Are micro-cap mutual funds indeed riskier?

Javier Rodríguez
University of Puerto Rico

Abstract: Micro-cap mutual funds allow investor to access very low-priced stocks issued by the smallest of companies. The stock of these firms are usually not traded in major exchanges and their financial information is not readily available; thus regarded as risky investments. In this study I examine the cross-sectional risk variation of micro-cap funds in comparison with that of small-cap and mid-cap mutual funds. I find that, based on total and idiosyncratic risk metrics the sample of micro-cap funds is riskier than the size-matched samples of small-cap and mid-cap funds. I also report that the sample of micro-cap funds fail to generate higher excess returns than the less risky small-cap and mid-cap funds.

1. Introduction

Micro-cap mutual funds invest in publicly traded companies with very low capitalizations, low prices and thin volume. These firms are known as micro-cap and nano-cap. Loosely speaking, micro-cap stocks are publicly traded firms with market capitalizations between $50 million to $250 million and nano-caps are firms with less than $50 million in assets. Micro-caps are regarded as risky investments because reliable financial information about them is hard to get (Traves, 2003). This lack of information, important for investor to make sound investment decisions, is the reason behind many of the scams related to micro-cap firms reported in the popular press[1]. On the academic front, evidence on the lack of financial information and market inefficiencies in the micro-cap market are reported in Traves (2003), Cudd, Davis, Eduardo (2006), and Cudd, Eduardo, and Roberts (2008), among others.

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[1] Some popular press articles include: "Thirteen Charged in US Microcap Kickback Cases," Reuter Online Edition, December 1st, 2011. "Wall Street Eugenics: SEC Charges Microcap Frauds...Again," Forbes Online Edition, January 27, 2012.

In most cases, financial frauds related to micro-cap consist of spreading false information. Some of the most common schemes are "e-mail spam," and "pump and dump". In the former, fraudulent information about the firm is spread over the internet to potential investors. In the latter, miss leading information is spread through messages posted on the internet or by phone by telemarketers urging investors to quickly buy a micro-cap security not knowing that company insiders stand ready to sell their shares after the stock price is "pumped," by the ill-caused buying frenzy. After insiders secure their profits they stop marketing the security causing the stock price to fall and investors lose their money. Other scams include: "boiler rooms," offshore schemes, and fake press releases. The Depository Trust and & Clearing Corporation (DTCC) have called the attention of the negative ramp and ramification these scams have on the integrity of financial markets. To better deal with these issues, the Security and Exchange Commission (SEC) created a special investigation unit and already have prosecuted a large number of firms[2].

There are several reasons why trustworthy information about micro-cap stocks is so hard to get. For once, many micro-cap companies chose not to report their financial statements to the SEC. The financial information provided by the firms to the SEC can be access free of charge thorough the SEC website and become a reliable source of information to investors and analysts. Also, many micro-cap stocks do not meet the minimum requirements, like total assets and number of shareholders, to list their stock on major exchanges or on NASDAQ. Consequently, they trade their stock in the over-the-counter (OTC) market and are quoted in listings like the Pink Sheets. Additionally, very few analysts follow these firms, so less information is available to investors[3].

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[2] "The DTCC Takes on Micro-cap Fraud," http://www.dtcc.com/news/newsletters/dtcc/2011/dec/dtcc-takes-on-microcap-fraud.php.

[3] Some of this information is based on a report published by the SEC entitled "Microcap Stock: a Guide to Investors," (http://www.sec.gov/investor/pubs/microcapstock.htm).

But micro-cap risk is not only related to limited financial information. Liquidity is another issue. Since micro-caps firms do not trade the stocks in major exchanges, investors might find it hard to sell their shares if they find out that the firm is in trouble. Finally, since micro-cap stocks have low market prices and are thinly traded, few trades in a day can have a huge impact in their prices – exposing investors to large swings in the value of their portfolios.

In this study I look at micro-cap open-end mutual funds risk for several reasons. First, fund managers are experts in discerning through financial information in order to pick the best investments for the fund, not an easy task when dealing with micro-cap stocks. Secondly, although micro-caps are regarded as riskier investments than larger stocks, they are also sough of investments. This is because as a sector, micro-caps have low correlations with major indexes which translate to potential diversification gains for investors' portfolios. Finally, as nearly half of all households in the US hold mutual funds, it is only natural to think that many investors might choose to invest in micro-cap stocks through mutual funds, especially after all the negative press micro-cap and nano-caps get[4].

