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Factors determining mutual funds' performance

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CONTENT INDEX

ABSTRACT

The purpose of this Project is to assess how mutual funds' performance is influenced by certain factors and how we can determine these factors. First, we have examined how academic studies have historically tried to come across with factors influencing mutual funds' performance. Lately, we have studied the current state of the US market and different financial and investing concepts that we consider as relevant. Finally, using a 105 US Equity mutual funds' sample among the best performers of past years, we have tested if these academic studies are applicable to our particular case. The results show that risk, measured by beta, and efficiency ratios, such as the Sharpe Ratio, serve to explain the performance of these funds. Nonetheless, in contrast with many of the studies analyzed, expenses, style (value or growth), R2 ratio and managers' factors (years of experience, number of members, education…) do not explain return. Finally, a precise analysis was developed with two particular factors that presented interesting results and we concluded that mutual funds' performance is also determined by funds' size and managers' level of studies positively.

El objetivo de este Proyecto es evaluar de qué manera el rendimiento de los fondos de inversión está influenciado por ciertos factores y cómo podemos determinar estos factores. Primero, hemos examinado los estudios académicos que históricamente han tratado de descubrir los factores que influyen la rentabilidad de los fondos de inversión. Después, hemos realizado un estudio del estado del mercado estadounidense, haciendo referencia a diversos conceptos financieros que consideramos de interés. Por último, a través de una muestra de 105 fondos de inversión de renta variable norteamericana, elegidos entre los mejores de los últimos años, hemos comprobado si los estudios analizados son aplicables a nuestro caso particular. Los resultados muestran que el riesgo, medido a través de la beta, o ciertas ratios (como el Ratio Sharpe) sí que sirven para determinar la rentabilidad de los fondos de inversión. Sin embargo, en contraposición con algunos estudios analizados, los gastos, el estilo del fondo (valor o crecimiento), el ratio R2 o los factores de los gestores del fondo (años de experiencia, número de miembros, educación…) no explican la rentabilidad. Finalmente, un análisis concreto ha sido realizado con dos factores que presentaban resultados interesantes y hemos concluido que la rentabilidad de los fondos de inversión también viene determinada de manera directa por el tamaño del fondo y el nivel de estudios de los gestores.

KEYWORDS

Mutual Funds – Performance – Risk – Size and Style – Managers

Fondos de inversión – Rentabilidad – Riesgo – Tamaño y estilo - Gestores

0. INTRODUCTION: OBJECTIVES AND METHODOLOGY

A mutual fund is a professionally-managed investment scheme, usually run by an asset management company that brings together a group of people and invests their money in stocks. As an investor, you can buy mutual fund 'units', which basically represent your share of holdings in a particular scheme. This project (hereinafter, the "**Project**") will consist of a theoretical, technical and empirical analysis trying to discover the factors determining the performance of US equity mutual funds.

First of all, the Project is going study the academic studies that have been produced in the financial and investing field and the main financial theories that have been developed from the beginning of the XX century in order to explain the performance of securities, in particular, and the stock exchange, in general. This phase is characterized for being a research phase and celebrities such as Harry Markowitz or William Sharpe will be taken into consideration. Secondly, we will develop the "state of the art", in order to come across with all the relevant academic studies that have been done so far in order to prove the previous theories. Once we have finished this part, we will define our hypotheses that we will have to test in the empirical part of the Project. The hypotheses include variables such as risk, size of the fund, type of the fund, ratios (like Sharpe Ratio) and management factors, like gender or years of experience.

Afterwards, we will figure out the current state of the U.S. market, concerning the U.S. Stock Exchange and several concepts in connection with investing and mutual funds for our target market. This part is the most descriptive one and it is relevant to understand the framework of the Project. In this section, an empirical interview to a relevant investing celebrity, Professor Frank Jones, is included as an expertise figure for our Project. Finally, the empirical part of the project will be developed. Our sample is composed of US mutual funds, investing in US equity securities and has been selected among the best performers of the past years.

The main objective of the Project is to determine which factors, in connection with our hypothesis, serve to explain the return of the best US mutual funds' performers. The methodology followed implies that, together with other statistical tests, we will do a regression analysis in order to assess which factors are the ones explaining the performance of our sample. The level of significance of our regression model will show us if, effectively, a certain variable is determinant in the performance of the best US mutual funds.

To conclude, we will contrast our hypothesis previously delimitated, confirm if we have to accept or reject them and explain the possible implications of these results.

1. THEORETICAL APPROACH CONCERNING THE PERFORMANCE OF MFs

In this section, we will chronologically study the main investing celebrities who have analyzed the factors influencing securities' return. The idea is to have a theoretical framework, in order to delimitate the fundamental studies and theories developed in this field from the beginning of the XX century.

1.1. THE SUPERINVESTORS OF GRAHAM-AND-DODDSVILLE

One of the first modern approaches might be the one given by David Dodd and Benjamin Graham (Warren Buffett's teacher) by 1934, when they wrote the book later known as the foundation of value investing. "*Security Analysis*", that was the name, had a terrible impact in Wall Street and market professionals for focusing on reported earnings and criticizing the brokers' lack of concern about the client. In fact, they decided to use a method for valuing stocks based on analyzing undervalued prices. Stocks that had a high price-to-earnings ratio, a high dividend yield and a price below its book and its net current asset value were the target. However, according to Joe Ponzio (2007), in the 1945-1956 period, the method obtained a 15.5% return to shareholders, whereas the S&P 500 returns 18.3% in the same period. Indeed, by the 1970s, Graham (1976) was rather skeptical with his own ideas and quoted that "in the light of the enormous amount of research now being carried on, I doubt whether in most cases such extensive efforts will generate sufficiently superior selections to justify their cost. To that very limited extent I'm on the side of the efficient market school of thought now generally accepted by the professors"(Graham, 1976, p.3).

Graham ended saying that the average manager of institutional funds could not get better returns than stock market indexes, which contrasts with the ideas defended in the book, since "that would mean that the stock market experts as a whole could beat themselves — a logical contradiction" (Graham, 1976, p.4). However, it had to be Warren Buffet the one defending the ideas of Graham and Dodd's studies and, he did so in an article based on a speech given on May 17, 1984, at the Columbia University School of Business, precisely commemorating the 50th anniversary of the publication of "*Security Analysis*". Buffet (2004) stated in the article, after presenting several successful investors through the Graham-and-Doddsville method, that "*adding many converts to the value approach will narrow the spreads between price and value. I can only tell you that the secret has been out for 50 years, ever since Ben Graham and Dave Dodd wrote Security Analysis, yet I have seen no trend toward value investing in the 35 years I've practiced it. There seems to be some perverse human characteristic that likes to make easy things difficult. The academic world, if anything, has actually backed away from the teaching of value investing over the last 30 years. It's likely to continue that way. Ships will sail around*

the world but the Flat Earth Society will flourish. There will continue to be wide discrepancies between price and value in the marketplace, and those who read their Graham & Dodd will continue to prosper" (Bufffet, 2004, p. 15).

Finally, recent recognitions of Graham and Dodd's work include the CFS Institute saying in 2012 that "*the roots of value investing can be traced back to the 1934 publication of Benjamin Graham and David Dodd's classic*" (Moy, 2012, p.3), the Wall Street Journal in 2015 writing that "*is widely viewed as the text of modern value investing"* (Weinberg, 2015, p. 12) and, by 2016, *Fortune* calling the book "*still the best investment guide*" and noting its "*extraordinary endurance*" (Lowenstein, 2016, p.3).

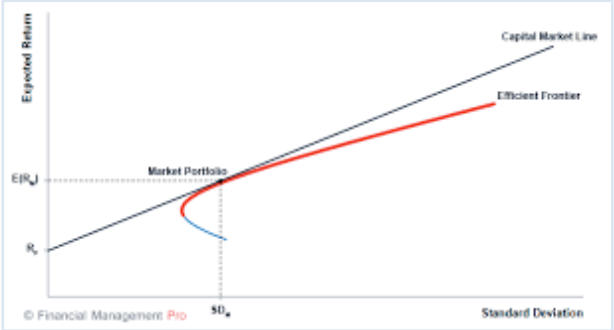
1.2. THE STEPS DRIVING US TO THE CAPM – MARKOWITZ AND TOBIN

The next figure emerging at this point might be that of John Bur Williams (1938), author of the widely spread "*The Theory of Investment Value*" and considered as the father of the Discounted Cash Flow Model (DCF) and Dividend Discount Model (DDM). He challenged the vision of efficient markets as well, and defended that prices should, therefore, reflect an asset's intrinsic value: "*Separate and distinct things not to be confused, as every thoughtful investor knows, are real worth and market price..."*(Williams, 1938, p.23). Moreover, Williams (1938) stated that for a common stock, the intrinsic, long-term worth is the present value of its future net cash flows. This is, under conditions of certainty, the value of a stock is, indeed, the discounted value of all its future dividends (DDM and Gordon Model).

Furthermore, history leads us to the first American winning the Nobel Memorial Prize in Economic Sciences: Paul Samuelson in 1970. Samuelson was likely the most influential economist of the later 20th century and had many contributions regarding macroeconomics, international, welfare and public economics and public finance, as a recognized Keynesian economist. When it comes to finance, he is best known for the efficient-market hypothesis, which states that asset prices fully reflect all available information.

However, it was Harry Markowitz, Nobel Memorial Prize in Economic Science in 1990, the one who first formulated the concept of "efficient frontier" by 1952. Formally, it is defined as the set of portfolios which satisfy the condition that no other portfolio exists with a higher expected return but with the same standard deviation of return. Even though the theory might have some limitations, it allows us to understand that there are a set of optimal portfolios that offers the highest expected return for a defined level of risk or the lowest risk for a given level of expected return. The optimal portfolio aims to balance securities with the greatest potential returns with an acceptable degree of risk, or, on the other hand, securities with the lowest degree of risk for a given level of potential return.

1.2.1 Efficient frontier and Capital Market Line

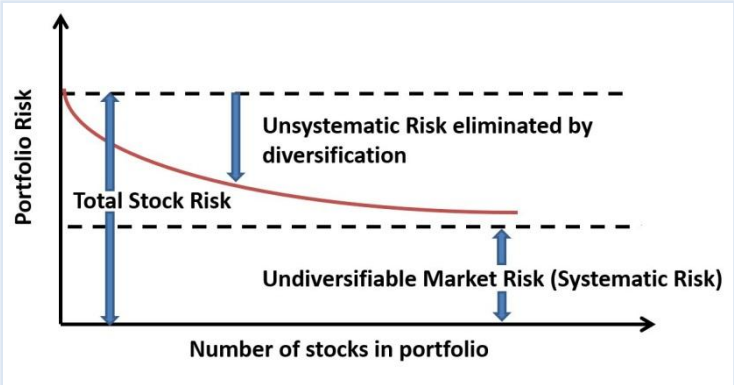


Source: Financial Management. Yuriy Smirnov, Ph.D.

Moreover, it is important to mention in this section the contribution done by James Tobin, with his Capital Market Line or CML. The CML is created by sketching a tangent line from the intercept point on the efficient frontier to the place where the expected return on a holding equals the risk-free rate of return. However, the CML is better than the efficient frontier because it considers the infusion of a risk-free asset in the market portfolio. This background drives us to the creation of the CAPM that will be explained forward, and is characterized by the differentiation between two types of risks:

- Systematic risk: It is connected with the market. It cannot be diversified or reduced through diversification: market risk always remains.
- Non-systematic risk. (Idiosyncratic) It is diversifiable. This kind of risk can be diversified away at no cost by increasing N (number of securities). Diversification tries to reduce risk with no reduction in return, the so called "free lunch". Warren Buffet operates in non-systematic risk region.

1.2.2 Systematic and unsystematic Risk



Source: Ordnur Textile and Finance (2016). Difference between systematic and unsystematic risk

1.3. THE CAPITAL ASSET PRICING MODEL (CAPM)

The Capital Asset Pricing Model or CAPM was introduced for the first time by Jack Treynor (1961, 1962), William F. Sharpe (1964), John Lintner (1965) and Jan Mossin (1966) independently, basing their studies on the work done by Markowitz years before, but it was Sharpe the one receiving the 1990 Nobel Prize in Economics (same year as Markowitz by the way) for the importance of his studies. Actually, particularly relevant is the publication done by Sharpe by 1964 in the Journal of Finance: "*Capital Asset Prices: A theory of market equilibrium under conditions of risk*". Basically, the CAPM describes the relationship between systematic risk and the expected return for individual assets. For individual securities, we make use of the security market line (SML) and its relation to expected return and systematic risk (beta) to show how the market must price individual securities in relation to their security risk class. The world-wide known resulting formula is the following:

1.3.1 Capital Asset Pricing Model (CAPM) formula:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

$E(R_i)$	is the expected return on the capital asset
R_f	is the risk-free rate of interest such as interest arising from government bonds
β_i	is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole
$E(R_m)$	is the expected return of the market (arithmetic average of historical return on a market portfolio such as the S&P 500)
$E(R_m) - R_f$	is sometimes known as the market premium

Beta is calculated using a regression analysis. A security's beta is calculated by dividing the covariance of the security's returns and the benchmark's returns by the variance of the benchmark's returns over a specified period:

1.3.2 Covariance formula:

$$\beta_i = \frac{\operatorname{Cov}(R_i, R_m)}{\operatorname{Var}(R_m)} = \rho_{i,m}\frac{\sigma_i}{\sigma_m}$$

The most important contributions of the CAPM include the following ones:

- Simplification. Not very complex calculations needed to obtain valid estimations of rates of return, under
- Unsystematic risk elimination: It considers that most investors have diversified portfolios from which unsystematic risk has been minimized.

- Systematic risk – Beta inclusion: In contrast to the DDM model, the CAPM includes beta in the calculation of the estimated rate of return and including the systematic risk is seen as one key factor for future models. Mainly, it generates a theoretically-derived relationship between required return and systematic risk which has been subject to frequent empirical research and testing.

Finally, this section needs to include the contribution of two of the promoters of the CAPM with the creation of their own financial ratios: the Sharpe Ratio and the Treynor Ratio:

- The Treynor Ratio, named after Jack L. Treynor, allows us to estimate the excess returns owned in opposition to a non-risk investment, per unit of market risk assumed. The formula is rather easy:

1.3.3 Treynor Ratio formula:

$$T = \frac{r_i - r_f}{\beta_i}$$

$T \equiv$ Treynor ratio
$r_i \equiv$ Portfolio's return
$r_f \equiv$ Risk free rate
$\beta_i \equiv$ Portfolio's beta

- The Sharpe Ratio, named after William F. Sharpe, measures as well the excess return (or risk premium) per unit of risk. The formula is as follows:

1.3.4. Sharpe Ratio formula:

$$= \frac{\bar{r}_p - r_f}{\sigma_p}$$

Where:
$\bar{r}_p$ = Expected porfolio return
r_f = Risk free rate
σ_p = Portfolio standard deviation

However, the CAPM has limitations and it has been restudied by many experts over decades. These limitations will lead us to the following chapter and following implications of this model. In the empirical part of our project, the beta or systematic risk will be taken into consideration as a factor influencing the performance of MFs and we will see if the model developed by William Sharpe is met for our sample.

1.4. VERSIONS OF THE CAPM AND LIMITATIONS OF THE TRADITIONAL CAPM

The most important reinterpretation of the CAPM at the time was done by Fischer Black and Myron Scholes (1973), who published together in 1973 the paper named "The Pricing of Options and Corporate Liabilities", in The Journal of Political Economy, where they included the famous Black-

Scholes equation. This version does not assume the existence of a riskless asset and is said to be more robust against empirical testing, as it was fundamental in the widespread adoption of the CAPM.

The recognition was such that it caused a boom in options trading and, nowadays, it is still widely used by market participants.

