Research on Correlation Analysis Modeling between Economic Growth and Region Information-oriented

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Abstract: The continuous improvement of the region information-oriented process and the enormous enhancement of resources transactions has provided a novel motivations and power guarantee for regional economic development. However, existing economic growth investigation through correlation are primarily towards on concerning on the economic parameters including the growth ratio, population or others indicators and ignore the region information-oriented impacts, which is also an essential parameter to influence the economic growth. Therefore, we propose a novel correlation analysis regression model to investigate the relationships and quantify the specific parameters of correlation analysis. Specifically, we initially collect the information-oriented ratio and economic growth data-set to analyze the correlations and provide the analysis results. Subsequently, we simulate the correlation inspections and obtain the results of regression model analysis. From our extensive experimental results, we can significantly conclude that region information-oriented has impacts on economic growth and evaluate the Moran l index affections on the established regression model.

Keywords: Economic Growth, Region Information-oriented, Moran I, Regression Model.

1. Introduction

Information-oriented is the process of using information technology to improve the efficiency and effectiveness of a region area. Information-oriented involves the utilization of artificial intelligent, hardware and software, Internet networks techniques and other digital technologies to automate processes, store and analyze the data, \facilitate communication and collaboration [1]. Information-oriented can assist region area to reduce costs, improve customer service and increase productivity and benefits. It can also assist region area to become more agile and responsive to changing market conditions. Therefore, the information-oriented is an important component of the digital transformation of region area economics.

Economic growth is defined as the increase in the production of goods and services in an economy over a period of time. The growth is measured by the growth rate of a country's gross domestic product (GDP). Economic growth is an essential indicator of a country's economic health and is a crucial factor in determining the standard of living of its citizens [2]. Economic growth is driven by factors such as technological innovation, increased investment, improved education, and increased trade. It is essential for a country to maintain a healthy rate of economic growth in order to ensure the long-term prosperity of its citizens.

With the continuous development of economic, the urban cluster is occurred and contained a densely populated area that is made up of several cities and towns. Urban cluster is typically characterized by high levels of economic activity, population density and infrastructure [3]. Urban clusters are often known as the engines of economic growth and development, which indicates that theses area can provide a concentration of re-sources and services that can be utilized to create jobs opportunities and stimulate eco-nomic activity. Urban clusters are also important for social and cultural activities, as they provide a platform for people to interact and share ideas [4]. Urban clusters are an im-portant part of the global economy and are increasingly becoming the focus of economic and social development initiatives.

The relationship between economic growth and region information-oriented is a complex issue. Information-oriented can assist to drive economic growth by increasing efficiency and productivity, reducing cost and improving customer service. At present, economic growth can also assist to drive information-oriented by providing the resources and capital needed to invest in technology. Information-oriented and economic growth are mutually reinforcing and both are essential for a region to achieve long-term prosperity [5].

Correlation analysis is a statistical technique used to measure the strength of the relationship between two or more variables. Correlation analysis method is utilized to determine if there is a correlation between two variables and if contains the correlation, determining the specific values to quantify the correlation parameter [6]. Correlation analysis can also be utilized to identify relationships between multiple variables including the relationship between economic growth and region information-oriented. It can also be utilized to identify patterns in data including the relationship between population density and economic activity [7]. Correlation analysis is an important tool for understanding the relationships between variables and can be utilized to inform decision-making.

Regression models typically are a mathematical models, which are primarily utilized to predict the value of a dependent variable based on the values of one or more independent variables. They are used to identify relationships between variables and to make predictions about future values [8]. Regression models can be utilized to analyze the relationship between economic growth and region information-oriented and to predict the impact of information-oriented on economic growth. Regression models are an important tool for understanding the relationships between variables and can be used to inform decision-making [9].

In this paper, we establish a regression mathematical model with the multiple correlation analysis methods to investigate the relationships between the region information-oriented and the economic growth. The reminder of this paper will be organized as an introduction about the primary parameters and related contributions are shown in section 2. The establishment process of the proposed methods is shown in section 3. Subsequently, section 4 will illustrate the experimental results and evaluation analysis. Finally, a conclusion and future improvements are provided in section 5.

2. Parameters and Background Introduction

2.1. Related Research Introduction

Correlation analysis is a powerful tool for exploring the relationship between economic growth and regional information-oriented. With the rapid development of information technology in recent years, regional information-oriented has become an important factor affecting economic growth. Through utilizing correlation analysis, researchers can determine whether regional information-oriented has a positive or negative impact on economic growth and to what degree.

In a study conducted in China, researchers utilized correlation analysis to examine the relationship between regional information-oriented and economic growth. The research found that regional information-oriented had a extreme positive effect on economic growth with a correlation coefficient approximately to 0.9, which indicates that as regional information-oriented increases and economic growth also increases [10].

The investigation also found that the level of regional information-oriented had a greater effect on economic growth in rural areas than in urban areas. In a separate study conducted in the United States, researchers used correlation analysis to examine the relationship between regional information-oriented and economic growth. The results of the study showed that there was a positive correlation between regional information-oriented and economic growth, with a correlation coefficient approximately to 0.6, which indicates that as regional information-oriented increases, economic growth also increases [11].

The study also highlighted the importance of regional information-oriented in promoting economic growth in rural areas. Generally, correlation analysis has been utilized to explore the relationship between regional information-oriented and economic growth. The results of these studies indicate that regional information-oriented has a positive effect on economic growth, with a greater effect in rural areas. This suggests that regional information-oriented should be a priority for governments and policy makers in order to promote economic growth [12].

