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Measuring Risk Allocation of Tax Burden for Small and Micro Enterprises

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Abstract: Tax burden outlier inhibits the growth of small and micro enterprises. This paper introduces the risk allocation of tax burden to measure the tax burden outlier. Using a time-varying nonparametric benchmark and path model, this paper measures the tax risk allocation of 3552 small and micro enterprises in the credit insurance fund from January 2016 to August 2018. This paper explores the configuration of tax burden risk allocation and discusses the changes along time and with the addition of other variables. Finally, this paper gives an analysis of strategies to improve tax burden risk allocation. The results provide decision support for reducing the tax burden and promoting the growth of small and micro enterprises.

Keywords: Tax burden; Risk Allocation; Small and micro enterprise; Measure

1. Introduction

As the most extensive and active production and management group in social and economic life, small and micro enterprises represent and even determine the development status of the entire social economy and their social and economic functions are highly correlated and interactive with public finance functions [1]. Small and medium enterprises (SMEs) are considered as the main pillars of almost every economy in the world. In most of the countries, they produce around 70% of jobs and account for 35% of GDP in developing countries, while 55% in developed countries [2]. In such, SMEs play a key role in social stability and contribute considerably to jobs creation, poverty alleviation, and economic growth. Regardless of the stage of economic development, SMEs enable innovation and foster creativity in the market. They transform the ideas from "concept to production" in a short period of time.

Even though SMEs account for a high fraction of GDP and occupy a large portion in the market, yet, their failure rate is very high. Mason [3] documented that within the first five years, more than 90% of SMEs are failed to continue their businesses. According to the report of the U.S department of Commerce [4], SMEs need to develop new and/or enhance technologies to improve their competitiveness in order to survive. However, small and micro enterprises are facing the problems of financing constraints and expensive financing, as well as the unreasonable ratio of output value to taxation. SMEs face problems and difficulties when they deal with the government, particularly with the tax administrations. For most of the SMEs, it is difficult to attain or manage their growing profitability, due to different factors including tax policies [5]. Especially in times of inflation, capital and inventory-intensive companies face higher real tax burdens [6]. Increasing corporate taxes will shift the tax burden more towards low-skilled, young and female employees [7].

In case the tax structure is not effectively designed to the conditions of the particular environment in which the SMEs operate, it may produce a significant tax burden on the tax-paying enterprises and consequently will impact the end users, due to changing ability of taxes. Auerbach [8] considered

that the US Tax Deduction and Employment Act of 2017 will increase US capital investment, thereby increasing wages, but increasing the magnitude is difficult to predict. Chen, et al. [9] found that tax cuts can reduce unemployment by 7%. Most of these difficulties with the taxes regulators might be considered as the outcomes of inadequate tax policies, as well as with the uncertainty about the changes in future policy. SMEs are characterized as intense labor force and are considered as the key element of economic growth in China. Their flexible operating mechanism allowed them to have relative competitive advantages [10]. As a result, enhancing and promoting the growth of SMEs should be a key concern to enhance the development of the economy. Thus, the government "as a regulator and policy maker" should moderately reduce corporate tax burdens in order to improve the competitiveness of SMEs.

Therefore, it is particularly important to correctly guide the reform of small and micro enterprises, vigorously support small and micro enterprises, and help small and micro enterprises to improve the quality of development. Given that friendly tax policy is instrumental to the growth and survival of SMEs, as taxes increase running cost and slow down the growth. Most of the SMEs face the problem of high tax rates, multiple taxations, lack of proper information and complex regulatory policies. Therefore, an appropriate tax policy is crucial for the survival of SMEs. The aim of our paper is to give an analysis of strategies to improve taxation policy.

This paper introduces the risk allocation of the tax burden to measure the tax burden outlier. Using time-varying nonparametric benchmark and path model, this paper measures the tax risk allocation of 3552 small and micro enterprises from Taizhou city (China) in the credit insurance fund, from the period of January 2016 to August 2018 to identify excess taxation in the form of sales revenue drivers. First, we established a benchmark model to identify the driving pattern of taxation/sales revenue above 6% and below 4% taxation: Whether it is a linear drive of the trend or a nonlinear drive of vibration. Then, we added time and other variables to measure the configuration of tax burden risk allocation. Finally, we analyzed the strategies to improve the allocation of tax burden risk. The results of our study provide a flexible decision-making basis for the government to adopt flexible taxation at different points in time and supplemented by credit policy to help small and micro enterprises grow.

The contents of this paper are organized as: Section 2, documents the related studies, Section 3, defines Tax Burden Outlier and proposes the problem to be solved in this paper. Section 4, analyzes the driving mode formed by the tax Burden Outlier. Section 5, adds time and other variables to analyze strategies for improving tax burden risk allocation. Section 6, summarizes the full text and answers the questions raised in this paper based on the research results.

2. Literature Review

The promotion and development of SMEs is a crucial topic of economic growth. In the given scenario, it is an important issue for researchers to grasp the direction of Tax Policy and to enhance the sustainable development of the economy. To promote SMEs, many developed countries have formulated tax policies, in order to help them for their growth and survival Pizzacalla [11]. Many scholars believe that the provisions of taxes may have a significant impact on the innovation of SMEs (see for example [12,13]. The study of Atkinson [14] documented that tax incentives significantly and effectively promote SMEs innovations. Burlamaqui and Cimoli [15] documented that tax incentives and other subsidies by the government can be treated as developmental rents.

Many other scholars have been actively promoting corporate tax cuts, but they have different opinions on the ways and effects of tax cuts. For example, Grubert and Altshuler [16] considered that changing the corporate income tax to personal income tax can significantly reduce the corporate tax rate; Hines Jr [17] considered that although the corporate tax rate in the United States provides a large number of additional deductions, tax exemptions, and tax credits, however, it creates the heaviest tax burden; Salaudeen and Atoyebi [18] demonstrated that the effect of tax reform was heterogeneous, which led to an increase or decrease in tax burdens in different industries.

Among all taxes, corporate income tax is considered as the biggest burden for enterprises. Although the nominal corporate income tax rate is decreasing, in some cases, the actual tax burden has increased [19]. Therefore, tax reduction should also be tailored to local conditions, and targeted implementation of flexible tax reduction policies can achieve better results. For example, Fang, et al. [20] argued that the reform of "streamlined management and tax reduction" should be vigorously promoted in the service industry, and corresponding policies should be implemented according to different regions, time and industries. Ye, et al. [21] studied the relationship between corporate tax heterogeneity and firm size, ownership, export and location characteristics, and promoted China's structural tax reduction reform. Cai, et al. [22] found that various factors, such as tax rate, risk aversion, interest rate, stock return, and volatility, jointly affect optimal portfolio allocation.

Most of the above researches suggest that tax incentives have a significant role in promoting the innovations and development of SMEs and the corporate income tax is considered as the biggest burden for enterprises. They suggest that the government should reduce corporate tax burdens in order to improve the competitiveness of SMEs. However, as a requirement for tax reduction and exemption, it is not merely enough to take into account the size of industries, regions, and enterprises, but rather it is necessary to identify the time period of excess taxation and formulate the policies and strategies for SMEs development. Therefore, an appropriate tax policy is crucial for the survival of SMEs. The aim of our paper is to give an analysis of strategies to improve taxation policy.

Our paper introduces the risk allocation of the tax burden to measure the tax burden outlier. Using time-varying nonparametric benchmark and path model, this paper measures the tax risk allocation of 3552 small and micro enterprises in the credit insurance fund from January 2016 to August 2018. First, we established a benchmark model to identify the driving pattern of taxation/sales revenue above 6% and below 4% taxation: Whether it is a linear drive of the trend or a nonlinear drive of vibration. Then, we added time and other variables to measure the configuration of tax burden risk allocation. Finally, we analyzed the strategies to improve the allocation of tax burden risk.

3. Data and Model

3.1. Data Description

The data used in this paper is a sample of 3552 small and micro enterprises from Taizhou city (China) of a certain credit insurance fund, from January 2016 to August 2018. This data is obtained from the government big data platform, which has comprehensive information about the lending, taxation, and output of more than 600,000 SMEs in all industries. The Observed variables in the model include: Company name, time, non-performing loan term, loan contract amount, loan balance, number of non-performing loans, loan form, actual tax payment, taxable amount, sales income, credit line, used credit line, average credit period, credit period, number of new credit grants, work injury subsidy, total wages of employees, social pension and medical insurance. Further, this paper divides 3552 small and micro enterprises into three categories, adjusting tax and credit lines according to different categories, and achieving the goal of improving tax risk allocation.

We used the method of culling with nonparametric variables Hall, et al. [23] to carry out our analysis. Based entirely on data-driven, work injury subsidy, the total wages of employees, social pension and medical insurance are summed up, and the total wages of the employees are obtained. We exclude the credit period and the number of new credit grants that are weakly related to sales revenue, and finally, sales revenue is selected as the explanatory variable. The taxable amount, the credit line used, the credit period, and the total wages of the employees are used as linear explanatory variables. Further, actual tax payment and credit line are used as part of non-linear explanatory variables. The variables and symbolic representations are shown in Table 1:

Table 1. Variable and symbolic representation.

