U.PORTO

FEP FACULDADE DE ECONOMIA UNIVERSIDADE DO PORTO

IS THE (AUTOMATIZATION OF) DIVIDENDS REINVESTMENT A GOOD STRATEGY?

Nuno Filipe Santos Oliveira

Intership Report

Master in Management

Supervised by:
Professor Miguel Augusto Gomes Sousa, PhD

2020/2021

Biographic Note

Nuno Filipe Santos Oliveira, born on 28th December of 1998, in Porto, has a Bachelor in Economics from the School of Economics and Management of University of Porto (FEP) completed in 2019 and awarded as top B of the class. He decided to enrol in the Master's in Management in the same institution to complement his course work by improving his knowledge in the fields of financial management, strategic thinking, implementation and decision.

Nuno had a proactive academic path, where he was engaged in many activities. He was a member of the sports department in the Students Union where he was coach of the female and male basketball teams; he was president of two electoral commissions and even national finalist on the L'Oreal Brandstorm Competition; finally, he volunteered at the Web Summit, the world's biggest technological fair.

Besides, Nuno was a basketball player and referee during his time in the university.

Regarding his professional experience, Nuno was a digital marketing intern at Betmarkets in 2020, during his first semester, where he was responsible for customer acquisition through SEO and growth hacking. Also, Nuno held a curricular internship at Finantech as a Business Analyst, where he was responsible for the integration of new functionalities and fundamental information in the company's products.

Acknowledgments

This study is dedicated to those who followed me during my life and made my time in university unforgettable.

A special thank you to my supervisor, who was always ready to help me and an eternal thank you to my family for the support given at any moment and the education that transformed me into the individual that I am today.

Abstract

The objective of this study is to test the advantage of the dividend reinvestment strategy to an individual investor, to propose the implementation of an automatic reinvestiment functionality in Finantech products. Using 15 years of data on stock returns, it pretends to measure the performance of portfolios with and without dividend reinvestment. In contrast to other studies that focused exclusively on companies that provide a DRIP - Dividend Reinvestment Plan - this study includes all the firms that paid constant dividends in the last 25 years (known as, Dividend Aristocrats). This study builds equal-weighted, and value-weighted portfolios, constituted from all the Dividend Aristocrats companies, with and without dividend reinvestment. Results confirm the positive effects of dividend reinvestment with an increase in abnormal returns, better Jensen's Alpha and Sharpe Ratio when compared to the returns of portfolios that do not reinvest dividends. However, the fact that all portfolios' Sharpe Ratio are smaller than 1 may suggest that investors would find better alternatives than investing in the Dividend Aristocrats (with or without reinvestment of dividends).

Keywords: drips, dividends, dividend reinvestment, investment strategies, dividend aristocrats;

JEL-Codes: G11, G23, G35;

Resumo

O objetivo deste estudo é o de testar a vantagem que a estratégia de reinvestimento de dividendos pode trazer a um investidor individual para propor a adoção de uma funcionalidade de reinvestimento automático de dividendos à Finantech. Num período de 15 anos, pretende-se medir a performance de portefólios com e sem reinvestimento de dividendos. Ao contrário de outros estudos que se debruçaram exclusivamente nos DRIPs – Dividend Reinvestment Plans -, este estudo inclui todas as empresas que tenham pago dividendos constantes nos últimos 25 anos (conhecidas como empresas aristocratas). Este estudo constrói portefólios equal-weighted e value-weighted constituído pelas empresas aristocratas, com e sem reinvestimento de dividendos. Os resultados confirmam o efeito positivo do reinvestimento de dividendos ao se verificar um maior retorno anormal, um melhor Jensen's Alpha e Sharpe Ratio quando comparados com os retornos de portefólios que não reinvestem dividendos. No entanto, o facto do Sharpe Ratio ser inferior a 1 em todos os portefólios pode sugerir que os investidores possam encontrar melhores investimentos alternativos às empresas aristocratas (com e sem reinvestimento de dividendos).

Palavras-chave: *drips*, dividendos, reinvestimento de dividendos, estratégias de investimento, empresas aristocratas;

Códigos JEL: G11, G23, G35;

Index

List of Tables

1. Introduction

This study is done as part of an internship held at Finantech, a Portuguese financial company that has been operating for the past 20 years. Finantech creates and develops both the software and the online applications for the capital markets.

With the technological development and the automatization of the capital markets, new investment opportunities are offered by companies, such as providing their investors with the option to reinvest automatically their dividends in the company, a practice known as Dividends Reinvestment Plans (DRIPs).

Finantech, aiming to innovate its products, was considering offering to its clients a similar strategy to DRIPs, i.e., a functionality that would allow the investor to automatically reinvest the dividends paid by companies, even if the company does not offer these plans to its shareholder. Even though this functionality (automatization of dividend reinvestment) is already offered by some competitors/brokers, the implementation of this functionality may represent a competitive advantage for Finantech in the European market as only a small number of brokers offer this product.

To understand if such functionality would be valued by Finantech clients, this study aims to answer the following questions:

(1) Does the reinvestment of dividends in the Dividend Aristocrats provide a higher return and lower volatility than not reinvesting dividends for each stock independently?
(2) Does the reinvestment of dividends present better results when compared to a market benchmark?

By doing so, this study helps to understand that the automatization of dividend reinvestment can benefit an investor such that he could have an edge over a portfolio without dividend reinvestment and over a benchmark.

After this introduction, the structure of this internship report goes as follows: Chapter 2 presents the internship review where is presented the benefits of an internship, the roles performed and, a market analysis combined with an implementation proposal. In Chapter 3 is presented a literature review about dividends, dividend reinvestment plans and the

respective critical analysis of literature. In Chapter 4, the methodology used is presented and discussed, while in Chapter 5 the main results are presented. Finally, Chapter 6 concludes and presents some limitations of the present study.

