Вибір моменту операції на ринку та вибірковість портфоліо: модифікація моделі Генріксона-Мертона

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Ця робота оцінює обрані функції параметричного тесту Генріксона-Мертона – методу вимірювання вибору моменту операції на ринку та можливостей вибірковості портфоліо. Також запропоновано шляхи подолання двох істотних недоліків даної моделі: відносно непрямої інтерпретації та сприйнятливості до малозначущих параметрів. У першому розділі обгрунтовано вибір предмету та визначено момент операції на ринку і види діяльності, пов'язані із вибірковістю портфоліо. У другому розділі підхід Генріксона-Мертона позиціонується на даному етапі знань про оцінку інвестицій. У третьому розділі описано параметричну модель Генріксона-Мертона та піддано випробуванню групою польських взаємних фондів за період 63-х місяців (з січня 2004 р. по березень 2009 р.). Аналіз свідчить про незадовільні результати значимості параметрів (див. Табл. 1).

Вони вказують на відсутність впливу вибірковості портфоліо та обмежений вплив вибору моменту операції на ринку на інвестиційну діяльність. Такі висновки є серйозним аргументом проти фундаментального аналізу фондів, згідно якого як вибір моменту операції, так і вибірковість портфоліо міцно вкорінені у інвестиційну стратегію фондів. Четвертий розділ містить пропозицію щодо внесення зміни до структури рівняння Генріксона-Мертона з метою покращення непостійності моделі та полегшення її тлумачення. Модифікований тест був згодом успішно підтверджений на цій же базі даних (див.Табл. 2). Згідно попередніх досліджень, емпіричні результати вказують на те, що вибір моменту операції та навички щодо вибору портфоліо все ж таки мають вплив на рівень надмірної дохідності портфелів. У проаналізованому прикладі попередній результат був позитивним, а наступний – негативним. Насамкінець вказано подальші напрямки для досліджень.

Переклад виконано в Агенції перекладів PIO
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On Market Timing and Portfolio Selectivity: Modifying the Henriksson-Merton Model

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This paper evaluates selected functionalities of the parametrical Henriksson-Merton test, a tool designed for measuring the market timing and portfolio selectivity capabilities. It also provides a solution to two significant disadvantages of the model: relatively indirect interpretation and vulnerability to parameter insignificance. The model has been put to test on a group of Polish mutual funds in a period of 63 months (January 2004 – March 2009), providing unsatisfactory parameter significance results. A modification to the structure of the equation was proposed in order to improve the versatility of the tool and make it easier to interpret. The modified model was later successfully verified on the same database. Consistent with prior literature, the empirical results indicated that the market timing and portfolio selectivity skills do have an impact on the level of excess portfolio returns.

Keywords – investment performance, market timing, portfolio selectivity, investment funds, mutual funds

I. Introduction

The performance of investment managers has been widely discussed both in the academic forums and among practitioners already for a few decades. On one hand, it has been empirically proven on multiple occasions that active investment management does not bring extraordinary returns in the long term [1][2], which is in line with E. Fama's Effective Markets Theory [3]. On the other, worldwide net assets of mutual funds at the end of 2010 were worth $24,699B, which stands for almost 40% of World's GDP [4]. Therefore, even if the mentioned funds do not outperform the markets, evaluating their managers' performance proves to be a necessity for comparative purposes.

Investment performance is driven by two key sets of abilities: micro-forecasting (portfolio selectivity) and macro-forecasting (market timing) skills. The former refer to making the right choices on specific components within the portfolio, whereas the latter focus on reducing the risk exposure of the whole portfolio during negative market trends and increasing it when the markets grow. These two abilities can be and are used independently by the investment managers [5]. At the same time, the effects of both are simultaneously measured in only a few of the available investment performance evaluation models.

One of them is the Henriksson-Merton (H-M) approach [6]. Although, it may be considered as a very effective tool for measuring investment performance, two key disadvantages can be identified. Firstly, it is not uncommon that the H-M model provides unsatisfactory statistical significance results. Secondly, the model is relatively difficult to interpret. It explains the impact of

market timing and portfolio activities on the portfolio return in excess of the risk-free return, whereas usually investment managers aim at outperforming the market rather than the risk-free rate.

The aim of this paper is to present briefly the parametrical Henriksson-Merton test within the current state of knowledge on measuring investment performance and to investigate the opportunity of improving it. The key objective of the modification is to make the model even more versatile and intuitive, with no negative impact on the key functionalities.

II. Measuring Market Timing and Portfolio Selectivity

There is currently a wide range of investment performance evaluation methods available. Most of them employ the Capital Assets Pricing Model (CAPM) approach [7], which is focused exclusively on measuring the portfolio selectivity abilities. It ignores market timing strategies by assuming that risk levels for the total portfolio of managed funds remain stationary in all periods. As a result, the abnormal return estimations are downward biased where market timing activities are present [8]. Therefore, simple CAPM-based models not only fail to measure market timing, but also pose a high risk that measures on portfolio selectivity derived from them are significantly impacted by a factor not included in the analysis.

