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The Application of Additive Seasonal Model in the Analysis of Domestic Credit Scale

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Abstract: To establish statistical model of measurement, this paper analyses the five major domestic economic data whether impact on domestic credit amount, for the purpose of the data cointegration test to eliminate the spurious regression result in error, and through the OLS regression estimate and error correction model is established for dynamic balance of feedback in the short term, then use VAR impulse response function to feedback the long-term dynamic equilibrium, the last three parameters exponential smoothing model is set up to predict the future scale of the credit. According to the conclusion, the total domestic credit scale is a series with cycle fluctuation, seasonal effect and long-term trend. Domestic money supply and domestic fiscal revenue are the main factors affecting the scale of domestic credit. In other words, the fluctuation of domestic credit model tends to return to the normal level, which is balanced and restricted by the medium and long-term stable co-integration relationship of the model. To absorb the impact of domestic fiscal revenue or an increase in the domestic money supply, banks adjust for changes in the size of credit, and then show little change. In the short term, the two variables significantly affect the credit scale, but the long-term impact is not significant. Under the condition of constant economic environment, it will still show a steady rise in the future, and the trend of annual cycle is increasing month by month.

Keywords: Time Series Model; Domestic Credit Scale; Holt-Winters Smoothing Model; Addition of Seasonal Models

1 Establish a regression model

With the continuous advancement of China's interest rate liberalization, the focus of credit risk management also lies in interest rate risk management and domestic economic environment data. In the economic sense, the total domestic credit scale has five influencing factors, namely money supply (M2), loan interest rate (P2), gross domestic product (GDP) and fiscal Revenue [1]. The above data from November 2020 to January 2008 are used to preliminarily establish the model.

1.1 Co-Integration test

First of all, whether there is an equilibrium relationship among variables in the sense of effective economy is judged, and the co-integration test is carried out for each variable

Form 1-1 ADF Inspection Results

Series	ADF Test Statistic	Test shape	1% Critical Value	5% Critical Value	10% Critical Value	Conclusion
Y	-3.896231	(C, T, 0)	-4.023975	-3.441777	-3.145474	stable
Revenue	-5.931088	(C, N, 0)	-2.581233	-1.943074	-1.615231	stable

M2	-4.675185	(C，T，0)	-4.023975	-3.441777	-3.145474	stable
GDP	0.271132	(C，T，0)	-3.473672	-2.880463	-2.576939	unstable
GDP2	-10.03375	(C，T，2)	-4.019561	-3.439658	-3.144229	stable
P2	-1.340188	(C，T，0)	-2.580164	-1.942924	-1.615325	unstable
P2	-8.370496	(C，N，1)	-2.580164	-1.942924	-1.615325	stable

Note：Represents element differential processing

（C，T\N，X）C: Unit root test with constant terms，T : A trend term; N: No trend term is included，X: Lag order.

Yt =4.470- 0.146M1 + 0.754Revenue

(1.251) (0.075) (0.039)

t = (3.574) (-1.941) (19.193)

The test statistic -2.970 is less than the critical value -2.581 when the significance level is 1%. Therefore, the estimated residual series E can be considered as a stationary series, indicating that the total credit has a co-integration relationship with fiscal revenue and money supply [2]. Interest rate only has a large impact on the credit scale in the current period, without a long-term impact, so the correlation shown by interest rate is not significant, so this paper does not discuss the impact of interest rate.

1.2 Establish error correction model

It is found that the model passes the cointegration test and has long term dynamic equilibrium. However, the co-integration test cannot fit the short-term dynamic balance, so an error correction model is established to fit, and the results are as follows:

Y=-0.012+0.809D2M1+0.736D2REVENUE-0.363 E (-1)

The coefficient before the error correction term is negative, that is, the domestic credit model has a tendency to return to the normal level [3]. Domestic money supply and pre-value of domestic fiscal revenue positively affect the scale of domestic credit. Finally, R2 of 0.79 indicates that the model has a good goodness of fit, and P <0.05 indicates that the model has a significant correlation, which can well explain the change of money supply.

1.3 Establish VAR model

In terms of time dimension, the impulse response function of VAR was fitted and the chart was drawn to identify the positive or negative effects of the changes of various variables on credit [4].

