경제학석사학위논문

Mutual fund systematic risk and performance for bull and bear market

– An empirical examination in the US market

불 시장과 베어 시장에서 뮤츄얼펀드 체제적 위험과 실적

–미국 시장에 대한 실증분석

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서울대학교 대학원

사회과학대학 경제학

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지도교수 안 동 현

이 논문을 경제학 석사 학위논문으로 제출함

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Abstract

Mutual fund systematic risk and performance for bull and bear market

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This paper analyses mutual fund systematic risk and performance for bull and bear market through one traditional extended "single factor" CAPM model and another multi-factorial model constructed by adding 'size risk', 'value risk', 'momentum risk' factors. Our results show that US mutual fund market does not have successful timing ability of market risk and size risk, but success in timing value risk and momentum risk. Alpha performance is also valued in both bull market and bear market. In general, alpha performs better in bull market than bear market. Other notable findings are that relation between alpha performance and risk differential presents different features on different risk factors. Finally, we observe the relationship between risk and risk differential.

Key words: alpha differential; systematic risk differential; bull and bear market;

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Chapter 1. Introduction

The problem of evaluating the performance of investment portfolios is particular relevant with market- timing and security selection ability of fund manager. If beta does differ with market conditions, the conclusions about skills of fund manager will be different. Suppose that a manager adjusts the fund' s beta when he anticipates a bull market in the next period, but we use beta for the entire time which should be smaller than the adjusted bull market beta, the evaluated performance due to market-timing will be ignored.

The first purpose of this paper is to test whether the systematic risk for mutual funds in US market is different in bull and bear market.

At the same time, as financial blog Zero Hedge writes: "It is hard for a portfolio manager to focus on the nuances of stock selection when the prospects of a U.S. recession keep rising. . . . Simply put, the macro is overwhelming the micro." We know that the question as to whether or not markets are efficient has been much debated by academics and practitioners in the finance industry. The dilemma is that if markets are efficient, then over the long run, no one should be able to outperform the market. If the managers could outperform the market, from the motive generated by above idea, we want to explore such a question that how the performance of fund differ with market conditions. Our performance evaluated here has the same definition with Jensen's measure of performance which due to the manager's ability to systematically select securities because of special knowledge not available to others.

The second purpose of this paper is to test differential alpha with different market conditions.

The question will be answered through one factor model under CAPM framework and multi-factorial model. The factors considered in the multi-factorial performance models are from Fama and French (1993) and

Carhart (1997) .They added more other three factors to describe the returns of a portfolio. We introduce these factors into traditional model in order to use information by the implement of these factors and to see the correspondent timing ability of it.

Thirdly, as Jagannathan and Korajczyk (1986) concluded that if the funds holding less option-like (high-quality) assets than the average asset in the market proxy would yield negative timing and positive selectivity measures. Also, KON(1983) and Henriksson(1984) find that there is negative correlation between the measure of selection ability and market timing ability.

So, we also want to investigate the relationship between security selection and market timing. One more interesting question is, after introducing the 4 Fama, French and Carhart factors into the model, what is the relationship between selection ability and timing abilities of these factors, will the selection ability and timing ability of the whole market show negative correlation similar with the result from Jagannathan and Korajczyk, KON(1983) and Henriksson(1984).

At the end, we investigate the relationship between systematic risk and risk differential of each factor from the thinking that what is the reason of the different value of timing ability.

The results we found are that on average, there is no timing ability of market factor, both in traditional model and multi-factorial model, same with the timing ability of the size factor but the value and momentum factors shows positive timing ability from the manager. Select abilities in bull are better than bear market. With regard to the relation between select ability and timing ability, we find the similar negative correlation between select ability and market risk differential with prior literatures. We also find that some fund which has high sensitivity when adjust the risk also has a high absolute systematic risk value.

The rest of the paper is structured as follows: there is a review of the literature in Section 2; Section 3 describes the database used in our analyses

and presents the methodology used in the analyses; Section 4 comments on the results achieved; Section 5 gains our main conclusions.

Chapter 2. Related literature

The earliest literature on market timing owes to Treynor and Mazuy (1966). They argued that if the fund manager successfully forecasts the market upturn and changes the fund beta accordingly, then fund beta would be higher (high equity–debt ratio) than normal values, and the fund would be performing better than otherwise. Similarly, when the market declines, the fund will have a lower beta value and its decline would be less. Several other studies used this traditional model such as Chang (1984) and Luis Ferruz et al. (2015). They found little evidence of the presence of market timing. Using Henriksson and Merton (1981) methodology, Jagannathan and Korajczyk (1986) concluded that if the funds holding less option−like (high−quality) assets than the average asset in the market proxy would yield negative timing and positive selectivity measures. Conversely, funds holding assets that are more option−like assets would show positive timing and negative selectivity. These early literatures on the value of active mutual fund management focused on unconditional market timing studies and generally found that there is evidence of negative market timing.

