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Sentiment Strategy

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Abstract:
This study tests if investor's sentiment risk is valued by the stock markets. We form portfolios based upon the stock returns' exposure to sentiment. Our results show that, globally, the stocks most influenced by the sentiment factor earn higher returns than the stocks less impacted by the sentiment factor. The strategy consisting of buying portfolios of stocks with greater exposure to sentiment and selling those with the lower exposure generates a statistically significant raw profit. Exploring the sources of profit, we find that neither the traditional risk factors nor the momentum factor (conventional risk) can account for the profit. However, the addition of the sentiment risk premium contributes to better explain the profit.
Keywords: Investor sentiment, Stock returns, Noise trader risk.

1. Introduction

The standard risk-based asset pricing literature does not take into account the role of cognitive factors in financial markets. According to classical finance theory, investors are supposed to be Bayesian in forming fully rational expectations about future investment risks and cash flows. Consequently, equilibrium asset price reflects the fundamental value i.e. rationally discounted value of expected cash flows. The classical theory further recognizes that some agents cannot be rational but argues that their positions are offset by arbitrageurs bringing prices back to their fundamental value.

The succession of numerous stock market anomalies[1] has led to an alternative theory stating that asset prices are established through the dynamic interplay between rational investors and noise traders. In financial economics, a long-running debate concerns the role and possible effect of investor sentiment on asset prices. In fact, the studies often led to mitigate results. Some advances provide powerful and consistent empirical support for the hypothesis that stock prices are affected by sentiment risk. Other works show that financial markets do not price cognitive factors.

This article investigates an important question: Is sentiment risk valued by the stock market? To achieve our goal, we appeal to an approach proposed by Wang (2004) and used by Beer, Watfa and Zouaoui (2012). It is a simple strategy on the basis of the exposure of stock returns to the sentiment factor. The sentiment strategy buys stocks most impacted by investor sentiment and sells stocks with lowest exposure to sentiment. If the noise trader risk is priced by financial markets, this strategy should generate a statistically significant raw profit. So, this article documents the profitability of sentiment strategy. Our contributions can be summarized along two dimensions. The first contribution consists in the use of four sentiment indicators unlike to Wang (2004) and Beer, Watfa and Zouaoui (2012) who utilized a single measure. The objective is to see whether results depend on the sentiment proxy chosen. Second, this research work constitutes the first application of such strategy in the Tunisian context.

In this regard, we try to estimate this hypothesis:

The sentiment risk premium is priced by stock market and investors care about it.

The rest of the article is structured as follows. In the next section, we provide a deeper understanding of sentiment risk. The section three exposes the sentiment strategy. It describes the methodology used and evaluates the raw profit of the trading strategy. In the section four, we study the sources of profit. We examine the impact of both traditional and sentiment risks on the sentiment strategy's profit. Finally, the main results are summarized in the conclusion.

2. The sentiment risk

The role of investor sentiment in the financial markets has been modeled by several theoretical studies; for example Black (1986), De Long, Shleifer, Summers and Waldmann (1990) and Barberis, Shleifer and Vishny (1998). In these studies, two types of investors characterize the economy: noise traders (i.e. individuals) whose expectations lead to periods of over or undervaluation of financial assets and professional investors who rationally anticipate asset prices. Both types of investors are risk adverse and everyone's expectations are reflected in the equilibrium price. It follows that asset prices are influenced by noise traders' sentiment. The theoretical studies point out to that asset prices can diverge significantly from fundamental values. Moreover, rational investors fail to fully offset the effects of noise trader's sentiment because arbitrage has practical limits. So, the "noise trader risk", also known as the "sentiment risk", becomes a priced factor by financial markets.

[1] See Schwert (2003) for a detailed presentation about these anomalies.

The risk introduced by noise traders in the financial markets may not be diversifiable because their views affect many assets and are correlated. Therefore, assets subject to noise trader risk should provide higher returns than those assets not subject to that risk. As a result, their price should be below their fundamental value. In this context, Lee, Shleifer and Thaler (1991) note: "Like fundamental risk, noise trader risk arising from the stochastic investor sentiment will be priced in equilibrium. As a result, assets subject to noise trader risk will earn a higher expected return than assets not subject to such risk. Relative to their fundamental values, these assets will be underpriced".

The predictive ability of investor sentiment on the cross-section of stock returns has been explored by most empirical studies (Solt and Statman (1988); Clarke and Statman (1998); Neal and Wheatley (1998); Fisher and Statman (2003); Brown and Cliff (2005); Lemmon and Portniaguina (2006); Schmeling (2009); Beer, Nouyrigat and Zouaoui (2011); Zhu (2013)…). Furthermore, a significant number of works have tested the existence of noise trader's systematic risk priced by financial markets. This type of tests, according to Zweig (1973), is essential as the question of whether investor sentiment drives returns is necessary but insufficient condition for the noise trader hypothesis. Also, the studies undertaken often led to different conclusions. Some of them show that financial markets do not price psychological factors; others studies find that sentiment is an important factor in the return generating process of common stocks.

Elton, Gruber and Busse (1998) find that the variation of the closed-end fund discount is not a risk factor priced in markets. They show that the closed-end fund discount is not included in the return generating process more frequently than industrial returns indexes serie[1]. In addition, they note that the variation of the discount is not correlated to the five statistic factors which explain returns obtained from a principal components analysis.

According to Sias, Starks and Tinic (2001) and after having integrate management costs, investors in closed-end funds do not benefit a return higher than those who hold the assets that compose them. These results undermine the hypothesis which predict that closed-end funds, held essentially by individuals, are riskier (additional sentiment risk) than their underlying portfolio.

Glushkov (2006) develops a novel stock-by-stock measure of investor sentiment which he calls sentiment beta. This beta gives how much an individual stock is affected by sentiment changes. Using this measure, he finds that more sentiment-sensitive stocks are younger, smaller, with greater short-sales constraints, higher idiosyncratic volatility and lower dividend yields. Accounting for size and volatility, high sentiment beta stocks have more of an analyst following, lower book-to-market ratios, greater institutional ownership, a higher likelihood of S&P500 membership and higher turnover. Inconsistent with the idea that noise trader risk is priced, stocks that are more exposed to sentiment changes deliver lower future returns.