2. Internship Framework

2.1. Benefits from an internship

A curricular internship is a powerful tool for all the players involved in it: the student, the university and the company. An internship of this kind is a way that universities have to empower and leverage their students to acquire a new set of competencies that goes much beyond the technical competencies acquired in the educational institution (Amorim, Pimentel, & Rosa, 2012). Besides, students can also benefit from integrating more easily into the labour market either on the organization that held their internship or another one. Also, students can start to create a business network around them due to contact with clients and other professionals. These networks empower the students' career development, which, according to D'Abate (2010), is higher in the students that have made an internship than those who did not. Consequently, this brings more value-added to the student, representing a competitive advantage even from a short-term perspective. Regarding the company, it allows them to establish a connection with newly-students, most of them with the talent to prosper in the labour market. They aim to try to be on the front row on hiring the most recent talents from universities who will represent a guarantee for the company's future or business. Additionally, in the short term, the company may benefit from the services and research of the students. In the particular case of this internship, there will be a fourth agent who will also benefit from the internship, the investor. The research made on the company, and, namely in this essay, will help investors to take more careful decisions about their investment decisions, namely when to enrol on dividends reinvestment.

2.2. Internship Framework and Scope

This internship aims to identify and implement new functionalities that may have business potential for trading platforms mainly on the fields of: "automatic reinvestment of dividends"; "periodic investment plans for ETFs and shares"; "copy trading"; "social trading"; "round-up investing"; "negotiation of fractional financial instruments".

The internship will be made on the Front Office team, which is responsible for analyzing the necessities of the different clients and, consequently, developing new technological solutions. Besides, two products are under the remit of the team: **Sifox Deal** – which is a platform that lets bankers send the orders to the market; **Sifox Trader** – which is an online application designed for the retail investor to trade during the day at his expenditures. Many

research questions might be pursued in this field, namely which functionalities might be beneficial both for brokers and traders and the impact that these functionalities may have.

2.3. Market Analysis and Implementation

Finantech competitors are divided between Europe and the United States, being the latter, which has the highest reputation due to the faster technological development on the financial markets and hence, on Fintech companies. The functionality of dividends reinvestment is usually accompanied by others such as fractional shares, allowing the full reinvestment of dividends. Besides, Fintech companies offer dividends reinvestment for portfolio rebalancing or stock reinforcement. In the case of Finantech, the focus is on the latter option since the company segment is on trading rather than discretionary management.

In the European Market, only one player offers the option to reinvest the company's dividends in the same stock and hence, this may represent a competitive advantage for the company even if they want to go internationally.

Regarding the U.S. Market, many players offer this option. To enrol on it, users have to check on their profile the stocks they want dividends reinvestment. Consequently, these alterations are processed at the brokers' back office. Therefore, the trader will automatically buy new shares with the dividends the next day after its payment.

If this study proves that this functionality is advantageous for investors, Finantech expects to implement it both on Sifox Deal and Sifox Trader. Also, Finantech may use this study to convince investment banks to add this functionality to its portfolio. To be implemented, investment banks will be obligated to have both the front-office and back-office products of Finantech and real-time stock prices.

3. Literature Review

3.1. Dividends

Dividends were first paid more than 400 years ago, in the 17th century. Dividends are the distributions of the company's net earnings to its shareholders. The conditions and the motives behind dividends are reflected in the dividend policy of the company, in which the company sets some principles to follow and define the concrete amount of dividends to be paid to its shareholders in the form of a dividend-per-share (DPS). Some factors that may influence dividend payments are future investments on CAPEX, the firm's current earnings, the investor's preference for cash, among others. Dividend policy impacts the companies – the conflict between the manager and the shareholder – but also the investors since while some authors argued about the irrelevance of dividends, others considered them quite important when assessing the financial health of the company. Consequently, according to Watts (1973), these perspectives started a debate around the information content of dividends.

3.1.1. Main theories against dividends

Miller and Modigliani (1961) sustained that dividend policy was irrelevant for the companies, so companies should not spend time studying it. Despite uncertainty regarding future profits, investors were considered to be rational ("symmetric market rationality") in the sense that they wanted more wealth for the same level of risk or less risk for the same level of wealth, and also that they took their actions assuming others investors' rationality. Consequently, the dividend policy would not affect market prices.

The irrelevancy of dividend policy is also supported by other authors who hadn't found any relation between stock returns and the dividend yield or dividend payout, for instance Miller and Scholes (1982). Besides, Miller (1986) also recognized the importance of considering tax penalties over dividends and disregard the importance of incorporating behavioural or cognitive lines into the financial models. The behavioural impact of dividends would be so small that it would not be advantageous to incorporate.

Fama and French (2001) found that the dividend payment firms between 1978 and 1999 reduced from 66.5% to 20.8%, which could signalize that dividends destroy value. Indeed,

according to the authors, this decline is justified by the lack of incentives of companies to pay dividends due to the higher tax costs of dividends in comparison to capital gains.

This decrease is even more intense on smaller firms. In addition to the higher tax costs of dividends, profitability, investment opportunities and size, are three other factors that can affect companies' motivation for dividends (Fama & French, 2001). On the one hand, dividend payer companies are more profitable, but, on the other hand, new companies in the market want to benefit from the expected growth thanks to the new business opportunities and, hence, have no interest in paying dividends. The decrease observed between 1978 and 1999 is mainly explained by the increasing tilt of the already existing companies over the new entrants since the new ones usually don't pay dividends and, thus, they may use the retained earnings to invest in new business opportunities. However, larger firms didn't decrease their dividends since investors are expecting their dividend payments and, consequently, the propensity of these companies to reduce it is low.

