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A Different Approach to Jensen's Alpha and Its Relationship with Returning Ranking

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Abstract

Based on Michael C. Jensen's CAPM model (1968), this paper refines it with dummy variables included. It examines if fund manager's skill is contributing to fund's performance within a five-year span from June 2009 to June 2014, and if high total return ranking is related to outstanding Jensen's Alpha. The findings coincide with Jensen's research results.

Keywords

Jensen's Alpha, Econometrics, Returning Ranking, Fund

Cover Page Footnote

I would like to show my deepest gratitude to my supervisor Dr. Maria E. Canon, a respectable and inspirational scholar who has taught ECON413, an introductory course of Econometrics, during my sophomore year. She provided me with valuable guidance in every stage of this project. She also assisted me throughout the development of the model and supported me with programming in STATA.I shall extend my thanks to Ms. Bo Wang, for all her kindness and help as a TA for the course.

I. Introduction

A fund manager is someone who possesses high level of educational background and professional credentials and profound investment managerial experience. In order to qualify for this position, the manager has to boost the fund's performance. Fund with outstanding returns depends on market's fluctuation and manager's selection ability.

However, do fund managers actually possess the true ability to contribute to the fund's returns? Is the elevating mutual fund performance and high returns based on a manager's skill of picking stocks or is it just a matter of fact of market going up or down? This paper uses a dummy variable approach to determine whether the fund managers of top US mutual fund companies are outweighing market risk among the period from June 2009 to June 2014 month by month, and if we should trust fund managers based on their performance in improving the fund's return.

The term "Jensen's Alpha" was first introduced by Michael C. Jensen in 1968 and known as a measure that represents the average return on an asset predicted by the Capital Asset Pricing Model (CAPM), given the portfolio's beta and the average market return (Jensen 1968, p.390). This paper also examines the fund-characteristic captured by Jensen's Alpha and its relationship with 5-year returning ranking by a different approach using dummy variables.

II. Theoretical Model

- The Foundations of the Model

According to Jensen's article "The Performance of Mutual Funds in the Period 1945-1964", he evaluates the performance of fund manager on risky investments by examining the ability to increase returns on the portfolio through successful predictions of market risk. The well-known CAPM model generates Jensen's Alpha, the intercept term of his model, as a measure of forecasting ability or fund selection skill of fund manager (Jensen 1968, p.393).

Jensen's CAPM model can be written as:

$$\text{Jensen's CAPM model}: R_{i,t}-R_f = \alpha_i + B_i (R_{m,t} - R_f)$$

Where $R_{i,t}$ is the return on series or portfolio during the time period t; R_f is the risk free rate; $R_{m,t}$ is the return on market during the same time frame.

The CAPM model relates the excess return of the series or portfolio, the difference between the return on a particular series and the risk-free rate (Ri,t-Rf), as the dependent variable and the market risk premium, the difference between the expected return of the market and the risk-free rate (Rm,t- Rf), as independent variable (Sawicki, and Ong 2000, p.3).

Beta (Bi) is the measurement of activeness of a fund's returns in response to swings in the market or the systematic risk of the market; alpha (αi) is the measure of the manager’s performance after eliminating the systematic risk.

- **The Model**

The data analysis is performed using the CAPM model. Dummy variable regression is chosen because it is a device to find out if two mean values are different. Since not only the intercepts but also the slope coefficients vary between each funds, an extra variable Dn (Rm,t- Rf) is added to the model. Furthermore, because of the preference on the minimizing the luck factor of manager’s ability, a large set of observations is preferred in order to make the model more accurate. The baseline specification is therefore:

$$Ri,t-Rf = \alpha p + Bp\,(Rm,t- Rf) + \alpha 1\, D1 + B1\, D1\,(Rm,t- Rf) + \alpha 2\, D2 + B2\, D2\,(Rm,t- Rf) + \ldots + \alpha n\, Dn + Bn\, Dn\,(Rm,t- Rf) + \ldots + \alpha p\text{-}1\, Dp\text{-}1 + Bp\text{-}1\, Dp\text{-}1\,(Rm,t- Rf) + \alpha p{+}1\, Dp{+}1 + Bp{+}1D\, p{+}1\,(Rm,t- Rf) + \ldots + \alpha i\, Di + Bi\, Di\,(Rm,t- Rf) + u$$

$$Dn = \begin{cases} 1 \text{ if fund's ranking} = n \\ 0 \text{ if fund's ranking} \neq n \end{cases}$$

$$E\,(Ri,t-Rf \mid Dn = 1) = (\alpha p + \alpha n) + (Bp + Bn)\,(Rm,t- Rf)$$

n - the high-to-low ranking derived from return rank (1,…,(p-1), (p+1),…i), where i is the last term on the ranking
u - Error term

