Customer Satisfaction and Equity Mispricing

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Abstract

Does intangible asset customer satisfaction have a long term impact on the cross sectional stock returns? If so, does stock market fully value the customer satisfaction? The empirical results presented in this article suggest customer satisfaction lead to a significant positive excess returns (alpha) when valuing the cross sectional stock returns and valuing the portfolio returns. In order to test whether a higher satisfaction score lead to a higher stock return, the paper develops a new portfolio sort approach that rearranges the portfolio weight by using the customer satisfaction score-weighted method with the use of customer satisfaction score from American Customer Satisfaction Index. The result of new portfolio sort approach shows the average return of the portfolio is positively related to the portfolio customer satisfaction score over the long term. The paper for the first time raise the idea that firm level customer satisfaction can be perceived as a long term fundamental risk factor.

Chapter 1

Introduction

The paper is mainly focused on demonstrating the higher customer satisfaction score leads to an excess cross sectional stock return. The paper gives its economic explanations for the positive alpha arising from higher customer satisfaction score.

In the first part of the paper, a brief literature review about the impact of the intangible asset impact on the cross sectional expected returns will be conducted. The empirical findings and methods that used in analyzing the relation between intangible assets and stock returns will be summarized.

In the second part of the paper, the best customer satisfaction firms will be selected from each industry according to American Customer Satisfaction Index (ACSI) ranking. Then a value-weighted portfolio of the best customer satisfaction firms will be formed. The annual panel data set from 1995 to 2013 including the independent variables market risk premium, SMB and HML will be collected. Then the Famma French (1993) three factor models and Carhart (1997) four factor models will be conducted. We will examine whether the tests will generate a significant positive alpha compared to industry-matched benchmarks.

In the third part of the paper, a new portfolio sort approach will be introduced. Instead of using value-weighted or equal weighted methods, the paper comes up with a score-weighted method. This method rearranges the asset investment weight by taking the weighted average of the customer satisfaction score from the American Customer Satisfaction Index (ACSI). The portfolio will be sorted into five quintiles from lowest customer satisfaction score to highest customer satisfaction score across years from 1995 to 2013. The new approach will test whether the average return of the portfolio will increase from low quintile to high quintile.

In the fourth part of the paper, we will give several economic explanations for the higher alpha generated by higher customer satisfaction score. We will test two major hypotheses. The first hypothesis is that all else being equal, positive changes in customer satisfaction of firm positively influence changes lead to higher growth of product sales for the company which directly has positive impact on stock return. The second hypothesis is that all else being equal, positive changes in customer satisfaction of firm positively influence changes in analyst stock recommendations for the firm which indirectly has a positive impact on stock returns.

Chapter 2

The main goal of writing this paper is to identify whether the intangible asset like customer satisfaction can generate alpha for the investors. In addition, this paper is designed to see whether customer satisfaction can be used as a unique factor to form a portfolio that consistently outperforms the market.

Does the customer satisfaction have a significant impact on the equity pricing and if it does , how the customer satisfaction does influence the equity valuation? According to basic neoclassical economic theory, the higher customer satisfaction will be translated into a higher buyer utility and high buyer utility will lead customers to repeat their purchase of those companies' products, which will be converted into the firms' future profit growth. Growth of the companies will be ultimately interpreted as increasing allocation of the investors' capital on their equities and stocks' price would be more likely to go higher. In addition, the high customer satisfaction may also improve the chance to decrease the costs from customer complaints, warranties and future transaction costs.

Many papers have researched about the relationship among customer satisfaction, buyer utility, seller costs and firms' equity pricing. Most of papers indicate a similar finding as the basic neoclassical theory state. For instance, Anderson (1996) shows higher customer satisfaction would indicate lower price elasticity. Fornell et al. (1994) suggests that costs related to warranties, complaints and customer service costs would be likely to decrease with the increase of customer satisfaction. Heskett et al. (1997) indicates that with the increase of

the customer satisfaction, the employee loyalty, long-term sales growth and profitable performance will raise to some degree.

