the change of the price adjustment speed will change the stability of Nash equilibrium. Long and Zhao [14] constructed a duopoly price competition game model with cluster spillover in the enterprise cluster, analyzed the enterprise price competition behavior in the enterprise cluster, and studied the impact of cluster spillover on the price equilibrium of the discrete dynamic system. Liao [15] established a numerical simulation model of the price competition chaotic dynamical system and analyzed the complex system of price behavior. The second aspect is the study of the price competition behavior of the principal subordinate enterprises. For example, Xin and Chen [16] established a Stackelberg game system based on the price competition relationship between tap water and purified water enterprises, studied the price evolution process of the system, and proposed that the improved stable linearization method can control the occurrence of chaos. Lu [17] studied the dynamic nature of the Stackelberg game model based on the price adjustment mechanism of bounded rationality strategy and adaptive strategy for oligopoly enterprises and affirmed the important role of price adjustment speed to the price equilibrium stability. Gao and Liu [18] applied chaos control theory to realize adaptive fuzzy optimal control of price market.

Looking at the existing literature, the current research studies on the equilibrium and stability of price competition are mostly based on the oligarch environment in the pan competitive market. And the conclusions are relatively simple; most of them only emphasize the influence of price adjustment speed on price stability, lack of the research on the impact of other parameters on the market price equilibrium stability, and more lack of the study on the system mechanism establishment of the market price stability. This paper studies the competitive behavior of market price and stability, can reveal the process mechanism of price game to achieve Nash equilibrium in the intensive market, finds the strategy to realize the stability of market price, and better promote the development of the economy.

In order to promote economic development, various countries have adopted government tax policies in succession. However, the tax rate of different countries is different. Since China's reform and opening up, the tax rate changes show a V-shaped trajectory [19, 20]. So, it is necessary to study the government policy to explore the appropriate level of the current tax rate. At present, the research on government tax policy is mainly focused on the role of tax policy and how to establish a reasonable tax policy. For example, Jia and Ying [21] pointed out how to stimulate enterprise development and promote the kinetic energy of the rapid growth of the enterprise is to present China "supply side reforms" and the core of fiscal policy transformation, the government tax policy is a very important policy choice, and tax policy has good flexibility and very direct role in this process. Cleeve [22], Chang and Choi [23], Choi et al. [24], Wang and Yu [25], and so on proved that fiscal subsidies or

tax incentives can promote the R&D innovation of enterprises. Alonso-Carrera and Raurich [26] examined the change of industrial structure by introducing the minimum consumption demand, analyzed a multisectoral endogenous growth model under the government tax policy, and pointed out that the price effect drives the upgrading of the industrial structure. Room and Cisneros Örnberg [27], by studying the lessons of marijuana from the experience of alcohol monopoly, concluded that public monopoly is generally a better choice for public health and welfare. Abbasian and Souri [28] studied the inefficient behavior of government policies caused by the rise of energy prices in Iran, quantified the consumer subsidies by using the price gap method, and studied the impact of energy price rise. Chen et al. [29] studied the incentive mechanism of carbon emission tax policy for multinational or cross regional platform enterprises and proposed that a product with high price elasticity and carbon emission intensity will not only hinder enterprises to obtain higher income but also reduce the fairness of the system under the unchanged emission control policies.

Combining the existing literature, we find the current research on the government's tax policy lack of in-depth study on the appropriate level of tax rates and lack of the research on the influence of government tax on market stability. This paper will study the tax influence on enterprise competition price and the market price stability mechanism and process, explore the government tax on the important role of the market price stability, find the realization of market price stability strategy, and explore, on the basis of the government, the appropriate tax rate. The paper wish provides theoretical reference for the government to formulate relevant policies and tax policies to stabilize the market price.

2. The Model

We consider a Bertrand-type duopoly market where two oligopolies choose different prices for their heterogeneous products. Players can decide the prices according to the adjustment rules [30].

