How Will Irrational Investor Sentiment Affect CAPM

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Abstract: China's capital market started late and is not as mature as compared to Europe and the US. China's stock market contains many anomalies, such as scale effects, illiquidity premiums, etc. These phenomena cannot be well explained by the traditional CAPM. For this reason, we need to modify the CAPM by writing the beta as a function influenced by investor sentiment, macro indicators, economic uncertainty and other factors. The empirical results show that the value anomalies that are not explained by the traditional model are covered by the CAPM when adjusted for investor sentiment, and become less significant. This suggests that investor sentiment is an important influencing factor in the stock market, at least in China. This is probably due to the large number of individual investors in China and the fact that the securities market is more closely linked to government policy.

Keywords: Irrational Investor; Sentiment; CAPM

Introduction

A very important rational person assumption in traditional asset pricing models is that all investors respond homogeneously to information about the underlying asset without any bias. In general, the traditional model assumes that each individual's investment decision is solely related to his or her utility preferences and is not influenced by each individual's own traits. Under this assumption, the price of a stock essentially reflects its value and the market as a whole will exhibit more efficient characteristics. But we know that this is often not the case in reality, and that stock markets are usually weakly efficient.

How to measure and quantify investor sentiment is a difficult question. It is almost impossible to measure sentiment directly; what we can do is to measure certain economic indicators and argue that there is a strong correlation between these indicators and investor sentiment. This approach is similar to the proxy variable in regression analysis. In this paper, we argue that investor sentiment can be influenced by both firm and macroeconomic factors. At the firm level, it is clear that firms' first-day IPO returns have a strong boosting effect on investor sentiment, and this effect is reciprocal: IPO returns tend to be higher in bullish periods in the Chinese stock market, and investors generally hold high sentiment. At the macroeconomic level, this paper suggests using indicators such as policy uncertainty, CPI and macroeconomic sentiment index to express them.

Research methods

We construct the relationship between risk and expected return at the individual stock level based on Avramov and Chordia's conditional multi-factor model, which incorporates market capitalisation, book-to-market ratio and economic cycle-related variables in the CAPM.[1] Firstly, we add various variables to the beta expression of the conditional CAPM. This step is a time series regression where the explanatory variables are the returns of the sample stocks and the explanatory variables are the various risk pricing factors incorporated into the model, at which point the sum of the intercept and residual terms of the regression results is the risk-adjusted return; secondly, by making such adjustments, we actually find a new CAPM model. We want to test whether it can explain the various return anomalies in the stock market, i.e., the risk-adjusted returns obtained from the first part of the regression are used as the explanatory variables and the variables that generate the market anomalies are used as explanatory variables in a cross-sectional regression. If the CAPM model, which takes into account investor sentiment, is valid, then these variables should not be significant in

the second regression.

First, in the adjusted model, the rate of return is in the conditional form of k factors:

$$R_{jt} = E_{t-1}(R_{jt}) + \sum_{k=1}^{K} \beta_{jkt-1} f_{kt} + e_{jt}$$

where E_{t-1} denotes the conditional expectation operator, R_{jt} denotes the return of stock j at time t, f_{kt} is the kth factor of unanticipated returns (based on information from period t-1) and β_{jkt-1} is the conditional beta of that factor.

Through subtracting the risk-free rate from the expected return, we can obtain the estimated risk-adjusted return for each stock at moment t, which is the adjusted CAPM model. As can be seen, β is no longer a single coefficient, but is used as some sort of weight to sum up all the risk factors. The estimated adjusted return for each stock at time t is :

$$R_{jt}^{*} = R_{jt} - R_{ft} - \sum_{k=1}^{K} \hat{\beta}_{jkt-1} F_{kt},$$

where R_{ft} denotes the risk-free rate at time t, and F_{kt} denotes the sum of the information of the kth factor and the corresponding risk premium.

Subsequently, we introduced variables to adjust the beta values. Adjustments to β should be concise and should not use overly complex models, which is important in econometrics. Just as the complex process of thinking and comparing people when confronted with different goods can be defined in terms of a utility function to obtain a decision outcome. The specific setting form is :

$$\begin{aligned}\beta_{jt-1} = {} & \beta_{j1} + \beta_{j2} z_{t-1} + \beta_{j3} S_{t-1} + \beta_{j4} S_{t-1} z_{t-1} \\ & + (\beta_{j5} + \beta_{j6} z_{t-1} + \beta_{j7} S_{t-1}) \mathrm{Size}_{jt-1} \\ & + (\beta_{j8} + \beta_{j9} z_{t-1} + \beta_{j10} S_{t-1}) \mathrm{BM}_{jt-1},\end{aligned}$$

where z_{t-1} denotes macroeconomic variables in period $t-1$, S_{t-1} denotes investor sentiment value in period $t-1$, Size_{jt-1} denotes market capitalization size of listed company j outstanding in period $t-1$, BM_{jt-1} denotes book-to-market ratio of company j in period $t-1$. At this point, β_{jt-1} of individual stocks is time-varying and is based on information about individual stock characteristics, investor sentiment and macroeconomic conditions β. The β of individual stocks is affected differently under different investor sentiment or macroeconomic environments.