As the empirical results indicate that customer satisfaction will tend to increase the buyer utility which is reflected in the perspectives of increasing usage levels, future revenues growth, cross-buying and decreasing the transaction costs, service costs and price elasticity.

In an efficient market, an intangible asset that is indirectly beneficial to the firm value over time would be highly possible to be capitalized after the fundamental starts to get improved. However, the capitalization of the customer satisfaction score will be more likely to happen According to Edams (2011), market fails to capitalize the intangible assets like employee satisfaction immediately. Similarly, we can infer the customer satisfaction will not be capitalized immediately. Therefore, it is really important to use a long time period to test how the customer satisfaction score will have the impact on the equity pricing.

Chapter 3

In this paper, I combine the marketing data source with available finance data resource. Considering the quality of customer satisfaction score source, I locate the data resource from American customer satisfaction index website: www.theacsi.org because the American customer satisfaction is the only independent national benchmark of customer satisfaction available in the United States and it covers over 10 economic sectors, 47 industries and 230 companies. I hand collected the companies data from the web resource. To be noticed, after considering the firms' acquisitions and availability of relative firms' financial information, I finally locate only 222 companies and 222 of them have both customer satisfaction score and its financial information such as annual stock return, market capitalization over years from 1995 to 2013. For the financial information, I get annual financial information from morning star direct database. The financial data matches with marketing data on an annual basis.

The number of firms in our sample stays constant through time. I will use 222 NYSE and Nasdaq firms to form the portfolio from 1995 to 2013. The portfolio will be based on a special methodology: customer satisfaction weighted average method to weight the stock and calculate the portfolio return across years. The portfolio will also be compared to those formed by value-weighted and equal weighted method.

To have a clear picture of how the satisfaction may be related to the stock performance across years from 1995 to 2013, firstly I form a portfolio using these 222 companies. To form a portfolio, we first take each company customer satisfaction score minus the minimum customer satisfaction score in that year as final customer satisfaction score for this company.

Then we take the weighted average of the final customer satisfaction score for 222 companies over year 1995 to 2013, this weighted average score is assigned to be the portfolio customer satisfaction score. To calculate the portfolio return, we multiply the weighted average of final customer satisfaction score by each company stock return and then we sum those returns up and get the portfolio return.

To help see a clear picture of how the weighted average customer score portfolio return is calculated, we use the following equation to further explain it.

$$Rp_t = \sum_{i=1}^{222} r_{it} \times \frac{(c_{it} - minmumc_t)}{\sum_{i=1}^{222}\sum_{t=1995}^{2013}(c_{it} - minimumc_t)} \quad \ldots\ldots(1)$$

Where as r_{it}: $the\ stock\ return\ for\ the\ stock\ i\ at\ year\ t$

c_{it}: $the\ customer\ satisfaction\ score\ for\ the\ stock\ i\ at\ year\ t$

$minimumc_t$: $the\ minimum\ customer\ satisfaction\ score\ among\ all\ 222\ stocks\ at\ year\ t$

Rp_t: $the\ portfolio\ return\ at\ year\ t$

Next we use the equal weighted method to calculate the portfolio customer satisfaction score, the next equation (2) shows the portfolio customer satisfaction score.