Many empirical tests showed that the Black-Scholes price obtained through the BS equation is "fairly close" to the observed prices, although there are some opponents to this model as well and some discrepancies, such as the "option smile" (Marcus, 2008). Warren Buffet, in his 2008 letter to the shareholder of Berkshire Hathaway, stated, "*if the formula is applied to extended time periods, however, it can produce absurd results. In fairness, Black and Scholes almost certainly understood this point well. But their devoted followers may be ignoring whatever caveats the two men attached when they first unveiled the formula" (Warren Buffet, 2008, p. 20).*

Following our chronological order, we will refer now to the arbitrage pricing theory. Created in 1976 by Stephen Ross, this model infers a relationship between a portfolio's performance and the performance of a single asset by a combination of many macroeconomic factors. The number of factors will range depending on the analysis. APT states that the expected return on a stock or other security must adhere to the following relationship:

1.4.1 Arbitrage pricing theory

$$\text{Expected return} = r(f) + b(1) \times rp(1) + b(2) \times rp(2) + \ldots + b(n) \times rp(n)$$

Where, r (f) = the risk-free interest rate. b = the sensitivity of the asset to the particular factor. rp = the risk premium associated with the particular factor.

Indeed, Black-Scholes and Stephen Ross were not the only ones revising the traditional CAPM. In this section, the main limitations of the CAPM are analyzed, together with some comments presenting several, recent or not so recent, studies trying to overcome these limitations:

1.4.2. Limitations of the traditional CAPM and recent studies overcoming those limitations

Limitation	Comments
- **Use of historic data for future returns might be insufficient.**	- Modern CAPM approaches have used betas that rely on future risk estimates (Jordan, 2016)
- **Risk considered as constant (not-varying beta)**	- Time-varying betas have been tested to improve forecast accuracy of the CAPM (Jordan, 2016)
- **Assumes the variance of returns as an adequate measurement of risk**	- Some researches has shown that investors with very low risk tolerances should hold more cash than CAPM defends (Barclays Wealth, 2017)
- **Efficiency of the market. Not considering the possibility of market prices to be informationally inefficient.**	- This possibility is studied by behavioral finance, having in Richard Thaler and Daniel Kahneman their main figures. The first one received the Nobel Prize of Economic Sciences in 2017 for his contributions.

- **Not adequately explain the variation in stock returns**	- Empirical studies show that low beta stocks may offer higher returns than the model would predict (Harindra, 2012; Baker, 2010)
- **Model assumes that there are no taxes or transactions costs**	- Models have studied the performance implications of including taxes and costs (Goetzmannet al., 2009)
- **Model assumes two dates: not possible to consume or rebalance portfolios.**	- The Intertemporal CAPM (ICAPM) of Robert Merton (1973) and the consumption CAPM (CCAPM) of Breeden and Rubinstein (1979) extended this idea.
- **Some market anomalies, such as the size and value cannot be explained**	- Fama – French three-factor model

Source: All the articles mentioned and Bloomberg, The Journal of Financial Economics and Market Watch.

1.5. THE FAMA-FRENCH THREE-FACTOR MODEL

From all the different studies and articles published analyzing the limitations of the traditional CAPM and trying to overcome them, we would like to study the Fama-French model more in detail. It was in 1992, when Eugene F. Fama and Kenneth R. French published their article “The Cross Section of Expected Returns”in the Journal of Finance Perspectives. Both Fama and French were professor at the University Of Chicago Booth School Of Business and they were able to discover that, historically, value stocks outperform growth stocks and, similarly, small-cap stocks tend to outperform large-cap stocks. In fact, they did studies with thousands of random stock portfolios and concluded that, when size and value factors are combined with the beta factor, they could explain 95% of the return in a diversified portfolio (Fama and French, 1992), in opposition to the CAPM, which served to explain around the 70%. They gathered all their assumptions and theories into one formula, which includes three different factors studying the portfolio’s expected return:

1.5.1. The Fama-French Three-Factor Model:

$$r = R_f + \beta_3(K_m - R_f) + b_s \cdot SMB + b_v \cdot HML + \alpha$$

Here r is the portfolio's expected rate of return, Rf is the risk-free return rate, and Km is the return of the market portfolio. The "three factor" β is analogous to the classical β but not equal to it, since there are now two additional factors to do some of the work. SMB stands for "Small [market capitalization] Minus Big" and HML for "High [book-to-market ratio] Minus Low". They measure the historic excess returns of small caps over big caps and of value stocks over growth stocks.

Nonetheless, as it happens with every disrupting theory or model, there have been other studies trying to overcome the limitations produced by the Fama-French (1992) model. For example, Griffin (2002) defends that Fama and French factors are country specific (Canada, Japan, UK or US) and states that regional variables provides a better explanation than global factor. This finding was studied as well by a Fama and French study (2012), where they used local and global factors for four developed markets (North America, Europe, Japan and Asia Pacific). The conclusions explained that local factors are better

than global ones for regional cases. The importance of these studies is so, that the topic is analyzed by the own Kennet French (2018) in his own financial web page. Furthermore, latest articles have confirmed that the conclusions are valid for emerging markets too (Cakici and others, 2013; Hanauer and Linhart, 2015). Finally, recent studies defend that the application of the model to emerging markets means that, even though the book-to-market still explains the model, the market value of equity factor does it very poorly (Foye, Mramorand Pahor, 2016).

As a complement to the model developed by Fama and French (1992), Mark M. Carhart (1997) published the article "On Persistence in Mutual Fund Performance" which served as presentation of his Carhart four-factor model, including a momentum factor for asset pricing of stocks. Momentum is a classic concept in financial investing, and is defined as the tendency of a stock price or market to continue going up if it is rising and continue going down if it is declining. It tries to measure the tendency of the market to continue the trends developed in the past. The opposite term is called mean reversion, and measures the changes in market trends. The momentum is calculated by subtracting the equal weighted average of the worst performers from the average of the best performers (Carhart, 1997). This model is used to define and evaluate active and mutual fund management and is rather relevant for financial analysts, incorporating the 52-week price high/low in their Buy/Sell recommendations (Low and Tan, 2016). The formula used by Carhart is:

1.5.2. The Carhart four factor model

$$EXR_t = \alpha^c + \beta_{mkt} EXMKT_t + \beta_{HML} HML_t + \beta_{SMB} SMB_t + \beta_{UMD} UMD_t + \epsilon_t$$

We can see how, from the previous Fama-French three-factor model, a new UMD factor is included. This is defined as a zero-cost portfolio that is long previous 12-month return winners and short previous 12-month loser stocks.

Finally, in 2015, the three-factor model was extended to a five-factor model by Eugene Fama and Kennet French (2015) by adding two more factors: profitability and investment.

- The profitability factor (RMW) is calculated by subtracting the return of firms with high profitability to the return of firms with low profitability.
- The investment factor (CMA) is the difference between those firms investing in an active mode (aggressive) and those investing in a passive one (conservative).

The model for the US (1963-2013) seemed to be redundant, as it is enough with the relevant analysis of the previous factors. In particular, the CMA factor has a correlation of -0, 7 with HML, being a rather high value (Fama and French, 2015). Even though the model does not fulfill the Gibbons, Ross &

Shanken test (1989), which is done to test the factors explaining the future returns of various portfolios; the five-factor model improves the results obtained by the three-factor one. The main failure is supposed to arrive from the poor performance of portfolios made up of small-cap firms investing a high volume, despite its low profitability. One of the latest comments to this model came last year from James Foye (2017), who debates the way in which Fama and French calculated profitability and concluded that the model was not able to estimate a convincing asset pricing model for the U.K. sample analyzed.

2. "STATE OF THE ART": EMPIRICAL STUDIES ANALYZING THESE INVESTING THEORIES

The purpose of this section is to analyze which articles have been written so far trying to prove the previous financial theories (Chapter 1). After going through this section, we will be able to define the hypotheses that will be studied in our empirical part. Although many studies might be interrelated and speak not only about one factor, the initial idea is to organize this section depending on the most relevant variable or factor affecting MFs' performance.

Speaking widely, from the mid-XX century to the end of the 1990s, there are numerous relevant studies examining the performance of mutual fund by factors such as fund size, age, fees and expenses, loads, turnovers flows and return. To introduce the topic, we could mention, for example, Jensen (1968), Grinblatt and Titman (1989), Ippolito (1989), Hendricks, Patel, and Zeckhauser (1993), Brown and Goetzmann (1995), Malkiel (1995), Gruber (1996), Carhart (1997), Chevalier and Ellison (1997), Sirri and Tufano (1998), and Zheng (1999).

2.1. RISK INFLUENCES MFS' PERFORMANCE POSITEVILY

This might be considered as one of the fundamental aspects of financial investing. It is not only the factor explained by William Sharpe in CAPM, but the factor considered as the base for any financial concept: the more risk you assume, the more return (in theory) you are going to get. This is why the relationship between these two variables is direct.

Nonetheless, once we consider the risk as a factor, there are different ways or manners of estimating this variable. As we have seen before, Fama and French (1992) and Carhart (1997) considered the beta for measuring it. The importance of risk for explaining performance is obviously notorious as we have seen in the previous section. In addition, we can mention in this section the study developed by Connor and Korajczyk (1991), where they examine the risk and return characteristics of U.S. mutual funds, by

considering the CAPM and APT. They developed a timing ability test of the CAPM (extended it to the APT), and discovered that the test might be misspecified due to non-information-based changed in mutual fund betas. Concerning studies developed with European mutual funds, we need to refer to the one done by Otten and Bams (2002), which presents an overview of the European mutual fund industry and investigates mutual fund performance using a using a survivorship bias controlled sample of 506 funds from the five most important mutual fund countries. They use the Carhart (1997) 4-factor model and the fund characteristics on risk-adjusted performance are taken into consideration as well. After all these studies and the previously mentioned theories, it is time to outline our first hypothesis:

H1: Risk affects mutual funds' performance positively.

2.2. EXPENSES AFFECT RETURN NEGATIVELY

Expenses will be analyzed more in detail in Chapter 3 but it is relevant to understand how they are strictly connected with the Active – Passive debate. Theoretically, funds charging high expense ratios have more difficulties in outperforming the indexes (S&P 500). This is so, because the more resources you invest in active investing, the more expenses you need to charge and it does not mean that you are going to overcome your benchmark's return. Gil-Bazo and Ruiz – Verdu (2009) confirmed this statement saying that performance worsens with fees. In fact, they mentioned the puzzle stated by Gruber (1996): investors buy actively managed equity mutual funds, even though on average such funds underperform index funds. Besides, they go beyond this puzzle to discover that funds with worse before-fee performance charge higher fees. They say that this negative relationship between fees and performance is robust and can be explained as the outcome of strategic fee-setting by mutual funds in the presence of investors with different degrees of sensitivity to performance (Gil-Bazo and Ruiz - Verdu, 2009). Finally, they also found some evidence that better fund governance may bring fees more in line with performance.

One of the most complete analysis concerning expenses in mutual funds is the one done by Khorana, Servaes and Tufano (2008).They used a database of 46,580 mutual funds and analyzed the fees charged by them in 18 countries, which is about 86% of the world fund industry in 2002. They state that fees vary considerably across funds and from country to country bringing some substantial conclusions: larger funds and fund complexes charge lower fees; fees are higher for funds distributed in more countries and funds domiciled in certain offshore locations. They finish defending that fund fees are lower in countries with stronger investor protection (Khorana et al., 2008). Other conscious analysis of

expenses is done by Malhotra and McLeod (1997), where they start explaining how investors are subject to many increasing expenses, related to management and transactions costs, whereas mutual fund expenses remain constant. The conclusions of their equity analysis explain that expense-focused investors must look as well at the fund size, age and turnover ratio as determinants of those expenses.

Furthermore, Fama and French (2010) discovered that, "*even though the aggregate portfolio of actively managed U.S. equity mutual funds is close to the market portfolio, the high costs of active management show up intact as lower returns to investors*". In conclusion, not many funds are able to obtain benchmark-adjusted expected returns enough to cover their costs. Droms and Walker (1994) had the same opinion a couple of decades before. They considered that risk-adjusted and unadjusted investment returns are not connected to whether the fund is load or no-load and expense ratios are not related to performance. They ended stating that they found no reward for paying a load fee when investing in mutual funds (Droms and Walker, 1994). Finally, Dahlquist, Engström and Söderlind (2000) concluded that the low fee funds are among the best performers for their Swedish MFs' sample.

On the other hand, there are studies defending the value of active investing. Wermers (2000) found that funds hold stocks that outperform the market by 1.3 percent per year, but their net returns underperform by one percent. Of the 2.3 percent difference between these results, 0.7 percent is due to the underperformance of non-stock holdings, whereas 1.6 percent is due to expenses and transactions costs. Thus, funds pick stocks well enough to cover their costs. Moreover, high-turnover funds beat the Vanguard Index 500 fund on a net return basis. Their evidence supports the value of active mutual fund management. Besides, Otten and Bams (2002) explained that their results deviate from US studies that argue mutual funds under-perform the market by the amount of expenses they charge. They concluded that adding back management fees, four out of five countries exhibited significant out-performance at an aggregate level.

As we see, there are two opposed visions in this section. On the one hand, those who defend that expenses affect return negatively, and, on the other hand, those defending just the opposite. Out hypothesis is going to match the ideas of the first ones, because we see more evidence on the defenders of that side.

H2: Expenses affect mutual funds' performance negatively.

2.3. TYPE OF FUND (SIZE AND STYLE) INFLUENCES RETURN

Fama-French (1992) inferred that the best performance was achieved by small-value funds. Together with their risk measure, the fund size and the fund value had an effect on their performance. Let's see other examples of this theory.

2.3.1. FUND SIZE

One of the most relevant works done in this field is the one developed by Indro et al. (1999), named "Does Fund Size Matter?" where they analyzed a sample of 683 non-indexed U.S. equity fund over the 1993-1995 period and discovered that 20 percent of the mutual funds were smaller than the breakeven-cost fund size. Besides, according to them, mutual funds must attain a minimum fund size in order to achieve sufficient returns to justify their costs of acquiring and trading on information. However, 10 percent of the largest funds overinvested in information acquisition and trading.

In addition, Chen et al. (2004) studied the effect of scale on performance for actively managed funds. They were able to detect that fund return, both before and after fees and expenses, declined with lagged fund size. The relationship is said to be even more relevant among funds that have to invest in small illiquid securities. However, for a stable "fund size", the return does not worsen with the family's size that it belongs to (Chen, 2004). This implication is rather relevant, as we can infer that fund's size affect negatively performance but the bigger the family fund is, the better the fund's performance is as well.Pollet and Wilson (2008) continue investing how size affected mutual fund behavior. They stated that an active fund struggling with decreasing returns to scale should change the investment behavior as managed assets increase. In other words, they found that, although asset increase has little effect on behavior, large funds and small-cap funds diversify their portfolios in response to growth. This implication means that fund's size has a direct effect on performance. In a nutshell, the more a fund diversifies, the better it performs. Fund family growth leads to fund families with many "siblings" (as they say) and they diversify less rapidly as they grow, influencing the portfolio strategy (Pollet and Wilson, 2008).

We have to include Ferreira's et al. (2013) cross-section study investigating the determinants of the performance of open-end actively managed mutual funds in 27 countries. The study defends that the US evidence of diminishing returns to scale is not applicable to every country. In fact, the performance of funds located outside the US and funds that invest overseas is not negatively affected by size and suggest that the explanation for the US case is connected with liquidity concerns faced by funds. Finally, Yan (2008) analyzed a sample of U.S. actively managed equity mutual funds from 1992 to 2002 to investigate the relationship between fund size and fund performance. Consistent with Chen (2004),

he found an inverse relationship between fund size and fund performance. This relationship is more intense between those that hold less liquid portfolios and among growth and high turnover funds. Yan (2008) concludes that liquidity might be the reason why fund size destroys performance. In concordance with most of the studies presented, our third hypothesis is going to be:

H3.1: Fund size affects mutual funds' performance negatively.

