K. V. Kovalevskii

Graduate Student
Durham University Business School

ANALYSIS AND COMPARISON OF THE SKILLS OF TWO MUTUAL FUND MANAGERS

Abstract. The purpose of this paper is to analyze and compare the skills of two mutual fund managers. Also compare the exposure of the portfolios to different risk factors.
Keywords: mutual fund, skills of mutual fund managers, financial risks.

Valuating well-performing mutual funds, it is in the best interest of investors to find an answer to whether the mutual funds outperform the market by managerial skills or by chance (Lucena research, 2013). As a matter of fact, the extent of outperformance and mutual fund's manager skills are gauged by abnormal return, *alpha*. Different models, which adjust return for risk factors, have been exploited in order to assess the *alpha*. Thus, the success in explanation of *alpha* by applying these models corroborates the fact that managerial skills factually drive to the outperformance (Torre, 2010). In this paper, the CAPM, the FF's three-factor, and the extended version of the Carhart's four-factor models have been employed to compare skills of managers and disclose exposure to risk factors of two mutual funds.

Jensen's suggestion (1964) about the derivation of the CAPM for empirical application boils down to the following expression:

$$r_i - r_f = \alpha + \beta_1 (r_m - r_f) + u_i, \quad (1)$$

where *alpha,* adjusted for the market risk, measures the fund manager's skills.

The Fama-French's three-factor model is an alternative to the CAPM, it additionally includes two factors that explain the risk premium of a portfolio taking into consideration the size and expected book-to-market value. The model is expressed as follows:

$$r_i - r_f = \alpha_i + \beta_1 (r_m - r_f) + \beta_2 (SMB_t) + \beta_3 (HML_t) + u_i \quad (2)$$

Finally, the Carhart's model considers adding two extra adjusted for the risk factors related to momentum strategy and liquidity:

$$\begin{aligned} r_i - r_f &= \alpha_i + \beta_1 (r_m - r_f) + \beta_2 (SMB_t) + \beta_3 (HML_t) + \\ &+ \beta_4 (MoM_t) + \beta_5 (Tradedliq_t) + u_i \end{aligned} \quad (3)$$

Then, in order to assess the mutual funds' *alphas* as well as coefficients associated with risk factors, and furthermore, to compare them between both funds, it has been managed regression analysis for each model. The aim was to determine the OLS estimators that can be considered as proxies of the unknown real slopes (Stock & Watson, 2011). The outcome can be observed in the Table 1.

According to the resulting output related to the mutual fund 2 (*MF2*), the tested models could not cope with explanation of its returns at statistically adequate significance level. This fact supported by the evidences reflected both in the Table 1 for the *MF2* and hereafter:

(a) P-values of Fisher test are as follows: 0,051, 0,243 and 0,436 for CAPM, FF's and Carhart's, respectively.

(b) The monotonically increasing standard errors of regressions with adding new factors.

(c) The monotonically decreasing adjusted R^2.

As a result, since the regression models failed to explain the returns at appropriate significant level for the *MF2*, it is possible to say, that there must be other factors which could do well in explanation of its returns; thus, to compare its obtained results with the first mutual fund's ones is pointless.

However, before making the conclusion about the *MF1* estimators' efficiency, it is necessary to check them for the correspondence to Gauss-Markov's assumptions (*G-M*). Due to the fact that serial correlation and heteroskedasticity are persistently observed in time-series data (Stock & Watson, 2011), it has been suggested to perform the multicolinearity, Breusch-Godfrey *(B-G)* and White's tests. The LM test confirms the concerns about autocorrelation in residuals of the *MF1's* tested models. However, the multicolinearity was not been detected (Table 3), the White's test failed in rejection of null hypotheses in all three models. According to Stock and Watson (2011), t-statistics are inflated if serial correlation takes place. Therefore, the significance of regression estimators is overstated. Consequently, though the estimators remain unbiased and consistent, they are no longer efficient. To correct residuals for autocorrelation the Cochrane-Orcutt method was used, in turn, it allowed transforming the original models so, that the errors became serially uncorrelated, thus, the FGLS estimators are BLUE (Stock & Watson, 2011). The results of the transformed regressions are summarised in the Table 2. Hence, t-statistics as well as F-statistic can be considered as reliable for further references. Indeed, having applied the FGLS to the regression models for the *MF1*, the B-G test revealed that serial correlation in residuals no longer exists (*B-G's* p-value = 0,59). Thus, it is safe to commence the *MF1*'s exposure to risks analysis.