3.1.2. Main theories favoring dividends

According to Lintner (1956), dividends can signalize the financial health of the company. Following this perspective, either a decrease or instability surrounding dividends would signalize that the company was facing financial constraints. On the contrary, an increase in dividends would signalize financial health and positive prospects. The first shreds of evidence found out that companies struggled to decide the payout ratio for each year and to decide which input should be more relevant to assess it. In the end, companies tried to change dividends according to the earnings of each year, mainly in good years, to reflect "the increasing earnings fully and promptly" (Lintner, 1956, p. 100) .

Consistent with this view, Benartzi, Michaely, and Thaler (1997) found a strong connection between a company's past earnings and its present level of dividends. They stated that, although the predictive power of dividends is weak, an increase in dividends signals that the current enhancement in the company's earnings is permanent. Therefore, this connection between the past and the present dividend levels gives support to the idea that companies which increases their dividends constantly are less likely "to have subsequent earnings decreases than firms that do not change their dividends despite similar earnings growth" (Benartzi et al., 1997, p. 1032).

Nevertheless, it is worth realizing that, according to Skinner and Soltes (2009), more important than the magnitude of dividends is the stability and the continuous payment of them. There is evidence that earnings are more consistent in firms that pay regular dividends in place of those that do not pay. To add, losses in dividend payment ones may signalize only transitory losses due to special items, which, in turn, would result in better financial results in the future. It may be the reason behind the existence of "Dividends Aristocrats" [1]. Even those authors that defend the opposite view can't justify the stability of dividends payment of these companies in which the propensity to pay dividends doesn't change.

Moreover, and regarding mental accounting, investors might prefer to consume from dividends rather than from capital gains (Baker, Nagel, & Wurgler, 2006; Shefrin & Statman, 1984). Dividend income helps investors self-control themselves, eliminating the possibility of "taking an action" (Shefrin & Statman, 1984, p. 270) - hence, evidence shows that the propensity to consume from dividends is higher than the propensity to consume from capital gains. Therefore, some investors are more willing to pay a premium for a stock of a dividend-payment firm.

In spite, companies are shifting their preferences from dividends to other ways of remunerating shareholders, namely by shares repurchases (Skinner, 2008), that already account the same as dividends, other companies offer Dividend Reinvestment Plans (DRIPs) that engage with the shareholders and may bring some benefits to them.

3.2. The DRIPs – Dividend Reinvestment Plans

Dividend Reinvestment Plan, commonly known by DRIPs, is, according to European Securities and Markets Authority (ESMA), "an equity investment option where instead of receiving dividends directly as cash the investor elects in advance to have their dividends directly reinvested in the underlying equity" Authority (2016, p. 31). These plans, according to Dammon and Spatt (1992), could be accompanied by a VPO[2], had been offered by the issuing companies since 1960 to increase the liquidity of their shares and to have control over the shares stock price. This issuance was usually discounted, typically 5.263%, having as a

[1] Dividend Aristocrats are companies that have been increasing their dividends over the last 25 years.
[2] VPO is an abbreviation for "Voluntary Purchase Option". It allows the investor to make additional cash investments directly, rather than with dividends received.

calculus base the average stock prices of the previous days to minimize the effect of short sales in the market price (Dammon & Spatt, 1992; Scholes & Wolfson, 1989).

3.2.1. Main theories on companies' motivation for DRIPs

A company can have financial and agency-related motives when decided to enrol on a Dividend Reinvestment Plan. The former is supported when the issuance happens on the primary market (issuing of new shares or selling of treasury stocks), while the latter has stronger evidence when shares are traded on the open market (shares handed to the shareholders are bought directly in the stock market, using the proceeds from the dividends that were not paid) since no additional capital is raised.

- **Financial Motives**

In the first place, a DRIP allows a company to raise its equity at the same time that it increases its cash reserves/capital (Feito-Ruiz, Renneboog, & Vansteenkiste, 2020; Scholes & Wolfson, 1989; Steinbart & Swanson, 1998). These plans help, mainly in the case of financially constrained firms whose cash reserves are insufficient to cover future investment needs and which may struggle to raise their financial requirements on the market. Consequently, shareholders enrolling on a DRIP let the company preserve its cash by issuing new shares or selling treasury stocks (Feito-Ruiz et al., 2020). Moreover, companies may see this alternative of raising capital as a cheaper opportunity than underwriting additional stock. The company can overcome the underwriting expenses by eliminating the intermediaries (investment bankers, brokers) and dealing directly with the investor (Steinbart & Swanson, 1998).

- **Agency Motives**

The agency motives for a DRIP are mainly to minimize the governance problems inside the company by widening the shareholders' base, difficulting the transference of corporate control (Scholes & Wolfson, 1989; Steinbart & Swanson, 1998). The company aims to attract a higher number of long-term but small shareholders who want to pursue an investment strategy of "buy-and-hold" and, hence, who have a smaller propensity to challenge the managers' position on the general meetings with theirs voting rights.

According to Steinbart and Swanson (1998), agency-related motives have higher support than financial motives, mainly when shares are traded on the secondary market and, hence, no additional equity capital is raised through those plans. Evidence shows that companies who enrolled on a DRIP had seen a decline in the number of shares per shareholder in the next two years, while companies who had not enrolled in it had seen a significant increase in the number of shares per shareholder in the same period.

3.2.2. Main theories on investors' motivation for DRIPs

According to Berkman and Koch (2017), these plans benefited not only the issuing companies but also investors since they got the possibility of acquiring new discounted shares without having to pay brokerage costs and the possibility of acquiring fractional shares (Dammon & Spatt, 1992; Scholes & Wolfson, 1989). Moreover, when new shares are issued, investors enrolled in a DRIP would not see their position in the company diluted, whereas shareholders who prefer dividend income would experience dilution (Feito-Ruiz et al., 2020).