Although I am not aware of a study solely devoted to micro-cap mutual funds, few academic articles do include them as part of the sample of funds. Examples include, Elton, Gruber, and Blake (2012) and Amihud, Yakov and Goyenko (2013), among others. Other studies only examine small-cap funds. For example, Keim (1999) examine the design and investment strategy of one of the original small-cap index fund. The author shows novel evidence that an enhanced-index strategy works well in the illiquid market of small-cap stocks. Haslem and Scheraga (2006) look at the efficiency of portfolio management by applying data developing analysis to the Morningstar 500's

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[4] As reported by the Investment Company Institute, www.ici.org.

small-cap funds and report that the more inefficient funds are those with the more aggressive investment objectives and the smallest in size. There is also international evidence on the performance of small-cap funds. Comerton-Forde, Gallagher, and Nahhas (2010) look at the trading cost of Australian small-cap funds and report a larger price impact than previously reported on other studies. Also, Comerton-Forde, Gallagher, Lai, and Walter (2011) show that broker recommendations are positively related to the outperformance of small-cap funds in Austarlia. Finally, Otten and Reijnders (2012) examine the performance of UK-based small-cap funds. The authors report several results, most notably, that their sample of UK-based small-cap fund managers deliver positive and significant unconditional alphas and show good market timing ability.

I examine the risk profile of micro-cap mutual funds in comparison with its closest competitors, i.e., small-cap and mid-cap mutual funds. Although definitions may vary, small-caps and mid-caps companies are publicly traded firms with capitalizations between $300 million and $2 billion and between $2 and $10 billion respectively. I choose to compare micro-cap funds with small and mid-cap funds because, not only these funds compete for investors' money, but also because most of the firms classified as small and mid-cap do trade in major exchanges and report their financial information to the SEC on a regular basis. These two fundamental differences between micro-cap and small and mid-cap stocks make the three groups of funds an ideal subject group to examine mutual fund risk.

2. Mutual fund risk

I first examine the cross-sectional variation in risk and higher moments of the returns distributions of micro-cap mutual funds in comparison with that of their close competitors, small-cap and mid-cap mutual funds. Following Koski and Pontiff (1999), I consider the following measures:

a) Standard deviation (total risk): the standard deviation of monthly fund returns.

b) Idiosyncratic risk (firm specific risk): the standard deviation of the residual terms from a capital asset pricing model (CAPM) regression. In the model specification, mutual funds excess returns are regress on a constant and the excess returns on a well-diversified market index.

c) Beta (systematic risk): the beta coefficient from the CAPM regression.

d) Timing beta: the beta coefficient on a variable equal to the maximum of the excess return of the benchmark and zero from an extended CAPM regression.

e) Skewness: to measure the symmetry, or lack of thereof, of the return distribution.

f) Kurtosis: to measure whether fund managers smooth the return volatility on a month-to-month basis.

After examining the cross-sectional variation of fund risk for the three samples of funds, I ask whether the risk-adjusted performance of the funds is significantly different. In other words, is micro-cap fund risk compensated? As I mentioned before, micro-cap funds hold securities not traded in major exchanges and are followed by few analysts. This means that micro-cap fund managers can benefit from market inefficiencies in the micro-cap market and offer investor above average returns. To measure risk-adjusted performance I estimate the traditional Jensen's alpha. Jensen's alpha is the intercept on the following CAPM regression:

$$R_{F_t} - R_{f_t} = \alpha_F + \beta_F \left(R_{B_t} - R_{f_t} \right) + \varepsilon_{F_t} \quad , \tag{1}$$

where:

R_{F_t} is the fund's monthly return,

R_{f_t} is the monthly risk free rate,

R_{B_t} is the monthly return on the benchmark,

α_F is the intercept of the equation and the measure of risk adjusted performance,

β_F is the coefficient of systematic risk,

and ε_{F_t} is the unexplained component of the model.

A positive value of alpha is indicative of mutual fund outperformance. Equation (1) corresponds to the CAPM mentioned above, from which I am able to estimate the systematic and idiosyncratic risk variables.

