

Empirical Analysis of Consumer Confidence and Asset Pricing in Chinese Markets

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Abstract: Inspired by the development of behavioral finance and related research abroad, we decide to test the influence of consumer confidence index (CCI) on Chinese stock markets performance. Through empirical tests, we find that CCI has a strong explanatory power for small stocks with high book-to-market value and the excess returns of stocks in the next period can be predicted through the CCI. In addition, stocks in different industries and organizational forms have different responses to CCI, indicating that the CCI can comprehensively reflect and quantify investors' assessment of the current economic situations as well as their subjective future expectations.

1. Introduction

CAPM and CCAPM are popular for their simplicity and theoretical clarity in formulating models [1]. However, these models obviously fail to explain the relationship between asset returns and specific asset factors, such as the stock market value (MV) and the ratio of book value to market value (B/M ratio). And the combination of size and book-to-market ratio can obtain the cross-sectional change of the average stock return related to the market [2]. In general, neither model works well when trying to explain the return cross-section of a portfolio sorted by size and B/M ratio [2]. Since CAPM and CCAPM failed to fit the cross-section of portfolio returns, researchers explored the conditional version of these models and found that the risk premium and beta values change with time, depending on some macro-economic variables such as consumer confidence. Acemoglu and Scott [3] found that the consumer confidence index was highly correlated with the current economic situation and was a predictor of future economic strength. By analyzing US consumer confidence data, Carroll and others [4] illustrated that the drop of consumer confidence after Iraq's invasion of Kuwait is often cited as the main reason for the economic slowdown. Both studies showed that consumer confidence is a strong predictor of future consumption growth. Moreover, there is ample research evidence that the consumer confidence index does convey information to financial markets about the overall economic outlook. The business press has repeatedly pointed the shift in consumer psychology from pessimism to optimism as the key to ensure a long-term recovery from the current slowdown [5].

The Consumer Confidence Index (CCI), also known as the Consumer Sentiment Index, refers to consumers' comprehensive judgments on issues such as employment, income, prices and interest rates based on the economic development of the country or region. It could also be referred to as a leading indicator that comprehensively reflects and quantifies consumers' evaluation of the current economic situation and their subjective feelings about economic prospects, income levels, income expectations, and consumer psychology, as well as predicts economic trends and consumption trends.

Based on the composition and significance of the CCI and the development of behavioral finance, foreign scholars took the lead in realizing that the CCI can reflect investor sentiment to a certain extent, which in turn affects the price performance of the stock market [6].

Therefore, in this paper we would like to study how investor sentiment affects the cross-section of stock returns. We selected the historical data from Chinese stock markets to construct the

Fama-French 25 portfolio, explore the interpretation of the CCI on different investment portfolios, analyze its predictive power, test its stability and explain the significance of behavioral finance behind it. The main steps are as follows:

The first step is to acquire all A-share stocks in Shanghai and Shenzhen stock exchanges from 2010 to the end of 2019. We select monthly transaction data and related consumer confidence index, remove missing values and standardize the data.

The second step is to construct fama-French 25 portfolio, which is divided into 5 groups according to the market value, and then divided into 5 groups according to the score of book market value. A total of 25 portfolios are obtained, and the average return rate of 25 portfolios is calculated and explained variables ($R_{it}-R_{ft}$) are calculated. Finally, SMB (size factor) and HML (book market value factor) are calculated, and a total of 3000 data are obtained.

The third step is the empirical test, which examines the strength of the interpretation of the factors and performs regression analysis on each group to obtain 25 sets of indicators. As consumer confidence rises, the strength of the model's interpretation is also increased, and the ratio of consumer confidence index to high book-to-market value is obtained. The excess returns of stocks have a better explanation. According to multiple linear regression, the interpretation of CCI is not ideal for single linear regression, which may due to that the meaning of the indicator has been explained.