Variable	Symbolic Representation	Variable	Symbolic Representation
Sales revenue	Y	Credit period	X_4
Taxable amount	X_1	Actual tax payment	Z_5
Used credit line	X_2	Credit line	Z_6
The total wages of employees	X_3	-	-

3.2. Question

Using 2016 to 2018, setting the month to the horizontal axis, observing sales revenue and actual tax payment of selected 3552 companies' time arrival changeover situation.

The sales revenue reflects the economic benefits of the enterprise, and the tax reflects the corporate social responsibility. Intuitively, sales revenue and tax should be roughly synchronized, but as can be seen from Figure 1, the increase in sales revenue is slower than the increase in actual tax payment. From January 2016 to August 2018, although the company's sales revenue and original tax payments are usually on the rise Thus, it is meaningful to study the formation mechanism of the outlier in which sales revenues are not synchronized with taxes, and how to improve these outliers.

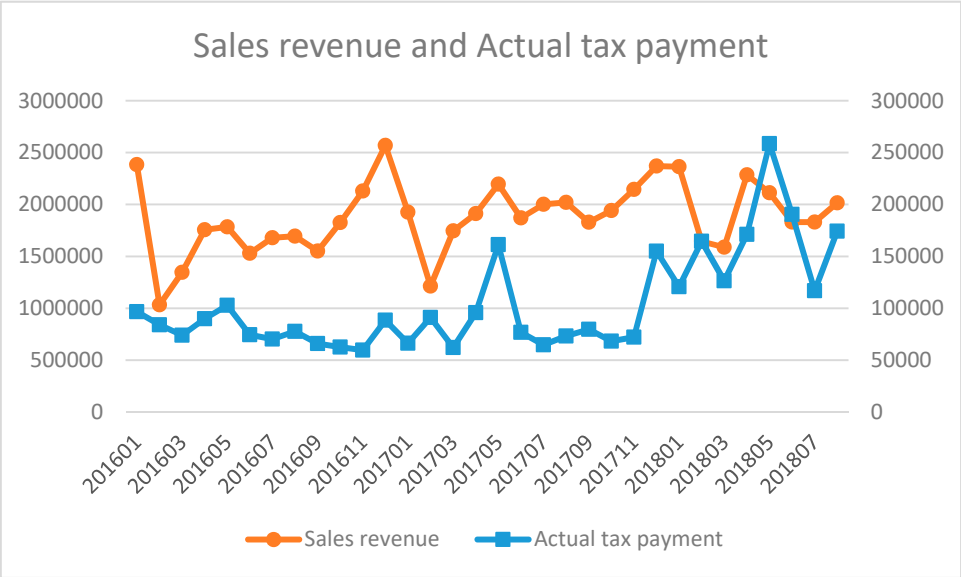

Figure 1. Sales revenue and actual tax payment trend chart.

Specifically, in the month of December 2016, sales revenue reached to its peak, but the actual tax payment did not reach the corresponding height; in May 2017, the actual tax payment was at a high point, but the sales revenue at this point were not as high as it were in the month of December 2016.

Assume that the tax burden of the enterprise is measured by the "Actual tax payment divided by Sales Revenue". This article defines the 'Tax Burden Outlier" as above 6%, and/or below 4%, i.e., when the ratio of actual tax payment to sales revenue is above 6%, and/or below 4%. The rationality of the definition is based on the Law of the People's Republic of China on Tax Collection and Administration [24], according to which the total value of VAT, stamp duty, urban construction tax, and education surcharge is roughly 4%, plus income tax should exceed 4%.

As can be seen from Figure 2, the tax burden is increasing year by year, and the tax burden at the four points: February 2017, May 2017, February 2018, and May 2018 is greater than the other periods. In February 2017 and February 2018, the sales revenues at these two points were smaller than the other

periods, but the tax revenue was not lowered at the same time, resulting in a large tax burden. The two points in May 2017 and May 2018 were due to the high tax revenue and the significant increase in sales revenue, which caused the tax burden to be too large. Management and investment can have adverse effects, resulting in a significant reduction in the cash flow of the company's investment, which in turn inhibits the improvement of financial performance [25].

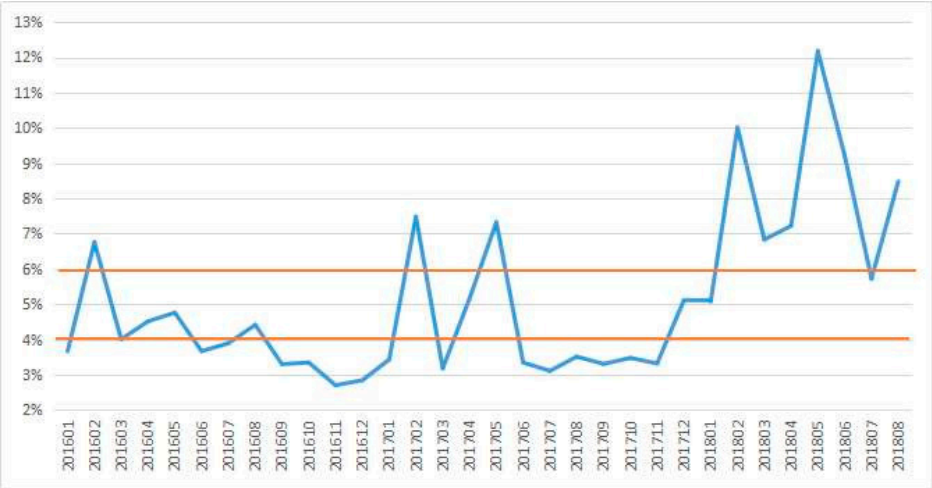

Figure 2. Actual tax payment/sales revenue.

Based on the above discussion, the following points mainly analyze risk allocation of the tax burden outliers:

The higher points include February 2016, February 2017, May 2017, February 2018, March 2018, May 2018, and August 2018; while.

The lower points include June 2016, July 2016, September 2016, October 2016, November 2016, December 2016, January 2017, March 2017, June 2017, July 2017, August 2017, September 2017, October 2017, and November 2017.

The following points will explore the configuration of tax risk allocation, and discusses the changes along time and with the addition of other variables. Finally, this paper gives an analysis of strategies to improve tax risk allocation.

3.3. Initial Model

Using Hall, Li and Racine [23] data-driven variable selection approach, this paper uses four variables namely, taxable amount X_1, used credit line X_2, total wage X_3, and credit period X_4 as control variables of the linear part, while the actual tax payment Z_5, the credit line Z_6 and time as control variables of the nonlinear part, and the sales income Y is taken as the explanatory variable. The variables and symbolic representations are shown in Table 1.

Establishing the time-varying semi-parameter initial benchmark model of sales revenue is as follows:

$$Y_t = a_{0t}X_{1t} + b_{0t}X_{2t} + c_{0t}X_{3t} + d_{0t}X_{4t} + G_0(t) + \varepsilon_{0t}, \quad (1)$$

where $G_0(t)$ represents the non-linear part of the model. We added the actual tax payment Z_5 as a nonlinear part of the variable to get the actual tax payment path model:

$$Y_t = a_{1t}X_{1t} + b_{1t}X_{2t} + c_{1t}X_{3t} + d_{1t}X_{4t} + G_1(t, z_5) + \varepsilon_{1t}. \quad (2)$$

Further, we added the credit line Z_6 as the variable of the nonlinear part to get the credit line path model:

$$Y_t = a_{2t}X_{1t} + b_{2t}X_{2t} + c_{2t}X_{3t} + d_{2t}X_{4t} + G_2(t, z_6) + \varepsilon_{2t}. \quad (3)$$

3.4. Error Test

In order to establish the relationship between the above-mentioned variables, it is necessary to test the fitting effect of the model. According to the sample data, through regression analysis we can get the relative error of the model, as shown in the Figures 3–5.