The three FGLS transformed models had estimated positive and statistically significant at 1 % level *alphas* (Table 2): the CAPM *alpha* is 0,535 %, FF's *alpha* is 0,525 %, and Carhart's *alpha* is 0,502 %. Although having boosted the CAPM model with additional factors, the standard errors of those remained the same, the standard error of regressions (*SE(R)*) tended to monotonic reduction: 0,004818, 0,004795, and 0,004716, respectively. The interpretation is the added factors do not capture the variance of *alphas;* therefore, they do not explain abnormal returns generated by managed *MF1* (Fama & French, 1993).

Next, the average monthly factor slopes, reflected in the Table 2, revealed the following results. There is an evidence of expansion in the values of market risk factor in terms of 2,9 %, 3 % and 3,2 % for the CAPM, FF's and Carhart's, respectively (all of them significant at 1 %). The positive values of size premium, which are 1,6 % and 1,7 % for the FF's and Carhart's models, can be explained such as small size companies in comparison with the large had generated higher returns, in average, for the entire period. On the other hand, the HML factor in the Carhart's model decreased in terms of the mean value and significance as well. However, the HML factor had not been already statistically significant in the base model (the FF's). It means that, particularly in the Carhart's model specification, the HML factor is redundant. The momentum and liquidity factors are positive and significant at 5 % level that accounts for 1,3 % and 2,4 %, respectively. Eventually, summary statistics demonstrates improvements in the regression models with adding new factors in terms of *SE(R),* for example, it reduced from 0,004818 for CAPM to 0,004716 for Carhart's. Fisher test demonstrates no rejections of null hypotheses for *MF1*'s models.

To summarise given results, although the *alphas* for both mutual funds are significant and positive, they prove the fact that managers outperformed the market, but this success cannot be attributed to managerial skills, on the contrary, it associated with the luck. In addition, the most powerful model in terms of explanatory ability for the *MF1* is the extended Carhart's four-factor model. It implies that market and liquidity factors are statistically significant for its performance.

References

1. Chrisitian de la Torre. Mutual fund performance [Electronic resource] / Chrisitian de la Torre. – 2010. – URL: https://professionsfinancieres.com/docs/2011103814_56--mutual-fund-performance.pdf

2. Fama E. Common risk factors in the returns on stocks and bonds / E. Fama, K. French // Journal of Financial Economics. – 1993. – Vol. 33. – P. 3–56.

3. Alpha: A Measure of Fund Management Skill [Electronic resource] / Lucena research. – 2013. – URL: https://lucenaresearch.com/alpha-a-measure-of-fund-management-skill.

4. Stock J. Introduction to Econometrics / J. Stock, M.Watson. – 3d ed. – Prentice Hall, 2011.

TABLE 1. RISK EXPOSURE OF THE MUTUAL FUNDS

The table reports the coefficients of risk adjusted factors for the period from February 1968 to July 2005. Alpha denotes average abnormal return per month generated by a mutual fund. Market is the return on the CRSP value-w eighted market index in excess of the one month T-bill rate. SMB is the monthly return difference betw een tw o portfolios that consist of large and small size stocks. HML is the monthly return difference betw een the tw o portfolios w ith high and low book-to-market equity ratios. MOM is the monthly return difference betw een the tw o portfolios w ith high and low returns. Tradedlq is traded liquidity factor. The standard errors in italics are calculated by applying for the Ordinary Least squares standard errors. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. (1),(2) and (3) denote the model applied for regression analysis as follow s: the CAPM, the Fama and French's, and the Carhart's extended 4-factor model, respectively.

	The mutual fund 1			The mutual fund 2		
	(1)	(2)	(3)	(1)	(2)	(3)
Alpha	0.0054***	0.0053***	0.0051***	0.0352***	0.0352***	0.0352***
st. er.	*0.000232*	*0.000237*	*0.000243*	*0.000535*	*0.000550*	*0.000572*
Risk adj factors for						
Market	0.029***	0.0297***	0.031***	0.023**	0.0194	0.0206
st. er.	*0.005039*	*0.005681*	*0.005657*	*0.011597*	*0.013168*	*0.013308*
					0.0085	
SMB		0.017**	0.0175**			0.0085
st. er.		*0.007408*	*0.007312*		*0.019805*	*0.017201*
HML		0.014	0.0137		-0.0049	-0.0019
st. er.		*0.008544*	*0.008573*		*0.017171*	*0.020167*
MoM			0.012**			0.0087
st. er.			*0.005558*			*0.013075*
Tradedliq			0.023***			-0.0065
st. er.			*0.006920*			*0.016278*
Summary Statistics and Joint Tests						
S.E. of regression	0.004907	0.004882	*0.004817*	0.011294	0.011315	*0.011332*
Adjusted R-sq	0.067	0.077	0.102	0.006	0.002	-0.0003
Prob(F-statistic)	**0.0000**	**0.0000**	**0.0000**	**0.051**	**0.243**	**0.436**
DW	1.615	1.619	1.59	1.907	1.904	1.906
White (Prob. F)	0.8676	0.9736	0.7595	0.8104	0.8277	0.8510