In order for active managers to generate alpha, financial markets must be predictable. Two possible methods used by managers to create value for investors are: superior market timing abilities (macro−forecasting); and superior stock selection (micro−forecasting). Regarding stock picking ability, in Jensen (1968)' s paper, alpha will be positive for two reasons: the extra returns actually earned on the portfolio due to the manager's ability and the positive bias in the estimate of alpha resulting from the negative bias in our estimate of beta. Grant D.1977 shows that the expected value of the Jensen measure of performance is downward biased by the inverse of the square of the coefficient of variation of the market, multiplied by the covariance between beta and market returns.

Fabozzi and Francis (1979) modified the Jensen model and developed a method to test for market timing. They introduced dummy variable on alpha and systematic risk beta so that the alphas and beta were allowed to vary with differing market conditions. They noticed that the alphas did not significantly change with differing market conditions. Furthermore, they concluded that there was no evidence to the notion of managers being able to forecast (or time) the market. In this paper, I use the Fabozzi and Francis (1979) specification for the alphas and apply this to Jensen's measure. Robert (2011) divided market condition into recessions and expansions by using NBER business cycle dates and resulted that various measures of risk-adjusted mutual fund performance or alpha are higher in NBER recession than NBER expansion periods. The paper shows that the stylized fact of average mutual fund underperformance documented in the literature stems from expansion periods when funds have statistically significant negative risk-adjusted performance and not recession periods when risk-adjusted fund performance is positive. When measuring fund performance without benchmark, the basic idea is that the assets held by informed portfolio managers will have higher returns when they are included in the portfolio than when they are not included. This idea was applied by Grinblatt, Mark, and Sheridan Titman(1993), Kacperczyk, Marcin, Stijn Van Nieuwerburgh, and Laura Veldkamp(2011,2014).

Chapter 3. Data and the estimation models

3.1. Data

The database used to implement our analyses was obtained from CRSP (Center for Research in Security prices). The CRSP US Mutual Fund Database provides mutual fund data beginning December 1961 and ending December 2014 for funds of all investment objectives, principally equity funds, taxable and municipal bond funds, international funds and money market funds. The sample consists of the monthly returns on the portfolios of 8475 mutual funds.

The database provided the detailed information of variables we used in this paper, like the fund name, identifier, monthly return, fund composition and so on. In this study, we limit our analysis to funds that include only mutual funds of stock fund and balanced fund, which the style of the fund can be confirmed by the fund compositions. If the fund possesses more than 70% stocks, we classify it as stock fund otherwise we classify it as balanced fund. We exclude all other funds, which include bond funds, money market mutual fund.

3.2. The estimation model

We will establish the estimation model still basing on the framework of CAPM. CAPM states that in equilibrium, expected returns are linearly related to their level of risk, more specifically, their beta or systematic risk. This linear function states that all assets (and portfolios) plot on the Securities Market Line (SML): It is similar with the portfolio performance models derived by Jesen(1967) and Fama(1972).

$$E(\widetilde{R_j}) = R_f + \beta_j[\widetilde{E(R_m)} - R_f] \qquad (1)$$

R_f : risk free interest rate

$\beta_j = \frac{cov(\widetilde{R_j}, \widetilde{R_m})}{\sigma^2(\widetilde{R_m})}$

$\widetilde{E(R_m)}$: expected return on market portfolio.

Using least squares regression theory, we can generate the least-squares estimation equation (2) as follows. $\widetilde{R_{mt}}$ is the monthly market for period t; Mathematically, β_j is the covariance of the return on asset with the return on the market portfolio divided by the variance of the return on the market portfolio; it is a measure of how the return of the asset (or portfolio) tends to move with the return of the market portfolio.; $\widetilde{e_{jt}}$ is the random error term; The variable $\widetilde{e_{jt}}$ is assumed to be independent normally distributed random variable.

$$\widetilde{R_{jt}} - \widetilde{R_f} = \alpha_j + \beta_j[\widetilde{R_{mt}} - \widetilde{R_f}] + \widetilde{e_{jt}} \quad (2)$$

$$E(\widetilde{e_{jt}}) = 0 \quad (2a)$$

$$\mathrm{cov}(\widetilde{e_{jt}}, \widetilde{e_{it}}) = \begin{cases} 0 & j \neq i \\ \sigma^2(\widetilde{e_j}) & j = i \end{cases} \quad (2b)$$

$$E(\widetilde{e_{jt}}|\widetilde{R_t}) = E(\widetilde{e_{jt}}) \quad (2c)$$

Basing on the underlying model framework above, we establish the model to evaluate the fund manager skill.

The measure of systematic on bull and bear market -- Beta actually measures sensitivity of a security' s returns to changes in the return on the market. The method used for measuring market timing ability also comes from the meaning of beta coefficient .When the market return is increasing, a successful market manager will add the value of beta in order to increase the portfolio return .Given this meaning of the fund beta, we add a dummy variable D into the equation. Dummy variable D divides market conditions into up and down. When the market to have a higher return than the risk-free rate, we value D equals to 1, while the market to have a smaller return than the risk-free rate, we value D equals to 0. If fund manager do well in market timing, he will add a positive value when market is bull and add a negative value when market is down to reduce the market risk preventing the underlying losses caused by market factors.

