Construction and Analysis of Individual Stock Sentiment Anomalies in the A-share Market

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Abstract. Behavioral finance heralds investor sentiment as an anomaly in traditional asset pricing models, and the financing and financing business is an important indicator of individual stock sentiment. In this paper, this paper try to use the growth rate of monthly balance of financing and financing securities as a factor SEN to explain stock returns in the context of Chinese A-share market. This paper finds that market capitalization and SEN have a significant inverse monotonicity, and their information crosses to a large extent to make SEN redundant. This paper argues that the reason for the redundancy of SEN due to market capitalization is that the A-share stock market has set a high margin for financing and financing business, which leads to a weaker liquidity of market transactions and limits the investment choices of rational investors to stocks with relatively small market capitalization. Based on the conclusion, this paper suggests that small investors adopt a strategy of going long on small-cap stocks and short on large-cap stocks.

Keywords: Sentiment; Financing and Securities Financing Trading; A-share Market.

1. Introduction

1.1 Background

Research on stock pricing has always occupied an important position in the financial field, and in 1964, Sharp et al. proposed the Capital Asset Pricing Model (CAPM model) based on Markowitz's portfolio theory, which argues that the return on a risky asset consists of two components, namely, risk-free return and systematic risk compensation [1], which is the basis of modern financial market price theory. This theory believes that the excess return of risky assets is entirely determined by systematic risk, and that unsystematic risk can be eliminated by investment portfolios, so there is no corresponding compensation for this part of risk. In 1992, Fama and French found that stock returns were related to firm size and book-to-market ratio, and in order to further improve the explanatory power of traditional pricing models, they proposed a three-factor model based on their previous research, adding a size factor and a book-to-market ratio factor to the CAPM model to reflect the size effect and book-to-market ratio effect. In 1995, Fama and French further studied the three-factor model and concluded that size and book-to-market ratio are related to earnings and investment [3]. earnings and investment factors were added to the three-factor model, and a five-factor model was proposed [4].

Behavioral finance denies the validity of the assumption of traditional financial theory about the homogeneous expectations of investors, and argues that the emotional effect generated under heterogeneous beliefs is an important cause of market price anomalies. Meanwhile, Stein argues that herding effect is evident in the market, and ordinary investors tend to follow the views of institutional investors, and the irrational effects of investors are not completely random and cannot cancel each other out [5].

1.2 Current Status of Research on Emotional Visions

Black argues that investor noise trading is investor emotional trading and that emotions can cause abnormal stock price fluctuations [6]. Miller argues that if there are short selling restrictions in the market, negative investor sentiment cannot be fully expressed and there is always a weakening of the negative market sentiment effect and a relative dominance of the positive sentiment effect, and the market arbitrage mechanism cannot function properly [7]. De Long demonstrated the existence of

investor sentiment in market trading through his study that market traders always believe that they have information specific to assessing the future performance of stock prices and do not refer much to expert advice, with the result that investors are always influenced by their own emotions in their decisions when they have incomplete information [8].

Various multi-factor models are unable to explain the full return of stocks, and many anomalies arise under the system of behavioral finance theory. Analyzing stock price performance from the perspective of investor sentiment is an important element of behavioral finance, and finding appropriate proxy variables for sentiment indicators has become a key problem for research.

Financing and financing business, as a kind of securities credit trading, allows investors to trade eligible stocks on margin guarantee. Investors can buy securities by borrowing funds for financing transactions, or reverse the operation and borrow securities to sell them for financing transactions. Some studies have argued that margin trading can calm market volatility and contribute to the stable operation of stock indices [9], while others have argued that margin trading may increase market volatility and thus lead to stock price collapse [10]. Due to the existence of heterogeneous beliefs in the market, if short selling is restricted, the market will be filled with optimistic traders under the overvaluation of stock prices, while bearish investors cannot operate through trading instruments, and when negative information accumulates excessively, it will cause a destructive impact on the external market and lead to stock price collapse [11]. It has also been argued that short selling constraints affect stock returns in a positively skewed distribution, but do not reduce the probability of extreme negative values, i.e., stock price crashes, suggesting that short selling constraints or not are not a causal factor in stock market crises [12].