The foundational model, or the Jensen’s equation, is utilized separately on each of the sample funds in the returning ranking, thus getting “n” number of corresponding alphas and betas. Out of the n’s alphas, the base alpha of the new model is determined by the fund with alpha closest to zero. Since this fund is ranked at p^{th} place in the ranking, the intercept term of the new model is defined as αp. Then, (i-1) dummies are generated for each of the rest of the funds, and we define the footnote of each coefficient based on their return rankings.

The differential intercept coefficient, or the alphas (αn), represents by how much the n^{th} fund is performing better than the base alpha ranked p^{th} on their manager's selection ability on average. To compute the true mean value of the Jensen's alpha of each fund, the value of the coefficient of the dummy variable has to be added to the intercept value, namely, (αp + αn).

Similarly, Bn, the differential slope coefficient represents by how much of the slope coefficient of the market risk premium differs between the two funds. It also measures by how much of the tendency the n^{th} fund's return is responding to the market's systematic risk. The sum of (Bp + Bn) is the fund's actual mean beta of n^{th} fund.

Since the base fund has Jensen's Alpha roughly equal to zero, the rest of the differential intercept coefficients (αn's) are indicating whether or not the mean values of their alphas differ. In other word, the goal of this model is to figure out whether or not the alphas of the funds are statistically different from zero and get the true Jensen's Alphas of each fund.

- **Hypothesis**

The null hypothesis is that the Jensen's Alpha is equal to zero, which is the same as saying that the manager's investment has earned a return adequate for the risk taken. In the dummy variable model, the main hypothesis is that the differential intercept coefficient (αn) is equal to zero. In other words, the null hypothesis that H0: $\alpha n = 0$; if we reject the null, we get H1: $\alpha n \neq 0$.

If we fail to reject the null hypothesis, then it is an indicator that high fund return is only caused by systematic risk, and that manager's ability has no effect on facilitating fund performance. However, if the alpha is significant and bigger than zero, the manager has outweighed the effect of systematic market on the fund and is making a difference on the performance of the fund. Individuals could bet on those fund managers and say that they've helped their investment in a positive way. Instead, the manager is just wasting time and money and taking advantage of the market ups and downs. The goal is to find out the number of funds, each with different alphas (αn's), is outperforming the market.

III. Data Description

The sample consists of data throughout the top 40 large-cap value funds that are 5-stars-rated on total returns by Lipper Leader in a 5-year period spanning from June 2009 to July 2014, sorting by month, which would result in 2440 observations (40 funds times 61 months). In addition, the funds are under the asset type of equity and of any fund family.

Ri,t is the return on a particular series or portfolio that we are observing, computed by the monthly rate of change of adjusted closed price. Each of the forty funds has its own corresponding Ri,t throughout each of the 61 months. Rf is the risk free rate, that is, rate of return associated with an asset that provides a guaranteed return. The best representation would be the 1-month T-bill of US, since it is issued by the US government to support government spending. It is a relatively safe investment that carries a very small amount of risk. Rm,t is the return on market, which is the monthly rate of change of the US S&P500 index. Since the S&P500 index is based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ, it is relatively compatible with the large-cap value funds' performance.

Lipper Leader is a trustful agent where strong assessments are taken. The raking is based on the percentage of five-year returns. We compare the funds in the ranking list to see if Jensen's Alpha of each fund has patterns relative to the ranking, contributing positive aspects to the fund, and whether these "outstanding" funds are consequences of fund manager's ability of asset selection.

