“Mutual fund performance evaluation during periods of market turbulence: evidence from the Greek market”

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Mutual fund performance evaluation during periods of market turbulence: evidence from the Greek market

Abstract

This paper examines fund managers' performance during an unprecedented world financial crisis using Greek domestic equity funds for the period 1/1/2007-30/11/2012. This period also covers the Greek fiscal crisis and the so called "Grexit" possibility, forming a unique setting for analysis. The author employs the widely used Treynor and Mazuy (1966) methodology augmented by new explanatory variables in order to identify fund managers' skills and capture the special characteristics of the Greek market, focusing on the extreme market conditions in the Greek stock market and the adverse shareholder sentiment reflected in fund outflows. The empirical results indicate that fund managers did not possess any superior selectivity or market timing skill. Moreover, fund flows had a significant impact on funds' performance during the turbulent period under examination making active management more difficult.

Keywords: mutual funds, performance evaluation, financial crisis.
JEL Classification: G15.

Introduction

Mutual funds have experienced a significant growth worldwide over the last few decades and have attracted investors' interest due to their important benefits, including professional management at a very low cost for individual shareholders, diversification benefits, increased liquidity, lower transaction costs as well as a wide variety of products that cover most of investment needs and goals.

Mutual fund performance evaluation and fund managers' ability to outperform the market has attracted significant research interest, mainly due to the ever-increasing importance and magnitude of institutional investors, with the worldwide total net assets of mutual funds reaching approximately $24.8 trillion by the end of the second quarter of 2012 and 73,490 individual funds (see Table 1)[1]. The steady increase in the number of funds and assets under management necessitates the evaluation of professional fund managers' skills, especially during periods of extreme market conditions. It is important to identify whether fund managers can exploit such turbulent periods for the benefit of their shareholders.

Table 1. The mutual fund industry worldwide (December 31, 2000-June 30, 2012)

	Number of funds	Millions of U.S. dollars	Millions of euros
31/12/2000	51,692	11,871,061	12,596,627
31/12/2001	52,849	1 1,654,904	13,073,364
31/12/2002	54,110	11,324,128	10,798,253
31/12/2003	5 4,569	1 4,048,311	11,122,970
31/12/2004	54,982	16,164,793	11,867,553
31/12/2005	56,867	17,757,360	15,064,023
31/12/2006	61,855	21,808,884	16,570,581
31/12/2007	66,347	26,131,496	17,751,170
31/12/2008	69,032	18,920,057	13,594,925
31/12/2009	67,551	22,952,806	15,932,806
31/12/2010	69,518	24,699,170	18,484,635
31/12/2011	72,657	23,779,874	18,386,977
30/6/2012	73,490	24,769,624	19,674,046

Source: Investment Company Institute (ICI).

The recent global financial crisis constitutes an important case study for investigating whether fund managers have been capable of taking advantage of the extreme market conditions and asset mispricing that had occurred so as to enhance shareholder wealth. It should be mentioned that very few studies have examined fund performance during the recent financial crisis[2]. Additionally, the Greek mutual fund market offers a unique setting for analysis since the Athens Stock Exchange was affected by both the global financial crisis and the Greek fiscal crisis[3]. The austerity measures implemented by the Greek government, as well as the increased political instability and uncertainty about a possible exit of Greece from the Eurozone resulted in a dramatic decrease in the capitalization of the Athens Stock Exchange and significant asset mispricing, driven mostly by investor sentiment and overreaction.

This paper empirically examines Greek mutual fund managers' performance using a sample of domestic equity funds for the period 31/12/2006-30/11/2012,

[1] Source: Investment Company Institute (ICI).

[2] For example Bangassa, Su and Joseph (2012) for the UK investment trusts for the period July 1981 to June 2009. However, most of the studies cover only the early burst of the financial crisis, for example Hsu, Ou, Yang, Ou (2012) for Taiwan for the period from November 2006 to October 2008, Eling and Faust (2010) using emerging markets' hedge funds and mutual funds data for the period from January 1995 to August 2008 etc.

[3] The generalized negative investor and economic sentiment was definitely intensified by successive analysts' estimates and forecasts regarding the possibility of the Greek default and the potential Eurozone exit e.g. according to Citigroup there was a 90% chance that Greece will exit the euro (Source: Bloomberg, July 2012).

focusing on the extreme market conditions in the Greek stock market and the adverse shareholder sentiment as evidenced by large fund outflows. To this end, we employ the traditional Treynor and Mazuy (1966) methodology augmented by new explanatory variables; namely regarding mutual fund size and flows, in order to identify fund managers' stock picking and market timing skills.

Previous literature has clearly demonstrated fund managers' inability to outperform the market or their relative benchmark indices (Babalos, Philippas, Doumpos and Zopounidis, 2012; Fama and French, 2010; French, 2008; Carhart, 1997; Gruber, 1996 etc.). In fact, Gruber (1996) describes the significant growth in active mutual funds as a "puzzle" since tens of millions of investors invest in actively managed funds that on average do not manage to outperform the market.