The measure of alpha performance.—in this paper, we also evaluate fund alpha performance into two parts. The general stock picking meaning is also from the measure of Jensen alpha which already has an extensive application on empirical test in many existing literatures. The ability of selectivity may increase the asset excess return compared with market portfolio when they

have a same systematical risk valued by β_j . We can see this effect from constant term "alpha", which means that managers select portfolios successfully above the security market line and thereof allow for the possible existence of a non-zero constant "alpha". Regarding stock picking ability of this part, we add a dummy variable which has the same pattern with above measure of market timing ability. It is a test to see that if the performance is different when market condition is varying. Fund manager surely has an incentive to do more selectivity skill when market is bull because of an easier selection of good performance stocks comparing with that of down market. So, if managers pick stocks successfully when they expect the market environment is good, then this will result in a better fund performance. On the contrary, the fund managers will get a low-alpha fund if they have no chance to play more stock picking skills when the market return is good.

3.2.1 One factor model

Combining with two ideas of the measure of time-varying market timing and stock picking abilities, we modified equation (2) and specified the model as follows:

$$r_{tj} = \alpha_{j-dowm} + \alpha_{j-up_{dowm}} \cdot D + \beta_{j-down} \cdot r_{mt} + \beta_{j-up_{down}} \cdot r_{mt} \cdot D + \varepsilon_{tj} \qquad (3)$$

$$j = 1, 2, 3 \cdots.$$

Definitions of the variables.—the following are exact definitions of the variables used in estimation procedures:

D =1, if $R_m > R_f$

=0, otherwise

r_{mt} = excess market return

$r_{tj} = R_{tj} - R_f$ =asset excess return

R_f = Risk−Free Return Rate (One Month Treasury Bill Rate)

$R_{tj} = \left[\frac{NAV_t \times cumfact}{NAV_{t-1}}\right] - 1$: Total Return per Share as of Month End[1]. Daily and monthly returns values of CRSP mutual fund database are calculated as a change in NAV including reinvested dividends form one period to the next. NAVs are net of management expenses and 12b−fees. Front and rear load fees are excluded.

According to the model specified in (3), the regression results will give us two beta and alpha values. If the fund managers estimate the market boom correctly and adjust the risk of the securities accordingly, then profit would rise. Conversely, if the fund managers estimate the market boom wrongly and does not adjust the securities accordingly, then the losses would be generated. The beta and alpha of the portfolio in a bear or down−market are β_{j-down} and

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[1] Where t−1 may be up to 3 periods prior to t. the *cumfact* variable is calculated for the period in following manner. For each fund we calculated a total adjustment factor for each day the fund trades. The total adjustment factor starts out as 1 for a given day and then is modified depending on the types of dividends found for that fund and day.

Adjustment factors for each dividend on a given day are calculated as follows: If first letter of dividends type is either Capital Gain No indication of term or Income Dividend ,then adjustment factor=distribution amount/reinvestment amount of daily or monthly NAV ;If the first letter of dividends type is split dividend, then adjustment factor=1/split ratio; The total adjustment factor, for a given day is updated for each dividend as follows: if the dividend type=split dividend ,then total adjustment factor= total adjustment factor* adjustment factor; if the dividend type= Capital Gain No indication of term or Income Dividend, then total adjustment factor= total adjustment factor+ adjustment factor

The dividend file in CRSP is sorted in distribution type order which implies that when split and cash dividends occur on the same day, the cash dividends are processed first.

Finally cumfact starts with the value of 1 and is calculated for the period of the return in the following manner: for each day in the holding period, cumfact=cumfact*total adjustment factor

α_{j-dowm} , for the bull or up market they are $\beta_{j-down} + \beta_{j-up\_dowm}$ and $\alpha_{j-dowm} + \alpha_{j-up\_dowm}$.

3.2.2 Multi-factorial model

Fama and French (1993) and Carhart (1997) added three more factors to describe the return, namely size (SMB), book-to-market (HML) and momentum at one year (PR1YR) for the US market. Fama and French argue that the inclusion of two additional factors help explain the excess returns on an asset (or portfolio) far better than the CAPM. The addition of SMB (small minus big), or size, represents the average return on three small portfolios less the average return on three big portfolios. The inclusion of HML, or book-to-market equity, represents the average return on two value portfolios less the average return on two growth portfolios. Carhart (1 997) argues that the four-factor model's pricing is superior to the CAPM or the Fama and French three-factor model. He notes that the four factors correlations with each other and the market proxies can aid in explaining sizeable time-series variation. We construct multi-factorial model by adding these three risk factors into equation (3).

$$r_{tj} = \alpha_{j-dowm} + \alpha_{j-up-down} \cdot D + b_{j-down} \cdot r_{mt} + b_{j-up-down} \cdot r_{mt} \cdot D + s_{j-down} \cdot SMB_t + s_{j-up-down} \cdot SMB_{mt} + h_{j-down} \cdot HML_{mt} + h_{j-up-down} \cdot HML_{mt} \cdot D + p_{j-down} \cdot PR1YR_{mt} + p_{j-up-down} \cdot PR1TR_{mt} \cdot D + \varepsilon_{tj} \quad (4)$$

Small minus Big (SMB) is the mean return of the three small portfolios minus the mean return of the three large portfolios:

SMB= 1/3(Small Value + Small Neutral +Small Growth) −1/3(Big Value +Big Neutral +Big Growth)

High minus Low (HML) is the mean return of two value portfolios minus the mean return of two growth portfolios:

HML = 1/2(Small Value + Big Value)−1/2(Small Growth + Big Growth)

Regarding the momentum factor at one year (PR1YRt), Carhart (1997) describes how this is constructed, by calculating the equally−weighted mean portfolio formed by 30% of the securities that produced the highest returns over the last 11months, lagged one month, minus the equally−weighted mean portfolio formed by 30% of the securities that produced the lowest returns over the last 11months, lagged 1 period.