1.3 Objective

On March 31, 2010, China's SSE and SZSE opened the financing and financing securities trading system. This paper directly uses the monthly growth rate of financing and financing balance of each stock in Chinese A-share stock market as the individual stock investor sentiment factor SEN, and tests whether the financing and financing indicators have good explanatory power for individual stock returns and whether they can improve the explanatory power of CAPM and Fama-French three-factor models.

2. Data Selection and Selection of Statistical Methods

2.1 Data Description

The sample of stocks selected in this paper is A-share stocks, and the following treatments are applied to the stock return data: (1) exclude ST and PT stocks; (2) exclude financial stocks. The yield data is the reinvestment yield after considering cash dividends, and the risk-free interest rate is the 1-year interest rate of regular whole deposit. Since the sample size of stocks opened for financing and financing before 2011 is small, the research interval of this paper is from January 2011 to June 2022. The monthly stock return, monthly market capitalization outstanding, monthly growth rate of financing and financing balance, and book-to-market ratio data are obtained from the Guotaian CSMAR database, the beta data of CAPM are obtained from the RESET database, and the Fama-French three-factor data are obtained from the Central University of Finance and Economics.

2.2 Construction of SEN

As can be seen from Table 1, the skewness of SEN is 12.04. It is necessary to add the same value to all the data to take a positive number according to the minimum size, and then take the natural logarithm to process, in order to make the cross-sectional data of SEN approximate a normal distribution and reduce the regression error. The number of stocks open to financing and financing only n is 2361, and the sample data is large enough.

Table 1. Descriptive statistics of SEN

Mean	SD	Skew	Kurt	Min	P5	P25	Median	P75	P95	Max	n
71.35	276.97	12.04	322.15	-86.89	-42.79	-5.10	16.67	69.04	342.50	8514.08	2361

3. Data Results and Analysis

3.1 Nature of SEN

Table 2 shows that the correlation coefficients between SEN, and β, Size, and BM are all between 0.42 and 0.51, all of which are correlated; the correlation coefficients between β, Size, and BM are also between 0.42 and 0.51, indicating that there is a correlation between the three relationships among stocks that are open to financing and financing.

Table 2. Correlation statistics of SEN

	SEN	$\ln^{SEN}$	β	Size	BM
SEN	-	0.96	0.49	0.42	0.49
$\ln^{SEN}$	0.95	-	0.49	0.42	0.49
β	0.51	0.50	-	0.49	0.50
Size	0.45	0.42	0.50	-	0.50
BM	0.51	0.50	0.49	0.49	-

Note: where the lower left is the Pearson product moment correlation coefficient and the upper right is the correlation coefficient with Spearman's rank; beta is the beta of the CAPM model, Size is the logarithm of market capitalization outstanding, and BM is the book-to-market ratio, the meanings of which remain unchanged in the following.

The data in Table 3 show that the persistence of SEN has a faster rate of decline with increasing time span than that of $\ln^{SEN}$, indicating that the persistence of SEN is not as good as that, so only stock return analysis is used after this paper, and all are referred to as SEN by proxy.

Table 3. Persistence statistics of SEN

τ	SEN	$\ln^{SEN}$
1	0.95	0.95
3	0.93	0.94
6	0.91	0.92
12	0.86	0.90
24	0.77	0.84
36	0.72	0.81
48	0.68	0.79
60	0.64	0.76
120	0.51	0.60

Note: τ denotes the lag time amount, and in this paper, the lag time amounts of 1, 3, 6, 12, 24, 36, 48, 60, and 120 months are taken for the persistence statistics of SEN and.

3.2 Statistical Analysis of SEN and Future Stock Returns

3.2.1 Monotonicity analysis of SEN with other relevant variables

The purpose of this section is to observe the monotonicity of the variables of interest with their relationships by grouping SEN from small to large.

Table 4 reflects the following: β does not have a significant monotonic relationship with SEN; MktCap is monotonically decreasing by data in groups 1 to 10, indicating that MktCap has a significant opposite monotonicity to SEN, suggesting that the size effect may have some explanatory power for SEN; BM has no significant monotonicity in groups 1 to 5 and is monotonically decreasing

in groups 5 to 10, suggesting that the book-to-market ratio effect may have some explanatory power for SEN within the large SEN grouping.

