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EVALUATING THE SELECTION AND TIMING ABILITIES OF A MUTUAL FUND

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Abstract: *The paper presents the methodology and a case study to evaluate the performance of a mutual fund by taking a look at the timing and selection abilities of a portfolio manager. Separating the timing and selection abilities of the fund manager is taken into consideration by two major models. The data about the mutual fund chosen for study is the German blue chip fund "DWS Deutsche Aktien Typ O", which includes most of the DAX 30 companies. The data consists of 117 monthly observations of the fund returns from January 1999 to September 2008. We used EViews to analyse the data.*

Key words: *selection ability, timing ability, portfolio risk, regression analysis.*

1. Methodology

The literature discusses three major models to evaluate timing and selection abilities. At first we considered taking a look at the overall performance of the fund manager. Therefore we decided to use Jensen's Alpha (1968) model:

$$R_{pt} - R_{ft} = \alpha_J + \beta^*(R_{mt} - R_{ft}) + u_{pt}$$

Although Jensen assumes stationarity in systematic risk, which is not the case in an actively managed fund over a long period of time, we used it to provide an image of the overall performance.

In a next step we wanted to separate the timing and the selection abilities of the fund manager by taking into consideration two major models: Treynor and Mazuy (1966) and Henriksson and Merton (1981). As a result of several empirical studies about the reliability of the Treynor and Mazuy (1966) model that showed that its beta estimates are biased (see e.g. Grinblatt and Titman (1991)), we decided not to use this model in our analysis. Hence, we decided to choose the model of Henriksson and Merton (1981):

$$R_{pt} - R_{ft} = \alpha_T + \beta_u{}^*X_{ut} + \beta_d{}^*X_{dt} + u_{pt}$$

where

$X_{ut} = \max\,[0, R_{mt} - R_{ft}]$;

$X_{dt} = \min\,[0, R_{mt} - R_{ft}]$; and

u_{pt} = random error term.

$(R_{pt} - R_{ft})$ is the excess return of the fund p over the risk-free rate f. $(R_{mt} - R_{ft})$ is the excess return of the market portfolio *m* over the risk-free rate *f*.

The main advantage of using this model is that it clearly separates the fund manager's timing and selection abilities.

The selection ability is shown by the intercept α_T, while β_u represents the timing ability in an up-market, β_d in a down-market, respectively. In order for the fund manager to have selection ability, α_T should be statistically significant and above zero.

As for the timing ability, the up-market β_u and the down-market β_d should be significantly different from each other (H_0:

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$\beta_u = \beta_d$) and for a good market timer β_u should be greater than β_d.

In this case a fund increases its advantages in an up-market by increasing its systematic risk and reducing the negative effects in a down-market by reducing its systematic risk.

2. Data

For the mutual fund we chose the German blue chip fund "DWS Deutsche Aktien Typ O" (ISIN: DE0008474289) [1] which includes most of the DAX 30 companies. The data consists of 117 monthly observations of the fund returns from January 1999 to September 2008.

For the market portfolio, we chose the DAX 30 PERFORMANCE index because it is representative for the German market's blue chips and it includes the same equities as in the fund's portfolio. We calculated the returns using the continuous compound returns formula $R_t = 100 * LN(Pt/P_{t-1})$.

For the risk-free rate we chose the 3 months EURIBOR, which is generally used in the Euro-zone. We divided the annualised EURIBOR data by 12 to be consistent with the monthly returns of the fund and market portfolio. We collected our data from Datastream.

3. Empirical Results

Estimating the Jensen regression we came to the following results:

$$R_{pt} - R_{ft} = 0.001152 + 1.004246 * (R_{mt} - R_{ft})$$
$$(0.001701) \quad (0.025269)$$

Running the t-test on the coefficients shows that the estimated Jensen Alpha of 0.001152 – although positive - is not significantly different from zero.

The Beta coefficient is highly significant, as it may be seen in the regression from Table 1.