Equations (4) indicate how the timing ability works regarding different factors; that is, how the beta changes when the manager receives the timing signal. A manager with successful timing ability will enhance his exposure to a particular factor when the timing signal perceived provides him with information on which specific factor will have the best performance.

Chapter 4. Empirical results

4.1 The beta differential and alpha differential

From the 8475 mutual funds, we selected 3394 stock and balanced funds by confirming the composition of the funds and regressed them through ordinary least square method. The coefficients of each fund will be obtained.

Table 1 presents some summary statistics of the regression estimates of the parameters of eq. (3) for mutual stock and balanced funds using all samples data−available for each fund. The table presents the mean, median, extreme values estimates of α_{j-dowm}, α_{j-up_dowm}, β_{j-down}, β_{j-up_dowm}, and $\alpha_{j-dowm} + \alpha_{j-up\_dowm}$. As can be seen in the table the average α_{j-dowm} is 0.000235with a minimum value of −0.04731 and a maximum value of 0.042093.The average value of α_{j-dowm} is 0.000235 which indicates that on average the funds earned about 0.0235% more per month than they should have earned given their level of systematic risk in down market casing from selectivity ability .The average $\alpha_{j-dowm} + \alpha_{j-up\_dowm}$ is 0.000489 with a minimum value of −0.04425and a maximum value of 0.04351. We can see that funds have a better performance on bull market and also have a positive alpha measure on bear market.

Since the average value of β_{j-down} is 0.481982, on average these funds tend to hold portfolios which are less risky than the market portfolio in down market. The average β_{j-up_dowm} is −0.07605, on bull market, they reduced the systematic risk which means fund manager fail to time market risk.

Table1

Summary of estimated regression statistics for equation (3)

$$r_f = \alpha_{j-dowm} + \alpha_{j-up\_dowm} * D + \beta_{j-down} * (r_{mt}) + \beta_{j-up\_dowm} * (r_{mt}) * D + \varepsilon_{tj} \quad j=1, 2\cdots,$$

Item	Mean value	Meadian value	Extreme value	
			Minimum	Maximum
α_{j-dowm}	0.000235 (2.12189)	0.000259	−0.04731	0.042093
$\alpha_{j-up-down}$	0.000254 (1.658819)	−0.00043	−0.06764	0.050273
β_{j-down}	0.481982 (87.90162)	0.961044	−1.18476	2.65206

$\beta_{\text{j-up-down}}$	−0.07605 (−22.2803)	−0.05011	−1.75614	1.08781
$\alpha_{\text{j-dowm}} + \alpha_{\text{j-up-down}}$	0.000489 (4.702854)	5.64E_05	−0.044252	0.043513

Table 2 presents some summary statistics of the regression estimates of the parameter of eq. (4) adding SML, HML and momentum risk factors for all mutual stock and balanced funds. As can be seen in the table the average $\alpha_{\text{j-dowm}}$ is −0.00048 with a minimum value of −0.03903 and a maximum value of 0.039861.The average value of $\alpha_{\text{j-dowm}}$ indicates that on average the funds have a loss about 0.048% per month than they should have earned given their level of systematic risk in down market. The average $\alpha_{\text{j-dowm}} + \alpha_{\text{j-up\_dowm}}$ is −0.00198. Funds have a negative performance on bull market and also have a negative alpha measure on bear market. So, with regard to stock−picking ability, it can be concluded that the managers generally show perverse ability, reaching a significant negative α coefficient on both bull and bear market.

After adding size, value and momentum risk factors into model, sensitivity of market risk moves up comparing to one factor model. Fund returns respond to size, value and momentum factors displays not so much strong slopes. In terms of timing ability, the results achieved for managers indicate absence of ability to time the market and size risk because of the negative slope value of each risk differential equals to −0.08011, −0.00231,respectivily. Meanwhile, with regard to the momentum factor and value risk factors, the managers show positive ability, obtaining positive PR1YR and HML risk differential coefficients.

