Mutual Funds: Measuring the Performance and Risk of Sector Funds. Evidence from the U.S.

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Abstract

This study examines the performance of U.S. equity mutual funds focused in well-defined economic sectors and compares them with diversified equity funds. Findings show that sector funds are indeed less diversified than other types of funds but still do not exhibit higher systematic risk. They do, however, have higher total risk. They also charge higher expenses which are not justified by increased net performance. There is not enough proof that they achieve significant positive or negative excess returns on average. Exceptions hold for energy and industrials sector funds, which demonstrate remarkable net and excess returns. Sector fund managers also do not appear to have market timing skills. Results claim that sector funds on average are a risky, yet not worthy investment on their own, but could be included in diversified portfolios.

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1. Introduction

The importance of mutual funds in the global economy and especially the economy of the U.S. has raised the awareness of academics and practitioners to investigate the various properties of the mutual fund industry.

Numerous studies focus their attention on exploring how mutual funds perform compared to the markets. In order to reach some conclusions, the researchers have been surveying whether the potential abnormal returns of the funds are due to fund managers' particular stock picking (selectivity) abilities that allows them to detect and acquire mispriced (undervalued) securities or whether they have some informational advantages over their counterparts that allow them to effectively handle their portfolio of assets. Multiple models that aim to measure the market timing ability have also been introduced. They are used to measure if the mutual fund managers have any capability of forecasting the relative market upward or downward movements so as to adjust their portfolio weightings on risky assets. Another important issue is to determine what types of funds are able to overperform the market. A debate holding is whether a portfolio concentrating in a small number of securities, a one investing heavily in a particular industry or a broadly diversified one will have better chances of growing in value. While a relatively large amount of studies focuses on generally diversified equity mutual funds, and fairly enough deal with concentrated funds in terms of number of securities or popular investment objectives (growth funds, income funds, growth and income funds etc), not a lot of research has been conducted concerning the mutual funds focused in individual economic sectors.

The present study focuses in sector funds and aims to investigate the performance, risk and diversification of sector funds, testing a sample of 675 funds investing in 7 distinct economic sectors and comparing it to a rather diversified type of mutual funds with growth investment objective and irrelevant of market capitalization focus (multi-cap focus). The control sample consists of additional 277 mutual funds. What this study investigates is the returns, the systematic and total risk and other risk-adjusted performance characteristics of the sector mutual funds compared to the market index return and to the diversified competitors of the sector funds (in this case the growth funds). Some of the research questions that the study plans to address are the following:

- Do sector mutual funds lack diversification compared to typical diversified mutual funds?
- Are sector funds more volatile than their diversified counterparts?
- Can sector mutual funds offer superior returns to the investors?
- Do sector mutual fund managers have on average significant security selecting skills?
- Do sector fund managers have particular market timing skills?
- How do sector mutual funds perform in comparison to diversified growth funds?
- Under what circumstances should an investor decide to invest in a sector specialized mutual fund?
- Are sector mutual funds' higher expenses justified by enhanced returns?
- Which sectors' funds perform on average better than funds of the others?

The rest of the study continues as follows: section 2 presents a theoretical overview of various aspects regarding the mutual funds in general with a brief look on the mutual fund industry specifically in the U.S. and ends with the classification of the economic sectors. Section 3 describes the literature review. Section 4 analyses the ways data were collected and sets the limitations of the study. Section 5 explains the methodology used to achieve the results. Section 6 analyses the results of the empirical research. Finally, sector 7 concludes the findings and suggest how the study on the particular subject could be enhanced.

2 Mutual Funds

A mutual fund is a "type of investment company primarily regulated under the Investment Company Act of 1940" (Haslem, 2003).

The Investment Company Institute (2007) offers the following definition: "A mutual fund is an investment company that pools money from shareholders and invests in a diversified portfolio of securities". Mutual funds are commonly referred as open-end funds, being one of the three types of investment companies. The other two are closed-end funds and unit trusts.

Investors have claims on these pools of securities. They buy shares in the fund and the ownership is proportional to the number of shares purchased by investors. The value of each share is known as the net asset value (NAV) and is determined as follows:

NAV = (Market value of assets – liabilities) / Number of shares outstanding (Cutherson and Nitzsche, 2008)

The NAV or price of the fund is determined once per day, at the close of the day. Any new investments into or withdrawals from the fund are priced at the closing NAV. Likewise the total number of shares increases or decreases during the day which is reflected at the closing NAV. For this reason such a fund is called "open-end" fund.

The present study focuses solely on open-end funds (mutual funds). Being portfolios of securities, they may include stocks, bonds and money market instruments (Fabozzi, 2009).

2.1 Benefits of Mutual Funds

Mutual Funds offer significant benefits to investors:

- Liquidity intermediation, as they allow investors to convert their investments into cash easily and at low cost. Mutual fund securities are redeemable at any time and in any amount.
- Denomination intermediation provides small investors with the ability to have access to securities like some money market instruments, only available in large

denominations. By pooling money, mutual funds can purchase such securities on behalf of their investors.

- Diversification, an important advantage for investors. Mutual funds offer a low cost way to diversify into multiple stocks and thus reduce risk. It would be not only costly, but also difficult for small individual investors to achieve mutual funds' broad diversification by acquiring securities on their own.
- Cost advantages. Mutual funds, using economies of scale, are better able to negotiate transaction costs and can therefore achieve much lower transaction fees when buying securities which in turn benefits small investors.
- Managerial expertise. Professional wealth managers offer their expertise on selecting securities that would hopefully lead mutual funds to outperform the market. Although their selectivity and timing skills are often controversial, mutual funds may charge significant fees which usually vary according to the investment objective (Mishkin and Eakins, 2009).

2.2 Mutual Fund types classified by investment objectives

Each mutual fund has a specific management or investment policy, described in the fund's prospectus. The management company of a mutual fund manages a family or "complex" of funds with various investment objectives to satisfy the needs of various investors. An entire collection of funds is organized and managed by the board of the fund and then management fees are collected for its operations.

Below follows a presentation of the most important fund types, classified by investment objective.

2.2.1 Equity Funds

Equity funds invest the majority of assets in common stock, but may hold around 5% of investments in money market instruments or other fixed-income securities in order to meet any liquidity needs for potential redemption of shares. Equity funds are further categorized in growth funds, income funds, sector funds and international funds.

Growth and aggressive growth funds (also called capital appreciation funds) are equity funds primarily concerned on capital gains on their investments and increasing the share price with concerning less about generating current income, that is dividend yields. They invest in stocks of companies usually young, not fully grown or even older, but still growing ones or with big potentials for growth -more than the average rate. They are considered a rather risky category of equity funds, while aggressive growth funds are even riskier since they invest in stocks with very high growth potential and increased volatility. Income funds on the contrary, mainly seek for high dividend yields on the stocks on which they focus their investments.

Sector funds concentrate their investments in groups of companies in particular industrial sectors, such as biotechnology, utilities, precious metals, telecommunications, technology, energy, banking etc. The risk of each such fund varies with the specific characteristics of each fund.

International funds have international focus, meaning that they invest in securities of companies outside the U.S. There are also Global funds that invest in securities both inside and outside the U.S. and emerging market funds that concentrate on securities in developing economies.

2.2.2 Index Funds

Index funds are designed to closely match the performance of a particular index e.g. S&P 500. For instance, an index mutual fund tracking the S&P 500 would buy shares in each of the companies that compose this index in proportion to the value of the companies' equity (Bodie et al, 2009). There are also index funds tied to bond or real estate indices. Index funds require little portfolio management since they are passively managed and thus bear fairly low fees and expenses, relatively lower than actively managed funds.

2.2.3 Bond Funds

Bond funds specialize in fixed-income securities, such as government bonds, corporate bonds, mortgage-backed securities or municipal bonds, which are tax-free. They can also differentiate as to the maturity of the securities (short-term to long-term) or to the risk level of the issuer from very safe to "junk", high-yield bonds.

2.2.4 Balanced Funds

Balanced funds, also called hybrid funds, combine both stocks and fixed income securities such as bonds in their investment objective in rather stable proportions. There are also life-cycle funds with static allocation of funds that maintain a fixed mix of assets to satisfy clients of specific risk level. For instance, while younger investors tolerating risk would seek for higher proportion of fund invested in stocks, older customers would rather prefer higher investments in fixed-income securities. Finally, targeted-maturity funds gradually reduce the stock exposure as the investor ages (Bodie et al, 2009).