2.3.2. FUND INVESTMENT STYLE

We are going to start this part speaking about Davis (2001) work. In his article, he questions if any investment style produces abnormal returns on average and when funds are grouped by style, if there is any style showing performance persistence. The answers from his study are that no style earns positive abnormal return in the 1965-1998 sample period and that even value funds obtained negative returns of about 2.75 percentage points per year. Only the best-performing growth funds showed some evidence of short-run persistence. This idea is shared by Chan, Chen and Lakonishok (2002), saying that few funds take extreme positions away from the index, but those who do it are most likely to favor growth stocks and past winners. In fact, they support that growth managers on average are able to outperform value ones. Besides, Chevalier and Ellison (1997) tried to study the desire of fund companies to increase the inflows of investments and they used a sample of growth and growth and income funds over the 1982-1992 period. As a matter of fact, incentives were created for fund managers to increase or decrease riskiness of the fund; this is change the fund style, depending on the fund's year-to-date return. This would mean that style varies with return.

A recent study is the one developed by Babalos, Mamatzakis and Matousek (2015), examining the performance of US no-load equity MFs and outlining the conclusions that these funds show different levels of efficiency over time. Nevertheless, this assumption changes depending on size and investment style. They consider that their investigation is strong enough to maintain the efficiency scores consistent across different selection of inputs and outputs. The previously mentioned Indro and others (1999), apart from studying how size affected performance, ended saying that value funds and blend (value and growth) were more flexible and practical when it comes to information activities. Indeed, value funds are more adaptable to not-overinvest in acquisition and trading and, therefore, being more efficient. Finally, we will refer to Daniel and others (1999), who used a mutual fund database of over 2,500 equity funds from 1975 to 1994 and concluded that some aggressive-growth funds exhibit some selectivity ability. After all these different ideas and relevant approaches, we can confirm that there is not only a one-direction analysis, but many different ones. Therefore, our hypothesis in this section is going to be as

follows:

H3.2: Style does not influence mutual funds' performance

2.4. WHICH EFFICIENCY RATIOS EXPLAIN MFs' PERFORMANCE?

When it comes to analyzing MFs' performance, there are many efficiency ratios used by investors and management to discover which funds have performed well in the past and will continue doing so in the future. Some of them have already been mentioned in this project (Treynor Ratio, Sharpe Ratio...), but which studies support the use of these ratios?

Eling (2008) starts questioning the idea that funds with a no-normal distribution cannot be properly evaluated using the classic Sharpe ratio. Nonetheless, he found for both hedge funds and mutual funds that comparing the classification or ranking given by the Sharpe ratio with other performance measures, gave the same results. The sample was composed by 38,954 funds investing in seven asset classes and was useful to conclude that choosing one performance measure is not critical to fund evaluation, being the Sharpe Ratio a generally adequate one. Following Eling (2008) work, Ornelas, Silva Junior and Fernandes (2012) compared 13 performance measures with the traditional Sharpe Ratio using a sample of US Mutual Funds. According to them, measures based on absolute reward-risk have similar rankings, but this does not apply to other type of performances. Moreover, the election of the performance measure is not irrelevant, and the use of several performance measures has a positive impact in the industry (Ornelas et al., 2012).

Continuing with this idea of the Sharpe ratio's importance, we will quickly mention the study of Liang (1999), who concluded years before that there was a connection between the high Sharpe Ratio obtained by hedge funds and their better performance for the January 1992 – December 1996 period. Even though our project is not focused in hedge funds, this study can be applied and useful as an explanation of Sharpe Ratio's relevance. In fact, Chang and others (2010), in their study discussing which measure is the most robust one, considered Sharpe Ratio and Treynor Ratio, together with Alpha, as the most commonly used measures for evaluating mutual funds' performance.

Concerning other efficiency ratios, we would like to include Amihud and Goyenko (2013) study about the R2 as a predictor of MFs' performance, obtained from a regression of returns on a multifactor benchmark model. In a nutshell, lower R2 means greater selectivity, and, therefore, results in a better performance. Stock funds sorted into lowest-quintile lagged R 2 and highest-quintile lagged alpha

produce significant annual alpha of 3.8%. Besides, R2 is positively associated with fund size and negatively with expenses.

Finally, when it comes to analyze the importance of alpha, Guercio and Reuters (2013), study the classic underperformance of actively managed mutual funds. They state that flows chase risk-adjusted returns and funds finish responding by investing more in active management. Consequently, they find no evidence that actively managed funds sold through brokers face a weaker incentive to generate alpha and underperform index fund. As we see, this alpha's relevance is strictly connected with studies defending the role of active investing. For all these reasons and studied, we are going to outline the following hypothesis:

H4: Efficiency ratios influence mutual funds' performance.

2.5. DO MUTUAL FUNDS' MANAGERS INFLUENCE PERFORMANCE?

The last factor that will be analyzed is the influence of the board of directors in the MF's return. Malkiel (1995) referred to several studies considering that equity mutual fund managers achieved superior returns and that considerable persistence existed. However, with his work he stated that funds have underperformed benchmark portfolios, both after management expenses and even gross of expenses, what diminished management's relevance. Brown and Goetzmann (1997) explained how mutual funds are typically grouped by their objectives and the "style" of the managers and proposed a new way to determinate manager "style". In fact, what they wanted to do is to capture patterns of returns that resulted from virtually all active portfolio management styles and they defend their category as superior to other common industry classifications. Management is relevant and, according to them, "growth" funds normally differ in different categories depending on the managers (Brown and Goetzmann, 1997).

When entering into the managers' characteristics, there are many variables that can be assessed: number of board members, years of experience, gender of the members, level of education, type of education… In general, we can mention several works that have studied the influence of these variables in MFs' performance. Ferreira et al. (2013), for example, found evidence that solo-managed funds perform better than team-managed funds, which is consistent with the evidence found by Chen et al. (2004). Switzer and Huang (2007) examined whether small and mid-cap fund performance is connected with fund manager human capital factors. They studied tenure, investment experience, education (MBA designation), professional training (CFA), and gender, for a 1,004 small and mid-cap equity funds sample from Morningstar database as of 31 December 2015. Their results showed that there are some

systematic cross-sectional differences in fund performance that can be attributed to differences in managerial human characteristics. Therefore, they concluded that management characteristics affected performance (Switzer and Huang, 2007). Connected with these demographics' study, Christoffersen and Sarkissian, (2011)documented factors such as managerial experience, location, education and gender and discovered that, for example, funds in financial locations traded more and that this extra-trading is mainly done by less experienced managers. Furthermore, these managers increased trading after good results and the consequence is particularly strong between more educated, male fund managers investing in growth stocks and located in New York (yes, they specifically mentioned NY). The relevance is to conclude that they found strong evidence of demographic factors affecting fund managers trading behavior and performance.

Speaking about managers' education, we need to mention Cici and Palacios (2015) approach for options' use in mutual funds. They examined the derivative-trading practices of mutual funds, to assess how they employ options, what funds use them, and how that affects performance and risk. Even though our project is not going to be focused on options or derivative instruments, it is interesting how Cici and Palacios (2015) were able to discover the connection between the use of options and experience, education and gender characteristics. Surprisingly, this use does not lead to performance superior results, but to underperformance in certain uses.

To conclude, we will speak about gender influence on mutual funds' returns. Atkinson, Baird and Frye (2003) studied the performance and investment behavior of female-fixed mutual fund managers in comparison with male fixed-income mutual fund managers. They concluded that male and female-managed funds have no significant differences in terms of performance, risk and other fund characteristics. Consequently, they assumed that difference in investing parameters between male and female might be due to investment knowledge and wealth constraints. However, in spite of these similarities, they considered that there are evidences to affirm that gender influences the decision making of mutual fund investors. Particularly, net asset flows into fund managed by females are lower than for males, especially for the manager's initial year managing the fund (Atkinson and Baird, 2003).

Finally, Babalos, Caporale and Philippas (2015) examined 358 European diversified equity mutual funds and, consistently with other previous studies, they stated that no significant differences existed between female and male managed funds. However, they said that perverse market timing manifests itself mainly in female managed funds and in the left tail of the returns distribution (Babalos et. al, 2015). According to all these factors we will estimate that:

H5.1: Gender does not influence mutual funds' performance.
H5.2: Specific management characteristics do influence mutual funds' performance.

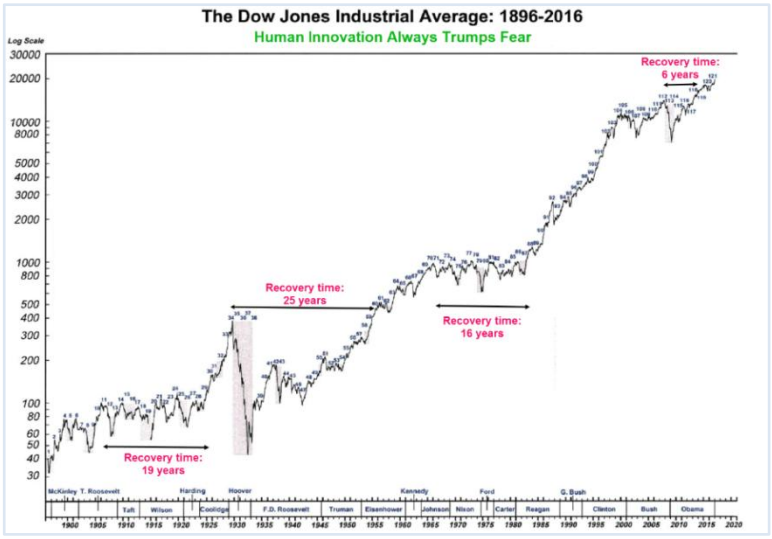
3. MARKET FRAMEWORK: U.S. STOCK EXCHANGE AND MUTUAL FUNDS

3.1. U.S. STOCK EXCHANGE EVOLUTION - THE DOW JONES INDUSTRIAL AVERAGE

The purpose of this section is not to make a historical analysis of the birth of Stock Exchanges, starting from the merchants of Venice, the East India Companies and the South Seas Bubble Burst, until the creation of the New York Stock Exchange by the end of the XVIII century. The purpose of this section is to go through the historical evolution of the U.S. markets in the last decades, to understand how the cyclical evolution of the Stock Exchange affects the performance of securities and, therefore, of Mutual Funds.

For this purpose, we have decided to select the Dow Jones Industrial Average, as it is one of the oldest and best-known indexes in the financial industry. It has become an important barometer of global confidence over the years, because of its nature as a benchmark for the largest stock markets in the world. As a consequence, it is interesting to remark how, since its creation by the end of the XIX century, it has maintained the same price-weighted system[1] of equivalence between its securities, becoming the only major index to keep this kind of weighting.

3.1.1. The Dow Jones Industrial Average: 1896 – 2016



Source: MarketWatch. DJIA historical chart. (2016)

[1] "*A price-weighted index is a stock index in which each stock influences the index in proportion to its price per share. The value of the index is generated by adding the prices of each of the stocks in the index and dividing them by the total number of stocks*". Price weighted index. Investopedia. Available in: https://www.investopedia.com/terms/p/priceweightedindex.asp Consulted on April 3, 2018.

Chris Kacher (2018), managing director of MoKa Investors, decomposed this previous chart of Dow's performance since 1896 to show how the index's peaks and troughs have reflected the U.S. economy's triumphs and tribulations. The graph also illustrates how the Dow has become a chronicle of investors' responses to significant global events. The main bull and bear periods from the beginning of the XX century can be summarized in the following table:

3.1.2 Stock market: An overview

Bull Period	Bear Period	Explanation
1920-1929		The Roaring Twenties
	1930-42	The Great Depression: 29 Crisis – Black Tuesday
1942-66		Post WWII Recovery: 50s and 60s as a period of benign deflation and steady growth
	1966-1982 (excluding 71-72)	Secular Bear Market: - DOW stuck at 1,000 (hit 1,000 every year from 1966 to 1982) - 1973-74 was a strong bear market after Nifty Fifty rally - Inflation continually increased until Volker took over as Fed Chairman (7/79) and tightened
1971-1972		Nifty Fifty Stock Rally: 50 large cap stocks meant to buy and hold (high quality)
1982-1999		Secular bull market for stocks, bonds, real estate.
	Oct. 19, 1987	Black Monday: Largest 1-day decline in stock market (-22.1% for DJIA)
1995-1999		Tech Bubble
	2000-2002	Tech Bubble Burst
2003-2007		Moderate Recovery from Tech Burst
	2008-2009	Severe Bear Market
	1999-2009	Negative returns over this decade (-0.9% in 2000s)
2009-2016		Increase in Stock Market / Slow Bottom of Bear Market Economic Growth. Bottom of Recession – June 2009

Source: Bloomberg, Market Watch and NASDAQ

It took 25 years for the market to recover from the 1929 stock-market crash, and 16 years for stocks to bounce back from the combined effect of the Vietnam War, the 1973 oil shock and the resignation of President Richard Nixon. The lesson is that the market always recovers. But sometimes, it just takes a little longer.

3.2. MUTUAL FUNDS HISTORY AND EVOLUTION

As in the previous chapter, the purpose of this section is not to make a dissertation about MFs history, but to get a few historic key facts to understand how this figure works and how it has evolved during the decades. In fact, it is iconic how the first MF in history received the name of "*unity creates strength*", defending one of the fundamental aspects of success in investing: diversification. It was a Dutch merchant, Adriaan Van Ketwich, the one who created the first investment trust by 1774 to attract

investments of people with less economic power[2]. From that point, the main milestones reached by mutual funds can be summed up as follows:

3.1.2 Mutual Funds History and evolution

Period	Situation	Events taking place
XIX Century	Spread across Europe and arrival in US	By 1868: the first "official" investment trust is founded in London (Foreign and Colonial Government Trust) and the shares are still traded on the LSE today. By 1893: the Boston Personal Property Trust becomes the first closed-end fund in the U.S.
Beginning of the XX Century	The great boom and the apparition of "real" MFs	March 21st 1924: The first official open-ended mutual fund was created: the Massachusetts Investors' Trust in Boston, organized by State Street (McWhinney, 2018). The great change: o By the end of 1929: there were 19 open-ended mutual funds vs. 700 closed-end funds in the U.S. o After the crash and Great Depression: the Securities and Exchange Commission (SEC), the passage of the Securities Act of 1933 and the enactment of the Securities Exchange Act in 1934 changes the situation.
Mid – XX Century	Expansion and consolidation	By 1951: there were more than 100 MFs and 150 more to be created in the next two decades. 1960s: Birth of the first aggressive growth funds, betting on high tech stocks. 1971: Creation of the first index fund by Wells Fargo. Debut of the First Index Investment Trust (based on the S&P 500) and the Reserve Fund. 1974: Vanguard's John Bogle takes the concept and creates the MF powerhouse for low-cost index funds: The Vanguard Group. 1976: The first municipal bond is launch.
Modern Times	Bullet and bear markets. Ups and downs.	1980s and 1990s: Superstar managers appear with Max Heine, Michael Price and Peter Lynch. In 1993: Nathan Most created a fund traded intraday: It is the beginning of the ETF revolution. 1997: The burst of the tech bubble and several scandals with big names makes the industry live critical moments. Despite 2003 scandals and 2008-09 global financial crisis, the industry is still growing. Now: In the U.S. alone there are more than 10,000 MFs.

Source: History of mutual funds in mutualfunds.com and Investopedia.

Globally, there are more than 14,000 mutual funds available nowadays, so it can be seen as a perfect exemplification of how the idea set by Van Ketwich in 1774 is still present today. Mutual funds have been, are and will continue to be a key instrument allowing investors to create wealth and improve their investing budgets.

3.3. MUTUAL FUNDS VS. ETFs

Technically, the definition of a mutual fund is said to be an investment vehicle made up of a pool of moneys collected from many investors for investing in securities such as stocks, bonds, money market instruments and other assets (Investopedia, 2018). This definition is very similar to the one we

[2] "Ketwich created a diversified pooled security specifically designed for citizens of modest means". 18th Century: Unity Creates Strength. Mutual funds.com. Available in:http://mutualfunds.com/education/mutual-funds-brief-history/

understand in Spain as "*fondo de inversion*". However, the definition of an ETF, or exchange-traded fund, understood as a marketable security that tracks an index, a commodity, bonds, or a basket of assets like an index fund (Investopedia, 2018), may led us to a misunderstanding. For this reason, it might be a good idea to break down both funds.

