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What is the impact of the international portfolio diversification on the financial performance of asset management companies and which factors can define this international portfolio diversification?

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Academic year 2018 -2019

First of all, I would like to express my sincere gratitude to my master thesis' supervisor Anh Nguyen for his valuable and relevant advices as well as his guidance during the whole progress of my master thesis. I also would like to thank my supervisor for his continuous support. He helped me from the beginning of researches. His expertise also greatly helped me for the relevancy of information within the literature review as well as for statistical analyses performed.

I wish to express my sincere thanks to my mother's friend Dominique Georgin and my friend Camille Lambert for their proofreading. They gave me relevant tips to improve my English as well as my wording. Their advices were strongly relevant and helpful for the writing of my master thesis.

Finally, I am strongly grateful to my parents for their support throughout my master thesis research and writing. I actually feel supported during the whole progress of my master thesis.

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ABSTRACT

This master thesis aims at appraising the impact of the international portfolio diversification on the financial performance of asset management companies as well as describing the impact of multiple factors on this international portfolio diversification. In this master thesis, the literature review firstly illustrates advantages from international portfolio diversification for investors, whereas the empirical research then analyzes those advantages but relative to asset management companies.

To begin, the literature review aims at describing the broad concept of the financial portfolio as well as manners to optimally manage a portfolio. Broadly speaking, investors have to diversify their portfolios, to invest abroad as well as into emerging markets to fully benefit from portfolio diversification. More to the point, benefits from international portfolio diversification are deeply analyzed in the literature review.

After that, regarding the empirical research, since the research question of this master thesis is "What is the impact of the international portfolio diversification on the financial performance of asset management companies and which factors can define this international portfolio diversification?", the financial performance as well as the international portfolio diversification are both variables deeply analyzed.

The first goal of the empirical research is to study the impact of the international portfolio diversification on the financial performance of asset management companies. For an ordinary investor, having a well-diversified portfolio represents an advantage. Moreover, having an internationally diversified portfolio is an extra additional advantage for the investor. Nevertheless, is a well-diversified or internationally diversified portfolio similarly an extra additional advantage for asset management companies? The research question of this master thesis is to assess if the well-known benefits of diversification for investors are the same for asset management firms. In other words, do investors have incentives to invest into asset management companies which have investments everywhere in the world or do they receive the same amount of money with firms which do not internationally diverse their investments? As the literature review deeply analyzes benefits from international portfolio diversification for

investors but not for asset management companies, the goal of this master thesis is to fill the gap. How does the international portfolio diversification of asset management companies impact their financial performance? To go further, another objective relative to this financial performance is to determine variables which potentially impact the performance of those asset management companies: the geographic area and the period. How does the geographic area and the period – as well as the globalization of the world – impact the financial performance of asset management companies?

Secondly, the behavior of the international portfolio diversification of companies is deeply analyzed. Relationships between this diversification and the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of asset management companies are actually analyzed. How does the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of asset management companies impact their international portfolio diversification? There is a real willingness to deeply describe this diversification behavior of asset management companies.

PART I – LITERATURE REVIEW

INTRODUCTION OF THE LITERATURE REVIEW

As this master thesis aims at studying the impact of the international portfolio diversification on the financial performance of asset management companies, deeply understand the well-known benefits received by individuals investing internationally is crucial. The goal of the literature review is therefore to appraise the benefits received by investors from diversified portfolios.

The broad concept of asset management is firstly analyzed: investors must decide if they commit their resources by themselves or if they use the services of professional asset managers. Institutions available for individuals are described. After that, portfolio management and financial portfolio are defined. How to optimally manage a portfolio is revealed as well as the two major theories of the portfolio management: the modern portfolio theory and the capital asset pricing model. The next chapter consists of presenting the portfolio diversification notion: benefits of this diversification are described as well as wrong side of this concept. Then, the impact of the behavioral finance on portfolios is analyzed. Broadly speaking, individuals tend to hold under-diversified portfolios due to behavioral biases – even if diversification is beneficial for them. Investors are not rational and do therefore not always make optimal decision. After that, the international portfolio diversification is presented: diversifying a portfolio internationally brings extra additional advantages than domestically diversifying a portfolio. Nevertheless, the next chapter presents that those extra advantages have decreased due to co-movements between markets and globalization of the financial world. Finally, the last chapter is about emerging markets and demonstrates that investing into those markets also brings extra additional advantages to classical portfolio diversification as well as to international portfolio diversification.

In closing, the objective of this literature review is to deeply describe this broad concept of financial portfolio management. Some behaviors have to be applied to ensure the optimal management of those portfolios. Diversifying a portfolio, investing internationally and investing into emerging markets are the three mains theories applicable to ensure optimal returns of portfolios – profit earned thanks to investments performed.

CHAPTER I – ASSET MANAGEMENT

Before making an investment, investors must firstly decide if they invest their money by themselves or if they use the services of specialists – called asset managers. Regarding this last option, investors have nowadays more and more solutions to spend their money. More specifically, institutions are available for individuals: investment companies, investment management companies, private equity firms and wealth management firms.

Asset managers are professionals and should therefore reduce the uncertainties of their investments since they are supposed to be expert in the financial field. Moreover, they have more knowledge about investments as they easily access information – at least easier than retail investors. However, the amount of information is so large that asset managers cannot trust all this information. A proportion of this information is actually only noise which does not really impact investments as this noise consists of useless information. Even if asset managers should be perfectly rational thanks to their skills, this is always not the case. Accordingly, the risk of badly investing does not totally disappear, even with professional advices (de Larminat, 2013).

In terms of asset management, more and more solutions are available for investors. There are essentially two major methods to manage assets: having similar assets with variations of characteristics or having different assets, called respectively fleet system and portfolio system. A fleet system is composed of similar investments – belonging to the same category or sharing similar characteristics –, whereas a portfolio system is composed of a variety of diverse investments. There is a growing number of solutions available since the willingness to satisfy investors' needs is strongly concerned (Petchrompo & Parlikad, 2019).

Regarding asset management performed by specialists, investors have multiple options. The most common institutions are the following: investment companies, investment management firms, private equity firms and wealth management firms (Bloomberg, 2019). Those four institutions are analyzed in this chapter as they all have personal characteristics. Firstly, an investment company can be defined as "*a company that invests the funds provided by shareholders in a wide variety of securities*" (Law, 2016). More precisely, it can be defined as "*a pool of assets consisting of securities belonging to the shareholders of the fund*" (Vito, 2011). In other words, they use the pooled capital committed by investors to invest into securities. Secondly, investment management companies manage investment of individuals. It is the

action of buying and selling securities – called portfolio management. An in-depth analysis of portfolio management is performed in the second chapter "Portfolio management". Thirdly, a private equity firm is defined as "*an investment firm that seeks to make high returns*" by taking different actions like "*obtaining a controlling interest in a target company*" for example (Law, 2016). Those firms proceed to "*active ownership*" in order to perform better than other firms within the same industry. Accordingly, value is created by outperforming the market (Heel & Kehoe, 2005). According to a survey made by the American Economic Association in 2015, private equity firms perform better than other ownership groups since they are better managed than those last groups. This study claims that private equity firms have better practices than other traditional asset management firms, therefore leading to stronger performance as well. In closing, major finding of this study is the fact that the management's level of a company is linked to its performance (Bloom, Sadun, & Van Reenen, 2015). Finally, wealth management firms offer services in terms of financial decisions and tax optimization (Law, 2016). This institution is significantly different from the first three since a wealth management firm considers personal characteristics of an individual – financial expectations and tax profile – to have a comprehensive understanding of his global investment objective. While classical asset management firms offer standardized solutions to their clients, wealth management firms offer customized solutions and services. There is a real willingness to understand the customer's profile to make optimal decisions (Jennings, Horan, Reichenstein, & Brunen, 2011). Those wealth management firms offer "*customized financial advice*" to their clients. Employees from those firms are strongly competent and therefore able to deliver reliable advices (Dubosson, Fragnière, & Tuchschmid, 2009).

To summarize this part, whilst investors can invest money by themselves, they can also make use of services of specialists – asset managers. Regarding the second option, lots of new services have appeared in the field of asset management. The four main institutions are investment companies, investment management firms, private equity firms or wealth management firms. Accordingly, this master thesis aims at studying the optimal realization of this asset management. As a matter of fact, firms analyzed within the empirical research are European and American asset management companies.

CHAPTER II – PORTFOLIO MANAGEMENT

The goal of this chapter is to study the broad concept which is the financial portfolio. More to the point, the objective is to figure out how to optimally manage a financial portfolio. On the one hand, investors have two main options: managing their own portfolios by themselves or making use of the services of specialists – portfolio managers. On the other hand, two main theories exist: the modern portfolio theory and the capital asset pricing model.

Individuals have two options: managing their portfolios by themselves or making the use of services of professional portfolio managers. In both cases, the objective is identical and is to maximize the return of a portfolio for a given level of risk (Nofsinger, 2017). Hence, a professional portfolio manager has more information about potential investments than a retail investor. A study has been made in 2013 by Berzins, Liu and Trzcinka, to evaluate the benefits from using services of financial experts or, more precisely, using services of financial institutions. Those services are strongly beneficial for investors thanks to the value-added those institutions can offer, but can be detrimental as well due to the conflict of interest those institutions create. Those financial institutions might actually earn money at the expense of individuals (Berzins, Liu, & Trzcinka, 2013). A conflict of interest can be defined as "*a situation in which a party to a transaction can potentially gain by taking actions that adversely affect its counterparty*" (Mehran & Stulz, 2005). In this specific case of financial institutions, those conflicts of interests can appear since specialists access and hold more information than investors. A relevant example of conflict of interest is when an analyst gives optimistic forecasts about a company so that individuals invest into this specific company. Therefore, the analyst keeps a good relationship with this company. Another relevant example is for brokerage activities. Analysts can benefit from advantages if investors buy specific products. Analysts might therefore produce optimistic forecasts for those specific products (Mehran & Stulz, 2005). Accordingly, decisions investors have to make regarding way of investing can sometimes be tricky and need deeper thinking.

The second key point of this chapter is to figure out how to optimally manage a portfolio. The two major theories applicable are the modern portfolio theory and the capital asset pricing model. Firstly, the modern portfolio theory has been introduced by Harry Markowitz (Fabozzi, Gupta, & Markowitz, 2002). This theory is a normative theory, demonstrating how investors should theoretically behave, and states that they should maximize the expected return of their

portfolios for a given level of risk. Three components therefore need to be considered: the risk of the investment, the return of the investment and the correlation of the investment with the existing investments within the portfolio (Nofsinger, 2017). The modern portfolio theory works in a "*risk-return*" framework. The optimal portfolio is the one composed of investments which all have the maximum return for a given level of risk. In the financial world, this optimal portfolio is called the efficient portfolio. This theory leads to the efficient frontier which is composed of all acceptable investments for an investor. It actually contains investments which have the maximum expected return for a given level of risk (Grasse, Whaley, & Ihrke, 2016). Figure 1 illustrates this efficient frontier. Portfolios located on the blue line between B and C are optimal portfolios, whereas portfolios located on the blue line between A and B and all other portfolios of this graph are not optimal. Portfolios located on the blue line between point B and point C are portfolios which have the highest return for a given level of risk – the variance (Grasse, Whaley, & Ihrke, 2016).

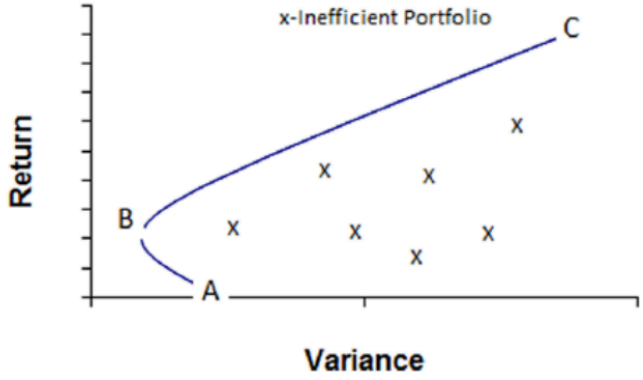

Figure 1 – Efficient Frontier[1]

According to the theory of Markowitz, the risk and the return can be reached using the mean and the variance of the investment (Jobson & Korkie, 1980). In this mean-variance framework, investors only consider investments which have a sufficient mean return for a given level of variance which is the risk. This theory of mean-variance is used to support the theory of asset allocation. More precisely, investors using this concept of asset allocation have a threshold for each asset class to reach. Consequently, individuals using asset allocation strategy can also use this mean-variance theory to ensure the allocation into each asset class is optimal (Sharpe, 2007). More precisely, the asset allocation strategy consists of making decisions about the amount of money which has to be invested into safe assets and the amount of money which has to be invested into risky assets. There is a broad range of assets classes like bonds, stocks or

[1] Grasse, N. J., Whaley, K. M., & Ihrke, D. M. (2016). Modern Portfolio Theory and Nonprofit Arts Organizations: Identiying the Efficient Frontier. *Nonprofit and Voluntary Sector Quarterly, 45*(4), p. 829.

bank accounts for example. Each asset class has its own characteristics. Broadly speaking, asset allocation can be defined as the allocation of money to different asset classes (Bodie, Kane, & Marcus, 2014). According to the modern portfolio theory, the expected return of a risky asset portfolio is defined by the following equation.

$$E(r_p) = \sum_{i=1}^{n} w_i E(r_i)$$

where $E(r_p)$ is the expected return of the portfolio, w_i is the weight of each asset within the portfolio and $E(r_i)$ is the expected return of this specific asset.

Another critical concept used in the modern portfolio theory is the expected utility defined as the happiness of an investor (Sharpe, 2007). The major objective of an individual is to maximize his happiness and therefore his expected utility – function of the mean-variance of an investment (Brealey, 1991). This factor is also defined as the satisfaction an investor enjoys with his money increase when his wealth grows (Bodie, Kane, & Marcus, 2014).

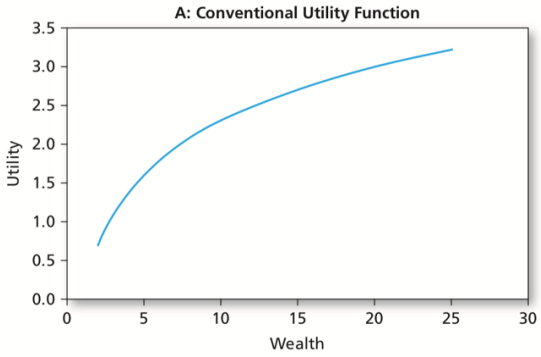

Figure 2 - Conventional Utility Function[2]

Figure 2 illustrates this theory: the utility of an individual increases with his wealth. A critical point about this theory is that this parameter increases less than proportionally. In other words, for the same increase of wealth, people with less money at the beginning have a bigger increase in utility than people with more money at the beginning. In closing, the objective of an investor is therefore to maximize his expected utility. The equation to maximize is the following,

$$eu = \sum_{i} \pi_i u(R_{pi})$$

where eu is the expected utility, π_i is the probability that the event i occurs and $u(R_{pi})$ is the utility of the return of the portfolio p (Sharpe, 2007).

[2] Bodie, Z., Kane, A., & Marcus, A. J. (2014). Investments. (M. G. Hill, Ed.) p.393.

The correlation defined as "*the co-movement of asset prices in time*" is a critical aspect of the modern portfolio theory (Albanese, Li, Lobachevskiy, & Meissner, 2013). Another definition of this factor is the following: "*the correlation between the returns of two assets measures the degree to which they fluctuate together*" (Perold, 2004). The correlation between two variables is measured by the correlation coefficient which is computed with the following equation,

$$\rho(X,Y) = \frac{cov(X,Y)}{\sigma(X)\sigma(Y)}$$

where $\rho\,(X,Y)$ is the coefficient of the correlation between two variables – X and Y –, $cov\,(X,Y)$ is the covariance between those variables and $\sigma(X)$ and $\sigma(Y)$ are the standard deviation of the variable X and the variable Y.

This concept of correlation brings some rules. Whilst a lower correlation between stocks of a portfolio leads to a lower risk of this portfolio, a lower correlation also leads to higher benefits for investors (Albanese, Li, Lobachevskiy, & Meissner, 2013). This concept of correlation can be linked with the diversification. Actually, higher diversification of stocks results in lower correlation between stocks and is therefore beneficial for individuals (Albanese, Li, Lobachevskiy, & Meissner, 2013). This portfolio diversification is analyzed in detail in the third chapter "Portfolio Diversification". Investors should take the correlation of an investment into consideration rather than the individual characteristics of this investment (Mansourfar, 2013). Accordingly, they should consider their portfolio as a global investment rather than look at all investments separately. There is actually a need to analyze the correlation between investments rather than analyzing individual characteristics of a potential new investment. Indeed, if the correlation between two assets is one, the risk of the portfolio is the weighted average sum of the risks of those two assets. However, if the correlation is lower than one, the risk of the portfolio is lower than the weighted average sum of the risks of those two assets. As a logical consequence, risk decreases when correlation decreases as well. However, those statements must be balanced. Actually, this risk decrease has a limit since two kinds of risk exist – the firm-specific risk and the systematic risk. While the firm-specific risk can totally disappear since portfolio diversification is applied, the systematic risk can never fully disappear (Perold, 2004). Finally, a critical characteristic of correlation is the fact this correlation is unpredictable since returns of stocks or bonds in finance are unpredictable as well. A relevant example is the case of the crisis of 2008 which led to an unpredictable increase into correlation which results in unpredictable losses (Burgin & Meissner, 2016). Actually, "*inefficient*

correlation modeling" were made for this crisis period since this correlation is unpredictable (Albanese, Li, Lobachevskiy, & Meissner, 2013).

The last relevant point about modern portfolio theory is the timing horizon. The timing of investment has to be taken into consideration. Actually, some events can appear and make a difference. According to Mansourfar (2013), some events like "*the consistent behavior of a security market or the effects of exogenous shocks*" can have an impact on expected returns. Investors have to take the time into consideration since what is accurate for today may not be accurate for the next six months. The holding period of investments has to be taken into consideration (Mansourfar, 2013). Short-term returns could be different from long-term returns for a same investment. Accordingly, timing has an impact on investments' returns (Alles & Murray, 2009).

Nevertheless, this modern portfolio theory encounters some limits. This theory asserts the investor is rational and adequately incorporates all information. According to this modern portfolio theory, investors act like computers meaning they are applying rules, without thinking. As a matter of fact, this theory is normative. Luckily, they are not always rational and do not act like computers. They are impacted by their own emotions. Consequently, they sometimes make suboptimal investment decisions. It brings around the behavioral finance (Preuschoff, Quartz, & Bossaert, 2008). According to the behavioral finance, individuals are not entirely rational and sometimes make sub-optimal decisions. The behavioral finance is analyzed in detail in the fourth chapter "Impact of behavioral finance on portfolio".

The second theory to optimally manage a portfolio is the "Capital Asset Pricing Model" – CAPM and has been developed by William Sharpe (Perold, 2004). The CAPM is working in a risk-return framework and offers the opportunity to define the relationship between the risk and the return of an investment (Bodie, Kane, & Marcus, 2014). According to the CAPM, risks need to be differentiated as some risks do not impact the return of investments (Perold, 2004). Whilst the market risk – also called the systematic risk or the under diversifiable risk – always affects the return of an investment, even after diversification, the independent risk – also called the firm-specific risk or the non-systematic risk – does not affect the return of an investment after diversification (Bodie, Kane, & Marcus, 2014). Specific risks of different investments can cancel each other when the portfolio is fully diversified, meaning investors do not have to consider those risks. Indeed, the benefits from diversification increase when correlation

decreases (Perold, 2004). This concept of diversification is analyzed in detail in the third chapter "Portfolio Diversification". According to the CAPM, the expected return is defined by the following equation defining the link between this expected return and the risk,

$$E(r_i) = r_f + \beta_i[E(r_M - r_f)]$$

where $E(r_i)$ is the expected return on the asset, r_f is the risk-free rate, $E(r_M)$ is the expected return on the market portfolio, and β_i is the "*sensitivity of the return on the asset to the return on the market portfolio*" (Perold, 2004).

Figure 3 depicts the efficient frontier and the capital market line – CML. Whilst the efficient frontier contains the optimal portfolio regarding the risk-return relation, the CML contains optimal market portfolios. Accordingly, the intersection of portfolios on the efficient frontier and portfolios on the CML is the optimal portfolio according to the CAPM (Bodie, Kane, & Marcus, 2014).

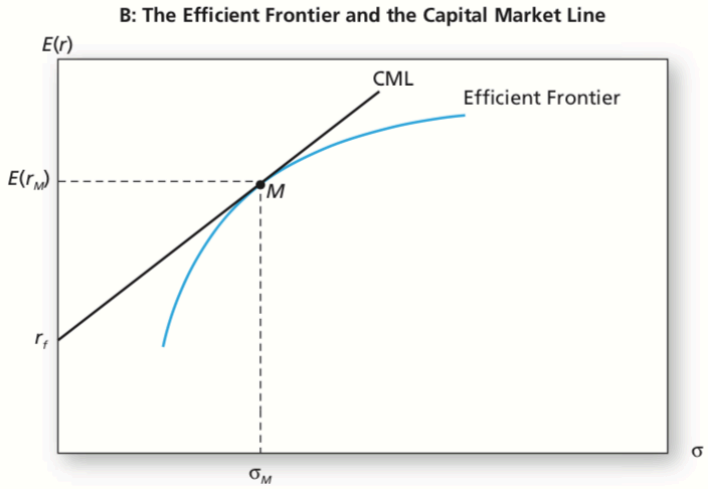

Figure 3 – Efficient frontier and the capital market line[3]

[3] Bodie, Z., Kane, A., & Marcus, A. J. (2014). Investments. (M. G. Hill, Ed.), p. 292.

CHAPTER III – PORTFOLIO DIVERSIFICATION

This chapter aims at appreciating the broad concept which is the portfolio diversification. As explained in the second chapter "Portfolio management", this concept of portfolio diversification can be linked with the correlation. The general trend is that an increase of diversification leads to a decrease of correlation resulting in benefits for investors. Accordingly, individuals really need to diversify their portfolio to maximize the returns of their investments for a given level of risk. In this chapter, the concept of portfolio diversification is analyzed in detail. Reasons of this diversification are presented as well. The question of how to optimally diversify a portfolio are also analyzed; the case of the US is exploited to illustrate this optimal diversification. Tools to measure the diversification – the correlation and the co-movement – are described. The fact that individuals' characteristics also play a role on diversification is appraised. Finally, the last objective of this chapter is to appreciate why investors tend to hold under-diversified portfolios. Moreover, even if portfolio diversification seems significantly beneficial for investors, it can also sometimes be detrimental for them.

The main objective of an individual is to maximize the performance of his portfolio of investments given his acceptable level of risk. In other words, the main objective is to maximize the expected return for a given level of risk. To achieve this objective, investors have to diversify their portfolio since diversification of investments within a portfolio reduces the global risk of this portfolio. However, they also have to take into consideration the "*investment period*". Expected returns of a same investment are different for different holding periods. To give an example: according to a study pursued by Mansourfar in 2013, for a short holding period, East Asian markets outperform Middle Eastern markets, whereas for a long holding period, Middle Eastern markets outperform East Asian markets. Portfolio diversification is strongly beneficial when the co-movement is low (Mansourfar, 2013). Diversification is about diversifying the risk. Indeed, diversification decreases the risk of the overall portfolio of investors. Moreover, investing abroad is beneficial for investors (Zayati, Chaabene, & Bellalah, 2016). This international diversification is analyzed in detail in the fifth chapter "International Portfolio Diversification". However, benefits from international diversification are nowadays decreasing due to the integration of different markets of the world. This integration is due to the liberalization of the world and the decrease of barriers between markets of different geographical areas. More to the point, according to Zayati, the correlation between developed countries was superior to 33% in 2016 (Zayati, Chaabene, & Bellalah, 2016). Accordingly,

markets are nowadays more and more "interdependent". Market prices therefore move together leading to an increase of correlation between those interdependent markets. Amongst other, one reason of this interdependence between markets is the globalization of the world, resulting in an easier transfer of information between markets of different countries. Thereupon, stock prices are more and more moving together resulting in an increase of correlation between stock prices since stocks prices are based on information (Rahim & Masih, 2016). Due to the fact those markets are linked together, if a country suffers some shocks, other countries endure the same shocks. Benefits from diversification decrease as well due to this interdependence (Syriopoulos, 2004). Those decrease of benefits of international portfolio diversification are analyzed in detail in the sixth chapter "International Portfolio Diversification: Decrease of Benefits".

Portfolio diversification is significantly beneficial for investors. In reality, they strongly need to make an "*efficient diversification*" ensuring the portfolio has the highest level of mean return for a given level or risk. Diversifying a portfolio means having multiple assets to ensure the portfolio is not relying on one single asset. Actually, in this last case, in case of failure, the return of the portfolio can be significantly badly impacted. As a global result, diversification decreases the global risk of the portfolio without affecting the global return of this portfolio. Diversification decreases the firm-specific risk but does not decrease the market risk (Bodie, Kane, & Marcus, 2014). This theory finds its principle from the modern portfolio theory which states that it is highly significant to find the appropriate number of investments in a portfolio to ensure that all of them do not behave in the same way. All investments therefore have to be assessed together rather than appraising each of them on their own (Rahim & Masih, 2016).

The case of the U.S. is a relevant example. According to Liu (2016), diversification of corporate bond portfolio decreases the risk of the portfolio and increases its return. Accordingly, if U.S. investors added foreign corporate bonds in their portfolios during the period 2000-2010, the total risk decreased by 80% and the Sharpe ratio – defined as a "*measure of excess portfolio return over the risk-free rate relative to its standard deviation*" (The Economic Times, 2019) – increased by 0.341. Liu therefore confirms the theory that diversifying a portfolio is beneficial for investors. Liu even adds that those benefits from diversification are applicable for all assets categories. In other words, even investors investing into safe assets – at least safer than stocks – need to diversify their portfolios. The asset class composed of investment-grade bond is a relevant example. Actually, those assets have always been considered as relatively safe assets

but the volatility of this asset class has increased – during the financial crisis – and therefore needs to be diversified. Accordingly, investors investing into those assets – in the corporate bond market – still need to diversify their portfolios. In closing, it means that even individuals investing into low-risk securities have incentives to diversify their portfolios since they benefit from diversification as well (Liu, 2016). However, Liu also mentions that even if benefits from diversification are significant, it is also costly and risky to diversify a portfolio. One has to realize that the gathering information can also be very costly. Later in this chapter, some key disadvantages of diversification are presented.

Previously, the most common way to evaluate the level of diversification of a portfolio was the correlation. As a quick reminder, the formula to compute the correlation between two assets is the equation below.

$$\rho(X,Y) = \frac{cov(X,Y)}{\sigma(X)\sigma(Y)}$$

The correlation is a necessary tool to analyze the potential return of an investment for a given level of risk in the risk-return framework. As a quick reminder, the correlation can be defined as "*the co-movement of asset prices in time*". The general rule about correlation is that a lower correlation between stocks of a portfolio results in higher returns of this portfolio for a same level of risk (Albanese, Li, Lobachevskiy, & Meissner, 2013). As a global result, a lower correlation between countries leads to higher benefits from diversification. According to Syriopoulos (2004), when returns of investments are not perfectly correlated, there are potential benefits from diversification when combining those investments. However, even if the correlation is a necessary tool for measuring the benefits from diversification, a new measure emanates: the co-integration. This parameter judges the relation of dependence between markets. With this parameter, investors can evaluate the extent to which returns of investments move together (Syriopoulos, 2004). The co-integration can be used to appraise if long-run relationships exist between investments since this measure is similar to the correlation (Qadan & Yagil, 2015).

The level of diversification depends on the individual's characteristics of investors. According to a study made on more than 60.000 investors in U.S., a large part tends to hold under-diversified portfolios – portfolios for which all the diversifiable risk does not disappear since the diversification is under-exploited leading to an insufficient number of assets within this portfolio. Investors having the least diversified portfolio have a return 2.40% inferior to

investors having the most diversified portfolio. The diversification's measure applied in the study to compute the diversification of portfolio is the normalized portfolio variance (NV):

$$NV = \frac{\sigma_p^2}{\bar{\sigma}^2}$$

where σ_p^2 is the variance of the portfolio and $\bar{\sigma}^2$is the average of variances of stocks within the portfolio. Two alternative diversification measures, though less precise, are also used but, due to the lack of accuracy, it is therefore not necessary to mention them in this paper. The study also reveals that, for example, individuals who hold retirement accounts tend to hold portfolios which are more under-diversified than other investors. It is also stated that diversification of household's portfolios varies considerably due to specific characteristics like income, wealth or age. Finally, professional investors hold portfolios which are more diversified, even if they are not perfectly diversified. Personal characteristics of investors play a major role in the realization of a portfolio as well (Goetzmann & Kumar, 2008). In other words, the level of diversification depends on the individual himself. A relevant example is the case of a study made in 2017 with financial professionals in Malaysia. Model regressions have been proceeded to analyze the relation between multiple variables. The major result of this study performed in 2017 with specialists from Malaysia is that financial professionals who have as investment characteristics "*active trading, usage of internet and telephone and saving for retirement objective*" are more inclined to diversify their portfolio, whereas financial professionals who have as investment characteristics "*spending less time on researching investment*" are more inclined to under-diversify their portfolios. Furthermore, this study also reveals that gender, income and experience of those financial professionals have an impact on the diversification of their portfolios (Khan, Tan, Chong, & Ong, 2017).

Investors therefore have incentives to diversify their portfolios since it is beneficial for them. Actually, diversification increases the mean return whilst decreasing the diversifiable risk. Moreover, they can relatively easily diversify their portfolios since they have access to other markets. This access to markets is analyzed in the fifth chapter "International portfolio diversification". However, lots of portfolios are still under-diversified (Khan, Tan, Chong, & Ong, 2017).

This under-diversification can be explained by the behavioral finance. Accordingly, behavioral characteristics of investors impact the diversification level of their portfolios. Investors are actually influenced by biases procuring under-diversification of their portfolios (Khan, Tan,

Chong, & Ong, 2017). Professional investors should not be affected by behavioral biases since they should have the necessary background to be optimally performant for investment choices. However, it is not the case and they are impacted by those external factors as well, like retail investors. Relevant biases and their impact on portfolio managers and portfolios themselves are presented in the fourth chapter "Impact of the Behavioral Finance on Portfolio". Behavior of investors actually has a strong impact on the way portfolio are managed.

To sum up, portfolio diversification is strongly beneficial for investors. The percentage holding of international equity has significantly increased – for example, the percentage of international equity within a portfolio was equal to 2% in the 1970's and to 8% at the end of 1994 (Rowland, 1999). Hence, this point of view calls for some nuance. Portfolio diversification can sometimes be detrimental for investors since it can be expensive and even risky as they have to pay high management fees and it takes time to find the right investment (Tang, 2004). As a matter of fact, diversifying a portfolio means adding assets to the portfolio. Moreover, adding an asset to an existing portfolio leads to additional costs (Scherer, 2013). Investors therefore have to take those transactional costs into consideration. They have to evaluate if the benefits from the diversification are greater than the costs involved by this diversification. If it is not the case, they should refrain from spending money to diversify their portfolios (Rowland, 1999).

Moreover, having a maximum number of assets is not necessary useful to maximize the return of a portfolio. As a statement, a small portfolio can be as optimal in terms of risk-reduction than a portfolio with a larger number of different assets. Accordingly, a portfolio composed of "*10 assets can be only 1% riskier*" than other portfolios made of a larger number of different assets (Cesarone, Moretti, & Tardella, 2016). Diversify a portfolio is thus not systematically necessary to be applied in order to maximize the mean return and minimize the risk of a portfolio.

In closing, even if portfolio diversification is significantly beneficial for investors, they also have to take into consideration the transactional costs of this diversification. Therefore, they have to evaluate if benefits from portfolio diversification are greater than the costs involved by this portfolio diversification. Moreover, sometimes, having a portfolio composed of a small number of assets can be as beneficial as a portfolio composed of lots of different assets. In this case, investors benefit from portfolio diversification without having to incur transactional costs.

CHAPTER IV – IMPACT OF BEHAVIORAL FINANCE ON PORTFOLIO

From the previous parts, one can understand that portfolio diversification seems crucial to maximize the return of a portfolio for a given level of risk. Investors have incentives to diversify their portfolios since this diversification is beneficial for them. Nevertheless, they tend to hold under-diversified portfolios. As a matter of fact, even if the theory specifically states that diversification results in higher returns, individuals do not always optimally diversify their investments. At first sight, this under-diversification seems irrational. This under-diversification can actually be explained by the behavioral finance. First of all, behavioral finance grew in popularity in recent years. Earlier in the 20th century, financial analysts were inclined to affirm investors were rational. It is only around the 1980's that financial analysists begin to integrate the fact investors were humans with feelings – sometimes generating sub-optimal decisions. Therefore, the objective was to develop new models which take human psychology into account – rather than making the wrong assumption that investors were always rational and always make optimal decisions. This growing interest for behavioral finance rather than modern portfolio theory comes from the fact rational explanations can no longer justify some investors' behaviors (Barberis & Thaler, 2003).

This chapter theoretically explains this under-diversification of portfolio, using the behavioral finance theory. Actually, the behavioral finance theory has an impact on the principles of the modern portfolio theory leading to an optimal portfolio management. Broadly speaking, this chapter also explains the general impact of the behavioral finance on the traditional portfolio management theory – the modern portfolio theory. To be more precise regarding the structure of this chapter, the general principles of the behavioral finance are firstly presented. The prospect theory is then analyzed. Lastly, key relevant aspects of behavioral finance that negatively impact the traditional theory of portfolio management – the modern portfolio theory – are developed. The end of the chapter consists in developing key relevant biases that negatively impact portfolio management.