As mentioned earlier, we use the IPO first day return to measure investor sentiment. In the weak efficient market hypothesis, investors cannot speculate on the likely future movement of a stock from previously available information. The specific setting form is :

$$\mathrm{IPOrate} = \frac{1}{N_t}\left(\frac{\mathrm{Clo}_{ti} - \mathrm{Ipop}_{ti}}{\mathrm{Ipop}_{ti}}\right)$$

where N_t denotes the amont of IPOs in month t, Clo_{ti} is the closing price of firm i on the first day of IPO in month t and Ipop_{ti} is the opening price of firm i on the first day of IPO in month t.

To calculate the volatility of individual stock characteristics, with reference to Guo[2] and taking into account the simultaneity of stock markets in developing countries, we construct the following indicators:

$$\begin{aligned}e_{i,d,t} = {} & \alpha + \beta_1 e_{m,d,t} + \beta_2 e_{m,d-1,t} + \beta_3 e_{m,d-2,t} + \beta_4 e_{m,d-3,t} \\ & + \beta_5 e_{m,d+1,t} + \beta_6 e_{m,d+2,t} + \beta_7 e_{m,d+3,t} + \eta_{i,d,t}\end{aligned}$$

$$IV_{i,t} = \sum_{d=1}^{D_{i,t}} \eta_{i,d}^{2},$$

where $e_{i,d,t}$ is the excess return of stock i on day d in month t and $e_{m,d,t}$ is the excess return of the integrated A-class market on day d in month t. To ensure the validity of OLS regression, stocks with trading days less than 15 in a month are excluded from this paper.

We construct an illiquidity measure based on turnover rates based on Brennan et al. as follows.

$$ILL_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{r_{id}}{TO_{id}},$$

where r_{id} is the return of stock i on day d in month t, TO_{id} is the turnover rate of stock i on day d in month t, and D_{it} the number of trading days of stock i in month t. At the same time, we introduce size $Size_{it-1}$ and book-to-market ratios $BookM_{it-1}$ to encompass the various pricing anomalies that can arise.

$$R_{it} = \alpha_j + \lambda_1 IV_{it-1} + \lambda_2 Size_{it-1} + \lambda_3 BookM_{it-1} + \lambda_4 ILL_{it-1} + u_{jt}$$

Results

The second column adds the IPO first-day return as a measure of investor sentiment as an information condition to the first column. The empirical results show that the adjusted model has better explanatory power than unadjusted CAPM, where the book-to-market ratio is no longer significant, but the liquidity premium remains. Column 3 adds an additional index of economic uncertainty to Colume 2 to represent macroeconomic conditions. The empirical results show that idiosyncratic volatility is positively correlated with the risk-return adjusted for in the model, with Merton suggesting that a positive risk-return relationship is needed for idiosyncratic volatility when investors hold non-diversified portfolios, while Carpenter and Whitelaw point out that the share of equity funds in China is still only a small part of the equity market, with most equity investors holding very few stocks in their portfolios.[6] The majority of equity investors hold only a small number of stocks in their portfolios. The model-adjusted returns are not significantly related to size, book-to-market ratio and illiquidity. The combination of investor sentiment and economic uncertainty as conditional information on individual stock beta explains the trait volatility anomaly, size anomaly and value premium and illiquidity premium in the cross-section.

Table 1 Regression Outcomes

VARIABLES	(1) Original	(2) With Sentiment	(3) With Macro & Sentiment
IV	-1.57***	5.14***	4.64***
	(-11.03)	(14.88)	(13.38)
Size	-9.10***	0.27	0.30
	(-4.15)	(0.20)	(0.27)
BookM	-1.39	2.88	1.49
	(-0.70)	(1.64)	(0.82)
ILL	5.84**	2.15**	1.48
	(5.63)	(2.15)	(1.52)

Discussion

Given that individual investors occupy the vast majority in the stock market and their portfolios are very scattered, the trading behaviors of individual investors are extremely susceptible to their emotions, leading to the fact that the stock market returns in our country are affected by investors' emotions to a great extent. In this context, the investor sentiment factor is incorporated into the traditional conditional asset pricing model as the information variable, and the investor sentiment conditional asset pricing model based on the first-day return of IPO is constructed, and the economic uncertainty indicator is added. In the framework of Avramov and Chordial's two-step regression analysis, the effect of the pricing model including emotional information and the pricing model without emotional information on the detection of abnormal stock market returns is compared and tested.[2] The results show that the conditional asset pricing model with emotional information can significantly explain the scale and value anomalies in the Chinese stock market. The results are still robust after adding economic uncertainty indicators as additional conditional information. For liquidity premium, only the conditional CAPM after the economic uncertainty indicator is used as additional conditional information

can be explained, which indicates that economic uncertainty is the main cause of liquidity premium in China's stock market. The empirical results of this paper are robust to different idiosyncratic volatility and illiquidity measures. In the model are in control of the first three months of the composite benefits, but the traditional asset pricing model is the reversal effect, but after joining the investor sentiment and political uncertainty, are converted to the momentum effect, thus further confirmed that investor sentiment plays a very important factor in asset pricing model, the role of, of course, the steady momentum effect empirical results still need further research.

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