3.3.1. PROS AND CONS OF MFs AND ETFs

Both funds have in common that are portfolios of securities. They are integrated by a series of negotiable market values that are bought and sold. However, the main difference is that, whereas mutual funds are traded at the end of the day (4.00 P.M. EST), ETFs trade like a common stock and get an intraday pricing (9.00 A.M. – 4.00 P.M.). In addition, the value of both MFs and ETFs is calculated based on their Net Asset Value (also known as "**NAV**") of its securities. With both securities' types, the per-share dollar amount of the fund is based on the total value of all the securities in its portfolio, any liabilities the fund has and the number of fund shares outstanding. Nonetheless, in the case of ETFs the price might not be equal to its NAV at some points, and this can led to a tracking error. When this situation takes place, it is readjusted by the authorized participant (also known as "**AP**"), which is the figure in charge of reducing shares in circulation when supply falls short or demand and keep share prices aligned with its underlying NAV. On the other hand, the price of MFs is calculated at the end of the day, so this tracking error does not take place.

Other key difference is that MFs can be exchanged as active or passive funds in the market, and this situation does not occur with ETFs. In fact, ETFs only accept passive strategies because the AP is the only authorized to transact with ETF sponsors. Finally, the main large MF companies that we have to consider would be Vanguard (there are also very important ETFs in the case of this company), Fidelity and American Funds. On the other hand, the main Large ETF sponsors would be Blackrock (also known as "**iShares**") and State Street. In Annex I, there is a chart with all these information summarized, together with some added interesting data.

3.3.2. DIFFERENT TYPES OF MFs

Once we have had a look at the differences and similarities between Mutual Funds and ETFs, we have to say that our project will be mainly focused on Mutual Funds. Consequently, inside mutual funds we can distinguish not only a single type of MF. For this reason, we will quickly glance down the two different types of mutual funds that we can find in the market depending on whether they are charged with a load or not:

3.3.2.1 DIFFERENT TYPES OF MFs		
	No loaded MF	Loaded MF
Negotiation type	Funds end up directly in a MF family	Funds end up directly in a MF family
Exchange type	Direct	Through broker
Load/No load	No load	Load: - Front (A): Break points. - Back (B) - Level (C) - Other
Price	Price = NAV	Price = NAV – Load
Exchange time	4.00 P.M. EST	4.00 P.M. EST
Fund type	Active and Passive	Active and Passive

Source: Frank Jones. Portfolio Management Lesson 172 B. San Jose State University, California.

3.4. ACTIVE AND PASSIVE INVESTING – BEYOND THE "STATE OF THE ART"

3.4.1. GENERAL CONSIDERATIONS

If you're a passive investor, you invest for the long haul. Passive investors limit the amount of buying and selling within their portfolios, making this a very cost-effective way to invest. Active investing, as its name implies, takes a hands-on approach and requires that someone act in the role of portfolio manager. This differentiation between passive and active investors, applies directly to active and passive funds. The best example of a passive way of investment drives us to an index fund that perfectly follows one of the major indices in the market, such as the S&P 500 in the U.S. or the IBEX 35 in Spain. The fund is prepared to be changing its portfolio and stock selection in case the stocks of the index vary. If a benchmark index varies its stocks portfolio (because it changes the stocks' weights or because one stock is replaced by other), the fund must change its portfolio selection too.

On the other hand, active investing requires someone acting in the role of a portfolio manager because the main objective of these kinds of funds is to beat the market's average returns. Generally, active funds have much higher expenses than passive funds because it requires much more resources trying to beat the market than just following it. Nevertheless, historically and statistically, data show the extreme difficulty of trying to beat the market. It was William Sharpe, by the way, the one saying "*before costs, the return on the average actively managed dollar will equal the return on the average passively managed, and after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar*" (Sharpe, 1991, p.7).

3.4.2.PROS AND CONS OF ACTIVE AND PASSIVE INVESTING

There will always be both defenders and detractors of active and passive investing in the US market. Whereas the already mentioned figures of Markowitz, Tobin or Sharpe have always defended a passive way of investing, Warren Buffet has being able to make tons of money through an active model of investing. The next table will try to sum up the main pros and cons of both strategies:

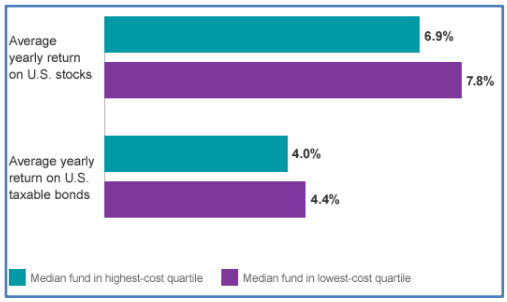
3.4.2.1 PROS AND CONS OF ACTIVE AND PASSIVE INVESTING		
	PROS	CONS
ACTIVE INVESTING	- Flexibility: portfolio managers looking and pitching for those "diamonds in the rough" - Hedging: techniques, such as short sales or put options. - Tax management: strategies to individual investors	- Very expensive: the returns can be killed through those expenses - Active risk –great when the analysts are right but terrible when they're wrong
PASSIVE INVESTING	- Ultra-low fees: oversight is much less expensive - Transparency: Always clear which assets are in an index fund - Tax efficiency	- Too limited: to a specific fund or predetermined set of investments - Small returns: by definition, not beat the market

Source: Wharton. University of Pennsylvania. Active vs. Passive Investing. Which approach offers better returns?

3.5. EXPENSES

Investment costs might not seem like a big deal, but they add up, compounding along with the investment returns. According to Vanguard[3], research on mutual funds has shown that higher-cost funds generally underperform lower-cost funds. That's because the fund managers charging these costs have a difficult time adding enough value to overcome the additional expense.

6.5.1. Why do cost matter?



Source: Vanguard calculations using data from Morningstar.

This illustration compares the annualized returns (for the 10 years ending December 31, 2014) of the median funds in two groups: the 25% of funds that had the lowest expense ratios as of year-end 2014 and the 25% that had the highest, based on Morningstar data. Returns are net of expenses, excluding loads and taxes. Both actively managed and index funds are included, as are all share classes with at least ten years of returns. Furthermore, unlike the markets, costs can be highly predictable. There is no reason to assume that you get more if you pay more, but it is certain that every dollar that it is expended

[3] Vanguard: Don't let high costs eat away your returns. Available in: https://investor.vanguard.com/investing/how-to-invest/impact-of-costs

in management is a dollar lost, and that is why expenses are a really vital feature of MFs. So it is important to give them the time and attention they deserve.

3.6. GROWTH VS. VALUE

This "style" differentiation has already been examined concerning several articles in Chapter 2, leading to the formulation of our hypothesis. In this section, we do not want to reiterate the previous ideas, but to clearly define the characteristics of both types of mutual funds in the US market, in order to clarify it.

3.6.1. GENERAL CONSIDERATIONS

The classification that leads us to have growth and value stocks is based on the intrinsic value and performance underlying below them. On the one side, growth stocks are considered to have potential enough to outperform the market because of its intrinsic growth (so logical). These kinds of stocks can be found in small, mid and large cap sectors and are only able to retain this status until analysts feel that they have achieved their potential. They are said to grow quickly, because they are rather expensive, popular: "pretty". These securities are connected with a tactical, short term strategy, based on price changes. On the other side, value stocks are usually larger, more well-established companies. Through a business valuation analysis, investors are able to determine if the stock price of a certain company has been undervalued, which means that is going to gain more value in the future. As we know, the typical methods to understand if a stock has been undervalued is through business valuation, by methods such as Discounted Cash Flows (DCF), Dividend Discount Model (DDM) or relative valuation. Their growth is expected to increase slowly, not like growth stocks, but in a long term basis, they are much more secure. The two typical ratios to define these kinds of stocks are the P/E (price to earnings) ratio and TO (turnover ratio). The growth stocks have a high P/E ratio and a high TO ratio, whereas in the case of value stocks are just the opposite. Besides, the main risks affecting them are the "torpedo" and the "value trap". The torpedo is a risk for growth stocks which means that if they start to fall at one point, they can keep going down without pause. The "value trap" for value stocks is that a value stock that is undervalued in comparison to the market remains undervalued with no expectation of growth.

3.6.2. HISTORICAL PERFORMANCE – BEYOND THE "STATE OF THE ART"

Apart from the academic studies recognized in Chapters 1 and 2, there are some other recent articles precisely referring to stocks' differentiation between growth and value. John Dowdee (2013), published a report named "Value Versus Growth: Which Is Better?", where he broke stocks down into six categories that reflected both the risk and returns for growth and value stocks in the small-, mid- and large-cap sectors, respectively. The study revealed that from July 2000 until 2013, when the study was

conducted, value stocks outperformed growth stocks on a risk-adjusted basis for all three levels of capitalization—even though they were clearly more volatile than their growth counterparts

Besides, Craig Israelsen (2015) published a different study in Financial Planning magazine in 2015 that showed the performance of growth and value stocks in all three cap sizes over a 25-year period from the beginning of 1990 to the end of 2014. The returns on this chart show that large-cap value stocks provided an average annual return that exceeded that of large-cap growth stocks by about three quarters of a percent. The difference was even larger for mid- and small-cap stocks, based on the performance of their respective benchmark indices, with the value sectors again coming out the winners. As it is explained by Mark P. Cussen (2017) in Investopedia article "Value or Growth Stocks: Which Are Better?", the study also showed that over every rolling five-year period during that time, large-cap growth and value were almost evenly split in terms of superior returns. Small-cap value beat its growth counterpart about three quarters of the time over those periods, but when growth prevailed, the difference between the two was often much larger than when value won. However, small-cap value beat growth almost 90% of the time over rolling 10-year periods, and mid-cap value also beat its growth counterpart. Probably, the most extended sample trying to analyze the performance of the different kinds of stocks over time is the one developed every year by the Stocks, Bonds, Bills and Inflation (SBBI) Yearbook. As the previous examples mentioned, the stocks are divided into different categories (four in this case) depending on the style and size they have. In the Yearbook for year 2017, the following data were shown:

3.6.2.1 Fama-French Growth and Value Series Compound Annual Rates of Return by Decade (%) 1928-2016

	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
F-F Large Growth	8,1	1,5	7,3	17,6	7,9	3,4	15,8	19,9	-1,8	13,0
F-F Large Value	9,0	-5,5	17,2	22,2	10,7	12,2	20,2	13,9	0,3	14,4
F-F Small Growth	-13,3	7,4	11,6	17,7	10,7	5,8	10,8	15,0	-1,1	12,7
F-F Small Value	-4,8	-0,3	21,0	20,0	15,4	15,0	21,1	14,5	10,6	14,7

Source: Excerpt from the 2017 Stocks, Bonds, Bills and Inflation (SBBI) Yearbook. .

If we have a look at the previous table, it might seem as a bunch of numbers with no real meaning by themselves, but it truly shows that small-value stocks beat small-growth stocks in all decades except the 1930s and the 1990s. It is also interesting to note that small-value stocks were never the worst performing among all four stock series in any decade. Besides, the following chart shows summary statistics of annual total returns for the growth and value series from 1928 to 2016:

3.6.2.2 F-F Growth and Value Series Summary Statistics of Annual Returns (%)

	Geometric Mean	Arithmetic Mean	Standard Deviation
F-F Large Growth	9,0	10,9	19,8
F-F Large Value	11,3	14,7	27,3
F-F Small Growth	9,3	13,8	32,5
F-F Small Value	14,0	18,6	32,2

Source: Excerpt from the 2017 Stocks, Bonds, Bills and Inflation (SBBI) Yearbook. .

Value outperformed growth across the market capitalization spectrum. In the large-cap arena, the extra return of value growth was at the expense of increased risk, as the standard deviation of large-value was 27.3 percentage points versus 19.8 percentage points for large-growth. In the small-cap series, small-value significantly outperformed small-growth and did so with lower volatility (32.2% vs. 32.5%) (SBBI Yearbook, 2017). This analysis does not want to alter our hypothesis established in Chapter 2, but simply to serve as another source of information of reference in order to understand the US market itself. We want to clarify that our hypothesis takes into consideration this type of analysis as well.

3.7. FRANK JONES' EXPERTISE

Frank Jones is a professor of financial studies in San Jose State University, with a Ph. D. in Economics by Stanford and more than forty years of investing experience. He has taught at Notre Dame, YU, Columbia, Yale or MIT and nowadays, he is still Co-Chair of the Private Ocean investment committee[4]. During the past December 2017, we did a questionnaire concerning the main financial and investing ideas developed during their lessons that had a connection with this Project and he kindly answered it. According to his investing and financial experience, we consider his answers of enough significance and importance to be included in this section, as a perfect empirical proof of US stock exchange market. The entire questionnaire is completely available for academic purposes, but some of the most relevant answers are summarized in the following table, for a better understanding.

	Questions	Frank Jones' response
General Questions	-First variable to look at? -Time horizon of a MF? -Factors by relevance	• Expenses • 2 years • 1. Active / Passive. 2. Small / Large. 3. Growth / Value 4. Taxation 5. Behavioral / Traditional
Style and size	-Value or growth? -Classification?	• Value (80% - 20%) • Small Value > Large Value > Large Growth > Small Growth
Type of investing	-Passive or active? -Traditional or behavioral?	• Passive (80% - 20%) • Traditional (Fama – Markowitz)

[4] "Frank's career accomplishments include playing a founding role at the International Securities Exchange (ISE), the first electronic options exchange, and managing a $29 billion stock, bond and real estate portfolio at Guardian Life Private Ocean. Frank held strategic and executive positions at Merrill Lynch, Kidder Peabody and the N.Y. Stock Exchange, where he initiated the New York Stock Exchange stock options program" Private Ocean. Team. Frank Jones. Available in: http://www.privateocean.com/frank-j-jones

	-Decision under uncertainty?	• Think slowly.
Expenses, ratios	-First ratio to look at? -Expenses or taxation? -Taxation?	• Expense Ratio • Both • Always considered in professional investing
Management	-0-10: Importance? -Perfect structure? -Best board? -Main challenges?	• 2 • 11 members. CEO, CFO, CIO • Vanguard • Control expenses, changing fund managers
U.S. MFs and market trends	-US Ranking? -0-10: Importance of ratings such as Morningstar? -Bloomberg or Morningstar? -Most relevant new trends? -Bitcoin opinion? -Cryptocurrencies and "robo-advisory"?	• 1. Vanguard 2. Primecap 3. Fidelity 4. T. Rowe Price 5. American Funds 6. Harbor • 7 • Morningstar • AI, IoT and Big Data • Don't touch bitcoin! Blockchain will become important. • No cryptocurrencies funds in my portfolio and "robo-advisory" will not change investing.
Conclusions	-Main challenges for the market? -Best MF performers? -Piece of advice for an undergraduate student?	• Finding the right balance between expenses and services. • Vanguard • Think slowly. Be deliberate. Be humble

Source: Interview done by Frank Jones in San Jose State University. December 2017.

Some of the answers provided are very useful for our next part of the Project. For example, he gives an extreme importance to expenses. In fact, for him the first factor to always look at in a mutual fund is the expense ratio. Besides, in the distinction between types of funds, he would pick value ones (80%), which is in perfect connection with some of the theories previously studied. When it comes to type of investing, he prefers passive investing, rather than active one (80%-20% as well), stressing the difficulty of beating the market, net of expense.