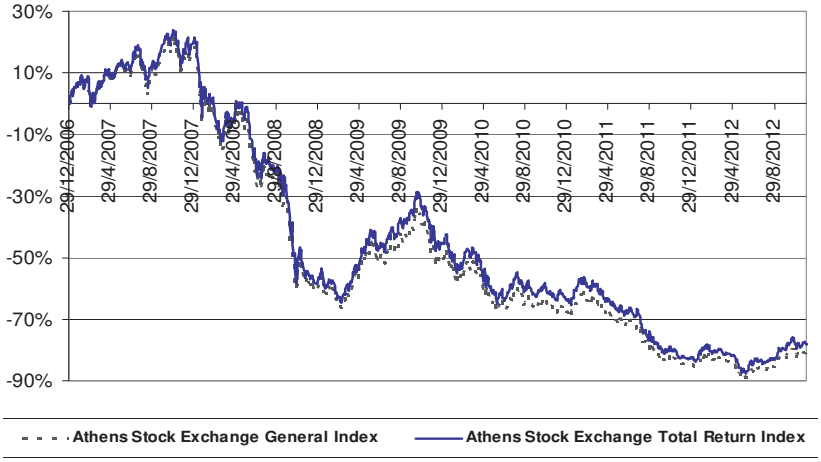
Moreover, a strong correlation of fund flows with stock market returns has been documented, as evidenced by fund inflows during positive market periods and fund outflows during negative market periods (Caporale, Philippas and Pittis, 2004). In this case, fund managers' decisions are strongly affected by inflows occurring when the market is already at its highest levels and outflows occurring when the market is already at its lowest levels, having an additional negative impact on their performance (Ferson and Schadt, 1996). In many cases, mutual fund flows have been directly associated with shareholder sentiment and overall market sentiment (Brown, Goetzmann, Hiraki, Shiraishi and Watanabe, 2003; Baker and Wurgler, 2007), with massive fund outflows reflecting adverse shareholder sentiment. Moreover, the interaction between fund flows and market returns is expected to be particularly important in relatively small stock markets. Additionally, apart from the impact of the fund flows on performance, Chen, Hong, Huang and Kubik (2004) have documented a significant negative relationship between fund size and performance, especially for funds which invest in relatively illiquid securities. In the same sense, fund size relative to the stock market transactions could be used as a representative measure of the managers' ability to make transactions in a market and is expected to have a negative relationship with fund performance.

The rest of the paper is structured as follows. Section 1 presents the characteristics of the Greek mutual fund market during the crisis period. Section 2 and Section 3 report the dataset and the methodology employed, respectively. Section 4 presents the empirical results and the final section concludes the paper.

1. The Greek mutual fund market

The Athens Stock Exchange is a relatively small stock market with low capitalization and thin trading. The Greek financial system is oligopolistic and dominated by a few large banking groups, which also control the main fund management companies of the mutual fund market[1].

The Athens Stock Exchange General Index, after successive shocks, experienced a dramatic decrease from 4,394.13 units on January 1, 2007 to 476.36 units on June 5, 2012 (an almost 90% decrease), reflecting the increased uncertainty regarding the crucial fiscal problems as well as investors' pessimism and overreaction (see Figure 1). It should also be mentioned that the stock market capitalization was approximately, in May 2012, 10% of the Gross Domestic Product.

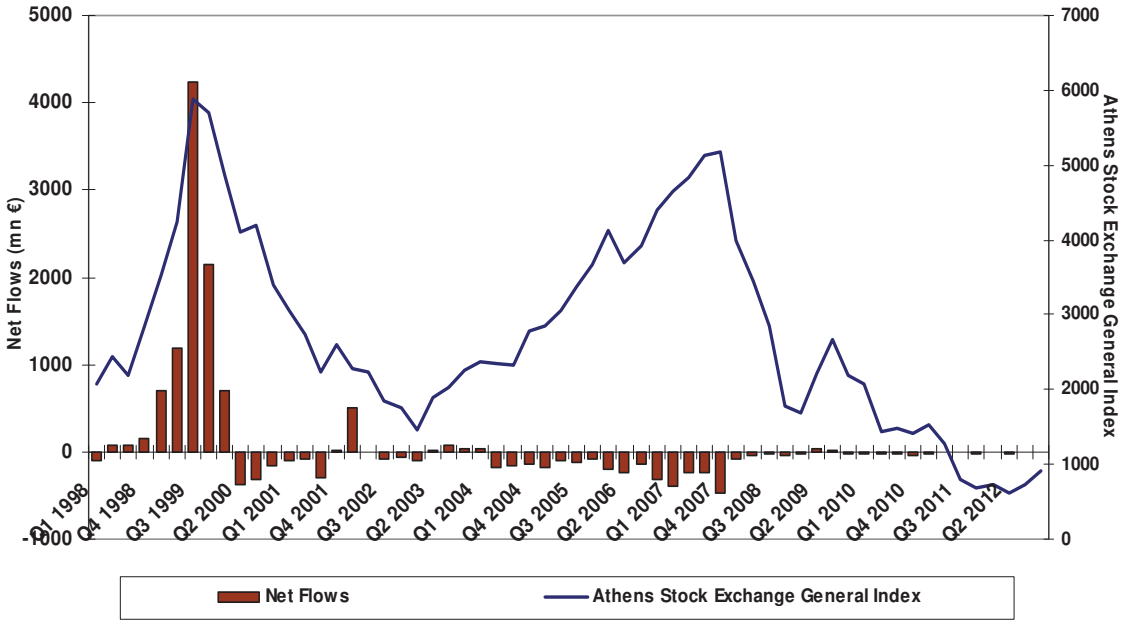


Source: Datastream, Bloomberg.