The major statement of the behavioral finance is that investors are not entirely rational and do not always make optimal decisions. This statement is quite the opposite from the modern portfolio theory claiming that individuals are rational and always make optimal decisions. The behavioral finance also asserts that this irrationality of human beings can be explained by the psychology of individuals. This theory can be linked with lots of biases bringing those sub-

optimal decisions (Barberis & Thaler, 2003). The most relevant biases are analyzed in detail later in this chapter. Those investors' irrationalities therefore lead to the behavioral portfolio theory for which the expected utility theory is no longer fully relevant and must be balanced as the reality of human being is not taken into consideration (Pfiffelmann, Roger, & Bourachnikova, 2016).

According to the behavioral finance theory, the expected utility – theory under the modern portfolio theory – must be balanced. More to the point, the expected utility has to be completed by the prospect theory. Whilst the expected utility theory states how investors should theoretically behave, the prospect theory states how they actually behave (Nofsinger, 2017). The prospect theory can be defined as "*a descriptive theory of decision making under uncertainty (human choice), which attempts to explain certain deviations of observed empirical behavior from expected utility theory*" (Gass & Fu, 2013). One of the key rules of this prospect theory is that a same investor exhibits risk-aversion behavior as well as risk-seeking behavior, what is inconsistent with the modern portfolio theory (Pfiffelmann, Roger, & Bourachnikova, 2016). Even more to the point, as observed in figure 4, investors are risk-averse in the domain of gain and risk-seeking in the domain of loss (Grinblatt & Han, 2005). Another key rule is the fact investors face loss aversion. For a same winning amount or losing amount, individuals feel more pain than joy (Nofsinger, 2017). Another fact is that investors determine if a return is a gain or a loss in comparison with a reference point (Grinblatt & Han, 2005). Finally, the last key relevant aspect of the prospect theory is the fact investors segregate their decisions by different mental accounts (Grinblatt & Han, 2005). Accordingly, they analyze each investment separately rather than analyzing all investments together as only one portfolio of investments (Nofsinger, 2017). Each investment therefore satisfies one mental account (Pfiffelmann, Roger, & Bourachnikova, 2016).

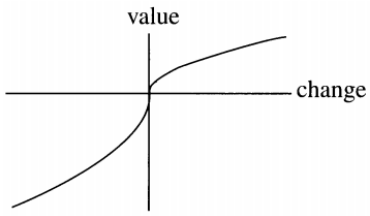

Figure 4 – Prospect theory function[4]

[4] Harbaugh, W. T., Krause, K., & Vesterlund, L. (2010). The Fourlfod Pattern of Risk Attitudes in Choice and Pricing Tasks. *The Economic Journal, 120*(545), p. 597.

This part of the chapter is dedicated to analyzing relevant issues related to behavioral finance that negatively impact the optimal management of a portfolio. Portfolios' composition can actually be negatively impacted by behavioral finance. A first relevant case of those irrationalities and biases is the fourfold pattern. Investors are risk-averse for low-probability event of loss and risk-seeking for low-probability event of gain. Decisions of individuals do therefore not follow the traditional pattern defined under the expected utility theory (Harbaugh, Krause, & Vesterlund, 2010). Actually, a same person buys insurance contracts, and is therefore risk-averse for a low-probability event of loss, as well as lottery tickets, and is therefore risk-seeking for a low-probability event of gain (Pfiffelmann, Roger, & Bourachnikova, 2016). As a global result, investors are risk-averse when they buy insurance contracts and risk-seeking when they buy lottery tickets. Therefore, the risk-aversion of investors depends of the framing. This pattern is inconsistent with the modern portfolio theory.

Another irrationality is the fact investors have subjective probability – represented by the broken line in figure 5 – rather than objective probability – represented by the continuous line in figure 5. As illustrated in figure 5, individuals tend to over-estimate low-probability event and under-estimate high-probability event. Consequently, the probability responds to a "*non-linear probability weighting function*" (Harbaugh, Krause, & Vesterlund, 2010). This over-estimation of low-probability events can be linked with the availability heuristic, meaning investors tend to over-estimate events that easily come to their mind (Van Boven, 2007).

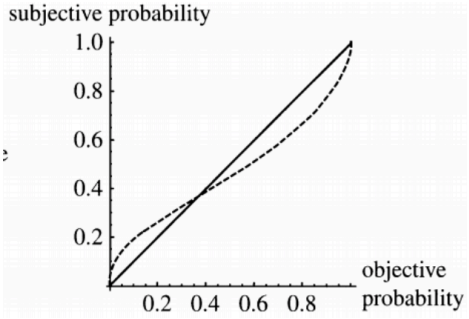

Figure 5 – The subjective probability weighting function[5]

Another relevant case of irrationalities is the fact investors consider each investment as a way to satisfy one specific goal rather than considering all investments as one global portfolio. Accordingly, under behavioral portfolio theory, each investment is optimal for one mental account (Pfiffelmann, Roger, & Bourachnikova, 2016). Optimal efficient portfolio is different

[5] Harbaugh, W. T., Krause, K., & Vesterlund, L. (2010). The Fourlfod Pattern of Risk Attitudes in Choice and Pricing Tasks. *The Economic Journal, 120*(545), p. 597.

under modern portfolio theory than under behavioral portfolio theory. As a matter of fact, optimal portfolios under behavioral portfolio theory are composed of a mixture of bonds and gambling games (Shefrin & Statman, 2000). Those portfolios are therefore not optimal portfolios. Actually, to obtain an optimal portfolio, investors rather have to consider all their investments as one portfolio.

In this last part of the chapter, key relevant biases that negatively impact portfolios are described. A first relevant bias is the case of overconfidence resulting in excessive trading. This phenomenon is negative as portfolio managers bear costs for trading and potentially hold bad investments. This excessive trading is inconsistent with modern portfolio theory claiming investors should rather proceed to periodic investments (Barber & Odean, 2001). Another issue is the disposition effect. Investors tend to sell winner stocks too quickly and hold loser stocks for too long. This phenomenon is explained by the fact investors seek pride – selling winner stocks too early – and avoid regrets – holding loser stocks for too long. Individuals can sell a stock, whether the stock price increases or decreases. Nevertheless, they tend to sell stocks for which price has increased and hold stocks for which price has decreased since investors seek pride and avoid regrets. Consequently, benefits from investments decrease. Selling winning stocks is negative for two mains reasons: investors have to pay taxes on their gains and winning stocks are supposed to have their prices which continue to increase (Chen, Kim, Nofsinger, & Rui, 2007). Another bias is the herding bias. Investors tend to follow the trend as they do not like to make decisions. Biases are thus emphasized since individuals replicate what other did (Filiz, Nahmer, Spiwoks, & Bizer, 2018). This list of external factors is not an exhaustive list. Besides, biases are inconsistent with the modern portfolio theory claiming investors are fully rational.

According to the modern portfolio theory, investors should consider all their investments as a global portfolio and should maximize the expected return for a given level of risk, whereas according to the behavioral portfolio theory, they do not consider all their investments as a global portfolio but rather pick investments which meet some specific goals. As a global result, rather than analyzing the correlation of the potential new investment with the existing portfolio, they only consider the risk of the potential new investment, independently of its correlation with the existing portfolio. Moreover, individuals are impacted by irrationalities and biases that produce sub-optimal portfolios.

CHAPTER V – INTERNATIONAL PORTFOLIO DIVERSIFICATION

From the learning of the previous chapters, portfolio diversification is significantly beneficial for investors since portfolio returns increase for a given level of risk. In this chapter, the objective is to stress that those benefits from portfolio diversification can still be enhanced. Actually, if investors invest internationally they benefit from additional advantages compared to benefits from traditional portfolio diversification. The objective of this chapter is therefore to interpret this broad concept of international portfolio diversification, to understand the benefits from international portfolio diversification, but also to interpret the reasons of those benefits. This chapter actually states that investing abroad is attractive for investors. However, those benefits from international portfolio diversification must be balanced. Investing abroad can sometimes be less optimal than expected.

Broadly speaking, international portfolio diversification generates additional benefits for investors. According to this theory, the modern portfolio theory and the capital asset pricing model have to be modified to take into consideration the international structure (Bartram & Dufey, 2001). International portfolio diversification is beneficial for investors if correlation between foreign stocks and domestic stocks is low. According to Kumar (2011), a low correlation between different countries can be due to three main reasons leading to a low co-integration between them. The first reason is that countries can be at different business cycle phase. The second reason is that countries can have different economic regulations resulting in variations of economic policies. The third reason is that countries can have specific returns which therefore differ from returns of other countries. In other words, correlation between countries is low when countries are not co-integrated (Kumar, 2011). International portfolio diversification benefits are greater than benefits from traditional portfolio diversification for investors. Actually, investing abroad is beneficial for individuals as the correlation between domestic and foreign stocks is lower than correlation between domestic stocks (Mushtaq & Shah, 2014). As a quick reminder, a low correlation between stocks is beneficial since stock prices do not move together what decreases the risk of a portfolio. Correlation decreases when stocks' behaviors are different (Mushtaq & Shah, 2014). Thereupon, foreign stocks' behavior and performance are different from domestic stocks' behavior and performance. In closing, international portfolio diversification leads to a lower correlation between stocks than traditional portfolio diversification. This low correlation between different countries can be explained by the fact co-movements between countries are low as well. However, a long-run

relationship between countries involves an increase of co-movements of those countries. It therefore leads to a decrease of benefits from international diversification (Valadkhani, Chancharat, & Harvie, 2008).

The development of countries also has a significant impact on benefits from international portfolio diversification. Actually, developing countries have greater profits from international diversification than developed countries. According to a study made by Driessen and Laeven, the average Sharpe ratio – defined as a "*measure of excess portfolio return over the risk-free rate relative to its standard deviation*" (The Economic Times, 2019) – increases by 13.5% for developing countries and only by 7.8% for developed countries when investing abroad. For example, investors from US have less benefits from international portfolio diversification than investors from developing countries. This theory can be explained by the fact those developed countries – like the US – already have diversified stocks whereas small developing countries do not have this optimal diversification. This theory can also be explained by the fact those small developing countries are not totally integrated into the financial world (Driessen & Laeven, 2007).

Nowadays, international portfolio diversification is easily reachable for every investor as there is a globalization of the world leading to an easier transfer of assets between countries. In other words, investing worldwide is attainable for everyone since financial transactions are easier between countries (Beine, Cosma, & Vermeulen, 2010). Amongst other, investors can easily invest internationally since the ETF – Exchange-traded funds – has appeared in 1993. Those funds are actually easily accessible for investors everywhere in the world (Leung, Lorig, & Pascucci, 2017). Those ETFs are strongly popular amongst investors as their diversification's need is satisfied by investing into those funds (Ben-David, Franzoni, & Moussawi, 2018). Reasons of globalization of the world are multiples. Amongst other, the reduction of barriers between countries, the ease of communication, the flexibility to travel between countries or even the speed of the information communication are reasons of the globalization of the world. It is no longer expected that individuals would limit their investments to domestic markets. In other words, they can easily extend their investments worldwide (Bartram & Dufey, 2001).

Investing internationally is a recent trend. A relevant example is the case of U.S. mutual funds which have begun to substantially commit their resources into international securities since 1980. The number of international US funds has actually increased by 50% since this period.

There is actually a real enthusiasm from investors for the future about investing abroad since this period. US investors invest more than $18 billion into those international funds thanks to their enthusiasm. They actually strongly believe benefits from international diversification will similarly carry on in the future (Bailey, Heck, & Wilkens, 2005). This significant increase of interest for international portfolio diversification comes from the fact investors truly believe investing abroad increases the expected return and decreases the risk. Moreover, they are confident for the future (Bailey, Heck, & Wilkens, 2005). Another reason of the benefits from international diversification is that it offers the opportunity to take advantage of economic growth of other countries. Some developing countries experience this rapid growth and investing into those countries is therefore strongly beneficial for investors. To give some figures, emerging markets like Chile, Colombia, Malaysia or Nigeria have an average economic growth rate respectively equal to 6.4%, 3.0%, 6.1% and 1.2% and an average annual return equal to 32.9%, 31.0%, 17.1% and 17.6%. Nevertheless, developed countries like the Japan or the US have an average economic growth equal to 1.2% and 1.2% and an average annual return equal to 13.9% and 13.4%. Developing countries have an average economic growth and an average annual return superior to developed countries (Bartram & Dufey, 2001).

As described above, whilst diversifying a portfolio increases the return of a portfolio of an investor for a given level of risk, investing abroad either leads to an additional increase of this return or an additional decrease of this risk of the portfolio. Moreover, investing into emerging market brings an additional advantage to this international diversification for investors. Broadly speaking, investing into emerging markets is beneficial in terms of return increase and risk reduction as well. Firstly, returns of investments into those emerging countries are superior than returns of developed markets since those emerging markets have greater opportunities for the future – average economic growth and average annual return of emerging markets like Chile, Colombia, Malaysia and Nigeria are presented in the previous paragraph. Secondly, the risk of the global portfolio decreases since those emerging markets have a very low correlation with developed markets. To give some figures, according to a study made by Solnik in 2000, correlation between stock markets between 1986 and 1996 of US with the world is equal to 0.83, whereas correlation of Chile, Colombia, Malaysia and Nigeria with the world are respectively equal to 0.12, 0.05, 0.53 and 0.06. As a logical consequence, those reasons combined lead to optimal portfolios which are even superior than portfolios optimally domestically diversified. According to a study made by the IMF in 2011, the amount of money invested into emerging markets has increased from $15 billions in 2004 to $197 billion in 2010

(Zonouzi, Mansourfar, & Azar, 2014). Benefits from investing into emerging markets rather than investing into developed markets and the reasons of those benefits are analyzed in the seventh chapter "International Portfolio Diversification: Emerging Markets". Risks of investing into emerging markets are presented as well in this chapter.

To summarize this first part of the chapter, even if the traditional portfolio diversification – concept under the modern portfolio theory – improves the portfolio of investors, this diversification can still be improved by investing internationally or investing into emerging markets. In other words, international diversification goes further than diversification amongst domestic stocks (Butler & Joaquin, 2002). Moreover, even if international portfolio diversification seems optimal for investors, it must be balanced. Actually, international portfolio diversification encounters some issues which decrease those benefits. Amongst other, behavioral finance theory, additional risks, correlation, increase of co-movement between countries, or even financial crisis are negative aspects generating a decrease of benefits from international portfolio diversification. Those negative aspects of international portfolio diversification are analyzed in detail in this chapter.

Individuals tend to hold under-diversified portfolios. More precisely, they are more inclined to invest into domestic stocks rather than into foreign stocks. It can be explained by the behavioral finance theory as well. Actually, behavioral finance hinders investors to totally benefit from this international portfolio diversification. The home bias impacts individuals who commit their resources into stocks in their home countries rather than investing abroad. As a logical consequence, this bias negatively impacts returns of portfolios for a given level of risk (Driessen & Laeven, 2007). This bias is strengthened as investors have to pay extra costs when investing abroad. In other words, extra costs also represent a barrier for investing abroad. Broadly speaking, it is easier and less constraining to invest into his own country rather than investing abroad (Mushtaq & Shah, 2014). Amongst other, investors pooling their money into foreign stocks bear transaction costs, liquidity costs and information costs (Liu, 2016). A relevant example is the case of U.S. investors. It is actually stated by Liu (2016) that "*U.S. investors hold a minimal amount of international bonds*". They prefer to commit their money into domestic bonds rather than foreign bonds. Even if they should benefit from international investments, they under-exploit this diversification because it is riskier and they should bear extra costs. Investors tend to invest into domestic corporate bonds rather than into foreign corporate bonds (Liu, 2016). More precisely, if individuals invest into foreign bonds, they bear

currency risk as well as hedging costs. The currency risk, also called the exchange-rate exposure, is defined as a "*risk associated with uncertain exchange rates*" (Law, 2016). This risk negatively impacts a portfolio return leading to a need to hedge this risk. Individuals therefore face hedging costs (Massa, Wang, & Zhang, 2016). Incentives to international investment therefore decrease.

Moreover, even if investing internationally seems widely beneficial, there are still other issues in addition to biases from behavioral finance theory as well as barriers. A major issue regarding international portfolio diversification is the fact it involves additional risks compared to traditional portfolio diversification (Bartram & Dufey, 2001). Amongst other, investors are actually confronted to the political risk. Another barrier to the international portfolio diversification is the fact the correlation varies over time leading to variations from benefits of international portfolio diversification. To give an example, the graph in appendix 1 illustrates that the correlation between 1960 and 1990 between the US and other countries varied consequently (Beine, Cosma, & Vermeulen, 2010). For example, correlation is higher during bear markets than during calm or bull markets. As a global result, returns on portfolio are lower than predicted for a given level of risk. According to a study made by Butler and Joaquin in 2002, correlation during bear and bull markets is respectively equal to 0.633 and 0.018 in US and to 0.667 and 0.074 in Europe (Butler & Joaquin, 2002). Actually, bear markets and bull markets have different returns. A bear market can be defined as "*a market characterized by falling prices for securities, usually stocks, within a context in which market participants are pessimistic about the chances of an imminent turnaround in prices*". However, a bull market can be defined as "*a market characterized by rising prices for securities, usually stocks, within a context in which market participants are optimistic that the trend increase in the value of the market index will continue for some time to come*" (Bevir, 2007). Correlation is higher during bear markets than during bull markets, meaning benefits from portfolio diversification decrease during bear markets (Butler & Joaquin, 2002). Actually, correlation is higher during volatile period than during calm period. As a logical consequence, since correlation is higher during bear markets, it could put into question the above findings stating international portfolio diversification leads to optimal portfolios. Another issue is the fact that co-movement between countries has nowadays increased, resulting in an increase of the correlation between countries which were previously uncorrelated (Bartram & Dufey, 2001). This increase of co-movement can be due to aspects like the introduction of the Euro, or the financial liberalization of the world, or even the exchange rate risk which all lead to a decrease of benefits from this

international diversification (Beine, Cosma, & Vermeulen, 2010). Moreover, co-movement and, therefore, correlation had increased more in developed countries than in emerging markets. There is therefore a need to invest internationally into emerging markets rather than into developed markets. Moreover, there is a decrease into benefits from international diversification for both developed countries and emerging markets, even if emerging markets are less impacted since diversification benefits are still available thanks to their low co-integration with the global world (Christoffersen, Errunza, Jacobs, & Jin, 2014). Another issue is the crisis of 2008. Even if this crisis especially emanated from developed countries, it also negatively impacted emerging markets. As a global result, benefits from diversification were reduced as well. Those statements must be balanced as even if correlation between countries has decreased, benefits from international portfolio diversification are still relevant today (Kumar, 2011). To sum up, those negative aspects of international portfolio diversification decrease the benefits from this diversification but do not totally cancel them. This decrease of benefits is analyzed in detail in the sixth chapter "International Portfolio Diversification: Decrease of Benefits".

In closing, as for the traditional portfolio diversification, international portfolio diversification is significantly beneficial for investors. Actually, it increases the return of a portfolio for a given level of risk or it decreases the risk of a portfolio for a same return. However, this statement must be balanced since those benefits vary over time. Moreover, benefits generated by this international diversification are currently decreasing. International portfolio diversification is therefore beneficial for investors but this statement must be balanced.

CHAPTER VI – INTERNATIONAL PORTFOLIO DIVERSIFICATION: DECREASE OF BENEFITS

As presented in the previous chapter, international portfolio diversification is significantly beneficial for investors. However, investors are nowadays confronted to a decrease of benefits from this international portfolio diversification. This chapter therefore aims at determining reasons of this decrease of benefits. Amongst other, two major reasons of this decrease of benefits are the co-movement between markets and the globalization of the financial world. Those phenomena are the main sources of the loss of profit for investors investing internationally. This chapter presents those phenomena and their origin into detail.

The phenomenon of co-movement occasions a loss of profit for investors investing internationally. This phenomenon means that stocks' behaviors have similarities. As a logical consequence, well-known benefits from diversification decrease due to co-movements existing within the financial world. As a quick reminder, diversification is beneficial for investors as this diversification decreases the correlation between stocks belonging to a same portfolio. Consequently, benefits from diversification decrease since the correlation between stocks increases due to this phenomenon of co-movement (Barberis, Shleifer, & Wurgler, 2005). In closing, co-movement negatively impacts portfolio since gains of portfolio decrease whilst risks increase. Accordingly, investors have to take those co-movements into consideration to perfectly assess portfolio's risks (Rua & Nunes, 2009).

This phenomenon of co-movement can be explained by multiple reasons. Firstly, the fact that investors tend to commit their money into "*a subset of all available securities*" brings co-movement. In other words, investors do not always consider all options available. Reasons of this phenomenon are multiples: transactional costs, lack of information… Therefore, securities belonging to specific subset behave similarly and correlation between those securities increases as well (Barberis, Shleifer, & Wurgler, 2005). Another potential explanation is the speed to which stocks incorporate information. If a specific category of stocks incorporates information relatively quickly into their price, they behave similarly as well. Actually, if a category of stocks similarly incorporates information, they tend to co-move. As for the previous explanation, this co-movement leads to a correlation's increase (Barberis, Shleifer, & Wurgler, 2005). As a logical consequence, those stocks belonging to specific asset classes therefore tend to co-move resulting in an increase of correlation between those stocks and a decrease of diversification

benefits (Bekaert, Hodrick, & Zhang, 2009). This phenomenon of holding same kind of stocks – belonging to similar classes – is called the asset class effect and is irrational. Reasons of this attachment of investors for a specific asset class are multiples. Amongst other personal characteristics or behavior of relatives are reasons of this devotion for a specific asset class. This phenomenon does not respect the fundamentals of finance and results in a correlation's increase as well (Honghui, Singal, & Whitelaw, 2016).

A relevant point about co-movement is the phenomenon of the contagion. The contagion occasions co-movements between markets. This phenomenon consists of a transmission of enthusiasm between different markets. This devotion of a country for a stock can lead other countries to be enthusiastic as well. Once again, this interest transmission is not rational since it does not take real figures into consideration. The result of this transmission is an increase of the correlation between stocks and consequently an increase of volatility (Karolyi & Stulz, 1996). This transmission of emotions also appears during crisis. A local crisis can actually impact other countries like the Asian crisis of 2007 or the tragic event of the 11 September 2001 for example (Hourvouliades, 2009). Regarding this contagion, Karolyi and Stulz (1996) make a difference between two types of shocks leading to correlation between countries. Whilst different markets are similarly impacted by global shocks, those markets are not similarly impacted by competitive shocks. Indeed, according to competitive shocks, whilst a market is positively impacted by this kind of shock, another market is negatively impacted. A relevant example mentioned in their paper is about the car industry. On the one hand, if the price of a specific car piece increases, all markets are similarly impacted by this price increase. On the other hand, if the price of a currency increases compared to another currency, the impact on both markets is opposite. In closing, correlation between markets thus increases according to global shocks and decreases according to competitive shocks (Karolyi & Stulz, 1996). Contagion differs from interdependence. Whilst the contagion is a sporadic phenomenon emerging following a shock, the interdependence is a strong and ongoing relationship between markets (Hourvouliades, 2009). This phenomenon of contagion especially appears during financial crisis. Accordingly, correlation is high during period of crisis since the impact of contagion is a correlation's increase (Bekaert, Campbell, & Ng, 2005). Consequently, co-movement is stronger as well during financial crises. This trend can be explained by the fact that the financial world is more interlinked during financial crises. According to a survey made by Tai in 2018, benefits from international portfolio diversification are ordinarily equal to 1.253%, whereas benefits from international portfolio diversification during the subprime crisis

were equal to 0.567%. Those findings confirm that financial crises negatively impact internationally diversified portfolios' returns (Tai, 2018). In closing, investors diversifying internationally their portfolios now have to take this co-movement into consideration to optimally assess expected gains of their portfolios.

Another phenomenon occasioning a decrease of benefits from international portfolio diversification is the globalization. In fact, the globalization of the world leads to an interaction's increase between markets since markets from different countries are more linked together. The link between markets has increased since investing abroad has become a natural tendency. This new trend can be explained by the global wealth's increase (Hourvouliades, 2009). To link with the previous paragraph, the globalization is characterized with strong co-movements (Chatterjee, 2016). Accordingly, markets are more and more integrated since globalization appears. This globalization of the world has pros and cons for investors. On the one hand, it is easier for them to invest abroad since transactional costs have decreased and barriers have disappeared as well (Click & Plummer, 2005). Accordingly, individuals can now easily have access to other markets to buy or sell stocks (Beine, Cosma, & Vermeulen, 2010). On the other hand, benefits from international portfolio diversification decrease since correlation between markets has increased (Click & Plummer, 2005). Actually, the reduction of barriers is negative for investors due to the fact frontiers lead to a lower correlation and consequently to benefits from international diversification for investors (Berger, Pukthuanthong, & Yang, 2011). Moreover, another negative aspect of this world globalization is the fact that a local crisis negatively impacts other markets. According to Hourvouliades (2009), the effect of a phenomenon in a specific market can move very quickly from one market to another (Hourvouliades, 2009).

This phenomenon of globalization can be explained by multiple factors. A first reason of the globalization of the financial world is the "*policy coordination*" between different countries (Chatterjee, 2016). This globalization also comes from the fact number of barriers between countries had significantly decreased (Tai, 2018). The "*financial openness*" of the world actually leads to the globalization of the world (Beine, Cosma, & Vermeulen, 2010). Amongst other, alternative sources of this financial globalization are the reduction of transport costs, the reduction of tariffs and the rise of the new technologies (Kato & Okubo, 2018). In closing, for all of those reasons, connecting all parts of the financial world becomes much easier today since those changes have appeared.

However, Tai (2018) states that even if benefits from international portfolio diversification decrease, investors still have to invest internationally. For example, even if stocks' returns are lower during a crisis period, investors do not have to take this loss of benefits into consideration. They only have to take into consideration general benefits from international portfolio diversification for the whole period. The main reason is that financial crises are not predictable; investors can therefore not take those crises into consideration. Tai (2018) even adds that the optimal portfolio an individual should hold is the "*world market portfolio*" (Tai, 2018). Investors still need to invest internationally since those co-movements do not always exist (Rua & Nunes, 2009).

To summarize this part, international portfolio diversification has been strongly beneficial for investors for a while. Even if results seem controversial, this international diversification is still beneficial for investors today. As a matter of fact, the difference is that this advantage has decreased due to phenomena like individuals' characteristics or behavioral biases leading to co-movements between markets. Another phenomenon called the contagion also results in a decrease of benefits from international portfolio diversification since it increases co-movements between countries as well. Other phenomena leading to a decrease of advantages from international portfolio diversification are the policy coordination between countries, the decrease of barriers, the openness of the financial world, the decrease of financial costs, the decrease of tariffs or the increase of new technologies promoting the globalization of the financial world. Accordingly, advantages from international portfolio diversification have decreased since co-movements and globalization have appeared. However, investors have to keep in mind that even if benefits from international portfolio diversification have decreased, it is still beneficial for them to invest internationally. At least, investing internationally is still more profitable for investors than investing locally since those decreases of benefits are not constant. As a matter of fact, even if the globalization is a constant trend, co-movements are sporadic and do therefore not always negatively impact portfolios since there are not always existing.

CHAPTER VII – INTERNATIONAL PORTFOLIO DIVERSIFICATION: EMERGING MARKETS

As presented in the previous parts, whilst traditional portfolio diversification increases the return of a portfolio for a given level of risk, diversifying a portfolio internationally additionally increases this return. Moreover, investing internationally into emerging markets also brings additional advantages to this international portfolio diversification. In reality, investing into emerging markets has nowadays become more interesting than investing into developed countries. The objective of this chapter is therefore to present reasons of this growing interest for emerging markets. Another objective of this chapter is to explain the reasons of those benefits. After that, some examples of emerging markets are presented. Another crucial point of this chapter is that emerging markets can also benefit from investing into developed countries. As a matter of fact, investing abroad is a win-win situation for both developed countries and developing countries. Some examples are presented as well. Finally, limits of investing into emerging markets are presented.

Investing internationally, meaning abroad, is a widely used technique. However, this technique seems nowadays flawed. There is actually a real need to find solutions to improve this international portfolio diversification in order to maintain the previous benefits from this international diversification (Abraham, Seyyed, & Al-Elg, 2001). In other words, investing internationally is no more sufficient today. There is a need to go further and, therefore, take emerging markets into consideration when investing abroad to maintain those benefits from international portfolio diversification: increase the return of a portfolio for a given level of risk or decrease the risk of a portfolio for a given level of return. This increase of interest to invest into emerging market can be explained by the significant decrease from benefits of international portfolio diversification due to the integration of the world. Actually, this integration of the world increases the correlation between markets. Actually, markets are nowadays more and more subject to co-movements which therefore lead to an increase of the correlation. Investing into those markets is still beneficial for investors from developed countries since emerging markets are not totally integrated with the rest of the world. As a logical consequence, it is beneficial for investors who have to find solutions to counteract this decline of benefits to invest into emerging markets which is the new turn of this international portfolio diversification. According to the survey pursued by Gilmore and McManus in 2002, it is expected that investors would invest around 20% of their investments in emerging markets (Gilmore & McManus,

2002). As a matter of fact, this interest for investing into emerging markets rather than investing into developed markets appears after the integration of the developed countries. In other words, it is the decrease of benefits from international portfolio diversification which promotes this growing interest for emerging markets. There is actually a need to find new opportunities of international benefits. Therefore, as the correlation between developed countries and emerging markets is low, investing into emerging markets brings additional advantages to traditional international portfolio diversification. According to a survey pursued by Fadhlaoui in 2009, the lowest correlation is between developed countries and emerging markets. To give an example, whilst correlation between U.K. and France – developed countries – is equal to 89.9%, correlation between U.S. and Czech Republic – developed country and emerging market – is equal to 10.1% (Fadhlaoui, Bellalah, Dherry, & Zouaouii, 2009). In closing, since developed countries and emerging markets are poorly correlated, they benefit from this low correlation. As a matter of fact, the return of a portfolio composed of stocks from those developed and emerging markets is higher than an internationally diversified portfolio only composed of stocks from developed markets (Abraham, Seyyed, & Al-Elg, 2001).

This increase of benefits from international diversification due to the integration of emerging markets comes from the fact those markets have higher expected return than developed markets. Moreover, emerging markets and developed markets benefit from a low correlation between each other. As a logical consequence, higher expected returns and lower correlation are beneficial for investors. As a quick reminder, whilst the objective of an investor is to maximize the expected return of his portfolio, a lower correlation between stocks leads to an increase of this expected return for a given level of risk (Harvey, 1995). Broadly speaking, a potential explanation of this higher expected return is that developed countries and emerging markets are not co-integrated and do therefore not behave similarly. Since those markets do not follow the same movements, investors from developed countries benefit from higher returns for a same level of risk by investing into emerging markets. A study has been made by Mushtaq & Shah in 2014 on the relationship which exists between the United States – developed markets – and the South Asia – developing markets. More to the point, they have proceeded to a correlation analysis. The major result of this analysis is that correlation between United States and emerging markets from South Asia is low leading to a near inexistence of co-movement between those markets. It is therefore beneficial for investors from United States to invest into South Asian markets. Correlations of the United States with Pakistan, India and Sri Lanka are respectively equal to 0.10, 0.39 and 0.11 for the period 1997-2001 (Mushtaq & Shah, 2014).

An alternative explanation of those benefits is the fact that emerging countries suggest strong potential in terms of future growth. This potential for future growth can be explained by the fact the average return of investment is higher than investment from developed countries. According to a study pursued by Harvey in 1995, the average return of emerging markets investments is equal to 20.4% and is around 13.9% higher than the MSCI world index average return (Kumar, 2011). Harvey (1995) also states that investing into emerging markets is beneficial since it offers new opportunities of investments (Harvey, 1995). The geographic area and the economic development also play a key role into the level of advantages. Markets in different geographical area or which are not at the same level of economic development do not behave similarly and are therefore not correlated. The correlation decreases and benefits from diversification increase as well (Valadkhani, Chancharat, & Harvie, 2008). Finally, a last explanation of this increase of expected return is the fact emerging markets are riskier than developed markets. As a logical consequence, as return increases with the risk, returns of stocks from emerging markets are higher than returns of stocks from developed markets which are less risky (Zonouzi, Mansourfar, & Azar, 2014).

Some relevant cases of emerging markets are presented and analyzed. To begin, a relevant example is the case of the Middle Eastern oil-producing countries. As stated earlier in this chapter, investing into emerging market is beneficial for investors from developed countries as those countries are not correlated, increasing the return of their portfolios for a given level of risk. Moreover, there are improvements in terms of investments into these oil-producing countries leading them to be even more attractive for investors (Zonouzi, Mansourfar, & Azar, 2014). Another example is the case of the Middle East and North American stock markets. Investing into those emerging markets is significantly beneficial for investors of developed countries since it decreases the risk of their portfolios (Kumar, 2011). Another relevant example is the case of the Emerging Gulf Equity Markets. Since they have a really low correlation with U.S. stocks, it is beneficial for U.S. investors to invest into those emerging markets (Abraham, Seyyed, & Al-Elg, 2001). In the same way, it is beneficial for U.S. investors to invest into South Asian markets due to their low co-movements (Mushtaq & Shah, 2014).