Referring to the basic descriptive statistics for each of the 40 variables (Table-1), we get the mean of the market risk premium (Rm,t- Rf) is about 1.267, with standard deviation of 3.811, minimum of -8.348 and max of 10.772 (%). The mean of the excess return from investing (Ri,t-Rf) of the entire forty funds (2440 observations) is 1.518%; the summary statistic of excess return of each fund during the period of 61 months is also attached to the graph. Among the 40 funds, their mean and standard deviation of excess return is similar to each other. Table-1 gives the basic descriptive statistic, where the term "rmrf" represents (Rm,t- Rf); "rirf" represents (Ri,t-Rf).

Table-1

Variable |	Obs	Mean	Std. Dev.	Min	Max
rmrf |	2440	1.26747	3.811396	-8.347591	10.7723
rirf |	2440	1.517611	4.209335	-10.32612	14.58154
rirf 1|	61	1.575396	3.376776	-7.002409	10.2546
rirf 2|	61	1.515887	3.388047	-6.900572	10.30369
rirf 3|	61	1.521815	3.6665	-7.686765	11.78145
rirf 4|	61	1.496431	3.386116	-7.050453	10.22605
rirf 5|	61	1.721024	4.853905	-10.15514	13.868
rirf 6|	61	1.704249	4.870666	-10.07917	13.94737
rirf 7|	61	1.475119	3.378498	-6.980907	10.25641
rirf 8|	61	1.710886	4.849993	-10.10969	13.77806
rirf 9|	61	1.684837	4.83595	-10.1229	13.73569
rirf 10|	61	1.433661	3.372485	-7.057895	10.11591
rirf 11|	61	1.527586	4.247048	-8.660638	11.82365
rirf 12|	61	1.554875	4.670069	-9.440817	14.58154
rirf 13|	61	1.568172	4.202612	-8.77069	11.75299
rirf 14|	61	1.631874	4.873523	-10.32612	13.87941
rirf 15|	61	1.555286	4.204762	-8.595298	11.57685
rirf 16|	61	1.551513	4.221258	-8.721429	11.70635
rirf 17|	61	1.521671	4.672635	-9.453562	14.53745
rirf 18|	61	1.577599	4.331738	-9.268236	12.12452
rirf 19|	61	1.597767	4.543091	-8.824532	12.10486
rirf 20|	61	1.556644	4.416975	-9.506179	11.37951
rirf 21|	61	1.531357	4.212496	-8.672728	11.68317
rirf 22|	61	1.562356	4.337397	-9.25921	12.15622
rirf 23|	61	1.500288	4.664743	-9.462265	14.45035
rirf 24|	61	1.47663	3.585313	-8.239501	9.253066
rirf 25|	61	1.581068	4.555019	-8.788563	12.09553
rirf 26|	61	1.51143	4.177276	-8.102872	11.02403
rirf 27|	61	1.365669	4.078757	-8.010867	11.71216
rirf 28|	61	1.514256	4.134209	-8.347452	11.70131
rirf 29|	61	1.504377	4.159407	-8.586578	11.94888
rirf 30|	61	1.496724	4.186547	-8.101219	10.98386
rirf 31|	61	1.558015	4.544082	-8.845653	12.08207
rirf 32|	61	1.555263	4.588512	-8.97016	12.75773
rirf 33|	61	1.598992	4.307498	-8.375617	10.97411
rirf 34|	61	1.40109	3.252042	-7.699361	8.709892
rirf 35|	61	1.033399	4.498147	-9.397564	11.61417
rirf 36|	61	1.49535	4.131813	-8.423362	11.7737
rirf 37|	61	1.490065	4.202014	-8.862122	11.57685
rirf 38|	61	1.132029	4.373526	-8.5875	12.37942
rirf 39|	61	1.482593	4.140623	-8.584431	11.85696
rirf 40|	61	1.431199	4.164341	-8.177099	12.00658

