On the Accuracy of Government Economic Indicators

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ABSTRACT. Can economic indicators announced by government units give an accurate report? In this study, the monthly data on the Taiwan Weighted Index (TAIEX) from 1999 to 2018 and various economic indicators issued by government units were used as the case data, hoping to explore whether the economic indicators were related to the Taiwan Weighted Index. It was found that the coincident index and the leading index do not have the characteristics of simultaneity and leading values. Thus, using these indices to determine the trend of the weighted share price index is unreliable.

1. INTRODUCTION

The stock market is not only the window of the economy but also an important economic indicator of a country. In recent years, many scholars have tried, through various methods, to study the orientation of macroeconomic indicators regarding index changes. This paper selects the economic data from January 1999 to November 2018 and the monthly data on the Taiwan weighted index to explore the relationship between the Taiwan weighted index and the economic leading index published by government units, using a total of 18 leading and lagging indicators.

2. LITERATURE REVIEW

Previous research literature has mainly focused on three areas: the influence of various economic indicators on stock price; the concept of relevance, and the prediction of investment decisions. Regarding the first of these, Pissarides and Wenchi (1990) explored the relationship between the monthly data of the stock price index and the exchange rate in six major industrialized countries. The literatures ([1] & [2]) on QE (quantitative easing) focus on the spillover effect（Fratzscher, Lo Duca & Straub, 2012; Fratzscher, Lo Duca & Straub, 2016).Han Ching Huang, Yong Chern Su and Wei-Shen Chen (2017) found that on the first trading day after the QE 1 policy was announced, one-minute interval data showed that lagging order imbalances could predict current returns [3]. Although the influence factors of the economic trend have been a heated topic in research, the existing literature has seldom focused on the well-known economic indicators for in-depth study to validate the accuracy of those indicators.

The second branch of research has focused on the concept of relevance, with many studies being conducted in this area. Identifying various channels through which financial markets are affected is important in promoting economic growth. Using the unit root test method and ARDL model under the condition of structural fracture, Lei Pan and Vinod Mishra (2016) find that the global financial crisis had a significant impact on both the actual sector and the financial sector in China [4]. Schumpeter (1911), McKinnon (1973) and Bernard Shaw (1973) have conducted pioneering studies on the causal relationship between the development of the financial sector and the growth of the economy ([5] & [6]), and these studies have attracted a lot of interest in the stock market.

A third focus in the literature has been on predicting investment decisions. The orientation of change in the stock price index has always been of interest to scholars. Speculating on the current trend by looking at macroeconomic data that are relevant to the stock price index helps investors make future decisions. Qi Sun and Shu-jun Ye (2016) point out that volatility is a representative method to measure risk [7].

In summary, the use of sensitive data and appropriate statistical methods to analyze economic data are the basis for predicting whether or not the information is reliable. This paper provides a reference to users for viewing these economic data correctly.

3. Data and Methods

3.1 Selection of data

Considering that Taiwan's economic data are released in a monthly cycle, which is large and complete, this paper chooses the economic data and the monthly data of Taiwan's weighted index over a twenty-year period, from January 1999 to November 2018. The paper explores the correlation between Taiwan's weighted index and the leading indicators, simultaneous indicators and lagging indicators of economic performance published by government units, with a total of 18 indicators.

3.2 Data processing methods: gray relational calculation and analysis

In this study, the gray relational analysis method is used to calculate and analyze the data correlation between the TAIEX and economic index. In addition, the traditional statistical correlation coefficient analysis is used to verify the reliability of the gray correlation research method. This study uses the gray correlation method to calculate the index data, provide users with accurate timing messages.

4. Empirical Results

4.1 Calculation of the average number of relations between TAIEX and individual economic data

First, this paper identified the reference sequence A0 and the comparative sequence Ai. In the current study, the TAIEX was set as the reference sequence and the 18 economic indicators were set as the comparative sequences. Second, this paper standardized the numerical values of the collected sequences. The third step was to calculate the grey relational distance Δ oij. Δ oij can be described as the distance between each numerical value post-standardization and the reference numerical value post-standardization:

$$\Delta_{\text{oij}} = |x_{oj}^* - x_{ij}^*| \qquad (1)$$

x*ij represents the reference numerical value after normalization; x * oj represents numerical values after normalization. Fourth, the grey relational coefficient γ oij was calculated. γ oij can be described as follows: ζ is the distinguishing coefficient, which aims to control the size of the grey relational coefficient to facilitate judgment, and 0.5 is generally used as the criteria:

$$\gamma_{oij} = \frac{\Delta \min + \zeta \Delta \max}{\Delta_{oij} + \zeta \Delta \max} \qquad (2)$$

$$\Delta \max = \max_i \max_i \Delta_{oij} \quad \Delta \min = \min_i \min_i \Delta_{oij} \quad \zeta \in [0.1]$$

Fifth, this paper calculated the grey relational grade. The grey relational coefficient was multiplied by the weighting of each assessment criterion, and the weighted average was the grey relational grade. The higher the score, the more important it is, or the better the performance. Sixth, this paper addressed the grey relational rank. The decision-making process was compared to the computed grey relational grade Γoi; the greater the value of Γoi, the more important it is, or the better the performance. The results of the analyses were obtained, as shown in Table 1.