Fig. 1. Athens Stock Exchange General Index and Athens Stock Exchange Total Return Index (cumulative returns, 29/12/2006-30/11/2012)

[1] See Babalos, Kostakis and Philippas (2009).

The Greek mutual fund market offers an interesting setting for a performance evaluation analysis during the financial crisis as well as the Greek debt crisis which had an extremely negative impact on the Athens Stock Exchange accompanied by significant outflows, reflecting negative investor's sentiment (See Figure 2).



Source: Datastream, AGII.

Fig. 2. Athens Stock Exchange General Index and net flows of Greek domestic equity funds (quarterly data, 1998-2012)

After a remarkable growth during the 1990s and the beginning of 2000s, the Greek mutual fund market experienced significant outflows during the financial crisis, with the size of the market shrinking to €5.7 billion in 30/11/2012, from €23.9 billion in 2006 (see Table 2)[1]. It should be mentioned, though, that the Greek mutual fund market moved to the opposite direction from the world mutual fund market which experienced a steady increase in assets under management (see Table 1 and Table 2). More precisely, the domestic equity funds experienced cumulative net outflows of approximately €1.2 billion for the period from 1/1/2007 to 30/11/2012 and assets under management were reduced significantly, reaching €818.5 million (see Table 3)[2].

Table 2. The Greek mutual fund industry, data for the period 31/12/2000-30/11/2012

	Number of funds	Net asset value in millions of euros
31/12/2000	266	30,888.66
31/12/2001	269	26,794.90
31/12/2002	260	25,385.15
31/12/2003	265	30,398.91
31/12/2004	262	31,647.83
31/12/2005	258	27,943.97
31/12/2006	269	23,892.16
31/12/2007	330	24,528.81
31/12/2008	354	10,414.61
31/12/2009	305	10,679.19
31/12/2010	303	8,015.64
31/12/2011	310	5,229.08
30/11/2012	285	5,665.39

Source: Association of Greek Institutional Investors (AGII).

Table 3. Greek domestic equity mutual funds, data for the period 31/12/2006-30/11/2012

	Number of domestic equity funds	Net asset value in millions of euros
31/12/2006	36	3,987.42
31/12/2007	43	3,596.75
31/12/2008	46	1,359.31
31/12/2009	45	1,728.33
31/12/2010	45	1,299.37
31/12/2011	45	691.28
30/11/2012	39	818.54

Source: Association of Greek Institutional Investors (AGII).

The oligopolistic structure of the mutual funds market as well as the relatively small in size and illiquid Athens Stock Exchange necessitates the evaluation of fund managers performance abilities since their performance could be adversely affected by massive inflows or outflows, when fund managers have to invest in or sell thinly traded assets, respectively. The significant fiscal distortion along with the global financial crisis created a financial storm that made active management even

[1] Source: Association of Greek Institutional Investors (AGII).
[2] Source: Association of Greek Institutional Investors (AGII).

more difficult and challenging. These unique circumstances of market turbulence accompanied by the special characteristics of the Greek mutual fund industry necessitate an in-depth analysis of professional management performance.

2. Data

In order to examine the fund managers' performance we employ monthly excess, log differenced returns of 38 domestic equity mutual funds from the Greek market for the period 1/1/2007-30/11/2012, covering both the pre-crisis and the post-crisis period[1].

Net share price and total assets data under management were derived from the Association of Greek Institutional Investors (AGII). Excess returns are calculated using the Greek 3-month T-Bill rate and market returns were calculated using both the Athens Stock Exchange General Index and the Athens Stock Exchange Total Return Index. It should be noted that for research purposes a more representative proxy is the Athens Stock Exchange Total Return Index[2]. Data for the risk free rate and the market index were derived from Datastream. Finally, we use the average daily cash value of total settled transactions in the Athens Stock Exchange (derived from the Athens Stock Exchange Monthly Statistics Bulletin) in order to generate a relative measure of size with respect to stock market transactions (fund assets divided by the average daily cash value of total settled transactions) used in the estimations presented in section 3.

3. Methodology

Several studies have examined funds performance evaluation using risk adjusted performance measures such as the Sharpe (1966) and Treynor ratios (1965) or more complicated models taking into consideration several risk factors such as the Treynor and Mazuy's model (1966), the Jensen's model (1968), as well as the Carhart's model (1997).

This is a first attempt to evaluate whether Greek fund managers possessed any particular skills, under such extraordinary conditions of combined financial and fiscal crisis. In this paper we employ the Treynor and Mazuy model (1966) introducing several new factors in the traditional approach. This model has been widely used[3] and accepted since it can capture both fund managers' potential stock selection and market timing skills.

The ideal fund manager should be able to select undervalued assets generating in this way positive abnormal returns for the shareholders (stock picking or selection ability). During periods of market stress investor sentiment and overreaction may lead to considerable asset mispricing. In this case fund managers should be able to identify undervalued securities and take advantage of the observed market inefficiencies.

At the same time, fund managers should be able to predict market shifts and transform their portfolios' composition accordingly, increasing or decreasing the risk level of their funds in bull and bear markets respectively (market timing ability). In this case, fund betas (systematic risk coefficients) tend to change in order to adjust their risk level according to the market conditions. Apart from adapting to market conditions, beta coefficients may also temporarily change as portfolio weightings change due to asset prices fluctuations or net fund flows.