JENSEN REGRESSION Table 1

Dependent Variable: EX_RET_FUND
Method: Least Squares
Date: 10/01/08 Time: 15:45
Sample: 1999M01 2008M09
Included observations: 117

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX_RET_MK	1.004246	0.025269	39.74172	0.0000
C	0.001152	0.001701	0.677452	0.4995

R-squared	0.932130	Mean dependent var	9.01E-05
Adjusted R-squared	0.931539	S.D. dependent var	0.070318
S.E. of regression	0.018399	Akaike info criterion	-5.136120
Sum squared resid	0.038929	Schwarz criterion	-5.088903
Log likelihood	302.4630	F-statistic	1579.404
Durbin-Watson stat	2.405850	Prob(F-statistic)	0.000000

HENRIKSSON AND MERTON REGRESSION Table 2

Dependent Variable: EX_RET_FUND
Method: Least Squares
Date: 10/01/08 Time: 15:44
Sample: 1999M01 2008M09
Included observations: 117

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY1*EX_RET_MK	1.058612	0.057585	18.38335	0.0000
DUMMY2*EX_RET_MK	0.971393	0.040198	24.16515	0.0000
C	-0.001051	0.002700	-0.389195	0.6979

R-squared	0.932780	Mean dependent var	9.01E-05
Adjusted R-squared	0.931601	S.D. dependent var	0.070318
S.E. of regression	0.018390	Akaike info criterion	-5.128661
Sum squared resid	0.038556	Schwarz criterion	-5.057836
Log likelihood	303.0267	F-statistic	790.9658
Durbin-Watson stat	2.478246	Prob(F-statistic)	0.000000

Not going into more detail with Jensen's model we now analyze the results of our main model, Henriksson and Merton (1981). We modelled the min/max-operators by using 2 dummy variables:

Dummy1 $\begin{cases} 1 \text{ if } R_{mt} > R_{ft} \\ 0 \textit{ otherwise} \end{cases}$

Dummy2 $\begin{cases} 1 \text{ if } R_{mt} < R_{ft} \\ 0 \textit{ otherwise} \end{cases}$

and so estimated the regression, from Table 2.

$$R_{pt} - R_{ft} = -0.001051 + 1.058612*(R_{mt} - R_{ft})*Dummy1 + 0.971393*(R_{mt} - R_{ft})*Dummy2$$
$$\quad (0.002700) \quad (0.057585) \qquad\qquad\qquad (0.040198)$$

Having estimated this regression, we checked if the OLS assumptions hold for our model.

- $E[u_t] = 0$; this is true as we have an intercept in the regression - α_T.
- $Var(u_t) = \sigma^2 < \infty$; the White test X^2 probability of 0.942216 shows that we cannot reject the H_0: Homoskedastic behavior – therefore we have no evidence for heteroskedasticity (Table 3):

WHITE TEST Table 3

White Heteroskedasticity Test:

F-statistic	0.185879	Prob. F(4,112)	0.945326
Obs*R-squared	0.771585	Prob. Chi-Square(4)	0.942216

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/01/08 Time: 16:30
Sample: 1999M01 2008M09
Included observations: 117
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000338	0.000119	2.845771	0.0053
DUMMY1*EX_RET_MK	-0.002183	0.004873	-0.448051	0.6550
(DUMMY1*EX_RET_MK)^2	0.024778	0.037938	0.653120	0.5150
DUMMY2*EX_RET_MK	-0.000528	0.003249	-0.162591	0.8711
(DUMMY2*EX_RET_MK)^2	-0.003310	0.014143	-0.234044	0.8154

R-squared	0.006595	Mean dependent var	0.000330
Adjusted R-squared	-0.028884	S.D. dependent var	0.000543
S.E. of regression	0.000551	Akaike info criterion	-12.12874
Sum squared resid	3.40E-05	Schwarz criterion	-12.01070
Log likelihood	714.5316	F-statistic	0.185879
Durbin-Watson stat	1.764434	Prob(F-statistic)	0.945326

- $Cov(u_i,u_j) = 0$; at first we ran the Durbin Watson test. The result was inconclusive, because the DW test statistic was in the range of 2.42 ($4-d_U$) to 2.50 ($4-d_L$) – *see Table 2*. Then we ran the Breusch-Godfrey test with 12 lags because we used monthly data and any autocorrelation can appear within one year and therefore should be tested. We could not reject the H_0: no autocorrelation at a 5% significance level because of a X^2 probability of 0.062404, as presented in Table 4:

BREUSCH GODFREY TEST Table 4

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.779658	Prob. F(12,102)	0.061351
Obs*R-squared	20.25554	Prob. Chi-Square(12)	0.062404