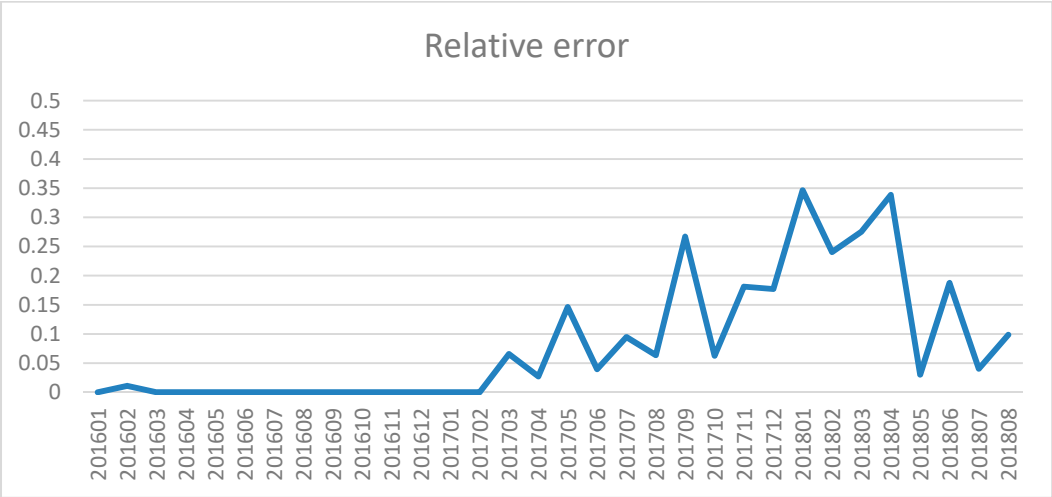

Figure 3. Basic model relative error.

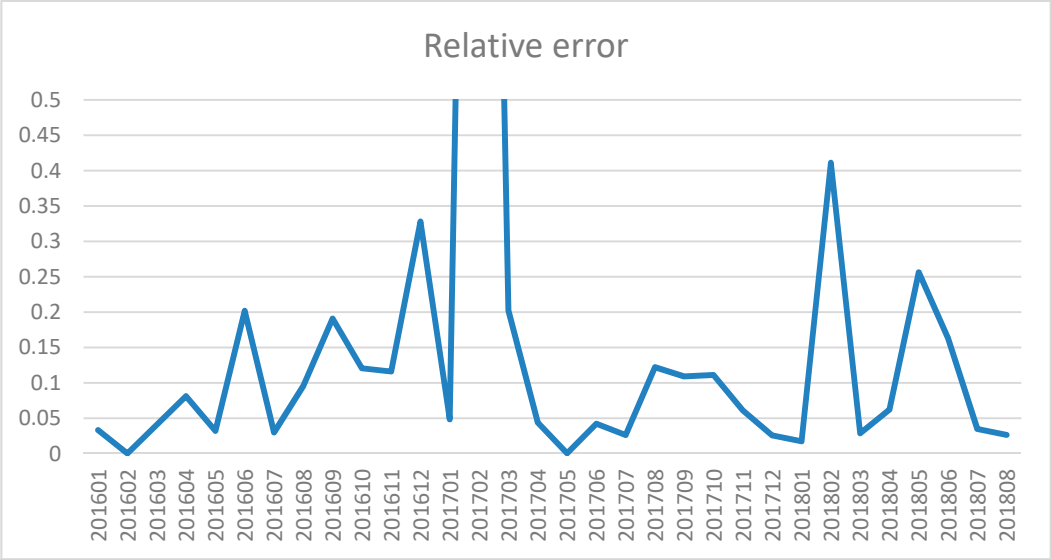

Figure 4. The actual tax payment path model relative error.

The regression estimation results of the three models show that, except a few individual points, the relative errors of the sample points fluctuate around zero as shown in Figures 3–5. The mean values of the relative errors of the three models are 0.084, 0.173, and 0.113, respectively. Removing the two points January 2018 and April 2018 in the base model, while the two points February 2017 and February 2018 in the RKSE path model, and the point February 2017 in the RKSE path model, the relative error means are calculated again which are 0.067, 0.091, and 0.051 respectively. The results indicate that the model of this paper has a good fitting effect.

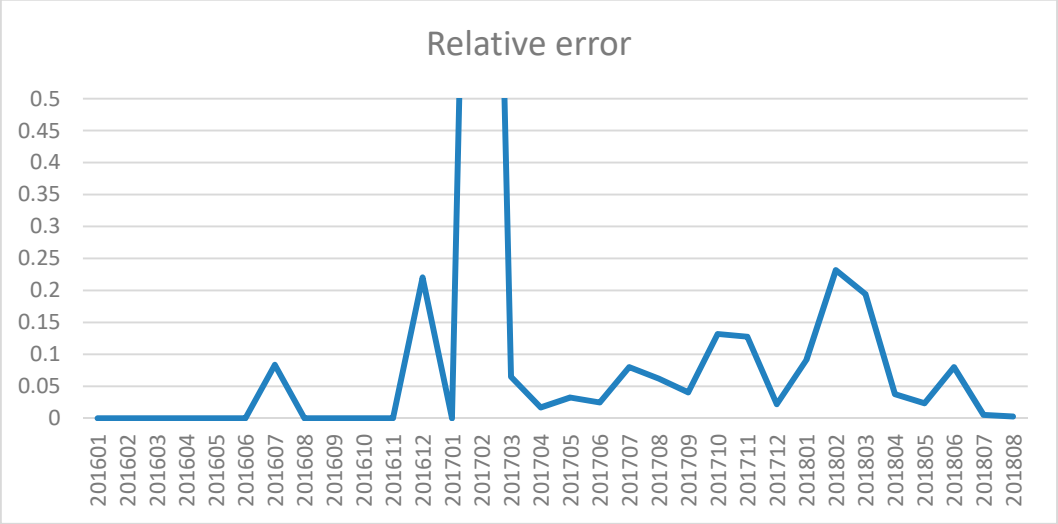

Figure 5. The credit line path model relative error.

4. Measuring Risk Allocation of the Tax Burden

This section uses the driving form of sales revenue to understand the formation mechanism of the tax burden outliers, along time and non-time path, where non-time includes linear and non-linear path.

4.1. Volatility or Trend

From the initial model i.e. Equation (1), the equation of the $t-1$ phase can be obtained:

$$Y_{t-1} = a_{0t-1}X_{1t-1} + b_{0t-1}X_{2t-1} + c_{0t-1}X_{3t-1} + d_{0t-1}X_{4t-1} + G_0(t-1) + \varepsilon_{0t-1}, \quad (4)$$

Equations (1)–(4) can obtain:

$$Y_t = Y_{t-1} + \sigma_0(t) + \varepsilon_t. \quad (5)$$

According to the data, the model can be used to calculate the trend linearity, volatility nonlinearity, and unobservable three parts:

$$\begin{aligned} \sigma_0(t) &= Y_t - Y_{t-1} - \varepsilon_t \\ &= I_1 + I_2 - \varepsilon_t, \end{aligned}$$

where I_1 is the trend linearity and I_2 is volatility nonlinearity, ε_t is the unobservable part.

$$I_1 = a_{0t}X_{1t} + b_{0t}X_{2t} + c_{0t}X_{3t} + d_{0t}X_{4t} - (a_{0t-1}X_{1t-1} + b_{0t-1}X_{2t-1} + c_{0t-1}X_{3t-1} + d_{0t-1}X_{4t-1})$$

$$I_2 = G_0(t) - G_0(t-1)$$

$$\varepsilon_t = \varepsilon_{0t} - \varepsilon_{0t-1}.$$

It can be seen from Figure 6 that the unobservable volatility is almost oscillating up and down around 0, and the relative volatility is small, so it can be ignored. The volatility caused by the time variables shows a mutual alternating trend. The positive and negative values of the volatility represent the direction of the influence, and the magnitude of the volatility determines the intensity of the influence.

If the tax burden fluctuates to the outliers, and if it is caused by a time variable, after some period of time, it may return to a reasonable level again. As shown in Figure 6 in point January 2017, it is negatively affected by time variables, corresponding to the sales income curve in Figure 1, it can be found that the sales revenue at this point in January 2017 shows a downward trend; in addition, as in

November 2016 and March 2017, it is positively affected by the time variable, and the tax burden of this point in Figure 2 is also less than 4%.

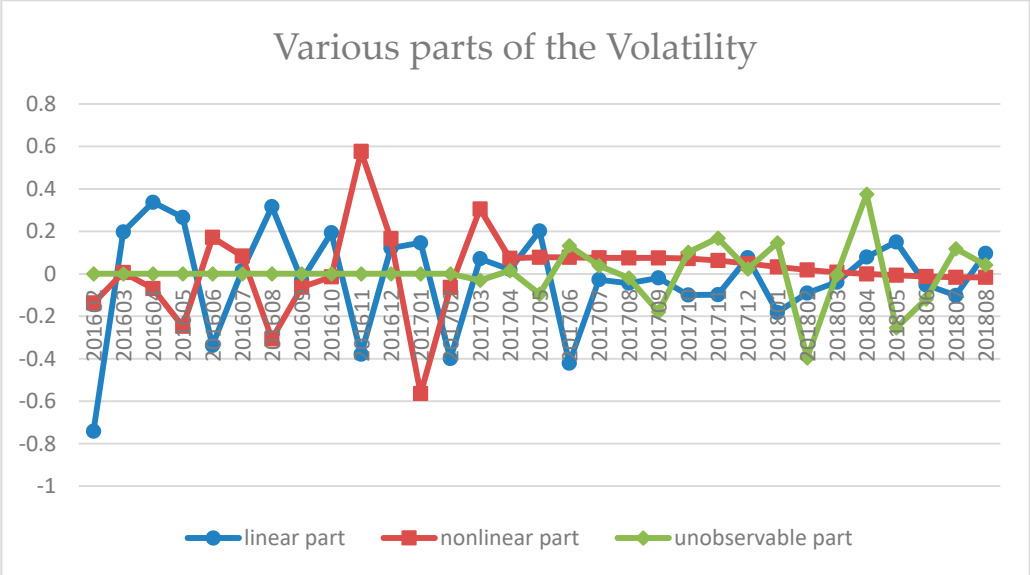

Figure 6. Various parts of the volatility.