The fourth step is the analysis of forecasting ability. We select the current excess return rate as independent variable and the next period excess return rate as the dependent variable and explore how the current indicators explain the excess return rate of the next period. In the case of single linear regression, the consumer confidence index has relatively good prediction strength for the model. In the case of multiple linear regression, the consumer confidence index also has a good performance.

The fifth step is to classify by industry. In the case of single linear regression, the consumer confidence index has a relatively strong explanation for the two industries of household appliances and building materials, but the impact on the pharmaceutical and biological industries is small. In the case of multiple linear regression, leisure services and household appliances have a strong explanation.

The final step is to classify according to organizational form, and through linear regression analysis, it is found that the consumer confidence index has a strong explanation for the excess returns of state-owned enterprises and central banks.

Through empirical analysis, we believe that CCI has important advantages over many conditional variables used in previous studies. In other words, it is not just a factor, and its change is related to the change of the stock or bond index.

This paper is organized as follows: section 2 lists the data that we used, section 3 describes the methodology, section 4 studies the empirical results, section 5 demonstrates robustness tests, section 6 is about the implications of our findings and section 7 concludes.

2. Data

We select monthly data of A-share stocks listed in Shanghai and Shenzhen stock exchanges and CST stocks from January 29, 2010 to December 31, 2019. The data contain the stock name, monthly return rate (r_i), market value (mv) and price-to-book ratio (pb). The book-to-market ratio (bm) is the reciprocal of pb . We also choose the monthly rate of change of consumer confidence Index as CCI, market return rate (CSI 300 monthly return rate) as r_m , and risk-free rate as r_f .

The missing values are first removed, and as long as a column contains missing values, the stock data is removed, leaving 556 stocks.

The data is then standardized. We select the maximum and minimum values in the market value, subtract the minimum value from the original value and divide by the difference between the maximum and minimum values. These values range from 0 to 100. We finally multiply these values by 100 to obtain the standardized market value mv .

3. Methodology

Firstly, a Fama-French three-factor model was constructed, which believed that the excess return of an investment portfolio could be explained by its exposure to three factors: market excess returns (Rm-Rf), size factor (SMB), and value factor (HML). First of all, we determine that the explanatory variables are the return rate of market asset portfolio (Rm-Rf), and the explanatory variables are the return rate of market risk factor (Rmt-Rft), the return rate of scale factor (SMB) and the return rate of book-to-market factor (HML), respectively. This method is similar to the orthogonal way of factors, because the interaction between factors needs to be excluded. Particular way is different according to the size of the market value will be divided into 5 groups, mv grouping variable for p_mv, then according to the size of the bm will be divided into 5 groups, mv grouping variable for p_bm, with total sorts variable p finally sign the total 25 groups, and calculate the average yield of each issue 25 portfolio, and all be explained variable (Rm - Rf), and then according to the company size and the carrying value than group, according to the size is divided into two groups, according to the bm is divided into 3 groups, group a total of 6, computing the SMB and HML.

We then calculate size and factor exposure by divide the stocks into 2 groups according to market value and 3 groups according to book-to-market ratio, with a total of 6 groups.

4. Empirical results

4.1 Explanation

In order to test the impact of consumer confidence index on stock excess returns, we take CCI as the independent variable and excess return rate as the dependent variable. Then a simple linear regression analysis is conducted to test the explanatory power of CCI. For intuitive analysis, we select data to reconstruct a 5*5 two-dimensional array, which is shown in Table 1.

From the array, it can be seen that the market value of CCI increases from top to bottom. From left to right, as the number of columns increases, the bm ratio of the portfolio increases. With the increase of BM, the value of CCI also increases.

And the value of CCI_p is relatively large, indicating that the significance of this value is not particularly strong in the case of a single linear regression. However, as the bm ratio increases, the significance of CCI increases.

Finally, CCI's interpretation of the entire model is analyzed. It can be seen from each line that, with the increase of book-to-market ratio, CCI's interpretation of the entire model also increases. In particular, the strength of the last explanation is about 0.01.