In another study, Kling and Gao (2008), to measure investors' sentiment, used daily survey data on Chinese institutional investors' forecasts. They found that investor sentiment and share prices do not have a long-run relation. Nevertheless, in the short-run, the mood of investors follows a positive-feedback process. Hence, when previous market returns were positive, institutional investors are optimistic. In contrast, negative returns trigger a decline in sentiment which reacts more sensitively to negative than positive returns.

However, some studies argue the existence of sentiment risk. Using a GARCH model, Lee, Jiang and Indro (2002) find that the variation of investor sentiment is positively correlated with the market return in excess of the risk free rate. Also, they affirm that the sentiment has a significant impact on the conditional volatility. An increase (decrease) of the sentiment causes a downward (upward) revision of the volatility.

Brown, Goetzmann, Hiraki, Shiraishi and Watanabe (2002) construct a sentiment factor using the flows of American and Japanese mutual funds. They conclude that exposure to this factor constitue a risk priced in these two countries.

For its part, Wang (2004) forms portfolios based on the exposure of securities to the closed-end fund discount. He shows that high levels of returns of portfolios most exposed to sentiment can not be explained by the sources of traditional risk.

Qiu and Welch (2006) distinguished between validation of sentiment proxies through closed-end fund discount and sentiment survey. They found that closed-end fund discount cannot be validated as a proxy while consumer confidence can be validated. The authors also explored the relation between sentiment and financial prices and affirmed that investor sentiment does have a contemporaneous correlation with certain financial market prices, specifically the size decile spread.

To capture the evolution of market sentiment, Leger and Leone (2007) used consumer confidence indicators. They also examined economic variables that help explain principal components in UK stock returns. They observed apparently systematic changes in the structure of risk and conjectured that consumer confidence captures a change in market sentiment which could be a signal for the evolution of stock prices.

By conducting an international study to examine the role of investor sentiment on the aggregate market

[1] These indexes are not a systematic risk factors.

returns of G7 nations, Bathia and Bredin (2010) included the following proxies: consumer confidence index, equity fund flow, closed-end equity fund discount and equity put-call ratio. The authors found that there is a significant negative relationship between survey sentiment and stocks returns. When investor sentiment is low (high), subsequent stocks returns are high (low).

In their study, Beer, Wafta, Zouaoui (2012) tested if the financial markets price the investor's sentiment risk. Using a composite sentiment index that includes several direct and indirect indicators, they constructed portfolios based on the exposure of stocks to sentiment factor. They found that when they include the stocks most sensitive to the sentiment, the portfolio returns increase. They counseled fund managers to take investor sentiment into account in the asset valuation models.

Finally, Yang and Copeland (2014) use the procedure of principal component analysis and construct investor sentiment of UK stock market. By analyzing the impact of sentiment on market excess return, they show that bearish sentiment leads to lower excess return while bullish sentiment leads to higher market excess return.

The sentiment risk, introduced in the financial markets by noise traders, is therefore an open empirical question. To estimate it, we use the strategy described in the next section.

3. The sentiment strategy

To test the potential existence of a sentiment risk priced, we use the monthly data of 36 stocks listed on the Tunisian stock market for the period from January 2005 through December 2012.

If the sentiment risk is priced by financial markets, the stocks most sensitive to the sentiment variable should produce higher returns than those less sensitive. In other words, the strategy, consisting of buying portfolios of stocks with greater exposure to sentiment and selling those with the lower exposure, should generate a statistically significant raw profit.

3.1The development of the strategy

To estimate the impact of investor sentiment on stock returns, we perform a linear model[1]. We use the following approach in order to obtain a time series of sentiment betas: starting from March 2008[2], we regress the monthly returns of each stock on the variation of investor sentiment over the window [t-1, t-36]. Our measure of the sensitivity of stock to sentiment factor in month t is the absolute value of the estimated coefficient. We then proceed by rolling forward by one month all the way to December 2012. The regression equation is as follows:

$$R_{i,t} = \propto_i + \beta_{i,t}\Delta Sent_t + \varepsilon_i \qquad t = t-36, \dots t-1 \qquad (1)$$

Where:

$R_{i,t}$: the return of stock i at time t,

$\Delta Sent_t$: the variation of investor sentiment over the window [t-1, t-36].

Based on the sentiment betas estimated in model (1), we sort all the stocks included in our sample into six portfolios. Specifically, using the ascending absolute value of the sentiment betas, we rank all the stocks into six portfolios. Portfolio 6 contains the stocks most impacted by investor sentiment and portfolio 1 the stocks the least impacted. We calculate the monthly portfolio return as a value-weighted average of all stocks in the portfolio.

The tables below present summary statistics for the sentiment betas:

Table 1**.** Descriptive statistics of estimated betas of portfolios (Variation Sent1)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.0006319	0.0003959	0.0002192	0.0013786
2	0.0019878	0.0004766	0.001495	0.0025084
3	0.0038894	0.000611	0.0029745	0.0045507
4	0.005166	0.000386	0.0046552	0.0056978
5	0.0064986	0.0005475	0.0059157	0.0074191
6. High exposition	0.0155133	0.005884	0.0100529	0.0264339

The average beta of portfolios comprising stocks the least sensitive to sentiment factor is about 0.0006319. The average beta of portfolios comprising stocks the most sensitive to sentiment factor is about 0.0155133. Note that some stocks show dependence to the sentiment factor, their sentiment betas reach 0.0264339. By contrast, others stocks do not appear to be impacted by the sentiment factor, their average beta is 0.0002192.

[1] We use a model similar to Wang (2004) and Glushkov (2006).

[2] The first estimation starts in March 2008 as the sentiment beta is calculated over a period of 36 months.

Table 2. Descriptive statistics of estimated betas of portfolios (Variation Sent2)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.000167	0.0001039	0.0000545	0.0003488
2	0.0004813	0.0000757	0.0003847	0.0005583
3	0.0008363	0.0002121	0.0006002	0.0011175
4	0.0014561	0.000169	0.0012548	0.0017333
5	0.0020982	0.0002307	0.0018978	0.0024441
6. High exposition	0.0040202	0.0012312	0.0026522	0.0051817

The average beta of portfolios comprising stocks the least sensitive to sentiment factor is about 0.000167. The average beta of portfolios comprising stocks the most sensitive to sentiment factor is about 0.0040202. Note that some stocks show dependence to the sentiment factor, their sentiment betas reach 0.0051817. By contrast, others stocks do not appear to be impacted by the sentiment factor, their average beta is 0.0000545.