2.2.5 Money Market Funds

This category of funds carries the lowest risk, as these funds invest in money market securities, such as commercial paper, U.S. Treasury securities, repurchase agreements or certificates of deposit. An important aspect is that they offer check-writing features and they are usually not charging investors with fees for buying or redeeming shares.

2.3 Charges, fees and expenses

2.3.1 Sales Charges (Loads)

Traditionally, most mutual fund shares were distributed by brokers who were compensated through commissions for their service. This commission was paid at the purchase and was immediately deducted from the value of the shares. Therefore, the sales charge for a mutual fund that is distributed through agents and intermediaries is called a load. There are three types of loads, front-end, back end and level loads. The first two are explained below, while level loads are explained later, under “12b-1 fees”.

2.3.2 Front-End Load

A front-end load, usually expressed as percentage on the amount initially invested, is a sales charge that is paid by subtracting the load from the initial investment. The

remainder is the net amount invested for the client. It is a charge that primarily compensates the broker who sells the funds (Bodie et al, 2009). The National Association of Securities Dealers (NASD) sets the maximum limit to sales charge at 8.5%, but in practice they are rarely higher than 6% (Fabozzi, 2009).

2.3.3 Back-End Load

A back-end load is redemption fee, imposed at the time fund shares are sold or redeemed. A typical back-end load is the contingent deferred sales charge (CDSC), which applies a gradually declining load on redemption that is usually eliminated after the sixth year.

2.3.4 Operating Expenses (Expense ratio)

The expense ratio or annual operating expense is composed of the annual management fee, the annual distribution fee and other annual expenses.

The management fee or investment advisory fee is the fee paid to the investment advisor for managing a fund's portfolio. It varies by the type and risk of the fund's asset class. The fee may increase accordingly to the increase of the risk of the asset. Usually money market funds charge the lowest fees, which increase for bond funds and maximize for some types of equity funds.

12b-1 fees (distribution fees) also called were introduced in 1980 by the Securities and Exchange Commission and are a fixed annual fee which covers distribution costs, agent compensation and manufacturer marketing and advertising expenses. By law they cannot exceed 1% of the fund's assets annually. It can also include a service fee of up to 0.25% of assets annually for the compensation of sales agents for their services or for the maintenance of shareholder accounts.

Other expenses may include the costs of custody, the transfer agent, independent public accountant fees and directors' fees (Fabozzi, 2009).

Different types of fees determine different share classes. They are offered by mutual funds to represent the ownership in the same portfolio but with different fees (Bodie et al, 2009). Front-end loads typically apply to A class shares, back-end loads to B class shares and level loads to C class shares. Alternatively, share classes are different forms of the same fund.

2.4 Brief overview of the mutual fund industry in the U.S.

2.4.1 Recent trends

Representing the largest part of the U.S.–registered investment companies, mutual funds play a substantial role in the U.S. economy. At the end of 2010, Investment companies held 27% of U.S. corporate equities, while U.S.-registered investment companies managed $13.1 trillion of assets, increased by $943 billion from the end of 2009, owned by more than 91 million U.S. investors.Table 1 demonstrates the development in the population of the investment companies in U.S. for the period 1995-2010.

Table 1

Number of U.S. Investment Companies[1] by Type
Year-end, 1995–2010

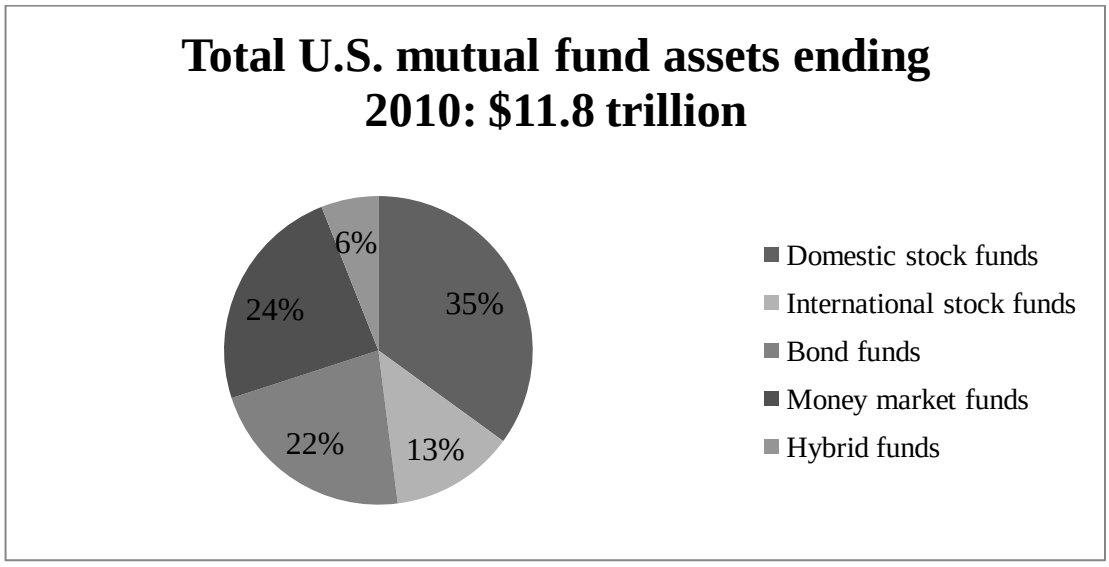
	Mutual funds[2]	Closed-end funds	ETFs[3]	UITs	Total
1995	5.761	500	2	12.979	19.242
1996	6.293	497	19	11.764	18.573
1997	6.778	487	19	11.593	18.877
1998	7.489	492	29	10.966	18.976
1999	8.003	512	30	10.414	18.959
2000	8.370	482	80	10.072	19.004
2001	8.518	492	102	9.295	18.407
2002	8.511	545	113	8.303	17.472
2003	8.426	584	119	7.233	16.362
2004	8.415	619	152	6.499	15.685
2005	8.449	635	204	6.019	15.307
2006	8.721	647	359	5.907	15.634
2007	8.747	664	629	6.030	16.070
2008	8.884	643	743	5.984	16.254
2009	8.617	628	820	6.049	16.114
2010	8.545	624	950	5.971	16.090

[1]Investment Company data include only investment companies that report statistical information to the Investment Company Institute.
[2]Data include mutual funds that invest primarily in other mutual funds.
[3]ETF data prior to 2001 were provided by Strategic Insight Simfund; ETF data include investment companies not registered under the Investment Company Act of 1940 and ETFs that invest primarily in other ETFs.
Sources: Investment Company Institute and Strategic Insight Simfund

The number of mutual funds is almost unchanged throughout the last decade while Exchange Traded Funds show a tremendous growth in population and Unit Investment Trusts have deteriorated significantly. However, mutual funds remain the most popular investment company of all with 8545 mutual funds out of 16090 investment companies in total available in 2010.

The global mutual fund market reached $24.7 trillion in 2010, of which $11.8 trillion or 48% was held by U.S. mutual funds. Particularly, the equity mutual funds (either domestic or international) hold 48% of the total net assets of U.S. mutual funds, as seen in Figure 1.

Figure 1



The decade 2000-2010 U.S. mutual fund net assets have increased by almost 70% in total. The most significant factor on this increase was the extraordinary growth of bond funds by 221% while, in comparison, equity mutual funds' net assets have grown by 43%. The relative net asset totals of each type of mutual fund are presented in table 2.

Table 2.

Total Net Assets of the U.S. Mutual Fund Industry
Billions of dollars, year-end

		Long-term funds			Money
Year	Total	Equity funds	Hybrid funds	Bond funds	market funds
2000	6.964,63	3.961,92	346,28	811,19	1.845,25
2001	6.974,91	3.419,61	344,87	925,12	2.285,31
2002	6.383,48	2.664,01	323,95	1.130,45	2.265,08
2003	7.402,42	3.686,30	428,33	1.247,77	2.040,02
2004	8.095,08	4.386,67	516,6	1.290,48	1.901,34
2005	8.891,11	4.942,65	564,35	1.357,28	2.026,82
2006	10.397,94	5.914,10	650,31	1.495,07	2.338,45
2007	12.002,28	6.518,76	716,73	1.681,03	3.085,76
2008	9.603,60	3.705,55	498,28	1.567,54	3.832,24
2009	11.120,20	4.957,04	639,15	2.208,11	3.315,89
2010	11.820,68	5.667,40	741,07	2.608,29	2.803,92

Note: Data for funds that invest primarily in other mutual funds were excluded from the series. Components may not add to the total because of rounding.