However, investors have some concern regarding dividends reinvestment, reflected in the households smaller propensity to reinvest dividends due to cash preferences (Kaustia & Rantapuska, 2012). Nevertheless, the research found out that dividends reinvestment increases investors wealth, mainly for those who have a long-term investment strategy and enrol on an automated investment strategy (Kaustia & Rantapuska, 2012).

Also, behavioural problems on investment decisions can be overcome by an automated strategy like a dividend reinvestment plan, being these problems the status quo bias, the analysis paralysis and the confirmation bias(O'Neill, 2007).

Nonetheless, probably, the most significant concept behind dividends reinvestment, also aligned with the discipline of investment, is dollar-cost-averaging. Dollar-cost-averaging is a technic widely defended by Mr Warren Buffet where an investor sets an amount that will be investing periodically in a given security. This technique reduces the portfolio risk since by keeping the investment amount stable, investors will acquire fewer shares when markets are up (bull market) and more shares when the market is down (bear market). This technique reduces the average price per share and increases the portfolio performance by benefiting from compound interests leading to a geometric increase in stock value and dividend growth

(Rubin & Spaht, 2011). Between 2008 and 2016, the S&P 500 return with dividends reinvestment was 92.5% against 55.2% without dividends reinvestment.

3.3. Critical analysis of the literature reviewed

The main theories against dividends disregard the importance of DRIPs over investors portfolio returns. Despite the decrease in the number of dividend paying firms presented by Fama and French (2001), there is an important number of companies that have been paying growing dividends over the last 25 years, which are called the "Dividend Aristocrats". This gap tends to sustain the perspective of the authors such as Lintner (1956) and Benartzi et al. (1997) that those type of companies has no interest whatsoever to reduce dividends. However, both perspectives don't argue whether investors could achieve abnormal returns at expenses of lower volatility in those dividend payment firms.

Besides, the literature review on DRIPs focused only on those companies that offered this mechanism and not all dividend-paying firms. Therefore, the supply for dividend reinvestment was limited to a restricted number of companies.

Nowadays, with the technological development of capital markets, dividends reinvestment is not limited to a few companies, but it is, in fact, available for all dividend payer companies. In this case, stocks are traded on the secondary market without the interference of companies and, thus, without the 5% discount (Dammon & Spatt, 1992; Scholes & Wolfson, 1989). Dividend reinvestment is an automated investment strategy set between the investor and the broker to reinforce its position in the company with the amount of dividends paid and free of some transaction costs.

This study intends to go beyond the current state of knowledge by testing whether an investor would have benefited from the automated reinvestment of dividends in companies that had been paying dividends over the last 15 years.

4. Methodology

The following section presents the different phases of the study. It starts with the data collection and treatment and finishes with the different metrics used to measure portfolio performance. Although past returns don't guarantee future returns, they are an important instrument of analysis. It will be built various portfolios, all composed of 61 from the 65 Dividend Aristocrats companies, according to Forbes (2020) [3]. The portfolios will include the past fifteen years and will be compared to a benchmark, the S&P 500 Total Return Index (S&P 500 TR), instead of the usual S&P 500 index. This decision is explained later in the results section.

4.1. Data Collection and treatment

To analyze the effectiveness of dividends reinvestment, following the different perspectives that sustain the importance of dividends stability, the companies chosen for this study are those that have been paying increasing dividends for the last 25 years, known as "Dividend Aristocrats"[4].

Daily stock prices and dividend payments will be extracted from Yahoo Finance website, while the S&P 500 and other financials needed will be extracted from Eikon. For simplification, only close (stock) prices were used.

In the end, the portfolio performance will be compared with the S&P 500 TR, which will be used as a proxy for a passive strategy.

4.2. Stock Performance with and without Dividend Reinvestment

For each stock is calculated the daily return, the daily standard deviation and the buy and hold return for the fifteen years considered (between 2005 and 2020), all used to construct an equal and a value-weighted portfolio. The buy-and-hold return is a relevant metric since it calculates the return of holding a stock during a certain period. It will be later

[3] The companies Amcor (**Ticker:** AMCR), AbbVie (**Ticker:** ABBV), Otis Worldwide Corp. (**Ticker:** OTIS) and Carrier Global Corp. (**Ticker:** CARR) were discarded from the analysis due to insufficient information about historical prices.
[4] You can find the companies analyzed in Appendix 1.

used to calculate the buy-and-hold abnormal return (AR) against a reference portfolio, the S&P 500 TR.

- **Return of a stock without accumulation of dividends**

This scenario is the only one where the stock returns are only a function of its prices, disregarding any dividends received. This return is expected to be compared with the S&P 500 to assess whether Dividend Aristocrats performed better than the market regarding capital gains.

The return of each stock in each day can be calculated as:

$$r_{it} = \frac{P_{it}}{P_{i(t-1)}} - 1 \tag{4.2.1}$$

Where:

- r_{it} – is the return of stock i in day t measured by its price variation;
- P_{it} – is the close price of stock i in day t;
- $P_{i(t-1)}$ – is the close price of stock i in day t-1;

- **Return of a stock without dividend reinvestment**

In this scenario, dividends are received and accumulated in the investor's portfolio without receiving any additional interest from them.