Table 3. Descriptive statistics of estimated betas of portfolios (Variation Sent3)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.000918	0.0007139	0.0001563	0.0017568
2	0.0022027	0.0002664	0.0019115	0.002596
3	0.0032292	0.0004793	0.0027052	0.0038203
4	0.0048135	0.0010258	0.0038922	0.0065085
5	0.008478	0.0016519	0.0068513	0.0113366
6. High exposition	0.0189926	0.009221	0.0123731	0.0370415

The average beta of portfolios comprising stocks the least sensitive to sentiment factor is about 0.000918. The average beta of portfolios comprising stocks the most sensitive to sentiment factor is about 0.0189926. Note that some stocks show dependence to the sentiment factor, their sentiment betas reach 0.0370415. By contrast, others stocks do not appear to be impacted by the sentiment factor, their average beta is 0.0001563.

Table 4. Descriptive statistics of estimated betas of portfolios (Variation Sent4)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.001392	0.001015	0.0000734	0.0021897
2	0.0031581	0.0007403	0.0023358	0.0042256
3	0.0049384	0.0004045	0.0043576	0.0055393
4	0.0059578	0.0004122	0.0055562	0.006706
5	0.007578	0.0007821	0.0069158	0.0088995
6. High exposition	0.0131412	0.0044391	0.0090637	0.0200934

The average beta of portfolios comprising stocks the least sensitive to sentiment factor is about 0.001392. The average beta of portfolios comprising stocks the most sensitive to sentiment factor is about 0.0131412. Note that some stocks show dependence to the sentiment factor, their sentiment betas reach 0.0200934. By contrast, others stocks do not appear to be impacted by the sentiment factor, their average beta is 0.0000734.

Tables (5), (6), (7), (8), present summary statistics for the constructed portfolio returns:

Table 5. Descriptive statistics of the sentiment portfolio returns (Variation Sent1)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.0002703	0.0576139	-0.2487421	0.149302
2	0.0067709	0.0445847	-0.1435284	0.1145921
3	0.002294	0.0525366	-0.2992919	0.1146643
4	0.0075275	0.0870322	-0.4899237	0.1894672
5	0.0095326	0.0965982	-0.1430619	0.1458821
6. High exposition	0.0161087	0.1049114	-0.6630231	0.2106235

The table (5) shows that the stocks most influenced by the sentiment factor earn higher returns than the stocks less impacted by the sentiment factor. The portfolio returns (with the exception of portfolio 3) increase when they include the stocks most sensitive to sentiment factor. Portfolio 6 provides an average return of 1.61087% and portfolio 1 earns an average return of 0.02703%. However, portfolios which provide the highest returns attest a level of risk most important. This finding may assume that the returns simply remunerate the traditional risk.

Table 6. Descriptive statistics of the sentiment portfolio returns (Variation Sent2)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.0041031	0.0662872	-0.3918315	0.1600478
2	0.0037415	0.0495989	-0.7316965	0.1646369
3	0.004982	0.0593369	-0.2708332	0.1427052
4	0.0060579	0.0599052	-0.3887609	0.1550457
5	0.0073258	0.0695368	-0.1872882	0.115098
6. High exposition	0.0082622	0.0801559	-0.624727	0.1486587

Results in the table (6) indicate that the stocks most influenced by the sentiment factor earn higher returns than the stocks less impacted by the sentiment factor. The portfolio returns (with the exception of portfolio 2) increase when they include the stocks most sensitive to sentiment factor. Portfolio 6 provides an average return of 0.82622% and portfolio 1 earns an average return of 0.41031%. However, portfolios which provide the highest returns attest a level of risk most important.

Table 7. Descriptive statistics of the sentiment portfolio returns (Variation Sent3)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.0010434	0.0555169	-0.2696355	0.1301934
2	0.0008939	0.0536183	-0.1400239	0.1502348
3	0.0007736	0.0578052	-0.3912894	0.169746
4	0.0043469	0.0547012	-0.3824503	0.1784361
5	0.0056373	0.0633441	-0.4153979	0.178698
6. High exposition	0.0068696	0.0839813	-0.615797	0.1410895

Results show that the stocks most influenced by the sentiment factor earn higher returns than the stocks less impacted by the sentiment factor. The portfolio returns (with the exception of portfolio 2 and 3) increase when they include the stocks most sensitive to sentiment factor. Portfolio 6 provides an average return of 0.68696% and portfolio 1 earns an average return of 0.10434%. However, portfolios which provide the highest returns attest a level of risk most important.

Table 8. Descriptive statistics of the sentiment portfolio returns (Variation Sent4)

Portfolios	Mean	Standard deviation	Minimum	Maximum
1. Low exposition	0.004836	0.0645329	-0.4026071	0.1483967
2	0.0046726	0.0578242	-0.3109109	0.1525267
3	0.0053938	0.0600468	-0.2873975	0.1394365
4	0.0056091	0.0509427	-0.1880648	0.1123775
5	0.002773	0.0697511	-0.3895704	0.1519606
6. High exposition	0.0069201	0.0743437	-0.3854095	0.1418924

We can note that the stocks most influenced by the sentiment factor earn higher returns than the stocks less impacted by the sentiment factor. The portfolio returns (with the exception of portfolio 2 and 5) increase when they include the stocks most sensitive to sentiment factor. Portfolio 6 provides an average return of 0.69201% and portfolio 1 earns an average return of 0.4836%. Portfolios which provide the highest returns don't attest automatically a level of risk most important. For example, portfolio 5 with lowest return records a level of risk of 0.0697511, while, portfolio 4 with high return earns a level of 0.0509427.

By using 4 investor sentiment measures, the development of sentiment strategy shows that some stocks record dependence to the sentiment factor, while others stocks do not appear to be impacted by this factor. Globally, the stocks most sensitive to the variable sentiment produce higher returns than those less sensitive. However, portfolios which provide the highest returns attest a level of risk most important, except for indicator Sent4. This finding may assume that the returns simply remunerate the traditional risk.