In order to take into consideration betas temporal variation and capture fund managers' potential superior market timing ability, Treynor and Mazuy (1966) added a quadratic term in the simple single factor model as follows:

$$R_{p,t} = a_p + b_p R_{m,t} + c_p R_{m,t}^2 + e_{p,t}, \quad (1)$$

$$\frac{\partial R_{p,t}}{\partial R_{m,t}} = b_p + 2c_p R_{m,t}, \quad (2)$$

where $R_{p,t}$ is the excess return of the fund p, $R_{m,t}$ is the excess return of the market portfolio, α_p measures the fund manager's selection ability, b_p is the beta coefficient of the portfolio p, c_p measures the fund manager's market timing ability and $e_{p,t}$ is a random error. Fund managers having superior selection and market timing abilities are expected to show positive, statistically significant a_p and positive, statistically significant c_p, respectively.

More specifically, equation (2) presents a first order differential equation. During bull markets ($R_{m,t} > 0$), if the coefficient c_p is positive, the slope of the characteristic line (beta coefficient) is assuming a higher value as market returns increase, meaning that the fund manager adjusted the risk level of his portfolio taking on more risky assets. If coefficient

[1] Our data set consists of 38 domestic equity funds that existed in 31/11/2012. One fund with available data of less than a year was omitted. 3 out of 38 funds cover a period smaller than the whole period under examination but cover at least a four years period or more.

[2] The Athens Stock Exchange General Index does not include reinvested dividends of the shares included in the index and tends to underestimate the total return of the index (see Figure 1). During the period from May 2001 to December 2012, the official Athens Stock Exchange General Index underestimated the total return by 11.5%. However, the Athens Stock Exchange Total Return Index includes both capital and dividend yield and provides a more representative proxy of the total market return to compare with Greek domestic equity funds.

[3] This methodology has been employed even in the most recent literature (for example see Alda, Ferruz and Gallagher, 2013; Bangassa, Su and Joseph, 2012).

c_p is zero, beta coefficient remains stable regardless of the market returns. Finally, if coefficient c_p is negative the slope of the characteristic line (beta coefficient) is getting lower as market returns increase, meaning that the fund manager has negative market timing (going to the wrong direction) and adjusted the risk level of his portfolio taking on less risky assets. Similarly, during bear markets ($R_{m,t} < 0$), fund managers are expected to adjust their portfolios risk level accordingly, shifting their composition to less risky assets.

$$R_{p,t} = a_p + b_p R_{m,t} + c_p R_{m,t}^2 + \\ + flows\ factor_{p,t} + e_{p,t}. \quad (3)$$

Moreover, we want to test whether fund inflows/outflows may affect fund managers' stock selection and market timing abilities. To this end, we augment the traditional Treynor and Mazuy model (1966) by the flows factor as follows:

Following, Caporale, Philippas and Pittis (2004) and Berk and Tonks (2007), we calculate the flows factor as follows:

$$flows\ factor_{p,t} = \frac{TA_{p,t} - TA_{p,t-1} \times (1 + R_{p,t})}{TA_{p,t-1}}, \quad (4)$$

where $TA_{p,t}$ are the total assets of fund p in time t and $R_{p,t}$ are the funds return for the period (t-1, t).

This relative flows factor is expected to have a positive relationship with fund performance, indicating that significant outflows may have a negative impact on fund performance. This behavior is particularly expected during crisis periods, when massive outflows force fund managers to sell their assets in order to be able to satisfy their shareholders' redemptions.

Finally, we examine the potential influence of fund's size relative to the total settled transactions in the Athens Stock Exchange. To this end, we augment the traditional Treynor and Mazuy model (1966) by the size factor as follows:

$$R_{p,t} = a_p + b_p R_{m,t} + c_p R_{m,t}^2 + size\ factor_{p,t} + e_{p,t}, \quad (5)$$

where the size factor is calculated by dividing the total assets of fund p by the average daily cash value of total settled transactions in the Athens Stock Exchange. This additional factor is used as a proxy of the fund's size and its relative ability to buy or sell assets in the Athens Stock Exchange and relates the fund's size to markets depth and liquidity. The size factor is expected to have a negative relationship with fund performance, indicating that a large fund in a relatively illiquid market would face difficulties in active management.

4. Empirical results

In this section we present the empirical results of our analysis and discuss their implications. Table 4 presents the results from the estimation of Treynor and Mazuy model (1966) (equation (1)) using the official Athens Stock Exchange General Index as a proxy for the Greek equity market. In this case 3 out of 38 domestic equity funds indicate superior selectivity, having positive and statistically significant α coefficients at a 5% significance level and 2 funds show negative selectivity. At the same time, none of the funds has superior market timing ability. However, the Athens Stock Exchange Total Return Index is considered to be a more representative benchmark in order to evaluate mutual funds performance since it includes reinvested dividends. Table 5 presents the estimation results. It should be mentioned that using the Athens Stock Exchange Total Return Index our results indicate reduced selectivity ability compared to the results of equation (1), as expected. In this case only 1 out of 38 funds shows superior selectivity and 7 funds present negative selectivity, while none of the funds has superior market timing ability, indicating that fund managers did not manage to adjust their portfolios' risk level relative to the extreme market conditions of the period under examination.

Table 6 presents the results of the augmented by the flows factor Treynor and Mazuy (1966) model. Consistent with our predictions, a positive statistically significant relationship between the flows factor and funds' performance is documented in most of the cases (31 out of 38 funds). This result confirms the significant flows impact on fund managers' investment decisions, as well as on their final performance. This finding should be considered when evaluating fund managers who have to invest in relatively small markets in terms of market capitalization and trading volume, especially during crisis periods, when fund flows are mainly driven by investor sentiment.