Hypothesis 1. Let p_i represent the price of firm i at discrete time periods $t = 0, 1, 2 \dots$ and q_i represent the output. Following Zhang et al. [13], suppose the market demand function of the players is

$$q_i = a - bp_i + dp_j, \quad (1)$$

where $a > 0, b > 0, d > 0, i, j = 1, 2, i \neq j$. The parameter d measures the degree of substitution of the two products. Large d represents big degree of substitution.

Hypothesis 2. Positive parameter c_i is the marginal cost of firm i . The cost function of enterprise i is

$$C_i = c_i q_i. \quad (2)$$

Hypothesis 3. The government revenue is based on the sales revenue of enterprises' products, and the tax rate is r ($0 \leq r < 1$).

Then, the profit function of enterprise i is

$$\pi_i = p_i q_i - c_i q_i - r p_i q_i. \quad (3)$$

From the profit maximization by player i the marginal profits in period t are obtained as follows:

$$\left(\frac{\partial \pi_i}{\partial p_i}\right) = d(1-r)p_j - 2b(1-r)p_i + (1-r)a + bc_i. \quad (4)$$

Then, the optimal price response function of firm i can be given by

$$p_i = \frac{d(1-r)p_j + (1-r)a + bc_i}{2b(1-r)}. \quad (5)$$

Information in the market usually is incomplete. Suppose players use different expectations to adjust the prices. Following Zhang et al. [13], suppose player 1 is boundedly rational [13] and player 2 is naive.

Boundedly rational player 1 makes its price decision based on an estimate of the marginal profit $\partial \pi_1 / \partial p_1$ [11]. Namely, it decides to increase its price p_1 if it has a positive marginal profit or decreases its price when the marginal profit is negative. Then, the dynamical equation of player 1 can be given by

$$p_1(t+1) = p_1(t) + kp_1(t)[d(1-r)p_2(t) - 2b(1-r)p_1(t) + (1-r)a + bc_1], \quad (6)$$

where k is a positive parameter which reflects the speed of price adjustment.

Naive player 2 makes its price decision according to the naive expectations rule [8]. The player 2 decides its prices with his reaction function. Hence, the dynamic equation of the naive expectation player 2 can be given by

$$p_2(t+1) = \frac{d(1-r)p_1(t) + (1-r)a + bc_2}{2b(1-r)}. \quad (7)$$

With the above assumptions, the duopoly game with heterogeneous players is formed from combining equations (6) and (7). Then, the dynamical system of the heterogeneous players is described as

$$\begin{cases} p_1(t+1) = p_1(t) + kp_1(t)[d(1-r)p_2(t) - 2b(1-r)p_1(t) + (1-r)a + bc_1], \\ p_2(t+1) = \frac{d(1-r)p_1(t) + (1-r)a + bc_2}{2b(1-r)}. \end{cases} \quad (8)$$

3. Model Analysis

3.1. Nash Equilibrium and Local Stability. In this part, the equilibria points of the dynamic system will be first studied (8), and then the stability will be discussed.

The dynamic duopoly game will achieve a Nash Equilibrium at last. The possible equilibrium point of map (8) can

be obtained as nonnegative solution of the nonlinear algebraic system [30]:

$$\begin{cases} kp_1[d(1-r)p_2 - 2b(1-r)p_1 + (1-r)a + bc_1] = 0, \\ p_2 = \frac{d(1-r)p_1 + (1-r)a + bc_2}{2b(1-r)}. \end{cases} \quad (9)$$

After the calculation of the system, it was found that the map has two equilibrium points:

$$\begin{aligned} E_1 &= (0, p_2^0), \\ E_2 &= (p_1^*, p_2^*), \end{aligned} \quad (10)$$

where

$$\begin{aligned} p_2^0 &= \frac{(1-r)a + bc_2}{2b(1-r)}, \\ p_1^* &= \frac{d[(1-r)a + bc_2] + 2b[(1-r)a + bc_1]}{(1-r)(4b^2 - d^2)}, \\ p_2^* &= \frac{d[(1-r)a + bc_1] + 2b[(1-r)a + bc_2]}{(1-r)(4b^2 - d^2)}. \end{aligned} \quad (11)$$