3. Data

In this study I examine the cross-sectional risk variation of micro-cap funds, in comparison with that of small-cap and mid-cap mutual funds during four different time periods. The complete time period and three sub-periods of the present study are conveniently chosen using as a point of reference the 2008 financial crisis. Given the magnitude of the crisis it is only appropriate that I consider its impact on mutual fund risk. The National Bureau of Economic Research (NBER) certified that the financial crisis ran for 18 months, ending in June 2009. I selected the fund samples as of December 2007 and follow them during the crisis plus three years before the crisis and two years after the crisis. This means that the complete time period of the study begins in January 2005 and ends in June 2011. The first sub-period (three years before the crisis) runs from January 2005

until December 2007. The second sub-period coincides with the crisis, that is, from January 2008 until June 2009. The third sub period (two years following the end of the crisis) runs from July 2009 to June 2011.

The samples of funds come from the Chicago Research in Security Prices Mutual Fund Database (CRSP). I identify all open-end mutual funds classified by Lipper as micro-cap funds as of December 2007. For funds with multiple classes, I include in the sample the class with the longest history. These filters yield a sample of 94 unique micro-cap funds. I then match by size each micro-cap fund with two small-cap funds and two mid-cap funds. The funds included in these size-matched samples were chosen following the same criteria as with the micro-cap sample. Each sample of small and mid-cap funds includes 188 funds. In all, I examine a total of 470 open-end mutual funds. All fund characteristics and monthly returns come from CRSP.

A brief description of the samples of funds is presented in Table 1. As constructed, the three samples of funds are similar in terms of their median amount of total net assets. Micro-cap funds have the largest expense ratio, 1.61 percent, compared with 1.40 percent and 1.37 percent for the small and mid-cap funds respectively. Mid-cap funds report the highest level of portfolio turnover with a median value of 100 percent, followed by micro-cap (84.21 percent) and small-cap (83.75 percent). Table 1 also shows some statistics about portfolio composition. There are no considerable differences in the portfolio composition of these funds, the median stock allocation for all three types of funds stands at about 96 percent, with zero allocation to bonds and between 2 and 3 percent in cash.

Since the samples of funds include a wide-range of public securities, to estimate systematic risk (beta), idiosyncratic risk and alpha I choose as a benchmark the Wilshire 5000. This index is meant

to measure the state of the total US market. Although, the name has not changed, the Wilshire 5000 tracks every stock for every company with headquarters in the US - more than 7000 securities in all. Monthly returns for the Wilshire 5000 come from Bloomberg and the risk free rate needed for the estimation of the models come from the Fama-French data library. In the next section I present the empirical results.

4. Empirical Results

4.1 Risk measures

As a first step, I examine the cross-sectional variation in fund risk of micro-cap mutual funds in comparison with that of small-cap and mid-cap mutual funds during the complete sample period which runs from January 2005 to June 2011. Table 2 shows the cross-sectional mean values for the six risk measures described above. The results are presented for each fund type and for each of the four time periods examined. The table also presents tests for significant differences in the cross sectional mean between the micro-cap funds and the small and mid-cap funds. The level of the significance is at 10 percent level or below.

During this time period, micro-cap funds show higher standard deviation of returns or total risk than the other two fund types. Moreover, the return standard deviation of micro-cap funds is significantly higher than that of small-cap and micro-cap funds. Fund specific risk or idiosyncratic risk, is also higher for micro-caps funds and the difference is also statistically significant. Although, micro-cap market risk, beta, is higher than that of the other fund types, it is only statistically significantly higher than that of mid-cap funds. The timing beta of micro-cap funds is not significantly different than that of the small and mid-cap funds. However, micro-cap mean

skewness and mean kurtosis are both significantly different than the mid-cap funds cross-sectional mean values.

As mentioned before, I also examine mutual fund risk during three time sub-periods. The results for these time periods are presented in Table 3 Panels A, B, and C. Panel A shows the results for the before the crisis time period (1/2005 to 12/2007). During this time period the results are similar to those find for the complete sample period. Both, total risk and specific risk cross-sectional means are significantly higher for the micro-cap funds. Micro cap systematic risk is significantly higher than that of mid-cap funds. For this time period, the average timing beta is negative for both, micro-cap and small-cap funds and positive for mid-cap funds. Moreover, micro-cap timing beta is significantly different that those of small-cap and micro-cap funds. Finally, micro-cap mean kurtosis is significantly to that of the other two fund types.

Panel B of Table 3 presents the results for the time period which corresponds to the financial crisis (1/2008 to 6/2009). During this time period the results show that micro-cap cross-sectional mean values of the six risk metrics are statistically different to those for the small-cap funds, except for the timing beta. Regarding the results for the mid-cap funds, the results show significant differences in all six measures.