Until here, benefits for developed countries to commit their money into emerging market have been presented. However, in parallel, investing into developed countries is beneficial for emerging markets (Mushtaq & Shah, 2014). For emerging markets, it is a recent trend to invest abroad. Actually, those markets could be restricted by their governments to invest in their home

countries. However, this situation has evolved leading investors from emerging markets to be able to invest abroad – and therefore into developed markets. Whilst it is beneficial for investors from developed countries to invest into developing countries, it is beneficial as well for investors from developing countries to invest into developed countries. However, developing countries still benefit from greater advantages to invest into developed countries than developed countries would have for a same amount. This additional advantage can be explained by two mains reasons. Firstly, the fact that those countries are riskier, it is more advantageous for them to invest into developed countries which are safer. Secondly, it is more advantageous for them to commit their money into developing countries because those emerging markets are less integrated in the global financial world than the developed countries (Driessen & Laeven, 2007). Developing countries are nowadays creating a favorable environment to participate into the global financial market. There is actually a real willingness from those countries to take part into the global market. In other words, there is a willingness from emerging markets to be able to benefit from advantages of this international portfolio diversification (Sahaym & Nam, 2013).

In closing, even if investing into emerging markets seems strongly beneficial for investors from developed markets, investing into those markets encounters some limits. Amongst other, a relevant issue regarding investing into emerging markets is the fact there is an increase of co-movement even between those emerging markets which therefore increases the correlation and decreases investment returns. After that, another issue encountered by emerging markets is the fact that there is a slight increase of volatility and a slight decrease of general returns. This trend change can be explained by economic crises. There is a slight decrease of international portfolio diversification benefits. There is therefore a need to find new emerging markets which are not concerned with those issues (Zonouzi, Mansourfar, & Azar, 2014). Finally, investing into emerging markets is risky since those markets are more subject to crisis and their business cycles are more volatile. It is therefore riskier for investors to pool their money into emerging markets than into developed markets (Margaretic, 2016).

CONCLUSION OF THE LITERATURE REVIEW

To sum up the literature review, major concepts of the portfolio management have been described. The central point of this literature review is that return of financial portfolio increases as diversification increases resulting in correlation decrease. As a matter of fact, since correlation between stocks within a portfolio decreases when stocks' behaviors are different, diversifying a portfolio is strongly beneficial for individuals thanks to the return increase. Besides, investing abroad brings extra advantages, as well as investing into emerging markets since correlation decreases additionally.

Nevertheless, the literature review does not study the impact of the international portfolio diversification on asset management companies' financial performance. The objective of the following empirical research is therefore to fill this gap. Consequently, the main goal of the empirical research consists of studying if asset management companies similarly benefit from this international portfolio diversification. Are benefits individuals received from portfolio diversification as well as extra benefits individuals received from international portfolio diversification or even from investing into emerging markets similar for asset management companies?

PART II – EMPIRICAL RESEARCH

INTRODUCTION OF THE EMPIRICAL RESEARCH

STRUCTURE

Objectives of this empirical research and research questions are emphasized again in this part, as well as hypothesis. Then, the methodology of this empirical research is presented. The statistical analyses exploited in this empirical research are presented as well as the measures of the variables analyzed in this study – the financial performance and the international portfolio diversification – and the computations conducted to obtain those variable measures. After that, the database is presented. More to the point, individuals and variables contained in this database are defined. Once the objectives, the methodology and the database are illustrated, statistical analyses are performed to answer research questions correctly. Finally, a conclusion resumes results of the statistical tests performed and answers the research questions.

OBJECTIVES OF THE EMPIRICAL RESEARCH

This empirical research aims at studying the impact of the international portfolio diversification as well as the impact of the geographic area and the period on the financial performance of asset management companies. Since the major focus of this master thesis is the relationship between the international diversification and the financial performance of companies, the behavior of firms' international portfolio diversification is deeply analyzed. The relationship between the diversification and the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of companies is studied. There is a willingness to assess the impact of those variables on the diversification's behavior of firms.

The literature review of this master thesis illustrates that investing internationally is significantly beneficial for individuals. Nevertheless, the literature review does not analyze the specific cases of asset management companies. The objective of this empirical research is therefore to fill this gap and assess the potential existence of a link between the financial performance of asset management companies and their international portfolio diversification. How does the international portfolio diversification of asset management companies impact their financial performance? To go further, another objective is to determine variables which impact the financial performance of those asset management companies. A first variable analyzed in this empirical research is the geographic area. The impact of the geographic area on the financial performance is studied as the main objective is to assess if the financial performance varies between European and American asset management companies. How does the geographic area impact the financial performance of asset management companies? A second variable analyzed is the period. The literature review illustrates that the globalization of the financial world has recently appeared. It is actually easier for investors to invest abroad

since barriers to international investments have decreased. The objective is therefore to assess if this globalization of the world has an impact on the financial performance of asset management companies as well. How does the globalization of the financial world impact the financial performance of asset management companies? After that, the behavior of the international portfolio diversification of companies is deeply analyzed. Relationship between this diversification and the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of asset management companies are actually analyzed. How do the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of asset management companies impact their international portfolio diversification?

HYPOTHESES OF RESULTS FROM THIS EMPIRICAL RESEARCH

Since the literature review states investing internationally brings additional advantages for investors, the main expected outcome of those analyses is that financial performance of asset management firms is positively impacted by international portfolio diversification. Regarding the geographic location of companies, it is expected that the geographic area has no impact on the financial performance since European and American stocks should benefit from relatively similar performance. There are two mains "investor mentalities": investors who believe that European stocks are more profitable and investors who believe that American stocks are more profitable (O'Neill, 2013). Regarding the period, expected result is that financial performance increases over time since the globalization resulting in the openness of the world leads to a decrease of barriers between countries and new investment opportunities for investors. It should be profitable for firms as investors should increase their foreign investments.

Regarding the international portfolio diversification, the process is quite different from the one relative to the financial performance's analysis. There are actually no a priori hypotheses regarding the relationship between the diversification and the geographic area or the unlevered beta. The objective of those analyses performed on the diversification is not to confirm or infirm statements but rather to analyze in-depth the behavior of this rate. Hence, relationships between the diversification and the period, the financial performance, the current market cap or the enterprise value are studied as well. The expected outcome is that diversification rate of firms increases over time due to the openness of the world resulting in an easier transfer of assets between countries. The other expected outcome is that firms having higher financial performance, current market cap or enterprise value have higher international portfolio diversification as investing abroad is costly and required resources. Through statistical tests, hypotheses are confirmed or infirmed as well as specific behaviors are deeply analyzed.

CHAPTER I – METHODOLOGY

Statistical analyses are performed to assess the potential existence of links between the financial performance of asset management companies and their international portfolio diversification, their geographic area and the period. Those statistical tests are also applied to determine the relation between the international portfolio diversification of those companies and their financial performance, their geographic area, the period, their current market cap, their enterprise value and their unlevered beta. Statistical tests proceeded with the software "R" are Chi-square tests, Student t-tests, variance analyses, linear regressions, linear models as well as generalized linear models. Those statistical tests are applied in this empirical research for two major reasons. Firstly, specific statistical tests have to be applied since each statistical test requires specific type of variables and the database exploited is composed of various type of variables. Conditions required by each statistical test are presented before the realization of the test. Secondly, to ensure results of statistical tests are correct, multiple statistical tests are applied to confirm or infirm findings from other tests.

Normality of data are firstly tested to determine if data exploited follow a normal distribution since some statistical tests require normally distributed data. Nevertheless, when facing data which do not follow a normal distribution, two options are available. Firstly, non-parametric tests – which do not assume normally distributed data – can rather be applied. Secondly, another option is to normalize those data. Both processes are applied in this empirical research since some statistical tests performed in this master thesis assume normally distributed data. Moreover, additional statistical tests are applied on residuals of linear regressions and linear models proceeded since residuals have to behave in a certain manner to ensure the validity of the model performed.

Finally, specific statistical tests require categorical variables. Consequently, some continuous variables are transformed into categorical variables for specific statistical tests performed in this empirical research. To properly realize this transformation, a function on R is performed. The numeric variable is cut in classes and each class is similar in terms of number of individuals within classes. Those variables transformations are presented in the chapter "Part III – Database".

In closing, before being realized, each statistical test of this empirical research is described as well as conditions required.

Regarding the financial performance of companies, this parameter is measured by three indicators: the return on assets, the adjusted return on equity and the operating margin of companies are exploited to ensure the financial performance of a company is correctly measured. Those measures of the financial performance indicators have been extracted from a Bloomberg's terminal. Those indicators are defined in the chapter "Part III – Database". The abbreviations used in this empirical research to mention those financial performance's indicators are presented in table 1.

After that, the level of international portfolio diversification of companies is measured by the diversification rate. This rate must be computed since it is not a mandatory measure to include in companies' annual report. Nevertheless, diverse kinds of computations must be conducted since all companies do not publish identical information into their annual reports. Computations of this diversification rate of each company for each year are presented in Appendix (**cfr. Appendix 2 and 3**).

Abbreviations in table 1 are used in this empirical research.

Diversification rate	div. rate
Return on assets	ROA
Adjusted return on equity	adj. ROE
Operating margin	op. margin
Geographic area	geo. area
Current market cap	mktcap
Enterprise value	EV
Unlevered beta	β

Table 1 – Abbreviations

CHAPTER II – DATABASE

The database exploited to perform statistical analyses is composed of 410 individuals and 9 variables. This database is modified as well for some statistical tests requiring specific data type. Transformation applied in this empirical research is the modification of numerical variables into dichotomous and non-dichotomous categorical variables. This database is composed of data from 2008 to 2017 leading to a relevant data range analyzed of ten years.

A. INDIVIDUALS

Individuals are European and American asset management companies. Filters are applied to keep relevant companies for this empirical research. More to the points, filters are applied to ensure companies studied earn money from the asset management segment since this master thesis analyzes asset management companies [1], belongs to the sector of asset management due to the topic of this master thesis [2], are companies having a market value which is large enough to ensure the relevance of the results delivered [3], are sufficiently large to ensure a relevant content to analyze [4] and, finally, encompass all companies meeting those criteria [5]. Broadly speaking, the major idea is to hold European and American asset management companies which are large enough to ensure relevant results which are representative of all companies of this specific sector.

[1] Latest FY product segment revenue percent: From asset management
[2] Sector: Asset management
[3] Current market cap >= 100M [EUR]
[4] Revenue >= 100M [EUR]
[5] Trading status: Active, acquired, delisted, liquidated

After applying those filters for European and American companies – as well as after the removal of companies which do not present enough figures into their annual reports to compute their diversification rate – fifteen and twenty-six companies are available, respectively. Tables in Appendix 4 and 5 mention the fifteen European asset management companies and the twenty-six American asset management companies from this selection which are exploited in the further analyses (**cfr. Appendix 4 and 5**).

B. VARIABLES

The initial database is composed of 9 variables. Tables 2, 3 and 4 depicts key relevant information relative to those variables.

- Diversification.rate: This variable measures the diversification rate of a company which is defined as the level of international portfolio diversification of a company. This variable is measured in percentage.
- Return.on.assets: This variable measures the return on assets of companies and is defined as the "*indicator of how profitable a company is relative to its total assets, in percentage and gives an idea as to how efficient management is at using its assets to generate earnings*" (Bloomberg, 2019). This variable is measured in percentage.

$$\frac{Trailing\ 12M\ Net\ Income}{Average\ Total\ Assets} * 100$$

- Adjusted.return.on.equity: This variable measures the "*returns on common equity based on net income excluding one-time charges*" (Bloomberg, 2019). This variable is measured in percentage.

$$\frac{Trailing\ 12M\ Normalized\ Income}{Average\ of\ Current\ and\ Prior\ Period\ (Common\ equity)} * 100$$

- Operating.margin: The operating margin is defined as the "*ratio used to measure a company's pricing strategy and operating efficiency, in percentage*" (Bloomberg, 2019). This variable is measured in percentage.

$$\frac{Operating\ Income\ (Losses)}{Total\ Revenue} * 100$$

- Category.geography: This variable is a categorical variable which differentiates companies having their country domicile in Europe from companies having their country domicile in the United States (where EU = European asset management companies and US = American asset management companies).
- Period: This variable is a categorical variable which differentiates period before 2012 and period after 2012. The objective of this variable is to equally divide the ten years analyzed in this empirical research.
- Current.mkt.cap: This variable is a measure of the current market cap and is defined as the "*total current market value of all of a company's outstanding shares stated in the pricing currency and the capitalization is a measure of corporate size*" (Bloomberg, 2019). This variable is measured in millions of EUR.

$$Current\ Shares\ Outstanding * Last\ Price$$

- Enterprise.value: The enterprise value is the "*measure of a company's theoretical takeover price*" (Bloomberg, 2019). This variable is measured in millions of EUR as well.

$$Market\ Capitalization + EV\ Components$$

- Beta: This variable represented the unlevered beta which "*measures the volatility of the stock price relative to the volatility in the market index and beta is the percent change in the price of the stock given a 1% change in the market index*" (Bloomberg, 2019). This variable is measured in percentage.

$$\frac{Linear\ Beta}{[1 + (1 - t)\left(\frac{D}{E}\right)]}$$

where t *is the tax rate and* $\frac{D}{E}$ *is the Debt to Equity ratio.*

Variables	Minimum	Maximum	Mean	n	NA
Diversification.rate	0,00	2,20	0,20	410	0
Return.on.assets	-70,11	50,23	5,90	402	8
Adjusted.return.on.equity	-114,11	230,02	12,36	398	12
Operating.margin	-645,68	2 421,27	40.58	399	11
Current.mkt.cap	52,43	69 189,26	4 960,46	400	10
Enterprise.value	-2 926,8	68 210,9	6 129,38	379	31
Beta	-125,14	122,87	-0,84	304	106

*Table 2 – Numerical variables description (**cfr. Appendix 6**)*

Variables	Counts category 1	Counts category 2
Geographic.area	[EU] 150	[US] 260
Period	[AFTER 2012] 205	[BEFORE 2012] 205

*Table 3 – Categorical variables description (**cfr. Appendix 6**)*

Variables	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Diversification.rate	0,17	0,17	0,22	0,21	0,20	0,19	0,21	0,19	0,23	0,20
Return.on.assets	-4,42	5,26	7,33	5,20	6,60	8,60	7,91	6,88	6,78	8,11
Adjusted.return.on.equity	0,23	8,71	16,87	15,98	11,44	15,75	14,86	12,03	13,58	12,76
Operating.margin	11,12	35,78	38,59	23,83	94,44	54,91	36,42	32,47	32,32	39,95
Current.mkt.cap	2377,61	3462,19	3864,58	3562,77	4185,37	5605,73	6202,17	6098,58	6550,23	7275,10
Enterprise.value	2558,34	3768,51	4746,70	4603,52	5763,96	7184,98	7765,75	7848,23	7882,01	8593,37
Unlevered.beta	1,40	1,24	-26,23	1,37	1,95	3,02	-5,60	10,31	4,69	1,03

*Table 4 – Yearly mean for each numerical variable (cfr. **Appendix 7**)*

C. CREATION OF CATEGORICAL VARIABLES

As presented in the methodology, some statistical tests require categorical data. There is therefore a need to transform continuous variables into dichotomous categorical variables. The following variables are transformed into dichotomous categorical variables: Diversification.rate, Return.on.assets, Adjusted.return.on.equity, Operating.margin, Current.mkt.cap, Enterprise.value and Unlevered.beta. For each variable, two classes are created: "Low" and "High". As a quick reminder, numeric variables are cut in classes and each class is similar in terms of number of individuals within classes thanks to a function of R. The range of each class is mentioned in table 5.

	Low	High
Diversification rate	[0.00 – 0.1199]	[0.12 – 2.2]
ROA	[-70.107 – 4.399]	[4.503 – 50.227]
ROE	[-114.115 – 10.325]	[10.365 – 230.022]
Margin	[-645.680 – 29.552]	[29.590 – 2 421.270]
Mktcap	[52.432 – 1 937.145]	[1 946.724 – 69 189.263]
EV	[-2 926.754 – 2 250.530]	[2 305.061 – 68 210.909]
Beta	[-125.138 – 0.970]	[0.971 – 122.867]

Table 5 – Classes of dichotomous categorical variables created from continuous variables

After that, a specific statistical test – the variance analysis – requires non-dichotomous categorical variables – composed of more than two classes. Continuous variables are therefore transformed into non-dichotomous categorical variables of three classes. The range of those classes are presented in table 6.

	Low	Middle	High
Diversification	[0.00 – 0.062]	[0.0624 – 0.228]	[0.232 – 2.22]
ROA	[-70.107 – 2.094]	[2.194 – 7.461]	[7.597 – 50.227078]
ROE	[-114.115 – 7.770]	[7.833– 14.216]	[14.399 – 230.021760]
Margin	[-645.680– 17.671]	[17.673 – 45.157]	[45.205 – 2421.269580]
Mktcap	[52,432 – 1 055,826]	[1 059,707 – 3 707,944]	[3 721,038 – 69 189,263]
EV	[-2 926,754 – 1 166,951]	[1 169,111 – 5 786,254]	[5 866,559 – 68 210,909]
Beta	[-125,138 – 0,236]	[0,256 – 1,847]	[1,850 – 122,867]

Table 6– Classes of non-dichotomous categorical variables created from continuous variables

CHAPTER III – NORMALITY TEST

A. INTRODUCTION

As presented in the methodology, some statistical tests assume normally distributed data. The Shapiro-Wilk test which determines if data follow a normal distribution must therefore be applied (Duignan, 2016). Whilst the null hypothesis of this test states data follow a normal distribution, the alternative hypothesis states data do not follow a normal distribution. The null hypothesis is rejected if the p-value resulting of the Shapiro-Wilk test is below 0.05 as a statistical confidence of 95% is accepted. The distribution of the data of each variable is tested to determine if those data follow a normal distribution. Numerical variables tested are the following: div. rate, ROA, adj. ROE, op. margin, mktcap, EV and β.

$$H_0: Variable\ do\ follow\ a\ normal\ distribution$$
$$H_1: Variable\ do\ not\ follow\ a\ normal\ distribution$$

B. SHAPIRO-WILK TEST

For each variable tested, a Q-Q plot is firstly built and the Shapiro-Wilk test is then performed. The quantiles of the data panel do not follow the theoretical line of the normal distribution according to the Q-Q plot of each variable tested (**cfr. Appendix 8, 9, 10, 11, 12, 13 and 14**). Nevertheless, to ensure this interpretation is correct, the normality of the panel data of each variable is tested with the Shapiro-Wilk test. Results are identical for all variables: a p-value below 2.2 x 10^{-16} leading to the reject of the null hypothesis since this p-value is below 0.05 (**cfr. Appendix 15, 16, 17, 18, 19, 20, and 21**). All variables do not follow a normal distribution.

C. RESULTS

Since all data – of the panel data of numerical variables – do not follow a normal distribution, alternative processes have to be performed for statistical tests requiring data normally distributed. Especially two alternative processes are applied in this empirical research: the normalization of data or the application of non-parametric tests.

CHAPTER IV – CHI-SQUARE

A. INTRODUCTION

The Chi-Square test aims at analyzing the dependent relation between two categorical variables. The null hypothesis under this test claims that both variables are independent, whereas the alternative hypothesis states both variables are not independent (Cornillon, et al., 2018).

$$H_0: Both\ variables\ are\ independent$$
$$H_1: Both\ variables\ are\ not\ independent$$

Some continuous variables have to be transformed into categorical variables since this Chi-Square test requires categorical variables. A function of R actually cuts continuous variables into categorical variables having similar number of items in each class.

B. FINANCIAL PERFORMANCE

Financial performance ~ Diversification rate

The probability for the ROA, adj. ROE and op. margin to obtain the χ^2 under the null hypothesis, respectively equal to 0.15942, 2.9048 and 10.587, are respectively equal to p-values of 68.99%, 8.832% and 0.1139% **(cfr. Appendix 22, 23 and 24)**. The ROA and the adj. ROE should theoretically be able to reach this χ^2 since p-values are above 5%. They should thus not be statistically bonded since the null hypothesis claiming both variables are independent cannot be rejected. Nevertheless, regarding the op. margin, the probability to obtain the theoretical χ^2 under the null hypothesis is very low – at least below 5% – and the null hypothesis is therefore rejected. The op. margin and the div. rate are therefore statistically bonded. Firms having a low op. margin have a low div. rate, whereas firms having a high op. margin have a high div. rate. This result is consistent with the hypothesis claiming that companies having a high div. rate should have a high financial performance since investing abroad should be profitable for them.

Financial performance ~ Geographic area

The ROA and the geo. area should be independent as the p-value of 0.2159 results in the non-reject of the null hypothesis. The probability to obtain the χ^2 under the null hypothesis equal to 1.5314 is actually above 5% and thus realistic. Hence, the adj. ROE and the op. margin are statistically bonded with the geo. area as the p-value are respectively equal to 0.001324 and 0.04386 leading to the reject of the null hypothesis (**cfr. Appendix 25, 26 and 27**). The probability for those variables to achieve the χ^2 under the null hypothesis is actually low – at least below 5%. Europeans companies have a low adj. ROE and American companies have a

high adj. ROE, whereas European companies have high op. margin and American companies have a low op. margin. This result confirms the hypothesis. There are two mains mentalities: investors who believe that European stocks are more profitable and investors who believe that American stocks are more profitable. It can therefore not be affirmed that companies located in a specific geographic area have a financial performance significantly superior to the one of companies located somewhere else (O'Neill, 2013). Regarding the "best high yield opportunities", a research made in 2016 illustrates that different well-known individuals have divergent opinions regarding those opportunities. Some of them believe investing in U.S. is more profitable, whereas other believe European stocks are more profitable (n.a., 2016).

Financial performance ~ Period

The financial performance seems to be statistically linked with the period since the ROA and the adj. ROE are linked with the period due to p-values respectively equal to 0.003812 and 0.0211 leading to a very low probability to reach the χ^2 under the null hypothesis and therefore resulting the reject of this last hypothesis (**cfr. Appendix 28 and 29**). Hence, the op. margin and the period should not be dependent of each other due to a p-value of 0.05063 above, leading to the non-reject of the null hypothesis as the probability for the op. margin to obtain the χ^2 is above 5% (**cfr. Appendix 30**). Companies have a low ROA before 2012 and a high ROA after 2012 and this behavior is similar for the adj. ROE. Financial performance of companies increases over time. This behavior is explained by the globalization and the openness of the financial world. It confirms the hypothesis of this master thesis claiming that investors can easily invest abroad. This decrease of barriers over time is therefore profitable for companies.

Variables	ROA			Adj. ROE			Op. margin		
	χ^2	P-value	Linked?	χ^2	P-value	Linked?	χ^2	P-value	Linked?
Diversification rate	0.15924	0.6899	NO	2.9048	0.08832	NO	10.587	0.001139	YES
Geographic area	1.5314	0.2159	NO	10.309	0.001324	YES	4.062	0.04386	YES
Period	8.3715	0.003812	YES	5.3187	0.0211	YES	3.8203	0.05063	NO

Table 7 – Results of Chi-square tests performed on the financial performance of companies

C. DIVERSIFICATION RATE

Diversification rate ~ Financial performance

Results are identical to the previous tests: the div. rate should not be dependent of the ROA and the adj. ROE since p-values are superior to 0.05, whereas the p-value resulting of the op. margin is below 0.05 (**cfr. Appendix 31, 32 and 33**).

Diversification rate ~ Geographic area

The div. rate and the geo. area should not be dependent of each other as the p-value resulting of the statistical test equal to 0.3052 is above 0.05 (**cfr. Appendix 34**). The probability to obtain the theoretical χ^2 is high resulting in the non-reject of the null hypothesis.

Diversification rate ~ Period

The probability that the period obtains the theoretical χ^2 is equal to 37.4%. Since this probability is above 5%, the null hypothesis cannot be rejected. The div. rate and the period should therefore be independent (**cfr. Appendix 35**).

Diversification rate ~ Current market cap

As the p-value is equal to 0.0000001154, the null hypothesis is rejected and the div. rate and the mktcap are therefore dependent of each other. The probability to obtain the χ^2 under the null hypothesis is indeed very low (**cfr. Appendix 36**). Companies having a low div. rate have a low mktcap, whereas companies having a high div. rate have a high mktcap. It is consistent with the hypothesis claiming that companies need sufficient resources to invest abroad.

Diversification rate ~ Enterprise value

The div. rate and the EV are variables which are statistically bonded as the p-value is below 5% and leads to the reject of the null hypothesis since it is unrealistic that the EV could reach the χ^2 (**cfr. Appendix 37**). Behavior of factors is similar as for the mktcap: companies having a low div. rate have a low EV and companies having a high div. rate have a high EV. This discovery confirms the hypothesis: sufficient resources are required by firms to invest abroad.

Diversification rate ~ Unlevered beta

The p-value resulting of the Chi-square test between the div. rate and the β is equal to 0.5661 leading to the non-reject of the null hypothesis (**cfr. Appendix 38**). Those variables should thus be independent as the β should easily reach the χ^2 under the null hypothesis.

Variables	Div. rate		
	χ^2	P-value	Linked?
ROA	0.15924	0.6899	NO
Adj. ROE	2.9048	0.08832	NO
Op. margin	10.587	0.001139	YES
Geo. area	1.0513	0.3052	NO
Period	0.79024	0.374	NO
Mktcap	28.096	0.0000001154	YES
EV	33.78	0.000000006172	YES
β	0.3293	0.5661	NO

Table 8 – Results of Chi-square tests performed on the diversification rate of companies

D. RESULTS

The financial performance of firms is statistically bonded with their geo. area and the period since two indicators out of three are statistically bonded. Regarding the geo. area, as European companies have an op. margin superior to American companies and an adj. ROE inferior to American companies, it can be assumed the financial performance is not impacted by the geography since two financial indicators behaviors for a same country of domicile are opposed. This result confirms the hypothesis claiming that the financial performance of companies is not linked to their geographic area since European and American stocks benefit from relatively similar performance according to the literature review. Hence, companies have greater financial performance after 2012 than before 2012. This finding confirms the hypothesis claiming that the globalization of the world over time leads to an increase of the global financial performance. It is actually easier for companies to invest internationally and therefore benefit from economic growth of foreign countries. After that, the div. rate of firms is statistically bonded with their mktcap and their EV: companies having a high mktcap or a high EV benefit from greater financial performance. The div. rate is statistically bonded with the op. margin as well. Hence, since only one financial performance's indicator is statistically linked with the div. rate, it can be assumed the div. rate of firms is not impacted by their financial performance.

CHAPTER V – STUDENT T-TEST

A. INTRODUCTION

The objective of the Student t-test is to compare the means of two categories of variables. This test requires the normality of the data exploited. Since the Shapiro-Wilk test has been realized and results affirm data do not follow a normal distribution, the non-parametric test – Wilcoxon test – is rather applied. More precisely the Wilcoxon test is a mean comparison test and consists of one categorical variable which explains a numerical variable (Broc, Carlsberg, Cazauvieilh, Faury, & Loyal, 2016). Hypotheses of this test are the following:

$$H0\colon \mu_1 = \mu_2$$
$$H1\colon \mu_1 \neq \mu_2$$

where μ_1 and μ_2 are mean of data belonging to the first and the second category, respectively (Cornillon, et al., 2018). In this study, the objective is to assess variables which impact the financial performance and the div. rate of asset management companies.

B. FINANCIAL PERFORMANCE

Financial performance ~ Diversification rate

Mean of the financial performance of each category – firms having a low or a high div. rate – is firstly computed. Firms having a low div. rate have an average ROA of 4.39, an average adj. ROE of 9.47 and an average op. margin of 48.97, whereas firms having a high div. rate have an average ROA of 7.45, an average adj. ROE of 15.32 and an average op. margin of 32.07 (**cfr. Appendix 39, 41 and 43**). The Wilcoxon test is applied to assess the significance of those differences. Results of the tests performed on the ROA and the adj. ROE are p-values above 0.05 – respectively equal to 0.05063 and 0.09030 – leading to the non-reject of the null hypothesis under the test statistic respectively equal to 17919 and 17855 (**cfr. Appendix 40 and 42**). Differences between average ROA or average adj. ROE of firms having a low or a high div. rate should not be statistically significant. Hence, the difference between the average op. margin of firms having a low or a high div. rate is statistically significant as the p-value of the test is equal to 0.02827 leading to the reject of the null hypothesis – claiming means of categories are not significantly different (**cfr. Appendix 44**). Since the p-value is below 5% when the test statistic is equal to 17372, means of each category significantly differs. Firms having a low div. rate have an average op. margin greater than firms having a high div. rate. This finding is inconsistent with the hypothesis claiming that companies diversifying internationally their portfolios should benefit from stronger financial performance. This finding rather demonstrates that investing internationally represents a sizable cost for firms resulting in a decrease of the financial performance.

Financial performance ~ Geographic area

European companies have an average ROA of 6.79, an average adj. ROE of 10.75 and an average op. margin of 61.75, whereas American companies have an average ROA of 5.37, an average adj. ROE of 13.33 and an average op. margin of 28.50 (**cfr. Appendix 45, 47 and 49**). The difference of average ROA between European and American companies should not be statistically significant since he p-value of 0.2448 leads to the non-reject of the null hypothesis as the average ROA of each category does not significantly differ under the test statistic equal to 20211 (**cfr. Appendix 46**). Nevertheless, the difference of average adj. ROE and average op. margin between European and American asset management companies is statistically significant as p-values – respectively equal to 0.001224 and 0.00006822 – lead to the reject of the null hypothesis under the statistic test respectively equal to 14959 and 22828 (**cfr. Appendix 48 and 50**). European firms have a lower adj. ROE means but a greater op. margin than American firms. Those results are quite opposite and consistent with the literature review claiming that investors can independently be attracted by European investments or by American investments; there is not a geographic location superior to the other. The financial performance should thus be independent of this geographic location.

Financial performance ~ Period

Before 2012, companies have an average ROA of 4.07, an average adj. ROE of 10.87 and an average op. margin of 42.03, whereas after 2012, companies have an average ROA of 7.66, an average adj. ROE of 13.80 and an average op. margin of 39.21 (**cfr. Appendix 51, 53 and 55**). The average ROA and the average adj. ROE significantly differ regarding the period as the p-values of the tests are equal to 0.01014 and 0.01041 leading to the reject of the null hypothesis under test statistic respectively equal to 23187 and 22732 (**cfr. Appendix 52 and 54**). Before 2012, companies have a lower ROA and a lower adj. ROE than after 2012. It confirms the hypothesis claiming that the globalization of the world over time leads to an increase of the financial performance of companies as investors can invest abroad easily. Hence, the average op. margin does not significantly differ regarding the period as the p-value of 0.1552 leads to the non-reject of the null hypothesis under the test statistic equal to 21522 (**cfr. Appendix 56**).

Variables	ROA			Adj. ROE			Op. margin		
	W	P-value	Linked?	W	P-value	Linked?	W	P-value	Linked?
Div. rate	17919	0.05063	NO	17855	0.09039	NO	17372	0.02827	YES
Geo. area	20211	0.2448	NO	14959	0.001224	YES	22828	0.00006822	YES
Period	23187	0.01014	YES	22732	0.01041	YES	21522	0.1552	NO

Table 9 – Results of Wilcoxon tests performed on the financial performance of companies

C. DIVERSIFICATION RATE

Diversification rate ~ Financial performance

Companies having a low ROA, a low adj. ROE, or a low op. margin have an average div. rate respectively equal to 0.22, 0.21 and 0.21, whereas companies having a high ROA, a high op. margin, or a high op. margin have respectively an average div. rate of 0.17, 0.19 and 0.19 (**cfr. Appendix 57, 59 and 61**). Hence, none of this difference is statistically significant as the three Wilcoxon tests performed have p-value above 0.05 leading to the non-reject of the null hypothesis. Actually, p-value of tests performed on the ROA, the adj. ROE and the op. margin have p-value respectively equal to 0.06415, 0.8358 and 0.166 (**cfr. Appendix 58, 60 and 62**). Means should therefore not significantly differ from each other for test statistics respectively equal to 22354, 19563 and 18307.

Diversification rate ~ Geographic area

European companies and American companies have an average div. rate of 0.23 and 0.18, respectively (**cfr. Appendix 63**). This difference of div. rates' mean should not be statistically significant as the p-value is above 0.05 – 0.08645 – leading to the non-reject of the null hypothesis for a test statistic of 21479 (**cfr. Appendix 64**).

Diversification rate ~ Period

Average div. rate of companies before 2012 is equal to 0.19 and after 2012 is equal to 0.20 (**cfr. Appendix 65**). As the p-value is equal to 0.4475, the null hypothesis cannot be rejected as the p-value is above 5% and the difference between the average div. rate should not be statistically significant regarding the period for a test statistic equal to 21923 (**cfr. Appendix 66**).

Diversification rate ~ Current market cap

Companies characterized by a low mktcap have an average div. rate of 0.17, whereas companies characterized by a high mktcap have an average div. rate of 0.22 (**cfr. Appendix 67**). This difference of average div. rate is statistically significant as the p-value is equal to 0.000006038. The null hypothesis is actually rejected under a test statistic equal to 14776 (**cfr. Appendix 68**). Firms having a low mkt have lower div. rate than firms having a high mktcap. This discovery confirms the hypothesis claiming that companies investing abroad need sufficient resources: investing internationally actually represents a sizable cost.

Diversification rate ~ Enterprise value

Whilst companies belonging to the category of firms having a "low enterprise value" have an average div. rate of 0.13, companies belonging to the category of "high enterprise value" have an average div. rate of 0.22 (**cfr. Appendix 69**). As the null hypothesis claiming means of categories are not significantly different is rejected due to the p-value of 0.0000001132, the

average div. rate significantly differs regarding the enterprise value category for a test statistic of 12308 (**cfr. Appendix 70**). As for the relation between the div. rate and the mktcap, companies having a low EV have a lower div. rate than firms having a high EV. This finding confirms the hypothesis as well: investing abroad represents a sizable cost and companies without enough resources can therefore not afford to invest internationally.