If it is the non-time-induced tax volatility fluctuates to the outliers, then further analysis of tax cuts or credit lines is needed to improve the abnormal volatility of the tax burden. As shown in Figure 6 in February 2016, June 2016, February 2017 and June 2017, the fluctuations caused by non-time taxable amount, used credit line, credit period, and the total wages have a negative impact. In Figure 2, the tax burden for February 2016 and February 2017 are both greater than 6%, and in Figure 1, it can be seen that the sales revenue at these four points is at a low level.

Of course, there are some outliers, such as December 2016, July 2016, September 2016, October 2016, May 2017, July 2017, August 2017, September 2017, October 2017, November 2017, February 2018, March 2018, May 2018, and August 2018, which cannot be directly explained in Figure 6, and further exploration is needed.

4.2. Tax Burden along the Time Path

Figure 7 depicts the proportion of the volatility of the various parts received by each point and specifically illustrates the magnitude of the influence of the volatility of each part received by each point.

When judging the driving mode, it is necessary to judge by means of the ratio of I_2/I_1. If this ratio is greater than one i.e. $I_2/I_1 > 1$, it means that the influence of nonlinear volatility is greater at this time, it is an oscillation drive. On the other hand, if $I_2/I_1 < 1$, it means that the linear volatility is more affected at this time, it is a trend-driven. It can be seen from Figure 8 that the absolute value of the ratio of 8 points is greater than 1, and the ratio of the remaining points is less than 1.

Observing the outliers mentioned in the second part: February 2016, June 2016, July 2016, September 2016, October 2016, November 2016, December 2016, 2017 1 Month, February 2017, March 2017, May 2017, June 2017, July 2017, August 2017, September 2017, October 2017, November 2017, 2018 2 Month, March 2018, May 2018, August 2018.

At the lower points, it can be found that I_2/I_1 of June 2016, October 2016, November 2016, December 2016, June 2017, October 2017, and November 2017 are greater than 1, and the driving form is time-oscillation driven and can wait for the decision after regression; and I_2/I_1 of July 2016, September 2016, January 2017, March 2017, July 2017, August 2017, September 2017 are all less than 1,

the driving forms are trend-driven, and the volatility in the control variables are caused by actual tax payments amount and credit line.

AT the higher points, I_2/I_1 of February 2016, February 2017, February 2017, February 2018, March 2018, May 2018, and August 2018 are all less than 1, driving forms are trend-driven, and the volatility is caused by actual tax payments and credit lines.

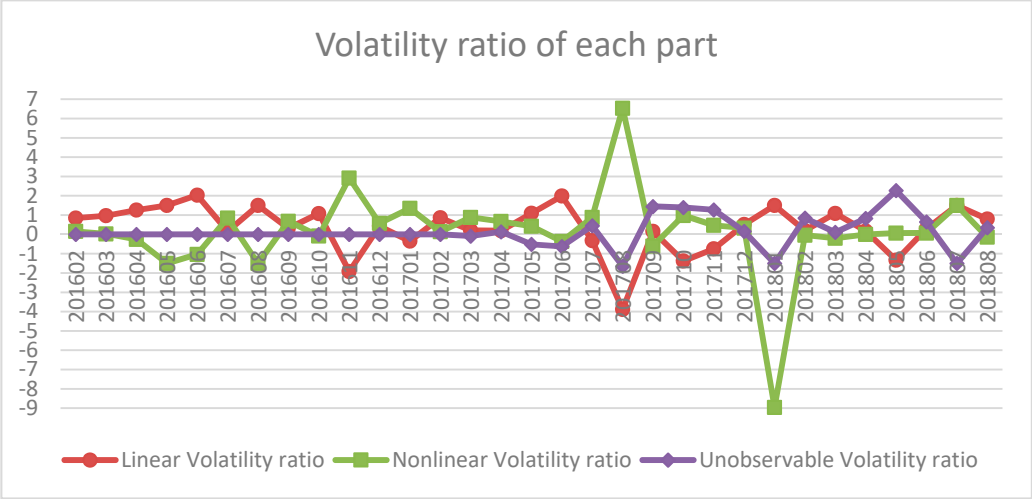

Figure 7. Volatility ratio of each part.

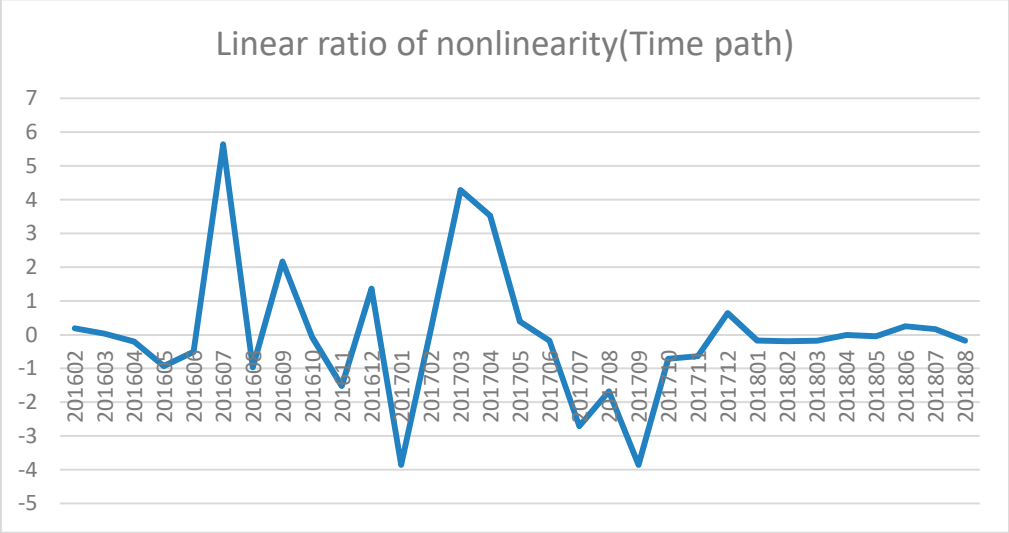

Figure 8. The Linear ratio of nonlinearity (time path).

4.3. Tax Burden along Actual Tax Payment or Credit Path

Figures 9 and 10 are the volatility diagrams of I_2/I_1 based on the actual tax payment and the credit line.

Observing the outliers mentioned in the second part: February 2016, June 2016, July 2016, September 2016, October 2016, November 2016, December 2016, 2017 1 Month, February 2017, March 2017, May 2017, June 2017, July 2017, August 2017, September 2017, October 2017, November 2017, February 2018, March 2018, May 2018, August 2018.

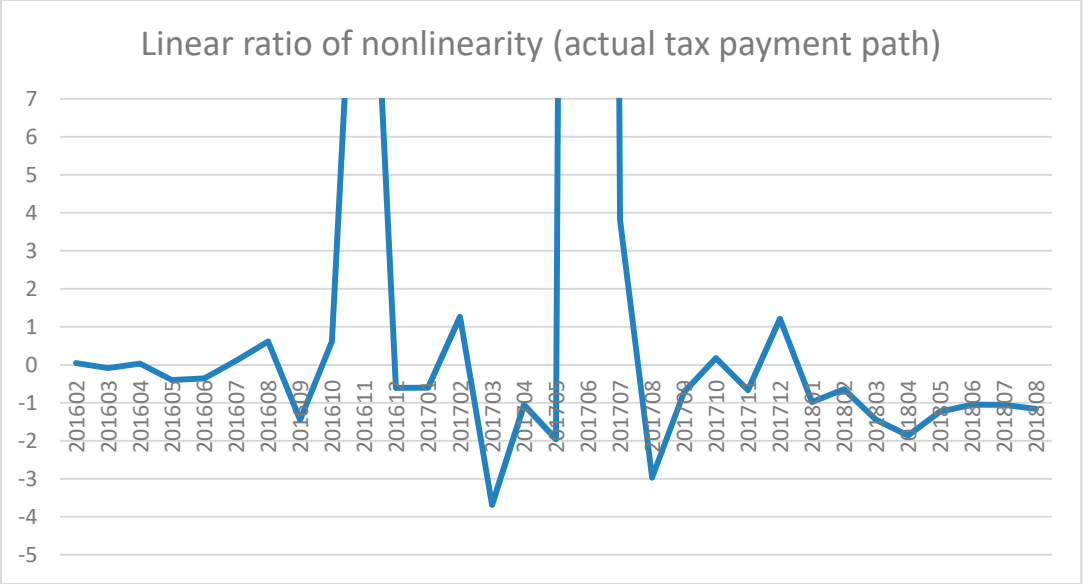

Figure 9. Linear ratio of nonlinearity (actual tax payment path).