3.2 The raw profit of the sentiment strategy

We perform *t* tests for the mean portfolio returns to test whether the differences between our portfolio returns are statistically significant. As the strategy is to buy the stocks most influenced by the sentiment factor and sell those least influenced, we use portfolio 1 as a benchmark for the significance tests.

The tables below present the raw profits, *t*-stats and *p*-values for the difference in mean returns tests:

Table 9. The raw profits for sentiment strategies (Variation Sent1)

Strategies	Mean	t-stat	P-value
Portfolio 6 - Portfolio1	0.0092623	**1.2247***	**0.0911**
Portfolio 5 - Portfolio1	0.0065006	0.8743	0.1915
Portfolio 4 - Portfolio1	0.0020236	0.2543	0.3998
Portfolio 3 - Portfolio1	-0.0067979	-0.6381	0.7379
Portfolio 2 - Portfolio 1	-0.016379	-1.3408	0.9092

The table shows that the difference in mean returns between portfolio 6 and portfolio 1 is about equal to 0.9% per month, for annual raw profit of 10.8%. This difference in returns is significantly different from zero at 10%. The *p*-value and *t*-stat of the strategy consisting of buying portfolio 6 and selling portfolio 1 are respectively 0.0911 and 1.2247. Nevertheless, for the other portfolios, the differences in mean returns are not significant at conventional levels.

Table 10. The raw profits for sentiment strategies (Variation Sent2)

Strategies	Mean	t-stat	P-value
Portfolio 6 - Portfolio1	0.010161	**1.1143***	**0.0833**
Portfolio 5 - Portfolio1	0.0083653	0.7880	0.2158
Portfolio 4 - Portfolio1	0.0037774	0.4408	0.3299
Portfolio 3 - Portfolio1	0.0081852	0.9015	0.1842
Portfolio 2 - Portfolio 1	-0.0096384	-0.7373	0.7691

Results indicate that the difference in mean returns between portfolio 6 and portfolio 1 is about equal to 1% per month, for annual raw profit of 12%. This difference in returns is significantly different from zero at 10%. The *p*-value and *t*-stat of the strategy consisting of buying portfolio 6 and selling portfolio 1 are respectively 0.0833 and 1.1143. Nevertheless, for the other portfolios, the differences in mean returns are not significant at conventional levels.

Table 11. The raw profits for sentiment strategies (Variation Sent3)

Strategies	Mean	t-stat	P-value
Portfolio 6 - Portfolio1	0.0056302	0.6883	0.2461
Portfolio 5 - Portfolio1	0.0020505	0.2603	0.3975
Portfolio 4 - Portfolio1	-0.005913	-0.5755	0.7172
Portfolio 3 - Portfolio1	-0.0004061	-0.0472	0.5188
Portfolio 2 - Portfolio 1	-0.0113903	-1.1111	0.8660

Table 12. The raw profits for sentiment strategies (Variation Sent4)

Strategies	Mean	t-stat	P-value
Portfolio 6 - Portfolio1	-0.0117562	-1.1701	0.8783
Portfolio 5 - Portfolio1	-0.002063	-0.2127	0.5841
Portfolio 4 - Portfolio1	0.000773	0.0921	0.4633
Portfolio 3 - Portfolio1	-0.0102298	-1.1371	0.8715
Portfolio 2 - Portfolio 1	-0.0095086	-1.0752	0.8582

Examination of the two tables (11) and (12) shows that, for both indicators Sent3 and sent4, the differences in mean returns are not significant for all portfolios.

Overall, we can say that, at a percentage of 50%, the Tunisian stocks which have higher exposure to sentiment factor earn greater returns than stocks with lower exposure to sentiment.

4. The sources of profit

We found, in the previous sections, that the sentiment strategy generates a raw profit statistically significant. Portfolios of stocks more sensitive to the sentiment factor produce significantly higher returns than portfolios less sensitive to that factor. In this section, we explore the sources of the sentiment strategy's profit.

4.1 The impact of traditional risk

To examine whether the traditional risk explains the high returns of portfolios most sensitive to sentiment, we use the four-factor model of Carhart (1997) shown in equation (4.2)[1]:

$$R_{p,t} - R_{ft} = \alpha_p + \beta_{1p}\left(R_{m,t} - R_{ft}\right) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}UMD_t + \mu_{pt} \quad (2)$$

Where:

[1] We reason, here, in terms of portfolios.

$R_{p,t}$: the return of portfolio p at time t,

R_{ft}: the risk-free rate of return at time t,

$R_{m,t}$: the market return at time t,

$R_{m,t} - R_{ft}$: the market return in excess of the risk-free rate (one-month bill rate) at time t,

SMB_t: the difference between the value-weighted return of a portfolio of small stocks and the value-weighted return of a portfolio of large stocks at time t,

HML_t: the difference between the value-weighted return of a portfolio of high book to market (B/M) stocks and the value-weighted return of a portfolio of low B/M stocks at time t,

UMD_t: the difference between the value-weighted return of a portfolio of stocks with high returns and the value-weighted return of a portfolio of stocks with low returns over the past 12 months (past year) at time t.

The regression results are presented in tables (13), (14), (15) and (16):

Table 13. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) (Variation Sent1)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	Adjusted R^2
1. Low exposition	-0.0561791 (-0.82)	0.9901487 (73.22)	0.4074703 (3.67)	0.2269118 (2.73)	-0.0005937 (-0.01)	0.9833
2	-0.0292555 (-0.52)	0.9958409 (89.77)	-0.1406458 (-1.55)	-0.0817611 (-1.20)	-0.1597435 (-2.10)	0.9891
3	0.0419811 (0.85)	1.010284 (103.45)	0.022849 (0.29)	0.0321579 (0.54)	0.3344681 (4.99)	0.9916
4	0.0677025 (0.79)	1.017355 (59.62)	-0.0978117 (-0.70)	-0.4461866 (-4.25)	0.4655178 (3.97)	0.9759
5	0.0726186 (2.01)	1.015539 (101.37)	-0.1229867 (-1.50)	-0.1475819 (-2.40)	-0.0785479 (-1.14)	0.9914
6. High exposition	0.1310872 (1.99)	1.031354 (41.57)	0.2433287 (1.20)	-0.4481514 (-2.94)	-0.4260414 (-2.50)	0.9524

The t-stat of the coefficient estimates are reported in the parentheses.