Diversification rate ~ Unlevered beta

The average div. rate of companies having a low β is equal to 0.18, whereas companies having a high β have an average div. rate equal to 0.22 (**cfr. Appendix 71**). This difference should not be statistically significant as the p-value equal to 0.05387 is above 0.05 leading to the non-reject of the null hypothesis under test statistic equal to 10075 (**cfr. Appendix 72**).

Variables	Div. rate		
	W	P-value	Linked?
ROA	22354	0.06415	NO
Adj. ROE	19563	0.8358	NO
Op. margin	18307	0.166	NO
Geo. area	21479	0.08645	NO
Period	21923	0.4475	NO
Mktcap	14776	0.000006038	YES
EV	12308	0.0000001132	YES
β	10075	0.05387	NO

Table 10 – Results of Wilcoxon tests performed on the diversification rate of companies

D. RESULTS

According to the tests performed, the financial performance is impacted by the geo. area and the period since two financial performance indicators out of three tested are impacted by those variables. Asset management firms have greater ROA and greater adj. ROE after 2012 than before 2012. The financial performance of companies has therefore increased over time. Hence, regarding the geo. area, as the ROA and the adj. ROE are impacted in the opposite direction by this geo. location, it can be assumed the financial performance is not impacted by the geography of companies. However, the financial performance is not impacted by the div. rate since only one indicator out of three is impacted by this rate. Finally, the div. rate is not impacted by the financial performance, the geo. area, the period or the β but is impacted by the mktcap and the EV. As for the previous analysis, companies having a low div. rate have a low mktcap and a low EV, whereas companies having a high div. rate have a high mktcap and a high EV. All those results are consistent with the a priori hypothesis of this master thesis regarding the financial performance and the international portfolio diversification of companies.

CHAPTER VI – VARIANCE ANALYSIS

A. INTRODUCTION

An analysis of variance describes a numerical variable by a non-dichotomous categorical variable. The null hypothesis under this statistical test states that the difference between mean of categories does not significantly differ from 0. This test assumes data normally distributed (Broc, Carlsberg, Cazauvieilh, Faury, & Loyal, 2016). Therefore, the non-parametric test "Kruskal-Wallis" has to be applied since data of the database are not normally distributed.

$$H0: \mu_1 = \mu_2$$
$$H1: \mu_1 \neq \mu_2$$

B. FINANCIAL PERFORMANCE

Financial performance ~ Diversification rate

Firms having a low div. rate have an average ROA, adj. ROE and op. margin respectively equal to 4.97, 9.80 and 50.75; firms having a middle div. rate have an average ROA, adj. ROE and op. margin respectively equal to 7.53, 13.97 and 40.26; firms having a high div. rate have an average ROA, adj. ROE and op. margin respectively equal to 5.19, 13.35 and 30.35 (**cfr. Appendix 73, 75 and 77**). Those differences between average financial performance indicators regarding the div. rate category to which firms belong to should not be significant as p-values resulting of tests performed on the ROA, the adj. ROE and the op. margin are respectively equal to 0.2188, 0.9019 and 0.06449 (**cfr. Appendix 74, 76 and 78**). The null hypothesis cannot be rejected under the χ^2 respectively equal to 3.0391, 0.2065 and 5.4842. The div. rate should not impact the financial performance.

Variables	ROA			Adj. ROE			Op. margin		
	χ^2	P-value	Linked?	χ^2	P-value	Linked?	χ^2	P-value	Linked?
Div. rate	3.0391	0.2188	NO	0.2065	0.9019	NO	5.4824	0.06449	NO

Table 11 – Results of Kruskal-Wallis tests performed on the financial performance of companies

C. DIVERSIFICATION RATE

Diversification rate ~ Financial performance

Firms having a low ROA, a low adj. ROE or a low op. margin have a div. rate respectively equal to 0.22, 0.22 and 0.17; firms having a middle ROA, a middle adj. ROE or a middle op. margin have a div. rate respectively equal to 0.20, 0.19 and 0.26; firms having a high ROA, a high adj. ROE or a high op. margin have a div. rate respectively equal to 0.17, 0.19 and 0.17 (**cfr. Appendix 79, 81 and 83**). Difference between average div. rate of firms having a low, a middle and a high ROA or adj. ROE is not statistically significant as p-values are equal to 0.5332 and 0.8458 under χ^2 (**cfr. Appendix 80 and 82**). The difference between div. rate mean

of firms having a low, a middle or a high op. margin is statistically significant as the p-value is equal to 0.00002792 under the χ^2 of 20.973 (**cfr. Appendix 84**). Firms having a middle op. margin have a div. rate superior to firms with a high op. margin which have a div. rate superior to firms with a low op. margin. It confirms the hypothesis claiming that firms diversifying internationally their portfolios need sufficient resources and a strong financial performance.

Diversification rate ~ Current market cap

Companies having a low, a middle or a high mktcap have an average div. rate respectively equal to 0.13, 0.21 and 0.25 (**cfr. Appendix 85**). This difference between div. rate's mean is statistically significant as the p-value of 6.131 x 10^{-16} leads to the reject of the null hypothesis (**cfr. Appendix 86**). Firms having a high mktcap have a higher div. rate than firms having an inferior mktcap. It confirms the hypothesis that investing abroad is costly and requires funds.

Diversification rate ~ Enterprise value

Firms having a low, a middle or a high EV have an average div. rate equal to 0.13, 0.15 and 0.25 respectively (**cfr. Appendix 87**). As the p-value equal to 5.897 x 10^{-16}, the average div. rate differs regarding the category of EV to which they belong to (**cfr. Appendix 88**). Firms having a high EV have higher div. rate than firms having a middle or a low EV. This finding confirms the hypothesis as well: consequent resources are required to invest abroad.

Diversification rate ~ Beta

Firms having a low, a middle or a high β respectively have a div. rate equal to 0.18, 0.20 and 0.22 (**cfr. Appendix 89**). This difference is not statistically significant as the p-value resulting of the test equal 0.3775 (**cfr. Appendix 90**). The null hypothesis cannot be rejected and div. rate means should not significantly differ regarding the β category for a χ^2 equal to 1.9485.

Variables	Div. rate		
	χ^2	P-value	Linked?
ROA	1.2577	0.5332	NO
Adj. ROE	0.33497	0.8458	NO
Op. margin	20.973	0.00002792	YES
Mktcap	42.425	6.131 x 10^{-16}	YES
EV	42.503	5.897 x 10^{-16}	YES
β	1.9485	0.3775	NO

Table 12 – Results of Kruskal-Wallis tests performed on the diversification rate of companies

D. RESULTS

The financial performance of a company is not impacted by its div. rate, whereas the div. rate is impacted by the mktcap and the EV. Firms having a high mktcap or a high EV have a div. rate superior to firms having a low mktcap or a low EV.

CHAPTER VII – LINEAR REGRESSION

A. INTRODUCTION

A linear regression is a statistical method whose objective is to determine if a link exists between variables: the explanatory variables – the independent variables – and the variable to explain – the dependent variable. The equation of a linear regression is presented below, where Y is the dependent variable, X the independent variable and ε the error term. Parameters β_0 and β_1 respectively correspond to the intercept and the slope (Cornillon, et al., 2018).

$$Y = \beta_0 + \beta_1 X_1 + \cdots + \beta_i X_i + \varepsilon$$

The hypotheses of a linear regression are the following:

$$H0: Independent\ variables\ cannot\ predict\ the\ dependent\ variable$$

$$H1: Independent\ variables\ can\ predict\ the\ dependent\ variable$$

This statistical test assumes normally distributed data. Besides, to ensure linear regressions are relevant, residuals of regressions have to respect four conditions. Statistical tests mentioned below are performed on residuals of regressions performed to ensure conditions are respected. There must not exist any outlier amongst residuals [1], residuals have to be normally distributed [2], residuals have to be independent [3] and residuals have to be homoscedastic [4] (Broc, Carlsberg, Cazauvieilh, Faury, & Loyal, 2016).

[1] Outlier test

$$H0: \beta_1 = There\ is\ no\ outlier$$

$$H1: \beta_1 \neq There\ exists\ outliers$$

[2] Shapiro-Wilk test

$$H0: \beta_1 = Data\ follow\ a\ normal\ distribution$$

$$H1: \beta_1 \neq Data\ do\ not\ follow\ a\ normal\ distribution$$

[3] Durbin-Watson test

$$H0: \beta_1 = Data\ are\ independent$$

$$H1: \beta_1 \neq Data\ are\ not\ independent$$

[4] Breusch-Pagan

$$H0: \beta_1 = Data\ are\ homoscedastic$$

$$H1: \beta_1 \neq Data\ are\ not\ homoscedastic$$

In this study, linear regressions are firstly performed without normalizing the data exploited. Residuals of those regressions do not fully respect conditions listed above. To improve the relevancy of linear regressions performed, new linear regressions have been performed with normalized data. Even if conditions listed above are still not fully respected, those last linear regressions – exploiting normalized data – are still more relevant than previous linear regressions – exploiting data not normally distributed – since conditions are more respected. Therefore, linear regressions performed in this chapter exploit normalized data and results described those linear regressions exploiting normalized data.

B. FINANCIAL PERFORMANCE

Relationships between financial performance's indicators of asset management companies and their div. rate are analyzed. Linear regressions precisely performed are the following.

$$[1]\ \boldsymbol{ROA \sim \beta_0 + \beta_1\, x\, Div.rate + \varepsilon}$$
$$[2]\ \boldsymbol{Adj.ROE \sim \beta_0 + \beta_1\, x\, Div.rate + \varepsilon}$$
$$[3]\ \boldsymbol{Op.margin \sim \beta_0 + \beta_1\, x\, Div.rate + \varepsilon}$$

Results of those linear regressions are quite similar as all financial performance's indicators could not be explained by the div. rate as p-values resulting of those regressions lead to the non-reject of the null hypothesis. Besides, statistical tests are performed on residuals as conditions have to be respected by those residuals to ensure the relevancy of linear regressions performed.

[1] $\boldsymbol{ROA \sim \beta_0 + \beta_1 x\, Div.rate}$

The ROA is equal to 6.3514 when the div. rate is equal to 0. Moreover, the ROA could be predicted by the equation below leading to a decrease of the ROA of 2.2576 percentage points when the div. rate increases by one. Hence, this decrease is not statistically significant as the p-value is above 0.05, leading to the non-reject of the null hypothesis. The div. rate should actually not be able to predict the ROA (**cfr. Appendix 91**).

$$\boldsymbol{ROA \sim 6.3514 + (-2.2576)\, x\, Div.rate}$$

	Estimate	**p-value**
Intercept	6.3514	1.59×10^{-16}
Div. rate	-2.2576	0.41

Table 13 – Results of the linear regression [ROA ~ $\beta_0 + \beta_1$ x Div.rate]

The effect of the variable div. rate explains 0.17% of the variable ROA variance due to the value of the R^2 under the F-statistic of 0.6801. This model is not statistically significant as the p-value is above 5%. It is logical since the independent variable does not explain the dependent variable.

$\boldsymbol{R^2}$	**F-statistic**	**p-value**
0.001697	0.6801	0.4101

Table 14 – Validity of the linear regression [ROA ~ $\beta_0 + \beta_1$ x Div.rate]

Statistical tests are performed on residuals of this model to assess the relevancy of this model (**cfr. Appendix 92**). As observed in table 15, this model is relevant since there is no outlier and residuals are normally distributed but is not relevant as residuals are not independent and not homoscedastic.

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.9992	YES
Independence	2.2×10^{-16}	NO
Homoscedasticity	0.00178	NO

Table 15 – Residuals analysis of the linear regression [ROA ~ $\beta_0 + \beta_1$ x Div.rate]

[2] $\boldsymbol{Adj.ROE \sim \beta_1 x\ Div.rate}$

According to the equation below, the adj. ROE is equal to 12.490 when the div. rate is equal to 0 and decreases by 0.619 percentage points when the div. rate increases by one. However, this decrease is not statistically significant as the p-value resulting of the linear regression performed on the adj. ROE is above 0.05 leading to the non-reject of the null hypothesis. The div. rate should therefore not be able to predict this adj. ROE (**cfr. Appendix 93**).

$$\boldsymbol{Adj.ROE \sim 12.490 + (-0.619)\ x\ Div.rate}$$

	Estimate	p-value
Intercept	12.490	1.73×10^{-16}
Div. rate	-0.619	0.908

Table 16 – Results of the linear regression [Adj.ROE ~ $\beta_0 + \beta_1$ x Div.rate]

As observed in table 17, the model explains a low percentage of the total adj. ROE variance since the R^2 is low. This result is for a test statistic equal to 0.01327 but the model is not statistically significant as the p-value is above 5% since the explanatory variable does not explain the dependent variable.

R^2	F-statistic	p-value
3.352×10^{-16}	0.01327	0.9083

Table 17 – Validity of the linear regression [Adj.ROE ~ $\beta_0 + \beta_1$ x Div.rate]

This linear regression is relevant as there is no outlier amongst residuals, residuals are normally distributed and residuals are homoscedastic. Hence, the model is not relevant as residuals are not independent (**cfr. Appendix 94**).

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	1	YES
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.3173	YES

Table 18 – Residuals analysis of the linear regression [Adj.ROE ~ $\beta_0 + \beta_1$ x Div.rate]

[3] $\boldsymbol{Op.margin \sim \beta_1 x\ Div.rate}$

The op. margin is equal to 36.486 when the div. rate is equal to 0 and increases by 20.387 percentage points when the div. rate increases by one. Hence, this increase is not statistically significant as the p-value of the div. rate is above 5%, leading to the non-reject of the null hypothesis. Accordingly, the div. rate should not impact the op. margin **(cfr. Appendix 95**).

$$\boldsymbol{Op.margin \sim 36.486 + 20.387\ x\ Div.rate}$$

	Estimate	p-value
Intercept	36.486	0.0000833
Div. rate	20.387	0.516

Table 19 – Results of the linear regression [Op.margin ~ $\beta_0 + \beta_1$ x Div.rate]

The effect of the variable div. rate explains 0.11% of the op. margin's variance for a test statistic of 0.4221. This model is not statistically significant as the p-value is above 0.05 and the independent variable does not explain the dependent variable.

R^2	F-statistic	p-value
0.001062	0.4221	0.5163

Table 20 – Validity of the linear regression [Op.margin ~ $\beta_0 + \beta_1$ x Div.rate]

The linear regression proceeded is relevant as no outlier exists amongst residuals and residuals follow a normal distribution. Hence, this model is not statistically significant as residuals are dependent and heteroscedastic (**cfr. Appendix 96**).

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.9998	YES
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.01222	NO

Table 21 – Residuals analysis of the linear regression [Op.margin ~ $\beta_0 + \beta_1$ x Div.rate]

C. DIVERSIFICATION RATE

The following linear regression is performed regarding the div. rate.

$$\boldsymbol{Div.rate \sim \beta_0 + \beta_1\, x\, ROA + \beta_2\, x\, Adj.ROE + \beta_3 x\, Op.margin + \beta_4\, x\, Mktcap + \beta_5\, x\, EV + \beta_6 x\, \beta + \varepsilon}$$

According to the linear regression proceeded, the div. rate is equal to 0.170 when all variables included in the model are equal to 0. Then, the only variable impacting this div. rate is the ROA since its p-value is below 5% (**cfr. Appendix 97**). The div. rate actually decreases by 0.004 percentage points when the ROA increases by one. This result is inconsistent with the hypothesis claiming that companies investing abroad need sufficient resources and accordingly a consequent financial performance. This finding rather illustrates that investing abroad is costly and reduces the financial performance.

$$\boldsymbol{Div.rate \sim 0.170 + (-0.004)\, x\, ROA + 0.00037\, x\, Adj.ROE + 0.00023\, x\, Op.margin + 0.0000083\, x\, Mktcap + (-0.00000036)\, x\, EV + 0.00071\, x\, \beta}$$

	Estimate	p-value
Intercept	0.170	3.54 x 10^{-16}
ROA	-0.004	0.0402
Adj. ROE	0.00037	0.6760
Op. margin	0.00023	0.0572
Mktcap	0.0000083	0.0659
EV	-0.00000036	0.9312
	0.00071	0.2275

Table 22 – Results of the linear regression [Div.rate ~ β_0 + β_1 x ROA+ β_2 x Adj.ROE + β_3 x Op.margin+ β_4 x Mktcap + β_5 x EV+ β_5 x β]

As observed in table 23, the model explains 12.74% of the div. rate variance under a test statistic equal to 6.838. This model is statistically significant as the p-value is below 0.05.

R^2	F-statistic	p-value
0.1274	6.838	0.0000008706

Table 23 – Validity of the linear regression [Div.rate ~ β_0 + β_1 x ROA+ β_2 x Adj.ROE + β_3 x Op.margin+ β_4 x Mktcap + β_5 x EV+ β_6 x β]

The linear regression proceeded is relevant as no outlier exists amongst residuals and residuals are homoscedastic. Hence, this model is not statistically significant as residuals do not follow a normal distribution and are not independent (**cfr. Appendix 98**).

Conditions	p-value	Respected?
No outlier	0.12115	YES
Normal distribution	0.001311	NO
Independence	2.2×10^{-16}	NO
Homoscedasticity	0.08403	YES

Table 24 – Residuals analysis of the linear regression [Div.rate ~ $\beta_0 + \beta_1$ x ROA+ β_2 x Adj.ROE + β_3 x Op.margin+ β_4 x Mktcap + β_5 x EV + β_6 x β]

D. RESULTS

To conclude, the financial performance is not impacted by the div. rate as all financial performance indicators tested are not impacted by this rate.

Variables	ROA		Adj. ROE		Op. margin	
	P-value	Linked?	P-value	Linked?	P-value	Linked?
Div. rate	0.41	NO	0.908	NO	0.516	NO

Table 25 – Results of linear regressions performed on the financial performance of companies

After that, the div. rate is impacted by the ROA. Nevertheless, as the div. rate is not impacted by the adj. ROE or the op. margin, it can be assumed the financial performance does not impact the div. rate as two financial performance indicators out of three do not impact the div. rate.

Variables	Div. rate	
	P-value	Linked?
ROA	0.0402	YES
Adj. ROE	0.6760	NO
Op. margin	0.0572	NO
Mktcap	0.0659	NO
EV	0.9312	NO
β	0.2275	NO

Table 26 – Results of linear regressions performed on the diversification rate of companies

CHAPTER VIII – LINEAR MODEL

A. INTRODUCTION

The objective of a linear model is to predict a dependent variable by one or more than one independent variables. The null hypothesis of this statistical test states the dependent variable cannot be predicted by the independent variables. The dependent variable has to be a numerical variable and the independent variables can independently be numerical or categorical (Broc, Carlsberg, Cazauvieilh, Faury, & Loyal, 2016). As for linear regressions, linear models assume normally distributed data. Those linear models are thus performed without normalized data and then with normalized data. As for linear regressions, linear models are more relevant with normalized data since conditions required by residuals are more respected with normalized data. Consequently, results in this chapter are from linear models exploiting normalized data.

B. FINANCIAL PERFORMANCE

Linear models performed regarding the financial performance are the following.

$$[1]\ \boldsymbol{ROA \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$
$$[2]\ \boldsymbol{Adj.ROE \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$
$$[3]\ \boldsymbol{Op.margin \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$

---

[1] $\boldsymbol{ROA \sim \beta_0 + \beta_1 x\, Div.rate + \beta_2 x\, Geo.area + \beta_3\, x\, Period}$

The ROA is equal to 9.142 when the div. rate is equal to 0. Moreover, the ROA is only impacted by the period as this variable as a p-value which allows to reject the null hypothesis. Other variables have p-values above 0.05 leading to the non-reject of the null hypothesis (**cfr. Appendix 99**). The div. rate and the geo. area should not explain this ROA, whereas the period explains the ROA. The ROA is 3.357 percentage points lower before 2012 than after 2012. This result confirms the hypothesis claiming that the financial performance of companies has increased over time since the globalization of the world has appeared and is profitable for them since investors can more easily invest everywhere in the world.

$$\boldsymbol{ROA \sim 0.142 + (-3.061)\, x\, Div.rate + (-1.572)\, x\, Geo.area + (-3.357)\, x\, Period}$$

	Estimate	p-value
Intercept	9.142	4.68 x 10^{-16}
Div. rate	-3.061	0.26312
Geo. area (US)	-1.572	0.18806
Period (Before 2012)	-3.357	0.00363

Table 27 – Results of the linear model [ROA ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

As observed in table 28, this model explains 2.65% of the total ROA variance for a test statistic equal to 3.611. Besides, this model is statistically significant as the p-value of the model is below 0.05.

R^2	F-statistic	p-value
0.0265	3.611	0.01345

Table 28 – Validity of the linear model [ROA ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

Statistical tests are performed on residuals of this model to assess the relevancy of this model (**cfr. Appendix 100**). As there is no outlier and residuals are normally distributed, the model is relevant. Hence, the model is not totally relevant as residuals are not independent and are not homoscedastic.

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.6475	YES
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.0002751	NO

Table 29 – Residuals analysis of the linear model [ROA ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

[2] $$\boldsymbol{Adj.ROE \sim \beta_0 + \beta_1 x\ Div.rate + \beta_2 x\ Geo.area + \beta_3\ x\ Period}$$

The adj. ROE is equal to 11.0661 when other variables – div. rate, geo. area and period – are equal to 0. Then, the adj. ROE is explained by the geo. area and the period as p-values of those variables resulting of the linear model performed allow the reject of the null hypothesis. American companies have an adj. ROE 6.3762 percentage points higher than European companies. This finding is analyzed in parallel with the op. margin behavior in the last part of this chapter. Then, all companies have an adj. ROE 5.6203 percentage points lower before 2012 than after 2012. This finding is consistent with the hypothesis claiming that firms benefit from a stronger financial performance over time thanks to the globalization and the openness of the financial world. Investors can actually invest more easily abroad (**cfr. Appendix 101**).

$$\boldsymbol{Adj.ROE \sim 11.0661 + 0.3124\ x\ Div.rate + 6.3762\ x\ Geo.area + (-5.6203)\ x\ Period}$$

	Estimate	p-value
Intercept	11.0661	0.0000124
Div. rate	0.3124	0.9533
Geo. area (US)	6.3762	0.0062
Period (Before 2012)	-5.6203	0.0122

Table 30 – Results of the linear model [Adj. ROE ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

The model explains 3.47% of the total adj. ROE variance under the test statistic of 4.721. this model is statistically significant since the p-value is below 5%.

R^2	F-statistic	p-value
0.0347	4.721	0.002997

Table 31 – Validity of the linear model [Adj. ROE ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

The model is valid as three conditions applied on residuals out of four are respected. Actually, there is no outlier amongst residuals, residuals are normally distributed and residuals are homoscedastic (**cfr. Appendix 102**).

Conditions	p-value	Respected?
No outlier	0.67524	YES
Normal distribution	0.8748	YES
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.05512	YES

Table 32 – Residuals analysis of the linear model [Adj. ROE ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

[3] $$Op.margin \sim \beta_0 + \beta_1 x\ Div.rate + \beta_2 x\ Geo.area + \beta_3\ x\ Period$$

The op. margin is impacted by the geographic area as the null hypothesis is rejected for this variable. Hence, the div. rate and the period should not impact the op. margin as the p-value are above 0.05 (**cfr. Appendix 103**). The op. margin of American companies is actually 57.138 percentage points lower than European companies. This finding is analyzed in parallel with the adj. ROE behavior in the last part of this chapter.

$$Op.margin \sim 85.189 + 3.795\ x\ Div.rate + (-57.138)\ x\ Geo.area + (-18.5)\ x\ Period$$

	Estimate	p-value
Intercept	85.189	0.0000000109
Div. rate	3.795	0.902
Geo. area (US)	-57.138	0.0000351382
Period (Before 2012)	-18.500	0.158

Table 33 – Results of the linear model [Op. margin ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

The model explains 4.811% of the op. margin variance under the test statistic of 6.655. Moreover, this model is statistically significant as the p-value is below 5%.

R^2	F-statistic	p-value
0.04811	6.655	0.0002154

Table 34 – Validity of the linear model [Op. margin ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

Statistical tests are performed on residuals of this model to assess its relevancy. There is no outlier amongst residuals and residuals follow a normal distribution. Hence, they are dependent and heteroscedastic (**cfr. Appendix 104**). The model is thus not totally relevant.

Conditions	p-value	Respected?
No outlier	0.68189	YES
Normal distribution	0.3596	YES
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.00003193	NO

Table 35 – Residuals analysis of the linear model [Op. margin ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

C. DIVERSIFICATION RATE

The linear regression proceeded regarding the div. rate is the following.

$$\boldsymbol{Div.rate \sim \beta_0 + \beta_1\, x\, ROA + \beta_2\, x\, Adj.ROE + \beta_3\, x\, Op.margin + \beta_4\, x\, Geo.area + \beta_5\, x\, Period + \beta_6\, x\, Mktcap + \beta_7\, x\, EV + \beta_8\, x\, \beta + \varepsilon}$$

The div. rate is not impacted by any variable analyzed according to this statistical test (**cfr. Appendix 105**). Therefore, any decrease or increase on the div. rate generated by following variables is not statistically significant since p-values are all above 0.05.

$$\boldsymbol{Div.rate \sim 0.155 + (-0.004)\, x\, ROA + 0.000355\, x\, Adj.ROE + 0.000233\, x\, Op.margin + 0.00498\, x\, Geo.area + 0.020\, x\, Period + 0.0000083\, x\, Mktcap + (-0.00000036)\, x\, EV + 0.00071\, x\, \beta}$$

	Estimate	p-value
Intercept	0.155	0.000000414
ROA	-0.0040	0.0505
Adj. ROE	0.000355	0.6930
Op. margin	0.000233	0.0591
Geo. area	0.00498	0.8519
Period	0.020	0.3867
Mktcap	0.00000815	0.0734
EV	0.00000002856	0.9946
β	0.0007639	0.1989

Table 36 – Results of the linear model [Div.rate ~ $\beta_0 + \beta_1$ x ROA + β_2 x Adj.ROE + β_3 x Op.margin + β_4 x Geo.area + β_5 x Period + β_6 x Mktcap + β_7 x EV + β_8 x β]

The model explains 13% of the div. rate variance for a test statistic equal to 5.209. Moreover, this model is statistically significant as the p-value is below 5%.

R^2	F-statistic	p-value
0.13	5.209	0.000004416

Table 37 – Validity of the linear model [Div.rate ~ $\beta_0 + \beta_1$ x ROA + β_2 x Adj.ROE + β_3 x Op.margin + β_4 x Geo.area + β_5 x Period + β_6 x Mktcap + β_7 x EV + β_8 x β]

The model performed is relevant as there is no outlier amongst residuals and those residuals are homoscedastic. Hence, they do not respect the following condition: being normally distributed and being independent (**cfr. Appendix 106**). This model is therefore not fully relevant.

Conditions	p-value	Respected?
No outlier	0.13348	YES
Normal distribution	0.001082	NO
Independence	2.2 x 10^{-16}	NO
Homoscedasticity	0.1127	YES

Table 38 – Residuals analysis of the linear model [Div.rate ~ $\beta_0 + \beta_1$ x ROA + β_2 x Adj.ROE + β_3 x Op.margin + β_4 x Geo.area + β_5 x Period + β_6 x Mktcap + β_7 x EV + β_8 x β]

D. RESULTS

The financial performance is impacted by the geographic area. Actually, American companies have higher adj. ROE and lower op. margin than European companies. Since both indicators impact the div. rate in the opposite direction, it can be assumed the geo. area does not impact the div. rate of asset management companies. The financial performance is also impacted by the period: firms benefit from stronger financial performance after 2012 than before 2012. Those findings confirm hypothesis of this master thesis.

Variables	ROA		Adj. ROE		Op. margin	
	P-value	Linked?	P-value	Linked?	P-value	Linked?
Div. rate	0.26312	NO	0.9533	NO	0.902	NO
Geo. area	0.18806	NO	0.0062	YES	0.0000351382	YES
Period	0.00363	YES	0.0122	YES	0.158	NO

Table 39 – Results of linear models performed on the financial performance of companies

Variables	Div. rate	
	P-value	Linked?
ROA	0.0505	NO
Adj. ROE	0.6930	NO
Op. margin	0.0591	NO
Geo. area	0.8519	NO
Period	0.3867	NO
Mktcap	0.0734	NO
EV	0.9946	NO
β	0.1989	NO

Table 40 – Results of linear models performed on the diversification rate of companies

CHAPTER IX – GENERALIZED LINEAR MODEL

A. INTRODUCTION

A generalized linear model is applied when data exploited do not respect the conditions required by traditional linear models (Broc, Carlsberg, Cazauvieilh, Faury, & Loyal, 2016). In this case, the "logit" function is used as variables explained are binary qualitative variables – dependent variable following a binomial distribution. The goal of a logistic regression is to predict a binary qualitative variable by quantitative and qualitative variables (Cornillon, et al., 2018).

$$H_0: Independent\ variables\ have\ no\ impact\ on\ the\ dependent\ variable$$
$$H_1: Independent\ variables\ have\ an\ impact\ on\ the\ dependent\ variable$$

B. FINANCIAL PERFORMANCE

The generalized linear models below are performed in this chapter.

$$[1]\ \boldsymbol{ROA \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$
$$[2]\boldsymbol{Adj.ROE \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$
$$[3]\ \boldsymbol{Op.margin \sim \beta_0 + \beta_1\, x\, Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon}$$

---

[1] $\boldsymbol{ROA \sim \beta_1 x\, Div.rate + \beta_2 x\, Geo.area + \beta_3\, x\, Period}$

As observed in table 41, the ROA is impacted by the div. rate and the period as p-values of those variables are statistically significant (**cfr. Appendix 107**). The null hypothesis claiming those variables have no impact on the ROA is rejected. The ROA decreases by 1.3506 percentage points when the div. rate increases by one. This result is inconsistent with the hypothesis claiming that companies diversifying internationally their portfolios should benefit from higher financial performance. This finding rather illustrates that investing abroad is a sizable cost decreasing the financial performance of companies. After that, the ROA is 0.6195 percentage points lower before 2012. This result confirms the hypothesis claiming that financial performance of companies has increased over time due to the globalization of the financial world. Investors can actually invest more easily everywhere in the world.

$$\boldsymbol{ROA \sim 0.7772 + (-1.3506)\, x\, Div.rate + (-0.3378)\, x\, Geo.area + (-0.6195)\, x\, Period}$$

Variable	Estimate	p-value
Intercept	0.7772	0.000724
Div. rate	-1.3506	0.007678
Geo. area (US)	-0.3378	0.112216
Period (Before 2012)	-0.6195	0.002472

Table 41 – Results of the generalized linear model LOGIT [ROA ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

The model approximately explains 3.3% of the ROA variance (**cfr. Appendix 108**).

Approximate R^2
0.03329631

Table 42 – Approximate R-squared of the generalized linear model LOGIT [ROA ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

[2] $$\boldsymbol{Adj.ROE \sim \beta_1 x\ Div.rate + \beta_2 x\ Geo.area + \beta_3\ x\ Period}$$

The adj. ROE is impacted by the geo. area and the period since their p-values are significant (**cfr. Appendix 109**). American firms have an adj. ROE superior of 0.6618 percentage points to European firms. This finding is analyzed in parallel with the op. margin in the last part of this chapter. Firms before 2012 have an adj. ROE 0.4759 percentage points lower than after 2012. It confirms the hypothesis: financial performance has increased over time due to the openness of the world leading to investments from everywhere thanks to the accessibility.

$$\boldsymbol{Adj.ROE \sim (-12.09) + (-0.3117)\ x\ Div.rate + 0.6618\ x\ Geo.area + (-0.4759)\ x\ Period}$$

Variable	Estimate	p-value
Intercept	-0.1209	0.58835
Div. rate	-0.3117	0.50809
Geo. area (US)	0.6618	0.00192
Period (Before 2012)	-0.4759	0.02022

Table 43 – Results of the generalized linear model LOGIT [Adj. ROE ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

This linear model explains 3.01% of the total population studied (**cfr. Appendix 110**).

Approximate R^2
0.03011079

Table 44 – Approximate R-squared of the generalized linear model LOGIT [Adj. ROE ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

[3] $$\boldsymbol{Op.margin \sim \beta_1 x\ Div.rate + \beta_2 x\ Geo.area + \beta_3\ x\ Period}$$

The op. margin is impacted by the geo. area and the period as they have p-values are statistically significant (**cfr. Appendix 111**). American firms have an op. margin 0.4464 percentage points inferior to European firms and companies before 2012 have an op. margin inferior of 0.4010 percentage points to period after 2012. The openness of the world over time is profitable for companies since investors can invest everywhere in the world more easily.

$$\boldsymbol{Op.margin \sim 0.5606 + (-0.4357)\ x\ Div.rate + (-0.4464)\ x\ Geo.area + (-0.4010)\ x\ Period}$$

Variable	Estimate	p-value
Intercept	0.5606	0.0126
Div. rate	-0.4357	0.3409
Geo. area (US)	-0.4464	0.0355
Period (Before 2012)	-0.4010	0.0479

Table 45 – Results of the generalized linear model LOGIT [Op. margin ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

The model explains the variance of 1.16% of the op. margin variance (**cfr. Appendix 112**).