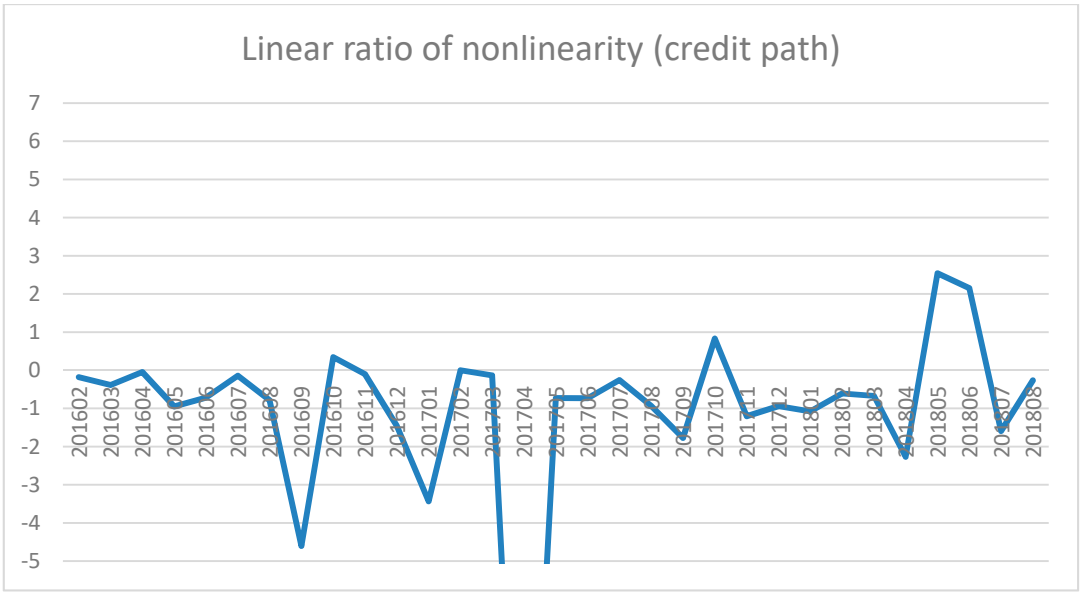

Figure 10. Linear ratio of nonlinearity (credit path).

Analysis of the actual tax payment path can be found in Figure 9. It is clear that the ratio I_2/I_1 of all the lower points, including, September 2016, November 2016, March 2017, June 2017, July 2017, and August 2017 is greater than 1, and the driving form is driven by time oscillation, which can wait for the decision after regression; I_2/I_1 of June 2016, July 2016, October 2016, December 2016, January 2017, September 2017, October 2017, and November 2017 are less than 1, the driving forms are trend-driven, and the control variables volatility is caused by actual tax payment and credit lines. The I_2/I_1 of higher points, including February 2016 and February 2018, are all less than 1. The driving forms are trend-driven, and the control variables fluctuations are caused by the actual tax payment and the credit line. In February 2017, May 2017, March 2018, May 2018, and August 2018, I_2/I_1 are all greater than 1. The driving forms are time-oscillation driven and can wait for the decision after regression.

Analysis of the credit path can be found in Figure 10, It is clear that the ratio I_2/I_1 of all the lower points, including, September 2016, December 2016, January 2017, September 2017, November 2017,

is greater than 1, and the driving form is time-oscillation driven, and can wait for the decision after regression; and June 2016, July 2016, October 2016, November 2016, March 2017, June 2017, July 2017, August 2017 and October 2017, I_2/I_1 is less than 1. The driving form is trend-driven, and the control variables volatility is caused by the actual tax payment and the credit line. The I_2/I_1 of higher points, including February 2016, February 2017, May 2017, February 2018, March 2018, and August 2018, are all less than 1 and the drive forms are trend-driven. The control variables volatility is caused by the actual tax payment and the credit line; while I_2/I_1 in May 2018 is greater than 1, the driving form is driven by time oscillation and can wait for the decision after regression.

It is clear from the above analysis, based on the actual tax payment or the credit line path; there is a change in the driving form of the outliers. Specifically, the time path to the actual tax payment path, the lower points, and the driving form of nine (9) outliers has been changed. Among those points, June 2016, October 2016, December 2016, October 2017, and November 2017 were changed from the time oscillation drive to the trend drive, while, the four points of September 2016, March 2017, July 2017 and August 2017, were changed from the trend drive to the time oscillation drive. At the higher points, there are changes in the driving form of five (5) outliers. In February 2017, May 2017, March 2018, May 2018, and August 2018, the trend drive becomes time oscillation drive. The time path to the credit path, the lower points, the driving form of seven (7) outliers has been changed, including June 2016, October 2016, November 2016, June 2017, and October 2017. It is changed from the time oscillation drive to the trend drive. In September 2016 and September 2017, the trend drive was changed to the time oscillation drive. Among the higher points, changed can be observed only at point May 2018, which is from the trend drive to the time oscillation drive.

5. Improving Tax Risk Allocation

This section analyzes improvement in tax burden risk allocation by reducing taxes or increasing credit. The results provide decision support for promoting the growth of small and micro enterprises.

5.1. Model Description

Equation (6) represents the Benchmark model, which only takes the time t as a nonlinear variable and compares the results with the path model. The actual tax payment refers to the amount of income tax in the previous year that appears in the financial statement of the following year; The original credit line refers to the stock management index of the short-term credit business approved by the commercial bank for the customer, so that the customer's requirements for the quickness and convenience of financial services are met within the credit line. This article refers to the stock of credit business of commercial banks under the principle of underwriting by Credit Insurance Fund. For the convenience of description.

$$Y_t = a_{0t}X_{1t} + b_{0t}X_{2t} + c_{0t}X_{3t} + d_{0t}X_{4t} + G_0(t) + \varepsilon_{0t}. \quad (6)$$

By adding $z5$ and $z6$ as nonlinear variables to the benchmark model, the path model is obtained, that is, Equation (7)

$$Y_{t-1} = a_{0t-1}X_{1t-1} + b_{0t-1}X_{2t-1} + c_{0t}X_{3t-1} + d_{0t-1}X_{4t-1} + G_0(t-1) + \varepsilon_{0t-1}, \quad (7)$$

$\sigma_0(t,p)$ be the sum of linear and nonlinear parts of the path model, $\sigma_0(t)$ be the sum of linear and nonlinear of the Benchmark model. In order to explore the role of the path model, by combining Equation (6) and Equation (7), we can get Equation (8)

$$Y_t = Y_{t-1} + \sigma_{0p}(t,p) + \varepsilon_{0pt}. \quad (8)$$

Now analyze Equation (8), if the error is small, its impact will be negligible, and the larger $\sigma_0(t,p)$ represents greater sales income, so we can approximate the size of sales revenue according to

the size of $\sigma_0(t,p)$. Where $\sigma_0(t,p) - \sigma_0(t)$ represents the difference between the Path model and the Benchmark model, $\sigma_0(t,z5) - \sigma_0(t)$ represents the impact of government taxation on the company's sales revenue; and $\sigma_0(t,z6) - \sigma_0(t)$ reflects the impact of credit guarantee fund on the company's sales revenue; $\sigma_0(t,z5,z6) - \sigma_0(t)$ represents the government's tax reduction while the Credit Guarantee Fund increases credit, the impact on corporate sales revenue. The ultimate goal of the three methods is to help in the faster development and growth of small and medium-sized enterprises, and to maximize social responsibility so that enterprises can obtain maximum economic benefits.

Since $\sigma_0(t,p) - \sigma_0(t)$ is an objectively calculated value, so the positive and negative effects of policy can be judged according to its value, then to choose the corresponding policy, that is, the policy which is most conducive to improving economic efficiency. If $\sigma_0(t,z5) - \sigma_0(t)$ or $\sigma_0(t,z6) - \sigma_0(t)$ is greater than 0, it indicates that the adjustment of the government and the letter insurance fund does not adversely affect the economic benefits of the enterprise; if it is significantly less than 0, it indicates that there is a negative impact which cannot be ignored, and it is necessary to change the adjustment mode and intensity to further integrate and optimize social responsibility and economic benefits.

5.2. Results and Discussions

5.2.1. Outliers Improvement (Full Sample Analysis)

From Figure 11, it can be seen that the negative effects of the four sample points, 201612, 201703, 201802, and 201805 are relatively large, which are −0.245, −0.206, −0.217, −0.384, respectively. The positive effects of the two sample points, 201701 and 201804, are 0.356 and 0.314 respectively, which are relatively large, and the rest of the values fluctuate around 0, indicating that the government's tax policy adjustment effect is ideal.