Table2

Summary of estimated regression statistics for equation (4)

$$r_{tj} = \alpha_{j-dowm} + \alpha_{j-up-down} \cdot D + b_{j-down} \cdot r_{mt} + b_{j-up-down} \cdot r_{mt} \cdot D + s_{j-down} \cdot SMB_t + s_{j-up-down} \cdot SMB_{mt} + h_{j-down} \cdot HML_{mt} + h_{j-up-down} \cdot HML_{mt} \cdot D + p_{j-down} \cdot PR1YR_{mt} + p_{j-up-down} \cdot PR1YR_{mt} \cdot D + \varepsilon_{tj}$$

Item	Mean value	Meadian value	Extreme value	
			Minimum	Maximum
α_{j-dowm}	−0.00048 (−4.67126)	−0.00077	−0.03903	0.039861
$\alpha_{j-up-down}$	−0.00151 (−12.6083)	−0.00104	−0.06915	0.052124
b_{j-down}	0.940931 (177.5964)	0.974546	−1.20585	2.77519
$b_{j-up-down}$	−0.08011 (−20.3918)	−0.0585	−2.04923	0.92456
s_{j-down}	0.128855 (23.52292)	0.048359	−1.08923	1.83659
$s_{j-up-down}$	−0.00231 (−0.61497)	0.005325	−2.56238	1.38622
h_{j-down}	−0.02909 (−4.8068)	−0.0372	−1.98209	2.69195
$h_{j-up-down}$	0.077457 (16.35208)	0.079259	−2.38337	2.09216
p_{j-down}	−0.00356 (−1.34598)	−0.01134	−1.10446	1.18997
$p_{j-up-down}$	0.03609 (14.1182)	0.0295	−1.738	1.3541
$\alpha_{j-dowm} + \alpha_{j-up\_dowm}$	−0.00198 (−20.526)	−0.00164	−0.03979	0.039409

As can be seen in Table 3, we do some statistical summary of eq.3 and eq.4 for all 3393 stock funds and balanced funds. The number of positive slope of risk factor differential, which also means successful timing ability for the market is 206, does not exceed 6 percentages of the 3393 stock funds and balanced funds. When we add other three factors into the model, from statistical summary of eq.4, it can be seen a little raising value of the percentages of timing ability for market risk, and timing abilities of value

factor and momentum factors account for more than 20% of the all stock funds and balanced funds. Fund managers have a good timing ability in these two risk factors.

Comparing to negative slope of risk factor differential, number of funds which do not have the timing ability of market risk factor is much more, but is much less of value and momentum risk factors. In a word, Funds timing ability of market are not so much, but fund managers do better timing abilities of value and momentum risk factors.

Table3

Statistical summary of eq.3 and eq.4 for stock and balanced mutual funds which have timing and selecting ability

model	Coef.(>0)	Number of funds	Significant at 10% percentage	Numberof funds	Significant at 5% percentage	Number of funds	Significant at 1% percentage
Eq. 3	$\alpha_{j-up-down}$	503	14.8%	308	9.1%	92	2.7%
	$\beta_{j-up-down}$	206	5.6%	121	3.6%	31	0.91%
Eq. 4	$\alpha_{j-up-down}$	274	8.1%	136	4.0%	45	1.3%
	$b_{j-up-down}$	358	10.5%	208	6.1%	65	1.9%
	$s_{j-up-down}$	435	12.8%	270	7.9%	93	2.7%
	$h_{j-up-down}$	946	27.9%	558	16.4%	208	6.1%
	$p_{j-up-down}$	1009	29.7%	732	21.6%	332	9.8%

Note: % is calculated with 3394 funds. (For example: 14.8%=503/3394)

Table4

Statistical summary of eq.3 and eq.4 for stock and balanced mutual funds which do not have timing or selecting ability

model	Coef.(<0)	Number of funds	Significant at 10% percentage	Numberof funds	Significant at 5% percentage	Number of funds	Significant at 1% percentage
Eq. 3	$\alpha_{j-up-down}$	564	16.6%	293	8.6%	59	1.7%
	$\beta_{j-up-down}$	877	23.7%	583	17.1%	178	5.2%

Eq. 4	$\alpha_{j-up-down}$	413	12.2%	178	5.2%	23	0.68%
	$b_{j-up-down}$	1099	32.3%	832	24.5%	476	14.0%
	$s_{j-up-down}$	423	12.5%	259	7.6%	67	1.9%
	$h_{j-up-down}$	267	7.9%	142	4.2%	55	1.6%
	$p_{j-up-down}$	484	14.3%	301	8.9%	129	3.8%

Note: % is calculated with 3394 funds. (For example: 16.6%=564/3394)

4.2 Relation between select ability and timing ability

Treynor ,Mazuy (1966) and Jagannathan(1986) have already pointed that when the proxy for the market portfolio contains option-like securities, portfolios with greater(lower) concentration in option-like securities will show positive(negative) timing performance and negative(positive) selectivity. In this paper, when we divided alpha into bull and bear market, we will investigate relationship between select ability and timing ability both on bull and bear market by regression equation(5).

$$\widehat{RISK}_{up-down-j} = a + b \cdot \widehat{ALPHA}_{up-down-j} + \varepsilon_j \qquad (5)$$

On bear and bull market, selectivity negatively correlates with timing ability of market, which means for most of the funds, when timing ability is positive selectivity is negative. In multi-factorial model, timing ability of size, value and momentum factors give some different results.