Finally, Table 7 presents the results of the augmented by the size factor Treynor and Mazuy (1966) model. The empirical results do not indicate any statistical significant relationship between our size factor[1] and funds' performance, with only a few exceptions. These results do not confirm our research hypothesis of a negative relationship between funds' size and performance.

[1] Apart from our definition of the size factor, an alternative definition has been used. Specifically, we divided the total assets of fund p by the average daily cash value of total settled transactions in the Athens Stock Exchange, we have also estimated equation (5) using the log of funds' assets as an additional explanatory variable. However, the results did not indicate any statistical significant relationship either.

Table 4. Empirical estimations of Treynor-Mazuy model using the Athens Stock Exchange General Index

Fund	α	*t*-stat.	*b*	*t*-stat.	*c*	*t*-stat.	Adj. R^2
1	0.33%	1.56	0.8951	12.22*	-0.4144	-0.51	84.94%
2	0.18%	0.98	0.9039	10.25*	-0.0758	-0.11	85.34%
3	0.14%	0.92	0.8669	15.65*	0.0747	0.14	88.75%
4	0.13%	1.63	1.0053	14.77*	0.1562	0.28	95.67%
5	0.16%	1.14	0.8813	12.42*	-0.1487	-0.25	89.63%
6	0.19%	1.30	0.7142	15.22*	-0.2257	-0.42	85.56%
7	0.17%	1.03	0.8867	10.09*	-0.1736	-0.26	86.75%
8	0.24%	1.99*	0.9549	20.79*	0.3023	0.72	94.91%
9	0.19%	1.89	0.9160	25.44*	-0.2948	-1.03	96.70%
10	0.33%	1.74	0.8260	13.81*	-0.1781	-0.30	86.77%
11	0.22%	1.89	0.6820	12.41*	-0.3004	-0.60	91.85%
12	0.09%	0.70	0.8394	15.30*	-0.2881	-0.51	93.53%
13	0.06%	0.54	0.7532	11.51*	-0.1424	-0.22	93.28%
14	-0.02%	-0.24	1.0305	26.16*	0.5126	1.39	97.74%
15	0.17%	1.61	0.9567	15.87*	-0.6881	-1.59	95.53%
16	0.16%	1.17	0.6649	11.50*	-0.2427	-0.47	89.52%
17	0.14%	2.32*	0.8790	31.30*	-0.1894	-0.81	97.59%
18	0.22%	1.66	0.9649	14.81*	-0.2810	-0.48	93.94%
19	0.08%	1.17	0.9222	19.71*	-0.3168	-0.80	96.89%
20	0.00%	0.00	0.8218	20.04*	-0.1215	-0.26	94.84%
21	0.14%	1.32	0.7843	18.67*	-0.3734	-0.87	92.55%
22	0.17%	1.61	0.9071	14.29*	-0.4594	-0.86	94.64%
23	0.00%	0.03	0.8548	17.94*	0.4569	0.63	93.97%
24	-0.10%	-1.51	0.7942	20.48*	0.4084	1.31	96.82%
25	0.29%	1.85	0.5749	11.76*	-0.9704	-1.31	88.01%
26	0.23%	1.85	0.9795	14.97*	-0.3759	-0.60	94.16%
27	0.10%	1.28	0.8038	32.29*	-0.4272	-1.12	96.95%
28	-0.19%	-1.91	0.7719	9.05*	0.7699	0.94	86.98%
29	0.09%	0.95	0.8592	18.38*	-0.1144	-0.27	95.74%
30	-0.24%	-2.67*	0.7959	18.25*	0.4125	1.21	93.76%
31	-0.07%	-0.75	0.9300	16.47*	0.1171	0.23	95.20%
32	-0.11%	-1.15	0.7782	22.31*	-0.3000	-0.77	94.10%
33	0.06%	0.56	0.8892	16.76*	-0.1638	-0.30	92.83%
34	-0.10%	-2.24*	0.8465	42.05*	0.3255	1.35	99.01%
35	0.08%	0.61	0.6560	17.08*	-0.2645	-0.83	89.71%
36	0.51%	2.38*	0.8149	14.51*	1.5529	1.40	86.95%
37	0.11%	1.30	1.0229	16.02*	0.1859	0.37	95.72%
38	0.15%	1.21	0.9510	15.12*	-0.5796	-1.31	94.91%

Notes: *t*-statistics have been calculated using Newey-West heteroscedasticity and autocorrelation consistent standard errors. *Represents statistical significance at the 5% level. Monthly excess returns for the period 1/1/2007-30/11/2012.