We could find from the results that the stock portfolios with high BM ratio has a premium effect, and the consumer confidence index has a good explanation for the excess return of the stock portfolios with high BM ratio.

Table 1 Data presentation under single linear regression of CCI. The first table is the coefficient fitted by CCI indicator, the first indicator is P values of CCI, and the last indicator is r square of the model.

CCI				
[[0.0913	0.2736	0.3533	0.2839	0.4828]
[0.1060	0.1471	0.2879	0.3388	0.5082]
[-0.0229	0.1368	0.3358	0.3618	0.4603]
[0.0952	-0.0078	0.2487	0.4067	0.4357]
[-0.0286	0.3912	0.2538	0.3359	0.2793]]
CCI_p				
[[0.8142	0.4668	0.3498	0.4324	0.1520]
[0.7804	0.6869	0.4192	0.3312	0.1330]
[0.9518	0.6838	0.3104	0.2785	0.1345]
[0.7837	0.9809	0.4292	0.1995	0.1510]
[0.9310	0.2286	0.4390	0.2774	0.2943]]

rsquare				
[[0.0005	0.0045	0.0074	0.0052	0.0173]
[0.0007	0.0014	0.0055	0.0080	0.0190]
[0.0000	0.0014	0.0087	0.0099	0.0189]
[0.0006	0.0000	0.0053	0.0139	0.0174]
[0.0001	0.0123	0.0051	0.0100	0.0093]]

After that, a multiple linear regression was made and hml, smb and rmf were added as independent variables to construct the regression. We carried out a model fitting operation to obtain another table containing different data. Similarly, data from the table was selected to construct a 5*5 two-dimensional array for analysis, which is shown in table 2.

It can be seen that with the increase of book-to-market ratio, the CCI index also increases from negative to positive, but the value of CCI_p is not particularly significant, except that the portfolio interpretation strength of the highest book-to-market ratio is 0.0236.

For the value of rsquare, since more factors are involved, the explanation strength is generally above 90%.

Table 2 Data presentation under multiple linear regression of CCI. The first table is the coefficient fitted by CCI indicator, the first indicator is P values of CCI, and the last indicator is r square of the model.

CCI				
[[-0.1975	-0.0974	-0.0250	-0.0911	0.0957]
[-0.0562	-0.0834	-0.0401	-0.0793	0.0647]
[-0.0418	0.0022	0.0969	0.0084	0.0022]
[0.1627	-0.1144	-0.0712	0.0319	-0.0229]
[0.0095	0.0958	-0.1513	-0.1366	-0.1817]]
CCI_p				
[[0.0815	0.2728	0.7679	0.3271	0.2343]
[0.6506	0.3943	0.6472	0.4370	0.5019]
[0.7481	0.9847	0.4018	0.9422	0.9820]
[0.2016	0.3264	0.4997	0.7940	0.8130]
[0.9317	0.3774	0.1200	0.0592	0.0236]]
rsquare				
[[0.9225	0.9490	0.9538	0.9396	0.9483]
[0.9021	0.9340	0.9444	0.9216	0.9262]
[0.8913	0.8975	0.8886	0.8887	0.9097]
[0.8766	0.8832	0.8970	0.8646	0.9072]
[0.8972	0.8982	0.9200	0.9506	0.9186]]

4.2 Predictive ability

After analyzing CCI's interpretation of the model, we choose to continue to analyze CCI's ability to predict future stock returns. The specific approach is to postpone the excess return period, with the independent variable being the CCI of the current period and the dependent variable being the excess return rate of the next period, so as to explore the influence of the indicators of the current period on the excess return of the next period.

A single linear regression of CCI is performed first, with results shown in table 3. The CCI values are all positive, and the value of CCI_p decreases as the book-to-market ratio of the stock increases, which means that its significance increases. Finally, we focus on rsquare and find model's explanatory power increases with size and decreases with value. Furthermore, the rsquare of many portfolios is greater than 0.01, indicating a strong explanatory power.