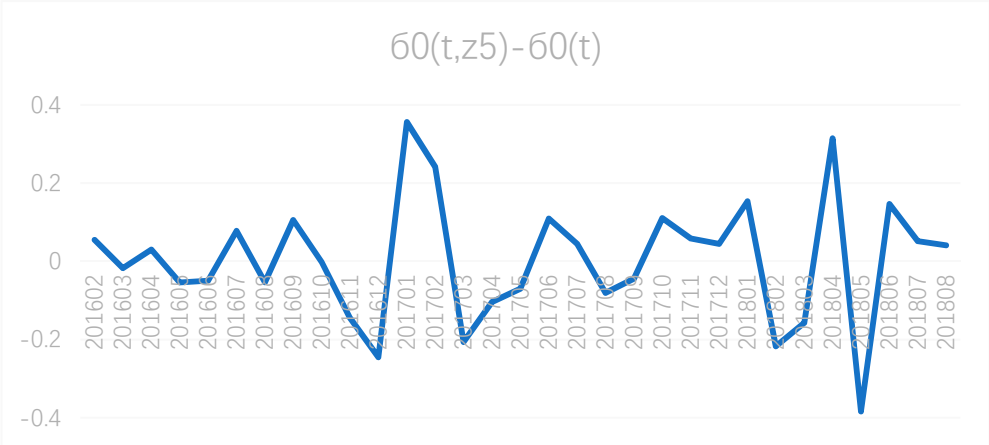

Figure 11. The actual tax payment path model minus the benchmark model.

According to Figure 12, the negative effects of the four sample points, 201612, 201703, 201802, and 201805 are relatively large, namely −0.220, −0.240, −0.224, −0.302, so credit should be moderately increased to promote improvement in economic benefits of the enterprise. The three sample points 201701, 201702, and 201804 have relatively positive effect, which are 0.220, 0.239, and 0.336 respectively, and it indicates that the credit line at this time is relatively reasonable. The rest of the values fluctuated around 0, indicating that the credit limit adjustment of the Credit Guarantee Fund is ideal.

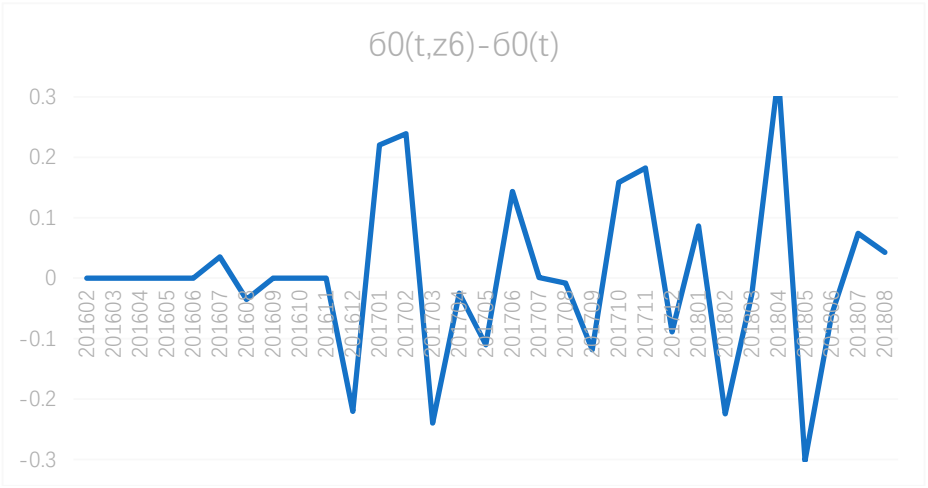

Figure 12. The credit line path model minus the benchmark model.

As can be seen from Figures 11 and 12, the negative impacts of the above four outliers on tax and credit are more obvious. Therefore, it is necessary to reduce taxes and increase credit to promote positive growth in output value. For the above four outliers, reduce the tax by 20,000 Yuan and increase the credit investment of two million Yuan, that is, integrate the actual tax payment and credit line to the new path model, and compare the results with the benchmark model whether it has a positive effect or vice versa.

It can be seen from Figure 13 that the negative effects of the two outliers at point 201612 and 201805 are significantly improved, and the negative effect at point 201612 is −0.006, which is nearly 20% lower than the negative effect produced by the single policy; The negative effect at point 201805 became −0.272, which was 11.2 percentage points lower than the negative effect before the tax cut, and the negative effect on the credit of Credit Guarantee Fund was reduced by three percentage points.

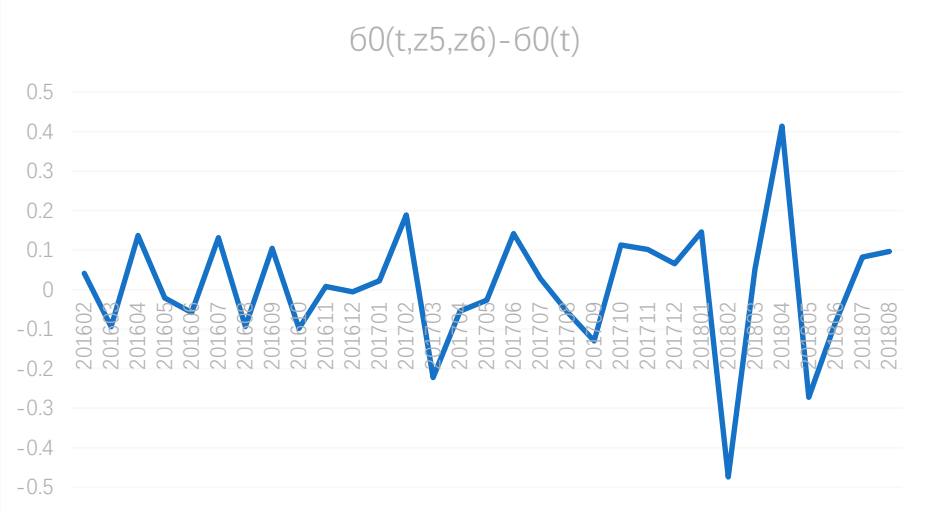

Figure 13. The adjusted path model minus the Benchmark model.

It is obvious from Table 2, different sample points apply to different models, and different path models should be adopted to reduce the implications of negative effects. Increasing credit at points 201703 and 201712 will increase the negative effect, and at that time the tax is more reasonable; and the policy of reducing taxes and increasing credit at the two points 201612 and 201805 will minimize the negative effect, and its volatility is small.

Table 2. The value of different path models minus benchmark models.

Path—Benchmark	201612	201703	201802	201805
$\sigma_0(t,z5)-\sigma_0(t)$	−0.245	−0.206	−0.217	−0.384
$\sigma_0(t,z6)-\sigma_0(t)$	−0.220	−0.240	−0.224	−0.302
$\sigma_0(t,z5,z6)-\sigma_0(t)$	−0.006	−0.222	−0.474	−0.272

According to the income range of employee wages/sales income, the enterprises are divided into three categories on average, and the three types of enterprises are discussed separately.

After adopting the policy of tax reduction and credit increase, the extraordinary tax burden at points 201802 and 201805 were improved, as shown in Table 3.

Table 3. Tax burden improvement comparison.

t	Before Improvement	Improved
201802	10.01%	5.32%
201805	12.18%	9.52%

It can be seen from Table 3 that after reducing the tax of 20,000 Yuan and increasing the credit of two million Yuan, the tax burden will fall to 5.32% at point 201802, reaching the reasonable range of 4%–6% as defined in Section 3; it has also dropped by 2.66% at point 201805. Therefore, our supernormal improvement results are effective.

5.2.2. Classified Enterprise Analysis

The First Category of Enterprises

As can be seen from Figure 14, in the first category of enterprises, the path models of $z5$ and $z6$ are added, and their values fluctuate around 0, indicating that for the first type of enterprises, the actual tax payment and credit line have no adverse effects on the economic benefits. It is more reasonable.