IV. Empirical Model to be Estimated

Using the CAPM model separately on each of the 40 funds, we get 40 corresponding alphas and betas. Out of these alphas, the fund with alpha closest to zero is ranked at 23rd place in the return ranking, thus the base fund's alpha is $\alpha 23$, which is roughly .033. It is also the Jensen's Alpha for Fund SLVRX (Columbia Select Large-Cap Value R). Then, 39 dummies on each of the rest of the funds are generated, and we define the footnote of each coefficient based on their return rankings. To compute the true mean value of the Jensen's alpha of each fund, we need to add the value of the coefficient of the dummy variable to the intercept value. The baseline specification is:

$$Ri,t\text{-}Rf = \alpha 23 + B23\ (Rm,t\text{-}\ Rf) + \alpha 1\ D1 + B1\ D1\ (Rm,t\text{-}\ Rf) + \alpha 2\ D2 + B2\ D2\ (Rm,t\text{-}\ Rf) + \ldots + \alpha 22\ D22 + B22\ D22\ (Rm,t\text{-}\ Rf) + \alpha 24\ D24 + B24\ D24\ (Rm,t\text{-}\ Rf) + \ldots + \alpha 40\ D40 + B40\ D40\ (Rm,t\text{-}\ Rf) + u \quad (1)$$

$$Dn = \begin{cases} 1 \text{ if fund's ranking} = n \\ 0 \text{ if fund's ranking} \neq n \end{cases}$$

$$E\ (Ri,t\text{-}Rf \mid Di = 1) = (\alpha 23 + \alpha n) + (B23 + Bn)\ (Rm,t\text{-}\ Rf)$$

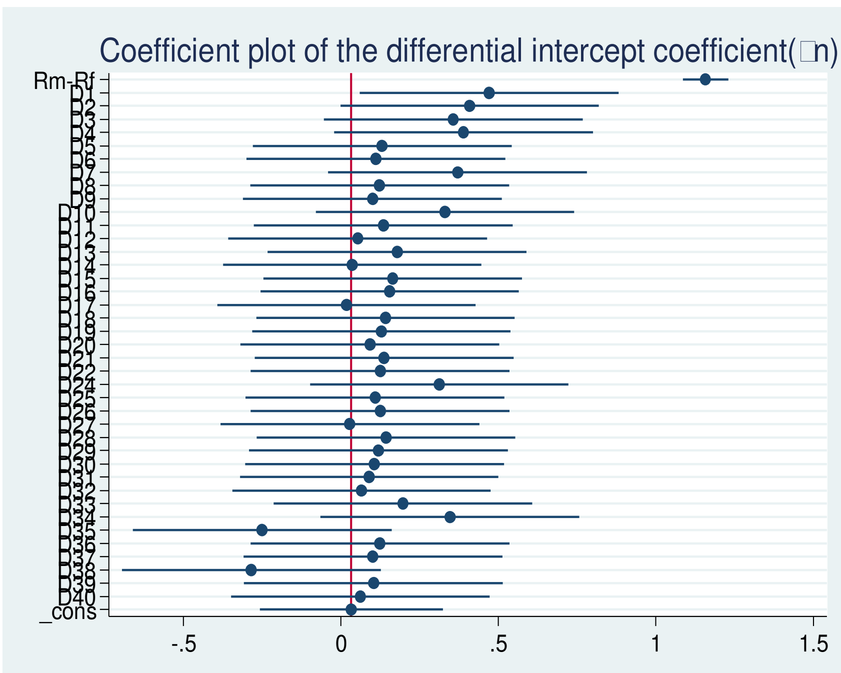
Since the differential intercept coefficient, or the alphas (αn), represents by how much the nth fund is performing better than the Fund SLVRX on their manager's selection ability on average, the sum of ($\alpha 23 + \alpha n$) gives the mean manager's Jensen's Alpha for the n^{th} fund. As an example, if we add ($\alpha 23$) to each individual coefficient of the dummy variables (αn), we would get the true Jensen's alpha of each fund. The Jensen's Alpha for fund1 is ($\alpha 23 + \alpha 1$) and that of fund 2 is ($\alpha 23 + \alpha 2$) etc. Similarly, the sum of (B23 + Bn) is the fund's actual mean beta of nth fund.

The null hypothesis is that the differential intercept coefficient is equal to zero ($H0 : \alpha n = 0$), meaning that there's no significant difference in the mean alpha of the base Fund SLVRX and the nth sample fund . The hypothesis is same as saying that the true Jensen's alpha of n^{th} fund is insignificant. By running regressions in the usual ordinary least squares manner, we are able to find out whether or not the computed αn is statistically significant on the basis of t-test.