The recent growth of mutual fund total net assets was partly tempered by the net outflows from money market funds. Overall, mutual funds reported $149 billion of net outflows in 2009 followed by consecutive net outflow of $297 billion in 2010 (the largest on record in dollar terms). Funds' ability to achieve investment objectives for the investors is an important factor that affects the demand for mutual funds. The demand for specific types of mutual funds is partly determined by the reactions of the investors to the global financial conditions. A recent trend in mutual fund industry is the increase in the share percentage of assets at large fund complexes. Characteristically, the share of assets managed by the largest 10 firms in 2010 was 53% compared to 44% in 2000. An important factor is the acquisition of smaller fund complexes by larger ones (Investment Company Fact Book, 2011).

Regarding the equity mutual funds, the demand is in general strongly related to performance in the stock markets. Net flows to equity funds tend to move on parallel to stock price trends. However, while major stock price indices rose since 2008, domestic equity funds have experienced four consecutive outflows totaling $335 billion. Equity fund trend for asset withdrawal, as a consequence of reduced demand, may be partly attributed to investors' quest for less risky investments during the current economically instable period (Investment Company Fact Book, 2011).

2.5 Industry Classification

The most common industry classification systems internationally are the Global Industry Classification Standard (GICS) developed by Morgan Stanley Capital International (MSCI) Barra and Standard and Poor's, and the Industry Classification Benchmark (ICB) developed by Dow Jones and FTSE.

GICS consists of 10 sectors, 24 industry groups, 68 industries and 154 sub-industries (GICS 2009), while ICB uses a system of 10 industries, 19 supersectors, 41 sectors and 114 subsectors (ICB 2011) with roughly the same characteristics. However, none of the two offered completely compatible classification with the data of the present study as, for instance, they both classify the "real estate" group under the "financials" parent group, while in the present study separately "real estate" and "financial services" focused funds are used instead. Therefore, other type of classifications patterns were used to absolutely match the research, namely the Bloomberg fund classification system and the Lipper Objective Classifications Codes[1]

Bloomberg Database and Lipper Objective and Classifications Codes (CRSP, 2011) describe and explain the specific characteristics of the sector mutual funds that were included in the present study.

2.5.1 Energy Sector Funds

They are funds also called Natural Resource funds that invest mainly in equity securities of companies engaged in the energy industry which includes, exploration, production, marketing, refining and or distributing oil and gas products, renewable energy firms, pipelines etc.

2.5.2 Financial Services Sector Funds

Funds that invest primarily in equity securities of firms engaged in providing financial services that may include banks, asset managers, finance and insurance companies, securities/brokerage firms, investment services, mortgage finance.

2.5.3 Health/Biotechnology Sector Funds

[1] Included in the "Survivor-bias-free US mutual fund guide", provided by CRSP.

Funds that invest primarily in shares of companies engaged in health care equipment, health care related services, medicine, biotechnology and research.

2.5.4 Industrial Sector Funds

Funds that invest primarily in securities of companies engaged in manufacturing and distributing capital goods including aerospace and defense, construction, engineering, and building products, electronic and electrical equipment, industrial machinery, commercial services and supplies including printing, employment, environmental, and office services; transportation services including airlines and couriers, and marine, road and rail, and transportation infrastructure.(GICS)

2.5.5 Multi-Cap Growth Funds

"Funds that invest in a variety of market capitalization ranges without concentrating 75% of their equity assets in any one market capitalization range over an extended period of time. Multi-cap growth funds typically invest between 25% to 75% of their assets in companies with market capitalizations (on a three-year weighted basis) above 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Multi-cap growth funds usually have an above-average price-to-earnings ratio, price-to-book ratio, and three-year sales-per-share growth value, compared to the S&P SuperComposite 1500 Index." (CRSP, 2011).

2.5.6 Real Estate Sector Funds

Funds invest primarily in stocks of domestic companies dealing with real estate investment and services and in different types of Real Estate Investment Trusts (REITs).

2.5.7 Science & Technology Sector Funds

Funds invest predominantly in companies engaged in science and technology such as computer software, hardware, internet and computer services, semiconductors and telecommunications equipment.

2.5.8 Utility Funds

Funds invest mainly in utility firms that may include gas and water distributors, and conventional and alternative electricity companies. [2]

3 Literature Review

In the recent years mutual fund performance has gathered some research attention which led academics to investigate the relation between mutual fund performance and diversification. Various studies question the efficient market hypothesis which indicates that markets are "unbeatable" and cannot be outperformed, as they contain all the available information at the time. A consequence deriving from this hypothesis is that diversification of funds (up to an extent) is strongly recommended for the average individual investor. Otherwise, by investing funds in a non-diversified or focused portfolio of securities can add risk on the investment without ensuring additional returns.

Literature, however, has occasionally identified that fund managers may have informational advantages on some stocks, sectors or industries which obviously allows them to invest more of a fund's assets in a particular security or group of securities.

Various studies draw their attention in comparing the performances of concentrated (in a number of ways) mutual funds with regular, diversified equity mutual funds that have various investment objectives.

Although various academics have engaged into measuring mutual fund performance taking into consideration different characteristics, limited research has been conducted related to the special case of sector or industry focused mutual funds.. Some significant works by Khorana and Nelling (1997), Burlacu et al (2006) and Kacperczyk et al (2007) are mentioned below.

Carhart's (1997) study on mutual funds' performance persistence finds evidence "consistent with market efficiency". He supports in his work that managers' stock-picking skills only slightly explain persistence in the performance of the mutual

[2] Lipper objective and Classifications Codes in CRSP Survivorship-bias-free US mutual fund Database Guide, 2011. Pp.17-26.

funds under management. Nevertheless, Carhart (1997) mainly controls for momentum factors (timing) on mutual fund managers' ability to adjust their funds' risk rather than purely their skill to select the desirable securities.

In another study, Sapp and Yan (2008) examine the performance of actively managed focused funds and conclude that they actually underperform diversified (passive) ones, after deducting expenses. Such conclusion may partly derive from the fact that the managers of focused mutual funds are rather "unskilled" in selecting securities. Their lack of such skill combined with the agency conflict between them and the individual investors may lead them to pursue more concentrated portfolios in order to obtain potentially higher returns. The disproportionally higher potential inflow of funds in case of an appreciated security compared to the lower, possible outflow of an unsuccessful stock-pick may give further incentive to low-skilled managers for concentration.

Similarly to the above study, fund portfolios with few holdings on average do not outperform the S&P 500 index according to Kaushik & Barnhart (2009). They actually underperform the market on a risk and investment style adjusted basis. In the same study, authors find a significant difference among the "Winner and Loser" focused portfolios in the role of turnover ratio as a factor that affects the abnormal performance of the portfolio.

Another paper consistent with the theory that the performance of actively managed mutual funds is not significantly related to the level of sector concentration is presented by Burlacu et al (2006). Their results for actively managed funds indicate that the degree of sector concentration is not significantly connected to the net performance of the funds, thus managers' informational advantages cannot adequately explain net performance. Concerning sector funds however, results indicate a positive and significant relation between performance and degree of sector concentration.

However, other academics have observed significant stock-picking abilities by some mutual fund managers. In particular Kacperczyk et al (2007) indicate that fund managers holding concentrated portfolios in a few industries appear to have superior investment abilities over those with more diversified portfolios, finding that some industry focused portfolios with the highest concentration actually outperform passive benchmarks that resemble the market portfolio. Similar results are obtained from an earlier research (Kacperczyk et al, 2005) where the authors evaluate the

performance of mutual funds considering their concentration in industries. They find that “more concentrated funds perform better after adjusting for risk and style differences" (Kacperczyk et al, 2005) for which they use the four factor model of Carhart (1997). Also, Kacperczyk et al (2005) link focused fund superior performance primarily to security selection ability which is more successful in concentrated than in diversified funds. However, they mention that concentrated funds may differ from diversified funds in key characteristics like size, fees and turnover, among others. For example, concentrated funds charge higher expenses than diversified funds, partly due to diseconomies of scale, as diversified funds are usually larger in asset value and can therefore charge lower fees.

Ciccotello et al (2006) observe in their research that focused families’ equity funds with narrow investment objectives reward their investors with 0,5% annual excess return compared to more broad fund families.