Approximate R^2
0.01618456

Table 46 – Approximate R-squared of the generalized linear model LOGIT [Op. margin ~ $\beta_0 + \beta_1$ x Div.rate + β_2 x Geo.area + β_3 x Period]

C. DIVERSIFICATION RATE

The linear regression proceeded regarding the div. rate is the following.

$$\boldsymbol{Div.rate \sim \beta_0 + \beta_1\, x\, ROA + \beta_2\, x\, Adj.ROE + \beta_3\, x\, Op.margin + \beta_4\, x\, Geo.area + \beta_5\, x\, Period + \beta_6\, x\, Mktcap + \beta_7\, x\, EV + \beta_8\, x\, \beta + \varepsilon}$$

According to the generalized model performed, the div. rate is impacted by the ROA (**cfr. Appendix 113**). This variable is actually the only one which has a p-value statistically significant leading to the reject of the null hypothesis. The div. rate of a company increases by 0.04920 percentage points when the ROA increases by one. This finding confirms the a priori hypothesis claiming that companies are able to invest internationally only if they have enough resources since investing abroad represents a sizable cost. It is therefore logical that the diversification rate of a company increases when the financial performance increases as well. Companies actually benefit from consequent resources and are thus more inclined to invest internationally.

$$\boldsymbol{Div.rate \sim (-0.90559) + 0.04920\, x\, ROA + (-0.01037) x\, Adj.ROE + (-0.003257) x\, Op.margin + 0.0369798\, x\, Geo.area + 0.07973\, x\, Period + 0.00006183\, x\, Mktcap + 0.00006283\, x\, EV + (-0.0075528)\, x\, \beta}$$

Variable	Estimate	p-value
Intercept	-0.90559	0.0210
ROA	0.04920	0.0346
Adj. ROE	-0.01037	0.4576
Op. margin	-0.003257	0.3463
Geo. area	0.0369798	0.9007
Period	0.07973	0.7653
Mktcap	0.00006183	0.3398
EV	0.00006282	0.2656
β	-0.0075528	0.2892

Table 47 – Results of the generalized linear model LOGIT [Div.rate ~ $\beta_0 + \beta_1$ x ROA + β_2 x Adj.ROE + β_3 x Op.margin + β_4 x Geo.area + β_5 x Period + β_6 x Mktcap + β_7 x EV + β_8 x β]

As observed in table 48, the model performed explains 14.14% of the total variance of companies exploited in this study (**cfr. Appendix 114**).

Approximate R^2
0.1414379

Table 48 – Approximate R-squared of the generalized linear model LOGIT [Div.rate ~ $\beta_0 + \beta_1$ x ROA + β_2 x Adj.ROE + β_3 x Op.margin + β_4 x Geo.area + β_5 x Period + β_6 x Mktcap + β_7 x EV + β_8 x β]

D. RESULTS

As a global result, the financial performance is impacted by the geo. area and the period. Firstly, regarding the geo. area, since American companies have greater adj. ROE than European companies but lower op. margin, it can be assumed the financial performance of firms is not impacted by their geo. area since both financial performance indicators are impacted in the opposite direction. Those findings are consistent with the hypothesis claiming that the financial performance should not be different between European and American companies as investors believe that performances of European and American stocks should be relatively similar. The finding relative to the period is consistent as well: financial performance of firms has increased over time due to the openness of the world leading to investments from everywhere.

Variables	ROA		Adj. ROE		Op. margin	
	P-value	Linked?	P-value	Linked?	P-value	Linked?
Div. rate	0.007678	YES	0.50809	NO	0.3409	NO
Geo. area	0.112216	NO	0.00192	YES	0.0355	YES
Period	0.002472	YES	0.02022	YES	0.0479	YES

Table 49 – Results of generalized linear model LOGIT performed on the financial performance of companies

After that, the div. rate is not impacted by any variable. More to the point, it can be assumed the div. rate is not impacted by the financial performance as only one indicator out of the three analyzed impacts this rate.

Variables	Div. rate	
	P-value	Linked?
ROA	0.0346	YES
Adj. ROE	0.4576	NO
Op. margin	0.3463	NO
Geo. area	0.9007	NO
Period	0.7653	NO
Mktcap	0.3398	NO
EV	0.2656	NO
β	0.2892	NO

Table 50 – Results of generalized linear model LOGIT performed on the diversification rate of companies

CHAPTER X – FLUCTUATIONS ANALYSIS

A. INTRODUCTION

In this part, extra analyses are executed. Whilst previous analyses performed in this master thesis exploited the data themselves, those extra analyses are exploiting variations of data. Linear regressions are consequently performed exploiting variations of data. The formula below is used to compute variations, where X_t is a variable. A new database has therefore been created. Each data is computed according to the following equation.

$$\frac{X_t - X_{t-1}}{X_{t-1}}$$

As explained in the chapter "X. Linear model", those tests assume normally distributed data. Therefore, as for the previous linear models performed, linear models were performed without normalized data and with normalized data. As conditions on residuals are more respected with normalized data, results of this chapter are linear models exploiting normalized data. The function "Normalize ()" on R is thus exploited. As a matter of fact, to ensure linear models are correct, residuals of those regressions have to respect four conditions. Statistical tests are actually performed on residuals of regressions performed to ensure conditions are respected. There must not exist any outlier, residuals have to be normally distributed, residuals have to be independent and residuals have to be homoscedastic.

B. FINANCIAL PERFORMANCE

$$[1]\ \Delta ROA \sim \beta_0 + \beta_1\, x\, \Delta Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon$$
$$[2]\ \Delta Adj.ROE \sim \beta_0 + \beta_1\, x\, \Delta Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon$$
$$[3]\ \Delta Op.margin \sim \beta_0 + \beta_1\, x\, \Delta Div.rate + \beta_2\, x\, Geo.area + \beta_3\, x\, Period + \varepsilon$$

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[1] $\Delta ROA \sim \beta_1 x\, \Delta Div.rate + \beta_2 x\, Geo.area + \beta_3\, x\, Period$

The ΔROA is not impacted by any other variation according to the test (**cfr. Appendix 115**). As a logical consequence, impact of variables within the equation below are not statistically significant.

$$\Delta ROA \sim 1.2886242 + (-0.0001977)\, x\, \Delta Div.rate + (-0.2429840)\, x\, Geo.area + (-0.0.622720)\, x\, Period$$

	Estimate	p-value
Intercept	1.2886242	0.0527
ΔDiv. rate	-0.0001977	0.9800
Geo. area	-0.2429840	0.7435
Period	-0.0622720	0.9320

Table 51 – Results of the linear regression [ΔROA ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

As observed in table 52, the percentage of the ΔROA variance explained by the model is low under the test statistic of 0.03802 and this model is not statistically significant. It is logical since independent variables do not explain the dependent variable.

R^2	F-statistic	p-value
0.0003751	0.03802	0.9901

Table 52 – Results of the linear regression [ΔROA ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

As observed in table 53, the model performed is totally relevant since all conditions required from residuals are respected (**cfr. Appendix 116**).

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.9998	YES
Independence	0.9151	YES
Homoscedasticity	0.08417	YES

Table 53 – Residuals analysis of the linear regression [ΔROA ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

[2] $\boldsymbol{\Delta Adj.ROE \sim \beta_1 x\, \Delta Div.rate + \beta_2 x\, Geo.area + \beta_3\, x\, Period}$

The Δ adj. ROE is not impacted neither by other variables since all p-values are not statistically significant (**cfr. Appendix 117**). As for the previous linear model realized, no variation does impact the Δ adj. ROE.

$$\boldsymbol{\Delta Adj.ROE \sim 0.622665 + (-0.002695)\, x\, \Delta Div.rate + (-0.468695)\, x\, Geo.area + 0.040044\, x\, Period}$$

	Estimate	p-value
Intercept	0.622665	0.287
ΔDiv. rate	-0.002695	0.699
Geo. area	-0.468695	0.474
Period	0.040044	0.950

Table 54 – Results of the linear regression [ΔAdj. ROE ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

As a logical consequence, the R^2 is low and the model is not statistically significant since independent variables do not explain the dependent variable.

R^2	F-statistic	p-value
0.002137	0.2163	0.8851

Table 55 – Results of the linear regression [ΔAdj. ROE ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

The model is not fully relevant as one condition out of four residuals have to respect is not verified (**cfr. Appendix 118**). Residuals are not homoscedastic.

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.9965	YES
Independence	0.9972	YES
Homoscedasticity	0.00003316	NO

Table 56 – Residuals analysis of the linear regression [ΔAdj. ROE ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

[3] $\boldsymbol{\Delta Op.margin \sim \beta_1 x\, \Delta Div.rate + \beta_2 x\, Geo.area + \beta_3\, x\, Period}$

As for previous financial performance's indicators, Δop. margin is not impacted by other variables (**cfr. Appendix 119**). This indicator behavior is similar as the two firsts tested: no variable has an impact on the Δop. margin.

$$\boldsymbol{\Delta Op.margin \sim 0.304817 + (-0.003073)\, x\, \Delta Div.rate + 0.503041 x\, Geo.area + (-0.456961)\, x\, Period}$$

	Estimate	p-value
Intercept	0.304817	0.806
ΔDiv. rate	-0.003073	0.836
Geo. area	0.503041	0.718
Period	-0.456961	0.739

Table 57 – Results of the linear regression [ΔOp. margin ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

Once again, the R^2 is low and the model is not statistically significant.

R^2	F-statistic	p-value
0.0009802	0.09845	0.9608

Table 58 – Results of the linear regression [ΔOp. margin ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

As observed in table 59, this linear model is fully relevant as residuals respect all necessary conditions required to ensure the relevancy of a model (**cfr. Appendix 120**).

Conditions	p-value	Respected?
No outlier	NA	YES
Normal distribution	0.9619	YES
Independence	0.9972	YES
Homoscedasticity	0.4652	YES

Table 59 – Residuals analysis of the linear regression [ΔOp. margin ~ $\beta_0 + \beta_1$ x ΔDiv.rate + β_2 x Geo.area + β_3 x Period]

C. DIVERSIFICATION RATE

The linear regression proceeded regarding the div. rate is the following.

$$\Delta Div.rate \sim \beta_0 + \beta_1 \, x \, \Delta ROA + \beta_2 \, x \, \Delta Adj.ROE + \beta_3 \, x \, \Delta Op.margin + \beta_4 \, x \, Geo.area + \beta_5 \, x \, Period + \beta_6 \, x \, \Delta Mktcap + \beta_7 \, x \, \Delta EV + \beta_8 \, x \, \Delta\beta + \varepsilon$$

The Δ div. rate is not impacted by any other variables as no variable has a statistically significant p-value (**cfr. Appendix 121**). As for the financial performance's indicators, the Δ div. rate is not impacted by any other variable variation.

$$\Delta Div.rate \sim 3.867896 + 1.313474 \, x \, \Delta ROA + 0.747049 \, x \, \Delta Adj.ROE + (-0.511848) x \, \Delta Op.margin + (-6.057395) x \, Geo.area + 4.548189 \, x \, Period + 26.340510 \, x \, \Delta Mktcap + (-6.912013) \, x \, \Delta EV + (-0.003728) \, x \, \Delta\beta$$

	Estimate	p-value
Intercept	3.867896	0.5379
ΔROA	1.313474	0.1612
ΔAdj. ROE	0.747049	0.4097
ΔOp. margin	-0.511848	0.2104
Geo. area	-6.057395	0.3626
Period	4.548189	0.4609
ΔMktcap	26.340510	0.0809
ΔEV	-6.912013	0.3600
$\Delta\beta$	-0.003728	0.3712

Table 60 – Results of the linear regression [ΔDiv.rate ~ $\beta_0 + \beta_1$ x ΔROA + β_2 x ΔAdj.ROE + β_3 x ΔOp.margin + β_4 x Geo.area + β_5 x Period + +β_6 xΔ Mktcap + β_7 x ΔEV + β_8 x Δβ]

As for the financial performance's indicators, the model trying to predict the div. rate is not statistically significant and the model does not explain a large percentage of the total div. rate variation variance as the R^2 is low.

R^2	F-statistic	p-value
0.07078	1.809	0.0777

Table 61 – Results of the linear regression [ΔDiv.rate ~ $\beta_0 + \beta_1$ x ΔROA + β_2 x ΔAdj.ROE + β_3 x ΔOp.margin + β_4 x Geo.area + β_5 x Period+ β_6 x Δ Mktcap + β_7 x ΔEV + β_8 x Δβ]

As observed in table 62, the model is fully relevant as all conditions required from residuals are respected (**cfr. Appendix 122**).

Conditions	p-value	Respected?
No outlier	0.20409	YES
Normal distribution	0.9894	YES
Independence	0.4927	YES
Homoscedasticity	0.1046	YES

Table 62 – Residuals analysis of the linear regression [ΔDiv.rate ~ $\beta_0 + \beta_1$ x ΔROA + β_2 x ΔAdj.ROE + β_3 x ΔOp.margin + β_4 x Geo.area + β_5 x Period + β_6 xΔ Mktcap + β_7 x ΔEV + β_8 x Δβ]

D. RESULTS

Both the Δ financial performance's and the Δ div. rate are not impacted by any variable. Fluctuations of financial performance and diversification rate are thus independent variables.

Variables	ΔROA		ΔAdj. ROE		ΔOp. margin	
	P-value	Linked?	P-value	Linked?	P-value	Linked?
ΔDiv. rate	0.9800	NO	0.699	NO	0.836	NO
Geo. area	0.7435	NO	0.474	NO	0.718	NO
Period	0.9320	NO	0.950	NO	0.739	NO

Table 63 – Results of linear regressions performed on the Δ of financial performance of companies

Variables	ΔDiv. rate	
	P-value	Linked?
ΔROA	0.1612	NO
ΔAdj. ROE	0.4097	NO
ΔOp. margin	0.2104	NO
Geo. area	0.3626	NO
Period	0.4609	NO
ΔMktcap	0.0809	NO
ΔEV	0.3600	NO
$\Delta\beta$	0.3712	NO

Table 64 – Results of linear regressions performed on the Δ of diversification rate of companies

CHAPTER XII – DISCUSSION OF RESULTS

Results of statistical tests performed on the financial performance and the international portfolio diversification of European and American asset management companies are presented in this chapter. The financial performance is measured by three indicators – the ROA, the adj. ROE and the op. margin –, whereas the international portfolio diversification is appraised by the div. rate. Financial performance indicators are figures extracted from Bloomberg, whereas the diversification rate must be computed since it is not a mandatory data companies have to publish in their annual report. Finally, multiple statistical tests have been performed on those variables to ensure the existence of a sufficient confidence level regarding findings.

FINANCIAL PERFORMANCE

Regarding the financial performance, three indicators are analyzed to take an extra statistical confidence of the results relevance. To determine if the global financial performance of a company is impacted by the variable analyzed, the following rule is applied on those indicators: if at least two indicators out of three have a specific behavior, it will be assumed this behavior is representative of the global financial performance of the company studied. Results of statistical tests performed on the financial performance are summarized in table 65.

Firstly, the div. rate has no impact on the financial performance as six statistical tests out of six performed have a negative result regarding the relationship between the financial performance and the div. rate. Consequently, extra advantages received by individuals diversifying their portfolios internationally are not similar for asset management companies holding internationally diversified portfolios. A comparison between investors and asset management companies can therefore not be made regarding benefits provided by international portfolio diversification. Individuals strongly benefit from investing abroad, whereas asset management firms investing internationally do not benefit from extra advantages. Individuals have incentives to invest internationally, whereas asset management firms have no incentive to invest abroad. This finding does not confirm the hypothesis of this master thesis claiming that companies investing internationally should benefit from greater financial performance.

After that, the geo. area of asset management companies affects their financial performance. More to the point, according to statistical tests performed, European companies have a lower adj. ROE and a higher op. margin than American companies. Nevertheless, since the geo. area

impacts each financial performance indicator in the opposite direction, it cannot be concluded that the geo. area significantly impacts the financial performance. Those findings confirm statements written in the literature review. There are actually two mains "investor mentalities": investors who believe that European stocks are more profitable than American stocks and investors who believe that American stocks are more profitable than European stocks. It can therefore not be affirmed that companies located in a specific geographic area – in Europe or in the U.S. – have a financial performance significantly superior to the one of companies located in the other geographic area. Accordingly, the hypothesis of this master thesis claiming that the geo. area does not impact the financial performance of companies is confirmed.

Finally, the period impacts the financial performance indicators as well. Findings of tests performed demonstrated that companies have lower ROA and lower adj. ROE before 2012 than after 2012. Financial performance of asset management companies has therefore increased over time. A link between the globalization of the world and the financial performance should therefore exist. Actually, the literature review of this master thesis states that the globalization of the world has recently appeared resulting in a decrease of barriers between countries, a decrease of transactional costs to invest abroad and new opportunities for investors everywhere in the world. A link should therefore exist between this financial world globalization and the financial performance increase of companies. In other words, companies benefit from higher financial performance since the openness of the financial world has appeared. Even if firms do not increase their international investments, individuals and retail investors can easily invest abroad leading to an increase of investments within asset management companies. This finding confirms the hypothesis of this master thesis claiming that the financial performance of companies should have increased due to the globalization of the world.

To summarize this part, the financial performance is impacted by the geo. area and the period. Regarding the geo. area, since two financial performance indicators are impacted in the opposite direct, it is rather assumed this geo. area does not impact the financial performance of companies. Then, regarding the period, companies enjoy greater financial performance for the period between 2013 and 2017 than for the period between 2008 and 2012. It therefore means that the financial performance of asset management companies has increased over time. Those findings confirm hypotheses of this master thesis claiming that the geo. area has no impact on the financial performance of companies and that the period has an impact on this financial performance of companies.

	Chi-square	Student	ANOVA	Linear reg.	Linear model	Logit linear model
Div. rate	NO	NO	NO	NO	NO	NO
Geo. area	YES	YES	/	/	YES	YES
Period	YES	YES	/	/	YES	YES

Table 65 - Results of statistical tests performed on the financial performance of companies

INTERNATIONAL PORTFOLIO DIVERSIFICATION

In the second part of this chapter, results of analyses performed on the div. rate are appraised. Results of statistical tests performed are summarized in table 66. Broadly speaking, the div. rate is impacted by the op. margin, the mktcap and the EV as three tests out of six performed demonstrate that a positive relationship exists between those variables and the div. rate.

Firstly, regarding the relationship between the op. margin and the div. rate, companies having a low op. margin have a low div. rate. Nevertheless, it is assumed that the div. rate is not impacted by the financial performance as only one financial performance indicator out of three tested impacts this rate. Indeed, the op. margin impacts the div. rate of companies, whereas the ROA and the adj. ROE do not impact this rate. In closing, it is expected that the financial performance does not impact the div. rate of asset management companies. This finding does not confirm the hypothesis of this master thesis claiming that companies need a strong financial performance to benefit from a high diversification rate since investing internationally represents a sizable cost.

After that, regarding the geographic area, the div. rate of companies is not impacted by this variable: European and American companies do not notice significant difference between their div. rate. In other words, companies of one specific geo. area do not invest more internationally than other companies.

The period has no impact on the div. rate of companies neither. Actually, the div. rate has not significantly evolved from 2008 to 2017. Companies have not modified their investment strategies in terms of international perspectives. Therefore, there is no link between the globalization of the world and the div. rate of asset management companies. Even if barriers between countries have decreased and transfer of information between countries has become easier, the div. rate has not increased and companies have therefore not modified their investment strategies. A comparison between investors and asset management companies can therefore not be made regarding the relationship between the div. rate and the period. Whilst

individuals invest internationally more easily since the globalization of the financial world has appeared, companies have not increase their international portfolio diversification, even if this globalization of the world has appeared. Therefore, this finding does not confirm the hypothesis of this master thesis claiming that companies should increase their international investments due to the openness of the world leading to an easier transfer of assets between countries.
Finally, the current market cap as well as the enterprise value have an impact on the div. rate of firms. Companies having a lower current market cap or a lower enterprise value have a lower div. rate than companies having a high current market cap or a high enterprise value. Since a positive link exists between those variables and the div. rate, it can be assumed the div. rate of a company increases with its mktcap as well as with its EV. Companies having more resources are more incline to invest internationally than small companies having less resources. This assumption seems logical since investing abroad represents a cost. It is actually essential to have sufficient funds to make international investments. This finding confirms the hypothesis of this master thesis which states that the div. rate should be positively linked with the mktcap and the EV of companies since investing internationally required sufficient resources due to additional transactional costs generated by this international investment strategy.
Finally, the div. rate is not impacted by the unlevered beta. There was no a priori hypothesis regarding this variable.

To summarize this part, the div. rate of asset management companies is positively impacted by their mktcap and their EV: companies having sufficient resources diversify more internationally their investment portfolios than companies having less resources. Moreover, the fluctuation analysis does not bring additional information since no test performed have significant results.

	Chi-square	Student	ANOVA	Linear reg.	Linear model	Logit linear model
ROA	NO	NO	NO	YES	NO	YES
Adj. ROE	NO	NO	NO	NO	NO	NO
Op. margin	YES	NO	YES	NO	NO	NO
Geo. area	NO	NO	/	/	NO	NO
Period	NO	NO	/	/	NO	NO
Mktcap	YES	YES	YES	NO	NO	NO
EV	YES	YES	YES	NO	NO	NO
β	NO	NO	NO	NO	NO	NO

Table 66 - Results of statistical tests performed on the diversification rate of companies

PART III – CONCLUSION OF THE MASTER THESIS

CONCLUSION

This master thesis aims at appraising the effect of the international portfolio diversification on the financial performance as well as the effect of the geographic area and the period. Nevertheless, since the main focus of this master thesis is the relation between the international portfolio diversification and the financial performance of asset management companies, there is a real willingness to deeply understand this international portfolio diversification. Additional statistical tests are therefore performed on this variable. Research questions of this master thesis were the following: How does the international portfolio diversification of asset management companies impact their financial performance? How does the geographic area and the period – as well as the globalization of the world – impact the financial performance of asset management companies? How does the financial performance, the geographic area, the period, the current market cap, the enterprise value and the unlevered beta of asset management companies impact their international portfolio diversification? Through statistical analyses, this master thesis answers those questions. Major findings of this master thesis are developed in the conclusion.

The literature review states individuals diversifying internationally their portfolios benefit from extra additional advantages regarding their portfolio's return for a given level of risk compared to individuals who do not diversify their portfolios as well as to individuals diversifying their portfolios locally. Nevertheless, this extra additional advantage conferred to investors by this international portfolio diversification is not accurate for asset management companies. The financial performance of asset management companies is actually not positively or negatively impacted by their international portfolio diversification. This finding does therefore not confirm the expected result of the a priori hypothesis that a positive link should exist between the financial performance of companies and their diversification rate. Nevertheless, this financial performance is influenced by the period. Companies benefit from greater financial performance for the period between 2013 and 2017 than between 2008 and 2012. This increase can be the result of the globalization and the openness of the financial world. It is actually easier for individuals to invest abroad since barriers between countries have decreased, as well as transactional costs between countries has decreased. Individuals can actually invest into those asset management companies even if the location of those firms is not optimal for them. This finding confirms the expected outcome of the a priori hypothesis claiming that the financial performance and the period should be bonded. Finally, the financial performance of is not

impacted by their geographic area. The performance of companies is actually independent of their geographic location. This result confirms the expected results: financial performance of companies should not be impacted by their geo. area since European and American stocks' performance should be relatively similar.

Regarding the international portfolio diversification of asset management companies, the current market cap as well as the enterprise value of those companies impact their diversification rate. Other variables analyzed have no impact, meaning the diversification rate of asset management companies is independent from their financial performance, their geographic area, the period or their unlevered beta. Nevertheless, the positive relationship of the current market cap and the enterprise value with the diversification rate comes from the fact companies investing internationally require sufficient resources to bear the costs generated by an international strategy of investments. The literature review actually states investing abroad represents a sizable cost. Transactional costs are higher when investing abroad than locally. In closing, companies need to have sufficient funds since investing abroad represents extra costs. As companies having a high current market cap and a high enterprise value have more resources, those kinds of companies invest internationally more easily than smaller companies which do not afford to invest abroad. Those findings relative to the current market cap and the enterprise value are consistent with the expected results. The hypothesis actually states that a positive relationship should exist between the diversification rate of companies and their current market cap as well as between the diversification rate and their enterprise value.

Nevertheless, the empirical research of this master thesis encounters some limits. Firstly, the number of data exploited is low. The relevancy of results is therefore not fully optimal as well as the representativeness of results for all European and American asset management companies. Another issue is the diversification rate exploited in the empirical research. This parameter is not a mandatory measure to include in companies' annual report and must therefore be computed. Moreover, diverse kinds of computations must be conducted since all companies do not publish identical information into their annual report. The consistency between all diversification rates computed can therefore not be ensured since all rates are not computed similarly. Finally, some models have a really low R-squared resulting in a low part of population explained. In other words, some statistical tests performed are not representative of the whole population of European and American asset management companies.

BIBLIOGRAPHY

Abraham, A., Seyyed, F. J., & Al-Elg, A. (2001). Analysis of Diversification Benefits of Investing in the Emerging Gulf Equity Markets. *Managerial Finance, 27*(10-11), p. 47.

Albanese, C., Li, D., Lobachevskiy, E., & Meissner, G. (2013). A Comparative Analysis of Correlation Approaches in Finance. *Journal of Derivatives, 21*(2), p. 42.

Alles, L., & Murray, L. (2009). Investment performance and holding periods: An investigation of the major UK asset classes. *Journal of Asset Management, 10*(5), pp. 280-292.

Bailey, B. A., Heck, J. L., & Wilkens, K. A. (2005). International Mutual Fund Performance and Political Risk. *Review of Pacific Basin Financial Markets and Politics, 8*(1), pp. 167-184.

Barber, B. M., & Odean, T. (2001). Boys Will be Boys: Gender, Overconfidence, and Common Stock Investment. *The Quarterly Journal of Economics, 116*(1), pp. 261-292.

Barberis, N., & Thaler, R. (2003). A survey of Behavioral Finance. *Handbook of the Economics of Finance, 1*, pp. 1053-1128.

Barberis, N., Shleifer, A., & Wurgler, J. (2005). Comovement. *Journal of Financial Economics, 75*(2), pp. 283-317.

Bartram, S. M., & Dufey, G. (2001). International Portfolio Investment: Theory, Evidence, and Institutional Framework. *Financial Markets, Institutions & Instruments, 10*(3).

Beine, M., Cosma, A., & Vermeulen, R. (2010). The dark side of global integration: Increasing tail dependence. *Journal of Banking & Finance, 34*, pp. 184-192.

Bekaert, G., Campbell, R. H., & Ng, A. (2005). Market Integration and Contagion. *The Journal of Business, 78*(1), pp. 39-69.

Bekaert, G., Hodrick, R. J., & Zhang, X. (2009). International Stock Return Comovements. *The Journal of Finance, 64*(6), pp. 2591-2626.

Ben-David, I., Franzoni, F., & Moussawi, R. (2018). Do ETFs increase volatility? *The Journal of Finance, 73*(6), pp. 2471-2535.

Berger, D., Pukthuanthong, K., & Yang, J. (2011). International diversification with frontier markets. *Journal of Financial Economics, 101*(1), pp. 227-242.

Berzins, J., Liu, C., & Trzcinka, C. (2013). Asset management and investment banking. *Journal of Financial Economics, 110*(1), pp. 215-231.

Bevir, M. (2007). Encyclopedia of Governance. *1-2*.

Bloom, N., Sadun, R., & Van Reenen, J. (2015). Do Private Equity Owned Firms Have Better Management Practices? *105*(5), pp. 442-446.

Bloomberg. (2019).

Bodie, Z., Kane, A., & Marcus, A. J. (2014). Investments. (M. G. Hill, Ed.)

Brealey, R. A. (1991). Harry M. Markowitz's Contributions to Financial Economics. *The Scandinavian Journal of Economics, 93*(1), pp. 7-17.

Broc, G., Carlsberg, M., Cazauvieilh, C., Faury, S., & Loyal, D. (2016). Stats facile avec R: Guide pratique. *Ouvertures Psychologiques*.

Burgin, M., & Meissner, G. (2016, 2). Extended Correlations in Finance. *Scientific Research, 6*(1), pp. 178-188.

Butler, K. C., & Joaquin, D. C. (2002). Are the gains from international portfolio diversification exaggerated? The influence of downside risk in bear markets. *Journal of International Money and Finance, 21*, pp. 981-1011.

Cesarone, F., Moretti, J., & Tardella, F. (2016). Optimally chosen small portfolios are better than large ones. *Economics Bulletin, 36*(4), pp. 1876-1891.

Chatterjee, A. (2016). Globalization and monetary policy comovement: International evidence. *Journal of International Money and Finance, 68*, pp. 181-202.

Chen, G., Kim, K. A., Nofsinger, J. R., & Rui, O. M. (2007). Trading Performance, Disposition Effect, Overconfidence, Representativeness Bias, and Experience of Emerging Market Investors. *Journal of Behavioral Decision Making, 20*, pp. 425-451.

Christoffersen, P., Errunza, V., Jacobs, K., & Jin, X. (2014). Correlation dynamics and international diversification benefits. *International Journal of Forecasting, 30*, pp. 807-824.

Click, R. W., & Plummer, M. G. (2005). Stock market integration in ASEAN after the Asian financial crisis. *Journal of Asian Economics, 16*, pp. 5-28.

Cornillon, P.-A., Guyader, A., Husson, F., Jégou, N., Josse, J., Klutchnikoff, N., . . . Thieurmel, B. (2018). R pour la statistique et la science des données.

de Larminat, P. (2013). Entre "quantitatif" et "qualitatif". Comment les investisseurs professionnels évaluent les gérants d'actifs financiers. *63*(1), pp. 77-105.

Driessen, J., & Laeven, L. (2007). International portfolio diversification benefits: Cross-country evidence from a local perspective. *Journal of Banking & Finance, 31*(6), pp. 1693-1712.

Dubosson, M., Fragnière, E., & Tuchschmid, N. S. (2009). Wealth Management "Manufacturing": Delivering More Value? . *The Journal of Wealth Management, 11*(4), pp. 48-59.

Duignan, J. (2016). A Dictionary of Business Research Methods.

Fabozzi, F., Gupta, F., & Markowitz, H. (2002). The Legacy of Modern Portfolio Theory. *Institutional Investor*.

Fadhlaoui, K., Bellalah, M., Dherry, A., & Zouaouii, M. (2009). An Empirical Examination of International Diversification Benefits in Central European Emerging Equity Markets. *14*(2), pp. 163-173.

Filiz, I., Nahmer, T., Spiwoks, M., & Bizer, K. (2018). Portfolio diversification: the influence of herding, status-quo bias, and the gambler's fallacy. *Financial Markets and Portfolio Management, 32*(2), pp. 167-205.

Gass, S., & Fu, M. (2013). Encyclopedia of Operations Research and Management Science.

Gilmore, C. G., & McManus, G. M. (2002). International portfolio diversification: US and Central European equity markets. *Emerging Markets Review, 3*(1), pp. 69-83.

Goetzmann, W. N., & Kumar, A. (2008). Equity Portfolio Diversification. *Review of Finance, 12*, pp. 433-463.

Grasse, N. J., Whaley, K. M., & Ihrke, D. M. (2016). Modern Portfolio Theory and Nonprofit Arts Organizations: Identiying the Efficient Frontier. *Nonprofit and Voluntary Sector Quarterly, 45*(4).

Grinblatt, M., & Han, B. (2005, 11). Prospect theory, mental accounting, and momentum. *Journal of Financial Economics, 78*(2), pp. 311-339.

Harbaugh, W. T., Krause, K., & Vesterlund, L. (2010). The Fourlfod Pattern of Risk Attitudes in Choice and Pricing Tasks. *The Economic Journal, 120*(545), pp. 595-611.

Harvey, C. R. (1995). Predictable Risk and Returns in Emerging Markets. *The Review of Financial Studies, 8*(3), pp. 773-816.

Heel, J., & Kehoe, C. (2005). Why some private equity firms do better than others. *The McKinsey Quarterly*(1).

Honghui, C., Singal, V., & Whitelaw, R. F. (2016). Comovement revisited. *Journal of Financial Economics, 121*(3), pp. 624-644.

Hourvouliades, N. (2009). International Portfolio Diversification: Evidence from European Emerging Markets. *European Research Studies, 12*(4), pp. 55-78.

Jennings, W. W., Horan, S. M., Reichenstein, W., & Brunen, J. L. (2011). Perspectives from the Literature of Private Wealth Management. *The Journal of Wealth Management, 14*(1), pp. 8-40.

Jobson, J. D., & Korkie, B. (1980). Estimation for Markowitz Efficient Portfolios. *Journal of the American Statistical Association, 75*(371), pp. 544-554.

Karolyi, G. A., & Stulz, R. M. (1996). Why Do Markets Move Together? An Investigation of U.S.-Japan Stock Return Comovements. *The Journal of Finance, 51*(3), pp. 951-986.

Kato, H., & Okubo, T. (2018). Market size in globalization. *Journal of International Economics, 111*, pp. 34-60.

Khan, M. T., Tan, S.-H., Chong, L.-L., & Ong, H.-B. (2017). Investment characteristics, stock characteristics and portfolio diversification of finance professionals. *Borsa Istanbul Review, 17*(3), pp. 164-177.

Kumar, S. S. (2011). Are Emerging Markets Relevant for Portfolio Diversification? *Review of Market Integration, 3*(2), pp. 103-119.

Law, J. (2016). *A Dictionary of Accounting*.

Leung, T., Lorig, M., & Pascucci, A. (2017). Leveraged ETF implied volatilities from ETF dynamics. *27*(4), pp. 1035-1068.