Table 4. Monotonicity analysis by SEN grouping

Value	1	2	3	4	5	6	7	8	9	10
SEN	84.67	97.08	104.59	113.17	122.95	135.63	157.31	203.20	304.17	810.43
β	1.05	1.05	1.05	1.04	1.05	1.05	1.04	1.06	1.07	1.08
MktCap	26480300	22692750	20023173	18965670	18442372	18587642	17006213	13746183	13307717	12745166
BM	1.19	1.26	1.27	1.24	1.30	1.24	1.12	1.05	1.02	1.02

Note: SEN is divided into ten groups from small to large, etc., and the β, market value outstanding (MktCap), and book-to-market ratio (BM) of CAPM within each group are numerically averaged.

3.2.2 Univariate portfolio analysis

The following is divided into 10 groups based on SEN from smallest to largest and constitutes a long-short portfolio based on the difference between the largest group and the smallest group. The stocks within each portfolio are allocated according to equal weights and market value outstanding weighting to constitute the portfolio.

In the EW grouping of Table 5, the excess returns, CAPM and for the long-short portfolio (10-1) are positive and all are at the 95% level of certainty, which is somewhat significant, indicating that under the EW grouping, SEN is significantly correlated with future stock returns and cannot be explained by the CAPM and FF models. Under the VW grouping, the excess returns of the long-short portfolio (10-1) with CAPM are positive and negative, but both are below the 90% level of certainty and not significantly significant, indicating that SEN is not significantly correlated with stock future returns under the VW grouping and can be explained by the CAPM and FF models.

Table 5. Average monthly excess returns for univariate portfolio analysis by SEN versus abnormal returns for CAPM and Fama-French three-factor models (%)

EW											
Value	1	2	3	4	5	6	7	8	9	10	10-1
Excess Return	0.95	0.98	0.88	0.86	0.98	1.01*	1.18*	1.51	1.55	1.70	0.75**
	(1.56)	(1.45)	(1.46)	(1.40)	(1.56)	(1.76)	(1.83)	(2.17)	(2.22)	(2.12)	(2.47)
CAPMα	0.43	0.45	0.36	0.33	0.44	0.55	0.64	0.98	1.01	1.11	0.68**
	(1.78)	(2.03)	(1.71)	(1.55)	(2.15)	(2.50)	(2.63)	(3.55)	(3.28)	(3.02)	(2.47)
FFα	0.23	0.17	0.09	0.03	0.17	0.28	0.35	0.65	0.67	0.78	0.55**
	(1.24)	(1.14)	(0.60)	(0.22)	(1.22)	(1.92)	(2.30)	(4.26)	(4.41)	(3.76)	(2.33)
VW											
Value	1	2	3	4	5	6	7	8	9	10	10-1
Excess Return	0.87	0.88	0.48	0.82	0.64	0.82	0.73	1.00	1.07	1.09	0.23
	(1.44)	(1.56)	(0.84)	(1.36)	(1.08)	(1.44)	(1.13)	(1.58)	(1.63)	(1.52)	(0.58)
CAPMα	0.43	0.44	0.03	0.33	0.15	0.32	0.20	0.48	0.56	0.54	0.11
	(1.89)	(2.52)	(0.19)	(2.06)	(0.75)	(1.55)	(0.89)	(2.20)	(2.32)	(1.71)	(0.28)
FFα	0.51	0.47	0.07	0.32	0.16	0.39	0.23	0.47	0.50	0.39	-0.12
	(2.27)	(2.66)	(0.36)	(2.04)	(0.80)	(1.91)	(1.01)	(2.10)	(2.63)	(1.67)	(-0.33)

Note: EW and VW denote weighted grouping by equal weights and market capitalization in circulation, respectively; SEN is divided into ten groups from smallest to largest, "10-1" denotes the tenth group minus the first group of long-short portfolios; CAPM and abnormal returns of CAPM, Fama-French three-factor model, respectively; data in parentheses denote T-statistics adjusted by Newey-West; * and ** denote 90% and 95% confidence levels of T-statistics, respectively; the above is also applicable to the table below.