In the traditional economic view, nonnegative equilibrium is meaningful. Obviously, E_1 is a boundary equilibria ($p_2^0 > 0$). E_2 is the unique Nash equilibrium point and has economic meaning provided that $p_1^* > 0$, $p_2^* > 0$, namely,

$$4b^2 - d^2 > 0. \quad (12)$$

In order to study the local stability of equilibrium, the Jacobian matrix of map (8) should be considered. The matrix form is as follows:

$$\begin{bmatrix} 1 + k[d(1-r)p_2 - 4b(1-r)p_1 + (1-r)a + bc_1] & kd(1-r)p_1 \\ \frac{d}{2b} & 0 \end{bmatrix}. \quad (13)$$

The equilibrium point is stable only when all eigenvalues ϕ_i ($i = 1, 2$) of the Jacobian matrix satisfy $|\phi_i| > 0$. According to this theory, the following result about E_1 can be received.

Proposition 1. *The equilibrium point E_1 of system (8) is a saddle point.*

Proof 1. . The Jacobian matrix of E_1 has the form

$$J(E_1) = \begin{bmatrix} 1 + k[d(1-r)p_2^0 + (1-r)a + bc_1] & 0 \\ \frac{d}{2b} & 0 \end{bmatrix}. \quad (14)$$

Its eigenvalues are

$$\phi_1 = 1 + k[d(1-r)p_2^0 + (1-r)a + bc_1], \quad \phi_2 = 0. \quad (15)$$

For the condition that $a, b, d, (1-r)$ are all positive parameters, $\phi_1 > 1$ is workable. Then, the equilibrium point E_1 is a saddle node.

The proof of the proposition is completed.

Next, the local stability of the Nash equilibrium point E_2 will be studied. The Jacobian matrix of E_2 . E_2 is

$$J(E_2) = \begin{bmatrix} 1 + k[d(1-r)p_2^* - 4b(1-r)p_1^* + (1-r)a + bc_1] & kd(1-r)p_1^* \\ \frac{d}{2b} & 0 \end{bmatrix}, \quad (16)$$

where the trace of $J(E_2)$ is

$$\begin{aligned} T &= \text{Tr}(J(E_2)) \\ &= 1 + k[d(1-r)p_2^* - 4b(1-r)p_1^* + (1-r)a + bc_1]. \end{aligned} \quad (17)$$

The determinant of $J(E_2)$ is

$$D = \text{Det}(J(E_2)) = -\left(\frac{kd^2}{2b}\right)(1-r)p_1^*. \quad (18)$$

The characteristic equation of $J(E_2)$ is

$$P(\phi) = \phi^2 - T\phi + D. \quad (19)$$

The discriminant is

$$\Delta = T^2 - 4D. \quad (20)$$

Since $\Delta = T^2 + (2kd^2/b)(1-r)p_1^* > 0$, the eigenvalues of Nash equilibrium E_2 are real.

Necessary and sufficient conditions for local stability of the Nash equilibrium E_2 are Jury's condition, which is given by

$$\begin{cases} 1 + T + D > 0, \\ 1 - T + D > 0, \\ 1 - D > 0. \end{cases} \quad (21)$$

Since $1 - D > 0$ and $1 - T + D = (2kb[(1-r)a + bc_1] + kd[(1-r)a + bc_2])/2b > 0$ are always satisfied, then the local stability condition of is $1 + T + D > 0$.

Since $1 + T + D = (4b(4b^2 - d^2) - 2kb(4b^2 + d^2))[(1-r)a + bc_1] - kd(4b^2 + d^2)[(1-r)a + bc_2]/2b(4b^2 - d^2) > 0$, namely,

$$\begin{aligned} &4b(4b^2 - d^2) - 2kb(4b^2 + d^2)[(1-r)a + bc_1] - k \\ &d(4b^2 + d^2)[(1-r)a + bc_2] > 0. \end{aligned} \quad (22)$$

We can draw the following conclusion.