Therefore, through empirical study, we believe that CCI has a less significant but better explanatory power for the model in the case of single linear regression.

Table 3 CCI predictive power test under a single linear regression data presentation. The first table is the coefficient fitted by CCI indicator, the first indicator is P values of CCI, and the last indicator is r square.

CCI				
[[0.2836	0.2722	0.3090	0.2758	0.3093]
[0.2905	0.2837	0.3163	0.3887	0.3756]
[0.2936	0.2638	0.2123	0.3892	0.4119]
[0.1056	0.4056	0.3488	0.4251	0.5108]
[0.3678	0.3537	0.4197	0.4716	0.4255]]
CCI_p				
[[0.4671	0.4717	0.4159	0.4477	0.3628]
[0.4460	0.4392	0.3768	0.2673	0.2707]
[0.4404	0.4343	0.5237	0.2462	0.1830]
[0.7619	0.2156	0.2693	0.1807	0.0932]
[0.2650	0.2747	0.2007	0.1245	0.1085]]
rsquare				
[[0.0045	0.0044	0.0057	0.0049	0.0071]
[0.0050	0.0051	0.0067	0.0105	0.0104]
[0.0051	0.0052	0.0035	0.0115	0.0151]
[0.0008	0.0131	0.0104	0.0153	0.0239]
[0.0106	0.0102	0.0140	0.0201	0.0219]]

We then run a multiple linear regression and the results shown in table 4 are similar. The CCI_p value is not high and rsquare values are generally about 0.05 meaning the CCI contributed 0.01 to 0.02 to the total 0.05 explanation. This suggests that CCI has a better performance of model predictions. However, the significance is still not very strong, which may due to the lack of sample data.

Table 4 Data presentation under multiple linear regression of CCI predictive power test. The first table is the coefficient fitted by CCI indicator, the first indicator is P values of CCI, and the last indicator is r square.

CCI				
[[0.0671	0.0972	0.0900	0.0923	0.124]
[0.1777	0.0986	0.1403	0.1964	0.1958]
[0.0718	0.0587	0.0718	0.1876	0.2452]
[-0.0642	0.2079	0.2064	0.2649	0.3716]
[0.2304	0.2514	0.3022	0.3654	0.3509]]
CCI_p				
[[0.8653	0.8019	0.8152	0.8034	0.7197]
[0.6514	0.7913	0.7007	0.5808	0.5724]
[0.8505	0.8629	0.8329	0.5802	0.4356]
[0.8556	0.5250	0.5221	0.4132	0.2324]
[0.4900	0.4494	0.3706	0.2477	0.2002]]
rsquare				
[[0.0549	0.0361	0.0573	0.0444	0.0513]
[0.0226	0.0514	0.0463	0.0580	0.0538]
[0.0812	0.0684	0.0396	0.0660	0.0583]
[0.0585	0.0897	0.0462	0.0534	0.0548]
[0.0654	0.0367	0.0353	0.0392	0.0344]]

4.3 Industry

Because of the wide variation between industries, the consumer confidence index may have a different impact on stock returns in different industries. As a result, our stocks for different industries do next single linear regression analysis, and the analysis method of the same before.

We can find that p values of household appliances and building materials are less than 0.01 and their rsquare values are high, reaching 2.4560 and 2.2590 respectively. This means that CCI has

significant explanation for these two industries. On the contrary, the significance of industries such as medicine and biology, food and beverage, agriculture, forestry, fishery and animal husbandry, and national defense and military industry is very small, and the explanatory power is relatively low.

Then a multiple linear regression was performed with *rmf*, *hml*, *smb* and other variables added. We could find that CCI is significant in the leisure services, household appliances, light industry manufacturing, agriculture, forestry, fishery and animal husbandry.