Table 14. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) (Variation Sent2)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	Adjusted R^2
1. Low exposition	0.0825231 (0.99)	1.021555 (61.86)	-0.6235816 (-4.60)	-0.2679279 (-2.64)	0.2020098 (1.78)	0.9775
2	0.0130218 (0.10)	1.00536 (39.40)	0.8569504 (4.09)	-0.1321758 (-0.84)	-0.0054019 (-0.03)	0.9460
3	0.0779105 (1.21)	1.017636 (79.55)	-0.106106 (-1.01)	-0.191779 (-2.44)	-0.1019921 (-1.16)	0.9862
4	0.015074 (0.21)	1.003711 (68.82)	0.199421 (1.67)	-0.0804882 (-0.90)	0.1097207 (1.10)	0.9814
5	-0.0155611 (-0.37)	0.9991556 (120.68)	0.1167692 (1.72)	0.1152446 (2.26)	0.1195408 (2.10)	0.9938
6. High exposition	0.0949855 (1.07)	1.013104 (52.69)	-0.1312481 (-0.83)	-0.3074851 (-2.60)	-0.1888185 (-1.43)	0.9693

The t-stat of the coefficient estimates are reported in the parentheses.

Table 15. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) (Variation Sent3)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	Adjusted R^2
1. Low exposition	0.0883749 (1.33)	1.021309 (69.51)	0.2696202 (2.24)	0.1634196 (1.81)	-0.0819087 (-0.81)	0.9816
2	-0.0092584 (-0.18)	1.000065 (95.85)	0.0003317 (0.00)	-0.0177218 (-0.28)	0.0661609 (0.92)	0.9903
3	-0.0153694 (-0.23)	0.9987852 (75.60)	-0.2714106 (-2.50)	-0.1322555 (-1.63)	0.3073514 (3.39)	0.9846
4	0.0399917 (0.56)	1.010836 (71.46)	0.5579469 (4.81)	-0.2359804 (-2.71)	0.1844739 (1.90)	0.9830
5	0.0215311 (0.27)	1.007709 (63.33)	-0.3381047 (-2.59)	-0.3927321 (-4.01)	-0.1438493 (-1.32)	0.9787
6. High exposition	0.092684 (2.27)	1.021818 (48.31)	0.0938201 (0.54)	-0.2493408 (-1.92)	-0.1971684 (-1.36)	0.9635

The t-stat of the coefficient estimates are reported in the parentheses.

Table 16. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) (Variation Sent4)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	Adjusted R^2
1. Low exposition	0.0234375 (0.34)	1.006488 (73.34)	-0.1378782 (-1.22)	0.0339201 (0.40)	0.4522854 (4.80)	0.9834
2	0.0254506 (0.35)	1.008516 (69.86)	0.0133063 (0.11)	-0.2336804 (-2.63)	-0.0546217 (-0.55)	0.9822
3	-0.023452 (-0.32)	0.9980551 (67.59)	0.3361442 (2.77)	0.1605497 (1.77)	-0.0876169 (-0.86)	0.9806
4	0.0111507 (0.21)	1.003187 (94.81)	0.1572672 (1.81)	-0.1278153 (-1.96)	-0.0127538 (-0.18)	0.9902
5	0.1173862 (1.60)	1.026822 (70.39)	-0.475888 (-3.98)	-0.4425656 (-4.93)	-0.1258133 (-1.26)	0.9828
6. High exposition	0.0739806 (0.96)	1.017452 (66.50)	0.4192518 (3.34)	-0.2550208 (-2.71)	-0.0364198 (-0.35)	0.9804

The t-stat of the coefficient estimates are reported in the parentheses.

The exam of these tables shows that the adjusted R^2 is high in all cases, although somewhat lower for the portfolio 6 most exposed to sentiment factor. This portfolio, with portfolio 5 sometimes, exhibits the largest alpha coefficients. For indicators Sent1and Sent3, the portfolios most exposed to sentiment exhibit a positive and significant excess return. Portfolio 6 of the Sent2 measure and portfolios 6 and 5 of the indicator Sent4 have positive but not significant coefficients.

Also, results show that the portfolios most sensitive to sentiment have higher systematic risk than the portfolios less impacted by sentiment for all indicators except for Sent2. Sensitivity to the market risk for Sent1, Sent3 and Sent4 measures is 1.031354, 1.021818, 1.017452 respectively for the portfolio of stocks with higher sensitivity to the sentiment factor; while, it is 0.9901487, 1.021309, 1.006488 respectively for the portfolio with lower sensitivity to the sentiment factor. Similarly, we find, for all indicators with the exception of Sent2, that the return of portfolio 6 covaries positively with SMB. Returns of other portfolios ventilate between positive and negative signs with SMB. This result indicates that the portfolios which are most exposed to sentiment contain more small capitalizations stocks than the other portfolios. This finding is consistent with that of most previous studies (Lee, Shleifer and Thaler (1991); Neal and Wheatley (1998)). The negative relation means the opposite explanation.

We note also that, overall, the returns of portfolios least sensitive to the sentiment covary positively with the factor HML, while, the returns of portfolios most impacted by sentiment factor covary negatively with HML. This indicates that the portfolios most (least) exposed to sentiment include more low (high) B/M stocks. Finally, results show that, for the four sentiment indicators, the regression coefficients for the factor momentum are negative for the majority of the portfolios and they are significant for the most of portfolios less vulnerable to the sentiment factor. This result implies that the portfolios least sensitive to sentiment factor include proportionally more stocks with low past performances. A possible explanation is that individual investors are attracted by stocks which have experienced good recent performance. This finding validates previous studies (Solt and Statman (1988), Clarke and Statman (1998) and Kurov (2008)) showing that noise traders adopt strategies of "positive feedback", i.e. they buy after prices increase and sell after prices decline.

Globally, we conclude that neither the three risk factors of Fama and French (1993) nor the momentum factor can explain the abnormal returns of portfolios most exposed to the sentiment factor. Thus, a risk premium

for these stocks appears justified.