Table 1. Results of Gray Relational Analysis

sort	economic indicator	classification	Gray correlation value
1	Number of employed persons in the non-agricultural sector (thousands)	simultaneous Indicators	0.9761
2	Manufacturing sales index	simultaneous Indicators	0.9605
3	Inlet value of machinery and motor equipment (1 billion Yuan)	simultaneous Indicators	0.959
4	Signal of prosperity countermeasures (points)	-	0.9588
5	Manufacturing inventory value (thousand Yuan)	lagging indicator	0.9539
6	Wholesale, retail and catering turnover ($1 billion).	simultaneous Indicators	0.9521
7	All financial institutions' loans and investments (1 billion Yuan).	lagging indicator	0.9479
8	Unemployment rate (%)	lagging indicator	0.9462
9	Total electrical consumption of electric power enterprises (billion degrees)	simultaneous Indicators	0.9459
10	Index numbers of industrial production	simultaneous Indicators	0.9427
11	Comprehensive index of lagging index (point)	lagging indicator	0.9418
12	Simultaneous index of composite index (point)	simultaneous Indicators	0.9414

4.2 Preliminary analysis of calculation results of the gray correlation coefficient

The result shows that the greatest correlation is between the number of employed persons in the non-agricultural sector (simultaneous indicators) and the weighted index. This paper chooses the most prominent leading indicator: the total number of currencies M1B. In addition, the number of people employed in the non-agricultural sector, the numerical turning point and the weighted index in the 20 years study period is analyzed, in order to test the extent to which both the simultaneous ratio and the leading ratio occur at the same time.

4.3 Verifying the correlation between TAIEX, simultaneous indicators, and leading indicators

In this section, we determine whether the indicator trend of employment in the non-agricultural sector, which ranks first in the relational coefficient sequence, can be used as an important indicator to observe the future trend of TAIEX. A total of 239 months of data have been collected from the sample data in the past 20 years. Among them, the total number of high and low turning points of the weighted index is 125 points, the total number of high and low turning points of non-agriculture ministry employment is 84 points, and the total number of high and low turning points of currency M1B is 95 points. For comparison, the number of employed persons in the non-agricultural sector is used as a simultaneous index; there are 27 points with the same turning point as the weighted index, accounting for 32.14% of the number of employed persons in the non-agricultural sector ratio, but only 21.6% of the weighted index ratio. So, there is no statistically significant correlation. The total currencies, M1B, are a leading indicator based on a one-month lead. Compared with the high and low turning points of the weighted index, 28 points played a leading role, accounting for 29.47% of the total currencies(M1B), but only 22.4% of the weighted index ratio. There is also no statistically significant correlation. In addition, it is also found that regardless of whether the index is simultaneous or leading, there are many cases of reverse indication between the high and low turning points of the value and the weighted index. Among them, the "number of employed persons in the non-agricultural sector " has 19 points, accounting for 22.62% of the number of employed persons in the non-agricultural sector ratio and 15.20% of the weighted index. The total currency M1B has 23 points, accounting for

24.21%of the total currencies(M1B) and 18.40% of the weighted index. The results show that the reliability of the two indexes is not high.

4.4 Verification by correlation coefficient method

Using the same data to calculate the statistical correlation coefficient, we find that the simultaneous index has the greatest correlation with the Taiwan weighted index. Furthermore, using the same method to analyze the turning point of the simultaneous index, we find that only 3 of the 23 high and low turning points in the simultaneous index are the same as points in the weighted index, accounting for 13.04% of the TAIEX index. Again, using the same data to calculate the statistical correlation coefficient, we find that the results are not as good as the method used in this study. This also shows that the method used in this study is better than the traditional statistical method. the relevant statistics are shown in Table 2.

Table 2 Correlation Coefficient Ranking of TAIEX and individual economic data

Time Period: 1999 – 2018

sort	economic indicator	correlation coefficent
1	Simultaneous index of composite index (point)	0.797764011
2	Composite index of leading indicators (points)	0.79063337
3	Index numbers of industrial production	0.778092788
4	All financial institutions' loans and investments (1 billion Yuan).	0.755479096
5	Total currency count M1B (billion Yuan)	0.751570745
6	Inlet value of machinery and motor equipment (1 billion Yuan)	0.747963521
7	Number of employed persons in the non-agricultural sector (thousands)	0.732432709
8	Comprehensive index of lagging index (point)	0.728711287
9	Manufacturing sales index	0.720126446
10	Wholesale, retail and catering turnover ($1 billion).	0.71075365
11	Customs export value (billion Yuan)	0.707928812
12	Manufacturing inventory value(thousand Yuan)	0.646627827

5. Conclusion

5.1 The gray correlation statistics method has a high level of credibility when used in economic analysis.

As verified in this article, gray relational analysis shows excellent trustworthiness in the economic field because of its small sample requirement, strong pertinence, and dimensionless processing. It provides a new angle and train of thought for the study of relationships in the economic field.

5.2 Investment requires accurate forecasting.

Considering the statistical analysis and data calculation in this paper, it is apparent that both well-known indicators and leading indicators are unreliable investment signals for investors. Furthermore, the reverse ratio, which cannot be ignored, brings some misleading information to investment decision-making. In conclusion, the deviation of the macro-economic index has brought too many decision-making risks to the data user.

5.3 Empirical conclusions of the data

The economic simultaneous index cannot be used as a reliable simultaneous indicator of data for two reasons: First, as a simultaneous index, the synchronization shown in the data in the past 20 years is not high, and it is not worth letting users ignore other unstable factors because of their synchronization. Second, the empirical results show that the reverse indicator of the index is not low, which seriously affects its role as a simultaneous indicator. The leading index also shows the same phenomenon and provides no leading reference in empirical research.

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