Liu, E. X. (2016). Portfolio Diversification and International Corporate Bonds. *Journal of Financial and Quantitative Analysis, 51*(3), pp. 959-983.

Mansourfar, G. (2013). Econometrics and Metaheuristic Optimization Approaches to International Portfolio Diversification. *Iranian Journal of Management Studies, 6*(1), pp. 47-77.

Margaretic, P. (2016). Emerging Market Risk Premia Fluctuations: A micro founded decomposition. *Finance, 37*(1), pp. 7-50.

Massa, M., Wang, Y., & Zhang, H. (2016). Benchmarking and Currency Risk. *Journal of financial and quantitative analysis, 51*(2), pp. 629-654.

Mehran, H., & Stulz, R. M. (2005). The economics of conflicts of interest in financial institutions. *Journal of Financial Economics, 85*, pp. 267-296.

Mushtaq, R., & Shah, S. Z. (2014). International Portfolio Diversification: United States and South Asian Equity Markets. *Panoeconomicus, 2*, pp. 241-252.

n.a. (2016). Europe versus US: Where are the best high yield opportunities? . *The Big Question*.

Nofsinger, J. (2017). The Psychology of Investing.

O'Neill, J. (2013). 2013 themes: US versus China versus Europe? *Investment Week, 40*(3).

Perold, A. F. (2004). The Capital Asset Pricing Model. *American Economic Association, 18*(3), pp. 3-24.

Petchrompo, S., & Parlikad, A. (2019). A review of asset management literature on multi-asset systems. *Reliability Engineering & System Safety, 181*, pp. 181-201.

Pfiffelmann, M., Roger, T., & Bourachnikova, O. (2016). When Behavioral Portfolio Theory Meets Markowitz. *Economic Modelling, 53*, pp. 419-435.

Preuschoff, K., Quartz, S., & Bossaert, P. (2008). Markowitz in the brain? *La neuroéconomie, 118*(1).

Qadan, M., & Yagil, J. (2015). Are international economic and finanical co-movements characterized by asymmetric co-integration? *Review of Accounting and Finance, 14*(4), pp. 398-412.

Rahim, A. M., & Masih, M. (2016). Portfolio diversification benefits of Islamic investors with their major trading partners: Evidence from Malaysia based on MGARCH-DCC and wavelet approaches. *Economic Modelling, 54*, pp. 425-438.

Rowland, P. (1999). Transaction costs and international portfolio diversification. *Journal of International Economics, 49*(1), pp. 145-170.

Rua, A., & Nunes, L. C. (2009). International comovement of stock market returns: A wavelet analysis. *Journal of Empirical Finance, 16*(4), pp. 632-639.

Sahaym, A., & Nam, D. (2013). International diversification of the emerging-market enterprises: A multi-level examination. *International Business Review, 22*(2), pp. 421-436.

Scherer, B. (2013). Frictional Costs of Diversification. *Journal of Portfolio Management, 39*(3), pp. 7-9.

Sharpe, W. F. (2007). Expected Utility Asset Allocation. *Financial Analysts Journal, 63*(5), pp. 18-30.

Shefrin, H., & Statman, M. (2000). Behavioral Portfolio Theory. *The Journal of Financial and Quantitative Analysis, 35*(2), pp. 127-151.

Syriopoulos, T. (2004). International portfolio diversification to Central European stock markets. *Applied Financial Economics, 14*, pp. 1253-1268.

Tai, C.-S. (2018). International diversification during financial crises. *Managerial Finance, 44*(12), pp. 1434-1445.

Tang, G. (2004). How efficient is naïve portfolio diversfication? an educational note. *Omega, 32*(2), pp. 155-160.

The Economic Times. (2019). Definition of 'Sharpe Ratio'.

Valadkhani, A., Chancharat, S., & Harvie, C. (2008). A factor analysis of international portfolio diversification. *Studies in Economics and Finance, 25*(3), pp. 165-174.

Van Boven, L. (2007). Encyclopedia of Social Psychology. *1*, p. 92.

Vito, B. (2011). Revisiting the Inadvertent Investment Company. *Fordham Journal of Corporate & Financial Law, 16*(1), p. 125.

Zayati, M., Chaabene, A. S., & Bellalah, M. (2016). Bénéfices de la diversification internationale des portefeuilles. *Revue de l'OFCE, 2*(146), pp. 89-123.

Zonouzi, S. J., Mansourfar, G., & Azar, F. B. (2014). Benefits of international portfolio diversification. *International Journal of Islamic and Middle Eastern Finance and Management, 7*(4), pp. 457-472.

APPENDIXES

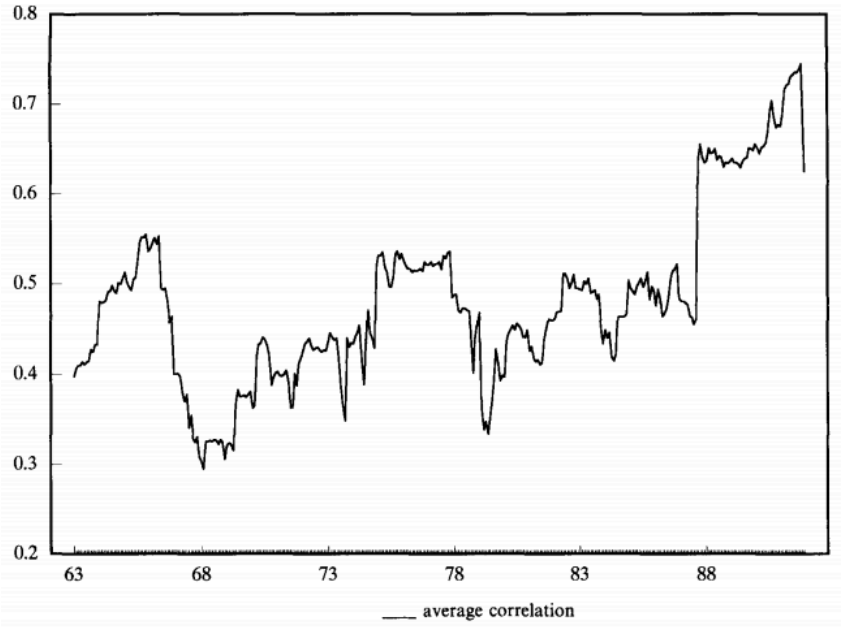

FIGURE 1. Correlation of the US stock market. This figure reports the (unweighted) average correlation of the US stock market with the other seven stock markets. The correlation is computed over sliding windows of four years, using local currency monthly total returns. The period is December 1959–91.

Appendix 1 – Correlation movements of the US stock market with the world

Enterprise name	Date	Diversification rate	Computation proceeded
BREDERODE	2008	0,379	Exposure to currencies excluding the euro
BREDERODE	2009	0,422	Exposure to currencies excluding the euro
BREDERODE	2010	0,424	Exposure to currencies excluding the euro
BREDERODE	2011	0,438	Exposure to currencies excluding the euro
BREDERODE	2012	0,501	Exposure to currencies excluding the euro
BREDERODE	2013	0,521	Exposure to currencies excluding the euro
BREDERODE	2014	0,665	Exposure to currencies excluding the euro
BREDERODE	2015	0,513	Exposure to currencies excluding the euro
BREDERODE	2016	0,479712237	Diversification by currency
BREDERODE	2017	0,502682846	Diversification by currency
CIE DU BOIS SAUVAGE SA	2008	< 10%	Currency exposure
CIE DU BOIS SAUVAGE SA	2009	< 10%	Currency exposure
CIE DU BOIS SAUVAGE SA	2010	< 10%	Currency exposure
CIE DU BOIS SAUVAGE SA	2011	< 10%	Currency exposure
CIE DU BOIS SAUVAGE SA	2012	< 5%	Currency exposure
CIE DU BOIS SAUVAGE SA	2013	< 7%	Currency exposure
CIE DU BOIS SAUVAGE SA	2014	>8%	Currency exposure
CIE DU BOIS SAUVAGE SA	2015	>10%	Currency exposure

CIE DU BOIS SAUVAGE SA	2016	>9%	Currency exposure
CIE DU BOIS SAUVAGE SA	2017	7%	Currency exposure
EDMOND DE ROTHSCHILD SUISSE	2008	0,428420228	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2009	0,051908492	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2010	0,454137233	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2011	0,450492231	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2012	0,459025685	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2013	0,442707144	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2014	0,458646518	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2015	0,430666395	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2016	0,433609336	Total assets by major currency
EDMOND DE ROTHSCHILD SUISSE	2017	0,412622479	Total assets by major currency
EFG INTERNATIONAL AG	2008	0,7	Currency risk
EFG INTERNATIONAL AG	2009	0,7	Currency risk
EFG INTERNATIONAL AG	2010	1,2	Currency risk
EFG INTERNATIONAL AG	2011	1	Currency risk
EFG INTERNATIONAL AG	2012	0,5	Currency risk
EFG INTERNATIONAL AG	2013	0,3	Currency risk
EFG INTERNATIONAL AG	2014	0,2	Currency risk
EFG INTERNATIONAL AG	2015	0,6	Currency risk
EFG INTERNATIONAL AG	2016	2,2	Currency risk
EFG INTERNATIONAL AG	2017	0,8	Currency risk
EURAZEO SE	2008	0,092301786	Breakdown of borrowings by currency
EURAZEO SE	2009	0,072317466	Breakdown of borrowings by currency
EURAZEO SE	2010	0,099784347	Breakdown of borrowings by currency
EURAZEO SE	2011	0,09632075	Breakdown of borrowings by currency
EURAZEO SE	2012	0,102437617	Breakdown of borrowings by currency
EURAZEO SE	2013	0,08044351	Breakdown of borrowings by currency
EURAZEO SE	2014	0,852842564	Presence of Europcar, Elis and Asmodee outside the Eurozone (Revenue)
EURAZEO SE	2015	N/A	Presence of Fintrax and Asmodee outside the Eurozone
EURAZEO SE	2016	<7%	Foreign-exchange risk
EURAZEO SE	2017	13%	Exposure of the performance to foreign exchange risk
GAM HOLDING AG	2008	0,103947723	Information about geographical areas (income CHF m)
GAM HOLDING AG	2009	0,256694032	Information about geographical areas (income CHF m)

GAM HOLDING AG	2010	0,201403509	Information about geographical areas (income CHF m)
GAM HOLDING AG	2011	0,209857978	Information about geographical areas (income CHF m)
GAM HOLDING AG	2012	0,107244915	Information about geographical areas (income CHF m)
GAM HOLDING AG	2013	0,095419289	Information about geographical areas (income CHF m)
GAM HOLDING AG	2014	0,103598515	Information about geographical areas (income CHF m)
GAM HOLDING AG	2015	0,113560454	Information about geographical areas (income CHF m)
GAM HOLDING AG	2016	0,0849939	Information about geographical areas (income CHF m)
GAM HOLDING AG	2017	0,089217391	Information about geographical areas (income CHF m)
GIMV NV	2008	0,000204246	Currency risk on 31/03/08/Valeur totale du portefeuille
GIMV NV	2009	0,000149906	Currency risk on 31/03/09/Valeur totale du portefeuille
GIMV NV	2010	0,000144838	Currency risk on 31/03/10/Valeur totale du portefeuille
GIMV NV	2011	0,118619828	Currency risk on 31/03/11/Valeur totale du portefeuille
GIMV NV	2012	0,11776433	Currency risk on 31/03/12/Valeur totale du portefeuille
GIMV NV	2013	0,085211694	Currency risk on 31/03/13/Valeur totale du portefeuille
GIMV NV	2014	0,078678596	Currency risk on 31/03/14/Valeur totale du portefeuille
GIMV NV	2015	0,062385797	Portfolio in foreign currency on 31/03/15/Valeur totale du portefeuille
GIMV NV	2016	0,054223415	Portfolio in foreign currency on 31/03/16/Valeur totale du portefeuille
GIMV NV	2017	0,03779394	Portfolio in foreign currency on 31/03/17/Valeur totale du portefeuille
GROUPE BRUXELLES LAMBERT	2008	0	No information
GROUPE BRUXELLES LAMBERT	2009	0	Transactions carried out by GBL are primarily denominated in euros
GROUPE BRUXELLES LAMBERT	2010	0	Transactions carried out by GBL are primarily denominated in euros
GROUPE BRUXELLES LAMBERT	2011	0,453303965	Breakdown of revenue by geographical region
GROUPE BRUXELLES LAMBERT	2012	0,480651332	Breakdown of revenue by geographical region
GROUPE BRUXELLES LAMBERT	2013	0,72	Geographical breakdown of 2013 turnover (EU vs Rest of the world)
GROUPE BRUXELLES LAMBERT	2014	0,75	Geographical breakdown of 2014 turnover (EU vs Rest of the world)
GROUPE BRUXELLES LAMBERT	2015	0,008204663	Variation/Total portfolio value
GROUPE BRUXELLES LAMBERT	2016	0,188958323	Variation/Total portfolio value
GROUPE BRUXELLES LAMBERT	2017	0,216207036	Variation/Total portfolio value
IDI	2008	0,38028169	Number of participations
IDI	2009	0,448717949	Number of participations
IDI	2010	0,87	Geographic breakdown
IDI	2011	0,137	Private equity by emerging countries
IDI	2012	0,162	Private equity by emerging countries
IDI	2013	0,069321546	Variation/Total portfolio value
IDI	2014	0,155777482	Variation/Total portfolio value
IDI	2015	0,216396281	Variation/Total portfolio value
IDI	2016	0,236069752	Variation/Total portfolio value

IDI	2017	0,163088661	Variation/Total portfolio value
INDUSTRIVARDEN AB-A SHS	2008	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2009	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2010	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2011	0,175737659	Variation/Total portfolio value
INDUSTRIVARDEN AB-A SHS	2012	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2013	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2014	0	Limited effect on income
INDUSTRIVARDEN AB-A SHS	2015	0,11571217	Variation/Total portfolio value
INDUSTRIVARDEN AB-A SHS	2016	0,1864124	Variation/Total portfolio value
INDUSTRIVARDEN AB-A SHS	2017	0,48	Portfolio structure by geography (Sales)
INVESTOR AB-B SHS	2008	0,097896933	Variation/Total portfolio value
INVESTOR AB-B SHS	2009	0,096417405	Variation/Total portfolio value
INVESTOR AB-B SHS	2010	0,161060143	Net sales by geographical market
INVESTOR AB-B SHS	2011	0,176911544	Net sales by geographical market
INVESTOR AB-B SHS	2012	0,181197697	Net sales by geographical market
INVESTOR AB-B SHS	2013	0,249020489	Net sales by geographical market
INVESTOR AB-B SHS	2014	0,227735849	Net sales by geographical market
INVESTOR AB-B SHS	2015	0,287403903	Net sales by geographical market
INVESTOR AB-B SHS	2016	0,374519564	Net sales by geographical market
INVESTOR AB-B SHS	2017	0,409441261	Net sales by geographical market
LUNDBERGS A-B SHS	2008	0,1	Net sales by geographical market
LUNDBERGS A-B SHS	2009	12	Net sales by geographical market
LUNDBERGS A-B SHS	2010	0,11	Net sales by geographical market
LUNDBERGS A-B SHS	2011	0,1	Net sales by geographical market
LUNDBERGS A-B SHS	2012	0,12	Net sales by geographical market
LUNDBERGS A-B SHS	2013	0,12	Net sales by geographical market
LUNDBERGS A-B SHS	2014	0,13	Net sales by market
LUNDBERGS A-B SHS	2015	0,14	Net sales by market
LUNDBERGS A-B SHS	2016	0,102133595	Net sales by market
LUNDBERGS A-B SHS	2017	0,121838855	Net sales by market
PARTNERS GROUP HOLDIGN AG	2008	0,051303708	Net revenues
PARTNERS GROUP HOLDIGN AG	2009	0,064808053	Net revenues
PARTNERS GROUP HOLDIGN AG	2010	0,131310528	Net revenues
PARTNERS GROUP HOLDIGN AG	2011	0,156747761	Net revenues
PARTNERS GROUP HOLDIGN AG	2012	0,168234342	Net revenues
PARTNERS GROUP HOLDIGN AG	2013	0,158943391	Net revenues
PARTNERS GROUP HOLDIGN AG	2014	0,168034066	Net revenues
PARTNERS GROUP HOLDIGN AG	2015	0,241598283	Net revenues
PARTNERS GROUP HOLDIGN AG	2016	0,233063648	Revenues from management services, net
PARTNERS GROUP HOLDIGN AG	2017	0,232407529	Revenues from management services, net

SOFINA	2008	0,080824964	Currency risk/Total portfolio value
SOFINA	2009	0,158443047	Currency risk/Total portfolio value
SOFINA	2010	0,147802399	Currency risk/Total portfolio value
SOFINA	2011	0,130098278	Currency risk/Total portfolio value
SOFINA	2012	0,121967222	Currency risk/Total portfolio value
SOFINA	2013	0,125287967	Currency risk/Total portfolio value
SOFINA	2014	0,056574521	Currency risk/Total portfolio value
SOFINA	2015	0,036937234	Currency risk/Total portfolio value
SOFINA	2016	0,041129766	Currency risk/Total portfolio value
SOFINA	2017	0,044894042	V Currency risk/Total portfolio value
UNION FINANCIERE DE FRANCE	2008	0	No international diversification
UNION FINANCIERE DE FRANCE	2009	0	No international diversification
UNION FINANCIERE DE FRANCE	2010	0	No international diversification
UNION FINANCIERE DE FRANCE	2011	0	No international diversification
UNION FINANCIERE DE FRANCE	2012	0	No international diversification
UNION FINANCIERE DE FRANCE	2013	0	No international diversification
UNION FINANCIERE DE FRANCE	2014	0	No international diversification
UNION FINANCIERE DE FRANCE	2015	0	No international diversification
UNION FINANCIERE DE FRANCE	2016	0	No international diversification
UNION FINANCIERE DE FRANCE	2017	0	No international diversification

Appendix 2 – Diversification rate computations [European asset management companies]

AFFILIATED MANAGERS GROUP	2008	0,467	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2009	0,57	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2010	0,66	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2011	0,67	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2012	0,64	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2013	0,62	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2014	0,62	Composition of assets under management by geography
AFFILIATED MANAGERS GROUP	2015	0,332984504	Revenue by geographic location
AFFILIATED MANAGERS GROUP	2016	0,326756584	Revenue by geographic location
AFFILIATED MANAGERS GROUP	2017	0,318264642	Revenue by geographic location
AMERIPRISE FINANCIAL INC	2008	0,06	Net revenues
AMERIPRISE FINANCIAL INC	2009	0,05	Net revenues
AMERIPRISE FINANCIAL INC	2010	0,06	Net revenues
AMERIPRISE FINANCIAL INC	2011	0,06	Net revenues
AMERIPRISE FINANCIAL INC	2012	0,06	Net revenues
AMERIPRISE FINANCIAL INC	2013	0,08	Net revenues
AMERIPRISE FINANCIAL INC	2014	0,11	Net revenues
AMERIPRISE FINANCIAL INC	2015	0,09	Net revenues
AMERIPRISE FINANCIAL INC	2016	0,06	Net revenues

AMERIPRISE FINANCIAL INC	2017	0,06	Net revenues
APOLLO INVESTMENT CORP	2008	0,1	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2009	0,084	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2010	0,062	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2011	0,094	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2012	0,081	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2013	0,072	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2014	0,102	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2015	0,117	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2016	0,175	Composition of our investment portfolio by geographic region
APOLLO INVESTMENT CORP	2017	0,091	Composition of our investment portfolio by geographic region
BLACKROCK INC	2008	0,321090047	Total revenue by geographic region
BLACKROCK INC	2009	0,295957447	Total revenue by geographic region
BLACKROCK INC	2010	0,323734324	Total revenue by geographic region
BLACKROCK INC	2011	0,332232133	Total revenue by geographic region
BLACKROCK INC	2012	0,311449074	Total revenue by geographic region
BLACKROCK INC	2013	0,329174853	Total revenue by geographic region
BLACKROCK INC	2014	0,342478116	Total revenue by geographic region
BLACKROCK INC	2015	0,341987545	Total revenue by geographic region
BLACKROCK INC	2016	0,324966383	Total revenue by geographic region
BLACKROCK INC	2017	0,327035466	Total revenue by geographic region
BLACKROCK TCP CAPITAL CORP	2008	0,32	Revenues by client region
BLACKROCK TCP CAPITAL CORP	2009	0,3	Revenues by client region
BLACKROCK TCP CAPITAL CORP	2010	0,388664262	AUM by client region
BLACKROCK TCP CAPITAL CORP	2011	0,395480546	AUM by client region
BLACKROCK TCP CAPITAL CORP	2012	0,478596408	AUM by client region
BLACKROCK TCP CAPITAL CORP	2013	0,385875357	AUM by client region
BLACKROCK TCP CAPITAL CORP	2014	0,383616139	AUM by client region
BLACKROCK TCP CAPITAL CORP	2015	0,368188225	AUM by client region
BLACKROCK TCP CAPITAL CORP	2016	0,360171388	AUM by client region
BLACKROCK TCP CAPITAL CORP	2017	0,103019865	AUM by client region
BLUCORA INC	2008	0,024507583	Geographic revenue information
BLUCORA INC	2009	0,013946813	Geographic revenue information
BLUCORA INC	2010	0,024792039	Geographic revenue information
BLUCORA INC	2011	0,011293065	Geographic revenue information
BLUCORA INC	2012	0,010476286	Geographic revenue information
BLUCORA INC	2013	0,026793617	Geographic revenue information
BLUCORA INC	2014	0,041765395	Geographic revenue information
BLUCORA INC	2015	0	Almost all of the Company's revenue for 2017, 2016, and 2015 was generated from customers located in the US
BLUCORA INC	2016	0	Almost all of the Company's revenue for 2017, 2016, and 2015 was generated from customers located in the US

BLUCORA INC	2017	0	Almost all of the Company's revenue for 2017, 2016, and 2015 was generated from customers located in the US
CARLYLE GROUP/THE	2008	0,4	Assets under management by geography
CARLYLE GROUP/THE	2009	0,41	Assets by geographic location
CARLYLE GROUP/THE	2010	0,48	Corporate private equity aum by geography
CARLYLE GROUP/THE	2011	0,15	Revenue by geographic location
CARLYLE GROUP/THE	2012	0,38	Revenue by geographic location
CARLYLE GROUP/THE	2013	0,41	Revenue by geographic location
CARLYLE GROUP/THE	2014	0,41	Revenue by geographic location
CARLYLE GROUP/THE	2015	0,49	Revenue by geographic location
CARLYLE GROUP/THE	2016	0,4979	Percentage of investments of consolidated funds
CARLYLE GROUP/THE	2017	0,6287	Percentage of investments of consolidated funds
COHEN & STEERS INC	2008	0,25	Assets concentrated in non-US real estate securities
COHEN & STEERS INC	2009	0,154994213	Revenue by client domicile
COHEN & STEERS INC	2010	0,200742361	Revenue by client domicile
COHEN & STEERS INC	2011	0,249281337	Revenue by client domicile
COHEN & STEERS INC	2012	0,251070177	Revenue by client domicile
COHEN & STEERS INC	2013	0,19858723	Revenue by client domicile
COHEN & STEERS INC	2014	0,184105576	Revenue by client domicile
COHEN & STEERS INC	2015	0,179181817	Revenue by client domicile
COHEN & STEERS INC	2016	0,182864786	Revenue by client domicile
COHEN & STEERS INC	2017	0,171303617	Revenue by client domicile
FEDERATED INVESTORS INC-CL B	2008	0,03691488	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2009	0,029758068	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2010	0,023152647	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2011	0,018556296	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2012	0,023789634	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2013	0,023777131	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2014	0,02074018	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2015	0,020254498	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2016	0,023819915	Revenues from domestic and foreign operations
FEDERATED INVESTORS INC-CL B	2017	0,030244151	Revenues from domestic and foreign operations
FRANKLIN RESOURCES INC	2008	0,304331312	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2009	0,330265903	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2010	0,357226891	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2011	0,325179552	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2012	0,213969154	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2013	0,214245336	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2014	0,202313272	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2015	0,385977637	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2016	0,506992898	Operating revenues by geographic segment
FRANKLIN RESOURCES INC	2017	0,410976247	Operating revenues by geographic segment

HERCULES CAPITAL INC	2008	0,075	Investment portfolio by geographic location
HERCULES CAPITAL INC	2009	0,069	Investment portfolio by geographic location
HERCULES CAPITAL INC	2010	0,071	Investment portfolio by geographic location
HERCULES CAPITAL INC	2011	0,028	Investment portfolio by geographic location
HERCULES CAPITAL INC	2012	0,006	Investment portfolio by geographic location
HERCULES CAPITAL INC	2013	0,051	Investment portfolio by geographic location
HERCULES CAPITAL INC	2014	0,052	Investment portfolio by geographic location
HERCULES CAPITAL INC	2015	0,028	Investment portfolio by geographic location
HERCULES CAPITAL INC	2016	0,044	Investment portfolio by geographic location
HERCULES CAPITAL INC	2017	0,089	Investment portfolio by geographic location
ICAHN ENTERPRISES LP	2008	0,477686396	Net sales by geographic area
ICAHN ENTERPRISES LP	2009	0,508136095	Net sales by geographic area
ICAHN ENTERPRISES LP	2010	0,512904858	Net sales by geographic area
ICAHN ENTERPRISES LP	2011	0,512160386	Net sales by geographic area
ICAHN ENTERPRISES LP	2012	0,299986277	Net sales by geographic area
ICAHN ENTERPRISES LP	2013	0,259432106	Net sales by geographic area
ICAHN ENTERPRISES LP	2014	0,275896414	Net sales by geographic area
ICAHN ENTERPRISES LP	2015	0,337715694	Net sales by geographic area
ICAHN ENTERPRISES LP	2016	0,323770228	Net sales by geographic area
ICAHN ENTERPRISES LP	2017	0,313529446	Net sales by geographic area
INVESCO LTD	2008	0,552575886	Total operating revenues by geographical information
INVESCO LTD	2009	0,565104861	Total operating revenues by geographical information
INVESCO LTD	2010	0,515267942	Total operating revenues by geographical information
INVESCO LTD	2011	0,491202776	Total operating revenues by geographical information
INVESCO LTD	2012	0,492124235	Total operating revenues by geographical information
INVESCO LTD	2013	0,498643586	Total operating revenues by geographical information
INVESCO LTD	2014	0,505274815	Total operating revenues by geographical information
INVESCO LTD	2015	0,489839739	Total operating revenues by geographical information
INVESCO LTD	2016	0,468316999	Total operating revenues by geographical information
INVESCO LTD	2017	0,468577408	Total operating revenues by geographical information
INVESCO LTD	2008	0,038	Geographic compositions of portfolio
INVESCO LTD	2009	0,032	Geographic compositions of portfolio
INVESCO LTD	2010	0,03	Geographic compositions of portfolio
INVESCO LTD	2011	0,014	Geographic compositions of portfolio
INVESCO LTD	2012	0,023	Geographic compositions of portfolio
INVESCO LTD	2013	0,01	Geographic compositions of portfolio
INVESCO LTD	2014	0,014	Geographic compositions of portfolio
INVESCO LTD	2015	0,02	Geographic compositions of portfolio
INVESCO LTD	2016	0,01	Geographic compositions of portfolio
INVESCO LTD	2017	0,034	Geographic compositions of portfolio
LADENBURG THALMANN FINANCIAL	2008	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.

LADENBURG THALMANN FINANCIAL	2009	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2010	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2011	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2012	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2013	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2014	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2015	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2016	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LADENBURG THALMANN FINANCIAL	2017	0	Domiciled in the US and substantially all of our revenue is attributed to activities in the US. All of our long-lived assets are located in the US.
LEGG MASON INC	2008	0,317776698	Revenues by geographic region
LEGG MASON INC	2009	0,291463099	Revenues by geographic region
LEGG MASON INC	2010	0,310538276	Revenues by geographic region
LEGG MASON INC	2011	0,321337172	Revenues by geographic region
LEGG MASON INC	2012	0,310838038	Revenues by geographic region
LEGG MASON INC	2013	0,316377053	Revenues by geographic region
LEGG MASON INC	2014	0,298367993	Revenues by geographic region
LEGG MASON INC	2015	0,297938549	Revenues by geographic region
LEGG MASON INC	2016	0,246347469	Revenues by geographic region
LEGG MASON INC	2017	0,241748139	Revenues by geographic region
LPL FINANCIAL HOLDINGS INC	2008	0	Extrapolation
LPL FINANCIAL HOLDINGS INC	2009	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2010	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2011	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2012	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2013	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2014	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2015	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2016	0	Revenues were derived from our operations in the US
LPL FINANCIAL HOLDINGS INC	2017	0	Revenues were derived from our operations in the US
MAIN STREET CAPITAL CORP	2008	0	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2009	0	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2010	0	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2011	0	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2012	0,017	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2013	0,041	Composition of portfolio investments

MAIN STREET CAPITAL CORP	2014	0,029	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2015	0,035	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2016	0,033	Composition of portfolio investments
MAIN STREET CAPITAL CORP	2017	0,029	Composition of portfolio investments
OAKTREE SPECIALTY LENDING CO	2008	0	Geographic composition
OAKTREE SPECIALTY LENDING CO	2009	0	Geographic composition
OAKTREE SPECIALTY LENDING CO	2010	0	Geographic composition
OAKTREE SPECIALTY LENDING CO	2011	0,0163	Geographic composition
OAKTREE SPECIALTY LENDING CO	2012	0,08	Geographic composition
OAKTREE SPECIALTY LENDING CO	2013	0,06	Geographic composition
OAKTREE SPECIALTY LENDING CO	2014	0,0678	Geographic composition
OAKTREE SPECIALTY LENDING CO	2015	0,0469	Geographic composition
OAKTREE SPECIALTY LENDING CO	2016	0,047	Geographic composition
OAKTREE SPECIALTY LENDING CO	2017	0,0356	Geographic composition
OPPENHEIMER HOLDINGS-CL A	2008	0,04586766	Extrapolation
OPPENHEIMER HOLDINGS-CL A	2009	0,04586766	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2010	0,057775316	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2011	0,051439428	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2012	0,037837021	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2013	0,040663362	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2014	0,048884778	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2015	0,049654656	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2016	0,04960252	Revenue by major geographic areas
OPPENHEIMER HOLDINGS-CL A	2017	0,043175442	Revenue by major geographic areas
PROSPECT CAPITAL CORP	2008	0,031	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2009	0,047	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2010	0,062	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2011	0,129	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2012	0,211	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2013	0,172	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2014	0,172	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2015	0,182	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2016	0,196	Composition of investment portfolio by geographic location
PROSPECT CAPITAL CORP	2017	0,212	Composition of investment portfolio by geographic location

PZENA INVESTMENT MANAGM-CL A	2008	0,224299065	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2009	0,328671329	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2010	0,352564103	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2011	0,414814815	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2012	0,362573099	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2013	0,396	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2014	0,393501805	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2015	0,442307692	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2016	0,316666667	US and non-US investment strategies
PZENA INVESTMENT MANAGM-CL A	2017	0,535064935	US and non-US investment strategies
RAYMOND JAMES FINANCIAL INC	2008	0,093353785	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2009	0,109528527	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2010	0,119910785	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2011	0,101828677	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2012	0,090971361	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2013	0,091160134	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2014	0,07476408	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2015	0,072735967	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2016	0,071557539	Revenues by major geographic area
RAYMOND JAMES FINANCIAL INC	2017	0,075136095	Revenues by major geographic area
T ROWE PRICE GROUP INC	2008	0,133912414	Non-US dollar denominated securities account for about 37$ billion of our year-end assets under management.
T ROWE PRICE GROUP INC	2009	0,140557117	Non-US dollar denominated securities account for about 55$ billion of our year-end assets under management.
T ROWE PRICE GROUP INC	2010	0,145228216	Non-US dollar denominated securities account for about 70$ billion of the total.
T ROWE PRICE GROUP INC	2011	0,128702758	Non-US dollar denominated securities of our total assets under management.
T ROWE PRICE GROUP INC	2012	0,145	Non-US dollar denominated securities account for about 14,5% of our total assets under management.
T ROWE PRICE GROUP INC	2013	0,139	Non-US dollar denominated securities held in client accounts are 13,9% of our total assets under management.
T ROWE PRICE GROUP INC	2014	0,135	Non-US dollar denominated securities held in client accounts are 16,5% of our total assets under management.
T ROWE PRICE GROUP INC	2015	0,138	Non-US dollar denominated securities held in clients accounts are 13,8% of our total assets under management.