Frank Jones' investing approach would use traditional approaches, instead of behavioral ones, and he remarks how taxation does not have to be forgotten, even though sometimes it its forgotten by professional investors. Moreover, it is particularly influential the secondary importance that he gives to managers, as it only has 2 out of 10 in a relevance scale. This assumption contrasts with our H5.2 hypothesis of managers' characteristics influencing mutual funds' performance, so in the next Chapter we will infer if we have to accept or reject that hypothesis. Finally, the last part of the questionnaire was focused on certain trends affecting the US and global markets. For instance, he showed the importance of Morningstar for MFs' selection and did a ranking with the main US mutual funds' families. He has always pointed Vanguard as the best mutual fund family, followed by Primecap or Fidelity. Concerning new marketing trends, he stated the importance of artificial intelligence, internet of things and big data, as some of the drivers of future investing. In addition, he does not consider that "robo-advisory" will change the way investing is done and it is remarkable the fear showed concerning new investing trends

such as bitcoin or cryptocurrencies mutual funds. In fact, he alerted not to touch bitcoin, but he considered that the technology beyond it, blockchain, will become important in the future.

4. OUR EMPIRICAL ANALYSIS: U.S. EQUITY MUTUAL FUNDS

After all the theoretical and academic research developed in the previous chapters, now it is the moment to develop our own empirical work in order to test our hypothesis (Chapter 2) and find out if the studies done before match with our results or not.

4.1. SELECTION OF OUR SAMPLE, VARIABLES AND METHODOLOGY

First, we need to select our sample. As we know, there are different methods of sample selection and the criteria we follow might affect our results. In this project, the objective is to define which factors are the ones affecting mutual funds' performance the most. Consequently, the sample will be formed by mutual funds with a good performance over time. Our total population would be U.S. equity mutual funds investing in U.S. securities (not foreign ones, not fixed-income vehicles, not derivatives or options, not hedge funds or ETFs…). Out of this total population, the method for our sample selection is named "*stratified sampling*"[5], because we are going to select those who might be considered as the best performers. We have decided to follow this method, because we consider it as the best way to infer which factors they share to become great performers. Moreover, our statistical analysis will be based on these assumptions, to conclude if some of the variables might explain the good performance of these funds.

Therefore, the selection method must be "clean" and not be altered by our biases or, otherwise, the results obtained will not be reliable. For the selection of our sample, we have followed several articles written by some of the most prestigious investing platforms of the world. MarketWatch[6] and U.S. News[7] are characterized for developing investment rankings about the best mutual funds over time, so we decided to select the funds of those rankings that adjusted precisely to our criteria. We remark that following the rankings exactly is rather relevant, in order not to alter our sample selection. As we know, Morningstar, probably the best well-known platform for mutual fund analysis, defines its own MFs'

[5] "*When the population embraces a number of distinct categories, the frame can be organized by these categories into separate "strata." Each stratum is then sampled as an independent sub-population, out of which individual elements can be randomly selected*" Groves, R. M. et al. (2009); Survey methodology.

[6] "*If past performance is any indication of future returns, it's not surprising that investors are skeptical of the mutual fund industry*". Market Watch. The Top 100 Mutual Funds. Available in: https://www.marketwatch.com/story/the-top-100-mutual-funds-1326410692855.

[7] U.S. News. The 100 Best Mutual Funds for the Long Term. Available in: https://money.usnews.com/funds/mutual-funds/us-stock. Available in: https://money.usnews.com/money/personal-finance/mutual-funds/articles/2010/05/19/the-100-best-mutual-funds-for-the-long-term.

rankings. Nonetheless, we decided not to follow them because the information is going to be obtained from Morningstar and we wanted to differentiate between the sample selection and the information gathering.

Before doing our statistical analysis, we had to filter possible outliners' values that might affect our results. For doing this, we have calculated the percentiles of those variables that might present these kinds of values and see if we had to remove any of them. The statistical table with the percentiles' calculation for the dependent variable (three-year return) is shown in Annex IV – Paragraph 1. Finally, the number of our mutual funds' sample is 105. This number matches with the required sample size for hypothesis tests[8], taking into account our total population and the statistical factor that will be used.

Furthermore, the next step is the selection of our variables. The variables or factors that we need to gather from Morningstar are in precise connection with our hypothesis of Chapter 2. Consequently, we have gathered all those variables that we consider of relevant interest for our future statistical testing. In Annex II, there is a table showing the variables that we have selected from Morningstar, a little explanation for each one of them and the values that these variables might take. In fact, not all the variables collected have been used in this Project, so the financial implications of this sample can overcome our approach. Finally, Annex III presents a part of our sample with some of the most important variables for each one of the 105 US Equity mutual funds.

Concerning our methodology, the main statistical process that we are going to use is a regression analysis, which focuses on the relationship between a dependent variable (three-year return in our case) and one or many independent variables (more than one, in our case). In fact, this process allows us to understand how the MFs' performance changes when any one of the independent factors varies and while the others remain constant. The statistical software used for our analysis is named Stata[9] and it is used in research studies of different fields, from economics to biomedicine or political science. Apart from our regression analysis, we have developed other statistical methods, such as the Student's t-test, which serves to determine if two sets of data are significantly different from each other.

The data used to evaluate if an independent variable is determining our dependent variable is the p-value. The p-value for each independent variable tests the null variable: the variable has no correlation with the dependent variable. If the p-value for a variable is less than our significance level, our sample will provide enough evidence to reject the null hypothesis for the entire population and accept the

[8]Kenny, David A. (1987). *Statistics for the social and behavioral sciences*. Chapter 13, pp. 215. Boston: Little, Brown

[9]STATA. "*Stata is a complete, integrated statistical software package that provides everything you need for data analysis, data management, and graphics*". Available in: https://www.stata.com/why-use-stata/

alternative hypothesis. However, a p-value greater than the significance level means there is insufficient evidence in our sample to conclude that a non-zero correlation exists (Frost, 2017). For our analysis, we are going to consider a significance level of p = 0.1 (in other words, 10%).

Besides, the coefficient's sign allows us to know if there is a positive or negative correlation between the profitability (dependent variable) and the independent variables. A positive sign means that there is a positive or direct relationship between them, whereas a negative sign indicates just the opposite: an inverse relationship. Finally, after doing our regression analysis we need to observe if the variance inflation factor (also known as "VIF") gets the proper value (< 2.00) to qualify the analysis as adequate. VIF quantifies the severity of multicolinearity and provides an index that measures how much the variance of an estimated regression coefficient has increased because of co-linearity (Gareth et al, 2017). For our analysis, if it gets values higher than 2.00, our analysis has to be rejected. The tables with all the statistical results obtained using STATA are organized by sections in Annex IV, whereas in the following subsection we are going to directly dissect those results.

4.2. RESULTS OBTAINED

4.2.1. DESCRIPTIVE RESULTS AND PEARSON CORRELATION COEFFICIENT

Our dependent variable is the return or profitability of each mutual fund. Morningstar provides us with different types of profitability, depending on whether we want to know it in a one-year, three-year, five-year or ten-year basis. The descriptive results for each one of these results are the followings:

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Return 1 year	105	14.29%	9.24%	-12.27 %	46.13 %
Return 3 years	105	8.83 %	4.29 %	-6.98 %	21.87 %
Return 5 years	105	12.05 %	4.09 %	-6.13 %	21.03 %
Return 10 years	105	9.86 %	2.80 %	-2.02 %	16.05 %

Observing the data above, we can infer how the one-year results are the ones with a higher average return, but with a higher standard deviation as well. It is rather interesting to study how the five-year return has a higher profitability than the three-year one, but with a lower standard deviation. As a consequence, in this years' range we could obtain a better return with less risk. Looking at the minimum and maximum, the one-year return has the most scattered distribution, presenting the highest and lowest values among the others. After all these results, we have decided to take the three-year return

distribution for our regression analysis, as we consider it as a more consistent variable that fits with the independent values taken for other factors (for instance, beta or the efficiency ratios).

Concerning the independent variables, we have analyzed the variables of risk (measured by beta) and the efficiency ratios that we have estimated as relevant in Chapter 2. The descriptive results for these variables are the followings:

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Beta	105	0.94	0.16	0.18	1.4
Alpha	105	0.53	2.77	-7,.92	9.97
R2	105	90.17	7.46	47.68	98.51
Sharpe Ratio	105	0.82	0.32	0.02	1.75

First, it is relevant how the beta (understood as a measure of systematic risk) takes an average value close to one, which is the market risk, and has a relatively low standard deviation. In further analysis, we will see how this beta affects profitability. Secondly, Alpha and the Sharpe ratio are, according to our initial hypothesis, directly connected with return, whereas R2 is inversely related. The most volatile ratio is Alpha, while R2 gets a rather high mean value. Moreover, the average Sharpe Ratio is close to that one-value of reference.

Finally, the two variables connected with mutual funds' managers that might be taken into consideration for this descriptive analysis are the followings:

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Number of members	105	2.70	2.14	1	16
Years of experience	105	24.46	7.79	10	50

The results show how the average fund has between two and three members (even though there is one fund formed by 16 members!) and with almost 25 years of investing experience, being the range between ten and fifty years. Further results will determine if these management factors affect the three-year return of mutual funds.

The Pearson correlation coefficient (also known as Pearson's r or the bi-variate correlation) is used as a measure of the linear correlation between two variables and gets a value between +1 and -1. +1 is the total positive linear correlation (direct relationship between the variables), -1 is the total negative linear correlation (inverse relationship) and 0 means there is no linear correlation. As our dependent variable

is going to be the three-year return for each fund, we will show in the following table the correlation coefficient of each of the other independent variables with it:

4.2.1.1 Pearson Correlation Coefficient of each variable with three-year return.

Size	0.1691	Alpha	**<u>0.7334</u>**	B number	0.0307	B business	0.0123
Type	-0.0951	Beta	0.1261	B male	-0.0494	B university	0.0464
Expenses	-0.1344	R2	0.0950	B years	-0.0373	B level 0	-0.2199
SD3	-0.1367	Sharpe R	**<u>0.7568</u>**	B level	*0.2981*	Return 3	1.000

Source: Statistical results obtained from our analysis using STATA.

At a glance, it might seem as a pool of numbers with no statistical meaning, so it is important to look closer into them. The vast majority of the coefficients have small values (close to zero). It means that there is no linear correlation between them and the three-year return (Return 3). However, there are two variables that have high values, close to one and that appear in bold and underlined: alpha and the Sharpe Ratio. Therefore, there might be a direct relationship between the performance of the two of them, in connection with the three-year return, and it might affect our future analysis. Besides, the next higher value is "B level", meaning the level of studies of the board member, and it is signed in italics. Nonetheless, we do not consider that value as high enough to be taken into consideration. Annex IV – Paragraph 2 presents the complete table with the Pearson Correlation Coefficient between all the different variables studied.

4.3. STUDENT'S T-TEST AND FACTORS' IMPLICATIONS

Before doing our regression analysis, we wanted to have a deeper look into our variables, doing a previous statistical analysis to see if, effectively, we can infer which factors affect the most our three-year return. In order to examine it, firstly we have divided our sample by groups according to those factors, from a descriptive perspective. Furthermore, we have done a t-test with those binary or dichotomous variables to see which sets of data are significantly different from each other, in connection with performance.

4.3.1. RISK IMPLICATIONS

Concerning to risk measured by beta, we have divided our sample between those funds having a beta under 1 and those with a beta higher than 1 and determine the differences between them. As a reminder, a beta of 1 means that the systematic risk of a mutual fund coincides with the benchmark index mutual fund.

Return if…	Observations	Mean	Std. Deviation	Minimum	Maximum
Beta > 1	36	9.44%	5.14%	6.68%	19.05%
Beta < 1	69	8.51%	3.77%	-6.98%	21.87%

These results verify the literature studied in Chapter 2. There are 36 mutual funds with a beta higher than one, which means that are more volatile than the benchmark index; whereas there are 69 mutual funds with a beta lower than one, meaning just the opposite. The results prove that the higher the beta is, the better the return will be and, consequently, the higher the standard deviation is too. Nonetheless, it is remarkably surprising how the Student's t-test analysis shows that there is no a significant difference between the two groups (mutual funds with betas higher and lower than one), as the p-value is 0.2931. The result of this t-test analysis is included in Annex IV – Paragraph 3.1. In any case, this result will be tested more precisely trough the regression model.

4.3.2. SIZE IMPLICATIONS

For going more into detail, we have differentiated between funds categorized as "Large" and those as "No Large" (Mid-cap and small funds). The results are shown in the following table:

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Return 3 if Size=1[10]	61	9.44%	3.43%	-2.13%	19.05%
Return 3 if Size=0	44	7.98%	5.17%	-6.99%	21.87%

As we can observe, there is a relevant difference between the performances obtained by the 61 "Large Funds" and the ones of the 44 "No Large Funds". The average return is almost 1.5% higher for the large group and this result is significant, taking into consideration that the standard deviation is 1.74% lower in the first case. Furthermore, the range of data can serve us to infer that the first distribution is less spread. These observations are in concordance with the results obtained in the Student's t-test (whose results are included in Annex IV – Paragraph 3.2), which conclude that there is a significance difference in performance between "Large" funds and "No Large" funds.

[10] Size=1 means "Large Funds", while Size=0 means "No Large Funds"

4.3.3. EFFICIENCY RATIOS IMPLICATIONS

In this section, we have decided to divide the results between those funds having a negative Alpha, and those having a positive one. Moreover, we will divide funds as well between those having a Sharpe Ratio higher than 0.80 (the average is 0.82) and those having it lower than 0.80.

Return if…	Observations	Mean	Std. Deviation	Minimum	Maximum
Alpha is positive	64	10.76%	3.04%	6.32%	21.87%
Alpha is negative	41	5.82%	4.25%	-6.98%	11.61%
Sharpe Ratio >0.8	55	11.30%	2.98%	6.32%	21.87%
Sharpe Ratio < 0.8	50	6.10%	3.84%	-6.98%	12.21%

The results are consistent with the literature studied in Chapter 2, stating that both Alpha and Sharpe Ratio measures better performance in mutual funds. We can see how the average difference in return between those funds having a positive alpha and those with a negative one is close to 5.00% (4.94%). Besides, Sharpe Ratios' owners of a value higher than 0.8 outperforms the other group by more than that 5.00% (5.20%). In addition, the two best performers (high Sharpe Ratio and high Alpha) have a lower standard deviation than the other two groups. In addition, the Student's t-test results (Annex IV – Paragraph 3.3 and 3.4) give us a p-value of 0.000 in both cases, which means that we can state that there is a significant difference between the groups.

4.3.4. MANAGERS': LEVEL OF EDUCATION

Concerning the explanation of our variables (Annex II), the maximum level of education (this is 2) meant that every member of the board had at least one M.B.A. or CFA. We decided to divide our sample between managers with a high level of education and the rest. The results obtained are the followings:

Return if…	Observations	Mean	Std. Deviation	Minimum	Maximum
High level of education	77	9.39%	3.45%	0.49%	21.87%
Lower level of education	28	7.27%	5.75%	-6,98%	19.05%

The number of observations show how the vast majority of our mutual funds' sample have managers with a high level of education (almost 75%), which is consistent with the idea of a great level of preparation needed in order to reach the top funds in USA. In other words, education and post-graduate certificates are understood as a necessary condition, more than a differentiating factor. However, we can observe as well how the MFs managed by managers with a high level of education outperform the others by 2.12%, assuming a 2.30% less risk. Moreover, the Student's t-test confirms these results

(Annex IV – Paragraph 3.5), meaning that there is a significant difference between groups, with a p-value of 0.0242 (below our significance level of 0.1).

4.3.5. STYLE, GENDER AND UNIVERSITY

Finally, the last factors studied in this section will be style (value-growth), gender and university. In style, we have divided between "Value" funds and "No Value" funds; in gender, between funds with all men and funds with a least one woman in the board of directors and in university between "prestigious" university and "less prestigious" university (see variables description, Annex II). The results are the followings:

Return if...	Observations	Mean	Std. Deviation	Minimum	Maximum
Value Fund[11]	39	8.30%	2.88%	-2.13%	15.75%
No Value Fund	66	9.13%	4.93%	-6.98%	21.87%
B male = 1[12]	90	8.74%	4.54%	-6.98%	21.87%
B female =1	15	9.34%	2.30%	-3.98%	14.02%
Prestigious university	54	9.02%	3.38%	0.49%	15.97%
Less prestigious university	51	8.62%	5.10%	-6.98%	21.87%

- Value vs. No Value Funds. The results show that there is no clear differentiation between the funds categorized as Value Funds and those that are not. For example, No Value Funds have a better average, but having as well a higher standard deviation. The Student's t-test (Annex IV – Paragraph 3.6) confirms these results (p-value=0.8327) stressing that there is no significant difference between the groups.