$$CP_t = \frac{\sum_{i=1}^{222} c_{it}}{222} \quad \ldots\ldots(2)$$

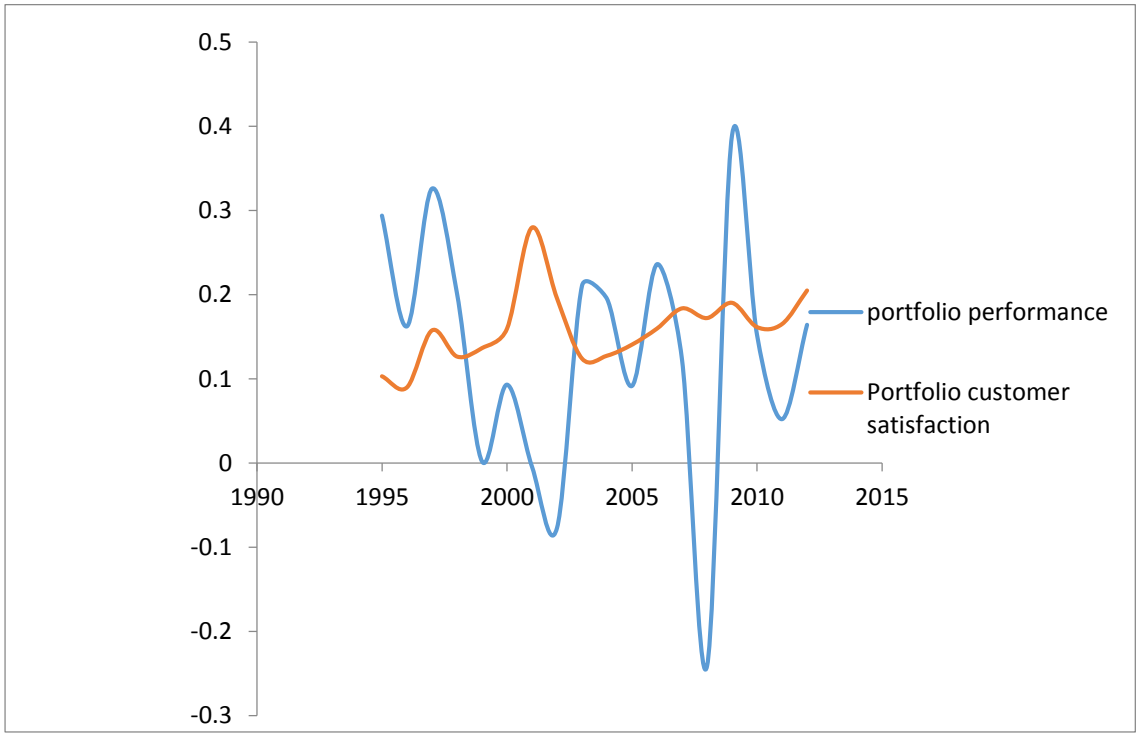
whereas CP_t: $the\ portfolio\ customer\ satisfaction\ score$

c_{it}: $the\ customer\ satisfaction\ score\ for\ the\ stock\ i\ at\ year\ t$

After forming this customer satisfaction weighted average portfolio, we are really interesting to see the correlation between the portfolio customer satisfaction score and portfolio return over time.

Figure 1 exhibits the chart of the portfolio's performance related to its customer satisfaction score.

Figure 1 Portfolio Performance V.S. Portfolio Customer Satisfaction



As we can see from the chart, the portfolio return has a general similar moving pattern as the portfolio customer satisfaction.

My empirical model to explore the alpha generated by high satisfaction score is the Famma French (1993) three-factor asset pricing model and Carhart (1997) four-factor asset pricing model. As equation (3) shows Famma French three factor model and equation (4) shows

Carhart (1997) four-factor model.

$$R_{i,t} = r_{f,t} + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + \varepsilon_{i,t} \ldots.(3)$$

$$R_{i,t} = r_{f,t} + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + M_i MOM_t + \varepsilon_{i,t} \ldots.(4)$$