Proposition 2. *The Nash equilibrium at E_2 is stable if and only if inequality (22) holds.*

Proposition 2 characterizes the stability region in which the Nash equilibrium E_2 is local stable. The violation of inequality (22) will lead to a flip bifurcation.

3.2. Analysis of the Influence of Variables on Equilibrium Point Stability

3.2.1. *The Influence of Price Adjustment Speed on Equilibrium Point Stability.* Through (21), the condition about adjustment speed k can be derived:

$$k < \frac{4b(4b^2 - d^2)}{2b(4b^2 + d^2)[(1-r)a + bc_1] + d(4b^2 + d^2)[(1-r)a + bc_2]}. \quad (23)$$

Proposition 3. *The evolution of price system (8) is in a stable state and E_2 is the Nash equilibrium point when $k < k^0$. The price system (8) undergoes a flip bifurcation at E_2 when $k = k^0$. While, the price system bifurcates from E_2 . E_2 when $k > k^0$, where $k^0 = (4b(4b^2 - d^2))/2b(4b^2 + d^2)[(1-r)a + bc_1] + d(4b^2 + d^2)[(1-r)a + bc_2]$.*

Proof 2. According to the stability theory of Jury's condition, the flip bifurcation occurs when $1 + T + D = 0$. Namely,

$$\begin{aligned} &4b(4b^2 - d^2) - 2kb(4b^2 + d^2)[(1-r)a + bc_1] - k \\ &d(4b^2 + d^2)[(1-r)a + bc_2] = 0. \end{aligned} \quad (24)$$

Then, $k = k^0$.

So, the Nash equilibrium point will lose stability when $k = k^0$. The system is in stable when $k < k^0$ and bifurcates when $k > k^0$.

From Proposition 3, it is known that it will cause the bifurcation and chaotic of the price evolution to take a large price adjustment speed for boundedly rational player 1. So, keeping low price adjustment speed is beneficial to obtain a steady state and the Nash equilibrium profit.

Noticing that the stability region is associated with r .

In the same way, the similar propositions can be given about the tax rate r .

The influence of price adjustment speed on the discrete price system is investigated, and (22) can be transformed into a price discrete system:

$$r > 1 - \frac{4b(4b^2 - d^2) - kb(2bc_1 + dc_2)(4b^2 + d^2)}{ka(2b + d)d(4b^2 + d^2)}. \quad (25)$$

Proposition 4. When the government tax r meets condition (25), the price evolution will be in a stable state, which is the equilibrium price. Otherwise, the evolution will be in chaos or bifurcation.

Proof. According to the stability theory of Jury's condition, the flip bifurcation occurs when $1 + T + D = 0$. Namely,

$$4b(4b^2 - d^2) - 2kb(4b^2 + d^2)[(1 - r)a + bc_1] - kd(4b^2 + d^2)[(1 - r)a + bc_2] = 0. \quad (26)$$

Then, $r = 1 - (4b(4b^2 - d^2) - kb(2bc_1 + dc_2)(4b^2 + d^2)) / ka(2b + d)d(4b^2 + d^2)$.

That is to say, the government tax is conducive to the stability of the market price, and the higher tax rate is more conducive to the realization of the stable and balanced market price.

From the above description and Propositions 3-4, it can be concluded that high tax rate is beneficial to obtain a steady state and the Nash equilibrium profit. It can expand the stable region and enhance the stability of the product price of market to increase the tax rate.

4. Numerical Simulation and Analysis

Because the discrete dynamic system does not have analytic solution, this section will study the evolutionary characteristics of duopoly game dynamic system (8) by numerical simulation and provide some numerical evidences to prove above results. In MATLAB programming, given the number of iterations is $N = 500$, the other parameters are satisfied under (12) conditions. The influence of price adjustment coefficient and government tax ratio on the price behavior of enterprises in market is investigated [30-34].