4.2 The impact of sentiment risk

We test, through this sub-section, the central hypothesis of investor sentiment theory; investor sentiment risk is a priced risk factor and requires a risk premium for any stocks that have an exposure to it. Like Beer, Watfa and Zouaoui (2012), we use the Fama-French (1993) portfolio approach to construct the portfolios mimicking risk factors related to size, B/M ratio and exposure to sentiment factor. We so form portfolios as the intersections of the three independent sorts: size, B/M ratio and exposure to sentiment factor.

4.2.1Construction of sentiment risk premium

Risk factors SMB and HML are similar to those in the Fama and French (1996) portfolio formation procedure. At the end of June of year t, the sample securities are divided into two groups (S for small and B for big) according that their market value in June t is lower or higher than the median market value of the sample. Independently, securities are classified according to their book-to-market equity (BE/ME ratio) in December t-1, and divided into three groups corresponding respectively to first three deciles (L for low), the four median deciles (M for medium) and the three latter deciles (H for high). Six portfolios (S/L, S/M, S/H, B/L, B/M, B/H) are constituted at the intersection of the two previous distributions. The returns are calculated each month from July t to June t + 1.

For the sentiment risk, in June of each year t, stocks are arranged according to their sensitivity to the sentiment factor using the absolute value of their sentiment betas. Then, they are split into three portfolios: the first includes the stocks not exposed to sentiment (N, (D1-D3)); the second portfolio includes the stocks moderately exposed to sentiment (M, (D4-D7)) and the third includes the stocks most sensitive to the sentiment factor (E, (D8-D10)).

The intersection of independent sorts of stocks into size, B/M ratio and sensibility to sentiment factor yield to 18 portfolios that are S/L/N, S/M/N, S/H/N, B/L/N, B/M/N, B/H/N,

S/L/M, S/M/M, S/H/M, B/L/M, B/M/M, B/H/M, S/L/E, S/M/E, S/H/E, B/L/E, B/M/E and B/H/E. Monthly value weighted returns of these portfolios are calculated from July of year t to June t+1.

The exposure to sentiment may be correlated with other variables which could also affect the relationship between risk and return. For example, we reported earlier that small firms are more sensitive to sentiment factor than big firms. This implies that a portfolio constructed using the sentiment factor may include a large number of small firms and the size effect could affect portfolio returns. Therefore, to avoid confounding the sentiment effect with the size effect, the factors must be made perfectly orthogonal. This is why we build each factor neutralizing other factors using the procedure described below.

The SMB factor corresponding to the difference between the monthly returns of the small capitalization portfolios and the big capitalization portfolios is calculated as follows:

$$SMB = \frac{1}{6}[R_{S/L/N}+R_{S/M/N}+\ldots+R_{S/H/E}] - \frac{1}{6}[R_{B/L/N}+R_{B/M/N}+\ldots+R_{B/H/E}] \quad (3)$$

Similarly, the HML factor which corresponds to the difference between the monthly returns of the portfolios with high B/M ratio and the portfolios with low B/M ratio is given by the following equation:

$$HML = \frac{1}{6}[R_{S/H/N}+R_{S/H/M}+\ldots+R_{B/H/E}] - \frac{1}{6}[R_{S/L/N}+R_{S/L/M}+\ldots+R_{B/L/E}] \quad (4)$$

Dedicated to replicate the sentiment risk premium, the EMN factor is the difference between the monthly returns of the portfolios with higher exposure to the sentiment factor and the portfolios with lower exposure to the sentiment factor:

$$EMN = \frac{1}{6}[R_{S/L/E}+R_{S/M/E}+\ldots+R_{B/H/E}] - \frac{1}{6}[R_{S/L/N}+R_{S/M/N}+\ldots+R_{B/H/N}] \quad (5)$$

The table below gives summary statistics of portfolio risk factors over the study period:

Table 17. Summary statistics for monthly returns of portfolio risk factors

	Mean	Standard deviation	Minimum	Maximum
Rm-Rf	-5.004009	0 .3882131	-5.78335	-4.295588
SMB	-0.0147553	0 .0581703	-0.3839296	0.1547858
HML	0 .0013162	0 .0830437	-0.1271554	0 .5164218
UMD	0.0023832	0 .0597946	-0.3575916	0.113456
EMN (Sent 1)	0.0075598	0 .0620135	-0.343661	0.1729295
EMN (Sent 2)	0.007285	0 .0673311	-0.2350539	0.4350093
EMN (Sent 3)	-0.0060692	0 .0434291	-0.2172512	0.0746359
EMN (Sent 4)	-0.0045431	0 .055232	-0.3633746	0.171037

The results depicted in table (17) show that the risk premium linked to sentiment is positive for Sent1 and Sent2 (0.75598% and 0.7285% per month respectively) and negative for Sent3 and Sent4 (-0.60692% and -0.45431% per month respectively). The monthly average return in excess of the risk free rate is of the order of -5.004009.

The monthly premium associated with the risk factor SMB is negative (-1.47553%). The factor HML exhibits a positive average return of 0.13162%. For the factor UMD, it shows an average return of 0.23832%.
The correlation matrix among the factors is presented in the tables below:

Table 18. The correlations of portfolio risk factors (Sent1)

	Rm-Rf	SMB	HML	UMD	EMN (Sent 1)
Rm-Rf	1.0000				
SMB	-0.0397	1.0000			
HML	-0.1102	-0.5980	1.0000		
UMD	-0.0973	0.1641	-0.3591	1.0000	
EMN (Sent 1)	0.1910	0.2784	-0.3893	-0.0415	1.0000

Table 19. The correlations of portfolio risk factors (Sent2)

	Rm-Rf	SMB	HML	UMD	EMN (Sent 2)
Rm-Rf	1.0000				
SMB	-0.0397	1.0000			
HML	-0.1102	-0.5980	1.0000		
UMD	-0.0973	0.1641	-0.3591	1.0000	
EMN (Sent 2)	-0.0470	-0.1707	0.2972	-0.1448	1.0000

Table 20. The correlations of portfolio risk factors (Sent3)

	Rm-Rf	SMB	HML	UMD	EMN (Sent 3)
Rm-Rf	1.0000				
SMB	-0.0397	1.0000			
HML	-0.1102	-0.5980	1.0000		
UMD	-0.0973	0.1641	-0.3591	1.0000	
EMN (Sent 3)	0.1544	-0.0445	-0.2479	-0.0751	1.0000