Whereas $R_{i,t}$ is the return on company i at time t, $r_{f,t}$ is the risk free rate and we use one month treasury bill rate as the risk free rate. $r_{M,t}$is the value weight return of market portfolio that is composed of all CRSP firms incorporated in the US and listed on the NYSE, AMEX or NASDAQ. SMB_t is the returns on a portfolio of small stocks minus a portfolio of big stocks at year t. In addition, big stocks are above the median market equity value of NYSE, AMEX and NASDAQ firms and small stocks are those which are below the median market equity value of NYSE, AMEX and NASDAQ firms. HML_t is the difference between the return on a portfolio of high book to market (BE/ME) stocks and the return on a portfolio of low BE/ME stocks at year t. High BE/ME value is deriving from taking the average of aggregate small size stocks' high BE/ME and aggregate big size stocks' high BE/ME value. Low BE/ME value is deriving from taking the average of aggregate small size stocks' low BE/ME and aggregate big size stocks' low BE/ME value. MOM_t is the difference between the returns of high momentum stocks and low momentum stocks at year t. Whereas the momentum in securities is that their price is more likely to keep moving in the same direction and momentum is also considered an oscillator in the technical analysis.

Table I shows the summary statistics for RPM, SMB, HML and MOM from January, 1995 to December, 2013. Additionally, we want to see the whole picture of yearly summary statistics

from 1995 to 2013. This is for the consistency with the regressions in the following tables that will use the whole period from year 1995 to year 2013.

Table I also compare the monthly result with the yearly result and give a clear picture of how those four factors will differentiate from month to year. As we can see from the number of observations, monthly summary test has way more observations than the yearly summary tests. It will be likely four factors from monthly summary test will be more significant than those from yearly summary tests. In particular, we calculate the t-statistic for each summary test by subtracting zero from the average value of each factor and then divide by the standard deviation of each factor.

Table I

Summary Statistics for Monthly, Yearly Percent Four-Factor Explanatory Returns

is the risk free rate indicated by one month treasury bill rate from Kenneth R. French Data Library. is the value weight return of market portfolio that is composed of all CRSP firms incorporated in the US and listed on the NYSE, AMEX or NASDAQ for the previous calendar year. SMB is the returns on a portfolio of small stocks minus a portfolio of big stocks. In addition, big stocks are above the median market equity value of NYSE, AMEX and NASDAQ firms and small stocks are those which are below the median market equity value of NYSE, AMEX and NASDAQ firms. HML is the difference between the return on a portfolio of high book to market (BE/ME) stocks and the return on a portfolio of low BE/ME stocks. To be included in the portfolio, the firms must also have COMPUSTAT or CRSP data

on market equity value (ME) for December of previous calendar year. In order to protect the consistency of the test result, we do not include negative book to market (BE) sample.

	RM - Rf	SMB	HML	MOM
Jan, 1995 to Dec, 2013 : months				
Ave	0.562	0.214	0.265	0.243
Std Error	0.317	0.244	0.231	0.012
t(Ave)	1.772	0.876	1.146	19.888
1995 to 2013: 19 years				
Ave	7.664	2.133	3.469	4.915
Std Error	4.690	2.814	3.570	6.058
t(Ave)	1.632	0.758	0.972	0.811

As exhibited by the table I, the average value of the market risk premium is 7.66% per year for the full 19-year sample period (t- statistic =1.63). The market premium for the whole sample period is 0.52 percent per month. Both are about 1.7 standard errors from zero. Therefore, on a 90% confidence level, the market risk premium has a strong impact on returns.

In contrast to market risk premium, the size factor SMB and value factor HML does not have a significant impact on the returns. The weak size effect may attribute from the fact that value-weight portfolio determines the market risk premium and size has a neutral impact on returns when book to market is also used. Value premium does not play an important role in explaining the returns across 19 years this is because the number of observations is not sufficient. By comparing the monthly summary test to yearly summary test, we can easily see that when the number of observations is increasing the factors' statistical significance is increasing. To be noticed, the momentum factor has its statistical significance increased the most from yearly test to monthly test.

Although each factor separately did not really have a significant impact on the returns, the overall impact of using all four factors may still have a significant impact on the portfolio return. In the next chapter, I will introduce the main empirical tests to examine whether the customer satisfaction score will play an important role in determining the stock portfolio performance over a 19 year long term period.