The return of a stock without dividend reinvestment can be calculated as:

$$rA_{it} = \frac{P_{it} + \sum_{n=0}^{t} D_{it}}{P_{i(t-1)} + \sum_{n=0}^{t} D_{i(t-1)}} - 1 \tag{4.2.2}$$

Where:

- rA_{it} – is the return of stock i without dividend reinvestment in day t;
- P_{it} – is the close price of stock i in day t;
- $P_{i(t-1)}$ – is the close price of stock i in day t-1;
- $\sum_{n=0}^{t} D_{it}$ – is the total sum of dividends received from stock i until day t;

- $\sum_{n=0}^{t} D_{i(t-1)}$ – is the total sum of dividends received from stock i until day t-1;

- **Return of a stock with dividend reinvestment in the risk-free asset**

In this scenario, dividends aren't reinvested in the same stock but instead reinvested at the risk-free rate for each year, given by the U.S. Government Bonds 1-Year Maturity Yield[5]. The risk-free rate is divided by 250 since it is an estimation of the number of investment days (business days) available per year. Dividends are reinvested in the risk-free asset to avoid undervaluation of the stock returns due to an accountable opportunity cost.

Dividends are in a deposits account that aggregates both the new dividends and the previously compounded dividends.

The value of the deposits accounts each day can be calculated by:

$$DO_{it} = DO_{i(t-1)} * \left(1 + \frac{Rf_t}{250}\right) + D_{it} \quad (4.2.3)$$

Where:

- DO_{it} – is the value of the deposits account for stock i in day t;
- $DO_{i(t-1)}$ – is the value of the deposits account for stock i in day t-1;
- $\frac{Rf_t}{250}$ – is the daily risk-free rate in day t;
- D_{it} – is the amount of dividends paid of stock i in day t;

Consequently, the daily return for each stock with dividend reinvestment in the risk-free asset is represented by:

$$rB_{it} = \frac{DO_{it} + P_{it}}{DO_{i(t-1)} + P_{i(t-1)}} - 1 \quad (4.2.4)$$

[5] In Appendix 2, you can find a table with the dividend yields of the U.S. Government Bonds used for each year.

Where:

- rB_{it} – is the daily return of stock i in day t with dividend reinvestment in the risk-free asset;
- DO_{it} – is the value of the deposits account for stock i in day;
- $DO_{i(t-1)}$ – is the value of the deposits account for stock i in day t-1;
- P_{it} - is the close price of stock i in day t;
- $P_{i(t-1)}$ – is the close price of stock i in day t-1;

- **Return of a stock with dividend reinvestment in the same stock**

In this scenario, the calculus is much easier because past dividend returns are the same as the stock returns, since dividends are reinvested in the same stock.

Daily returns are only a function of the close price and the dividends paid.

Hence, the daily return of a stock with dividend reinvestment is:

$$rC_{it} = \frac{P_{it} + D_{it}}{P_{i(t-1)}} - 1 \qquad (4.2.5)$$

Where:

- rC_{it} - is the daily return of stock i in day t with dividend reinvestment in the same stock that issued dividends;
- P_{it} - is the close price of stock i in day t;
- $P_{i(t-1)}$ – is the close price of stock i in day t-1;
- D_{it} – is the amount of dividends paid of stock i in day t;

- **Abnormal Returns**

Abnormal Returns (AR) is a methodology commonly used in finance to evaluate the performance of a stock or portfolio during a given period and, research mainly focused on the long-term as in our case (Barber & Lyon, 1997; Lyon, Barber, & Tsai, 1999).

The Buy-and- Hold Return of a security or portfolio can be calculated as:

$$Buy - and - Hold\ Return_{it} = \prod_{t=1}^{4028}(1 + R_{it}) - 1 \quad (4.2.6)$$

Where:

- $\prod_{t=1}^{4028}(1 + R_{it}) - 1$ - is the product of all the stock or portfolio i returns during the 4028 t days;

Buy-and-Hold Abnormal Returns are usually preferred over Cumulative Abnormal Returns (CARs) for the long-term since the former present better statistical results and are less biased as CARs neglect the compounding effect (Barber & Lyon, 1997).

The Buy-and-Hold Abnormal Returns can be treated as the difference between the buy-and-hold return of a security or portfolio and its expected buy-and-hold return such that:

$$AR_{it} = \prod_{t=1}^{4028}(1 + R_{it}) - \prod_{t=1}^{4028}(1 + E(R_{it})) \quad (4.2.7)$$

Where:

- $\prod_{t=1}^{4028}(1 + R_{it})$ – is the buy-and-hold return of security or portfolio i at period t;
- $\prod_{t=1}^{4028}(1 + E(R_{it}))$ – is the expected buy-and-hold return of security or portfolio i at period t.

Since this essay works with past returns, it is possible to replace the expected return for a reference portfolio that would be, in this essay, the S&P 500 TR. Therefore, the buy-and-hold abnormal returns are going to be calculated as:

$$AR_{it} = \prod_{t=1}^{4028}(1 + R_{it}) - \prod_{t=1}^{4028}(1 + R_{mt}) \quad (4.2.8)$$

Where:

- $\prod_{t=1}^{4028}(1 + R_{it})$ – is the buy-and-hold return of security or portfolio i at period t;
- $\prod_{t=1}^{4028}(1 + R_{mt}))$ – is the buy-and-hold return of the reference portfolio m at period t.

This metric will be used either on stock evaluation and portfolio evaluation.

In the end, every metric will be annualized for easier comparisons and to allow to build performance measures to evaluate the portfolio performance.

4.3. Portfolio Construction and Returns

The portfolio consists of all the 61 Dividend Aristocrat companies that follow an equal-weighted[6] or (market) value-weighted[7] approaches.

According to the literature, a value-weighted portfolio has a lower systematic risk than an equal-weighted one (Pae & Sabbaghi, 2015). Also, value-weighted portfolios are becoming more popular among investors, mainly in developed markets where the public information disclosure environment is good and, hence, stock-picking strategies become less popular (Bhattacharya & Galpin, 2011). Moreover, benchmarks such as the S&P 500 and the Russell 200 are constructed under a value-weighted approach (Bhattacharya & Galpin, 2011).