Similarly, Baks et al (2006) find evidence that concentrated mutual funds outperform more widely diversified ones. Their study however, deals with concentration in mutual funds in the sense of taking “big bets”, investing heavily on particular securities, regardless of the total number of securities in a portfolio.

A different approach on concentration in mutual funds is given by Khorana and Nelling (1997). They examine the performance of sector funds which, by default, have limited diversification potential, finding that it varies depending on the benchmark used to compare it with. Further, their findings indicate that sector funds on average have similar performance and systematic risk to other (diversified) funds, but exhibit higher idiosyncratic risk instead. Finally, sector fund performance is not found to be persistent due to limitations of investment objectives. The assumption that benchmark selection affects the results on performance is also met in Grinblatt and Titman (1994) study. An important finding on the latter study is that “very few funds successfully time the market”. However, the particular paper deals with mutual funds in general, not specifically with sector funds, which is the subject of the present study.

Unfortunately, there are not enough studies that deal with performance of sector funds. The most useful benchmark study to which the results of this study can be compared is the study by Khorana and Nelling (1997). The context and aims of the particular research are similar to the present one, although the methodologies used differ significantly.

4 Sources of data and information

4.1 Mutual fund data

In the present study the data set was obtained from Bloomberg Professional Service database. Monthly data of closing prices on equity mutual funds' net asset values (NAVs) were collected. Funds focusing on seven major economic sectors or industrial subdivisions were chosen according to the availability and sufficiency of data, plus the control sample consisting of growth mutual funds. More specifically energy, financial services, health care and biotechnology, industrials, real estate, technology and utilities compose the sample with a total of 952 funds of which 675 specialty (sector) and 277 growth funds. Financial services group, as opposed to "financials" sector excludes the category of real estate funds. All funds are open-end equity funds, domiciled in the U.S.A., geographically focused on U.S.A. companies and available for trade in the U.S.A. Furthermore, industry focused funds are not market cap restricted while the growth funds are mutli-cap focused and classified under "growth" investment style. Criteria are based on Bloomberg's classifications. The sample spans the 10-year period from January 2001 to December 2010.

In order to calculate and measure abnormal returns, a minimum 12-month consecutive period of monthly NAVs is required for each mutual fund retained in this study, similar to the analyses of Burlacu et al (2006) and Bauer et al (2006).

4.2 Benchmark data

Standard and Poor's 500 Index was used as the market index. Additionally, 7 sector indices are used as benchmarks to the 7 sector fund groups. These are the S&P 500 Energy Index, S&P 500 Financials index, S&P 500 Health Care Index, S&P 500 Industrials Index, Dow Jones United States Real Estate Index, S&P 500 Information Technology Index and the S&P 500 Utilities Index. As a riskless rate, US Generic Government 3 Month Treasury Bill Yield is used, similar to Bauer et al (2006) who used the corresponding riskless rate for New Zealand.

For all data mentioned, monthly last prices were collected. In addition, annual fund expense ratios were obtained from Bloomberg for all funds used in the study.

4.3 Limitations of the study

4.3.1 Limitations regarding data sources

All monthly data on last quoted prices of NAV of the mutual funds, monthly quoted US 3-month Treasury bill rates and monthly last (closing) prices on indices were obtained solely from Bloomberg Database and therefore they were not double-checked using other sources of data, which could limit the validity and precision of the data used and consequently, the results.

4.3.2 Limitations regarding the choice of sample

Not all available funds that were pre-selected did qualify for the final sample. Funds with less than 12 monthly closing price observations were filtered out in order for the samples to include only funds with at least 12 months continuous observations. This could result in raising survivorship bias to the study, while the inclusion of both active and "dead" funds partly mitigates it. Also, mutual funds with multiple share classes were included both in the sector samples and the control (growth mutual funds) sample. According to CRSP[3] it "can create a bias when averaging returns across mutual funds". Another issue that could count as a limitation of the study is that it is focused in some but not all of the economic sectors or industries, as defined by various reliable classification authorities. The reason is that there was either limited number of mutual funds for the particular sectors or, in cases of sufficient population of funds, there were very limited monthly observations due to short lives of mutual funds. Therefore the results and conclusions of the present study may not be generalized to include the universe of sector funds.

4.3.3 Limitations regarding benchmarks and control sample

This study aims to investigate the performance of a particular type of mutual funds, the sector funds, in contrast to other more diversified funds. As this category of funds has specific characteristics regarding the diversification and risk compared to other types of possibly more generalized and widely diversified - not specialty funds, it is reasonable to apply a comparison with a similarly risky, yet more broadly

[3]Center for Research in Securities Prices.

focused type of funds. For this reason, the multi-cap growth mutual funds were selected as a comparable type of funds that implies significant risk tolerance and a more diversified investment objective. Therefore, conclusions of the study may not be extended to assume similar behavior considering the performance of sector funds in comparison with generally widely diversified mutual funds of any type other than growth multi-cap funds, as the results may be differing significantly. Benchmark indices used in this study consist of Standard and Poor's Select Sector Indices, except for the real estate industry which is regressed against Dow Jones US Real Estate Index, as the corresponding Standard and Poor's index observations were not enough to cover the entire period (1/1/2001-31/12/2010) of the study's analysis. However, S&P Financials Index includes the real estate industry. Finally, samples of the various sectors or industries are not composed of equal populations of mutual funds, but rather vary according to the availability and sufficiency of data. The populations of funds within the sectors range from 15 (industrials) to 223 (real estate) while the control sample (growth) consists of 277 equity mutual funds.

5 Methodology

5.1 Returns

First of all, the returns of funds calculated are natural logarithmic returns using the following formula, similar to Koulis et al (2011):

$$R_{t,ln} = \ln(NAV_t/NAV_{t-1}) \quad (1)$$

where $R_{t,ln}$ is the logarithmic return of the fund or index on month t, NAV_t is the net asset value on month t and NAV_{t-1} is the net asset value on the month prior to t (Giamouridis and Sakellariou, 2008). The same formula was used for indices' returns.

The returns calculated are originally gross (raw) returns, without subtracting the funds' expense ratios. Although gross returns may be revealing of potential manager's ability, net returns (after expenses) are more relevant and appealing to the investor's perspective (Sapp and Yan, 2008). For this reason, average net returns of the funds grouped in sectors are also provided in the present study.

It should be mentioned that in order to annualize monthly quoted risk-free rates, average monthly fund and index returns, the following equation was used:

$$R_{annual} = (1+ R_{monthly})^{12} - 1 \quad (2)$$

so as to take into account the effect of compounding, in which R denotes the return.

5.2 Measures of risk

In order to measure funds' specific risk, two main factors are used. The β coefficient and the standard deviation (σ). The former is calculated normally by regressing a portfolio's returns to the returns of an index that represents the market, using the Capital Asset Pricing model:

$$R_i = R_f + \beta(R_m - R_f) \quad (3)$$

in which R_i represents the portfolio's expected return, R_f denotes the risk-free rare, β is the systematic risk of the portfolio and R_m is the return of the market, represented by a particular index. However, the β coefficient used for this study derives from the Jensen's (1968) model which is described later in the chapter.

Another measure of risk is the standard deviation (σ) of mutual funds' monthly returns around their mean value, which is also obtained from the descriptive statistics results of the regression run according to Jensen's model.

5.3 Measures of Diversification

A measure of diversification also used by Khorana and Nelling (1997) is the R^2 value (coefficient of determination), calculated using the regression with Jensen's model, that shows how well mutual fund returns can be explained by the particular market's returns. Moreover, a high value of R^2 is an indicator that the value of β coefficient obtained from the regression is of higher significance and usefulness.

5.4 Risk-adjusted performance measurement

Various methods are equipped to measure the risk-adjusted performance of the sector funds. Treynor (1965) first proposed a risk- adjusted performance measure of mutual funds, calculated as the ratio of excess performance of the mutual fund over the risk free return, divided by the β (systemic risk) of the fund (Thanou, 2008):

Treynor ratio = $(R_i - R_f)/\beta$ (4)

where R_i denotes the average annual fund return, R_f is the annualized riskless rate of return (in this case the 3-month T-Bill)

Later, Sharpe (1966) introduced a similar technique to measure performance, only replacing the denominator in Treynor's index by standard deviation.