I will form the customer satisfaction weight portfolio and use fixed panel data regression fixed effect model to identify the general pattern for the portfolio alpha.

Chapter 3

Our main interest is to examine whether one of the companies' intangible assets customer satisfaction will have a significant impact on its stock performance. Intuitively, the consistent high customer satisfaction score over years will convince the companies' customers to repeat purchase of the firms' products or services, which will boost up the companies' sales and profit growth so as to generate a sound cash inflow for the companies and those all improve the companies' fundamental. The consistent high customer satisfaction score and the increase of customer satisfaction will be mostly positively correlated with the improvement of the companies' fundamental. Many fundamental investors will be attracted to investing their capital on those that consistently have the high customer satisfaction. Therefore, the companies will have a relatively good stock performance related to their benchmark over a long period. This good stock performance will be reflected in the abnormal return alpha.

Firstly, I select the 192 companies which have consistently high customer satisfaction over 19 years from American Customer Satisfaction Index (ACSI) as a major sample. In addition, I select another sample composed of 222 companies which have included all the existing and nonexistent companies due to the merging or bankruptcy over 19 years. I will run a panel data fixed effect model on those two samples with the use of Famma French (1993) three-factor model and Carhart (1997) four-factor model. My prediction is that both samples will generate a positive significant alpha.

In order to derive models that exhibits in the form of alpha, we can transform the equations (1) and (2) to (3) and (4) as followings.

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + \varepsilon_{i,t} \ldots (5)$$

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + M_i MOM_t + \varepsilon_{i,t} \ldots (6)$$

Table II, III summarizes the estimates of the three factor regression (5) and four factor regression (6) for the returns on two samples. As we can predict from the Famma French (1993) three factor and Carhart (1997) four factor models, the size has a negative significant impact on the asset return minus risk free rate and Market risk premium has a positive impact on the residual return of the asset. In addition, the momentum has a positive impact on the residual return of the asset.

Tests of Famma French (1993) three factor and Carhart (1997) four factor models emphasize on the intercepts of the regressions, which states in the efficient market the intercepts should not be different from zero. However, in our empirical tests, my hypothesis is that the companies which maintain the high customer satisfaction will generate a significant positive intercept alpha. This alpha exists for both the sample that has only existent high satisfaction firms and the sample that include both existent and previous existent high satisfaction firms over 19 years. Table II, III also presents the minor difference between four factors and three factors estimates.

Table II Three-Factors Regressions for the Portfolio formed from 192 Existing Companies over Last 19 Years

We form a portfolio composed of 222 existing companies maintaining high customer satisfaction score in their industries from year 1995 to 2013. Each individual firm's customer satisfaction score and its industry customer satisfaction score come from the American Customer Satisfaction Index. The matching annual return comes from the Morning Star Direct database. The returns explained by the regressions, are the equal-weight returns on the portfolio. The whole firm sample is conducted in a panel data set, fixed effect model over 19 years.

Three factors model regression

		1995-2013 annually						
		Alpha		RM-Rf		SMB		HML
Avg Return		0.032		0.764		-0.133		0.388
Std Error		0.013		0.062		0.095		0.082
t-statistic		2.470		12.260		-1.390		4.760

Four factors model regression

		1995-2013 annually						
	Alpha	RM-Rf		SMB		HML		MOM
Avg Return	0.054	0.663		-0.278		0.320		-0.198
Std Error	0.014	0.678		0.103		0.083		0.052
t-statistic	3.800	9.780		-2.690		3.850		-3.600

As the table II indicates that market risk premium and value premium both meet the

prediction, because they both have significant positive impacts on the residual return of the asset. However, to our surprise, the Momentum has significant negative impact on the residual return of the asset; this may be caused by the irrational trading behaviors such as status quota bias, which may render the momentum lose its influence on the residual return of the asset. Another explanation would be investors did not chase the performance of this portfolio composed of those 222 companies from the long term perspective. The investors tend to buy those stocks at low customer satisfaction score level but once the customer satisfaction score has been raised to certain level, the investors tend to trim their position instead of chasing the momentum of the stocks. Overall, we can see the 222 companies that maintain the high satisfaction score generate a significant positive alpha over a long time period from 1995 to 2013 as we predicted before.