4.4 Organization form

Similarly, different organizational forms of stocks may also influence the extent to which the consumer confidence index affects them. Therefore, we made a linear regression analysis of stocks with different organizational forms. It can be seen that the value of CCI_p in the form of local state-owned enterprises is the lowest, indicating that the significance of CCI is higher. Meanwhile, the value of ITS R² is also high, indicating that CCI has strong explanatory power for the analysis model of local state-owned enterprises. In contrast, for private enterprises, the significance of CCI is very small, and the interpretation of the model is relatively low.

We then run a multiple linear regression and find that CCI has a strong significance of central state-owned enterprises.

5. Robustness tests

In this section, we test the robustness of the model by constructing two sub-samples, dividing the 10 years by the first 5 years and the second 5 years. The data analysis approaches are similar as the previous studies and the interpretation strength of the model is demonstrated.

In the case of single linear regression, it can be seen that, as before, with the increase of book-to-market ratio, the value of CCI also increases, while the value of CCI_p basically stays above 0.15. This indicates that in the case of single linear regression, the significance is not very strong but increasing. For *rsquare* values, most of them are around 0.01, meaning considerable explanatory power. Therefore, the results are similar to the previous analysis. The consumer confidence index does a good job of explaining the excess returns on high BM stocks. Then multiple linear regression analysis was carried out, and the results were similar to the previous results as well. Since multiple linear regression analysis included other factors, the interpretation strength was not strong enough. That is, multiple linear regression analysis was not as effective as single linear regression analysis.

Next, we test the predicative power of CCI. We chose CCI in the current period as the independent variable, and the excess return *rif* in the next period as the dependent variable. We first conducted a single linear regression analysis and the results show CCI still has strong explanatory power for the model. In the case of multiple linear regression analysis, the explanatory power of CCI is not obvious but cannot be ignored.

We then analyze the second set of data. In the same step, single linear regression analysis and multiple linear regression analysis were successively carried out. It can be seen from the array that the results were similar to those in the first set of data. In the case of multiple linear regression analysis, the explanatory power of CCI is not as strong as that of single linear regression analysis. However, it is still feasible to use CCI to explain the change of future return rate.

Hence, the robustness test results obtained by analyzing the subsamples are similar to the previous studies, indicating there is no obvious problem about constructed model in section 4.

6. Implication

The significance of this paper is to use the previous research on consumer confidence index for reference and conduct an empirical test on China's A-share market from the perspective of the current situation of China's market. Not only we discovered that small size stock premium effect exists, but also revealed that consumer confidence index for stocks with higher book-to-market ratios has a better explanation in the Chinese market. In addition, according to different stocks in the industry and the different organization forms, we also obtained the different results for different

organization form and different industries, and different stock sensitivity to the consumer confidence index. Therefore we can analyze the influence on different categories of stocks to construct the different investment portfolios based on the consumer confidence index.

7. Conclusion

Through the relevant research on consumer confidence index, our main empirical findings show that the excess return of quite a few stocks depends on the initial agent of consumer sentiment. In particular, the consumer confidence index of stocks with higher book value has a stronger explanation. In particular, when large consumer sentiment estimates, those that will appeal to the optimist and speculators to share will decline, at the same time, the stock of arbitrageurs unattractive, such as young, small, unprofitable, non-dividend, distressed stocks often earn subsequently low returns. In addition, stocks in different industries and different organizational forms are affected differently by the consumer confidence index.

The results provide several inspirations for future research. In corporate finance, a better understanding of emotions may reveal time-series evidence of securities issuance and the supply of corporate characteristics correlated with share prices. In asset pricing, what we demonstrated indicate that an accurate price and expected return model needs to include the salient role of investor sentiment.

In addition, no matter what stock variables or combinations we use in our empirical studies, we are still unable to replicate the exact set of information available to investors, on the basis of which investors set conditions for their expectations of risk prices. Arguably, the use of the consumer confidence index provides additional evidence on this issue, but while the data provide some direction, it is not a complete and ideal proxy for an investor's information set. We conclude, therefore, that the search for a link between consumer confidence and complete information on investors and stock price movements still needs to more explorations.

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