Sharpe ratio = $(R_i - R_f)/\sigma$ (5)

where R_i, R_f are explained above and σ is the annual standard deviation of the fund returns, similar to Kaushik and Barnhart (2009). The advantage of Sharpe ratio is that is directly computable, not depending to a market index (Koulis et al, 2011).

The two measures are quite simple but used extensively by academics, Artikis (2002), Sorros (2003) and Rompotis (2007) among others.

In order to investigate the stock selectivity skill, if any, of the mutual funds' managers, a rather traditional measure is used, derived from the following model developed by Jensen (1968):

$R_i - R_f = a_i + \beta_i (R_M - R_f) + \varepsilon_i$ (6)

where R_i is the monthly return of the fund i, R_f is the riskless rate (3-month T-bill rate), the coefficient a_i is Jensen's measure of risk-adjusted excess return, which also implies the managerial skill in selecting securities for the fund, coefficient β_i denotes the systematic risk, the sensitivity of the fund returns relative to the benchmark index, R_M is the monthly return of the benchmark index and term ε_i represents the residuals of the regression equation, has expected value of zero and constant variance (Philippas and Tsionas, 2001) . The above regression is run on all sector funds and the control sample (growth funds). Particularly for the sector funds, it was run separately with the S&P 500 Index and the corresponding sector indices, following the study of Khorana and Nelling (1997) so as to investigate whether the choice of benchmark affects the performance measurement or not, as the authors mentioned have found.

5.5 Market timing measurement

Apart from measuring mutual fund manager's ability to add value to the fund by selecting undervalued stocks, it is also useful to evaluate their skill to predict market's upside and downside movements that is, their market timing capability.

Treynor and Mazuy (1966) extended Jensen's model by adding a quadratic factor that measures the fund managers' market timing skill. In detail,

$$R_i - R_f = a_i + \beta_i (R_M - R_f) + \gamma (R_M - R_f)^2 + \varepsilon_i \quad (7)$$

where a_i still measures the selectivity skill and γ is the coefficient that measures the market timing capacity.

The theory supporting this model is that, normally, when managers expect growth of the markets they would rather increase their portfolio positions on risky assets in order to capture the potential abnormal returns offered by such assets, while in cases of downward market movements they are likely to limit the exposure on such risky assets and invest in money market instruments or other safer securities (Dritsakis et al, 2006). According to (7) a significantly positive γ coefficient is translated to superior market timing ability (Bauer et al, 2006) while a negative and insignificant one means that the managers failed to correctly predict the market trends (Filippas and Psoma, 2001).

6 Data analysis & Discussion

This section analyses the various findings of the study and aims to interpret different aspects and characteristics of the sector funds. Appendices provide the accumulated results of the statistics of all regressions undertaken for this study separated in tables of mean, median, minimum and maximum values.

6.1 Diversification and Risk

As a measure of diversification, the coefficient of determination R^2 is used. The results in table 3 indicate that R^2 is higher for all sectors, when the sector funds' returns are regressed against sector indices than when they are regressed against S&P 500, which is absolutely sensible and expectable. There is, however, a significant observation when comparing R^2 of the sector funds to that of growth funds. The latter's value is almost 0,8 while the average R^2 among the sector funds is less than 0,55. This directly means that the returns of the sector funds are much less explained by the particular market indexes' returns, which implies that probably sector funds on average are much less diversified than a group of well-diversified funds such as

growth funds. This finding is in line with or may even strengthen Khorana and Nelling (1997) findings, who also observe significant under-diversification of sector funds compared with other domestic equity funds, because in the present study a perhaps more narrowly objective defined type of diversified funds is used. Similarly for the β coefficients and standard deviations, the findings agree with the research mentioned before. On average, sectors do not exhibit larger beta risk (1,071) than the growth fund sample (1,085) at 1% significance level. Moreover, average monthly standard deviation (σ) of sector funds (7,08%) is slightly higher than the σ of the control sample (6,15%). This indicator of higher total risk in sector funds suggests that, on average, an investor should not concentrate their entire portfolio value on such a fund but could instead add it in an already diversified portfolio to reduce the risk, as the lower beta implies. Another remarkable aspect is that Technology funds appear to be the riskiest, both terms of total (10,03%) and systematic risk (1,798) while the "safest" sectors are Utilities (β=0,68 & σ=4,43%) and Health Care & Biotechnology (β=0,707 & σ=4,74%).

Table 3. Regression results on R^2, beta coefficient and standard deviations.

SECTORS	No. of Funds	R^2	R_s^2	β	β_s	σ
Financial services	71	0,5533	0,6957	0,9351	0,7296	0,0618
Utilities	36	0,5317	0,7887	0,6794	0,8110	0,0443
Health care & Biotechnology	82	0,4787	0,5774	0,7068	0,8889	0,0474
Energy	38	0,4306	0,7828	1,0523	1,1306	0,0805
Industrials	15	0,6636	0,7116	1,2064	1,0064	0,0773
Real estate	223	0,4407	0,8360	1,1206	0,9655	0,0836
Technology	210	0,7167	0,8915	1,7976	1,0356	0,1003
Growth	277	0,7958		1,0852		0,0615
TOTAL	952					

Note: R^2 values refer to the relation of each sector to the S&P 500 general Index, while R_s^2 is related to the corresponding index of each sector. Likewise for the β coefficients. Growth funds relative values are not applicable as they are regressed only against the S&P 500 Index. σ denotes the standard deviations of returns around the mean values.β values significant at 1% level.

6.2 Performance and selectivity measures

6.2.1 Expense ratios and net returns

The performance measures estimated using the regression model (6) and the Treynor and Sharpe ratios are demonstrated in Table 4. Also, in the same table there are the average annual expense ratios of each group of sector funds and of the growth funds. Sector funds have on average higher expense ratios than other equity mutual funds according to Khorana and Nelling (1997), a statement that still seems to hold as a fact. According to the results of the present research, sector funds have an average annual expense ratio of 1,61% relatively higher than the growth fund sample which has an average ratio of 1,47%. However, they both remain quite high in comparison to other equity funds, as, according to Investment Company Institute (2011) the average total expense ratios of U.S. equity funds during the 2001-2010 period was almost 0,9%. Literature often claims that the expense ratios play a significant role in the performance of mutual funds and that there is negative correlation between fund net returns and level of expense ratios. Specifically, Wermers (2000) finds that the negative net returns on the funds are largely due to the level of the expenses and costs, which funds charge. He concludes that funds actually overperform in gross returns, but after deducting such expenses they tend to have negative returns. Therefore, while higher expenses may be positively related to higher returns, they are sometimes surpassing the abnormal return they are achieving, resulting in lower or negative net returns.

Moreover, since sector funds are considered rather concentrated funds they tend to charge higher expense ratios than diversified ones (Kacperczyk et al, 2006). According to the present study's results, two of the sectors with the highest expense ratios, namely technology and financial services, have respective average annual ratios of 2,03% and 1,73% but they both failed to add value on average to the funds, as the net annual returns were -13,71% and -7,16% respectively. In fact, all but two of the sector funds have in general negative average net annual expenses. The two sector fund groups whose funds have grown in value by 8,29% and 7,33% on average annually are energy and industrials respectively. It is worth noticing that they also charge the lowest annual expense ratios on average, compared to all other sector funds investigated. Also, the growth funds rank third both in high annual net return percentage (1,9%) and low expense ratio (1,47%). By examining the results on

the 3 sectors left (health care & biotechnology, utilities and real estate) it can be observed that they all have median expense ratios relative to the sample and negative net returns. However, the sectors of health care and the real estate have negative net but positive gross returns, indicating their expense ratio played a substantial role in determining their performance and perhaps the charges are more than enough compensating the earnings of the funds on average.