Table III Three-Factors, Four-Factors Regressions for the Portfolio formed from 222 Existing and Nonexistent Companies over Last 19 Years

We form a portfolio composed of 222 existing and nonexistent companies maintaining high customer satisfaction score in their industries from year 1995 to 2013. Each individual firm's customer satisfaction score and its industry customer satisfaction score come from the American Customer Satisfaction Index. The matching annual return comes from the Morning Star Direct database. The returns explained by the regressions are the equal-weighted. The whole firm sample is conducted in a panel data set, fixed effect model over 19 years.

Three factors model regression

		1995-2013 annually						
		Alpha		RM-Rf		SMB		HML
Avg Return		0.062		0.955		-0.100		0.220
Std Error		0.012		0.055		0.087		0.074
t-statistic		5.400		17.310		-1.150		2.980

Four factors model regression

		1995-2013 annually						
	Alpha	RM-Rf		SMB		HML		MOM
Avg Return	0.071	0.909		-0.162		0.191		-0.082
Std Error	0.013	0.061		0.094		0.076		0.047
t-statistic	5.630	14.880		-1.720		2.520		-1.730

As the table III indicates the similar results from table II. To be noticed, both tables show that in the three factor models the SMB is not a significant factor that impacts on the residual return of the asset. In addition, the momentum in the table III has insignificant impact on the residual return of the asset even though its coefficient is negative. As predicted, the market risk premium and book to market have significant positive impact on the residual return of the asset. The positive abnormal return alpha exists for the 222 existing and nonexistent companies.

The main difference between the 192 companies and 222 companies sample is that the 192 companies may subject to the survivorship bias because the sample only include those firms that survive and maintained the high satisfaction score over last 19 years and 222 companies sample does not subject to any survivorship bias because the sample include both existing and nonexistent companies which maintained high customer satisfaction score during their life time. Comparing the results of table II to those of table III, we can infer that the survivorship bias does not play an important role in interpreting the abnormal return. As the result show that the sample not subject to survivorship bias outperform the sample with survivorship bias, the alpha of sample with survivorship bias generate alpha for 3.2% in 3 factor model and 5.4% in 4 factor model and alpha of sample without survivorship bias generate alpha for 6.2% in 3 factor model and 7.1% in 4 factor model.

As the table II and table III exhibit that the companies with persistent high satisfaction score would be likely to generate a statistically significant positive abnormal return. The positive abnormal return does not come from the survivorship bias. Therefore, we can infer that the

persistent high customer satisfaction can explain the positive abnormal return.

After examining the positive relationship between the abnormal return and persistent high customer satisfaction score over a long term, my interest is to see if there is one method that can help us to use customer satisfaction score to interpret a portfolio return. By following the value weight average method, I develop a customer satisfaction weighted average method. The method is like following:

$$R_{p,t} - r_{f,t} = \alpha_i + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + \varepsilon_{i,t} \ldots (7)$$

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_i\left(r_{M,t} - r_{f,t}\right) + S_i SMB_t + h_i HML_t + M_i MOM_t + \varepsilon_{i,t} \ldots (8)$$