Table 5. Empirical estimations of Treynor-Mazuy model using the Athens Stock Exchange Total Return Index

Fund	α	*t*-stat.	*b*	*t*-stat.	*c*	*t*-stat.	Adj. R^2
1	0.23%	1.12	0.8983	12.96*	-0.3786	-0.48	85.67%
2	0.08%	0.47	0.9068	10.79*	-0.0439	-0.06	86.18%
3	0.05%	0.34	0.8678	17.10*	0.0867	0.17	89.48%
4	0.02%	0.34	1.0067	16.00*	0.1983	0.39	96.31%
5	0.06%	0.49	0.8833	13.39*	-0.1212	-0.22	90.34%
6	0.12%	0.85	0.7153	16.23*	-0.2267	-0.45	86.33%
7	0.07%	0.47	0.8911	10.43*	-0.1178	-0.18	87.66%
8	0.14%	1.21	0.9548	22.25*	0.3297	0.81	95.42%
9	0.09%	0.92	0.9161	28.23*	-0.2698	-0.99	97.01%
10	0.24%	1.29	0.8286	14.35*	-0.1367	-0.23	87.43%

Table 5 (cont.). Empirical estimations of Treynor-Mazuy model using the Athens Stock Exchange Total Return Index

Fund	*α*	*t*-stat.	*b*	*t*-stat.	*c*	*t*-stat.	Adj. R^2
11	0.14%	1.24	0.6822	13.44*	-0.2883	-0.62	92.20%
12	-0.01%	-0.06	0.8411	16.32*	-0.2450	-0.45	93.98%
13	-0.03%	-0.26	0.7548	12.44*	-0.1046	-0.17	93.81%
14	-0.13%	-2.10*	1.0296	30.63*	0.5387	1.57	98.22%
15	0.06%	0.65	0.9597	16.51*	-0.6322	-1.48	95.95%
16	0.09%	0.65	0.6664	12.38*	-0.2154	-0.45	90.06%
17	0.05%	0.87	0.8785	35.26*	-0.1730	-0.79	97.89%
18	0.11%	0.86	0.9678	15.89*	-0.2143	-0.38	94.43%
19	-0.02%	-0.26	0.9229	21.93*	-0.2872	-0.81	97.29%
20	-0.09%	-0.83	0.8219	22.23*	-0.0966	-0.22	95.19%
21	0.06%	0.57	0.7829	19.57*	-0.3881	-0.93	92.83%
22	0.07%	0.71	0.9098	14.97*	-0.4064	-0.79	95.12%
23	-0.09%	-0.70	0.8539	19.30*	0.4759	0.67	94.47%
24	-0.19%	-2.92*	0.7934	22.64*	0.4292	1.52	97.27%
25	0.23%	1.41	0.5786	12.49*	-0.9227	-1.26	88.53%
26	0.12%	0.99	0.9824	16.14*	-0.3073	-0.51	94.60%
27	0.02%	0.24	0.8000	28.14*	-0.4572	-1.10	96.82%
28	-0.28%	-2.81*	0.7724	9.72*	0.8138	1.06	87.75%
29	-0.01%	-0.06	0.8582	19.86*	-0.0874	-0.22	95.83%
30	-0.33%	-3.75*	0.7960	20.41*	0.4449	1.46	94.32%
31	-0.17%	-1.96*	0.9305	17.88*	0.1490	0.31	95.72%
32	-0.19%	-1.97*	0.7774	24.61*	-0.2929	-0.79	94.33%
33	-0.04%	-0.35	0.8892	18.37*	-0.1416	-0.27	93.19%
34	-0.19%	-4.59*	0.8439	53.01*	0.3321	1.46	99.14%
35	0.01%	0.08	0.6565	18.71*	-0.2459	-0.83	90.06%
36	0.42%	2.03*	0.8087	14.73*	1.5431	1.41	87.15%
37	0.00%	0.01	1.0238	17.35*	0.2230	0.48	96.31%
38	0.04%	0.35	0.9540	15.67*	-0.5219	-1.19	95.37%

Notes: *t*-statistics have been calculated using Newey-West heteroscedasticity and autocorrelation consistent standard errors. *Represents statistical significance at the 5% level. Monthly excess returns for the period 1/1/2007-30/11/2012.

Table 6. Empirical estimations of Treynor-Mazuy model augmented by the flows factor

Fund	*α*	*t*-stat	*b*	*t*-stat	*c*	*t*-stat	Flows factor	*t*-stat.	Adj. R^2
1	0.05%	0.31	0.7206	11.13*	-0.8281	-1.30	0.1312	3.82*	88.85%
2	-0.17%	-1.03	0.6605	6.11*	-0.2948	-0.49	0.1683	2.27*	88.10%
3	0.14%	1.09	0.5856	5.01*	-0.5599	-1.47	0.2180	2.22*	92.95%
4	0.11%	1.36	0.8731	9.45*	-0.2025	-0.42	0.0956	1.64	96.83%
5	0.13%	1.60	0.3104	2.54*	-1.2555	-5.33*	0.4890	4.41*	97.27%
6	0.01%	0.04	0.6288	7.88*	-0.2720	-0.57	0.0932	1.38	87.41%
7	0.26%	2.68*	0.1301	2.00*	-1.4973	-3.98*	0.6357	12.60*	97.48%
8	0.06%	0.55	0.8910	20.02*	0.3684	0.88	0.0522	2.55*	95.61%
9	0.10%	1.19	0.6853	12.03*	-0.7510	-2.74*	0.1864	4.11*	97.76%
10	0.10%	0.46	0.7071	10.11*	-0.2434	-0.46	0.0878	2.80*	89.23%
11	0.12%	1.29	0.3202	5.44*	-0.6637	-2.84*	0.3796	6.64*	96.84%
12	-0.02%	-0.18	0.6949	11.67*	-0.4004	-0.74	0.1340	3.12*	95.06%
13	-0.25%	-2.31*	0.4104	2.61*	-0.6135	-1.55	0.3354	2.25*	96.46%
14	-0.11%	-1.73	0.9020	14.46*	0.2693	0.78	0.0941	2.45*	98.34%
15	0.37%	3.61*	0.6439	7.36*	-1.2974	-4.75*	0.2463	3.26*	97.43%
16	0.03%	0.31	0.2079	3.24*	-0.8599	-4.54*	0.4926	6.43*	96.18%
17	0.10%	1.25	0.6708	8.08*	-0.6127	-2.83*	0.1672	2.27*	98.30%
18	0.21%	1.99*	0.6550	7.51*	-0.8618	-1.59	0.2340	3.74*	96.20%
19	0.09%	1.48	0.5747	4.48*	-0.9605	-3.06*	0.2866	2.68*	98.47%
20	-0.01%	-0.08	0.7456	23.46*	-0.1344	-0.37	0.0855	3.95*	96.39%
21	0.21%	2.19*	0.5413	4.64*	-0.7846	-2.16*	0.2446	2.25*	94.59%