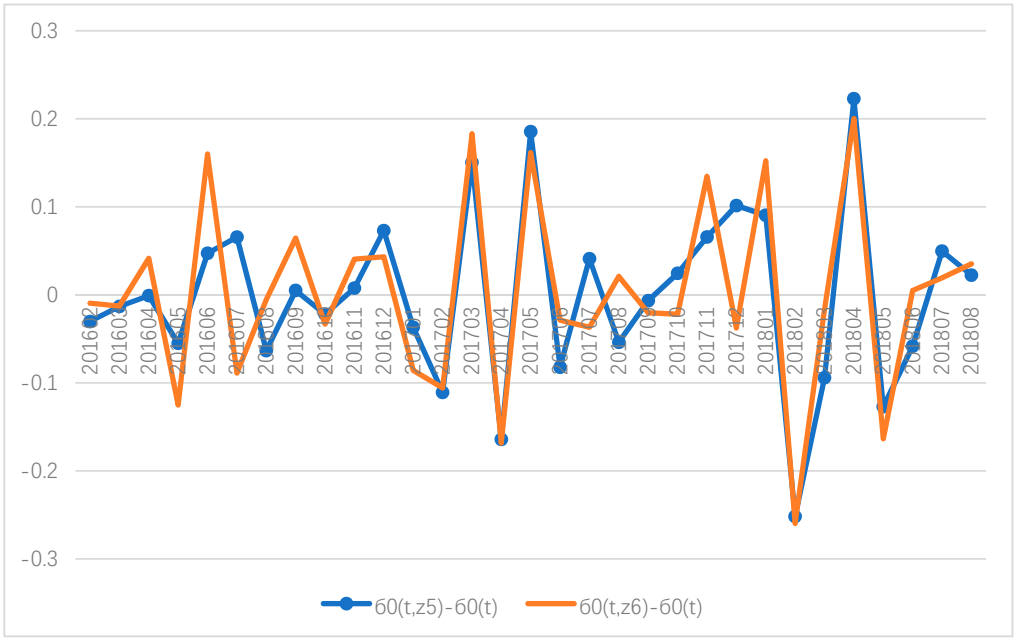

Figure 14. The first type of path model minus the benchmark model.

The first category of enterprises will also adjust the tax and credit in the same proportion. After adjustment, it can be seen in Figure 15, that more values have a relatively large negative effect. It can be seen that the first type of enterprise is not suitable for tax reduction and increasing credit simultaneously, but is more suitable for a single type policy.

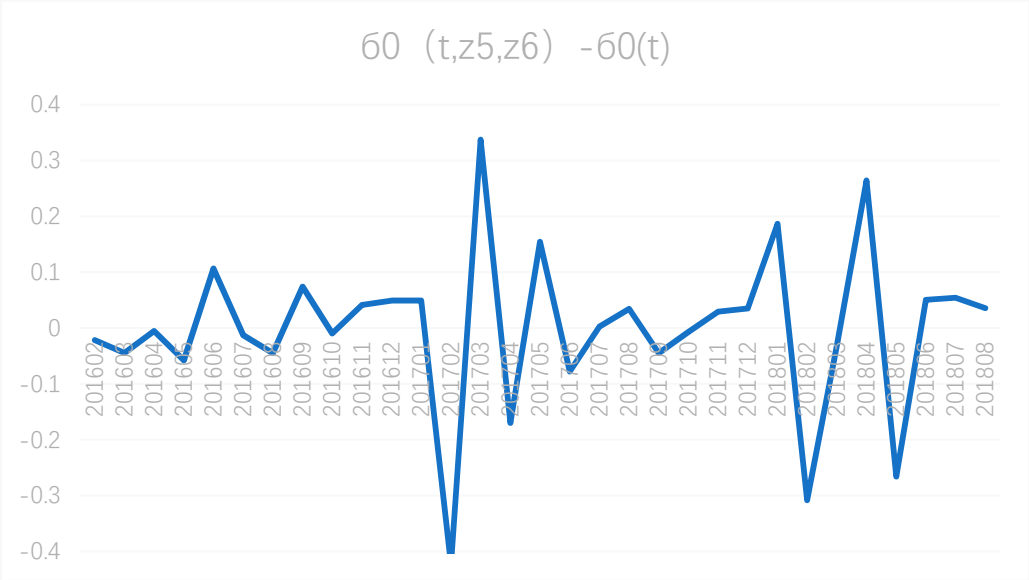

Figure 15. The first type of adjusted path model minus the benchmark model.

After adopting the policy of tax reduction and credit increase, the extraordinary tax burden at points 201802 and 201805 were improved, as shown in Table 4.

Table 4. Tax burden improvement comparison.

t	Before Improvement	Improved
201802	8.27%	4.69%
201805	9.26%	6.72%

It can be seen from Table 4, that after reducing the tax by 20,000 Yuan and increasing the credit by two million Yuan, the tax burden will fall to 4.69% at point 201802, reaching the reasonable range of 4%–6% as defined in Section 3; it has also dropped by 2.54% at point 201805. Therefore, our supernormal improvement results are effective.

The Second Category of Enterprises

For the second type of enterprises, it is clear from Figure 16, that most of the time, the positive effect of credit is more significant, but at point 201706, the negative effect of the actual tax payment is smaller, which is −0.178, and the negative effect of the credit line is quite large, which is −0.280, so it is better to reduce the actual tax payment at this point than to increase the credit.

Running the program again with the same revision rate also found that the results have not a single tax exemption policy effect as shown in Figure 17.

Since the tax burden at point 201706 is 4.34%, within the reasonable tax gap, tax adjustments are no longer carried out.

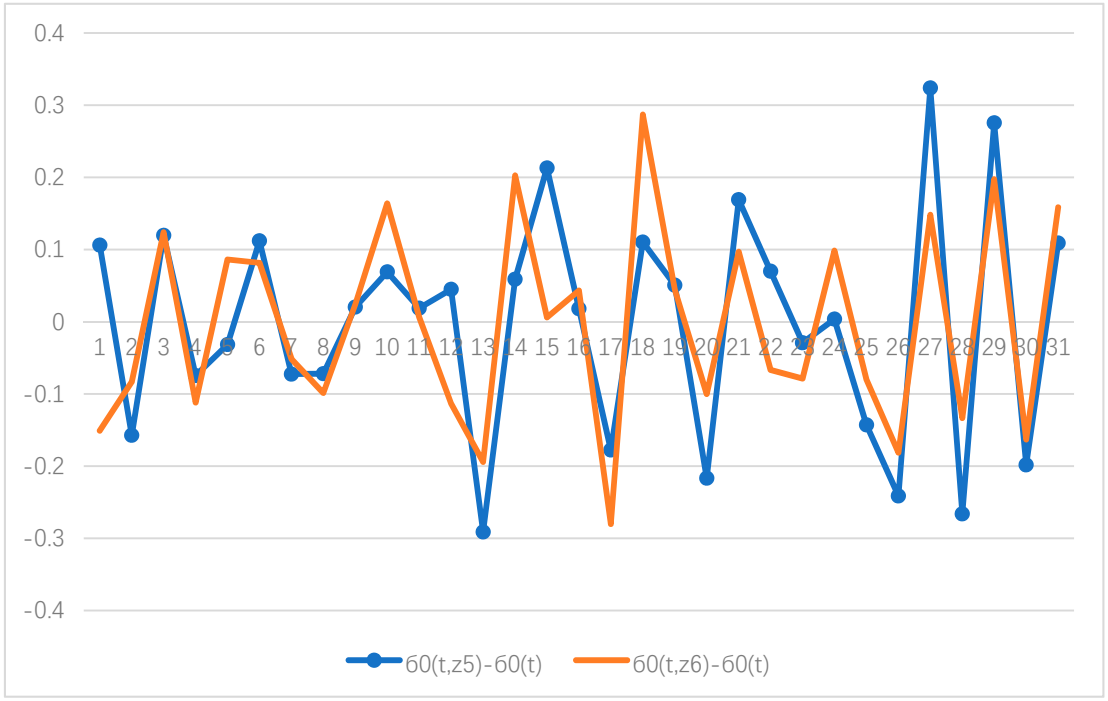

Figure 16. The second type of path model minus the benchmark model.

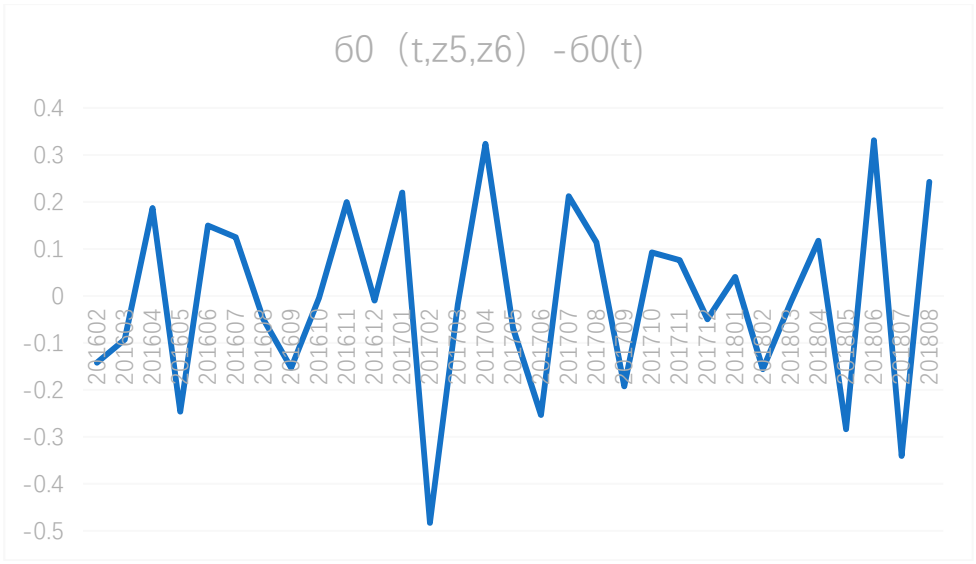

Figure 17. The second type of adjusted path model minus the benchmark model.