Whereas $Rp_t = \sum_{i=1}^{222} r_{it} \times \frac{(c_{it} - minmumc_t)}{\sum_{i=1}^{222}\sum_{t=1995}^{2013}(c_{it} - minimumc_t)}$

$$r_{it}: the\ stock\ return\ for\ the\ stock\ i\ at\ year\ t$$

$$c_{it}: the\ customer\ satisfaction\ score\ for\ the\ stock\ i\ at\ year\ t$$

$$minimumc_t: the\ minimum\ customer\ satisfaction\ score\ among\ all\ 222\ stocks\ at\ year\ t$$

$$Rp_t: the\ portfolio\ return\ at\ year\ t$$

. We form the portfolio as taking following steps, we first take each company customer satisfaction score minus the minimum customer satisfaction score in that year as final customer satisfaction score for this company. Then we take the weighted average of the final customer satisfaction score for 222 companies over year 1995 to 2013, this weighted average score is assigned to be the portfolio customer satisfaction score. To calculate the portfolio return, we multiply the weighted average of final customer satisfaction score by each company stock return and then we sum those returns up and get the portfolio return.

Next we use the equal weighted method to calculate the portfolio customer satisfaction score, the next equation (2) shows the portfolio customer satisfaction score.

$$CP_t = \frac{\sum_{i=1}^{222} c_{it}}{222} \quad \text{……(2)}$$

whereas CP_t: $the\ portfolio\ customer\ satisfaction\ score$

c_{it}: $the\ customer\ satisfaction\ score\ for\ the\ stock\ i\ at\ year$

Table 5 Customer Satisfaction Weight Average

We form a portfolio based on 222 existing companies maintaining high customer satisfaction score in their industries from year 1995 to 2013. Each individual firm's weight is allocated according to the customer satisfaction weight average method.

Each individual firm's customer satisfaction score and its industry customer satisfaction score come from the American Customer Satisfaction Index. The matching annual return comes from the Morning Star Direct database. The market, size, value and momentum factors all come from the French R. Data library.

Three factors model regression

		1995-2013 annually						
		Alpha		RM-Rf		SMB		HML
Avg Return		0.065		0.751		-0.216		0.394
Std Error		0.015		0.073		0.114		0.096
t-statistic		4.227		10.259		-1.900		4.095

Four factors model regression

		1995-2013 annually						
	Alpha	RM-Rf		SMB		HML		MOM
Avg Return	0.086	0.657		-0.348		0.329		-0.176
Std Error	0.011	0.055		0.084		0.068		0.042
t-statistic	7.368	11.937		-4.126		4.876		-4.126

Table 5 exhibits the performance of the customer satisfaction score weight average portfolio. It clearly points out that compared to the results of panel data fixed effect models, a higher positive significant alpha will be achieved by forming a portfolio with use of weight allocation method mentioned above.

This result above gives us a practical strategy that we can buy the portfolio when the portfolio customer satisfaction score is at low level and sell it once the portfolio customer satisfaction score becomes higher from a long term perspective. Another interesting thing we can get from the result is that portfolio customer satisfaction score can be perceived as a fundamental risk factor that works in the long term perspective. When the portfolio customer satisfaction score raised to a high level, we perceive the portfolio have a higher fundamental risk than before because at this time, the portfolio has a higher probability of having its customer satisfaction score go down which directly lead customers to reduce their repurchase and companies will have worse performance in the next earning quarters. This finally led to a big drop for the companies' stock price

Chapter 4

Conclusion

This paper tries to answer the question will persistent high customer satisfaction over a long time generate a high abnormal return for the stock and for the portfolio? The paper uses the panel data fixed effect to capture the pattern of the alpha. The major contribution of this paper is that this paper designs a specific method to use the customer satisfaction score weight to interpret the high portfolio return over a long run. This method is different from the value-weight method in that this method does not use merely use the weight average to calculate the weight; instead, this method interacts with the minimum so as to enlarge the weight range of stocks. Another contribution of this paper is that this paper for the first time raise the customer satisfaction at the firm level can serve as a fundamental long term risk factor for the firms. In other words, we would perceive the firms with high customer satisfaction score riskier over the long term perspective because at this time it would be more difficult to maintain or even raise its customer satisfaction. Therefore, the investors will demand a higher premium return for its stock to compensate for this risk over the long term perspective.

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