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 10/01/08 Time: 16:41
Sample: 1999M01 2008M09
Included observations: 117
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY1*EX_RET_MK	0.036864	0.059640	0.618107	0.5379
DUMMY2*EX_RET_MK	-0.040651	0.041147	-0.987935	0.3255
C	-0.002088	0.002740	-0.761772	0.4480
RESID(-1)	-0.284617	0.103246	-2.756682	0.0069
RESID(-2)	0.167414	0.104053	1.608923	0.1107
RESID(-3)	0.163594	0.108813	1.503440	0.1358
RESID(-4)	-0.023717	0.110832	-0.213993	0.8310
RESID(-5)	-0.090872	0.111935	-0.811823	0.4188
RESID(-6)	0.052236	0.109575	0.476714	0.6346
RESID(-7)	0.175785	0.112971	1.556024	0.1228
RESID(-8)	0.010875	0.111965	0.097131	0.9228
RESID(-9)	-0.007293	0.113605	-0.064200	0.9489
RESID(-10)	-0.196191	0.112493	-1.744020	0.0842
RESID(-11)	0.030314	0.113992	0.265928	0.7908
RESID(-12)	0.132385	0.110658	1.196346	0.2343

R-squared	0.173124	Mean dependent var	7.12E-19
Adjusted R-squared	0.059632	S.D. dependent var	0.018231
S.E. of regression	0.017679	Akaike info criterion	-5.113633
Sum squared resid	0.031881	Schwarz criterion	-4.759509
Log likelihood	314.1476	F-statistic	1.525421
Durbin-Watson stat	1.914872	Prob(F-statistic)	0.115185

1.x_t are non-stochastic, but discrete observations

2. u_t normal distributed ~N(0,σ²); therefore we ran the Jarque-Bera normality test. We could not reject the H_0: normally distributed residuals at a 5% significance level because of the 0.180883 probability. The test is presented in the chart from Figure 1.

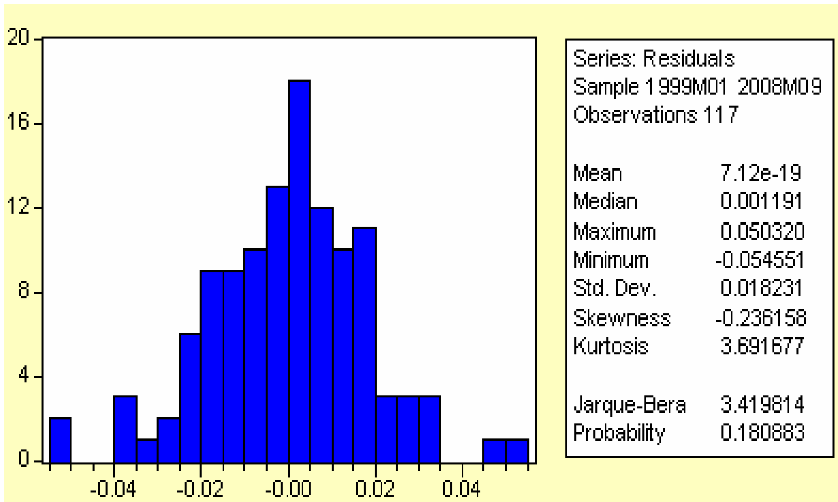

Fig. 1. *JARQUE-BERA Normality Test*

Further assumptions for correct estimation:

1. Multi-co-linearity; the correlation-matrix shows a coefficient of 0.423517 which is below the critical value of 0.8 for near multi-co-linearity. Therefore we conclude no multi-co-linearity.

2. Linearity; we conducted the Ramsey RESET test with two fitted variables and could not reject the H_0: linearity (*t* probabilities for fitted values 0.5566 and 0.1771), presented in Table 5.