2.2. Primary Parameters Introduction

Following Table 1 demonstrates the primary parameters in this model and explain the detail functions about these symbols.

Table 1 Primary parameter introduction

Parameter symbols	Explanations
R	*Regression value*
X	Sampling input data
P	Pearson correlation coefficient
w	Regression threshold
y	Real Features
C	Correlation output results

3. Correlation Analysis Model Structure

Initially, we propose a regression model with correlation analysis methods for disposing the collected data-set. Following Figure 1 demonstrated the general procedures of proposed model.
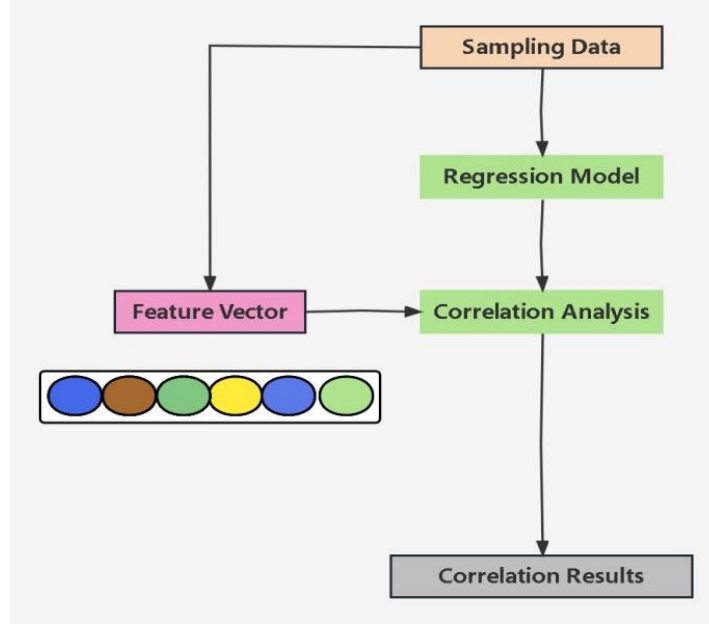

Figure 1: Regression model procedures.

Following Equation 1 demonstrates the regression calculation process, where the *R(x)* represents the regression values, *x* is the value of sampling data and *w* is the threshold of the regression model.

$$R(x) = \sum_{x=1}^{X} (y_x - x_x w)^2 \tag{1}$$

Information-oriented auto-correlation is utilized to the variation between geographically adjacent areas where observations are not spatially randomly distributed. There are similar values for quantities and we intends to use Moran I index to test whether the impact of information-oriented on the economic growth of urban agglomerations is affected. Moran I index is calculated as following Equation 2, where *S* is the sampling data variance, *x|* is the average value and *W* is the information-oriented weight matrix.

$$Moran\ I = \frac{\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{m}(x_i - \overline{x})(x_j - \overline{x})}{S\sum\limits_{i=1}^{n}\sum\limits_{j=1}^{m}(W_{ij})} \tag{2}$$

4.   Experimental Results and Analysis

In this section, we simulate the proposed regression model with correlation analysis. Following Figure 2 demonstrates the Moran I evaluation results. The x-axis of the Moran scatter graph is the variable x and the y-axis is its spatial lag term Wx, which is the spatial weight matrix. The x is the information index and the x-axis represents the degree of information flow of the spatial unit itself and the y-axis represents the weighted sum of the information index of its surrounding units.
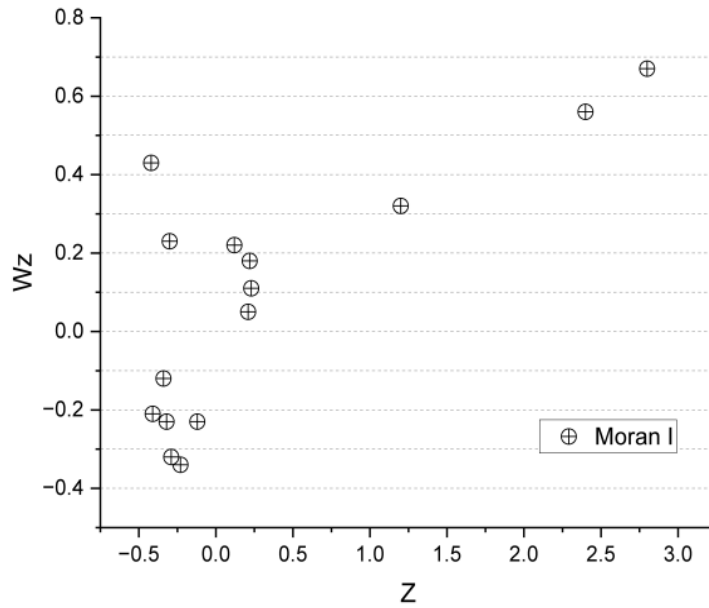

Figure 2: Evaluation accuracy comparison results.

Indeed, the correlation coefficients are simulating in proposed regression model and following Table 2 demonstrates the correlation analysis results. Pearson, Spearman, Kendall are three types of correlation coefficients. These are the three most important correlation coefficients in statistics, indicating the trend direction and degree of trend that change between two variables.

Table 2 Correlation analysis results

Correlation Method	Simulation Results
Pearson	*0.95*
Spearman	0.94
Kendall	0.97

5. Conclusion

The proposed method has shown that there is a strong positive correlation between the economic growth and information-oriented. This indicates that the development of region information-oriented can have a positive impact on economic growth. However, it is also necessary to pay attention that this correlation does not necessarily imply causation. Further research is needed to determine the causal relationship between the two variables. Additionally, further research can explore the potential for other factors to influence the relationship between economic growth and region information-oriented

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