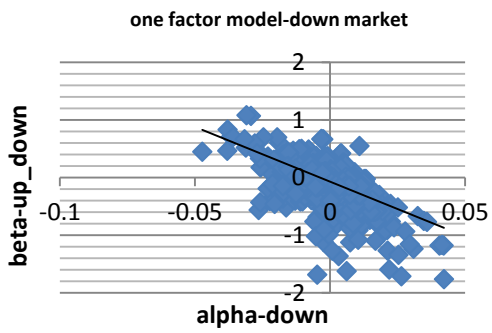
Relationship between selectivity and timing ability of size, value and momentum factors is a little murky. On bull market, no correlation can be seen from selectivity and timing ability. The scatter disperses a lot.

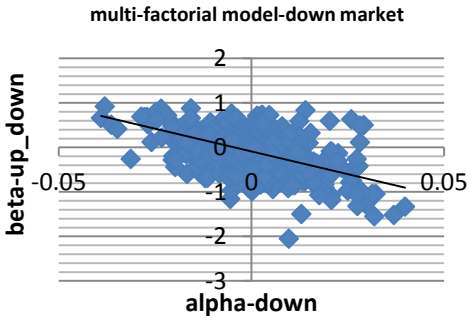
Table5

Summary of estimated regression statistics for equation (5)

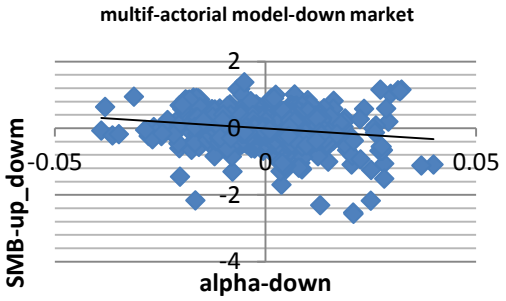
$$\widehat{\mathrm{RISK}}_{\mathrm{up-down-j}} = \mathrm{a} + \mathrm{b} \cdot \widehat{\mathrm{ALPHA}}_{\mathrm{up-down-j}} + \varepsilon_{\mathrm{j}};$$

One factor model				
		Coef.	*t−value*	*R−square*
alpha−down; beta−up_down	a	−0.0716	−26.6073	0.3800
	b	−19.0175	−47.5472	
alpha_up ; beta_up_down	a	−0.0702	−22.0084	0.1325
	b	−11.9465	−23.7325	
	d	−0.1936	−19.8785	
Multi−factorial model				
		Coef.	*t−value*	*R−square*
alpha−down; beta−up_down	a	−0.0896	−26.8190	0.2785
	b	−20.3469	−37.7350	
alpha_down ; SMB_up_down	a	−0.0064	−1.5372	0.0370
	b	−8.0436	−11.9059	
alpha_down ; HML_up_down	a	0.0757	16.0206	0.0045
	b	−3.1209	−4.0918	
alpha_down ; PR1YR_up_down	a	0.0346	9.9893	0.0090
	b	−3.2425	−5.8012	
alpha_up ; beta_up_down	a	−0.0934	−22.8611	0.0276
	b	−6.7469	−10.2397	
alpha_up ; SMB_up_down	a	−0.0303	−7.1183	0.1007
	b	−13.9664	−20.3228	
alpha_up ; HML_up_down	a	0.0519	10.7869	0.0681
	b	−12.7539	−16.4186	
alpha_up ; PR1YR_up_down	a	0.0289	7.9393	0.0103
	b	−3.6400	−6.1907	
	d	−0.8432	−48.2986	





Picture1



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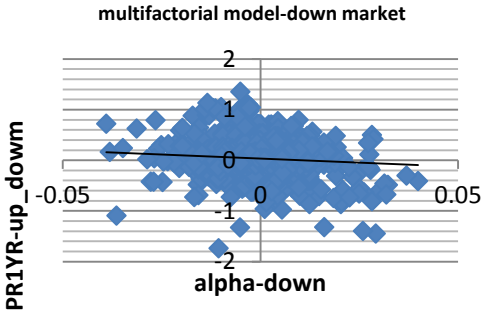

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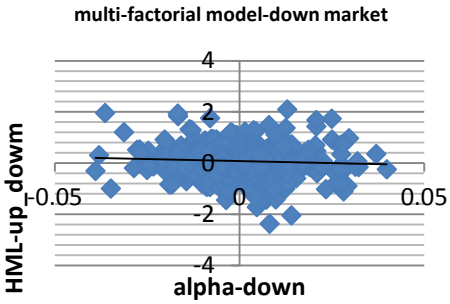
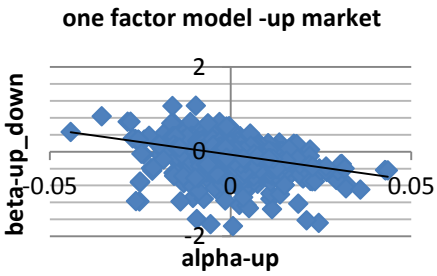
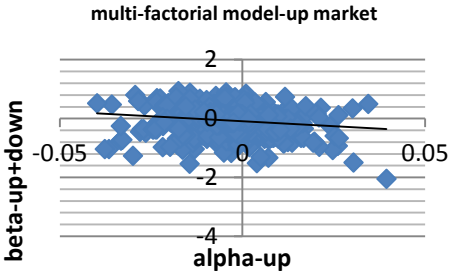