Table 4. Performance Measures													
	means				**significant a**		**significant a_s**		**net return***	**treynor***	**treynor$_s$***	**sharpe***	**expense ratio***
SECTORS	**a**	**p**	**a_s**	**p_s**	negative	positive	negative	positive					
Financial services	-0,44%	0,38	-0,12%	0,43	13 (**18,3%**)	1 (**1,4%**)	9 (**12,7%**)	3 (**4,2%**)	-7,16%	-8,14%	-10,44%	-32,24%	1,73%
Utilities	-0,15%	0,57	-0,05%	0,43	0	4 (**11,1%**)	5(**13,9%**)	3 (**8,3%**)	-2,09%	-4,11%	-3,44%	-17,73%	1,48%
Health care & Biotechnology	-0,03%	0,61	0,06%	0,48	0	0	0	10 (**12,2%**)	-1,27%	-2,49%	-1,98%	-0,94%	1,69%
Energy	0,83%	0,21	0,13%	0,59	0	17 (**44,7%**)	0	2 (**5,3%**)	8,29%	7,06%	6,57%	28,28%	1,32%
Industrials	0,79%	0,13	0,64%	0,17	0	9 (**60%**)	0	9 (**60%**)	7,33%	5,39%	6,46%	24,05%	1,36%
Real estate	-0,03%	0,62	-0,21%	0,42	0	4 (**1,8%**)	22 (**9,9%**)	19 (**8,5%**)	-1,34%	-1,66%	-1,92%	-1,37%	1,67%
Technology	-0,41%	0,48	-0,31%	0,42	5 (**2,4%**)	5 (**2,4%**)	24 (**11,4%**)	3 (**1,4%**)	-13,71%	-7,71%	-13,38%	-33,32%	2,03%
Growth	0,30%	0,36			2 (**0,7%**)	71 (**25,6%**)			1,90%	1,28%		6,53%	1,47%

Note: a intercepts denoted in monthly terms. a_s denote the intercepts of the regression on the respective sector index. Level of significance is 10%.

** Values correspond to annualized and averaged returns for the entire study period (2001-2010). Net return calculated by annualizing each fund's average gross monthly returns, subtracting the annual expense ratio and averaging for all funds in each sector. Treynor$_s$ is the Treynor measure calculated using β coefficients of the respective sectors.*

6.2.2 Sharpe and Treynor measures

Examining the results on the measure of Sharpe, one can observe that in 5 out of 7 sectors, the value is negative. This is due to the negative excess annual return over the annualized risk free rate. Like previously, funds in sectors of technology and financial services have the lowest score on the particular measure, of -33,3% and -32,2% respectively. Likewise, energy and industrials are the top rated with relative values of 28,3% and 24%, meaning that for each unit of total risk added, they will on average compensate the investor by 0,283 and 0,24 excess return on annual basis. Growth funds, have average relative Sharpe ratio of 6,53%.

The same pattern holds for the Treynor ratios. Again, the so far proven as loser sector funds of technology and financial services achieve very low, negative values, irrespectively of the choice of the systematic risk factor (β) used to calculate it. Similarly, the energy and industrials sector funds have on average (together with the control sample) positive Treynor ratios at the same order they did regarding the Sharpe ratios, the net returns and the expense ratios either by reference to the market β or the specific sector index systematic risk factor.

The results found so far cannot prove that the sector funds do on average perform better or worse than other equity mutual funds. They rather show that during the 2001-2010 period some sectors have on average experienced substantial losses while others perform fairly well above the market and the more widely diversified funds in particular.

6.2.3 Jensen's alpha coefficient

A more comprehensive measure, than the ones explained previously, to evaluate the performance and selectivity of a portfolio of securities (in particular a mutual fund) is the Jensen's alpha intercept. Quoted in monthly percentage terms in this study, it indicates the excess return earned on average over the risk-free rate and above the return justified by the systematic risk of the mutual fund over a period of a month. It also implicitly measures the level of ability of mutual fund managers to select undervalued stocks that are going to overperform the market. If alpha is significantly positive, the manager of the portfolio has probably added value to the fund, in excess of the riskless rate and the market index, equal to the relative alpha value. If the intercept is negative and statistically significant, the managers may have inferior

investment performance. All results regarding the significance of the value of alpha refer to a 10% significance level.

It is of great importance to stress that since sector funds have holdings heavily concentrated in securities of specific sectors, they are usually considered more volatile and thus are not likely to stand as a single asset in an investor's portfolio. This can increase the competition of fund managers within the same sector. It could explain why results of regressions exhibit some sensitivity to the particular benchmark used.

According to the results presented in table 4, there is not enough evidence of whether sector mutual funds on average outperform or underperform the market or the relative sector indices against which they are compared. The relative mean values of alpha intercepts are negative for 5 out of 7 sector funds, yet they are not significantly negative (even at 10% significance level) so that to make safe decisions on whether or not they outperform or underperform the market (S&P 500 Index). Also, the other 2 sector funds (energy and industrials) have positive alphas but still not significantly positive (on average) even at 10% level of significance.

Although it cannot be ascertained which, if any, sectors offer funds that significantly beat or are beaten by the market solely by examining the mean values of alphas, a thorough look on some independent fund results might shed some light.

More specifically, financial services sector contains 13 out of 71 (18,3%) funds that significantly underperform the market index and only 1 fund actually outperforms it. The relative results for the sector index are 9 (12,7%) and 3(4,2%). The rest of the funds (majority) in the sector do not show any significant difference, regarding the performance, compared to the market or the sector index.

In the utilities sector 11,1% of the fund managers have shown some skill in selecting stocks that beat the market index while the rest have not shown any clear superiority or inferiority of returns over the market. When compared to the sector index, 13,9% of the funds negatively underperform and 8,3% had abnormal positive returns. The rest of the funds do not exhibit any significant abnormal performance.

Results regarding the sector of Healthcare and Biotechnology show that in general its funds do not achieve remarkably higher or lower excess returns against the market index, but there are about 12% of the funds in this sector that have gained excessive returns over the sector index. This may most probably show that the managers of these funds have some selectivity skill over the fund managers of the same sector.

The rest of the funds have a value of alpha close to zero and it is statistically insignificant which shows that their managers are similarly skilled or unskilled in the selection of securities in the sector.

Contrary to the Healthcare sector, Energy sector has a significant percentage of funds (44,7%) that achieved statistically significant abnormal returns against the market, but relatively few (5,3%) funds outperformed the sector index. It may imply that mutual funds focused on this particular sector have good chances of beating the market as a whole rather than their peer funds. Still, no funds of this sector were observed to significantly underperform either the market or the sector.

Industrials sector also displays a large proportion of funds with excess returns both in comparison to the market and the corresponding sector index. In fact, 9 out of 15 funds of the sector have statistically significant abnormal returns over the market and exactly the same funds also overperform the sector benchmark index. None of the funds present inferior returns to the market or the specific sector index. A remarkable aspect of the funds of this sector is that the level of their diversification (denoted by the value of R^2) towards the market index ($R^2 = 0,66$) and the specific sector index ($R^2 = 0,71$) is really similar. It may mean that the market index represented by the S&P 500 is largely affected by industrials sector stocks. This is probably why the same funds outperformed both the funds within the sector and the market. However, conclusions on the funds of this sector may not be reliable, as only a narrow sample of funds was available for analysis.

Funds in Real Estate sector do not in general exhibit significant extreme performance, neither higher nor lower than the market. According to results, only 1,8% of the fund managers selected stocks that outperformed the S&P 500 index and none significantly performed lower. Within the sector, almost 10% of the funds had remarkably negative returns towards their peer funds and 8,5% of the funds have excess returns over their sector competitors.

In the technology sector the majority of fund managers have not shown any extraordinary level of selection capacity. Only 2,4% of the funds had superior returns and equally as many had excess negative returns compared to the market. Within the sector, 11,4% of the funds significantly underperformed while only 1,4% achieved excess returns.

Averaging, less than 6% of the total sector funds succeeded to beat the market index while one out of four (25,6%) funds of the control sample had abnormal positive

returns over the market. The respective percentage on funds experiencing significantly negative returns was on average 2,7% for sector funds and only 0,7% for the growth funds.

Consequently, there are obvious discrepancies in the funds among the sectors, regarding their performance and the selectivity skill of their managers. Relatively large populations of energy and industrials sector funds, even in limited sample of the latter, exhibit significantly positive returns in excess of the market but the finding may not be generalized to include the universe of the sector funds. Compared to the control sample, they results demonstrate evidence that sector fund managers generally lack skill in selecting undervalued securities.

6.3 Market timing

The market timing, the ability of fund managers to forecast whether the markets will incline or decline, is calculated using Treynor and Mazuy's model discussed earlier. The coefficients obtained from the regression results are demonstrated in table 5. Coefficients γ of the model, when positive and statistically significant, are indicators of mutual fund managers' correct prediction of the market movement, either if it is rising or falling. The characteristic of a growing market is that its return is higher than the risk free rate, while a falling market earns less than the risk free rate (Thanou, 2008). In case of significant timing skill, the managers will normally increase the exposure of the fund in risky assets when markets are expanding in order to benefit from abnormal returns and will otherwise tend to shift some volatile equity securities to less risky assets, when markets are falling. For significantly negative γ values, it may be an indicator that managers not only lack timing abilities, but that may also affect negatively the performance of the fund under management. According to the present results, mutual fund managers on average do not present any significant ability to time the market. The values observed for the γ coefficients are statistically insignificant at 10% level.