4.1. The Market Price Evolution Situation about Price Adjustment Speed

4.1.1. The Influence of Price Adjustment Speed Change on the Stability of Market Price. When $a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2$, and $r = 0.2$, the price game system is (27), and the evolution of price game is shown in Figure 1:

$$\begin{cases} p_1(t + 1) = p_1(t) + kp_1(t)[1.6p_2(t) - 1.76p_1(t) + 2.7], \\ p_2(t + 1) = \frac{1.6p_1(t) + 3.8}{1.76}. \end{cases} \quad (27)$$

Figure 1 is a dynamic evolution diagram of discrete dynamical systems with respect to price adjustment speed. It is not difficult to find that when $0 \leq k < 0.031$, the product price of oligopoly enterprises is in the stable state and tends to equilibrium $(p_1^*, p_2^*) = (20.149, 20.476)$. When $k \geq 0.031$, the price is in the period doubling bifurcation and chaos, and the market price is in the unstable state.

4.1.2. The Stability of Market Price under a High Price Adjustment Speed. Let $a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2$, and $r = 0.2$, and the price evolution of the chaotic attractor diagram is shown in Figure 2.

Figure 2 is a chaotic attractor when the price discrete system passes through 50 iterations when $k = 0.04$.

At this point, the price evolution is in chaos, and the market price is in the unstable state.

4.2. The Market Price Evolution about the Government Tax Rate

4.2.1. The Influence of the Government Tax Ratio on the Stability of Market Price. The price game system is (28), and the evolution of price game is shown in Figure 3

Figure 3 is the dynamic evolution diagram of the discrete dynamic system with respect to the government tax rate. When $0.568 < r < 1$, the product price of oligopoly enterprise is in the stable state and tends to equilibrium $(p_1^*, p_2^*) = (28.775, 29.381)$. When $0 \leq r \leq 0.568$, the price is in period doubling bifurcation and chaos:

$$\begin{cases} p_1(t + 1) = p_1(t) + 0.04p_1(t)[2(1 - r)p_2(t) - 2.2(1 - r)p_1(t) + 2(1 - r) + 1.1], \\ p_2(t + 1) = \frac{p_1(t) + 1}{1.1} + \frac{1}{(1 - r)}. \end{cases} \quad (28)$$

4.2.2. The Stability of Market Price under a small Government Tax Rate

Let $a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, k = 0.04$, the price evolution chaotic attractor graph when $r = 0.2$ is shown in Figure 4.

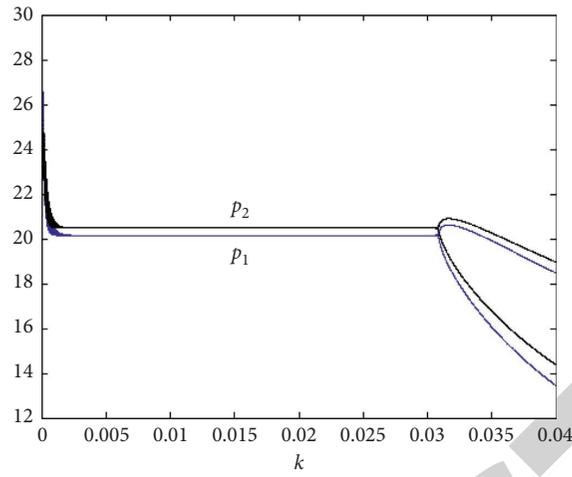
Figure 4 is a chaotic attractor when the price discrete system passes through 50 iterations in $r = 0.2$. At this point, the price evolution is in chaos.

In addition, the price evolution curve under different initial values of $r = 0.2$ is shown in Figure 5. Figure 5 is the evolutionary curve of the firm's 1 price at initial values (10, 15) and (10.001, 15).

It is not difficult to find that the price evolution is very sensitive to the initial value. Small initial value difference makes the curve obviously separate. The enterprises 2 and 1 are similar, and the whole price evolution system is in chaos.