RAMSEY RESET TEST Table 5

Ramsey RESET Test:

F-statistic	1.221915	Prob. F(2,112)	0.298563
Log likelihood ratio	2.525476	Prob. Chi-Square(2)	0.282878

Test Equation:
Dependent Variable: EX_RET_FUND
Method: Least Squares
Date: 10/01/08 Time: 16:58
Sample: 1999M01 2008M09
Included observations: 117

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY1*EX_RET_MK	1.143336	0.152148	7.514614	0.0000
DUMMY2*EX_RET_MK	0.978680	0.120932	8.092815	0.0000
C	-0.001518	0.004073	-0.372612	0.7101
FITTED^2	-0.474876	0.805379	-0.589630	0.5566
FITTED^3	-2.703209	1.989961	-1.358423	0.1771

R-squared	0.934216	Mean dependent var	9.01E-05
Adjusted R-squared	0.931866	S.D. dependent var	0.070318
S.E. of regression	0.018355	Akaike info criterion	-5.116058
Sum squared resid	0.037733	Schwarz criterion	-4.998016
Log likelihood	304.2894	F-statistic	397.6336
Durbin-Watson stat	2.487544	Prob(F-statistic)	0.000000

3.Parameter Stability; we considered the Chow break point test and the Predictive Failure test, however the excess returns of the fund graph show no obvious break points, as in the chart from Figure 2.

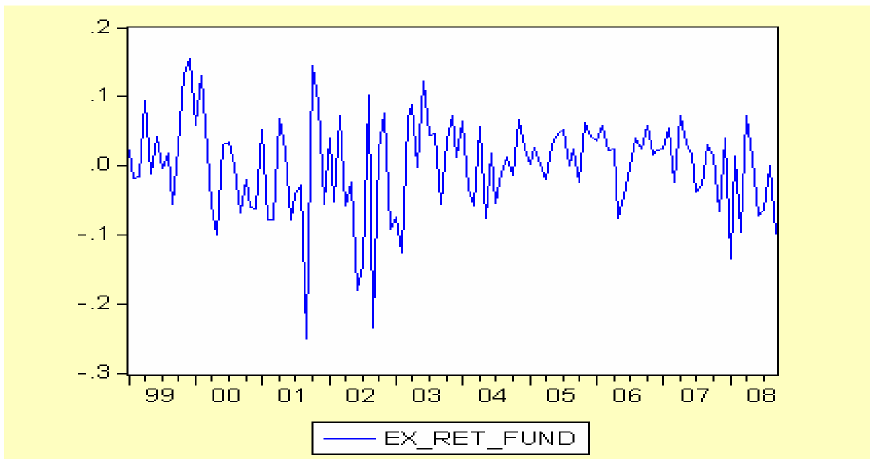

Fig. 2 *Excess Returns of the Fund*

Coming back to our original regression, we conducted F- and t-tests. The null hypotheses (H_0: all coefficients are zero) of the F-test is rejected.

WALD TEST Table 6

Wald Test:
Equation: HENRIK_REQ

Test Statistic	Value	df	Probability
F-statistic	1.103656	(1, 114)	0.2957
Chi-square	1.103656	1	0.2935

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(2)	0.087219	0.083022

Restrictions are linear in coefficients.

Running the t-test shows that the β_u and β_d are highly significant, while α_T is statistically not significant, as shown in Table 6.

Finally we conducted the Wald test to determine whether β_u and β_d are statistically different from each other (H_0: $\beta_u - \beta_d = 0$). Taking a look at the test statistics in Table 6, we failed to reject the null hypotheses at the 5% significance level, since the X^2 probability is 0.2935.

4. Conclusion

We found that the overall performance ability of the fund manager, as estimated in the α_J by the Jensen (1968) model is positive. However this coefficient is statistically insignificant, which means the fund is, in a statistical sense, not over-performing the market.

Separating the timing and selection abilities by using the Henriksson and Merton (1984) model, we found β_u greater than β_d, which could let us conclude that the fund manager has market timing ability.

However, we did not find the betas to be significantly different from each other. Therefore the fund manager is a poor market-timer. To evaluate his selection ability we took a look at the α_T of the regression. It is negative and not significantly different from zero. That shows the fund manager has no selection ability either.

A possible explanation for these results is the structure of the fund. The DWS Deutsche Aktien Typ O fund consists mainly of German blue chips and therefore is highly correlated with the German DAX 30 PERFORMANCE INDEX. This is also shown in the high R^2 (approximately 0.93 for both analysed models). That is one possible reason why it is difficult to over-perform the market.

References

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Notes

1. http://www.dws.de/DE/facts/FactSheetHoldings.aspx?FundId=286