Table 21. The correlations of portfolio risk factors (Sent4)

	Rm-Rf	SMB	HML	UMD	EMN (Sent 4)
Rm-Rf	1.0000				
SMB	-0.0397	1.0000			
HML	-0.1102	-0.5980	1.0000		
UMD	-0.0973	0.1641	-0.3591	1.0000	
EMN (Sent 4)	0.1367	0.4180	-0.5243	0.0798	1.0000

We can remark that the risk premium related to the sentiment factor is little correlated with the premiums for Rm-Rf, SMB and UMD for almost all indicators. The correlation between the factors EMN and HML is somewhat stronger averaging -0.3893, 0.2972 and -0.2479 respectively for Sent1, Sent2 and Sent3. These low correlations appear to confirm the hypothesis which states that the information contained in the factor sentiment is not connected to other risk factors. The correlation between the other factors is also quite low except for that recorded between size and B/M ratio (-0.5980).

4.2.2 Towards a model incorporating a sentiment risk premium

To test the hypothesis of a sentiment risk premium, we add it in the multi-factor model presented in the previous sub-section. Our main interest concerns the significance level and the sign of abnormal returns that should disappear or at least should be reduced if the risk sentiment is valued by the financial markets. Abnormal returns are estimated with the constant from the following model:

$$R_{p,t} - R_{ft} = \propto_p + \beta_{1p}\left(R_{m,t} - R_{ft}\right) + \beta_{2p} SMB_t + \beta_{3p} HML_t + \beta_{4p} UMD_t + \beta_{5p} EMN_t + \mu_{pt} \quad (6)$$

Where:

EMN_t: the difference between the monthly returns of the portfolios with higher exposure to sentiment factor and the portfolios with lower exposure to the sentiment factor at time t.

Tables (22), (23), (24) and (25) give the results of the estimation of the multi-factor model (6):

Table 22. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) including a risk sentiment factor (Variation Sent1)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	EMN	Adjusted R²
1. Low exposition	-0.0278813 (-0.43)	0.9961654 (76.54)	0.4311503 (4.07)	0.1437281 (1.73)	-0.0542537 (-0.60)	-0.283153 (-1.21)	0.9848
2	-0.0068299 (-0.13)	1.000609 (93.37)	-0.1218797 (-1.40)	-0.1476831 (-2.15)	-0.2022684 (-2.73)	-0.2243953 (-3.09)	0.9900
3	0.0336011 (0.68)	1.008502 (102.52)	0.0158365 (0.20)	0.0567916 (0.90)	0.3503588 (5.15)	0.0838518 (1.26)	0.9916
4	0.0954813 (1.13)	1.023261 (60.94)	-0.0745661 (-0.55)	-0.5278446 (-4.91)	0.4128419 (3.55)	-0.2779597 (-2.44)	0.9771
5	0.0618577 (1.22)	1.013251 (100.92)	-0.1319915 (-1.62)	-0.1159495 (-1.80)	-0.0581425 (-0.84)	0.1076752 (1.58)	0.9916
6. High exposition	0.0132347 (0.15)	1.006297 (58.24)	0.1447081 (1.03)	-0.1017146 (-0.92)	-0.2025621 (-1.69)	1.179254 (10.08)	0.9774

The t-stat of the coefficient estimates are reported in the parentheses.

We can observe that the EMN variable is significant for the portfolio 6 most exposed to sentiment and not significant for the portfolio 1 least exposed to sentiment. The returns of stocks the least sensitive to sentiment covary negatively with the EMN whereas those of stocks most exposed to sentiment covary positively with the sentiment risk premium. Also, by incorporating a sentiment factor, the alpha coefficients for portfolios 5 and 6 decreased (from 0.0726186 to 0.0618577 and from 0.1310872 to 0.0132347 respectively) and they are not significant. So, the addition of the sentiment risk premium helps to better explain the returns of these portfolios.

Table 23. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) including a risk sentiment factor (Variation Sent2)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	EMN	Adjusted R²
1. Low exposition	0.0778565 (1.05)	1.020027 (69.32)	-0.621692 (-5.15)	-0.1702368 (-1.84)	0.1794154 (1.77)	-0.4296801 (-4.97)	0.9821
2	0.0011018 (0.01)	1.001459 (60.78)	0.8617772 (6.38)	0.1173638 (1.13)	-0.0631165 (-0.56)	-1.097563 (-11.33)	0.9775
3	0.0781914 (1.21)	1.017728 (79.16)	-0.1062197 (-1.01)	0.1976592 (-2.44)	-0.1006322 (-1.14)	0.025863 (0.34)	0.9860
4	0.0155074 (0.21)	1.003853 (68.51)	0.1992455 (1.66)	-0.0895593 (-0.97)	0.1118187 (1.11)	0.0398979 (0.46)	0.9812
5	-0.0146342 (-0.35)	0.9994589 (122.11)	0.1163938 (1.73)	0.0958402 (1.86)	0.1240288 (2.20)	0.0853475 (1.77)	0.9939
6. High exposition	0.0609721 (0.73)	1.015063 (61.06)	-0.1336723 (-0.98)	-0.4328121 (-4.14)	-0.1598323 (-1.40)	0.5512324 (5.64)	0.9771

The t-stat of the coefficient estimates are reported in the parentheses.

This table shows that the variable related to sentiment is significant for both portfolios most and least exposed to sentiment. The returns of stocks the least sensitive to sentiment (portfolios 1 and 2) covary negatively with EMN variable. On the contrary, the returns of stocks most exposed to sentiment (portfolios 4, 5 and 6) covary positively with the sentiment risk premium. The alpha coefficients for portfolios most sensitive to sentiment are not significant.