Both Fama [9] and Jensen [10] offered models which analyze the effects of macro-forecasting, by comparing *ex post* the results of a specific investor with the average market return. Treynor and Mazuy developed the CAPM approach by adding the condition of quadratic form of the function, whereas the standard CAPM linear function excludes the impact of market timing [11].

A significant disadvantage of all models mentioned above is that they allow for measuring the effects of either portfolio selectivity or market timing. Analyzing only one of these effects in most cases brings a risk of biasing the abnormal return estimations, as both of these activities do have an impact on investment performance. Henriksson and Merton presented an approach, in which the impact of market timing and portfolio selectivity skills can be separately, but simultaneously evaluated [12].

III. The Standard Henriksson-Merton Model

The H-M approach includes two models, which can be used independently. One is called the non-parametrical test and employs conditional probabilities of providing an accurate forecast (this condition concerns the market portfolio providing higher returns than the risk-free rate). Implementing this model in practice is usually challenging, as researchers have rarely access to the forecasts of investment managers. The second test, called parametrical, can be considered far more applicable and therefore will be subject to further analysis.

The parametrical H-M test does not utilize the knowledge on the past or future forecasts of investment managers. In order to differentiate and measure the impact of micro- and macro-forecasting activities, it requires inputs on the abnormal portfolio return, the average market return and the risk-free return rate. The structure of the model, described by Eq. (1), results partially from the model proposed by Merton [13]. It assumes that in theory, perfect market timing can be achieved by investing a part of the assets in a market portfolio and buying free put options for this portfolio at the same time (Mertons Rational Option Pricing Theory). As a result, the standard Henriksson-Merton model takes the following form [14]:

$$Z_p(t) - R(t) = a + b_1 x(t) + b_2 y(t) + e(t) \qquad (1)$$

Where: $Z_p(t)$ = the portfolio return in period t; $R(t)$ = the risk free return; α = the abnormal return attributed to security selection (portfolio selectivity); β_1 = the coefficient representing the part of assets invested according to Mertons Rational Option Pricing Theory [15][16]; β_2 = the coefficient measuring the effect of market timing activities; $x(t)$ = the market return in excess of the risk free rate in period t; $y(t) = \max[0, -x(t)]$; $\varepsilon(t)$ = the random error term with expected mean of zero.

The model described above has been put to test on a database containing 1305 daily observations for 15 mutual funds present on the Polish market. On average, 87% of the analyzed funds' assets was invested in stocks, which can be considered as a relatively high risk exposure level, making portfolio selection activities easier to detect in the research. At the same time, all funds declared to have actively managed their portfolio risk levels in the tested period (January 2004 – March 2009). This justifies the assumption that market timing activities were present. In order to complete the database, the reference rate of the Polish National Bank (NBP) was included as the risk-free return and the Warsaw Stock Exchange Index (WIG) was used as a benchmark for the market return calculations.

Table 1 exhibits the statistical significance test results for the least-squares regression [17]. Significant parameters are labeled with an asterisk (*).

Table 1

Statistical significance results – Standard H-M Model

Fund	α	β_1	β_2
Arka Akcji FIO	0.112	0.000*	0.093
BPH F Akcji (subfund)	0.788	0.000*	0.521
CU Polskich Akcji (subfund)	0.093	0.000*	0.005*
DWS FIO Akcji	0.420	0.000*	0.092
DWS FIO Akcji Plus	0.162	0.000*	0.033*
Idea Akcji FIO	0.129	0.000*	0.021*
ING Akcji FIO	0.320	0.000*	0.688
LM Akcji FIO	0.209	0.000*	0.266
Millennium Akcji(subfund)	0.371	0.000*	0.024*
Pioneer Akcji Polskich FIO	0.919	0.000*	0.070
PKO/CS Akcji FIO	0.285	0.000*	0.013*
PZU FIO Akcji Krakowiak	0.124	0.000*	0.008*
SEB Akcji (subfund)	0.130	0.000*	0.014*
Skarbiec Akcja (subfund)	0.316	0.000*	0.203
UniKorona Akcje (subfund)	0.138	0.000*	0.046*
Total Significant	**0**	**15**	**8**

The probability of a Type I error in the α estimations proved in all cases to be above the assumed significance level of 5%. At the same time, all β_1 estimations were

statistically significant, whereas for β_2 this was the case for 8 out of 15 funds. Such results stood strongly against the aforementioned fundamental analysis of the funds, according to which both market timing and portfolio selection activities were strongly present in the funds' investment strategy. Especially the lack of impact of micro-forecasting in all considered cases, seemed much unlikely. It is not uncommon that CAPM-based models show poor statistical significance levels when the data contains a value peak. This was also verified and proved not to have occurred. Afterwards, a few more possible interfering factors were examined and excluded. A choice was made to modify the model.

IV. The Modified Henriksson-Merton Model

The described structure of the standard parametric H-M model determines operating within the CAPM assumptions framework. This results in analyzing the impact of each factor separately. At the same time, it is worthwhile mentioning that this structure can be easily adjusted to function as a multifactor model, which implies taking into consideration the combined impact of market timing and portfolio selectivity [18]. This approach is one of the possible solutions in a situation, when the base parametric version of the H-M test does not provide satisfying results. Another way of conduct is to transform the model by incorporating one of the independent variables into the dependent variable. This kind of procedure was utilized as the next part of the research described in this paper.