Picture4

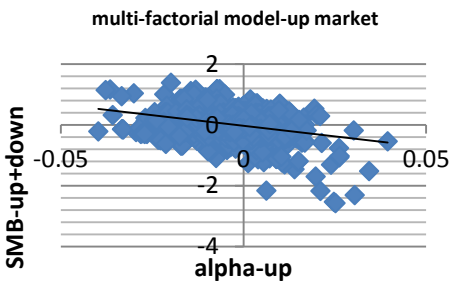
Picture5



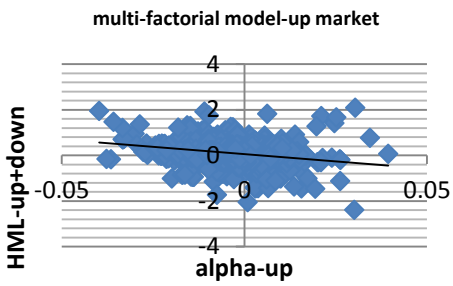


Picture6

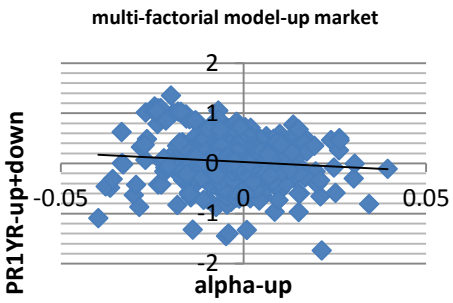
Picture7



Picture8



Picture9



Picture10

4.3 Relation between systematic risk and risk differential.

The reason to see relationship between systematic risk and risk differential is from the thinking that funds also have different timing ability and select ability. We find from picture1 to 10 that, some funds adjust risk with correspondent factors in a very sensitive way. We may get a reason from the relationship between systematic risk and risk differential.

$$\widehat{\mathrm{RISK}}_{\mathrm{up-down-j}} = c + d \cdot \widehat{\mathrm{RISK}}_{\mathrm{down-j}} + \epsilon_j \qquad (6)$$

From the result of regression equation (6), r−square of equation ranges from 0.09 to 0.38. Value and momentum factor get a linear relation in picture14 and 15 with r−square value more than 0.3. Variation of risk differential is explained by the risk.

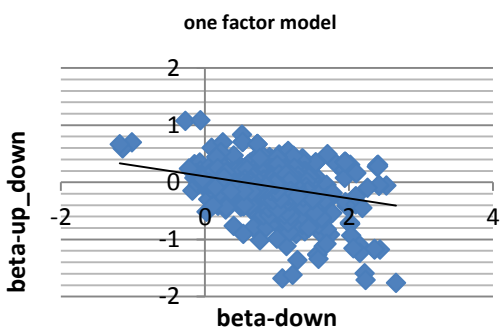
The more sensitivity with the factor, the more adjusted risk value the fund will have. As to market condition and size factors, a similar reason with value and momentum factors could also be found.

Table6

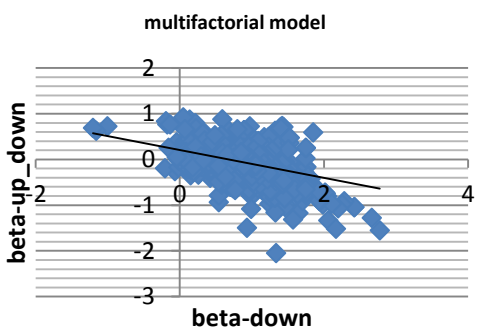
Summary of estimated regression statistics for equation (6)

$$\widehat{\mathrm{RISK}}_{\mathrm{up-down-j}} = \mathrm{c} + \mathrm{d} \cdot \widehat{\mathrm{RISK}}_{\mathrm{down-j}} + \epsilon_{\mathrm{j}}$$

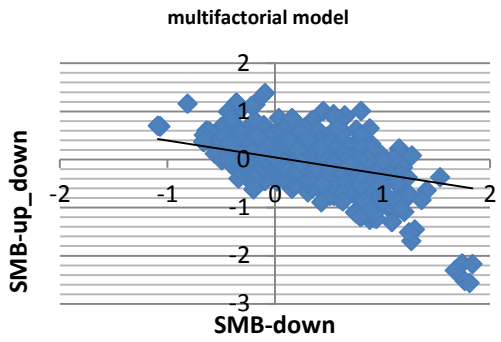
One factor model				
		Coef.	*t−value*	*R−square*
Beta_down;	c	0.1032	10.7672	0.0968
beata_up_down	d	−0.1936	−19.8785	
Multi−factorial model				
	.	*Coef.*	*t−value*	*R−square*
Beta_down;	c	0.2075	18.7996	0.1704
beata_up_downd	d	−0.3058	−27.5261	
SMB_down;	c	0.0424	10.3945	0.2021
SMB_up_downd	d	−0.3494	−30.5694	
HML_down;	c	0.0640	16.6173	0.3397
HML_up_down	d	−0.4639	−43.5683	
PR1YR_down;	c	0.0332	12.2367	0.3874
PR1YR_up_down	d	−0.8432	−48.2986	