Table 6 (cont.). Empirical estimations of Treynor-Mazuy model augmented by the flows factor

Fund	*α*	*t*-stat	*b*	*t*-stat	*c*	*t*-stat	Flows factor	*t*-stat.	Adj. R^2
22	0.25%	2.41*	0.2675	3.01*	-1.5892	-3.57*	0.5252	7.03*	98.31%
23	-0.13%	-1.20	0.5837	8.69*	0.1239	0.29	0.2337	3.92*	96.76%
24	-0.12%	-1.76	0.4887	6.27*	-0.2347	-0.92	0.3024	4.08*	98.48%
25	0.17%	1.35	0.4545	6.21*	-1.0903	-1.95*	0.1284	2.07*	90.60%
26	0.13%	1.16	0.5027	5.28*	-1.0623	-2.30*	0.3840	4.99*	96.90%
27	0.01%	0.09	0.7870	19.98*	-0.4918	-1.14	0.0134	0.78	96.80%
28	-0.30%	-2.84*	0.7702	9.70*	0.8264	1.07	0.0018	2.43*	87.64%
29	0.14%	1.44	0.3301	2.39*	-1.0309	-3.19*	0.4747	4.24*	98.33%
30	-0.34%	-4.09*	0.7968	20.37*	0.4729	1.56	0.0014	6.17*	94.34%
31	-0.24%	-2.81*	0.8560	15.26*	0.0012	0.00	0.0542	1.75	95.85%
32	-0.22%	-2.45*	0.7407	25.41*	-0.3537	-0.90	0.0434	6.17*	95.06%
33	0.07%	0.78	0.5831	4.95*	-0.7164	-1.47	0.2792	2.78*	95.43%
34	-0.15%	-3.43*	0.7947	17.56*	0.3317	1.45	0.0580	1.62	99.23%
35	0.12%	0.92	0.4789	4.44*	-0.5957	-2.17*	0.1836	1.97*	92.03%
36	0.39%	2.01*	0.8157	14.53*	1.5545	1.40	0.0002	2.60*	87.23%
37	0.03%	0.42	1.0366	16.01*	0.2153	0.46	-0.0066	-1.00	96.28%
38	0.07%	0.72	0.9670	15.11*	-0.4857	-1.10	-0.0068	-0.68	95.36%

Notes: *t*-statistics have been calculated using Newey-West heteroscedasticity and autocorrelation consistent standard errors. *Represents statistical significance at the 5% level. Monthly excess returns for the period 1/1/2007-30/11/2012.

Table 7. Empirical estimations of Treynor-Mazuy model augmented by the size factor