- B male vs. B female. In this case, the results obtained by the funds with at least one woman in the board of directors are better than those with all men. However, the notable difference in the observations (90 vs. 15), which shows the huge gender inequality as well existing in the professional investing field, together with the regression analysis can lead us to take this data as insignificant. Besides, the Student's t-test (Annex IV – Paragraph 3.7) matches with these

[11] "Value Fund" means all the Funds categorized as value ones by Morningstar, whereas "No Value Fund" includes "Growth" and "Blend" (mixture of growth and value).
[12] B male = 1 records all the funds where the board of directors is composed of only men. B female =1 is the variable for all the funds with at least one woman in the board.

observations, because with a p-value of 0.6169 we cannot reject the null hypothesis of no relationship.

- Prestigious vs. less Prestigious University. These final results exhibit how the funds with managers attending to more prestigious universities get better average return (not big difference) assuming less risk. Furthermore, a p-value of 0.3193 in the Student's t-test (Annex IV – Paragraph 3.8) serves to confirm that there is no significant difference between these groups.

4.4. REGRESSION ANALYSIS

In this section, we are going to determine which variables are the ones influencing mutual funds' performance for our sample. The regression analysis has been done in different ways. The most important and relevant one is the one developed with all the factors of our hypothesis simultaneously (Annex IV – Paragraph 4). Furthermore, in certain cases that will be explained later we have decided to do a regression analysis individually (just the variable and the three-year return) and clustering by hypotheses' variables (Annex IV – Paragraphs 5 and 6).

4.4.1. WHICH VARIABLES DETERMINE PROFITABILITY?

In this subsection, the variables with a p-value inferior to 0.1, when the analysis is done with all factors at the same time, are gathered:

- The Beta or systematic risk has a p-value of 0.000. This means that the risk influences the return or profitability of our MFs' sample. The coefficient has a positive value, which allows us to explain the positive relationship between risk and return. These results are consistent with our first hypothesis or H1.

- The Alpha has a p-value of 0.000 too, which means that it is statistically significant and that it explains how the dependent variable (three-years return) varies. Like in the previous example, the coefficient has a positive sign which indicates that an increase in Alpha is directly connected with an increase in the three-year return.

- The Sharpe Ratio, like the two previous examples, has a p-value of 0.000 and a positive coefficient sign. The relationship between the Sharpe Ratio and the return means that an increase in the first one will lead to an increase in performance.

4.4.2.WHICH VARIABLES DO NOT DETERMINE PROFITABILITY?

However, not all the variables of our analysis have a under our significance level of 0.1, which indicates that not all the variables' selection explains mutual funds' performance of our sample.

- The style ("type") of the mutual fund (value vs. growth) has a p-value of 0.296, which means that we cannot reject the null hypothesis and therefore, this means that there is no evidence enough to accept that the style of the fund influences its return. This result is in connection with our hypothesis 3.2 or H3.2.

- Expenses and Load. Both Expenses (p-value = 0.263) and Load (p-value = 0.358) have values over our significance level, which does not allow us to reject the null hypothesis of no correlation between them and the three-year return. This result is in connection with our hypothesis 2 or H2.

- The R2 is the only ratio which has a high p-value (0.603) of all the efficiency ratios studied. In contrast with the Alpha, Beta and Sharpe Ratio, the R2 p-value is higher than 0.1, which means that we cannot reject the null hypothesis. This result is related to our hypothesis 4 or H4.

- Finally, the variables analyzed in connection with the board of directors or managers of the fund have very similar result. Nor the number of board members (p-value = 0,697), nor the gender of the managers (p-value = 0.409), nor the number of years of investing experience (p-value = 0.671), nor the type of studies of the managers (p-value = 0.184) or not even if the university they attended is prestigious or not (p-value = 0.128) have p-values under 0.1 to reject the null hypothesis. This means that all these factors connected with the MFs' managers do not influence the three-year return of our MFs' sample.

4.4.3.WHICH VARIABLES MIGHT OR MIGHT NOT DETERMINE PROFITABILITY?

Lastly, there are two variables that present particularly interesting results, as their p-values vary notoriously depending whether the testing is done with all the variables simultaneously or individually (Annex IV – Paragraph 5) and grouping them into different clusters by hypotheses (Annex IV – Paragraph 6). For this reason, we have decided to present them in this separate subsection, as, after many tests done, the results showed significant results. The variables are:

- The MFs' size (small vs. large). Even when the analysis is done with all the variables at the same time, it presents a p-value (p-value = 0.178) rather close to that 0.1. Nonetheless, if the

analysis is done individually, we obtain a p-value of 0.085 (Annex IV – Paragraph 5.1), below our significance level. Moreover, if we do the analysis clustering by hypothesis 3 with fund size and fund style (Annex IV – Paragraph 6.1), the result obtained is the same. This is the reason why we consider "Size" variable as one of these two special cases and we conclude that it is a factor affecting mutual funds' performance positively.

- "B level" or managers' level of studies. The case is rather similar to the one previously described. When it is analyzed with all the other factors simultaneously, it indicates a p-value (p-value = 0.135) close to our significance level. However, if it is analyzed individually (just the variable and the three-year return) the p-value (0.024) is below our level of significance and we can state that it affects mutual funds' performance (Annex IV – Paragraph 5.2). Furthermore, the same results are obtained clustering by hypothesis 5 with managers' factors, obtaining a p-value of 0.002 (Annex IV – Paragraph 6.2). We can reject the null hypothesis of no connection between the managers' level of studies ("B level") and the dependent variable and conclude that managers' level of studies influence performance.

It is important to explain that the criteria followed for these two cases are not only connected with the low p-value obtained by both of them in the global analysis. If this was the case, the "B University" variable (or prestige of the university attended by the managers) should also be considered, with a p-value in the global analysis inferior to both of them (0.128). However, these results must be understood in strict connection with all the other analysis done individually and clustering by hypothesis and these evidences did not take place for the "B university" variable, obtaining a p-value of 0.639 in the individual analysis Annex IV – Paragraph 5.3.

4.5. HYPOTHESIS CONTRAST

After presenting all the results, the last part of this analysis is logically destined to contrast if our hypotheses of Chapter 2 have to be confirmed or rejected. The information is displayed presenting each one of the hypothesis, the variable analyzed with the p-value obtained, the contrast done and, consequently, some comments about the results.

Hypothesis	*Variable analyzed and p-value (<0.1)*	*Contrast*	*Comments*
H1: Risk affects mutual funds' performance positively.	-Beta: p=0.000	***ACCEPT***	We reject the null hypothesis of no relationship, which means that we accept our hypothesis because the coefficient sign is positive as well.
H2: Expenses affect mutual funds' performance negatively.	-Expenses: p=0.263 -Load p=0.358	***REJECT***	Both Expenses and Load factors have a p-value higher than 0.1, which means that we cannot reject the null hypothesis of no relationship.
H3.1: Fund size affects mutual funds' performance negatively.	Size: -Clustering: p=0.000 -Individually: p=0.085 -All variables: p=0.178	***REJECT***	This is a particular case, as we have seen before. If we admit that size influences return, it does it in a *positive way*, so our H3.1 should be rejected.
H3.2: Style does not influence mutual funds' performance	-Type (Style): p=0.296	***ACCEPT***	We cannot reject the null hypothesis of no relationship which means that we accept H3.2.
H4: Efficiency ratios influence mutual funds' performance.	-Alpha: p=0.000 -Sharpe Ratio: p=0.000 -R2: p=0.603	***ACCEPT AND REJECT***	For Alpha and Sharpe Ratio, we can reject the null hypothesis of no relationship and accept our H4. However, R2 has a p-value higher than our significance level, which means that we reject that part of H4.
H5.1: Gender does not influence mutual funds' performance. *H5.2: Specific managers' characteristics do influence mutual funds' performance*	1. Gender: p=0.409 2. B number: p=0.697 B years: p=0.671 ***B level: p=0.02*** B type of studies: p=0.184 B university: 0.128	***1. ACCEPT*** ***2. REJECT***	1. Gender, with a p-value of 0.409, means that it does not influence mutual funds' performance. 2. However, the others managers' variables do not influence performance, so we reject the H5.2. The only exception might be the level of education of the board members, as we have previously seen.

5. PROJECT CONCLUSIONS AND FURTHER IMPLICATIONS

The purpose of this Project, as defined in the first part of this paper, is to determine which factors influence mutual funds' performance. For this reason, we have selected a sample of 105 US Equity mutual funds, considered to be the best performers of their categories over the past few years. Besides, we have outlined five different hypotheses figuring out the factors that influence mutual funds' performance, according to the financial literature analyzed. The methodology of the Project has consisted on developing several statistical methods to test these hypotheses, being the regression one the most relevant.

The results obtained serve us to conclude that risk affects mutual funds' performance. This fact is consistent with all the academic literature studied in this paper. Nonetheless, expenses has not been proved to be a factor influencing mutual funds' performance, even though most of the articles revised defended the existence of a negative relationship between return and expenses. In addition, size, considering the different methods followed, does influence mutual funds' performance positively, whereas fund style does not have an impact in return. The most important efficiency ratios present differences. For instance, while efficiency ratios such as Alpha and Sharpe Ratio do influence mutual funds' performance of our sample, R2 is not considered to be a determining variable. Finally, a notorious conclusion is the fact that the only manager's factor influencing performance is the level of studies. In fact, gender, years of experience or number of board members are not considered as variables determining mutual funds' performance. Consequently, our recommendation, following the particular characteristics of our Project[13], would be to consider risk, size, Alpha, Sharpe Ratio and managers' level of studies as the factors determining mutual funds' performance.

1. Risk determines mutual funds' performance positively.
2. Expenses do not determine mutual funds' performance.
3. Fund size might determine positively mutual funds' performance.
4. Fund style does not affect mutual funds' performance.
5. Alpha and Sharpe Ratio influence mutual funds' performance positively. R2 does not.
6. The only specific managers' factor that determines mutual funds' performance is the level of studies.

[13] It is relevant to remark that the conclusions obtained have to be analyzed according to the sample selection developed in Chapter 4.1 and with the particular methods followed and explained during the entire Project. They cannot be considered as absolute or objective references, but in concordance with all the circumstances surrounding our Project.

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ANNEX I – SIMILARITIES AND DIFFERENCES BETWEEN MUTUAL FUNDS AND ETFs

	Annex I. Differences between mutual funds and ETFs		
	MF	ETF	Comments
Exchange type	Exchanged through a Fund Company (e.g. Vanguard)	Traded through a sponsor (e.g. Blackrock), with the AP participation.	ETFs can be leverage or shorted[14], not MFs.
Exchange time	End of the day pricing (4.00 P.M. EST)	Intraday pricing (9.30 AM – 4.00 PM)	ETFs can be aggressively traded ("day trading"), even though they do not have active funds.
NAV	P = NAV (due to exchange through Fund Company)	P ≈ NAV. AP try to make it P = NAV	ETF may have "tracking errors" on less liquid portfolios.
Active – Passive	Both active and passive funds	Mainly passive funds	Some active ETFs being developed, not yet successful
Load / Commission	May have a load (like a commission) on load funds. Load may be waived for some types of Funds (e.g. retirement funds)	Commission on each transaction (ETFs are like a stock)	
Expenses	Low expenses for passive MF, higher expenses for active MFs	Very low expenses for very liquid ETF	ETF have slight expense advantage for passive portfolio

Source: Frank Jones. Portfolio Management Lesson 172 B. San Jose State University, California.

ANNEX II – DESCRIPTION OF THE VARIABLES

The following table gathers every variable selected for the analysis, a little explanation for each one of them and the possible values that it might take.

Group	Variable	Explanation	Values and Comments
General concepts - Category	Ticker	Ticker name of the mutual fund.	Descriptive values.
	Total Assets (B)	Total assets earned by each fund in billion dollars.	Numerical values from less than $1 B to almost $100 B.
	Size (S/M/L)	Size or scale of the fund according to the assets it invests in.	- 0: Small - 1: Mid-cap - 2: Large
	Type (V/B/G)	Type of investment style followed by the fund.	- 0: Value - 1: Blend (mix value and growth) - 2: Growth
Expenses	Load	Funds that have a load (5.25; 5.75...)	- 0: Load - 1: No Load
	Expense	Expense Ratio charged by the fund.	Percentage values from 0,14% to more than 2,00%
	Return	Return in 1, 3, 5 and 10 years.	Percentage values. Three-year return (Return3) is the variable used for the statistical analysis.

[14] Shorted. Definition. Investopedia. "*Investment strategy where the investor sells shares of borrowed stock in the open market. The expectation of the investor is that the price of the stock will decrease over time, at which point the he will purchase the shares in the open market and return the shares to the broker which he borrowed them from.*" https://www.investopedia.com/terms/s/short.asp

Return-Risk	Return subjective	Return criteria according to Morningstar.	– 0: Low. 1: Below average. 2: Average. 3: Above Average. 4: High
	Risk	Standard deviation of the fund in 3, 5 and 10 Years (SD).	– SD 3 is the measure equiparable with Return 3.
	Risk subjective	Risk criteria according to Morningstar.	– 0: Low. 1: Below average. 2: Average. 3: Above Average. 4: High
Ratios (3 years)	Alpha	As a measure of good active performance.	It takes numerical values (positive and negative ones)
	Beta	As a measure of mutual fund's systematic risk.	It takes numerical values around 1 (perfect correlation with the market), less than one (less volatile than the market) or more than one (more volatile)[15].
	R2	As a measure of fund's percentage that can be explained by benchmark's movements.	It takes values below 100 (which means a perfect passive strategy, following the benchmark index).
	Sharpe Ratio (Sharpe R)	As a measure of the average return earned in excess of the risk-free rate per unit of volatility or total risk.	It takes numerical positive values around one.
Managers Specific Factors	Number of board member (B number)	Number of members as managers of the fund.	Numerical values from 1 to 16. A variable with Solo-managed – various managers is also included.
	Gender (B gender)	Gender between board members.	• 0: all members are men. 1: all members are women. 2: men and women. • A variable with "no women – at least one woman" (B male) is also included
	Years of experience (B years)	Average number of investing experience among all board members.	Numerical values from 12,0 to 50,0 years of investing experience
	Level of education (B level)	Level of academic and professional education between managers.	• 0: Only Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) for all members • 1: Less than one post-graduate certificate (MBA, CFA...) per manager • 2: At least one post-graduate (MBA, CFA...) certificate per manager
	Type of education (B Business)	Educational background of managers.	• 0: All managers have academic studies in business (finance, accounting...) • 1: There are managers with business backgrounds and others (engineers, chemists, politics, arts...) • 2: Both businessmen and others • A variable with "Business – No Business" (B business) is included.
	Type of university (B university)	Theoretical level of university, according to reputation.	• 1: Most prestigious Universities: Ivy League and Top Universities by rankings[16] • 0: Universities not belonging to the previous group.

[15] Interpreting Beta. Investopedia: "(…) *if a stock's beta is 1.2, it's theoretically 20% more volatile than the market. Conversely, if an ETF's beta is 0.65, it is theoretically 35% less volatile than the market. Therefore, the fund's excess return is expected to underperform the benchmark by 35% in up markets and outperform by 35% during down markets".* Available in: https://www.investopedia.com/terms/b/beta.asp. (Consulted on May 6 2018)

[16] Rankings concerning the best universities of the United States by 2018
Available in: https://www.timeshighereducation.com/student/best-universities/best-universities-united-states
And: https://www.usnews.com/best-colleges/rankings/national-universities

ANNEX III – SAMPLE OF OUR STUDY

The following table gathers the 105 US Equity mutual funds of our sample with the information of the most important variables of our analysis.