A value-weighted portfolio assumes that a company's size, measured by its market capitalization, is a factor that should be taken into account. Consequently, it uses it as a proxy for stock allocation in the portfolio.

Hence, the weight of each stock will be given by the following formula:

$$w_{it} = \frac{Market\ Cap\ of\ stock\ i\ at\ time\ t}{Market\ Cap\ of\ all\ stocks\ i\ at\ time\ t} \tag{4.3.1}$$

Where:

- w_{it} is the weight of stock i at the time t;
- Market Cap of stock it at time t can be calculated as the multiplication of the stock close price with the number of shares outstanding: $(stock\ close\ price)_{it} * (nº\ of\ shares\ outstanding)_{it}$;
- Market Cap of all stocks i at time t can be calculated as: $\sum_{n=0}^{t} Market\ Cap_{it}$.

[6] The company's weight on an equal-weighted portfolio is the same and independent of its market capitalization. It can be represented as $\frac{1}{n}$, being "n" the number of companies in the portfolio.

[7] The company's weight on a market value-weighted portfolio is a function of the market capitalization of the stock against the market capitalization of all the companies in the portfolio.

However, on the other hand, Frankfurter and Vertes (1990) state that the lower systematic risk of value-weighted portfolios present biased results since market values are negatively correlated with risk. Despite the higher systematic risk of an equal-weighted portfolio, this is justified by higher returns and volatility when compared to value-weighted portfolios (Pae & Sabbaghi, 2015). Also, equally-weighted portfolios are easier to construct, which saves time on research about stock allocations and, under the matrix theory, can be seen as an optimal portfolio (Deng & Li, 2008).

The equally-weighted portfolio assumes that every stock should have the same weight in the portfolio and, hence, it can be stated as:

$$w_{it} = \frac{1}{n} \tag{4.3.2}$$

Where:

- w_{it} is the weight of stock i at the time t;
- n is the total number of stocks in the portfolio;

Consequently, the return of each portfolio separately (value-weighted and equal-weighted with and without dividend reinvestment) is given by:

$$r_{pt} = \sum_{t=1}^{n} w_{it} \, . \, r_{it} \tag{4.3.3}$$

Where:

- r_{pt} - is the return of the portfolio p in day t;
- n – are the number of observations;
- w_{it} - is the weight of stock i in the portfolio p in day t;
- r_{it}– is the return of stock i in the portfolio p in day t.

4.4. Portfolio performance and measurement

Theories about portfolio performance, selection and measurement started with Markowitz (1952). The author, taking into account the return and the variance of different assets, stated two propositions that still holds today: "There is a rule which implies both that

the investor should diversify and that he should maximize expected return." (Markowitz, 1952, p. 79).

Despite the lack of explanations on algebraic and mathematical terms, this study led to the creation and development of the Capital Asset Pricing Model (CAPM) by Sharpe (1963); (1964), Lintner (1965) and Mossin (1966). Under the assumptions that there is an efficient market portfolio, that investors have homogenous preferences, that investors want to maximize the expected utility, among others, the model relates the expected return of an asset with the return of a risk-free asset and an optimal market portfolio (that will be in any point of the SML - Security Market Line). The function is given by the following:

$$E(R_i) = R_f + \big(E(R_m) - R_f\big).\beta_i \qquad (4.4.1)$$

Where:

- $E(R_i)$ – is the expected return of asset i;
- R_f – is the risk-free rate;
- $E(R_m)$ – is the expected market return;
- $\big(E(R_m) - R_f\big)$- is the expected market risk premium;
- β_i – is the sensitivity of the expected asset returns to the expected excess market returns, or, in other words, the **systematic risk** of the i asset and is equal to $\beta_i = \frac{Cov(R_i,R_m)}{Var(R_m)}$.

CAPM was criticized mainly because of their simplistic assumptions and also because of its incapacity to incorporate other factors such as the "size effect"(Schwert, 1983), which led to bad statistical results (MacKinlay, 1997; Schwert, 1983).

Nonetheless, and even with the appearance of new models such as the tri-factorial model of Fama and French (1996), the systematic risk represented by β_i still holds and continues to be one of the most important factors when evaluating a portfolio. This factor will be one of the measures used for assessing the systematic risk of the portfolio.

Besides, CAPM continues to be one of the most used theorems to calculate expected returns and so, it is used for the calculus of the Jensen's Alpha as it is going to be shown.

4.4.1. Performance measures

- **Jensen's Alpha**

Jensen's Alpha (Jensen (1968)), measures the capacity of an investor or fund to outperform the market. The foundations of this measure derive from Sharpe (1964) and Lintner (1965) since the author uses CAPM as a basis for calculus. According to the author, if we assume the validity of the asset pricing model as in Jensen (1969), the reached, or expected, return can be represented as a linear function such that:

$$\widetilde{R_{Jt}} = R_{Ft} + \beta_j [\tilde{R}_{Mt} - R_{Ft}] + \tilde{e}_{jt} \quad (4.4.2)$$

Where:

- $\widetilde{R_{Jt}}$ – is the reached returns of any security or portfolio j in period t;
- R_{Ft} – is the risk-free rate of return in period t;
- β_j - is the systematic risk of any security or portfolio j;
- $[\tilde{R}_{Mt} - R_{Ft}]$ - is the market premium of realized returns in period t;
- $\tilde{e}_{jt}$ – is a random error, which has an expected value 0.