Having a closer look in the particular sectors one can observe that most of the mutual fund sectors include some funds with significantly negative market timing ability.

Analytically, a 4,2% of financial services mutual funds have exhibited negative market timing while 11,3% of the sector's fund managers have correctly predicted

the market movements. This is somewhat controversial to the findings regarding the performance, as the specific sector has experienced negative excessive returns. Regarding the timing ability towards the movement of the corresponding sector index, 4,2% of the funds show negative market timing ability while 18,3% were able to time the specific index. On average, both the market γ and the sector γ are positive, but statistically insignificant and it cannot therefore be claimed that financial services mutual funds have talented managers relatively to the market timing ability.

Utilities sector funds have negative γ both compared to market and to their sector index. It is not statistically significant though, and one cannot safely decide on whether their managers can time the market and the sector index. A large population of utilities funds (30,6% of the funds) significantly fails to time the market while a corresponding 5,6% does not time the sector index. This raises some confidence to reject any assumption that these sector fund managers are skilled market timers.

Healthcare and biotechnology funds have a slightly negative γ coefficient to the market which is insignificant and a negative but also insignificant sector γ value. Taking sector's funds individually, a total 19,5% of them has significantly negative timing ability towards the market movements and the relative percentage for the sector index is 39%. Perhaps relatively many fund managers within the sector are indifferent on the market movements due to the funds' potentially unique characteristics or due to funds' altering management objectives. No funds have demonstrated significantly positive timing abilities.

While previous results in performance (within the study) have shown that energy funds are exceeding the market and the sector indexes' returns, the values of γ now exhibit an inability in market timing. Almost 37% of the funds present significantly negative timing skill regarding the market while there is no fund with positive and significant value for γ. Concerning the sector index, 47,4% of the funds fail to time it and only 2,6% has significantly positive γ coefficient.

Industrials sector's average γ is positive, yet insignificant both for the market and the sector index. No single fund was found to have significantly negative timing ability while one out of three exhibited significantly positive γ against the market and one out of five correctly predicted sector's index movements. These findings may have low validity due to the narrow sample. However, it is the only sector that shows both selectivity skills of some managers and also market timing ability.

Real estate funds have the lowest average γ coefficient against the market which might be considered significant (if median p-value is being used). 61% of the managers of the funds in this sector have significantly failed to time the market while 6,7% were not able to predict the relevant sector's movements and another 9,4% showed some timing ability on the sector index.

Regarding the technology sector, most fund managers do not prove to have market timing abilities. On average, the γ value is positive but not statistically significant, while the specific sector γ is insignificantly negative. Out of the 210 funds in this sample, 28 (13,3%) show some market timing skill and 3,3% of the sector fund managers did not succeed to time the market. Reverse results are observed considering the sector index. 20,5% of technology funds had bad timing ability and only 5 funds (2,4%) within the sector had a positive and significant γ coefficient.

Making a comparison to the growth objective funds (control sample), there is no evidence that either group (sector or control sample funds) has managers that on average have market timing skills, since neither growth funds provide γ coefficients significantly different from zero (0). Examining individual funds however, shows that 27,7% of all the sector funds have significant negative timing skills while the corresponding percentage for the control sample is much lower (7,2%). Finally, managers of 6,1% of sector funds show significant timing abilities but only 1,8% of the growth funds were able to achieve significant positive market timing.

Overall, excluding the real estate industry funds, of which a significant proportion of managers fails to time the market, there is not enough evidence that the rest of the sector funds appear to have extraordinary abilities or inabilities to predict the market upward or downward movements.

Table 5. Market timing measures

	Means(medians)				significant γ		significant γ_s	
SECTORS	**γ**	**p**	**γ_s**	**p_γ**	negative	positive	negative	positive
Financial services	0,549	0,460	0,087	0,380	3 (**4,2%**)	8 (**11,3%**)	3 (**4,2%**)	13 (**18,3%**)
Utilities	-1,277	0,221	-0,384	0,623	11 (**30,6%**)	0	2 (**5,6%**)	0
Health care & biotechnology	-0,041	0,383	-1,662	0,358	16 (**19,5%**)	0	32 (**39%**)	0
Energy	-1,666	0,272	-0,883	0,170	14 (**36,8%**)	0	18 (**47,4%**)	1 (**2,6%**)
Industrials	1,323	0,189	0,703	0,482	0	5 (**33,3%**)	0	3 (**20%**)
Real estate	-3,045	0,172(0,068)	0,060	0,421	136 (**61%**)	0	15 (**6,7%**)	21 (**9,4%**)
Technology	0,527	0,455	-0,198	0,391	7 (**3,3%**)	28 (**13,3%**)	43 (**20,5%**)	5 (**2,4%**)
Growth	-0,329	0,511			20 (**7,2%**)	5 (**1,8%**)		

Note: γ coefficients obtained from regressions run with monthly returns. Number and percentages of significant positive and negative γ values refer to 10% level of significance. γ refers to the coefficient with respect to the market index while γ_s refers to the coefficient with respect to the specific sector index.

7 Conclusion and Recommendations

In the present study, the main goals were to evaluate the performance, the risk and diversification of U.S. Sector mutual funds and to investigate whether there are specific sectors which are able to achieve higher adjusted returns over the market or among their various sector counterparts. The analysis was based on comparing the sample of funds with a relatively broadly diversified control sample of funds, the mutual funds with growth investment objectives and multi-capitalization focus, as it would be more useful to compare two theoretically riskier than average types of funds, yet one with specific industry objective and another with a investment objective irrelevant to the type of industry its stocks are placed in.

The results on annual net returns have shown that on average, sector funds lose value annually while sample funds have a small positive return. Of the sector funds, only the industrials and energy sector funds had positive net returns on average throughout the period of analysis, while technology and financial services demonstrated massive losses on average. Risk-adjusted measures showed that less than 6% of all the sector funds were able to provide abnormal returns (in excess of the market) to the investors, while one out of four growth funds had abnormal positive return.

Sector funds were observed to be less diversified than growth funds, comparing their relative R^2 value against the market index. However, their systematic risk was found to be really close to the control sample's systematic risk. It can be said that they are on average equally risky against the market while their total risk differs, with the sector standard deviation being higher than the one of growth funds but roughly 1%.

This makes sector funds a rather risky component a diversified portfolio, which can potentially enhance its value in expanding market circumstances but may as well deteriorate the total asset value. It would therefore be suggested that sector funds be added in a diversified portfolio of assets instead of investing entirely on them.

Concerning the market timing ability of the mutual funds' managers, it is found that neither sector nor control sample funds exhibit significant timing skills on average. Real estate sector funds have shown rather bad market timing ability while excluding them, the rest of the sectors have almost 11% of funds with negative and significant

market timing indicator. There is no proof that a significant population of either sector funds or growth funds demonstrated remarkable market timing skills.

Of course, this study was conducted under numerous limitations and there are various recommendations that would enhance its validity.

Firstly, a separation in multiple time periods could be applied, so that the results have some intuition relative to the specific financial events that take place, for instance the recent (2008) global financial crisis and onwards.

Additionally, a larger sample of funds and the inclusion of all economic sectors would improve the assumptions being made for the sector funds as a whole.

Finally, some more detailed models on measuring the performance of the funds that include conditional terms to control for the size of the funds, the market cap focus on the stocks traded or the turnover ratios would presumably enrich the results study so that to achieve more confident results.