The significance of stock future returns differs significantly between EW and VW groupings and the explanatory power of CAPM and FF models, so the predictive power of SEN on stock future returns and its explanatory power by the two models still need further confirmation.

3.2.3 Bivariate portfolio analysis

In the following, using independent grouping, SEN and the associated control variables are first divided into five groups each, and later crossed to form 25 portfolios. The stocks within each portfolio are weighted by equal weights and market capitalization outstanding to form a portfolio that exhibits the average monthly returns of the stocks with the abnormal returns of the CAPM and Fama-French three-factor models.

Table 6. Bivariate Portfolio Analysis of SEN and MktCap Variables (%)

Control	Weight	Value	Control 1	Control 2	Control 3	Control 4	Control 5	Control Avg
MktCap	VW	Return	0.07	0.43*	0.39	-0.15	-0.37	0.08
			(0.14)	(1.88)	(1.30)	(-0.43)	(-0.69)	(0.28)
		CAPMα	0.04	0.43	0.38	-0.15	-0.42	0.06
			(0.13)	(1.58)	(1.41)	(-0.51)	(-0.87)	(0.28)
		FFα	0.06	0.42	0.35	-0.07	-0.46	0.06
			(0.19)	(1.57)	(1.29)	(-0.26)	(-0.97)	(0.31)
	EW	Return	0.30	0.44**	0.37	-0.19	0.65	0.05
			(0.70)	(1.96)	(1.24)	(-0.52)	(0.18)	(0.56)
		CAPMα	0.30	0.43	0.36	-0.18	-0.24	-0.11
			(0.88)	(1.59)	(1.34)	(-0.65)	(-0.98)	(-0.35)
		FFα	0.31	0.45*	0.33	-0.10	0.37	0.14
			(0.90)	(1.65)	(1.22)	(-0.36)	(0.49)	(0.74)

Table 7. Bivariate combination analysis of SEN and CAPM beta variables (%)

Control	Weight	Value	Control 1	Control 2	Control 3	Control 4	Control 5	Control Avg
β	VW	Return	0.24	0.04	0.67	0.12	-0.15	0.19
			(0.65)	(0.09)	(1.34)	(0.23)	(-0.49)	(0.57)
		CAPMα	0.19	-0.02	0.60	-0.01	-0.25	0.10
			(0.42)	(-0.06)	(1.43)	(-0.03)	(-0.66)	(0.35)
		FFα	0.06	-0.24	0.39	-0.15	-0.37	-0.06
			(0.15)	(-0.66)	(1.01)	(-0.33)	(-0.97)	(-0.25)
	EW	Return	0.61**	0.31	0.06	0.61**	0.74**	0.47*
			(2.11)	(1.25)	(0.19)	(2.18)	(2.18)	(1.87)
		CAPMα	0.57**	0.29	0.03	0.55*	0.70**	0.43*
			(2.08)	(1.07)	(0.10)	(1.91)	(2.14)	(1.94)
		FFα	0.49*	0.21	-0.01	0.44*	0.63**	0.35*
			(1.86)	(0.81)	(-0.04)	(1.67)	(2.06)	(1.79)

Table 8. Bivariate combination analysis of SEN and BM variables (%)

Control	Weight	Value	Control 1	Control 2	Control 3	Control 4	Control 5	Control Avg
BM	VW	Return	0.24	0.04	0.67	0.12	-0.15	0.19
			(0.65)	(0.09)	(1.34)	(0.23)	(-0.49)	(0.57)
		CAPMα	0.19	-0.02	0.60	-0.01	-0.25	0.10
			(0.42)	(-0.06)	(1.43)	(-0.03)	(-0.66)	(0.35)
		FFα	0.06	-0.24	0.39	-0.15	-0.37	-0.06
			(0.15)	(-0.66)	(1.01)	(-0.33)	(-0.97)	(-0.25)
	EW	Return	0.53*	0.61**	0.83**	0.43	0.31	0.54**
			(1.72)	(2.00)	(2.51)	(1.35)	(1.43)	(2.43)
		CAPMα	0.54	0.53*	0.80**	0.40	0.25	0.50**
			(1.56)	(1.75)	(2.56)	(1.36)	(0.95)	(2.32)
		FFα	0.50	0.44	0.69**	0.35	0.17	0.43**
			(1.56)	(1.56)	(2.26)	(1.21)	(0.67)	(2.16)

Note; Tables 6 to 8 are divided into five groups from small to large (Control 1 to Control 5) and average group (Control Avg) by grouping variables, respectively; the values in all three tables are the data of large and small decreasing multiple null combinations of SEN into five groups by small to large etc. under the grouping of each grouping variable.