Fund	*α*	*t*-stat.	*b*	*t*-stat.	*c*	*t*-stat.	Size factor	*t*-stat.	Adj. R^2
1	-0.13%	-0.41	0.8905	13.11*	-0.3737	-0.49	0.0947	1.53	85.69%
2	0.18%	0.43	0.9076	10.70*	-0.0561	-0.08	-0.0091	-0.29	85.98%
3	-0.09%	-0.24	0.8665	16.81*	0.1110	0.22	0.0255	0.43	89.34%
4	0.17%	0.58	1.0078	15.48*	0.1711	0.34	-0.0272	-0.56	96.26%
5	-0.06%	-0.17	0.8815	13.09*	-0.1131	-0.21	0.0024	0.41	90.21%
6	-0.07%	-0.30	0.7122	17.01*	-0.2299	-0.47	0.1285	0.94	86.28%
7	0.29%	0.52	0.8925	10.22*	-0.1552	-0.23	-0.0046	-0.46	87.50%
8	0.06%	0.22	0.9533	21.52*	0.3352	0.81	0.0053	0.44	95.36%
9	-0.07%	-0.33	0.9145	28.12*	-0.2524	-0.92	0.0247	1.02	96.99%
10	0.21%	0.85	0.8271	13.38*	-0.1377	-0.23	0.0023	0.22	87.25%
11	-0.12%	-0.48	0.6791	13.62*	-0.2754	-0.60	0.0075	1.21	92.24%
12	0.19%	0.76	0.8420	16.12*	-0.2719	-0.50	-0.0646	-1.00	93.93%
13	-0.03%	-0.19	0.7547	12.06*	-0.1044	-0.17	0.0007	0.03	93.72%
14	0.02%	0.11	1.0304	30.25*	0.5135	1.46	-0.0063	-0.90	98.20%
15	0.47%	1.47	0.9630	16.38*	-0.7256	-1.64	-0.0089	-1.65	95.97%
16	0.01%	0.04	0.6655	12.26*	-0.2121	-0.44	0.0026	0.54	89.93%
17	-0.04%	-0.38	0.8773	35.63*	-0.1672	-0.77	0.0005	1.08	97.88%
18	0.31%	0.74	0.9692	15.53*	-0.2497	-0.43	-0.0197	-0.56	94.36%
19	-0.01%	-0.06	0.9229	21.29*	-0.2875	-0.82	0.0000	-0.01	97.25%
20	0.02%	0.05	0.8218	22.24*	-0.1204	-0.26	-0.3513	-0.27	95.13%
21	-0.20%	-0.72	0.7808	19.54*	-0.3575	-0.87	0.0205	1.03	92.79%
22	0.35%	1.09	0.9114	14.70*	-0.4544	-0.87	-0.0022	-1.07	95.09%
23	-0.03%	-0.21	0.8545	19.09*	0.4744	0.66	-0.0037	-0.44	94.39%
24	-0.06%	-0.34	0.7945	22.35*	0.4191	1.45	-0.0024	-0.76	97.25%
25	0.05%	0.27	0.5733	12.79*	-0.9375	-1.32	0.0113	2.18*	88.96%
26	0.34%	1.18	0.9839	15.96*	-0.3401	-0.55	-0.0084	-0.99	94.55%
27	0.01%	0.11	0.7999	28.64*	-0.4573	-1.09	0.0010	0.07	96.77%
28	-0.39%	-3.54*	0.7707	9.76*	0.8222	1.09	0.1089	1.30	87.65%
29	-0.22%	-1.82	0.8549	19.71*	-0.0939	-0.24	0.0046	1.52	95.94%
30	-0.52%	-2.96*	0.7910	19.86*	0.4400	1.46	0.0372	1.38	94.33%
31	0.15%	0.81	0.9328	17.68*	0.1224	0.25	-0.0230	-2.00*	95.78%
32	0.05%	0.19	0.7807	24.32*	-0.3051	-0.82	-0.0264	-1.18	94.32%
33	-0.03%	-0.09	0.8893	18.05*	-0.1421	-0.26	-0.0003	-0.01	93.09%

Table 7 (cont.). Empirical estimations of Treynor-Mazuy model augmented by the size factor

Fund	α	*t*-stat.	*b*	*t*-stat.	*c*	*t*-stat.	Size factor	*t*-stat.	Adj. R^2
34	-0.06%	-0.77	0.8449	51.57*	0.3190	1.41	-0.0015	-1.85	99.15%
35	-0.16%	-0.58	0.6548	18.44*	-0.2366	-0.81	0.0034	0.67	89.96%
36	0.89%	2.80*	0.8136	14.52*	1.4453	1.34	-0.0876	-1.82	87.77%
37	0.02%	0.08	1.0239	17.09*	0.2205	0.48	-0.0141	-0.09	96.25%
38	-0.11%	-0.55	0.9514	15.56*	-0.5210	-1.20	0.0105	1.17	95.36%

Notes: *t*-statistics have been calculated using Newey-West heteroscedasticity and autocorrelation consistent standard errors. *Represents statistical significance at the 5% level. Monthly excess returns for the period 1/1/2007-30/11/2012.

Conclusions

In this paper we examined fund managers' performance during an unprecedented crisis period, using domestic equity funds from the Greek market for the period 1/1/2007-30/11/2012. To this end we employed the widely accepted Treynor and Mazuy (1966) model augmented by several new factors. These factors intend to capture the managers' relative ability to buy or sell assets in a quite illiquid market as the Athens Stock Exchange as well as the adverse shareholders' sentiment reflected in their fund outflows.

This paper makes a contribution to the existing literature examining fund managers' performance during an extremely turbulent crisis period for the Greek market, experiencing the combined effects of both financial and fiscal crisis, accompanied by increased uncertainty and negative investor sentiment.

The empirical results clearly indicate that fund managers did not present any superior selectivity or market timing skill during the crisis period. In fact, fund managers did not manage to adjust their portfolios according to the extreme market conditions that occurred for the benefit of their shareholders. However, fund managers should be able to take advantage of asset mispricing and identify the most undervalued equities as well as adapt their portfolio's risk level to bull and bear markets, respectively.

An interesting empirical result is that fund flows had a statistically significant impact on funds' performance during the crisis period under examination, consistent to previous findings and our research hypothesis. This finding indicates that active management is much more difficult for professional managers when they also have to face the unpredictable shareholder sentiment reflected in massive inflows or outflows. This behavior may lead to less than optimal transactions reducing fund's final performance. An extended analysis of fund net flows in the Greek fund market would provide useful information about shareholder sentiment and its relation to the stock market cycle.

Even though the size factor did not present a statistically significant impact on fund performance future research should focus on fund's optimal size since a fund with a much higher size might be less flexible on its transactions. Moreover, future research should identify a more comprehensive proxy for fund's size or size relative to market capitalization which could capture its impact on fund's performance.

The performance evaluation of Greek fund managers could also be extended to domestic bond fund managers who invest mostly on domestic bonds and had to face the Greek bond haircut. Finally, performance evaluation research should also focus on markets facing similar fiscal problems and imbalances in the recent years, such as Italy, Spain and Portugal, in order to identify fund managers' skills under such extreme market conditions.

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