V. Estimation and Results

Figure-1 is the coefficient plot of the dummy variable coefficients, namely, the αn of each fund. For example, coefficient of D1 has a corresponding plot of .471. The bottom term _cons is the intercept of the model, which is the base alpha of Fund SLVRX. The vertical red line through the plot of _cons is an indicator of the alpha value of Fund SLVRX. We can observe that most of the points are skew to the right, which means that most of the difference alphas are positive, and most of the funds seems to perform better than the base fund which has Jensen's Alpha roughly equal to zero.

Figure-1 Coefficient plot of the differential intercept coefficient



There are left-skewed points on the graph that suggest the presence of negative Jensen's Alpha. According to Jensen's study, he finds out that "76 funds having alpha < 0 and only 39 with α > 0. It is possible for a fund manager to do worse than a random selection policy since it is easy to lower a fund's returns by unwisely spending resources in unsuccessful attempts to forecast security process" (Jensen 1968, p.405).

Despite of the fact that most of αn's are larger than the base alpha, very few fund managers actually possess significant Jensen's alpha. The two-tailed critical t-value with degrees of freedom of 2360 (n-numbers of parameter = 2440-80) at 5% level of significance is 1.961 = tc. If the computed t-value of each dummy coefficients (αn) exceeds the critical t-value, then we would reject the null hypothesis that $\alpha n = 0$, and conclude that the fund has significant Jensen's alpha, and that the alpha is significantly different from zero.

However, if we take a closer look of the regression result, out of the 39 funds (excluding Fund SLVRX), only one fund, which is Fund 1 ranked the highest, has significant alpha. It has computed t-value of 2.25, which exceeds tc , and p-value of 0.025, which is below the level of significance of 0.05. The rest of dummy coefficients are insignificant. If we were to set the significance level to 10%, the two-tailed critical t-value would be 1.64549957 = tc . Out of the 39 funds, 6 funds with ranking 1, 2, 3, 4, 7 and 34 are significant. The changing of significance level to a higher level still generates only 15% of funds having significant alphas.

The results coincide with Jensen's research. He collects the portfolios of 115 open end mutual funds for the ten-year period and finds out that only 3 funds have significantly positive alphas and that most of the alphas are insignificant and even negative. He concludes there's little evidence that any individual fund was able to do significantly better than that which we expected from mere random chance. It's necessary for the fund managers to provide investors with maximum possible returns for the level of risk undertaken by focusing on their true asset selection and forecasting ability (Jensen 1968, p.415).

Figure-2 plots the resulting Jensen's alphas of each fund; the x-axis is denoting the funds with their corresponding return rankings. From the graph, we get that most of the alphas are positive and between the range of 0-0.2, there are some seemingly outstanding alphas around the top rankings and only one or two in the middle till the end of the ranking graph, while two funds having alphas below zero. The mean of the alphas is about 0.17 with maximum at 0.5 and minimum little below zero (Table-2). No alphas are higher than 0.6. There isn't an obvious downward trend of the plots as the ranking is getting lower and 5-year return decreasing (Figure-2). This matches the result from the regression model that few fund manager possesses significant alphas, namely, asset selection and prediction ability, and that the high return of funds does not have obvious relationship with the manager's skill.