Consequently, the Jensen's Alpha is given by the difference between our portfolio return and the reached returns $\widetilde{R_{Jt}}$:

$$Jensen's\ Alpha_{pt} = R_{pt} - \widetilde{R_{Jt}} \quad (4.4.3)$$

Where:

- R_{pt} - is the return of the investors' portfolio p in period t;
- $\widetilde{R_{Jt}}$ – is the reached returns of any security or portfolio j in period t;

Deriving from formulas (4.4.2) and (4.4.3) we have:

$$Jensen's\ Alpha_{pt} = R_{pt} - (R_{Ft} + \beta_j [\tilde{R}_{Mt} - R_{Ft}] + \tilde{e}_{jt}) \quad (4.4.4)$$

- **The Sharpe Ratio**

The Sharpe Ratio developed by Sharpe (1994) allows the investor to evaluate the excess return for any additional unit of risk taken. This ratio is mainly developed for *ex-ante* decisions to help the investor to decide which portfolio best suits him. Nevertheless, and since this analysis uses past returns, it will be used the *ex-post* variation of the Sharpe Ratio. It is important to keep in mind that this ratio does not take correlations into account. The function is given by:

$$S_h = \frac{R_p - R_F}{\sigma_p} \tag{4.4.5}$$

Where:

- S_h – is the Sharpe Ratio;
- R_p – is the return of the portfolio p;
- R_F – is the return of the risk-free asset;
- σ_p – is the standard deviation of the portfolio p;

5. Results

In this section, the results derived from the methodology previously presented are discussed. It is expected that it answers two different questions:

(1) Does the reinvestment of dividends in the Dividend Aristocrats provide a higher return and lower volatility than not reinvesting dividends for each stock independently?
(2) Does the reinvestment of dividends present better results when compared to a market benchmark?

5.1. Benchmark Adoption and Price Performance

Table 1 shows the results for the S&P 500 and S&P 500 Total Return, being the latter the one which will serve as a benchmark for the next chapter's analysis. Since the usual S&P 500, in contrast to the S&P 500 TR, doesn't include the dividends paid, the former only can be used to make price-performance comparisons.

Table 1 - Benchmark Data

	S&P 500	**S&P 500 TR**
Return	9.44 %	11.71 %
Buy-and-Hold Return	7.89 %	10.29 %
Standard Deviation	19.70 %	19.71%

** Returns are annualized*

The presented annualized results for the past 15 years mirrors the importance of dividends in a portfolio. The S&P 500 TR performed better with an annualized return of 11.71% and an annualized buy-and-hold return of 10.29% in contrast to the 9.44% and 7.89% of the S&P 500, respectively. S&P 500 TR performed better with almost the same volatility as the S&P 500.

Therefore, the S&P 500 is not a good proxy to serve as a benchmark to evaluate the impact of dividends reinvestment and, hence, the S&P 500 TR will be preferred over it.

However, S&P 500 can still be used to assess how Dividend Aristocrats performed at the price level during the same period.

Table 2 shows the results of 2 portfolios, equal and value-weighted, which hadn't dividends accumulation during the past 15 years and are composed by the Dividend Aristocrats.

Table 2 – Performance of an Equal-Weighted and Value-Weighted portfolios without dividends accumulation

	Equal-Weighted	**Value-Weighted**
Return	11.73 %	8.15 %
Buy-and-Hold Return	10.55 %	7.16 %
Abnormal Return**	2.66 %	-0.73 %
Standard Deviation	18.74 %	16.73 %

** Returns are annualized*

*** Only in this case the benchmark used for the Abnormal Return was the S&P 500*

In a scenario where dividends weren't received/accumulated between 2005 and 2020, the equal-weighted portfolio composed by the Dividend Aristocrats performed better than the value-weighted one. The equal-weighted portfolio reached an annualized return of 11.73% and an annualized buy-and-hold return of 10.55%, while the value-weighted portfolio had 8.15% and 7.16%, respectively. The better results achieved in the equal-weighted portfolio were made at expenses of higher volatility than the value-weighted portfolio, i.e. higher risk, with a standard deviation of 18.74%, two percentage points over the standard deviation of the value-weighted portfolio. Nevertheless, the standard deviation of both portfolios was under the standard deviation of the S&P 500.

Comparing these portfolios against the market represented in this case by the S&P 500, it is seen that only the equal-weighted one outperformed it with an annualized abnormal return of 2.66%. On the other hand, the value-weighted portfolio presented a negative annualized abnormal return of -0.73%.

This section focused on perceiving which benchmark was more useful to discuss the impact of dividends reinvestment. Besides, it evaluated how the Dividend Aristocrat's

portfolios behaved regarding their price performance. In the upcoming sections, it is studied the impact of dividends reinvestment at the stock level and at the portfolio level.

5.2. Stock Analysis

Table 3 shows individual stock results for our sample, the companies that are known as Dividend Aristocrats[8], according to different portfolio strategies, without dividend reinvestment, with dividend reinvestment in the risk-free asset and with dividend reinvestment in the same stock, as explained before.

Table 3 – Average Individual Stocks Performance

Scenario A represents a portfolio without any dividend reinvestment and, hence, receiving no interests over dividends. Scenario B represents a portfolio whose dividends are reinvested in the risk-free asset and, hence, receiving interests over all the dividends received. Scenario C represents a portfolio whose dividends are reinvested in the same stock that issued the dividends.