				Expen.	Risk-Return			Ratios		Managers		
		Ticker	Category	Expense Ratio	Beta	Return 3 years	Alpha	R2	Sharpe Ratio	Number	Gender	Level
1	T. Rowe Price Media & Telecommunications	PRMTX	Large Value	0,79%	1,02	15,75%	3,77	85,92	1,19	1	0	2
2	Inveso Growth and Income A	ACGIX	Large value	0,82%	1,12	8,49%	0,41	91,23	0,72	4	0	2
3	AIG Focused Dividend Strategy A	FDSAX	Large Value	1,04%	0,85	7,28%	-1,29	80,90	0,72	3	0	0
4	Auxier Focus	AUXFX	Large Value	0,98%	0,85	5,90%	-2,88	93,52	0,66	1	0	0
5	Homestead Value	HOVLX	Large Value	0,62%	1,11	8,46%	0,57	92,12	0,74	1	1	2
6	Vanguard Equity Income Fund	VEIPX	Large Value	0,26%	0,90	9,45%	1,12	94,25	1,00	3	0	2
7	Madison Dividend Income Fund	BHBFX	Large Value	0,95%	0,89	9,14%	0,15	90,74	0,96	2	0	2
8	LSV Value Equity Fund	LSVEX	Large Value	0,65%	1,07	8,76%	1,09	94,73	0,79	5	0	2
9	DFA Tax-Managed US Marketwide Val Port	DTMMX	Large Value	0,37%	1,08	8,13%	0,46	97,28	0,75	3	0	2
10	DFA US Large Cap Value II Portfolio	DFCVX	Large Value	0,14%	1,11	9,47%	1,54	97,11	0,84	3	0	2
11	Payden Equity Income Fund	PYVLX	Large Value	0,80%	0,84	8,47%	-0,02	88,18	0,93	2	0	2
12	Northern Large Cap Core Fund	NOLCX	Large Value	0,46%	1,01	8,67%	-1,05	97,43	0,85	1	0	2
13	Manning & Napier Disciplined Value I	MNDFX	Large Value	0,57%	0,95	10,50%	1,14	92,07	1,07	3	0	2
14	Strategic Advisers® Value Fund	FVSAX	Large Value	0,46%	1,02	8,51%	1,05	97,10	0,80	16	2	1
15	Columbia Dividend Income Fund	LBSAX	Large Value	0,98%	0,88	9,72%	0,76	93,70	1,04	3	0	1
16	Northern Income Equity Fund	NOIEX	Large Value	1,01%	0,84	8,08%	-0,34	87,72	0,90	3	0	2
17	American Funds Washington Mutual Fund	AWSHX	Large Value	0,58%	0,95	9,58%	0,00	96,04	0,97	7	0	1
18	JPMorgan Large Cap Value Fund	HLQVX	Large Value	0,69%	1,10	10,03%	-0,18	87,35	1,48	1	0	2
19	Dodge & Cox Stock Fund	DODGX	Large Value	0,52%	1,13	9,77%	2,01	88,44	0,83	8	2	2
20	Fidelity® Large Cap Value Enhanced Index	FLVEX	Large Value	0,39%	0,99	8,09%	0,77	97,66	1,37	5	0	1
21	PIMCO RAE Fundamental PLUS Fund	PIXAX	Large Value	1,19%	1,11	8,35%	0,48	96,22	0,75	3	0	2
22	Vanguard Windsor™ Fund	VWNDX	Large Value	0,31%	1,08	7,35%	-0,12	92,01	0,68	5	0	2
23	Fairholme	FAIRX	Large Value	1,02%	1,12	-2,13%	-6,03	47,68	0,02	1	0	0
24	Invesco Comstock Y	ACSDX	Large Value	0,59%	1,21	7,81%	-0,49	92,84	0,66	4	0	2
25	Manning & Napier Disciplined Value S	MDFSX	Large Value	0,82%	0,95	10,22%	0,94	91,72	1,05	3	0	2
26	Transamerica Systematic Small/Mid Cap Value	IIVAX	Large Value	1,28%	0,97	9,32%	2,11	97,95	1,64	2	0	1
27	Alger Spectra	SPECX	Large Growth	1,28%	0,96	10,06%	-1,33	93,56	0,85	2	0	2
28	Berkshire Focus	BFOCX	Large Growth	2,02%	1,23	19,05%	4,35	77,73	1,12	1	0	0
29	Fidelity OTC Portfolio	FOCPX	Large Growth	0,81%	1,28	15,07%	0,18	84,02	1,00	2	0	1
30	Voya Large Cap Growth Port S	IEOSX	Large Growth	0,92%	0,99	10,82%	-1,14	96,97	0,85	3	0	1
31	Reynolds Blue Chip	RBCGX	Large	1,98%	0,86	6,07%	-4,06	90,72	0,58	1	0	2

	Growth		Growth									
32	T. Rowe Price Institutional LrgCpVaFd	TRLGX	Large Growth	0,56%	1,02	14,73%	2,40	90,64	1,12	1	0	2
33	Goldman Sachs Large Cap Value InsghtsFd	GLCGX	Large Growth	0,93%	1,02	11,61%	-0,36	98,51	1,04	3	0	2
34	The Jensen Portfolio	JENSX	Large Growth	0,88%	0,89	10,82%	1,35	87,43	1,08	7	0	1
35	Franklin Growth A	FKGRX	Large Growth	0,87%	0,91	10,53%	-0,03	97,35	1,06	3	2	2
36	Vanguard Capital Opportunity Inv	VHCOX	Large Growth	0,44%	1,05	11,32%	-0,38	82,41	0,95	5	0	2
37	Prudential Jennison 20/20 Focus A	PTWAX	Large Growth	1,19%	0,94	9,25%	-1,48	91,89	0,82	2	0	1
38	Fidelity® Contrafund®	FCNTX	Large Growth	0,74%	0,87	12,21%	1,53	94,88	0,76	1	0	2
39	Provident Trust Strategy	PROVX	Large Growth	1,01%	0,91	12,67%	2,86	75,68	1,14	2	0	2
40	Madison Investors Y	MINVX	Large Growth	0,95%	0,85	9,62%	1,49	90,33	1,07	2	0	2
41	Buffalo Large Cap	BUFEX	Large Growth	0,96%	0,89	9,03%	-0,71	92,37	0,97	1	1	2
42	American Funds AMCAP A	AMCPX	Large Growth	0,69%	0,96	9,37%	0,76	92,55	0,71	5	2	2
43	T. Rowe Price Instl Large Cap Core Gr Fd	TPLGX	Large Growth	0,57%	1,03	14,13%	1,84	94,39	1,10	1	0	2
44	T. Rowe Price Blue Chip Growth Fund	TRBCX	Large Growth	0,72%	1,03	14,04%	1,71	94,41	1,08	1	0	2
45	Fidelity® Blue Chip Growth Fund	FBGRX	Large Growth	0,70%	0,97	11,91%	0,31	91,92	0,97	1	0	2
46	Harbor Capital Appreciation Fund	HACAX	Large Growth	0,66%	1,03	12,63%	0,75	93,51	1,01	2	2	2
47	PrimeCap Odyssey Growth Fund	POGRX	Large Growth	0,67%	1,09	15,11%	6,80	84,15	1,17	5	0	2
48	Vanguard PrimeCap Core Fund	VPCCX	Large Growth	0,46%	1,05	10,95%	1,15	91,32	1,00	5	0	2
49	Franklin DynaTech Fund	FKDNX	Large Growth	0,89%	1,05	14,47%	2,09	89,31	1,08	2	0	1
50	Hartford Disciplined Equity HLS IB	HBGIX	Large Growth	1,03%	0,89	9,41%	0,19	94,08	1,00	3	0	2
51	Fidelity Select Consumer Staples Portfolio	FDFAX	Large Blend	0,76%	0,96	2,30%	-2,08	90,15	0,63	1	0	0
52	T. Rowe Price Health Sciences	PRHSX	Large Blend	0,77%	1,14	3,77%	-0,86	90,30	0,34	1	0	2
53	Yacktman	YACKX	Large Blend	0,76%	0,71	7,74%	0,47	81,61	1,75	2	0	2
54	Amana Trust Income	AMANX	Large Blend	1,13%	0,91	7,04%	-1,44	88,20	0,74	2	0	2
55	Prudential Jennison Equity Income	AGOCX	Large Blend	1,90%	0,92	2,43%	-6,51	90,01	0,31	2	0	1
56	Holland Balanced	HOLBX	Large Blend	1,94%	0,60	4,86%	-0,66	88,74	0,76	1	0	2
57	CGM Focus Fund	CGMFX	Large Blend	1,20%	1,01	6,43%	-6,49	68,48	0,44	1	0	2
58	Parnassus Core Equity Investor	PRBLX	Large Blend	0,87%	0,83	8,08%	0,17	92,04	0,92	2	0	1
59	Oakmark Investor	OAKMX	Large Blend	0,86%	1,14	10,24%	-0,28	90,63	0,87	2	0	2
60	Payson Total Return	PBFDX	Large Blend	0,98%	0,95	8,03%	-0,59	89,71	0,85	2	0	2
61	Mairs& Power Growth Inv	MPGFX	Large Blend	0,66%	0,86	6,92%	0,71	89,42	0,70	2	0	1
62	Fidelity Low-Priced Stock	FLPSX	Mid-Cap Value	0,68%	0,78	7,64%	1,19	89,80	0,88	7	2	1
63	AMG Managers Fairpointe Mid Cap N	CHTTX	Mid-Cap Value	1,14%	1,40	3,98%	-7,92	86,18	0,34	4	2	1
64	Ariel Appreciation Investor	CAAPX	Mid-Cap Value	1,12%	1,25	4,19%	-4,09	87,37	0,38	2	0	2
65	Icon Energy	ICENX	Mid-Cap Blend	1,41%	0,98	-6,98%	-3,34	92,96	0,04	1	0	0
66	Williston Basin/Mid-North America Stk A	ICPAX	Mid-Cap Blend	1,47%	1,02	-6,68%	-3,23	92,20	0,32	3	0	0
67	Saratoga Technology & Communication Portfolio	STPAX	Mid-Cap Blend	2,22%	0,87	15,97%	0,93	93,68	1,25	2	0	2

68	FMI Common Stock	FMIMX	Mid-Cap Blend	1,04%	0,78	7,16%	1,38	87,97	0,66	10	0	2
69	Invesco Mid Cap Core Equity A	GTAGX	Mid-Cap Blend	1,24%	0,79	4,53%	-0,46	89,72	0,58	2	0	2
70	Dreyfus Opportunistic Midcap Value A	DMCVX	Mid-Cap Blend	1,17%	0,97	4,88%	-1,14	85,84	0,45	4	0	2
71	Dreyfus Mid-Cap Index	PESPX	Mid-Cap Blend	0,50%	0,84	7,82%	1,92	95,54	0,73	3	2	2
72	Henssler Equity Investor	HEQFX	Mid-Cap Blend	1,48%	0,83	4,80%	-2,78	86,36	0,54	3	0	2
73	Tilson Dividend	TILDX	Mid-Cap Growth	2,10%	0,32	6,32%	3,26	77,65	1,02	1	0	0
74	American Century Heritage Investor	TWHIX	Mid-Cap Growth	1,01%	0,95	5,91%	-1,30	96,63	0,60	2	0	2
75	Voya MidCap Opportunities Port S	ISMOX	Mid-Cap Growth	0,91%	0,90	8,24%	1,23	95,02	0,69	2	0	1
76	Janus Triton	JANIX	Mid-Cap Growth	0,81%	0,87	10,54%	3,02	95,55	0,93	2	0	2
77	Royce Small/Mid-Cap Premier Fund Service Class	RGFAX	Mid-Cap Growth	1,30%	0,87	7,86%	2,02	91,33	0,72	1	0	2
78	Intrepid Small Cap Investor	ICMAX	Small Value	1,40%	0,18	0,49%	-1,14	65,80	0,04	1	0	2
79	Hancock Horizon Burkenroad	HHBUX	Small Blend	1,39%	0,91	6,01%	-0,74	90,48	0,48	1	0	2
80	Royce Micro-Cap Fund Investment Class	RYOTX	Small Blend	1,57%	0,91	2,52%	-3,83	89,13	0,25	2	0	2
81	SouthernSun Small Cap Investor	SSSFX	Small Blend	1,22%	1,13	1,16%	-5,45	84,79	0,16	1	0	2
82	Lord Abbett Small-Cap Value	LRSCX	Small Blend	1,18%	0,83	5,75%	-0,99	92,59	0,50	2	0	2
83	Royce Pennsylvania Mutual Invmt	PENNX	Small Blend	0,93%	0,99	8,46%	1,73	92,56	0,68	5	2	1
84	T. Rowe Price Small-Cap Stock	OTCFX	Small Growth	0,90%	0,87	8,57%	1,54	97,29	0,73	1	0	2
85	Lazard US Small-Mid Cap Equity Portfolio Open Shares	LZCOX	Small Growth	1,20%	0,86	5,70%	-0,32	93,12	0,52	3	0	1
86	Neuberger Berman Genesis	NBGNX	Small Growth	1,02%	0,82	11,15%	3,25	91,66	0,84	4	2	2
87	Vanguard Small Cap Value Index Fund	VISVX	Small Value	0,19%	0,86	7,93%	2,83	97,16	0,62	2	0	1
88	Bridgeway Omni Small-Cap Value Fund	BOSVX	Small Value	0,60%	1,08	9,04%	0,40	95,55	0,58	4	2	2
89	Victory Sycamore Small Company OppFd	SSGSX	Small Value	1,23%	0,89	11,67%	4,03	94,14	0,86	5	0	2
90	Nuveen Small Cap Value Fund	FSCAX	Small Value	1,20%	1,01	9,75%	1,63	94,68	0,66	3	2	2
91	DFA US Targeted Value Portfolio	DFFVX	Small Value	0,37%	1,00	7,50%	-0,53	96,68	0,52	3	0	2
92	Undiscovered Managers Behavioral Val Fd	UBVAX	Small Value	1,39%	0,79	9,34%	4,49	89,95	0,76	2	0	2
93	Franklin Small Cap Value Fund	FRVLX	Small Value	1,05%	0,94	9,06%	1,93	88,62	0,69	2	0	2
94	Wells Fargo Special Small Cap Value Fund	ESPAX	Small Value	1,33%	0,88	9,11%	1,91	94,57	0,70	3	0	2
95	Boston Partners Small Cap Value Fund II	BPSCX	Small Value	1,35%	0,93	10,82%	0,32	96,95	0,58	2	0	2
96	T. Rowe Price New Horizons Fund	PRNHX	Small Growth	0,79%	1,02	13,40%	4,80	91,64	1,09	1	0	2
97	T. Rowe Price QM US Small-Cap Gr EqFd	PRDSX	Small Growth	0,81%	0,86	9,14%	1,09	94,38	0,77	1	0	2
98	Wasatch Micro Cap Value Fund	WAMVX	Small Growth	1,84%	0,61	12,18%	6,05	83,32	1,18	1	0	2
99	Meridian Growth Fund®	MERDX	Small Growth	0,89%	0,79	10,99%	3,68	91,43	0,89	2	0	2
100	T. Rowe Price Instl Small-Cap Stock Fund	TRSSX	Small Growth	0,67%	0,88	9,31%	1,61	97,17	0,73	1	0	2
101	Fidelity® Small Cap Growth Fund	FCAGX	Small Growth	1,36%	0,84	13,51%	5,21	92,17	1,10	1	0	0
102	Virtus KAR Small-Cap Growth Fund	PSGAX	Small Growth	1,48%	0,90	21,87%	9,97	67,72	1,56	2	0	2
103	Janus Henderson	JGMAX	Small	1,26%	0,87	10,92%	2,73	95,61	0,80	2	0	2

	Triton Fund		Growth									
104	Conestoga Small Cap	CCASX	Small Growth	1,10%	0,84	15,47%	7,27	80,28	1,08	2	0	2
105	JPMorgan Small Cap Growth Fund	PGSGX	Small Growth	1,31%	1,17	14,02%	2,99	93,60	0,85	4	2	2

Due to extension and format circumstances, it was not possible to include all the variables analyzed. The variables of the study include the following list, so if the complete sample is requested for academic purposes, it is completely available:

Total Assets (B)	Return 1 year	Standard deviation (SD) 3 years	Years of experience
Size (S/M/L)	Return 5 years	SD 5 years	Type of education
Type(V/B/G)	Return 10 years	SD 10 years	Type of University
Load	Morningstar Return (L/BA/A/AA/H)	Risk (L/BA/A/AA/H)	Name of University

ANNEX IV – STATISTICAL RESULTS OF OUR SAMPLE

In the following graphs, the statistical results obtained during our analysis with Stata are presented in a clear and understandable way. This annex is organized according to the position of the statistical result in the Project.