Figure-2 True Jensen's Alpha of each fund

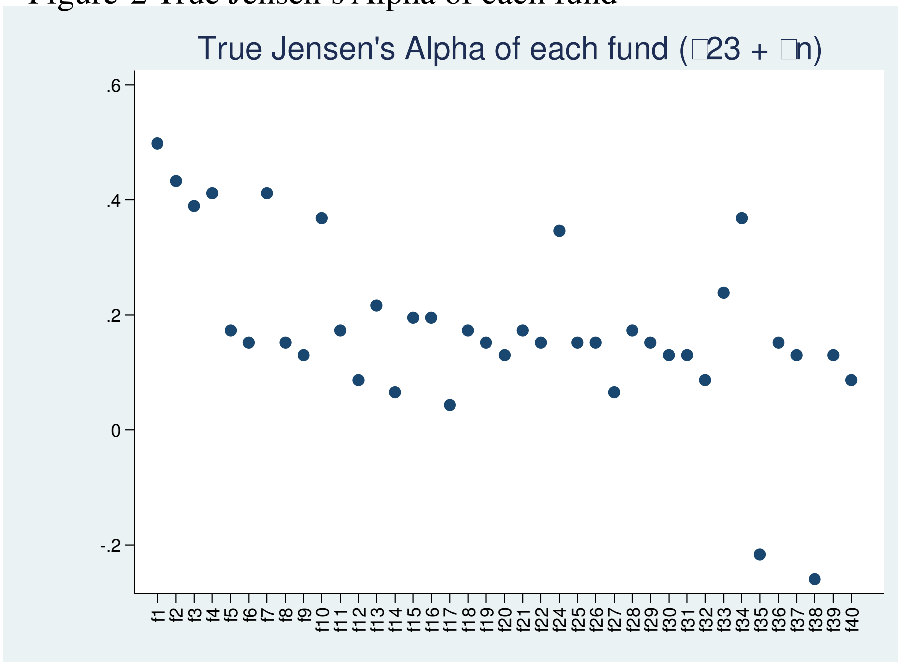


Table-2: Summary Statistic of the Jensen's Alpha

Variable |	Obs	Mean	Std. Dev.	Min	Max
a |	40	.1736845	.1503174	-.251898	.5032389

Figure-3 indicates the betas of each fund. The average of the Betas is 1.06, which is almost one, which means most of the well-performing funds are dependent on the market risk premium (Table-3). Most of the fund's return will move with the market. The maximum beta is still not high enough, which is 1.23, it's theoretically 23% more volatile than the market. As can be seen from the graph, 9 of the funds have betas below one, meaning that the fund will be less volatile than the market. The fund managers are not taking much selection risks to outperform the market or nor independent of market ups and downs.

Figure-3 Betas of each fund

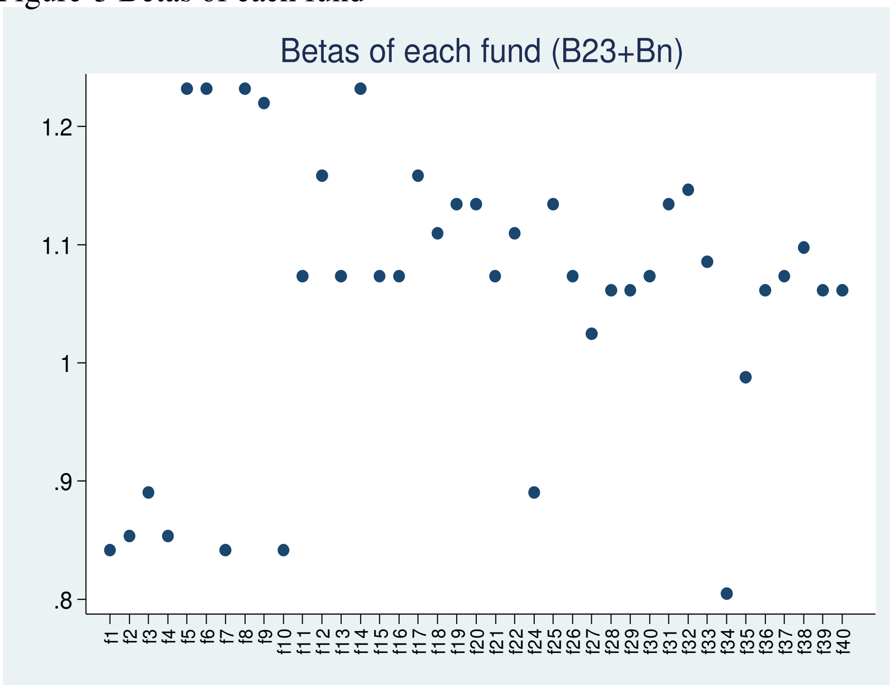


Table-3: Summary Statistic of Beta

Variable |	Obs	Mean	Std. Dev.	Min	Max
b |	40	1.060322	.1202268	.8067966	1.233829

VI. Additional Tests

(1) Multicollinearity

The regression results have high R-squared (= 0.9342) and significant computed F-value (F(79, 2360) = 424.18) , but very few significant t-ratios, which suggests the possibility of multicollinearity. After computing the variance inflation factor for each of the variables, we could get Table-4. It shows that only the variable of (Rm,t-Rf) has relatively high VIF, while the rest of the variables do not have severe multicollinearity.