The final time sub-period examined corresponds to the two years following the end of the crisis (7/2009 to 6/2011). Panel C shows that only the micro-cap cross-sectional mean idiosyncratic risk is significantly higher that of the sample of small-cap funds. On the other hand, only the micro-cap beta and skewness are not significantly different than those of mid-cap funds. All the other four risk metrics are significantly different.

Summarizing, regarding total fund risk measured by the return standard deviation, micro-cap funds are found to be indeed riskier than small-cap and mid-cap funds. Only during the time period following the crisis, micro-cap standard deviation is not significantly higher than that of the small-cap funds. Micro-cap idiosyncratic risk is always significantly higher than that of the small-cap and mid-cap funds. Micro-cap systematic risk is significantly higher than the systematic risk of mid-cap funds, except only during the last time sub-period. Finally, micro-cap cross-sectional mean kurtosis is significantly higher than that of the mid-cap funds during all time sub-periods.

4.2 Risk adjusted performance

Given that based on different risk metrics and during different time periods micro-cap funds are found to be riskier than small-cap and mid-cap funds, it is only natural to ask whether micro-cap shareholders are compensated for bearing this extra risk. In this section I estimate the risk adjusted performance of the three fund types and ask whether or not micro-cap performance is significantly higher than that of the other two funds types. To measure fund performance I rely on alphas estimated during the same four time periods. Given the wide range of securities included in the samples of funds included in the present study, fund performance is examined relative to Wilshire 5000.

The results are presented in Table 4. The reported alphas in the table are annualized and expressed in percentages. The table also shows if the micro-cap mean alpha is higher than that of the other fund type and (in parenthesis) if the difference in average alphas is statistically significant at least at the 10 percent level. During the complete time period, micro-cap average alpha is not statically significant and both, small-cap and mi-cap funds, as a group show positive risk adjusted performance. The average small-cap alpha is 1.01 percent and the average mid-cap alpha is 1.42

percent, both statistically significant at 1 percent level. More importantly, micro-cap average alpha is lower and significantly different from that of the small-cap and mid-cap funds. To put this result in perspective, during the complete time period micro-cap funds are found to have significantly higher total and idiosyncratic risk than small and mid-cap funds; however their performance is significantly lower.

Regarding the comparison between micro-cap and small-cap, I find no significant differences during the three sub periods. In contrast, when compare with mid-cap funds micro-cap performance is always significantly different. During the time periods before and during the crisis, micro-cap average alpha is positive and highly significant. Moreover, micro-cap funds perform significantly higher than mid-cap funds during these two time sub periods. Linking this result with the risk analysis presented in the previous section, we can say that although micro-cap funds are found to be riskier than mid-cap funds, micro-cap shareholders were compensated for the bearing the extra risk before and during the 2008 financial crisis.

Finally, during the last sub period which corresponds to the two years following the crisis, mid-cap funds perform significantly better than micro-cap funds, even though during this time period micro-cap funds total and specific risk cross-sectional means are higher than those of mid-cap funds.

5. Concluding Remarks

Micro-cap mutual funds allow investor to access very low-priced stocks issued by the smallest of companies. The returns of these stocks have low correlation with major indexes, thus offering investor potential diversification benefits. In addition, micro-cap fund managers may offer investor above average returns by taking advantages of market inefficiencies in the micro-cap market.

However, in most cases the stock of these firms is not traded on major exchanges and their financial information is not readily available. Thus they are regarded as very risky investments and have been the subject of many financial frauds.

In this study I examine the cross sectional risk variation of micro-cap mutual funds in comparison with that of small and mid-cap funds. I find that micro-cap total and idiosyncratic risk is significantly higher than that of small-cap and mid-cap funds. This result is robust to different time partitions. I also report that, in comparison with mid-cap funds, the systematic risk of micro-cap funds is significantly higher. Finally, I examine the risk-adjusted performance of the three samples of funds. During the complete sample period, micro-cap funds fail to generate positive excess returns. Moreover, mean micro-cap alpha is significantly lower than that of small-cap and mid-cap funds.