(1) $R_{mf} - R_f = \alpha + \beta_1(R_m - R_f)$

(2) $R_{mf} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2(SMB) + \beta_3(HML)$

(3) $R_{mf} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2(SMB) + \beta_3(HML) + \beta_4(MoM) + \beta_5(Tradedliq)$

The reason of preventing the mutual fund 2 from further investigation can be explained as follow s. First of all, the idea of exploiting the Fisher test is to understand w hether all independent variables can affect independent variable in the regression equation. The result of the test show s that virtually all independent variables do not impose significant influence on the dependant one at 1% and 5% significance level. Secondly, adding extra regressor to the base model (CAPM) did not bring effect on standard error of regression; on the contrary, the error tended to boost in its value from model to model. Thirdly, the adjusted R-sq demonstrated monotonical decreasing in terms of changing the model specification. Eventually, almost all adjusted for risk factors are statistically insignificant in explanation of data provided, compiled in different combinations.

TABLE 2. RISK EXPOSURE OF THE MUTUAL FUNDS CORRECTED FOR SERIAL CORRELATION RESIDUALS

The table reports the coefficients of risk adjusted factors for the period from February 1968 to July 2005. 'Alpha' denotes average abnormal return per month generated by a mutual fund. 'Market' is the return on the CRSP value-w eighted market index in excess of the one month T-bill rate. SMB is the monthly return difference betw een tw o portfolios that consist of large and small size stocks. HML is the monthly return difference betw een the tw o portfolios w ith high and low book-to-market equity ratios. MOM is the monthly return difference betw een the tw o portfolios w ith high and low returns. Tradedlq is traded liquidity factor. The standard errors in italics are calculated by applying for the Generalized Least squares autocorrelation-consistent standard errors. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. (1),(2) and (3) denote the model applied for regression analysis as follow s: the CAPM, the Fama and French's, and the Carhart's extended 4-factor model, respectively.

	(1)	(2)	(3)
Alpha	0.00535***	0.00525***	0.00502***
st. er.	*0.000228*	*0.000231*	*0.000233*
Risk adj factors for			
Market	0.029***	0.0302***	0.032***
st. er.	*0.004917*	*0.005492*	*0.005437*
SMB		0.016**	0.017**
st. er.		*0.007131*	*0.007017*
HML		0.013	0.0119
st. er.		*0.008503*	*0.008486*
MoM			0.0131**
st. er.			*0.005328*
Tradedliq			0.0244***
st. er.			*0.006778*

Summary Statistics and Joint Tests			
S.E. of regression	0.004818	0.004795	0.004716
Adjusted R-sq	0.0714	0.0805	0.1105
Prob(F-statistic)	0.0000	0.0000	0.0000
B-G (Prob. F)	0.4716	0.4149	0.5979
White (Prob. F)	0.8750	0.9481	0.7350

(1) $(R_{mf1} - R_f)_t - \rho(R_{mf1} - R_f)_{t-1} = \beta_0(1-\rho) + \beta_1\left((R_m - R_f)_t - \rho(R_m - R_f)_{t-1}\right)$

(2) $(R_{mf1} - R_f)_t - \rho(R_{mf1} - R_f)_{t-1} = \beta_0(1-\rho)$
$+ \beta_1\left((R_m - R_f)_t - \rho(R_m - R_f)_{t-1}\right) + \beta_2(SMB_t - \rho SMB_{t-1}) + \beta_3(HML_t - \rho HML_{t-}$

(3) $(R_{mf1} - R_f)_t - \rho(R_{mf1} - R_f)_{t-1} = \beta_0(1-\rho)$
$+ \beta_1\left((R_m - R_f)_t - \rho(R_m - R_f)_{t-1}\right) + \beta_2(SMB_t - \rho SMB_{t-1}) + \beta_3(HML_t - \rho HML_{t-1})$ -
$\beta_4 (MoM_t - \rho MoM_{t-1}) + \beta_5(Tradedliq_t - \rho Tradedliq_{t-1})$

TABLE 3. MULTICOLINEARIATY

	MOM	MF2	MF1	HML	CRSP	USTB	SMB	TRADEDLIQ
MOM	1							
MF2	0.03	1						
MF1	0.06	0.055	1					
HML	-0.10	-0.05	-0.06	1				
CRSP	-0.07	0.075	0.25	-0.44	1			
USTB	0.01	0.025	-0.04	0.03	-0.04	1		
SMB	-0.005	0.039	0.15	-0.3	0.3	-0.06	1	
TRADEDLIQ	-0.12	-0.02	0.16	0.13	-0.06	0.03	-0.06	1