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Appendices

Aggregated Table 1. Breakdown of coefficient mean values in the various sectors

		Mean values												
SECTORS	No. of Funds	**a**	**p**	**a_s**	**p_s**	**γ**	**p**	**γs**	**pγ**	**β**	**b_s**	**σ**	**R^2**	**R_s^2**
Financial services	71	-0,435%	0,379	-0,12%	0,435	0,5492	0,460	0,0870	0,381	0,9351	0,7296	0,0618	0,5533	0,6957
Utilities	36	-0,155%	0,572	-0,05%	0,427	-1,2767	0,221	-0,3843	0,623	0,6794	0,8110	0,0443	0,5317	0,7887
Health care & biotechnology	82	-0,027%	0,614	0,06%	0,480	-0,0406	0,383	-1,6615	0,358	0,7068	0,8889	0,0474	0,4787	0,5774
Energy	38	0,833%	0,212	0,13%	0,586	-1,6663	0,272	-0,8826	0,170	1,0523	1,1306	0,0805	0,4306	0,7828
Industrials	15	0,790%	0,128	0,64%	0,168	1,3229	0,189	0,7034	0,482	1,2064	1,0064	0,0773	0,6636	0,7116
Real estate	223	-0,026%	0,621	-0,21%	0,422	-3,0448	0,172	0,0604	0,421	1,1206	0,9655	0,0836	0,4407	0,8360
Technology	210	-0,409%	0,482	-0,31%	0,424	0,5273	0,455	-0,1975	0,391	1,7976	1,0356	0,1003	0,7167	0,8915
Growth	277	0,296%	0,361			-0,3285	0,511			1,0852		0,0615	0,7958	
TOTAL	952													

Note: a, β, γ, σ, and R^2 calculated using Jensen's model and Treynor and Mazuy model regressions and represent monthly values. p-values next to a coefficients apply for a coefficients; p-values next to γ coefficients apply accordingly. a_s, p_s, γ_s, b_s refer to coefficients regressed against the corresponding sector market benchmarks. σ denotes the standard deviation

Aggregated Table 2. Breakdown of coefficient median values in the various sectors

		medians												
SECTORS	No. of Funds	**a**	**pa**	**as**	**ps**	**γ**	**p**	**γs**	**pγ**	**b**	**bs**	**σ**	**R^2**	**Rs^2**
Financial services	71	-0,36%	0,307	-0,11%	0,417	0,7387	0,419	0,2073	0,303	0,9481	0,7277	0,0626	0,5893	0,7478
Utilities	36	-0,05%	0,566	0,01%	0,395	-1,1528	0,210	-0,1283	0,734	0,6490	0,7939	0,0430	0,5561	0,8336
Health care & biotechnology	82	0,04%	0,684	0,16%	0,409	-0,4243	0,288	-1,2230	0,138	0,6774	0,9148	0,0425	0,4889	0,5940
Energy	38	0,86%	0,118	0,14%	0,610	-2,0494	0,172	-0,9175	0,088	1,0176	1,1319	0,0747	0,4427	0,8433
Industrials	15	0,77%	0,020	0,62%	0,044	-0,6369	0,242	-0,0835	0,562	1,2046	1,0030	0,0632	0,7484	0,8026
Real estate	223	0,01%	0,642	-0,13%	0,359	-3,0581	0,068	0,1148	0,359	1,0749	0,9867	0,0816	0,4295	0,9013
Technology	210	-0,36%	0,469	-0,19%	0,380	0,8766	0,416	-0,1450	0,294	1,7027	1,0399	0,0934	0,7323	0,9172
Growth	277	0,28%	0,286			-0,2445	0,536			1,1091		0,0616	0,8152	
TOTAL	952													

Note: a, β, γ, σ, and R^2 calculated using Jensen's model and Treynor and Mazuy model regressions and represent monthly values. p-values next to a coefficients apply for a coefficients; p-values next to γ coefficients apply accordingly. a_s, p_s, γ_s, b_s refer to coefficients regressed against the corresponding sector market benchmarks. σ denotes the standard deviation

Aggregated Table 3. Breakdown of coefficient minimum values in the various sectors

		min												
SECTORS	No. of Funds	**a**	**pa**	**as**	**ps**	**γ**	**p**	**γs**	**pγ**	**b**	**bs**	**σ**	**R^2**	**Rs^2**
Financial services	71	-2,08%	0,011	-0,96%	0,026	-2,3595	0,005	-2,2908	0,002	0,4600	0,3955	0,0354	0,1770	0,3127
Utilities	36	-0,67%	0,006	-0,70%	0,000	-4,3174	0,021	-1,7643	0,056	0,4995	0,6891	0,0346	0,3819	0,5893
Health care & biotechnology	82	-2,00%	0,144	-3,15%	0,011	-4,6618	0,003	-8,4338	0,002	0,2731	0,5359	0,0253	0,1763	0,1695
Energy	38	-0,66%	0,009	-0,92%	0,014	-3,6461	0,004	-2,7593	0,000	0,5386	0,7868	0,0498	0,2318	0,3297
Industrials	15	0,21%	0,000	0,19%	0,000	-0,9652	0,015	-0,3601	0,027	0,9519	0,7890	0,0577	0,2647	0,2888
Real estate	223	-1,42%	0,044	-1,29%	0,000	-8,5994	0,000	-4,6748	0,000	0,1280	0,3919	0,0276	0,0529	0,1916
Technology	210	-3,99%	0,043	-3,98%	0,006	-6,9458	0,002	-6,6651	0,000	0,9907	0,4357	0,0430	0,3755	0,4983
Growth	277	-1,52%	0,001			-3,9277	0,000			-0,5822		0,0189	0,1436	
TOTAL	952													

Note: a, β, γ, σ, and R^2 calculated using Jensen's model and Treynor and Mazuy model regressions and represent monthly values. p-values next to a coefficients apply for a coefficients; p-values next to γ coefficients apply accordingly. a_s, p_s, γ_s, b_s refer to coefficients regressed against the corresponding sector market benchmarks. σ denotes the standard deviation

Aggregated Table 4. Breakdown of coefficient maximum values in the various sectors

		max												
SECTORS	No. of Funds	**a**	**pa**	**as**	**ps**	**γ**	**p**	**γs**	**pγ**	**b**	**bs**	**σ**	**R^2**	**Rs^2**
Financial services	71	1,00%	1,000	1,36%	0,996	3,1559	0,999	1,1499	0,990	1,7367	1,0248	0,1201	0,8588	0,9557
Utilities	36	0,21%	0,946	0,27%	0,987	-0,5334	0,526	0,1131	0,991	0,9972	0,9769	0,0543	0,7530	0,9356
Health care & Biotechnology	82	0,57%	0,979	0,64%	0,993	7,9912	0,999	2,0673	0,991	1,4224	1,3225	0,1152	0,7040	0,9388
Energy	38	1,61%	0,937	0,62%	0,996	2,0148	0,895	4,1485	0,809	1,6355	1,3889	0,1386	0,6513	0,9087
Industrials	15	1,30%	0,664	1,13%	0,657	6,8247	0,334	3,5473	0,936	1,4115	1,1821	0,1286	0,8605	0,9041
Real estate	223	1,53%	0,988	0,84%	0,976	4,7650	0,984	2,4002	0,994	1,7053	1,2045	0,1441	0,8793	0,9947
Technology	210	1,43%	0,998	0,81%	0,992	6,3377	0,998	2,9199	0,983	3,2647	1,5855	0,2344	0,9034	0,9823
Growth	277	1,85%	0,993			5,0390	0,998			1,7451		0,1008	0,9655	
TOTAL	952													

Note: a, β, γ, σ, and R^2 calculated using Jensen's model and Treynor and Mazuy model regressions and represent monthly values. p-values next to a coefficients apply for a coefficients; p-values next to γ coefficients apply accordingly. a_s, p_s, γ_s, b_s refer to coefficients regressed against the corresponding sector market benchmarks. σ denotes the standard deviation

Aggregated Table 5. Breakdown of measures and performance ratios in the various sectors

SECTORS	net return*	treynor*	treynor$_{s*}$	sharpe*	expense ratio*
Financial services	-7,16%	-0,081	-0,104	-0,322	1,730%
Utilities	-2,09%	-0,041	-0,034	-0,177	1,478%
Health care & biotechnology	-1,27%	-0,025	-0,020	-0,009	1,694%
Energy	8,29%	0,071	0,066	0,283	1,319%
Industrials	7,33%	0,054	0,065	0,240	1,355%
Real estate	-1,34%	-0,017	-0,019	-0,014	1,667%
Technology	-13,71%	-0,077	-0,134	-0,333	2,032%
Growth	1,90%	0,013		0,065	1,468%

*Note: *Values correspond to annualized and averaged returns for the entire study period (2001-2010). Net return calculated by annualizing each fund's average gross monthly returns, subtracting the annual expense ratio and averaging for all funds in each sector. Treynor$_s$ is the treynor measure calculated using β coefficient of the particular sector each time.*