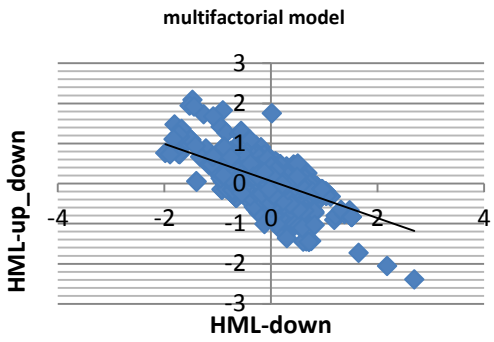
Picture11



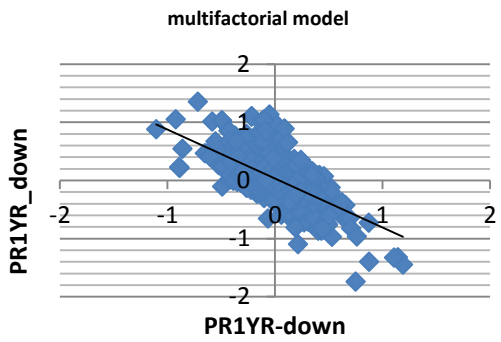
Picture12



Picture13



Picture14



Picture15

Chapter 5. Conclusion

Mutual fund managers outperforming the market at different periods in the market cycle has become a topic of much interest. This work studies whether or not fund managers are able to outperform the market on a risk adjusted basis and whether alpha for mutual funds in US market is different on bull and bear market, from a comparative point of view, between one factor and multi−factorial models. More specifically, the paper examines whether mutual fund managers perform better in bear markets than in bull markets. The second goal is to determine if the fund manager has timing ability of the whole

market risk factor, size risk factor, value risk factor and momentum risk factor.

All the analyses are carried out on a sample of US mutual funds from CRSP mutual fund database for the period from January 1961 to march 2015 (free of the survival bias). As far as we know, this is the first paper to carry out such a comparative analysis, with regard to stock-picking and timing abilities both on bull and bear market, considering one factor model and extending the model by introducing the 4 fama-French and Carhart risk factors in order to use all information to explain the return of portfolio by implement these factors.

The select ability on bull market and bear market of mutual funds has been analyzed in prior work [FRANK J. FABOZZI (1979)].The paper is focused on the performance differential and beta differential of a sample of US mutual funds. The tests performed extended Jensen's Alpha (1968) and the Fabozzi and Francis (1979) test for bull and bear market parameters by testing two different asset pricing models: the CAPM one factor model, the Fama- French and the Carhart four-factor model. Our paper extends studies in several fields: first, we analyzed the use of 4 Fama-French and Carhart factors; second, we analyzed the relation between select ability and timing ability on bull and bear market; third, we studied the relation between systematic risk and risk differential to explain the different timing ability of the funds.

The evidence obtained leads us to conclude that on average, there is little evidence for the timing ability of market factor, both in traditional model and multi-factorial model, same with the timing ability of the size factor. While the value and momentum factors shows better timing ability from the manager. Two models give us different results regarding to outperform the market on a risk adjusted basis. Model1 shows that managers successfully outperform the market and model2 shows a opposite result. Select abilities in bull are better than bear market, which means the resulting of a better performance in bull market.

As for the statistical summary of successful timing ability of each factor of funds, the empirical evidence on timing ability seems to indicate that significant timing ability is rare, funds number of successful timing ability for

market risk is the smallest, but fund managers do better on timing the value and momentum risk factors.

Finally, with regard to the relation between select ability and timing ability, we find the similar negative correlation between select ability and market risk differential with prior literatures. We also find that some fund which has high sensitivity when adjust the risk also has a high absolute systematic risk value. However, the reason of the correlation feature between select and timing ability of different risk factor may be a remained question in this paper. We hope more interpretations about this question in the future.

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Abstract in Korea

초 록

본 논문은 불(bull) 시장과 베어(bear) 시장에서 뮤추얼 펀드(mutual fund) 체계적 위험과 퍼포먼스(performance)를 분석했다. 이 분석은 확장된 "하나의 요인"CAPM 전통 모델과 '사이즈(size) 위험', '밸류(value) 위험', '모멘텀(momentum) 위험' 등 요소를 추가하여 구성된 여러 요인 모델을 통해 분석한 것이다. 그 결과, 미국 뮤추얼 펀드 시장은 시장 위험과 사이즈 위험에 대한 성공적인 타이밍 능력을 가지고 없음을 보여 줬으나, 밸류 위험,모멘텀 위험을 타이밍 할 때 더 성공적인 것이다. 알파의 퍼포먼스는 불 시장과 베어 시장에서 모두 측정되었다. 일반적으로, 알파는 베어 시장보다 불 시장에서 더 나은 퍼포먼스를 한다. 다른 주목할 만한 연구 결과는 알파 퍼포먼스와 위험 차이 사이의 관계는 다른 위험 요소에 다른 특징을 제공한다는 것이다. 마지막으로, 우리는 위험과 위험 차이 사이의 관계도 관찰하였다.

주요어: 알파 디퍼렌셜(alpha differential); 체제적 위협 디퍼렌셜; 불(bull) and 베어(bear) 시장;

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