According to the experiment, the optimal lag order is the fourteenth order. The result of the pulse diagram is shown in Figure 1-1 and Figure1-2:

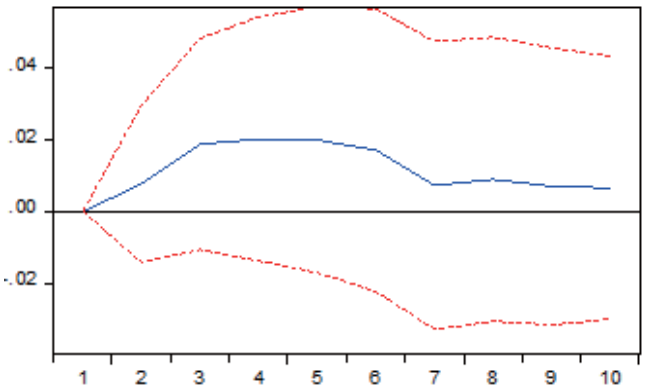

Figure 1-1. The response of domestic credit scale to money supply.

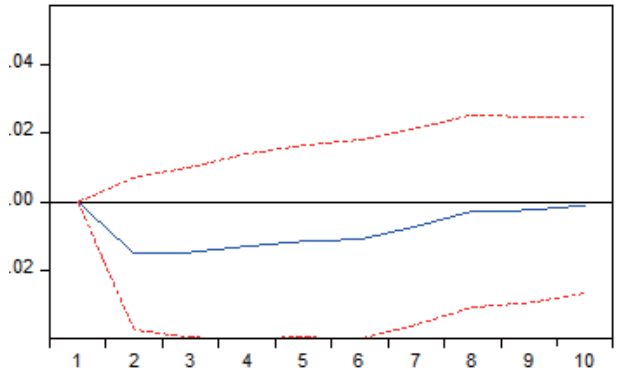

Figure 1-2. The response of credit scale to fiscal revenue.

The dependent variable has no significant effect on the total domestic credit. After the domestic money supply has a positive impact on the total domestic credit in the current period, the positive impact on the domestic credit scale increases, reaching the maximum in the third period, and then fluctuates stably. The impact decreases and tends to be stable in the seventh period [5]. However, the impact on domestic fiscal revenue is negative, and the impact reaches the highest in the second period, but after the eighth period, the impact efficiency gradually decreases. Generally, in order to absorb the impact of domestic fiscal revenue or the increase of domestic money supply, the commercial banks will adjust the changes in the credit scale, so the credit scale will then show a small change. In the short term, the two variables have a great impact on the credit scale, indicating that the short-term impact is significant on the total domestic credit, but the long-term impact is not significant

2 Build a forecast model for the total value of domestic credit scale

According to the conclusion above, credit scale is a stable, white noise series with a long-term trend. The time sequence diagram of LN (Y) series from 2008 to 2021 is drawn below to observe the characteristics of this series in detail [6]. The three-parameter exponential smoothing prediction model is established.

2.1 Extraction trend effect

The scale of domestic credit does not have the characteristics of large economic cycle. It is preliminarily judged that this sequence is affected by three factors: cycle fluctuation, long-term trend and seasonal effect.

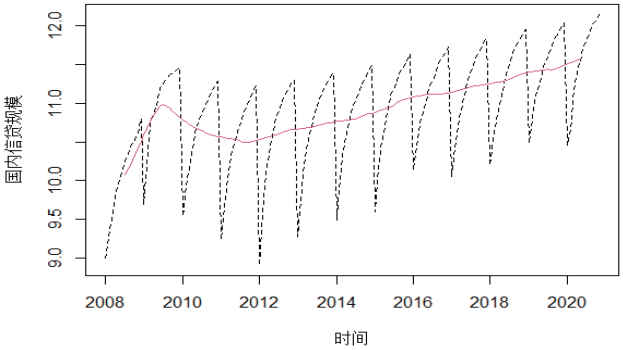

Figure 2-1. Time series chart of domestic credit scale.

Further extracting trend effect, we can judge that this series has a significant linear increasing trend, as well as a seasonal effect with an annual increasing cycle: the total domestic credit increases month by month, and the trend is >

in the fourth quarter, BBB> the third quarter, BBB2 i>e second quarter, and BBB2 in the first quarter [7]. So in addition to money supply and domestic fiscal revenues, gross domestic credit is also subject to long-term trends, cyclical effects and seasonal effects. The amplitude of each year is basically maintained relatively stable, that is, the cycle effect is not affected by the trend [8].