Table-4: Variance Inflation Factor (VIF) for Each Variables from the Original Model

Variable	VIF	1/VIF
rmrf	40.00	0.025000
D1rmrf	2.22	0.451318
D2rmrf	2.22	0.451318
Dirmrf	2.22	0.451318
D1	2.17	0.461737
D2	2.17	0.461737
Di	2.22	0.451318
Mean VIF	2.67	

*rmrf – ($R_{m,t}$- R_f) ; D1rmrf - D_1 ($R_{m,t}$- R_f) ; D2rmrf – D_2 ($R_{m,t}$- R_f) ; Dirmrf - D_i ($R_{m,t}$- R_f) ; D1- D_1 ; D2 – D_2 ; Di – D_i ; i is from 1 to 40 except 23;

(2) Heteroscedasticity

From the scatterplot of Figure-4, we can see that the squared residuals exhibit a pattern against the fitted (Ri,t-Rf). The histogram of squared residuals shows a highly concentrated region to the left of the graph (Figure-5). Both of these graphs suggest the squared residuals are systematically related to estimated excess returns, supporting the doubt of heteroscedasticity.

When we perform the Breusch-Pagan Test on the model, we get the following result:

Breusch-Pagan LM statistic: 1275.778 Chi-sq(79) P-value = 3.e-215

Since the P-value is less than 5% level of significance, we reject the null of no heteroscedasticity.

Figure-4 Test for Heteroscedasticity; Scatter plot of residuals vs. fitted excess return

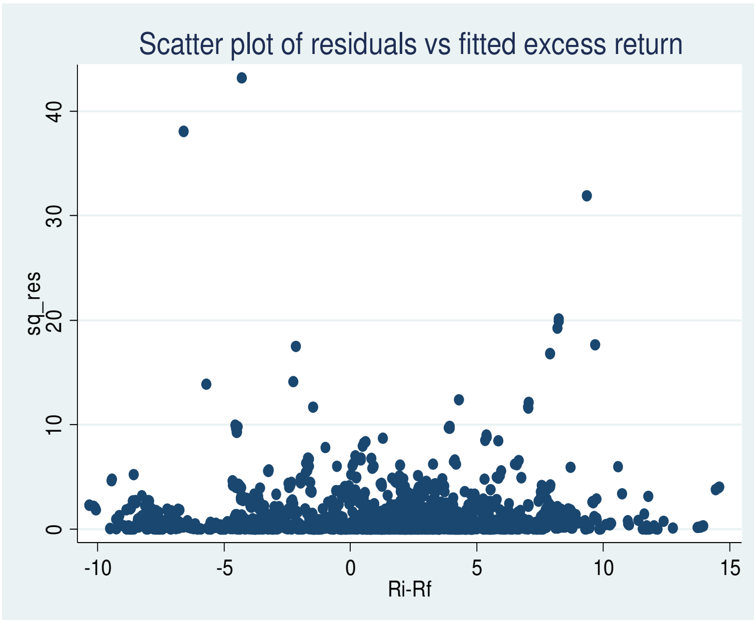
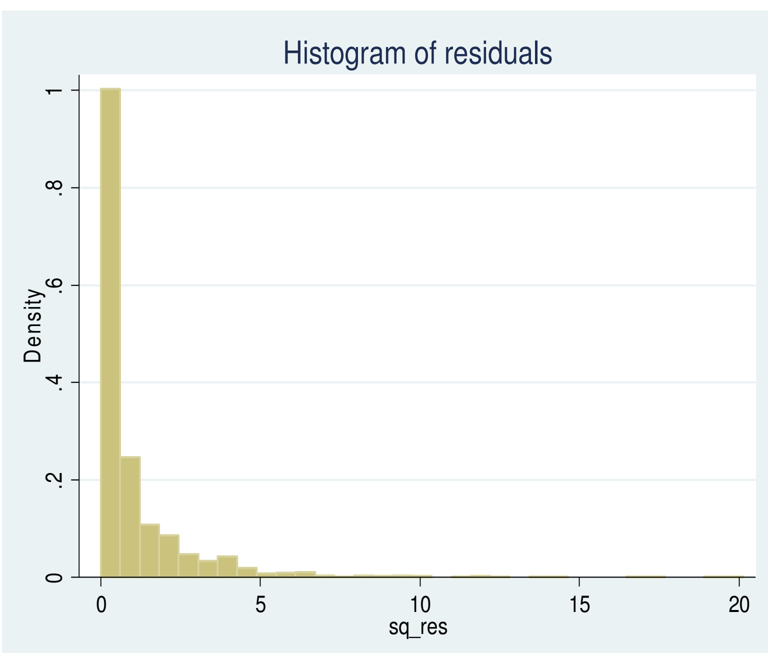