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Table 1: Fund samples description

	Micro	Small	Mid
Number of funds	94	188	188
Total net assets (Million)	32.10	30.50	29.10
Expense ratio (%)	1.61	1.40	1.37
Turnover ratio (%)	84.21	83.75	100.00
Stock (%)	96.35	96.62	96.58
Bond (%)	0.00	0.00	0.00
Cash (%)	3.24	2.49	2.46

Notes: This table presents a description of the three samples of funds. To reach at the values in the table I first computed the average value of each variable for each fund in the samples during the complete sample period and then computed the median value across the funds in each sample. Fund characteristics come from CRSP survivorship-bias free mutual fund database.

Table 2: Risk measures - complete sample period

	Micro	Small	Mid	Test of differences Micro vs Small Significant*	Test of differences Micro vs Mid Significant*
Panel A: Full time period					
Standard deviation	0.063	0.061	0.057	Yes	Yes
Idiosyncratic risk	0.027	0.023	0.019	Yes	Yes
Beta	1.198	1.176	1.126	No	Yes
Timing beta	0.015	0.003	-0.007	No	No
Skewness	-0.685	-0.721	-0.954	No	Yes
Kurtosis	1.550	1.748	2.501	No	Yes

Notes: This table presents mean estimates of the following risk variables: standard deviation, idiosyncratic risk, beta, timing beta, skewness, and kurtosis by fund objective during the January 2005 - June 2011. Tests of differences represent tests of the null hypothesis that mean variable estimates are equal for micro funds and the other fund objectives examined, i.e., mid-cap and small-cap funds at least at the 10 percent level.

Table 3: Risk measures - time sub-periods

	Micro	Small	Mid	Test of differences Micro vs Small Significant*	Test of differences Micro vs Mid Significant*
Panel A: Before the crisis					
Standard deviation	0.040	0.038	0.033	Yes	Yes
Idiosyncratic risk	0.023	0.019	0.016	Yes	Yes
Beta	1.359	1.351	1.194	No	Yes
Timing beta	-0.304	-0.170	0.218	Yes	Yes
Skewness	-0.331	-0.349	-0.343	No	No
Kurtosis	0.389	-0.018	-0.308	Yes	Yes
Panel B: During the crisis					
Standard deviation	0.092	0.089	0.086	Yes	Yes
Idiosyncratic risk	0.032	0.027	0.027	Yes	Yes
Beta	1.205	1.171	1.133	Yes	Yes
Timing beta	-0.128	-0.148	-0.013	No	Yes
Skewness	-0.192	-0.282	-0.350	Yes	Yes
Kurtosis	-0.213	0.066	0.172	Yes	Yes
Panel C: After the crisis					
Standard deviation	0.056	0.055	0.051	No	Yes
Idiosyncratic risk	0.027	0.023	0.016	Yes	Yes
Beta	1.108	1.139	1.081	No	No
Timing beta	-0.437	-0.343	-0.257	No	Yes
Skewness	-0.427	-0.403	-0.463	No	No
Kurtosis	-0.551	-0.547	-0.379	No	Yes

Notes: This table presents mean estimates of the following risk variables: standard deviation, idiosyncratic risk, beta, timing beta, skewness, and kurtosis by fund objective during each sub period. The before the crisis time sub period runs from January 2005 to December 2007, the sub period which corresponds to the 2008 financial crisis runs from January 2008 to June 2009, and the sub period after the crisis which runds from July 2009 to June 2011. Tests of differences represent tests of the null hypothesis that mean variable estimates are equal for micro funds and the other fund objectives examined, i.e., mid-cap and small-cap funds at least at the 10 percent level.

Table 4: Risk-adjusted performance (alpha)

	Micro	Small	Mid	Test of differences Micro vs Small Significant*	Test of differences Micro vs Mid Significant*
Complete time period	-0.60	1.01***	1.42***	No (Yes)	No (Yes)
Before the crisis	4.44***	-3.60***	0.00	Yes (No)	Yes (Yes)
During the crisis	5.52***	6.6***	2.76***	No (No)	Yes (Yes)
After the crisis	0.72	1.68***	3.24***	No (No)	No (Yes)

Notes: This table presents mean estimates of the Jensen's alpha by fund objective and for each time period considered. The table first show if the average alpha of micro-cap funds is higher than that of the other fund types. In parenthesis, tests of differences represent tests of the null hypothesis that mean alpha estimates for micro-cap funds are equal to those of mid-cap and small-cap funds. Alphas are annualized and express in percentages. ***, **, * denotes statistical significance at the 1, 5 and 10 percent level respectively.