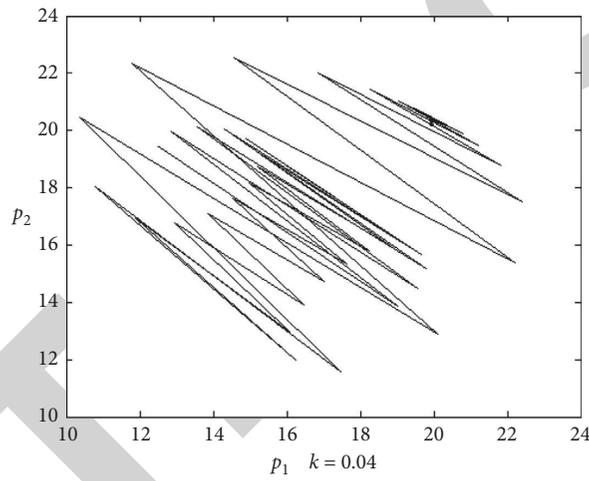
4.3. The Effect of Government Tax Ratio on the Stable Region of Price Adjustment Speed. Make $a = 2, b = 1.1, d = 2, c_1 = 1$, and $c_2 = 2$, a stable regional map of price adjustment speed on government tax rates, as shown in Figure 6. In Figure 6, with the increase of the government tax rate, the stable region of price adjustment gradually increases, and the market price is easier to achieve stability.

In addition, compared with Figures 1 and 3, in Figure 1, under the numerical example $r = 0.2$, the price discrete system is in bifurcation or chaos when $k \geq 0.031$, and the price system is in bifurcation state at $k = 0.04$.



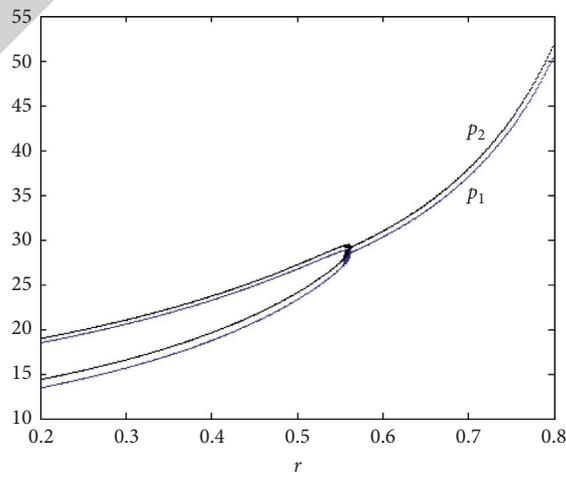
$$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, r = 0.2$$

FIGURE 1: Bifurcation diagram with respect to k .



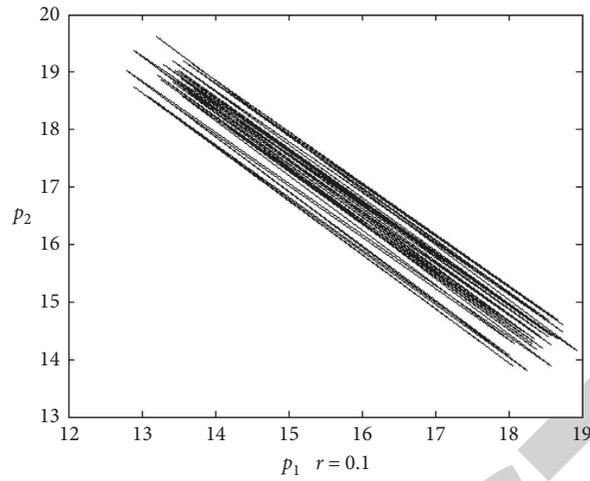
$$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, r = 0.2$$

FIGURE 2: Strange attractor when $k = 0.04$.