The Third Category of Enterprises

As can be seen from Figure 18, in the third category of enterprises, the path model of *z*6 is relatively stable in the early stage, but the negative effect suddenly becomes larger at point 201802, and the negative effect of the actual tax payment is less than the credit line. Since a relatively large negative effect can only be observed at point 201802, so the tax and credit are modified at that point only. It can be seen from Figure 19, that a single tax reduction policy is more conducive to obtaining a larger output value.

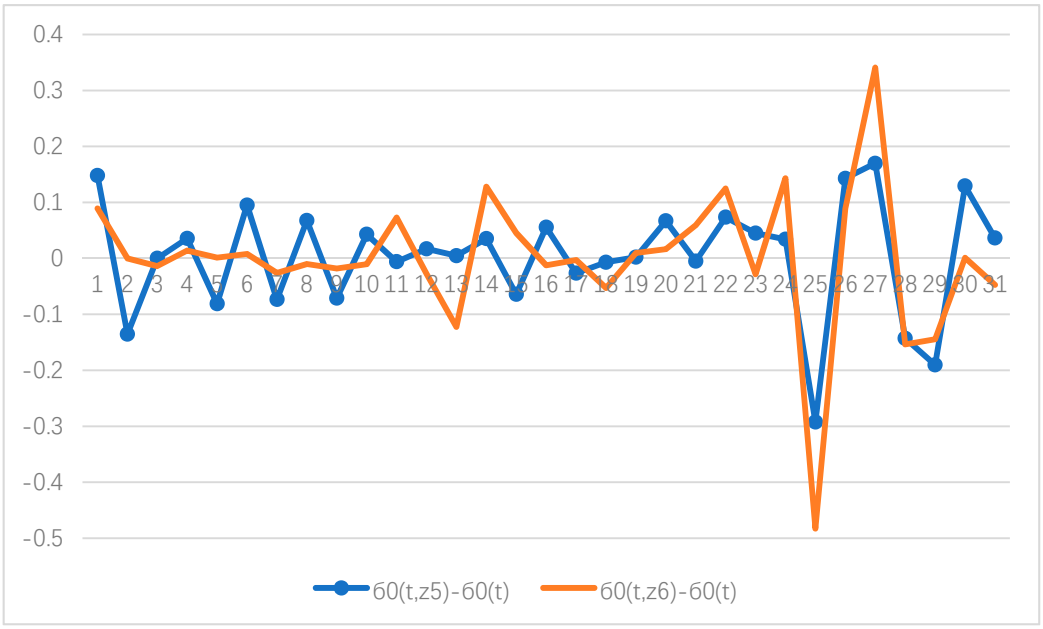

Figure 18. The third type of path model minus the benchmark model.

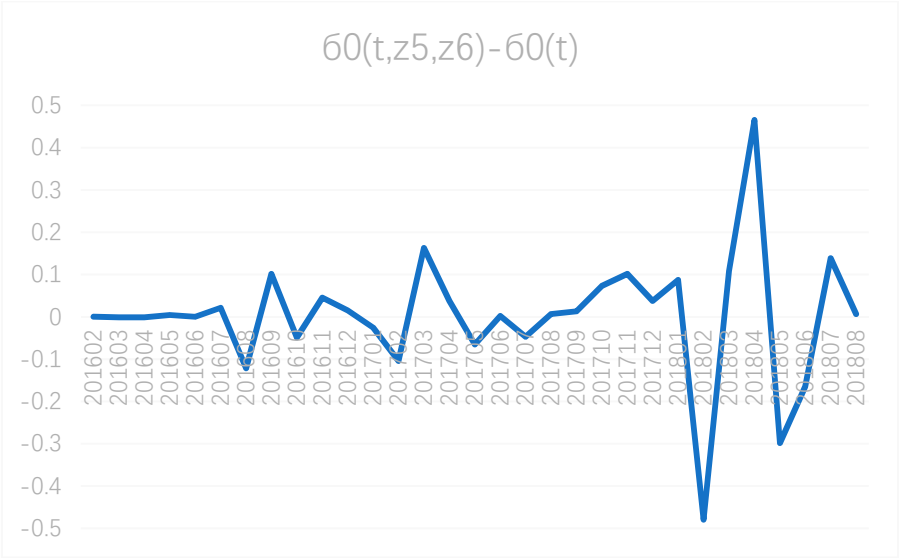

Figure 19. The third type of adjusted path model minus the benchmark model.

After adopting the policy of tax reduction and credit increase, the extraordinary tax burden at point 201802 was improved, as shown in Table 5

Table 5. Tax burden improvement comparison.

t	Before Improvement	Improved
201802	12.70%	5.98%

It can be seen from Table 5 that after reducing the tax by 20,000 Yuan and increasing the credit by two million Yuan, the tax burden falls to 5.98% at point 201802, reaching the reasonable range of 4–6% as defined in Section 3. Therefore, our supernormal improvement results are effective.

5.3. Discussions

This paper explores the configuration of tax burden risk allocation, and discuss the changes along time and with the addition of other variables. According to the results, the study found that the calculations of $\sigma_0(t)$ corresponding to the extraordinary time points often have more extreme values, either caused by nonlinear time variables or by linear control variables. If the ratio of $I_2/I_1 > 1$, it indicates that this is an oscillation drive; if the ratio of $I_2/I_1 < 1$, it indicates that this is a trend drive. In the tax exemption and credit increase sections, by adding nonlinear variables, the path model established by the actual tax payment and the credit line, compare with the benchmark model to reflect the government's tax and credit lines, indicate that the impact of the economic benefits of small and micro enterprises gives a scenario analysis to improve the abnormal point of taxation. Through research, it is found that the government's tax policy adjustment and the credit line adjustment of the credit insurance fund have a relatively satisfactory effect. Further, this paper divides 3552 small and micro enterprises into three categories, adjusting tax and credit lines according to different categories, and achieving the goal of improving tax risk allocation. Trying to find a reduction of 20,000 Yuan in actual tax payment while increasing the credit investment of two million Yuan, that is, integrating the actual tax payment and credit line to the new path model, the comparison benchmark model has produced a positive improvement effect. The conclusions of this paper provide empirical evidence for policy decision support.

6. Conclusions

SMEs occupy a very important position in the national economy. At present, SMEs registered in the industrial and commercial sector account for 99% of the total number of registered enterprises. As the most extensive and active production and management group in social and economic life, SMEs have become a new growth point for the economy. In the rapid economic growth since the 1990s, 76.7% of the newly added industrial output value comes from SMEs [26]. At the same time, SMEs are still the basic force to ease employment pressure and maintain social stability. Therefore, it is particularly important to correctly guide the reform of small and micro enterprises, vigorously support small and micro enterprises, and help small and micro enterprises to improve the quality of development.

Given that friendly tax policy is instrumental to the growth and survival of SMEs, as taxes increase running cost and slow down the growth. Most of the SMEs face the problem of high tax rates, multiple taxations, lack of proper information and complex regulatory policies. Therefore, an appropriate tax policy is crucial for the survival of SMEs. The aim of our paper is to give an analysis of strategies to improve taxation policy.

This paper introduces the risk allocation of the tax burden to measure the tax burden outlier. Using time-varying nonparametric benchmark and path model, this paper measures the tax risk allocation of 3552 small and micro enterprises in the credit insurance fund from January 2016 to August 2018. First, we established a benchmark model to identify the driving pattern of taxation/sales revenue above 6% and below 4% taxation: Whether it is a linear drive of the trend or a nonlinear drive of vibration. Then, we added time and other variables to measure the configuration of tax burden risk allocation. Finally, we analyzed the strategies to improve the allocation of tax burden risk.

For taxation abnormalities above 6% and below 4%, the study found that these outliers have a trend of linear drive and nonlinear drive of vibration, and there is a certain interaction between the two. In the time path, and if it is caused by a time variable, after some period of time, it may return to a reasonable level again. Under the path of credit and taxation, the excess tax drive mode will change and it is difficult to wait for the return to normal. Further, this paper gives an analysis of strategies to improve tax burden risk allocation. The results provide decision support for reducing the tax burden and promoting the growth of small and micro enterprises.

The results of our study provide a flexible decision-making basis for the government to adopt flexible taxation at different points in time and supplemented by credit policy to help small and micro

enterprises growth. However, there are some problems to be further studied. This paper only chooses the path of time and tax. Different paths will have different results. How to integrate as many paths as possible to get a robust result? Furthermore, how to use the conservatism results to warn the excess tax burden in advance? Further study of these questions will be more meaningful.

Author Contributions: B.X. put forward this idea and conceived the framework; L.L. and Y.L. processed and analyzed the data; the four together wrote this paper. In addition, M.U.R. modified the English wording.

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