T ROWE PRICE GROUP INC	2016	0,118	Non-US dollar denominated securities held in client accounts are 11,8% of our total assets under management.
T ROWE PRICE GROUP INC	2017	0,137	Non-US dollar denominated securities held in client accounts are 13,7% of our total assets under management.
WADDELL & REED FINANCIAL-A	2008	0,06	Ending assets under management by broad asset class
WADDELL & REED FINANCIAL-A	2009	0,156037663	Plan assets by category
WADDELL & REED FINANCIAL-A	2010	0,495006651	Plan assets by category
WADDELL & REED FINANCIAL-A	2011	0,403055363	Plan assets by category
WADDELL & REED FINANCIAL-A	2012	0,451496204	Plan assets by category
WADDELL & REED FINANCIAL-A	2013	0,50376587	Plan assets by category
WADDELL & REED FINANCIAL-A	2014	0,22299633	Plan assets by category
WADDELL & REED FINANCIAL-A	2015	0,209789983	Plan assets by category
WADDELL & REED FINANCIAL-A	2016	0,17	Plan assets by category
WADDELL & REED FINANCIAL-A	2017	0,18	Plan assets by category
WISDOMTREE INVESTMENTS INC	2008	0	Revenues are derived in the US and all of our assets are located in the US
WISDOMTREE INVESTMENTS INC	2009	0	Revenues are derived in the US and all of our assets are located in the US
WISDOMTREE INVESTMENTS INC	2010	0	Revenues are derived in the US and all of our assets are located in the US
WISDOMTREE INVESTMENTS INC	2011	0	Revenues are derived in the US and all of our assets are located in the US
WISDOMTREE INVESTMENTS INC	2012	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US
WISDOMTREE INVESTMENTS INC	2013	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US
WISDOMTREE INVESTMENTS INC	2014	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US
WISDOMTREE INVESTMENTS INC	2015	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US
WISDOMTREE INVESTMENTS INC	2016	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US
WISDOMTREE INVESTMENTS INC	2017	0	Revenues are primarily derived in the US and the vast majority of the Company's AUM is currently located in the US

Appendix 3 – Diversification rate computations [American asset management companies]

EUROPEAN ASSET MANAGEMENT COMPANIES
BREDERODE SA
CIE DU BOIS SAUVAGE SA
EDMOND DE ROTHSCHILD SUISSE SA
EFG INTERNATIONAL AG
EURAZEO SE
GAM HOLDING AG
GROUPE BRUXELLES LAMBERT SA
GIMV NV

IDI SCA
INDUSTRIVARDEN AB-A SHS
INVESTOR AB-B SHS
LUNDBERGS A-B SHS
PARTNERS GROUP HOLDIGN AG
SOFINA SA
UNION FINANCIERE DE FRANCE BQE SA

Appendix 4 – European asset management companies

AMERICAN ASSET MANAGEMENT COMPANIES
AFFILIATED MANAGERS GROUP INC
AMERIPRISE FINANCIAL INC
APOLLO INVESTMENT CORP
ARES CAPITAL CORP
BLACKROCK INC
BLACKROCK TCP CAPITAL CORP
BLUCORA INC
CARLYLE GROUP LP/THE
COHEN & STEERS INC
FEDERATED INVESTORS INC
FRANKLIN RESOURCES INC
HERCULES CAPITAL INC
ICAHN ENTERPRISES LP
INVESCO LTD
LADENBURG THALMANN FINANCIAL SERVICES INC
LEGG MASON INC
LPL FINANCIAL HOLDINGS INC
MAIN STREET CAPITAL CORP
OAKTREE SPECIALTY LENDING CORP
OPPENHEIMER HOLDINGS INC
PROSPECT CAPITAL CORP
PZENA INVESTMENT MANAGEMENT INC
RAYMOND JAMES FINANCIAL INC
T ROWE PRICE GROUP INC

WADDELL & REED FINANCIAL INC
WISDOMTREE INVESTEMENTS INC

Appendix 5 – American asset management companies

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> summary(Database)
                        Company    Diversification.rate Return.on.assets  Adjusted.return.on.equity Operating.margin  Geographic.area      Year            Period    Current.market.cap
Affiliated Managers Group Inc: 10   Min.   :0.00000    Min.   :-70.107   Min.   :-114.115          Min.   :-645.68   EU:150          Min.   :2008   AFTER 2012 :205   Min.   :   52.43
Ameriprise Financial Inc     : 10   1st Qu.:0.03867    1st Qu.:  1.089   1st Qu.:   5.792          1st Qu.:  13.49   US:260          1st Qu.:2010   BEFORE 2012:205   1st Qu.:  708.28
Apollo Investment Corp       : 10   Median :0.11996    Median :  4.451   Median :  10.345          Median :  29.55                   Median :2012                     Median : 1941.93
Ares Capital Corp            : 10   Mean   :0.19897    Mean   :  5.900   Mean   :  12.365          Mean   :  40.58                   Mean   :2012                     Mean   : 4960.46
BlackRock Inc                : 10   3rd Qu.:0.32376    3rd Qu.: 10.568   3rd Qu.:  19.002          3rd Qu.:  54.10                   3rd Qu.:2015                     3rd Qu.: 5664.54
BlackRock TCP Capital Corp   : 10   Max.   :2.20000    Max.   : 50.227   Max.   : 230.022          Max.   :2421.27                   Max.   :2017                     Max.   :69189.26
(Other)                      :350                       NA's   :8         NA's   :12                NA's   :11                                                         NA's   :10
Enterprise.value  Unlevered.beta       Cat.Year
Min.   :-2926.8   Min.   :-125.1382   2008   : 41
1st Qu.:  848.3   1st Qu.:  -0.5057   2009   : 41
Median : 2250.5   Median :   0.9706   2010   : 41
Mean   : 6129.4   Mean   :  -0.8442   2011   : 41
3rd Qu.: 8727.4   3rd Qu.:   2.3887   2012   : 41
Max.   :68210.9   Max.   : 122.8672   2013   : 41
NA's   :31        NA's   :106         (Other):164
```

Appendix 6 – Summary of numerical and categorical variables

```
> numSummary(Database[,c("Adjusted.return.on.equity", "Current.market.cap", "Diversification.rate", "Enterprise.value", "Operating.margin", "Return.on.assets", "Unlevered.beta"), drop=FALSE],
+   groups=Database$Cat.Year, statistics=c("mean", "sd", "IQR", "quantiles"), quantiles=c(0,.25,.5,.75,1))

Variable: Adjusted.return.on.equity
           mean       sd       IQR          0%        25%       50%       75%       100%  n NA
2008  0.2293153 26.38563 23.420789  -94.184827 -10.858155  7.661122 12.56263  47.44465 36  5
2009  8.7083299 25.44870  9.049296 -111.479887   5.288393  9.556971 14.33769  62.51304 39  2
2010 16.8670168 38.75247 16.346784  -45.389772   5.263951 10.282663 21.61073 230.02176 40  1
2011 15.9762304 27.81940 16.010657  -32.779913   5.510877 10.167976 21.52153 160.53489 40  1
2012 11.4375330 12.99983 10.496167  -36.587159   5.488489  9.850001 15.98466  40.82600 40  1
2013 15.7488456 13.26383 15.381753   -3.835335   6.195387 10.793671 21.57714  64.38544 41  0
2014 14.8626731 12.35792 13.596443   -2.234070   6.550972 11.429455 20.14741  47.36645 41  0
2015 12.0253298 23.64743 13.851730 -114.115181   7.315113 11.513490 21.16684  52.20433 41  0
2016 13.5834766 10.04945 12.256452   -4.547436   7.996207 11.189792 20.25266  40.37528 40  1
2017 12.7644479 19.35172 10.257211  -69.904765   7.231722 10.227698 17.48893  61.70117 40  1

Variable: Current.market.cap
          mean        sd      IQR        0%       25%      50%      75%     100%  n NA
2008 2377.615  3608.927 1641.498  52.43157  275.1580 1235.814 1916.656 15823.95 38  3
2009 3462.190  5864.133 2207.379  74.97204  416.4731 1704.065 2623.852 30580.02 38  3
2010 3864.576  5490.243 3341.529 159.59736  469.9261 2235.166 3811.455 27250.33 39  2
2011 3562.767  5348.843 3102.775 161.04168  549.7712 1645.844 3652.546 24603.71 39  2
2012 4185.376  6043.897 3952.755 153.82008  719.2018 2020.012 4671.956 27443.34 41  0
2013 5605.730  7940.813 5075.884 157.43005  917.7838 2657.413 5993.668 38838.71 41  0
2014 6202.168  9231.026 5566.200 171.87317  873.8513 2846.638 6440.052 49452.34 41  0
2015 6098.591  9440.145 6171.962 178.87809 1102.8631 2517.244 7274.825 52061.27 41  0
2016 6550.235 10502.674 6776.671 187.76061 1174.4520 2560.857 7951.123 59047.69 41  0
2017 7275.102 11985.743 8291.033 292.23889  919.5787 2544.263 9210.612 69189.26 41  0

Variable: Diversification.rate
           mean        sd       IQR 0%         25%         50%       75%       100%  n NA
2008 0.1670121 0.1841008 0.2867767  0 0.03100000 0.09335379 0.3177767 0.7000000 41  0
2009 0.1713109 0.1906600 0.2661994  0 0.02975807 0.09641740 0.2959574 0.7000000 41  0
2010 0.2232232 0.2654662 0.3324349  0 0.02479204 0.11991079 0.3572269 1.2000000 41  0
2011 0.2112428 0.2172759 0.2807927  0 0.05143943 0.13009828 0.3322321 1.0000000 41  0
2012 0.1963341 0.1846377 0.2736121  0 0.03783702 0.12196722 0.3114491 0.6400000 41  0
2013 0.1945573 0.1920444 0.2653771  0 0.05100000 0.12000000 0.3163771 0.7200000 41  0
2014 0.2105706 0.2189676 0.2463680  0 0.05200000 0.13500000 0.2983680 0.8528426 41  0
2015 0.1868615 0.1727836 0.2960473  0 0.03693723 0.12000000 0.3329845 0.6000000 41  0
2016 0.2275014 0.3530830 0.2767702  0 0.04700000 0.17000000 0.3237702 2.2000000 41  0
2017 0.2010871 0.1988147 0.2750892  0 0.04317544 0.13000000 0.3182646 0.8000000 41  0
```

Variable: Enterprise.value

	mean	sd	IQR	0%	25%	50%	75%	100%	n	NA
2008	2558.336	3685.579	2720.681	-456.20284	309.1154	980.0693	3029.797	13832.62	36	5
2009	3768.512	6137.373	4050.418	-2926.75387	434.0475	1673.4613	4484.465	31157.00	36	5
2010	4746.700	6051.483	6215.935	34.55683	570.3314	2250.5299	6786.266	28092.76	37	4
2011	4603.524	5948.048	4946.406	107.85773	646.7363	1815.5364	5593.142	26438.06	37	4
2012	5763.960	7415.705	6682.001	191.94392	854.6184	2332.4520	7536.620	29605.14	39	2
2013	7184.976	9070.937	8126.896	142.42105	1100.7753	4097.5116	9227.672	40455.44	38	3
2014	7765.755	10384.429	7898.876	190.30517	1092.5159	3131.4306	8991.392	51301.26	39	2
2015	7848.233	10634.262	7641.408	188.43609	1170.2249	3190.0960	8811.633	51692.84	39	2
2016	7882.084	10900.833	9211.377	196.18461	1209.5573	4092.2645	10420.935	58405.83	39	2
2017	8593.372	12416.633	9926.533	349.24826	1310.7757	3834.6155	11237.309	68210.91	39	2

Variable: Operating.margin

	mean	sd	IQR	0%	25%	50%	75%	100%	n	NA
2008	11.11996	53.04239	27.22707	-186.206718	4.316737	21.19578	31.54380	83.57636	34	7
2009	35.77156	65.52980	50.57216	-118.817471	12.007461	21.08316	62.57962	317.92604	40	1
2010	38.58563	55.11411	49.30417	-182.494831	13.956359	30.60527	63.26053	172.55976	40	1
2011	23.82718	120.32526	44.98780	-645.679663	12.653646	28.92224	57.64145	272.44333	39	2
2012	94.43766	374.03965	40.03606	-26.908842	13.423666	36.58485	53.45973	2421.26958	41	0
2013	54.91470	92.56332	36.16982	0.309125	19.481804	34.48029	55.65162	603.90044	41	0
2014	36.41879	27.26973	35.26707	-0.980915	14.936166	30.74880	50.20324	97.47798	41	0
2015	32.47260	29.91746	31.14220	-31.244308	15.018831	33.60837	46.16103	99.92478	41	0
2016	32.31507	41.94978	39.49455	-152.066735	14.548281	29.54343	54.04283	99.88939	41	0
2017	39.95285	30.13395	42.67247	-5.536521	15.551867	34.95445	58.22434	115.26096	41	0

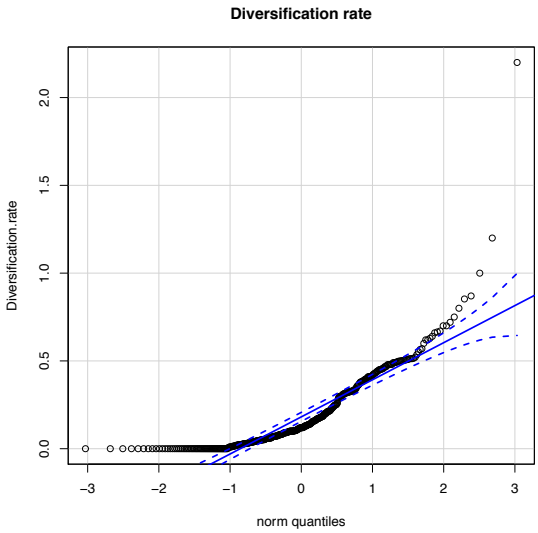
Variable: Return.on.assets

	mean	sd	IQR	0%	25%	50%	75%	100%	n	NA
2008	-4.418515	19.710153	15.225298	-66.306657	-11.117079	0.373753	4.108219	33.99984	38	3
2009	5.258747	16.386594	9.357557	-70.106838	1.154639	3.120993	10.512196	46.05136	39	2
2010	7.328732	11.111764	14.237255	-27.528489	1.138930	4.001577	15.376185	42.97541	40	1
2011	5.197866	8.312810	6.436948	-24.322455	1.199121	4.177080	7.636069	27.60702	40	1
2012	6.601774	8.089962	9.706521	-4.772981	1.400949	3.791257	11.107470	32.31172	40	1
2013	8.602223	9.945630	6.398796	-0.287076	3.121428	5.115483	9.520224	50.22708	41	0
2014	7.908877	9.111281	11.017842	-3.855831	1.433218	4.975265	12.451060	33.67941	41	0
2015	6.875762	8.385546	9.585258	-3.701434	1.062047	4.823550	10.647305	31.18237	41	0
2016	6.784705	8.609132	9.603879	-9.949605	0.920887	5.724491	10.524766	32.55063	41	0
2017	8.111418	8.017917	6.463271	-0.142723	3.071537	5.065730	9.534808	32.16954	41	0

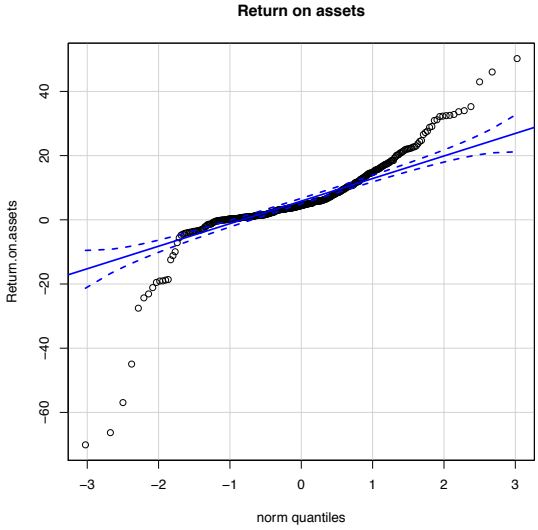
Variable: Unlevered.beta

	mean	sd	IQR	0%	25%	50%	75%	100%	n	NA
2008	1.403626	1.012339	1.283475	-0.744589	0.7879757	1.472615	2.0714510	3.110743	18	23
2009	1.242665	0.697586	1.158700	0.003062	0.6053920	1.197284	1.7640920	2.946746	29	12
2010	-26.228901	38.626098	48.507813	-125.138210	-47.9826403	-7.500568	0.5251728	22.052127	32	9
2011	1.366473	1.157808	1.640265	-0.399913	0.4761372	1.237759	2.1164025	5.067290	30	11
2012	1.946192	2.585669	1.770696	-6.191653	0.8127110	1.727518	2.5834070	7.491027	29	12
2013	3.019012	5.814260	3.963782	-8.220947	0.2363200	1.759483	4.2001020	22.613202	33	8
2014	-5.603335	12.793262	7.132739	-60.675200	-6.5744380	-1.855300	0.5583005	4.636095	35	6
2015	10.308958	29.288391	2.171755	-9.828998	-0.4815710	0.773975	1.6901840	122.867238	33	8
2016	4.690142	8.298664	6.695795	-16.603497	0.4644545	3.511712	7.1602500	36.873596	31	10
2017	1.025040	4.188442	4.201946	-9.262120	-1.3527087	0.627150	2.8492370	16.055565	34	7

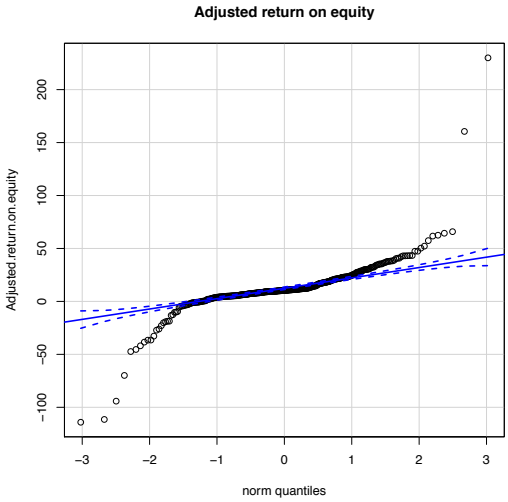
Appendix 7 – Yearly mean for each variable



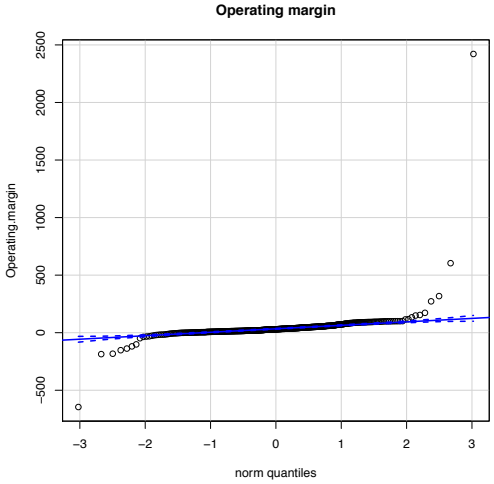
Appendix 8 – Q-Q plot of div. rate quantiles



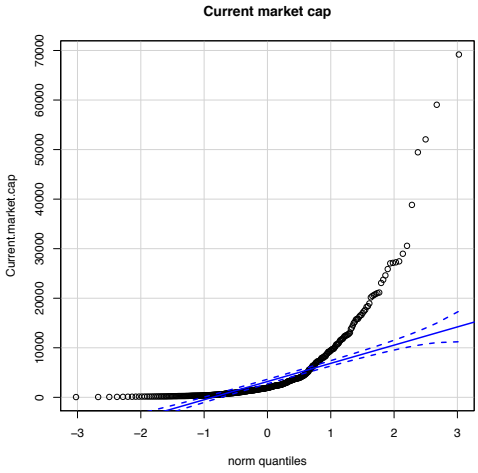
Appendix 9 – Q-Q plot of ROA quantiles



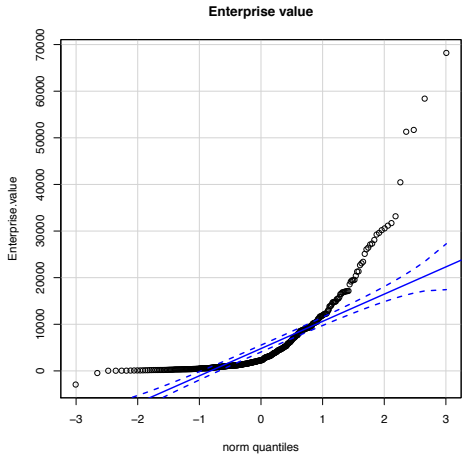
Appendix 10 – Q-Q plot of Adj. ROE quantiles



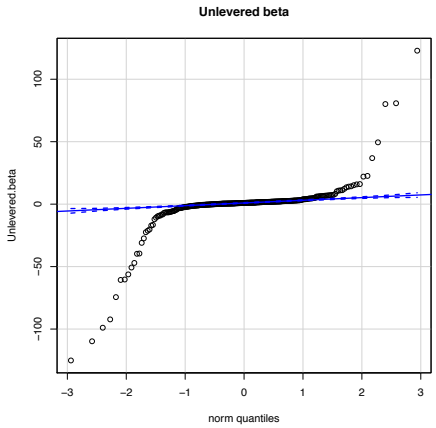
Appendix 11 – Q-Q plot of op. margin quantiles



Appendix 12 – Q-Q plot of mktcap quantiles



Appendix 13 – Q-Q plot of EV quantiles



Appendix 14 – Q-Q plot of β quantiles

```
> normalityTest(~Diversification.rate, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Diversification.rate
W = 0.7814, p-value < 2.2e-16
```

Appendix 15 – Results of Shapiro-Wilk test [Div. rate]

```
> normalityTest(~Return.on.assets, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Return.on.assets
W = 0.81941, p-value < 2.2e-16
```

Appendix 16 – Results of Shapiro-Wilk test [ROA]

```
> normalityTest(~Adjusted.return.on.equity, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Adjusted.return.on.equity
W = 0.6868, p-value < 2.2e-16
```

Appendix 17 – Results of Shapiro-Wilk test [Adj. ROE]

```
> normalityTest(~Operating.margin, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Operating.margin
W = 0.24096, p-value < 2.2e-16
```

Appendix 18 – Results of Shapiro-Wilk test [Op. margin]

```
> normalityTest(~Current.market.cap, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Current.market.cap
W = 0.58629, p-value < 2.2e-16
```

Appendix 19 – Results of Shapiro-Wilk test [Mktcap]

```
> normalityTest(~Enterprise.value, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Enterprise.value
W = 0.66881, p-value < 2.2e-16
```

Appendix 20 – Results of Shapiro-Wilk test [EV]

```
> normalityTest(~Unlevered.beta, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  Unlevered.beta
W = 0.50384, p-value < 2.2e-16
```

Appendix 21 – Results of Shapiro-Wilk test [β]

```
Frequency table:
       Cat.Div
Cat.ROA Low High
   Low  104   97
   High 100  101

Total percentages:
       Low High Total
Low   25.9 24.1    50
High  24.9 25.1    50
Total 50.7 49.3   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 0.15924, df = 1, p-value = 0.6899
```

Appendix 22 – Results of Chi-square test [ROA ~ Div. rate]

```
Frequency table:
       Cat.Div
Cat.ROE Low High
   Low  109   90
   High  92  107

Total percentages:
       Low High Total
Low   27.4 22.6    50
High  23.1 26.9    50
Total 50.5 49.5   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 2.9048, df = 1, p-value = 0.08832
```

Appendix 23 – Results of Chi-square test [ROE ~ Div. rate]

```
Frequency table:
            Cat.Div
Cat.Opmargin Low High
        Low  117   83
        High  84  115

Total percentages:
       Low High Total
Low   29.3 20.8  50.1
High  21.1 28.8  49.9
Total 50.4 49.6 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 10.587, df = 1, p-value = 0.001139
```

Appendix 24 – Results of Chi-square test [Op. margin ~ Div. rate]

```
Frequency table:
       Geographic.area
Cat.ROA  EU  US
   Low   69 132
   High  81 120

Total percentages:
        EU   US Total
Low   17.2 32.8    50
High  20.1 29.9    50
Total 37.3 62.7   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 1.5314, df = 1, p-value = 0.2159
```

Appendix 25 – Results of Chi-square test [ROA ~ Geo. area]

```
Frequency table:
       Geographic.area
Cat.ROE  EU  US
   Low   90 109
   High  59 140

Total percentages:
        EU   US Total
Low   22.6 27.4    50
High  14.8 35.2    50
Total 37.4 62.6   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 10.309, df = 1, p-value = 0.001324
```

Appendix 26 – Results of Chi-square test [ROE ~ Geo. area]

```
Frequency table:
            Geographic.area
Cat.Opmargin  EU  US
        Low   63 137
        High  82 117

Total percentages:
        EU   US Total
Low   15.8 34.3  50.1
High  20.6 29.3  49.9
Total 36.3 63.7 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 4.062, df = 1, p-value = 0.04386
```

Appendix 27 – Results of Chi-square test [Op. margin ~ Geo. area]

```
Frequency table:
       Period
Cat.ROA AFTER 2012 BEFORE 2012
   Low          88          113
   High        117           84

Total percentages:
      AFTER 2012 BEFORE 2012 Total
Low         21.9        28.1    50
High        29.1        20.9    50
Total       51.0        49.0   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 8.3715, df = 1, p-value = 0.003812
```

Appendix 28 – Results of Chi-square test [ROA ~ Period]

```
Frequency table:
       Period
Cat.ROE AFTER 2012 BEFORE 2012
   Low          90          109
   High        113           86

Total percentages:
      AFTER 2012 BEFORE 2012 Total
Low         22.6        27.4    50
High        28.4        21.6    50
Total       51.0        49.0   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 5.3187, df = 1, p-value = 0.0211
```

Appendix 29 – Results of Chi-square test [ROE ~ Period]

```
Frequency table:
            Period
Cat.Opmargin AFTER 2012 BEFORE 2012
        Low          93          107
        High        112           87

Total percentages:
      AFTER 2012 BEFORE 2012 Total
Low         23.3        26.8  50.1
High        28.1        21.8  49.9
Total       51.4        48.6 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 3.8203, df = 1, p-value = 0.05063
```

Appendix 30 – Results of Chi-square test [Op. margin ~ Period]

```
Frequency table:
       Cat.ROA
Cat.Div Low High
   Low  104  100
   High  97  101

Total percentages:
       Low High Total
Low   25.9 24.9  50.7
High  24.1 25.1  49.3
Total 50.0 50.0 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 0.15924, df = 1, p-value = 0.6899
```

Appendix 31 – Results of Chi-square test [Div. rate ~ ROA]

```
Frequency table:
       Cat.ROE
Cat.Div Low High
   Low  109   92
   High  90  107

Total percentages:
       Low High Total
Low   27.4 23.1  50.5
High  22.6 26.9  49.5
Total 50.0 50.0 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 2.9048, df = 1, p-value = 0.08832
```

Appendix 32 – Results of Chi-square test [Div. rate ~ Adj. ROE]

```
Frequency table:
       Cat.Opmargin
Cat.Div Low High
   Low  117   84
   High  83  115

Total percentages:
       Low High Total
Low   29.3 21.1  50.4
High  20.8 28.8  49.6
Total 50.1 49.9 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 10.587, df = 1, p-value = 0.001139
```

Appendix 33 – Results of Chi-square test [Div. rate ~ Op. margin]

```
Frequency table:
       Geographic.area
Cat.Div  EU  US
   Low   70 135
   High  80 125

Total percentages:
        EU   US Total
Low   17.1 32.9    50
High  19.5 30.5    50
Total 36.6 63.4   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 1.0513, df = 1, p-value = 0.3052
```

Appendix 34 – Results of Chi-square test [Div. rate ~ Geo. area]

```
Frequency table:
       Period
Cat.Div AFTER 2012 BEFORE 2012
   Low          98          107
   High        107           98

Total percentages:
      AFTER 2012 BEFORE 2012 Total
Low         23.9        26.1    50
High        26.1        23.9    50
Total       50.0        50.0   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 0.79024, df = 1, p-value = 0.374
```

Appendix 35 – Results of Chi-square test [Div. rate ~ Period]

```
Frequency table:
       Cat.Mktcap
Cat.Div Low High
   Low  128   75
   High  72  125

Total percentages:
      Low High Total
Low    32 18.8  50.8
High   18 31.2  49.2
Total  50 50.0 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 28.096, df = 1, p-value = 0.0000001154
```

Appendix 36 – Results of Chi-square test [Div. rate ~ Mktcap]

```
Frequency table:
       Cat.EV
Cat.Div Low High
   Low  129   72
   High  61  117

Total percentages:
       Low High Total
Low   34.0 19.0    53
High  16.1 30.9    47
Total 50.1 49.9   100

        Pearson's Chi-squared test

data:  .Table
X-squared = 33.78, df = 1, p-value = 0.000000006172
```

Appendix 37 – Results of Chi-square test [Div. rate ~ EV]

```
Frequency table:
       Cat.Beta
Cat.Div Low High
   Low   76   71
   High  76   81

Total percentages:
      Low High Total
Low    25 23.4  48.4
High   25 26.6  51.6
Total  50 50.0 100.0

        Pearson's Chi-squared test

data:  .Table
X-squared = 0.3293, df = 1, p-value = 0.5661
```

Appendix 38 – Results of Chi-square test [Div. rate ~ β]

```
> numSummary(Database[,"Return.on.assets", drop=FALSE], groups=Database$Cat.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
        mean   n NA
Low  4.393602 204  1
High 7.452677 198  7
```

Appendix 39 – Mean [ROA ~ Div. rate]

```
> wilcox.test(Return.on.assets ~ Cat.Div, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Return.on.assets by Cat.Div
W = 17919, p-value = 0.05063
alternative hypothesis: true location shift is not equal to 0
```

Appendix 40 – Results of Wilcoxon test [ROA ~ Div. rate]

```
> numSummary(Database[,"Adjusted.return.on.equity", drop=FALSE], groups=Database$Cat.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n NA
Low   9.466619 201  4
High 15.321568 197  8
```

Appendix 41 – Mean [Adj. ROE ~ Div. rate]

```
> wilcox.test(Adjusted.return.on.equity ~ Cat.Div, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Adjusted.return.on.equity by Cat.Div
W = 17855, p-value = 0.09039
alternative hypothesis: true location shift is not equal to 0
```

Appendix 42 – Results of Wilcoxon test [Adj. ROE ~ Div. rate]

```
> numSummary(Database[,"Operating.margin", drop=FALSE], groups=Database$Cat.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n NA
Low   48.96873 201  4
High 32.07016 198  7
```

Appendix 43 – Mean [Op. margin ~ Div. rate]

```
> wilcox.test(Operating.margin ~ Cat.Div, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Operating.margin by Cat.Div
W = 17372, p-value = 0.02827
alternative hypothesis: true location shift is not equal to 0
```

Appendix 44 – Results of Wilcoxon test [Op. margin ~ Div. rate]

```
> numSummary(Database[,"Return.on.assets", drop=FALSE], groups=Database$Geographic.area, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
       mean   n NA
EU 6.791220 150  0
US 5.370007 252  8
```

Appendix 45 – Mean [ROA ~ Geo. area]

```
> wilcox.test(Return.on.assets ~ Geographic.area, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Return.on.assets by Geographic.area
W = 20211, p-value = 0.2448
alternative hypothesis: true location shift is not equal to 0
```

Appendix 46 – Results of Wilcoxon test [ROA ~ Geo. area]

```
> numSummary(Database[,"Adjusted.return.on.equity", drop=FALSE], groups=Database$Geographic.area, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
       mean   n NA
EU 10.75177 149  1
US 13.32982 249 11
```

Appendix 47 – Mean [Adj. ROE ~ Geo. area]

```
> wilcox.test(Adjusted.return.on.equity ~ Geographic.area, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Adjusted.return.on.equity by Geographic.area
W = 14959, p-value = 0.001224
alternative hypothesis: true location shift is not equal to 0
```

Appendix 48 – Results of Wilcoxon test [Adj. ROE ~ Geo. area]

```
> numSummary(Database[,"Operating.margin", drop=FALSE], groups=Database$Geographic.area, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
       mean   n NA
EU 61.74600 145  5
US 28.50171 254  6
```

Appendix 49 – Mean [Op. margin ~ Geo. area]

```
> wilcox.test(Operating.margin ~ Geographic.area, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Operating.margin by Geographic.area
W = 22828, p-value = 0.00006822
alternative hypothesis: true location shift is not equal to 0
```

Appendix 50 – Results of Wilcoxon test [Op. margin ~ Geo. area]

```
> numSummary(Database[,"Return.on.assets", drop=FALSE], groups=Database$Period, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
                mean   n NA
AFTER 2012  7.656597 205  0
BEFORE 2012 4.072703 197  8
```

Appendix 51 – Mean [ROA ~ Period]

```
> wilcox.test(Return.on.assets ~ Period, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Return.on.assets by Period
W = 23187, p-value = 0.01014
alternative hypothesis: true location shift is not equal to 0
```

Appendix 52 – Results of Wilcoxon test [ROA ~ Period]

```
> numSummary(Database[,"Adjusted.return.on.equity", drop=FALSE], groups=Database$Period, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
                mean   n NA
AFTER 2012  13.80309 203  2
BEFORE 2012 10.86724 195 10
```

Appendix 53 – Mean [Adj. ROE ~ Period]

```
> wilcox.test(Adjusted.return.on.equity ~ Period, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Adjusted.return.on.equity by Period
W = 22732, p-value = 0.01041
alternative hypothesis: true location shift is not equal to 0
```

Appendix 54 – Results of Wilcoxon test [Adj. ROE ~ Period]

```
> numSummary(Database[,"Operating.margin", drop=FALSE], groups=Database$Period, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
                mean   n NA
AFTER 2012  39.21480 205  0
BEFORE 2012 42.02871 194 11
```

Appendix 55 – Mean [Op. margin ~ Period]

```
> wilcox.test(Operating.margin ~ Period, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Operating.margin by Period
W = 21522, p-value = 0.1552
alternative hypothesis: true location shift is not equal to 0
```

Appendix 56 – Results of Wilcoxon test [Op. margin ~ Period]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.ROA, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n
Low  0.2236196 201
High 0.1688431 201
```

Appendix 57 – Mean [Div. rate ~ ROA]

```
> wilcox.test(Diversification.rate ~ Cat.ROA, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.ROA
W = 22354, p-value = 0.06415
alternative hypothesis: true location shift is not equal to 0
```