1. Percentile results' for three-year return (Return3)

```
. centile Return3 , centile (1 2 5 10 50 90 95 97 98 99 )

                                                  -- Binom. Interp. --
    Variable |       Obs  Percentile    Centile        [95% Conf. Interval]
-------------+-------------------------------------------------------------
     Return3 |       105           1     -0.0696         -0.0698      0.0036
             |                     2     -0.0613         -0.0698      0.0214
             |                     5      0.0150         -0.0674      0.0410
             |                    10      0.0411          0.0153      0.0581
             |                    50      0.0906          0.0846      0.0945
             |                    90      0.1408          0.1220      0.1535
             |                    95      0.1536          0.1408      0.1960
             |                    97      0.1593          0.1488      0.2187
             |                    98      0.1868          0.1516      0.2187
             |                    99      0.2170          0.1576      0.2187
```

2. Pearson Correlation Coefficient

Pearson Correlation Coefficient

	Return3	Size	Type	Expense	SD3	Alpha	Beta	R2	SharpeR	Bnumber	Bmale1	Bfemale1	Byears	Blevel
Return3	1.0000													
Size	0.1691	1.0000												
Type	-0.0951	0.1335	1.0000											
Expense	-0.1344	-0.3533	-0.3226	1.0000										
SD3	-0.1367	-0.1616	-0.0547	0.0315	1.0000									
Alpha	0.7334	-0.1659	-0.0693	-0.0965	-0.1917	1.0000								
Beta	0.1261	0.2875	0.1648	-0.3546	0.6453	-0.2113	1.0000							
R2	0.0950	-0.0240	0.0600	-0.2967	-0.1996	0.0858	0.1537	1.0000						
SharpeR	0.7568	0.3439	-0.0493	-0.1590	-0.3377	0.6391	-0.0392	0.1220	1.0000					
Bnumber	0.0307	0.0634	0.2542	-0.3028	-0.0881	0.0797	0.1454	0.1616	0.0358	1.0000				
Bmale1	-0.0494	0.0946	-0.0805	0.1644	-0.0666	-0.0159	-0.1664	-0.1480	0.0482	-0.3755	1.0000			
Bfemale1	0.0494	-0.0946	0.0805	-0.1644	0.0666	0.0159	0.1664	0.1480	-0.0482	0.3755	-1.0000	1.0000		
Byears	-0.0373	0.0362	-0.1812	0.1686	0.0455	-0.1277	0.0034	-0.1489	-0.1141	0.0406	-0.2220	0.2220	1.0000	
Blevel	0.2981	-0.0459	-0.0080	-0.1813	-0.1811	0.1795	0.0182	0.1807	0.1261	-0.0277	-0.0554	0.0554	0.0574	1.0000
Blevel1	0.2199	-0.0757	-0.0267	-0.0850	-0.0791	0.1724	-0.0162	0.0652	0.0616	-0.1541	0.0000	0.0000	0.0454	0.9244
Blevel0	-0.2199	0.0757	0.0267	0.0850	0.0791	-0.1724	0.0162	-0.0652	-0.0616	0.1541	0.0000	-0.0000	-0.0454	-0.9244
Bbusiness1	0.0123	-0.1114	-0.0512	0.0712	0.1092	-0.0498	-0.0283	-0.0604	-0.1096	-0.3724	0.0314	-0.0314	0.0383	0.1566
Bnobusiness1	-0.0123	0.1114	0.0512	-0.0712	-0.1092	0.0498	0.0283	0.0604	0.1096	0.3724	-0.0314	0.0314	-0.0383	-0.1566
Buniversity	0.0464	0.0629	0.0372	-0.1421	-0.0984	-0.0639	0.0552	0.1189	-0.0555	0.1781	-0.0700	0.0700	0.0403	0.2420

3. Student's t-test between three-year return (Return 3) and the binary variable resulting from separating our sample by groups according to:

1. Funds with a beta higher than one and funds with a beta lower than one (p-value = 0.2931):

```
. ttest  Return3, by ( Beta1)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	69	.0850841	.0045395	.0377082	.0760256	.0941426
1	36	.0943972	.0085715	.0514293	.0769961	.1117984
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0093132	.0088132		-.0267921	.0081658

diff = mean(0) - mean(1) t = -1.0567
Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.1466 Pr(|T| > |t|) = 0.2931 Pr(T > t) = 0.8534

2.Funds divided between "Large" funds and "No Large" funds (p-value = 0.0846):

```
. ttest  Return3, by (  Size)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	44	.0797773	.0077981	.0517268	.0640509	.0955036
1	61	.0944082	.0043979	.0343488	.0856111	.1032053
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0146309	.0084015		-.0312934	.0020315

diff = mean(0) - mean(1) t = -1.7415
Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0423 Pr(|T| > |t|) = 0.0846 Pr(T > t) = 0.9577

3. Funds with a negative alpha and funds with a positive alpha (p-value = 0.000):

```
. ttest  Return3, by (  Alpha1)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	41	.0581927	.006643	.0425362	.0447666	.0716188
1	64	.10755	.0037948	.0303582	.0999667	.1151333
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0493573	.0071186		-.0634753	-.0352394

diff = mean(0) - mean(1) t = -6.9336
Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

4. Funds with a Sharpe Ratio higher than 0.8 and funds with a Sharpe Ratio lower than 0.8 (p-value = 0.000):

```
. ttest  Return3, by (  Sharpe1)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	50	.061034	.0054354	.0384343	.0501111	.0719569
1	55	.1130436	.0040238	.0298415	.1049764	.1211109
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0520096	.0066827		-.0652631	-.0387561

diff = mean(0) - mean(1) t = -7.7828
Ho: diff = 0 degrees of freedom = 103

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

5. Funds with managers having a "High Level of education" (cat. 2) and those with less than that (cat. 0 and 1) (p-value = 0.0242):

```
. ttest  Return3, by ( Blevel1)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	28	.0727143	.0108574	.0574518	.0504368	.0949918
1	77	.0939364	.0039854	.0349716	.0859988	.1018739
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0212221	.0092783		-.0396234	-.0028208

```
    diff = mean(0) - mean(1)                                      t =  -2.2873
Ho: diff = 0                                     degrees of freedom =      103

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0121         Pr(|T| > |t|) = 0.0242          Pr(T > t) = 0.9879
```

6. Funds categorized as "Value" funds and "No Value" funds (p-value = 0.3346):

```
. ttest  Return3, by ( Type)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	66	.091397	.0060703	.0493156	.0792737	.1035202
1	39	.0829974	.0046107	.0287935	.0736637	.0923312
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		.0083995	.0086651		-.0087857	.0255848

```
    diff = mean(0) - mean(1)                                      t =   0.9693
Ho: diff = 0                                     degrees of freedom =      103

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.8327         Pr(|T| > |t|) = 0.3346          Pr(T > t) = 0.1673
```

7. Funds where all the managers are men and managers with at least one woman in the board (p-value = 0.6169):

```
. ttest  Return3, by (  Bmale1)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	15	.09344	.0059412	.0230103	.0806973	.1061827
1	90	.0874167	.0047855	.0453992	.077908	.0969253
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		.0060233	.0120048		-.0177853	.029832

```
    diff = mean(0) - mean(1)                                      t =   0.5017
Ho: diff = 0                                     degrees of freedom =      103

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6915         Pr(|T| > |t|) = 0.6169          Pr(T > t) = 0.3085
```

8. Funds with managers attending to a "Prestigious" university and managers not attending to those universities (p-value = 0.6387):

```
. ttest  Return3, by (  Buniversity)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	51	.0862412	.0071429	.0510108	.0718941	.1005882
1	54	.0902	.0046091	.0338697	.0809554	.0994446
combined	105	.0882771	.0041857	.0428902	.0799768	.0965775
diff		-.0039588	.0084062		-.0206306	.012713

```
    diff = mean(0) - mean(1)                                      t =  -0.4709
Ho: diff = 0                                     degrees of freedom =      103

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3193         Pr(|T| > |t|) = 0.6387          Pr(T > t) = 0.6807
```

4. Regression Analysis with three-year return or Return3 (dependent variable) and the rest of variables of our analysis (independent variables) simultaneously.

```
 reg Return3 Size Type NoLoaded Expense Alpha Beta R2 SharpeR Bnumber
Bmale1 Bfemale1 Blevel1 Blevel0 Byears Bbusiness1 Bnobusiness1 Buniver
```

```
      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F( 14,    90) =   22.89
       Model |  .149364104    14  .010668865           Prob > F      =  0.0000
    Residual |  .041951541    90  .000466128           R-squared     =  0.7807
-------------+------------------------------           Adj R-squared =  0.7466
       Total |  .191315645   104  .001839574           Root MSE      =  .02159
```

Return3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Size	.0083412	.0061393	1.36	0.178	-.0038557	.020538
Type	-.0051122	.0048653	-1.05	0.296	-.0147779	.0045535
NoLoaded	-.0051074	.0055251	-0.92	0.358	-.016084	.0058693
Expense	.8085622	.7184049	1.13	0.263	-.6186745	2.235799
Alpha	.0083643	.0012514	6.68	0.000	.0058781	.0108505
Beta	.0699531	.0148789	4.70	0.000	.0403935	.0995127
R2	-.0001658	.0003172	-0.52	0.603	-.0007959	.0004644
SharpeR	.057149	.0113574	5.03	0.000	.0345855	.0797125
Bnumber	-.0004931	.0012635	-0.39	0.697	-.0030033	.0020172
Bfemale1	.0057642	.0069481	0.83	0.409	-.0080395	.0195679
Blevel1	.0079434	.005272	1.51	0.135	-.0025304	.0184171
Byears	.0001281	.0003006	0.43	0.671	-.000469	.0007252
Bbusiness1	.0064338	.0048093	1.34	0.184	-.0031207	.0159882
Buniversity	.0069534	.0045278	1.54	0.128	-.0020419	.0159487
_cons	-.0364999	.037717	-0.97	0.336	-.1114312	.0384315

```
. vif
```

Variable	VIF	1/VIF
SharpeR	2.79	0.358489
Alpha	2.69	0.371215
Size	2.07	0.483806
Expense	2.01	0.498696
Bnumber	1.64	0.610990
Bfemale1	1.33	0.750971
Beta	1.31	0.760652
NoLoaded	1.28	0.780563
Bbusiness1	1.28	0.783742
R2	1.25	0.799182
Type	1.24	0.803291
Blevel1	1.22	0.816767
Byears	1.22	0.817883
Buniversity	1.15	0.866864
Mean VIF	1.61	

5. Regression Analysis with three-year return or Return3 (dependent variable) and other variables individually:

5.1. Three-year return with Size (p-value: 0.085):

```
. reg Return3 Size
```

Source	SS	df	MS	Number of obs =	105
Model	.005471882	1	.005471882	F(1, 103) =	3.03
Residual	.185843763	103	.001804308	Prob > F =	0.0846
				R-squared =	0.0286
				Adj R-squared =	0.0192
Total	.191315645	104	.001839574	Root MSE =	.04248

Return3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Size	.0146309	.0084015	1.74	0.085	-.0020315	.0312934
_cons	.0797773	.0064037	12.46	0.000	.0670771	.0924774

```
. vif
```

Variable	VIF	1/VIF
Size	1.00	1.000000
Mean VIF	1.00	

5.2. Three-year return with managers' level of studies (p-value: 0.024):

```
. reg Return3 Blevel1
```

Source	SS	df	MS	Number of obs =	105
Model	.009247733	1	.009247733	F(1, 103) =	5.23
Residual	.182067912	103	.00176765	Prob > F =	0.0242
				R-squared =	0.0483
				Adj R-squared =	0.0391
Total	.191315645	104	.001839574	Root MSE =	.04204

Return3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Blevel1	.0212221	.0092783	2.29	0.024	.0028208	.0396234
_cons	.0727143	.0079455	9.15	0.000	.0569563	.0884722

```
. vif
```

Variable	VIF	1/VIF
Blevel1	1.00	1.000000
Mean VIF	1.00	

5.3. Three-year return with managers' university prestige (p-value: 0.639):

```
. reg Return3 Buniversity
```

Source	SS	df	MS	Number of obs =	105
Model	.000411062	1	.000411062	F(1, 103) =	0.22
Residual	.190904584	103	.001853443	Prob > F =	0.6387
				R-squared =	0.0021
				Adj R-squared =	-0.0075
Total	.191315645	104	.001839574	Root MSE =	.04305

Return3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Buniversity	.0039588	.0084062	0.47	0.639	-.012713	.0206306
_cons	.0862412	.0060284	14.31	0.000	.0742852	.0981972

```
. vif
```

Variable	VIF	1/VIF
Buniversity	1.00	1.000000
Mean VIF	1.00	

6. Regression Analysis with three-year return or Return3 (dependent variable) and other variables clustering by hypothesis:

   6.1. Hypothesis 3: Three-year return with size and style ("Type") (p-level of "Size": 0.061):

```
. reg Return3 Size Type

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  2,   102) =    2.27
       Model |  .008168717     2  .004084359            Prob > F      =  0.1080
    Residual |  .183146928   102  .001795558            R-squared     =  0.0427
-------------+------------------------------           Adj R-squared =  0.0239
       Total |  .191315645   104  .001839574            Root MSE      =  .04237

------------------------------------------------------------------------------
     Return3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        Size |    .016015   .0084569     1.89   0.061    -.0007592    .0327892
        Type |  -.0105834   .0086357    -1.23   0.223    -.0277123    .0065455
       _cons |   .0829042   .0068788    12.05   0.000     .0692601    .0965483
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
        Size |      1.02    0.982167
        Type |      1.02    0.982167
-------------+----------------------
    Mean VIF |      1.02
```

   6.2. Hypothesis 5: Three-year return and all managers' variables (p-level of "Blevel": 0.002):

```
. reg Return3 Bnumber Bmale1 Byears Blevel Bbusiness1 Buniversity

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  6,    98) =    1.74
       Model |  .018395473     6  .003065912            Prob > F      =  0.1202
    Residual |  .172920172    98  .001764492            R-squared     =  0.0962
-------------+------------------------------           Adj R-squared =  0.0408
       Total |  .191315645   104  .001839574            Root MSE      =  .04201

------------------------------------------------------------------------------
     Return3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     Bnumber |    .000494   .0022918     0.22   0.830    -.004054     .005042
      Bmale1 |  -.0046748   .0130711    -0.36   0.721    -.0306139    .0212643
      Byears |  -.0003442   .0005438    -0.63   0.528    -.0014233     .000735
      Blevel |   .0210705   .0067854     3.11   0.002     .0076052    .0345358
  Bbusiness1 |  -.0020379   .0091118    -0.22   0.823      -.02012    .0160442
 Buniversity |  -.0028696   .0086222    -0.33   0.740    -.0199801    .0142409
       _cons |    .067292   .025255      2.66   0.009     .0171743    .1174096
------------------------------------------------------------------------------

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
     Bnumber |      1.42    0.703044
      Bmale1 |      1.24    0.803254
  Bbusiness1 |      1.21    0.826487
 Buniversity |      1.11    0.904913
      Blevel |      1.09    0.913313
      Byears |      1.06    0.945710
-------------+----------------------
    Mean VIF |      1.19
```