Table 24. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) including a risk sentiment factor (Variation Sent3)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	EMN	Adjusted R²
1. Low exposition	0.1033803 (1.40)	1.022631 (69.61)	0.2307743 (1.86)	0.1193627 (1.23)	-0.1061852 (-1.04)	-0.1711279 (-1.23)	0.9817
2	-0.0048259 (-0.09)	1.001236 (96.42)	-0.0340679 (-0.39)	-0.0567358 (-0.83)	0.0446631 (0.62)	-0.1515404 (-1.54)	0.9904
3	-0.0173464 (-0.26)	0.9982629 (75.06)	-0.2560679 (-2.28)	-0.1148546 (-1.31)	0.3169397 (3.41)	0.0675894 (0.54)	0.9844
4	0.0334735 (0.47)	1.009114 (71.85)	0.6085335 (5.12)	-0.1786079 (-1.93)	0.2160877 (2.20)	0.2228491 (1.68)	0.9833
5	0.0053525 (0.07)	1.003435 (67.73)	-0.2125461 (-1.70)	-0.2503305 (-2.56)	-0.0653823 (-0.63)	0.5531235 (3.94)	0.9816
6. High exposition	0.0544855 (0.69)	1.011726 (64.85)	0.3902709 (2.96)	0.0868775 (0.84)	-0.0119032 (-0.11)	1.305956 (8.84)	0.9803

The t-stat of the coefficient estimates are reported in the parentheses.

Results indicate that the EMN variable is significant for the two portfolios the most sensitive to sentiment and it is not significant for the others. So, the portfolios most exposed to sentiment are those have been the most impacted by the EMN variable. The returns of stocks the least sensitive to sentiment (portfolio 1 and 2) covary negatively with the sentiment risk premium while the returns of stocks most exposed to sentiment covary positively with the EMN factor.

It is important to report that the addition of a sentiment risk premium contributes to offset the abnormal returns of portfolios 4, 5 and 6. The alpha coefficients for these portfolios are not significant and they decreased from 0.0399917 to 0.0334735, from 0.0215311 to 0.0053525 and from 0.092684 to 0.0544855 respectively.

Table 25. Regression of monthly excess returns on portfolio risk factors of Carhart (1997) including a risk sentiment factor (Variation Sent4)

Portfolios	Alpha	Rm-Rf	SMB	HML	UMD	EMN	Adjusted R²
1. Low exposition	0.052889 (0.86)	1.01258 (82.94)	-0.0562227 (-0.56)	-0.1192969 (-1.48)	0.4043569 (4.81)	-0.5108985 (-5.11)	0.9870
2	0.041148 (0.58)	1.011763 (71.46)	0.056828 (0.49)	-0.3153438 (-3.38)	-0.0801672 (-0.82)	-0.2723047 (-2.35)	0.9830
3	-0.0243631 (-0.32)	0.9978667 (66.89)	0.3336181 (2.70)	0.1652898 (1.68)	-0.0861341 (-0.84)	0.0158056 (0.13)	0.9803
4	0.0040803 (0.08)	1.001725 (94.74)	0.137664 (1.57)	-0.0910323 (-1.31)	-0.0012475 (-0.02)	0.1226522 (1.42)	0.9903
5	0.0938912 (1.35)	1.021963 (74.19)	-0.5410288 (-4.75)	-0.3203367 (-3.53)	-0.0875784 (-0.92)	0.4075694 (3.61)	0.9848
6. High exposition	0.0336988 (0.53)	1.009121 (80.25)	0.3075689 (2.96)	-0.045461 (-0.55)	0.0291335 (0.34)	0.6987721 (6.78)	0.9869

The t-stat of the coefficient estimates are reported in the parentheses.

For the indicator Sent4, results are similar to those of Sent2. Indeed, the sentiment risk premium is significant for both portfolios most and least exposed to sentiment. The returns of stocks most sensitive to sentiment covary positively with the variable related to sentiment. In contrast, the returns of stocks the least exposed to sentiment covary negatively with EMN variable. The alpha coefficients for portfolios most sensitive to sentiment are not significant.

Overall, according to the indicators Sent1 and Sent3, we can say that the portfolios most exposed to sentiment are those have been the most impacted by the EMN variable. The addition of the sentiment risk premium in the model contributes to offset the abnormal returns of portfolios most sensitive to sentiment and helps to better explain their returns. So, with a percentage greater than 50%, our results are consistent with the claims of the investor sentiment theory: the stocks most exposed to sentiment earn greater returns than stocks less sensitive to sentiment as a compensation for bearing sentiment risk.

5. Conclusion

In behavioral finance, the link between investor sentiment and asset valuation is at the centre of a long running debate which date back at least to Keynes (1936) and Friedman (1953). While Friedman contends that sophisticated investors will trade against irrational investors and quickly eliminate mispricing, Keynes argues that market prices can be viewed as the outcome of investor sentiment (animal spirits). Since then, an empirical

challenge is carried by several studies.

This article tests the hypothesis that the risk introduced by noise traders in the financial market may not be diversifiable because their views are correlated and affect many assets. Our research work is part of one of the few studies that implement a sentiment strategy to this end. It consists of buying stocks most impacted by the sentiment factor and selling stocks less impacted in the past 36 months. This approach provides a better understanding of investor's sentiment role in the return generating process for common stocks.

Using a four sentiment indices for 36 stocks listed on the Tunisian stock market between January 2005 and December 2012, we constructed portfolios based on the exposure of these stocks to the variable sentiment. We found that some stocks record dependence to the sentiment factor while others stocks do not appear to be impacted by this factor. Globally, the portfolio returns increases when they include the stocks most sensitive to the investor sentiment. However, except for indicator Sent4, portfolios which provide the highest returns attest a level of risk most important. This finding may assume that the returns simply remunerate the traditional risk.

The trading strategy generates a raw profit statistically significant at a percentage of 50%. In fact, for Sent1 and sent2 measures, the difference in mean returns between portfolios most and least exposed to sentiment is significative. Nevertheless, it is not significant for all portfolios based on indices Sent3 and sent4.

Exploring the sources of profit, we found that, overall, conventional risk does not explain the abnormal returns of portfolios most affected by the sentiment factor. However, the addition of a new risk factor, dedicated to replicate the sentiment risk, contributes to better explain the returns of these portfolios according to the indicators Sent1 and Sent3. So, with a percentage greater than 50%, our results are consistent with the claims of the investor sentiment theory: the stocks most exposed to sentiment earn greater returns than stocks less sensitive to sentiment as a compensation for bearing sentiment risk.

Thus, the results depend on the sentiment proxy chosen but globally, sentiment risk is priced by stock market. Therefore, we can confirm our hypothesis.

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