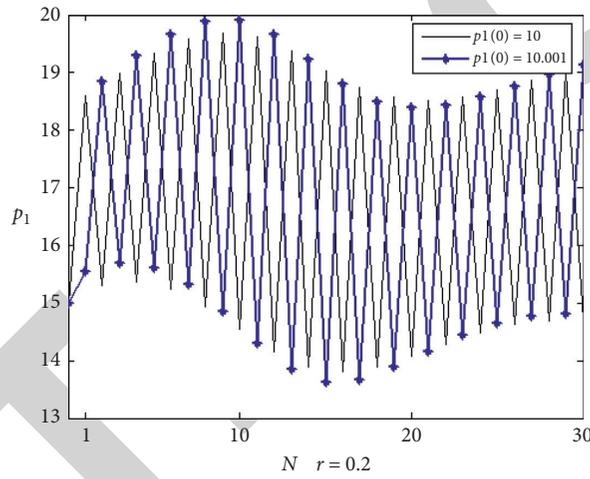
$$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, k = 0.04$$

FIGURE 3: Bifurcation diagram with respect to r when $a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2$, and $k = 0.04$.



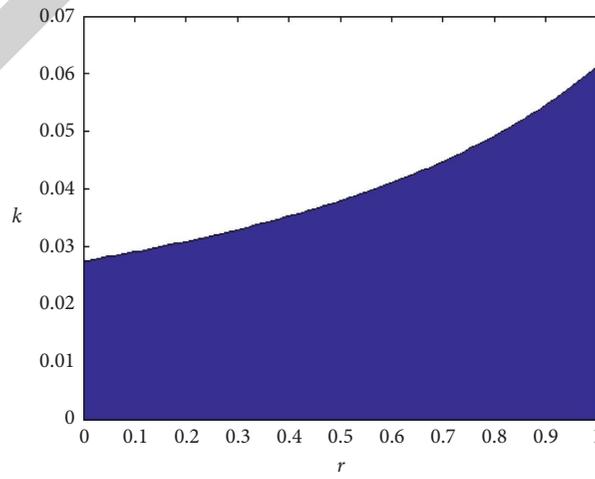
$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, k = 0.04$

FIGURE 4: Strange attractor when $r = 0.2$.



$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2, k = 0.04, r = 0.2$

FIGURE 5: Price evolution curve of player 1 on difference initial conditions.



$a = 2, b = 1.1, d = 2, c_1 = 1, c_2 = 2$

FIGURE 6: Region of stability in the plane (r, k) .

However, in Figure 3, as long as the government tax rates to meet the stability conditions of $0.568 < r < 1$, $k = 0.04$ is in the stable region and the price dispersion system is in the steady state.

Based on the theoretical analysis of the upper section and the numerical simulation results in this section, it is not difficult to find that the government tax ratio plays an important role in the chaotic control of the discrete price dynamic system. By increasing the government tax rate, the stable region can be increased, and the original chaotic or bifurcation price system tends to be stable. That is to say, the government tax is conducive to the stability of the market price.

5. Conclusion

In the market, there is price competition between the duopoly enterprises which produce substitutable products. The dynamic price game strategy may lead to the chaotic state of the price market, and the government tax plays an important role in improving the stability of the price game system. Research shows that (1) when the price adjustment speed of enterprises with GD strategy is less than a critical value, the price game system of oligopoly enterprises will be in a stable state, and the market price will be stable; (2) when the government tax rate is greater than a critical value, the price game system of oligopoly enterprises will be in a stable state, and the market price will be stable; (3) the government tax can effectively improve the stability of the price system and control the chaotic phenomenon of the price market. That is to say, the higher government tax rate is conducive to obtain a larger stable region and realize the stable equilibrium of the market price.

The results of this paper have important theoretical significance on how to stabilize the market price. First, the smaller price adjustment speed is more favorable to stabilize the market price, so the government can limit the price adjustment speed of enterprises. Second, the government tax is conducive to the stability of the market price, so the government can use the government tax policy lever to improve the stability of the market price.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors have declared that they no conflicts of interest regarding the publication of the article.

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