As can be seen from Table 6, when controlling for market capitalization outstanding as the control grouping variable, only under Control2 grouping, Return of VW and Return of EW, FF have significance at no less than 90% confidence level, while the rest of the values are not significant. It indicates that the predictive power of SEN on stock returns is insignificant and subject to the stronger explanatory power of the two models, controlling for market capitalization outstanding.

According to Table 7, when β is used as the control grouping variable, Return, and are significant only under Control 1, Control 4, Control 5 and Control Avg groupings of EW. Among them, the significance of Return, in Control Avg grouping only has 90% certainty level, and only in Control 4, Control 5 grouping has 95% certainty level. The above indicates that β does not fully explain the predictive power of SEN on stock returns under EW grouping and SEN cannot be fully explained by both models. However, the predictive power of SEN on stock returns is insignificant in the VW subgroup, controlling for β, and is more strongly explained by both models.

In Table 8, when BM is used as the control grouping variable, only under Control 1, Control 2, Control 3 and Control Avg grouping of EW, Return, and vs. are somewhat significant. Under Control 3 and Control Avg grouping, all three have 95% certainty level; while under Control 1 grouping, only Return has 90% certainty level, and under Control 2 grouping, Return has 95% certainty level and CAPM β has 90% certainty level. The above shows that BM cannot fully explain the predictive power of SEN on stock returns under EW grouping and SEN cannot be fully explained by both models. However, in the VW grouping, the predictive power of SEN on stock returns is insignificant and is better explained by both models, controlling for BM.

Combining the data in Table 6 to Table 8, it is clear that.

(1) Under the EW grouping, SEN has some predictive power for stock future returns and cannot be explained by β and BM, but is highly likely to be explained by MktCap; when controlling for β or BM, SEN cannot be fully explained by the CAPM and Fama-French three-factor models; long stocks with high monthly growth rates of financing and financing balances and short stocks with low growth rates are able to obtain significant positive The long stocks with high monthly financing balance growth rate and short stocks with low growth rate are able to obtain significant positive returns. However, not all Control combinations show significance. According to the analysis results in Table 3.1, SEN is correlated with β, MktCap, and BM by 0.42~0.51, so the regression results of SEN on stock returns and models are affected by all three to some extent.

(2) Under the VW grouping, after controlling for any of the grouping variables of β, MktCap, and BM, SEN no longer has the predictive power of future stock returns and is subject to the stronger explanatory power of the two models. According to the results of the analysis in Table 3.1 and Table

4, it is possible that SEN is significantly monotonically related to MktCap, in addition to being affected by the correlation with β, MktCap, and BM, resulting in almost all Returns and all CAPMα and FFα not being significant under the VW grouping. That is, the significant inverse monotonicity of SEN with MktCap may lead to the reduced significance of the data for all VW groupings.

3.2.4 Fama-Macbeth based regression analysis

This section uses Fama-Macbeth regression to explore the effect of SEN on stock returns after controlling for multiple correlates simultaneously. The explanatory variable is the individual stock monthly return, the explanatory variable is SEN, and the control variables are β, log market capitalization outstanding (Size), and book-to-market ratio (BM).

Table 9. Fama-Macbeth regression results (%)

	SEN	SEN, β	SEN, Size	SEN, BM	SEN, FF
Return	0.001**	0.36	0.003**	-0.05	0.15
	(2.38)	(1.47)	(2.40)	(-0.43)	(1.06)
n	2311	1653	2303	1527	1342

Note: n denotes the number of stock samples used in the regression.

As can be seen from Table 9, when controlling for other variables of interest, only the regression results of SEN on Return versus SEN and Size (the logarithmic form of MktCap) on Return are significant at the 95% level of confidence, and the average regression coefficients are only 0.001 and 0.003, respectively, with little positive predictive effect. The SEN itself has a significant inverse monotonicity with MktCap, further indicating that the predictive power of SEN on stock future returns is insignificant and SEN will be explained by MktCap.