Appendix 58 – Results of Wilcoxon test [Div. rate ~ ROA]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.ROE, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n
Low  0.2077943 199
High 0.1874856 199
```

Appendix 59 – Mean [Div. rate ~ Adj. ROE]

```
> wilcox.test(Diversification.rate ~ Cat.ROE, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.ROE
W = 19563, p-value = 0.8358
alternative hypothesis: true location shift is not equal to 0
```

Appendix 60 – Results of Wilcoxon test [Div. rate ~ Adj. ROE]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.Opmargin, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n
Low  0.2053863 200
High 0.1904809 199
```

Appendix 61 – Mean [Div. rate ~ Op. margin]

```
> wilcox.test(Diversification.rate ~ Cat.Opmargin, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.Opmargin
W = 18307, p-value = 0.166
alternative hypothesis: true location shift is not equal to 0
```

Appendix 62 – Results of Wilcoxon test [Div. rate ~ Op. margin]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Geographic.area, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
       mean   n
EU 0.2277001 150
US 0.1823951 260
```

Appendix 63 – Mean [Div. rate ~ Geo. area]

```
> wilcox.test(Diversification.rate ~ Geographic.area, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Geographic.area
W = 21479, p-value = 0.08645
alternative hypothesis: true location shift is not equal to 0
```

Appendix 64 – Results of Wilcoxon test [Div. rate ~ Geo. area]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Period, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
                mean   n
AFTER 2012   0.2041156 205
BEFORE 2012 0.1938246 205
```

Appendix 65 – Mean [Div. rate ~ Period]

```
> wilcox.test(Diversification.rate ~ Period, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Period
W = 21923, p-value = 0.4475
alternative hypothesis: true location shift is not equal to 0
```

Appendix 66 – Results of Wilcoxon test [Div. rate ~ Period]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.Mktcap, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
        mean   n
Low  0.1715884 200
High 0.2220796 200
```

Appendix 67 – Mean [Div. rate ~ Mktcap]

```
> wilcox.test(Diversification.rate ~ Cat.Mktcap, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.Mktcap
W = 14776, p-value = 0.000006038
alternative hypothesis: true location shift is not equal to 0
```

Appendix 68 – Results of Wilcoxon test [Div. rate ~ Mktcap]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.EV, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n
Low  0.1337425 190
High 0.2170110 189
```

Appendix 69 – Mean [Div. rate ~ EV]

```
> wilcox.test(Diversification.rate ~ Cat.EV, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.EV
W = 12308, p-value = 0.0000001132
alternative hypothesis: true location shift is not equal to 0
```

Appendix 70 – Results of Wilcoxon test [Div. rate ~ EV]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Cat.Beta, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n
Low  0.1776343 152
High 0.2221636 152
```

Appendix 71 – Mean [Div. rate ~ β]

```
> wilcox.test(Diversification.rate ~ Cat.Beta, alternative="two.sided", data=Database)

        Wilcoxon rank sum test with continuity correction

data:  Diversification.rate by Cat.Beta
W = 10075, p-value = 0.05387
alternative hypothesis: true location shift is not equal to 0
```

Appendix 72 – Results of Wilcoxon test [Div. rate ~ β]

```
> numSummary(Database[,"Return.on.assets", drop=FALSE], groups=Database$Catnondich.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n NA
Low    4.966145 137  1
Middle 7.529991 135  0
High   5.192417 130  7
```

Appendix 73 – Mean [ROA ~ Div. rate]

```
> kruskal.test(Return.on.assets ~ Catnondich.Div, data=Database)

        Kruskal-Wallis rank sum test

data:  Return.on.assets by Catnondich.Div
Kruskal-Wallis chi-squared = 3.0391, df = 2, p-value = 0.2188
```

Appendix 74 – Results of Kruskal-Wallis test [ROA ~ Div. rate]

```
> numSummary(Database[,"Adjusted.return.on.equity", drop=FALSE], groups=Database$Catnondich.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n NA
Low     9.798426 134  4
Middle 13.971159 134  1
High   13.353961 130  7
```

Appendix 75 – Mean [Adj. ROE ~ Div. rate]

```
> kruskal.test(Adjusted.return.on.equity ~ Catnondich.Div, data=Database)

        Kruskal-Wallis rank sum test

data:  Adjusted.return.on.equity by Catnondich.Div
Kruskal-Wallis chi-squared = 0.2065, df = 2, p-value = 0.9019
```

Appendix 76 – Results of Kruskal-Wallis test [Adj. ROE ~ Div. rate]

```
> numSummary(Database[,"Operating.margin", drop=FALSE], groups=Database$Catnondich.Div, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
          mean   n NA
Low    50.75317 136  2
Middle 40.25840 132  3
High   30.35165 131  6
```

Appendix 77 – Mean [Op. margin ~ Div. rate]

```
> kruskal.test(Operating.margin ~ Catnondich.Div, data=Database)

        Kruskal-Wallis rank sum test

data:  Operating.margin by Catnondich.Div
Kruskal-Wallis chi-squared = 5.4824, df = 2, p-value = 0.06449
```

Appendix 78 – Results of Kruskal-Wallis test [Op. margin ~ Div. rate]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.ROA, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.2243395 134
Middle 0.1955210 134
High   0.1688335 134
```

Appendix 79 – Mean [Div. rate ~ ROA]

```
> kruskal.test(Diversification.rate ~ Catnondich.ROA, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.ROA
Kruskal-Wallis chi-squared = 1.2577, df = 2, p-value = 0.5332
```

Appendix 80 – Results of Kruskal-Wallis test [Div. rate ~ ROA]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.ROE, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.2196216 133
Middle 0.1864403 132
High   0.1867738 133
```

Appendix 81 – Mean [Div. rate ~ Adj. ROE]

```
> kruskal.test(Diversification.rate ~ Catnondich.ROE, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.ROE
Kruskal-Wallis chi-squared = 0.33497, df = 2, p-value = 0.8458
```

Appendix 82 – Results of Kruskal-Wallis test [Div. rate ~ Adj. ROE]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.Opmargin, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.1648289 133
Middle 0.2554027 133
High   0.1736253 133
```

Appendix 83 – Mean [Div. rate ~ Op. margin]

```
> kruskal.test(Diversification.rate ~ Catnondich.Opmargin, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.Opmargin
Kruskal-Wallis chi-squared = 20.973, df = 2, p-value = 0.00002792
```

Appendix 84 – Results of Kruskal-Wallis test [Div. rate ~ Op. margin]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.Mktcap, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.1322046 134
Middle 0.2076484 133
High   0.2511349 133
```

Appendix 85 – Mean [Div. rate ~ Mktcap]

```
> kruskal.test(Diversification.rate ~ Catnondich.Mktcap, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.Mktcap
Kruskal-Wallis chi-squared = 42.425, df = 2, p-value = 6.131e-10
```

Appendix 86 – Results of Kruskal-Wallis test [Div. rate ~ Mktcap]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.EV, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.1303523 127
Middle 0.1495154 126
High   0.2462895 126
```

Appendix 87 – Mean [Div. rate ~ EV]

```
> kruskal.test(Diversification.rate ~ Catnondich.EV, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.EV
Kruskal-Wallis chi-squared = 42.503, df = 2, p-value = 5.897e-10
```

Appendix 88 – Results of Kruskal-Wallis test [Div. rate ~ EV]

```
> numSummary(Database[,"Diversification.rate", drop=FALSE], groups=Database$Catnondich.Beta, statistics=c("mean"), quantiles=c(0,.25,.5,.75,1))
           mean   n
Low    0.1822797 102
Middle 0.2023753 101
High   0.2152163 101
```

Appendix 89 – Mean [Div. rate ~ β]

```
> kruskal.test(Diversification.rate ~ Catnondich.Beta, data=Database)

        Kruskal-Wallis rank sum test

data:  Diversification.rate by Catnondich.Beta
Kruskal-Wallis chi-squared = 1.9485, df = 2, p-value = 0.3775
```

Appendix 90 – Results of Kruskal-Wallis test [Div. rate ~ β]

```
Call:
lm(formula = Normalize(Return.on.assets) ~ Normalize(Diversification.rate),
    data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-33.689  -7.779  -0.128   7.793  32.227

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                     6.3514     0.7962   7.978 1.59e-14 ***
Normalize(Diversification.rate) -2.2576     2.7375  -0.825     0.41
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 11.6 on 400 degrees of freedom
  (8 observations deleted due to missingness)
Multiple R-squared:  0.001697, Adjusted R-squared:  -0.0007985
F-statistic: 0.6801 on 1 and 400 DF,  p-value: 0.4101
```

Appendix 91 – Results of linear regression [ROA ~ Div. rate]

```
> outlierTest(RegModel.5)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
     rstudent unadjusted p-value Bonferroni p
402 -2.944371          0.0034254           NA

> normalityTest(~RegModel.5$res, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  RegModel.5$res
W = 0.99904, p-value = 0.9992

> dwtest(RegModel.5)

        Durbin-Watson test

data:  RegModel.5
DW = 0.89754, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
```

```
> bptest(RegModel.5)

        studentized Breusch-Pagan test

data:  RegModel.5
BP = 9.7635, df = 1, p-value = 0.00178
```

Appendix 92 – Residuals analysis of linear regression [ROA ~ Div. rate]

```
Call:
lm(formula = Normalize(Adjusted.return.on.equity) ~ Normalize(Diversification.rate),
    data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-64.182 -15.132   0.012  15.292  64.150

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                       12.490      1.567   7.968 1.73e-14 ***
Normalize(Diversification.rate)   -0.619      5.373  -0.115    0.908
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 22.56 on 396 degrees of freedom
  (12 observations deleted due to missingness)
Multiple R-squared:  3.352e-05, Adjusted R-squared:  -0.002492
F-statistic: 0.01327 on 1 and 396 DF,  p-value: 0.9083
```

Appendix 93 – Results of linear regression [Adj. ROE ~ Div. rate]

```
> outlierTest(RegModel.6)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
     rstudent unadjusted p-value Bonferroni p
298 -2.883415          0.0041491           NA
> normalityTest(~RegModel.6$res, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  RegModel.6$res
W = 0.99937, p-value = 1

> dwtest(RegModel.6)

        Durbin-Watson test

data:  RegModel.6
DW = 0.84793, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(RegModel.6)

        studentized Breusch-Pagan test

data:  RegModel.6
BP = 1.0002, df = 1, p-value = 0.3173
```

Appendix 94 – Residuals analysis of linear regression [Adj. ROE ~ Div. rate]

```
Call:
lm(formula = Normalize(Operating.margin) ~ Normalize(Diversification.rate),
    data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-379.10  -89.69    1.54   88.48  380.49

Coefficients:
                               Estimate Std. Error t value  Pr(>|t|)
(Intercept)                      36.486      9.177   3.976 0.0000833 ***
Normalize(Diversification.rate)  20.387     31.380   0.650     0.516
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 133.2 on 397 degrees of freedom
  (11 observations deleted due to missingness)
Multiple R-squared:  0.001062, Adjusted R-squared:  -0.001454
F-statistic: 0.4221 on 1 and 397 DF,  p-value: 0.5163
```

Appendix 95 – Results of linear regression [Op. margin ~ Div. rate]

```
> outlierTest(RegModel.7)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
   rstudent unadjusted p-value Bonferroni p
15  2.88841          0.0040845           NA
> normalityTest(~RegModel.7$res, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  RegModel.7$res
W = 0.99918, p-value = 0.9998

> dwtest(RegModel.7)

        Durbin-Watson test

data:  RegModel.7
DW = 0.62389, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
> bptest(RegModel.7)

        studentized Breusch-Pagan test

data:  RegModel.7
BP = 6.2792, df = 1, p-value = 0.01222
```

Appendix 96 – Residuals analysis of linear regression [Op. margin ~ Div. rate]

```
Call:
lm(formula = Normalize(Diversification.rate) ~ Normalize(Return.on.assets) +
    Normalize(Adjusted.return.on.equity) + Normalize(Operating.margin) +
    Normalize(Current.market.cap) + Normalize(Enterprise.value) +
    Normalize(Unlevered.beta), data = Database)

Residuals:
     Min       1Q   Median       3Q      Max
-0.39833 -0.13865 -0.01846  0.12146  0.64788

Coefficients:
                                      Estimate    Std. Error t value Pr(>|t|)
(Intercept)                         0.1700730027  0.0196191132   8.669 3.54e-16 ***
Normalize(Return.on.assets)        -0.0040680536  0.0019736385  -2.061   0.0402 *
Normalize(Adjusted.return.on.equity)  0.0003661867  0.0008751468   0.418   0.6760
Normalize(Operating.margin)         0.0002272974  0.0001190187   1.910   0.0572 .
Normalize(Current.market.cap)       0.0000083049  0.0000044983   1.846   0.0659 .
Normalize(Enterprise.value)        -0.0000003566  0.0000041295  -0.086   0.9312
Normalize(Unlevered.beta)           0.0007095326  0.0005866248   1.210   0.2275
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1878 on 281 degrees of freedom
  (122 observations deleted due to missingness)
Multiple R-squared:  0.1274, Adjusted R-squared:  0.1088
F-statistic: 6.838 on 6 and 281 DF,  p-value: 0.0000008706
```

Appendix 97 – Results of linear regression [Div. rate ~ ROA + ROE + Op. margin + Mktcap + EV + β]

```
> outlierTest(RegModel.1)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
   rstudent unadjusted p-value Bonferroni p
83 3.569552         0.00042065      0.12115

> normalityTest(~RegModel.1$res,test="shapiro.test",data=Database)

        Shapiro-Wilk normality test

data:  RegModel.1$res
W = 0.98242, p-value = 0.001311

> dwtest(RegModel.1)

        Durbin-Watson test

data:  RegModel.1
DW = 0.49968, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(RegModel.1)

        studentized Breusch-Pagan test

data:  RegModel.1
BP = 11.144, df = 6, p-value = 0.08403
```

Appendix 98 – Residuals analysis of linear regression [Div. rate ~ ROA + ROE + Op. margin + Mktcap + EV + β]

```
Call:
lm(formula = Normalize(Return.on.assets) ~ Normalize(Diversification.rate) +
    Geographic.area + Period, data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-31.651  -7.178  -0.428   7.278  30.909

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                        9.142      1.282   7.133 4.68e-12 ***
Normalize(Diversification.rate)   -3.061      2.731  -1.121  0.26312
Geographic.area[T.US]             -1.572      1.192  -1.319  0.18806
Period[T.BEFORE 2012]             -3.357      1.147  -2.926  0.00363 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 11.48 on 398 degrees of freedom
  (8 observations deleted due to missingness)
Multiple R-squared:  0.0265, Adjusted R-squared:  0.01916
F-statistic: 3.611 on 3 and 398 DF,  p-value: 0.01345
```

Appendix 99 – Results of linear model [ROA ~ Div. rate + Geo. area + Period]

```
> outlierTest(LinearModel.5)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
     rstudent unadjusted p-value Bonferroni p
402 -2.795914          0.0054267           NA
> normalityTest(~LinearModel.5$res,test="shapiro.test",data=Database)

        Shapiro-Wilk normality test

data:  LinearModel.5$res
W = 0.99692, p-value = 0.6475
> dwtest(LinearModel.5)

        Durbin-Watson test

data:  LinearModel.5
DW = 0.86859, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.5)

        studentized Breusch-Pagan test

data:  LinearModel.5
BP = 18.987, df = 3, p-value = 0.0002751
```

Appendix 100 – Residuals analysis of linear model [ROA ~ Div. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Adjusted.return.on.equity) ~ Normalize(Diversification.rate) +
    Geographic.area + Period, data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-69.019 -14.844  -1.573  14.797  64.374

Coefficients:
                                Estimate Std. Error t value  Pr(>|t|)
(Intercept)                      11.0661     2.4994   4.428 0.0000124 ***
Normalize(Diversification.rate)   0.3124     5.3361   0.059    0.9533
Geographic.area[T.US]             6.3762     2.3170   2.752    0.0062 **
Period[T.BEFORE 2012]            -5.6203     2.2320  -2.518    0.0122 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 22.22 on 394 degrees of freedom
  (12 observations deleted due to missingness)
Multiple R-squared:  0.0347, Adjusted R-squared:  0.02735
F-statistic: 4.721 on 3 and 394 DF,  p-value: 0.002997
```

Appendix 101 – Results of linear model [Adj. ROE ~ Div. rate + Geo. area + Period]

```
> outlierTest(LinearModel.6)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
     rstudent unadjusted p-value Bonferroni p
298 -3.160574          0.0016966      0.67524

> normalityTest(~LinearModel.6$res,test="shapiro.test",data=Database)

        Shapiro-Wilk normality test

data:  LinearModel.6$res
W = 0.99775, p-value = 0.8748

> dwtest(LinearModel.6)

        Durbin-Watson test

data:  LinearModel.6
DW = 0.86209, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.6)

        studentized Breusch-Pagan test

data:  LinearModel.6
BP = 7.597, df = 3, p-value = 0.05512
```

Appendix 102 – Residuals analysis of linear model [Adj. ROE ~ Div. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Operating.margin) ~ Normalize(Diversification.rate) +
    Geographic.area + Period, data = Database)

Residuals:
    Min      1Q  Median      3Q     Max
-405.03  -91.58   11.44   89.70  351.55

Coefficients:
                                Estimate Std. Error t value     Pr(>|t|)
(Intercept)                       85.189     14.588   5.840 0.0000000109 ***
Normalize(Diversification.rate)    3.795     30.939   0.123        0.902
Geographic.area[T.US]            -57.138     13.652  -4.185 0.0000351382 ***
Period[T.BEFORE 2012]            -18.500     13.066  -1.416        0.158
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 130.3 on 395 degrees of freedom
  (11 observations deleted due to missingness)
Multiple R-squared:  0.04811, Adjusted R-squared:  0.04088
F-statistic: 6.655 on 3 and 395 DF,  p-value: 0.0002154
```

Appendix 103 – Results of linear model [Op. margin ~ Div. rate + Geo. area + Period]

```
> outlierTest(LinearModel.7)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
     rstudent unadjusted p-value Bonferroni p
104 -3.158341           0.001709      0.68189

> normalityTest(~LinearModel.7$res,test="shapiro.test",data=Database)

        Shapiro-Wilk normality test

data:  LinearModel.7$res
W = 0.99577, p-value = 0.3596

> dwtest(LinearModel.7)

        Durbin-Watson test

data:  LinearModel.7
DW = 0.64412, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.7)

        studentized Breusch-Pagan test

data:  LinearModel.7
BP = 23.489, df = 3, p-value = 0.00003193
```

Appendix 104 – Residuals analysis of linear model [Op. margin ~ Div. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Diversification.rate) ~ Normalize(Return.on.assets) +
    Normalize(Adjusted.return.on.equity) + Normalize(Operating.margin) +
    Geographic.area + Period + Normalize(Current.market.cap) +
    Normalize(Enterprise.value) + Normalize(Unlevered.beta),
    data = Database)

Residuals:
     Min       1Q   Median       3Q      Max
-0.38810 -0.13885 -0.01593  0.12514  0.64167

Coefficients:
                                      Estimate     Std. Error t value    Pr(>|t|)
(Intercept)                        0.15467038744  0.02982494364   5.186 0.000000414 ***
Normalize(Return.on.assets)       -0.00395351290  0.00201310137  -1.964       0.0505 .
Normalize(Adjusted.return.on.equity)  0.00035520896  0.00089882905   0.395       0.6930
Normalize(Operating.margin)        0.00023306748  0.00012298545   1.895       0.0591 .
Geographic.area[T.US]              0.00498334891  0.02665950993   0.187       0.8519
Period[T.BEFORE 2012]              0.02009442039  0.02317582320   0.867       0.3867
Normalize(Current.market.cap)      0.00000814674  0.00000453318   1.797       0.0734 .
Normalize(Enterprise.value)        0.00000002856  0.00000421132   0.007       0.9946
Normalize(Unlevered.beta)          0.00076387490  0.00059324326   1.288       0.1989
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1882 on 279 degrees of freedom
  (122 observations deleted due to missingness)
Multiple R-squared:   0.13, Adjusted R-squared:  0.105
F-statistic: 5.209 on 8 and 279 DF,  p-value: 0.000004416
```

Appendix 105 – Results of linear model [Div. rate ~ ROA + Adj. ROE + Op. margin + Geo. area + Period + Mktcap + EV + β]

```
> outlierTest(LinearModel.1)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
   rstudent unadjusted p-value Bonferroni p
83 3.543213         0.00046348      0.13348
> normalityTest(~LinearModel.1$res, test="shapiro.test", data=Database)

        Shapiro-Wilk normality test

data:  LinearModel.1$res
W = 0.98198, p-value = 0.001082

> dwtest(LinearModel.1)

        Durbin-Watson test

data:  LinearModel.1
DW = 0.50463, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.1)

        studentized Breusch-Pagan test

data:  LinearModel.1
BP = 12.975, df = 8, p-value = 0.1127
```

Appendix 106 – Residuals analysis of linear model [Div. rate ~ ROA + Adj. ROE + Op. margin + Geo. area + Period + Mktcap + EV + β]

```
Call:
glm(formula = Cat.ROA ~ Diversification.rate + Geographic.area +
    Period, family = binomial(logit), data = Database)

Deviance Residuals:
   Min      1Q  Median      3Q     Max
-1.478  -1.158   0.205   1.114   1.628

Coefficients:
                      Estimate Std. Error z value Pr(>|z|)
(Intercept)             0.7772     0.2299   3.380 0.000724 ***
Diversification.rate   -1.3506     0.5066  -2.666 0.007678 **
Geographic.area[T.US]  -0.3378     0.2127  -1.588 0.112216
Period[T.BEFORE 2012]  -0.6195     0.2047  -3.027 0.002472 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 557.29  on 401  degrees of freedom
Residual deviance: 539.33  on 398  degrees of freedom
  (8 observations deleted due to missingness)
AIC: 547.33

Number of Fisher Scoring iterations: 4
```

Appendix 107 – Results of generalized linear model [ROA ~ Div. rate + Geo. area + Period]

```
> (GLM.5$null-GLM.5$dev)/GLM.5$dev
[1] 0.03329631
```

Appendix 108 – Approximated R-squared of linear model [ROA ~ Div. rate + Geo. area + Period]

```
Call:
glm(formula = Cat.ROE ~ Diversification.rate + Geographic.area +
    Period, family = binomial(logit), data = Database)

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-1.41402  -1.14018   0.07825   1.15568   1.56112

Coefficients:
                      Estimate Std. Error z value Pr(>|z|)
(Intercept)            -0.1209     0.2234  -0.541  0.58835
Diversification.rate   -0.3117     0.4710  -0.662  0.50809
Geographic.area[T.US]   0.6618     0.2133   3.103  0.00192 **
Period[T.BEFORE 2012]  -0.4759     0.2050  -2.322  0.02022 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 551.75  on 397  degrees of freedom
Residual deviance: 535.62  on 394  degrees of freedom
  (12 observations deleted due to missingness)
AIC: 543.62

Number of Fisher Scoring iterations: 4
```

Appendix 109 – Results of generalized linear model [Adj. ROE ~ Div. rate + Geo. area + Period]

```
> (GLM.6$null-GLM.6$dev)/GLM.6$dev
[1] 0.03011079
```

Appendix 110 – Approximated R-squared [Adj. ROE ~ Div. rate + Geo. area + Period]

```
Call:
glm(formula = Cat.Opmargin ~ Diversification.rate + Geographic.area +
    Period, family = binomial(logit), data = Database)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.4228  -1.1728  -0.9435   1.1457   1.3939

Coefficients:
                      Estimate Std. Error z value Pr(>|z|)
(Intercept)             0.5606     0.2248   2.494   0.0126 *
Diversification.rate   -0.4357     0.4574  -0.952   0.3409
Geographic.area[T.US]  -0.4464     0.2123  -2.102   0.0355 *
Period[T.BEFORE 2012]  -0.4010     0.2027  -1.978   0.0479 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 553.13  on 398  degrees of freedom
Residual deviance: 544.32  on 395  degrees of freedom
  (11 observations deleted due to missingness)
AIC: 552.32

Number of Fisher Scoring iterations: 4
```

Appendix 111 – Results of generalized linear model [Op. margin ~ Div. rate + Geo. area + Period]

```
> (GLM.7$null-GLM.7$dev)/GLM.7$dev
[1] 0.01618456
```

Appendix 112 – Approximated R-squared [Op. margin ~ Div. rate + Geo. area + Period]

```
Call:
glm(formula = Cat.Div ~ Return.on.assets + Adjusted.return.on.equity +
    Operating.margin + Geographic.area + Period + Current.market.cap +
    Enterprise.value + Unlevered.beta, family = binomial(logit),
    data = Database)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.0120  -0.9808  -0.4369   1.1309   1.7848
```

```
Coefficients:
                              Estimate  Std. Error z value Pr(>|z|)
(Intercept)                -0.90559546  0.39230116  -2.308   0.0210 *
Return.on.assets            0.04920943  0.02328575   2.113   0.0346 *
Adjusted.return.on.equity -0.01037144  0.01396131  -0.743   0.4576
Operating.margin           -0.00325708  0.00345861  -0.942   0.3463
Geographic.area[T.US]       0.03697983  0.29630524   0.125   0.9007
Period[T.BEFORE 2012]       0.07973212  0.26710354   0.299   0.7653
Current.market.cap          0.00006183  0.00006476   0.955   0.3398
Enterprise.value            0.00006282  0.00005643   1.113   0.2656
Unlevered.beta             -0.00755284  0.00712628  -1.060   0.2892
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 399.20  on 287  degrees of freedom
Residual deviance: 349.73  on 279  degrees of freedom
  (122 observations deleted due to missingness)
AIC: 367.73

Number of Fisher Scoring iterations: 6
```

Appendix 113 – Results of generalized linear model [Div. rate ~ ROA + Adj. ROE + Op. margin + Geo. area + Period + Mktcap + EV + β]

```
> (GLM.1$null-GLM.1$dev)/(GLM.1$dev)
[1] 0.1414379
```

Appendix 114 – Approximated R-squared of linear model [Div. rate ~ ROA + Adj. ROE + Op. margin + Geo. area + Period + Mktcap + EV + β]

```
Call:
lm(formula = Normalize(Delta.ROA) ~ Normalize(Delta.div) + Geographic.area +
    Period, data = Databasevar)

Residuals:
     Min       1Q   Median       3Q      Max
-17.8430  -4.1399   0.0008   4.2085  17.7458

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)              1.2886242  0.6626182   1.945   0.0527 .
Normalize(Delta.div)    -0.0001977  0.0078911  -0.025   0.9800
Geographic.area[T.US]   -0.2429840  0.7418974  -0.328   0.7435
Period[T.BEFORE 2012]   -0.0622720  0.7294816  -0.085   0.9320
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.315 on 304 degrees of freedom
  (102 observations deleted due to missingness)
Multiple R-squared:  0.0003751, Adjusted R-squared:  -0.00949
F-statistic: 0.03802 on 3 and 304 DF,  p-value: 0.9901
```

Appendix 115 – Results of linear model [ΔROA ~ ΔDiv. rate + Geo. area + Period]

```
> outlierTest(LinearModel.5)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
    rstudent unadjusted p-value Bonferroni p
54 -2.877972          0.0042869           NA

> normalityTest(~LinearModel.5$res,test="shapiro.test", data=Databasevar)

        Shapiro-Wilk normality test

data:  LinearModel.5$res
W = 0.999, p-value = 0.9998

> dwtest(LinearModel.5)

        Durbin-Watson test

data:  LinearModel.5
DW = 2.1657, p-value = 0.9151
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.5)

        studentized Breusch-Pagan test

data:  LinearModel.5
BP = 6.6435, df = 3, p-value = 0.08417
```

Appendix 116 – Residuals analysis of linear model [ΔROA ~ ΔDiv. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Delta.ROE) ~ Normalize(Delta.div) + Geographic.area +
    Period, data = Databasevar)

Residuals:
     Min       1Q   Median       3Q      Max
-15.7323  -3.8154   0.1819   3.8194  15.8843

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)            0.622665   0.583511   1.067    0.287
Normalize(Delta.div)  -0.002695   0.006961  -0.387    0.699
Geographic.area[T.US] -0.468695   0.653674  -0.717    0.474
Period[T.BEFORE 2012]  0.040044   0.643439   0.062    0.950

Residual standard error: 5.558 on 303 degrees of freedom
  (103 observations deleted due to missingness)
Multiple R-squared:  0.002137, Adjusted R-squared:  -0.007743
F-statistic: 0.2163 on 3 and 303 DF,  p-value: 0.8851
```

Appendix 117 – Results of linear model [ΔAdj. ROE ~ ΔDiv. rate + Geo. area + Period]

```
> outlierTest(LinearModel.6)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
    rstudent unadjusted p-value Bonferroni p
214 2.920669          0.003756           NA
```

```
> normalityTest(~LinearModel.6$res,test="shapiro.test", data=Databasevar)

        Shapiro-Wilk normality test

data:  LinearModel.6$res
W = 0.99854, p-value = 0.9965

> dwtest(LinearModel.6)

        Durbin-Watson test

data:  LinearModel.6
DW = 2.3249, p-value = 0.9972
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.6)

        studentized Breusch-Pagan test

data:  LinearModel.6
BP = 23.41, df = 3, p-value = 0.00003316
```

Appendix 118 – Residuals analysis of linear model [ΔAdj. ROE ~ ΔDiv. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Delta.Opmargin) ~ Normalize(Delta.div) +
    Geographic.area + Period, data = Databasevar)

Residuals:
     Min       1Q   Median       3Q      Max
-31.4798  -8.1062   0.0867   7.8410  30.1981

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)               0.304817   1.238593   0.246    0.806
Normalize(Delta.div)     -0.003073   0.014842  -0.207    0.836
Geographic.area[T.US]     0.503041   1.393551   0.361    0.718
Period[T.BEFORE 2012]    -0.456961   1.367813  -0.334    0.739

Residual standard error: 11.74 on 301 degrees of freedom
  (105 observations deleted due to missingness)
Multiple R-squared:  0.0009802, Adjusted R-squared:  -0.008977
F-statistic: 0.09845 on 3 and 301 DF,  p-value: 0.9608
```

Appendix 119 – Results of linear model [ΔOp. margin ~ ΔDiv. rate + Geo. area + Period]

```
> outlierTest(LinearModel.7)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
    rstudent unadjusted p-value Bonferroni p
33 -2.736227          0.0065852           NA
```

```
> normalityTest(~LinearModel.7$res,test="shapiro.test", data=Databasevar)

        Shapiro-Wilk normality test

data:  LinearModel.7$res
W = 0.99783, p-value = 0.9619

> dwtest(LinearModel.7)

        Durbin-Watson test

data:  LinearModel.7
DW = 2.3261, p-value = 0.9972
alternative hypothesis: true autocorrelation is greater than 0

> bptest(LinearModel.7)

        studentized Breusch-Pagan test

data:  LinearModel.7
BP = 2.5563, df = 3, p-value = 0.4652
```

Appendix 120 – Residuals analysis of linear model [ΔOp. margin ~ ΔDiv. rate + Geo. area + Period]

```
Call:
lm(formula = Normalize(Delta.div) ~ Normalize(Delta.ROA) + Normalize(Delta.ROE) +
    Normalize(Delta.Opmargin) + Geographic.area + Period + Normalize(Delta.mkt.cap) +
    Normalize(Delta.EV) + Normalize(Delta.beta), data = Databasevar)

Residuals:
    Min      1Q  Median      3Q     Max
-110.63  -28.55   -1.00   27.33  132.13

Coefficients:
                           Estimate Std. Error t value Pr(>|t|)
(Intercept)                3.867896   6.267788   0.617   0.5379
Normalize(Delta.ROA)       1.313474   0.933752   1.407   0.1612
Normalize(Delta.ROE)       0.747049   0.904147   0.826   0.4097
Normalize(Delta.Opmargin) -0.511848   0.407322  -1.257   0.2104
Geographic.area[T.US]     -6.057395   6.637730  -0.913   0.3626
Period[T.BEFORE 2012]      4.548189   6.155073   0.739   0.4609
Normalize(Delta.mkt.cap)  26.340510  15.010221   1.755   0.0809 .
Normalize(Delta.EV)       -6.912013   7.532849  -0.918   0.3600
Normalize(Delta.beta)     -0.003728   0.004160  -0.896   0.3712
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 41.99 on 190 degrees of freedom
  (211 observations deleted due to missingness)
Multiple R-squared:  0.07075, Adjusted R-squared:  0.03162
F-statistic: 1.808 on 8 and 190 DF,  p-value: 0.0777
```

Appendix 121 – Results of linear model [ΔDiv. rate ~ ΔROA + ΔAdj. ROE + ΔOp. margin + Geo. area + Period + ΔMktcap + ΔEV + Δβ]

```
> outlierTest(LinearModel.1)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
   rstudent unadjusted p-value Bonferroni p
74 3.335306          0.0010256      0.20409
> normalityTest(~LinearModel.1$res,test="shapiro.test", data=Databasevar)

        Shapiro-Wilk normality test

data:  LinearModel.1$res
W = 0.99753, p-value = 0.9894
> dwtest(LinearModel.1)

        Durbin-Watson test

data:  LinearModel.1
DW = 2.004, p-value = 0.4927
alternative hypothesis: true autocorrelation is greater than 0
> bptest(LinearModel.1)

        studentized Breusch-Pagan test

data:  LinearModel.1
BP = 13.216, df = 8, p-value = 0.1046
```

Appendix 122 – Residuals analysis of linear model [ΔDiv. rate ~ ΔROA + ΔAdj. ROE + ΔOp. margin + ΔGeo. area + Period + ΔMktcap + ΔEV + Δβ]

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