Deducting the variable x(t) from both sides of Eq. (1), resulted in the following form of the equation:

$$Z_p(t) - R(t) - x(t) = a + b_2 y(t) + e(t) \qquad (2)$$

According to the fact that x(t) stands for the market return in excess of the risk free rate in period t, the model ultimately took the form below:

$$Z_p(t) - Z_M(t) = a + b_2 y(t) + e(t) \qquad (3)$$

Where: $Z_M(t)$ = the market return in period t, all other denotations same as for Eq. (1).

As result, the modified H-M equation estimates are constrained to α and β_2 parameters. This, however, does not limit the functionality of the model, as the omitted β_1 parameter relates to the part of assets invested according to Mertons Rational Option Pricing Theory, and therefore is not crucial to understanding the impact of market timing (α) and portfolio selectivity (β_2) in the H-M approach. Moreover, in terms of estimated parameter values, the described changes to the test may result in a linear move of the whole function. This might change the absolute numbers, but can not influence the comparative efficiency of the model. Concluding, the proposed modification does not result in any negative impact to the key functionalities of the model, however it brings two crucial improvements.

The set-up of the modified model is more intuitive. Dependent variable ($Z_p(t) - Z_M(t)$) expresses portfolio return in excess of the market return in period t. This reflects better the reality, as the investors expect the investment managers to outperform not only the risk-free return rate, but also the market benchmark [19]. Coefficients α and β_2 represent two key components of investment performance: α stands for the abnormal return attributed to portfolio selectivity, β_2 measures the effect of market timing activities.

The presented modification can also provide better statistical significance results for α and β_2, as it removes the interfering impact of the variable representing the part of assets invested according to the aforementioned Rational Option Pricing Theory. Therefore, being applicable to more varied data sets, the improved model can be considered as more versatile.

In order to verify these two statements, the modified H-M model (see Eq. (3)) has been put to test on the same database, which was previously utilized for the standard parametrical H-M model. Table 2 exhibits the statistical significance test results for the least-squares regression. It is important to mention that they are accurate to the third decimal place, so 0.000 does not necessarily represent a zero value.

Table 2

Statistical significance results – Modified H-M Model

Fund	α	β_2
Arka Akcji FIO	0.000*	0.000*
BPH F Akcji (subfund)	0.000*	0.000*
CU Polskich Akcji (subfund)	0.000*	0.000*
DWS FIO Akcji	0.000*	0.000*
DWS FIO Akcji Plus	0.000*	0.000*
Idea Akcji FIO	0.000*	0.000*
ING Akcji FIO	0.000*	0.000*
LM Akcji FIO	0.000*	0.000*
Millennium Akcji (subfund)	0.000*	0.000*
Pioneer Akcji Polskich FIO	0.000*	0.000*
PKO/CS Akcji FIO	0.000*	0.000*
PZU FIO Akcji Krakowiak	0.000*	0.000*
SEB Akcji (subfund)	0.000*	0.000*
Skarbiec Akcja (subfund)	0.000*	0.000*
UniKorona Akcje (subfund)	0.000*	0.000*
Total Significant	**15**	**15**

In case of all α and β_2 estimations, the null hypothesis about parameter insignificance has been rejected (the probabilities of a Type I error were below the assumed significance level of 5%). It was proven, that for all 15 investigated mutual funds, the market timing and portfolio selectivity activities did have an impact on the portfolio return in excess of the market return. This can be considered in line with the existing literature and the conclusions coming from a qualitative research on the investigated funds' investment strategy [20]. The modifications applied to the parametric H-M test have proven to be successful.

Further steps of a complete research utilizing the modified parametric H-M model should include a detailed analysis of the parameter values. This was not within the scope of this paper, however in general, the results confirmed the well-documented statement, that active funds do not outperform the market [21]. Although the literature in parallel confirms that they do not successfully "time" the markets, in the described research the impact

of market timing abilities proved to be positive [22][23]. It was also revealed that portfolio selection had a negative influence on the funds' ability to provide excess returns, which is in line with the available research [24]. Surprisingly, the impact of both considered skills was strongly negatively correlated (-0.90).

Conclusion

This paper elaborates on the Henriksson-Merton model, which is one of the tools designed for measuring the impact of market timing and portfolio selectivity capabilities on investment performance. The parametrical form of the model was put to test on a group of 15 mutual funds from the Polish market. Most of the parameter estimates proved to be statistically insignificant, which was inconsistent with the conducted fundamental analysis of the funds' activities. A modification to the structure of the equation was proposed in order to improve the versatility of the model and to make it easier to interpret. The improved equation was successfully verified on the same database. Consistent with prior literature, the empirical results indicated that the market timing and portfolio selectivity skills do have an impact on the level of excess portfolio returns. In the analyzed sample the former effect was positive and the latter one negative. The phenomena of strong negative correlation between them is what requires further research [25]. If confirmed, it might implicate the presence of investment styles among investment managers.

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