4. Discussion

From the results of the data in the previous section, it can be found that.

(1) The results of the EW group of the univariate combination analysis indicate that SEN has some positive predictive power for stock future returns.

(2) The EW group of the three bivariate combination analyses indicates that β and BM cannot fully explain that SEN has some positive predictive power for stock future returns, while MktCap can explain it.

(3) SEN has some correlation with β, MktCap, and BM, and in particular, there is significant inverse monotonicity with MktCap, making the predictive power of SEN on stock future returns explained by the three correlated variables under both univariate combination analysis and VW grouping of bivariate combination analysis, and cannot improve the CAPM and Fama-French three-factor model on stock the explanatory power of returns.

(4) The Fama-Macbeth regression shows that the predictive power of SEN on stock returns is insignificant when it is combined with the relevant variables, except for Size, which is highly likely to explain the predictive power of SEN, so most of the information covered by SEN may be included by MktCap, making SEN redundant.

The reason for SEN redundancy may be related to the margin of financing and financing business. The role of the initial margin of financing and financing securities is to prevent the credit default risk of investors, and to a certain extent, it acts as a pledge. Some countries in Japan, Europe and the US have implemented dynamic margin systems. However, the margin ratio system of China's financing and financing securities is not conducive to setting the corresponding ratio according to the market situation and the fluctuation of securities, resulting in a high margin ratio in most cases, which increases investors' financing costs. the earliest initial margin ratio of 50% in the A-share market is too conservative, which is not conducive to customers' flexible use of funds and reduces the efficiency of investors' free funds; on the other hand, On the other hand, the excessive margin ratio provides brokerage firms with the condition of violent profitability with little risk, which deprives them of the

ability to actively manage risks and is not conducive to the development of the financing and financing business itself.

When the margin ratio increases, it is a signal from the regulator to investors that the market is overheated, and rational investors are more likely to reduce their participation in financing and financing [13]. From the perspective of liquidity effect and investor structure, when the margin ratio is increased, the liquidity of market transactions tends to weaken, rational investors reduce their transactions, and the proportion of their market structure decreases, which eventually leads to irrational transactions and increases the volatility of the stock market under the poor market liquidity [14]. Therefore, the higher the margin ratio of financing and financing securities, the smaller the market capitalization of stocks available to small investors; the inverse monotonicity of SEN and MktCap indicates that the smaller the market capitalization in circulation, the larger the growth rate of financing and financing balances of stocks; the EW group results of univariate portfolio analysis indicate that long stocks with high growth rates of financing and financing balances and short stocks with low growth rates of financing and financing balances are able to obtain significant positive returns. In conclusion, small investors should adopt the strategy of going long small-cap stocks and shorting large-cap stocks in financing and financing transactions when facing high margin ratios.

5. Conclusion

This paper uses the monthly growth rate of financing and financing balances to build the sentiment indicator SEN and investigates whether it can explain stock returns in the A-share market as an individual stock sentiment indicator.

The results find that the financing and financing indicator has some predictive power for future stock returns, and a positive return can be obtained by building a long-short portfolio based on SEN. However, the financing and financing indicator is extremely easy to be explained by market capitalization in circulation, which itself may also have some correlation with β and book-to-market ratio as well, so the possibility that the information contained in financing and financing is also included in these three cannot be ruled out. The reason for the redundancy of SEN in this paper is the margin setting of the financing and financing business. small investors in the A-share market, when faced with the high margin ratio at this stage, are more likely to choose small-cap stocks, i.e., stocks with higher growth rate of financing and financing balances, for frequent trading. Therefore, when considering individual stock sentiment, small investors in the A-share market should adopt a strategy of going long on small-cap stocks and short on large-cap stocks.

In the future, if there is a possibility of eliminating the redundancy of SEN, a new stock sentiment indicator can be constructed to find a more precise relationship between sentiment and stock returns by reducing the dimensionality of multiple sentiment indicators and removing overlapping information according to the "BW analysis" commonly used in the academic community [15].

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