2.2 Holt-Winters smoothing model

This sequence is a white noise sequence with seasonal effect, so the three-parameter exponential smoothing model is used to calculate the predicted value and draw the forecast chart in the next two years. The results are as follows:

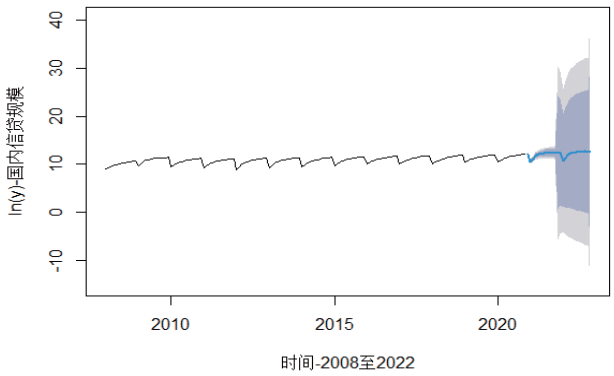

Figure 2-2. Domestic credit scale forecast chart.

Using Holt-Winters smoothing model to predict the results of the above, although the model can predict data at any time in the future, but because the future has too many uncertain factors, so its only short-term prediction to be practical significance, the predictive result for nearly two months, in December 2020, the domestic line with forecast of 198526.92 yuan, the total gross domestic credit forecast in January 2021 at 38923.365 yuan, the overall growth trend of periodic rise steadily, consistent with actual situation, and close to the actual data, so the prediction model is significantly related, making sense [9].

Form2-1. Projected gross domestic credit.

Y.M	Predictive value	Y.M	Predictive value
2020.Dec	198526.92	2021.Dec	260245.32
2021.Jan	38923.365	2022.Jan	49190.707
2021.Feb	70574.206	2022.Feb	90332.266
2021.Mar	133103.19	2022.Mar	172691.15
2021.Apr	171699.31	2021.Apr	223912.36
2021.May	195483.25	2022.May	255533.81
2021.Jun	226867.18	2022.Jun	297381.17
2021.Jul	230535.47	2022.Jul	302147.32
2021.Aug	237176.53	2022.Aug	310891.73
2021.Sep	246890.45	2022.Sep	323747.77
2021.Oct	240862.14	2022.Oct	315520.84
2021.Nov	247409.47	2022.Nov	324126.78

3 Conclusion

Domestic fiscal revenue and domestic money supply are the main factors affecting the credit scale. Through

OLS regression estimation and error correction model, the dynamic balance in the short term is fed back and the model equation is obtained. Then， the impulse response function of VAR is used to feed back the long-term dynamic equilibrium state, and the conclusion is as follows:

(1) The coefficient before the error correction term is negative, that is, the fluctuation of the domestic credit model tends to return to the normal level, which is balanced and restricted by the medium and long-term stable co-integration relationship of the model.

(2) Domestic fiscal revenue and money supply have a positive impact on the credit scale in the short-term dynamic balance.

(3) Domestic fiscal revenue and domestic money supply have no significant influence on the scale of domestic credit [10].

(4) When domestic money supply or domestic fiscal revenue has a positive impact on the total domestic credit in the current period, the former has a positive impact on the scale of domestic credit and then increases to a stable level, while the latter has a negative impact on the scale and then increases to a stable level, both of which have a significant impact on the total domestic credit in the short term.

(5) In order to absorb the impact of domestic fiscal revenue or the increase of domestic money supply, commercial banks adjust the change of credit scale, and then show a small change. In the short term, the two variables significantly affect the total domestic credit, but not in the long term.

By diagnosing the time sequence diagram of the domestic credit scale, the total domestic credit scale is a series with long-term trend, seasonal effect and periodic fluctuation. Using the Hot-winter three-parameter exponential smoothing model of the time series model to predict the data in the next two years.By comparing with the known data, it can be seen that the data is close to the actual data. In the case of stable economic conditions, the future will still show a steady rise and annual cycle of monthly increasing trend.

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