Figure-5 Test for Heteroscedasticity; Histogram of residuals



(3) Remedial Method

The model may contain too many variables and observations. If sample size is smaller, say the model were refined to include only those funds with statistically significant alphas from the initial model (funds 1, 2, 3, 4, 7, 34) at 10% significant level, and run the same dummy variable regression, we get the following improved model:

Ri,t-Rf = α23 + B23 (Rm,t- Rf) + α1 D1 + B1 D1 (Rm,t- Rf) + α2 D2 + B2 D2 (Rm,t- Rf)+ α3 D3 + B3 D3 (Rm,t- Rf) + α4 D4 + B4 D4 (Rm,t- Rf) + α7 D7 + B7 D7 (Rm,t- Rf)+ α34 D34 + B34 D34 (Rm,t- Rf) + ui (2)

By performing the White's general test, we would get the result as following:
White's general test statistic : 31.80127 Chi-sq(29) P-value = .0455 ≈ 0.05
where P-value is qpproximately equal to 5% level of significance (0.05), so we fail to reject the null that there's no heteroscedasticity, and the presence of heteroscedasticity is solved.

As we get the VIF of the variables from Table-5, and test for multicollinearity, we could observe that the VIF for variable (Rm,t- Rf) is 7.00, which indicates that the problem of collinearity is attenuated and that this variable is uncorrelated with the explanatory variables.

There are a total of 427 observations (7 funds including SLVRX, each with 61 observations). The first and second funds (DPDEX, DDVIX) in the ranking are the funds with significant t-value (5% significant level) out of the rest of 6 funds (with Computed t-value: 2.34; P-value: 0.020; Computed t-value: 2.03; P-value: 0.043, respectively). The R-squared is 0.922 and the F-value is F(13, 413) = 376.60. If we were to expand the significant level to 10%, we get that five funds have significant alphas (funds 1, 2, 3, 4, 7), by excluding Fund 34.

The improved method shows that out of the funds, including Fund SLVRX, two funds have significant alphas, which is different from the result we had before. This remedial solution also suggests that a minority of high return ranking funds has outstanding asset selection ability.

Table-5: Variance Inflation Factor (VIF) for Each Variable from the Improved Model

Variable	VIF	1/VIF
rmrf	7.00	0.142857
d1rmrf	2.19	0.456693
d2rmrf	2.19	0.456693
d34rmrf	2.19	0.456693
d3rmrf	2.19	0.456693
d4rmrf	2.19	0.456693
d7rmrf	2.19	0.456693
d1	1.90	0.525226
d2	1.90	0.525226
d3	1.90	0.525226
d34	1.90	0.525226
d4	1.90	0.525226
d7	1.90	0.525226
Mean VIF	2.43	

VII. Conclusion

As we perform the estimated model with dummy variable included, we could come up with a conclusion that on average, fund managers of the top US high-return fund companies do not possess outstanding asset selection skills. The true ability of fund manager to contribute to the fund's returns is without much supporting evidence. In fact, the success of high return on a fund is a matter of fact of market going up or down, at least within the period from June 2009 to June 2014. The result from the dummy approach coincides with Jensen's finding in 1968 that on average the fund managers were not quite successful enough to maximize possible returns for the level of risk taken by investors (Jensen 415). There's also little evidence that on average, fund manager could outrun the market risk with his or her management and selection skills.

The Lipper Leader's ranking of total returns within a five-year span does not have positive relationship with the fund-characteristic captured by Jensen's alpha. There is pressing need that the fund managers examine closely on the market performance and earn outstanding returns with respect to the expenses spent on research and investigation. Investors should be careful when holding bets on the funds that have high returns since the ranking does not show how well the fund manager contribute to the returns.

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