	Scenarios		
	A	**B**	**C**
Return	12.33 %	12.39 %	14.63 %
Buy-and-Hold Return	11.03 %	11.12 %	12.48 %
Abnormal Return	0.74 %	0.83 %	2.17 %
Standard Deviation	23.34 %	23.18 %	26.77 %
Stocks with AR > 0	26	27	33
Stocks with AR < 0	35	34	28

** Returns are annualized*

Both the annualized return and the annualized buy-and-hold return rose when dividends were reinvested during the past 15 years. The annualized return of not reinvesting dividends, reinvesting the dividends in the risk-free asset and reinvesting in the same stock are 12.33%, 12.39% and 14.63%, respectively. This means an increase of more than 2% in the annualized return between not reinvesting dividends and reinvesting them in the stock. Regarding the annualized buy-and-hold return, the results are 11.03%, 11.12% and 12.48% for the scenarios

[8] In Appendix 3, you can found all the results for each stock independently. Here the analysis focused mainly on the average since it would be too much expensive and inefficient to analyze each one separately.

without dividend reinvestment, with dividend reinvestment in the risk-free asset and with dividend reinvestment in the stock, respectively.

Although the annualized returns and the annualized buy-and-hold returns increase through dividends reinvestment, this is followed by an increase in the annualized standard deviation of more than three percentage points, being, in every scenario, higher than the standard deviation of the S&P 500 TR. The annualized standard deviation is very similar in the first two scenarios – 23.34% if the investor doesn't reinvest his dividends and 23.18% if he reinvests in the risk-free asset –, increasing to 26.77% when dividends are reinvested in the same stock.

Comparing these results with the S&P 500 Total Return, table 3 shows that all scenarios outperformed the market between 2005 and 2020, suggesting that Dividend Aristocrats are a good investment. In the case where dividends were reinvested in the same stock, the annualized abnormal return was 2.17%, while in the scenario where dividends were reinvested in the risk-free asset, the annualized buy-and-hold return was 0.83% and 0.74% when dividends weren't reinvested at all.

In the scenario where dividends weren't reinvested, 26 companies had positive annualized abnormal returns and 35 had negative annualized abnormal returns; when dividends were reinvested in the risk-free asset, 27 companies had positive annualized abnormal returns and 10 had negative annualized abnormal returns; when dividends were reinvested in the same stock, 33 companies had positive annualized abnormal returns and 28 had negative annualized abnormal returns.

Therefore, table 3 not only suggests that Dividend Aristocrats could outperform the market but also that the decision to reinvest dividends in the same stock can be decisive to increase investor's abnormal returns.

5.3. Portfolio Analysis

Table 4 shows the results of the portfolios constructed under two different approaches, equal-weighted and value-weighted, and under three different scenarios that are, as explained before: a portfolio without dividend reinvestment, a portfolio with dividend reinvestment in

the risk-free asset and a portfolio with dividend reinvestment in the same stock. Results are annualized and considered the period between 2005 and 2020.

Table 4 – Return and Volatility measures for the equal-weighted and the value-weighted portfolios

Scenario A represents a portfolio without any dividend reinvestment and, hence, receiving no interests over dividends. Scenario B represents a portfolio whose dividends are reinvested in the risk-free asset and, hence, receiving interests over all the dividends received. Scenario C represents a portfolio whose dividends are reinvested in the same stock that issued the dividends.

	Scenarios		
	A	**B**	**C**
		Equal-Weighted	
Return	12.33 %	12.39 %	14.63 %
Buy-and-Hold Return	11.70 %	11.80 %	13.63 %
Abnormal Return	1.41 %	1.50 %	3.34 %
Standard Deviation	16.25 %	16.13 %	18.74 %
		Value-Weighted	
Return	9.43 %	9.54 %	11.28 %
Buy-and-Hold Return	8.98 %	9.12 %	10.49 %
Abnormal Return	-1.31 %	-1.18 %	0.20 %
Standard Deviation	14.20 %	14.09 %	16.73 %

** Returns are annualized*

As it can be seen in table 3, while the equally-weighted portfolios outperformed the S&P 500 TR in all the three scenarios, the value-weighted portfolios only outperformed the benchmark in one scenario, when dividends were reinvested in the same stock, with as just as an annualized abnormal return of 0.20%. Nonetheless, in both portfolios where dividends were reinvested in the same stock, even more important than being able to outperform the S&P 500 TR, is the fact that these returns were achieved with lower volatility (risk) than the benchmark, suggesting that the investment in the Dividend Aristocrats with dividend reinvestment in the same stock is better than to follow a passive strategy of following the market index. Besides, the annualized abnormal return of the equal-weighted portfolio with dividend reinvestment in the same stock was 3.34%.

Firstly, comparing the scenario where dividends are reinvested in the risk-free asset with the scenario where dividends aren't reinvested, the results show a tiny increase in the annualized returns from 12.33% when dividends aren't reinvested to 12.39% when dividend are reinvested in the risk-free asset, in the equal-weighted portfolio and 9.43% to 9.54% in the value-weighted portfolio. Consequently, this leads to a higher buy-and-hold return in both equal and value-weighted portfolios. Although this increase is small, it happens with less volatility and, hence, the decision should be always to reinvest dividends, even if it is in the risk-free asset.

Secondly, comparing the dividend reinvestment strategy in the same stock with the other two strategies (not reinvesting dividends and reinvesting in the risk-free asset), the results show that this reinvestment strategy leads to higher returns and, consequently, to a higher buy-and-hold return, but also higher volatility. As table 4 shows, the annualized return of the equal-weighted portfolio increases more than 2%, from 12.33%, when dividends aren't reinvested, to 14.63% when dividends are reinvested in the same stock, while the value-weighted portfolio increases from 9.43 % to 11.28%%. This increase supports the importance of dividend reinvestment, mainly on those companies that pay constant and increasing dividends.

If we control all portfolio returns by their risk/volatility, using the most used performance measures presented in table 5, the results regarding the value-added of the dividend reinvestment strategy are not straightforward.

Table 5 - Performance measures for the equal-weighted and the value-weighted portfolios

Scenario A represents a portfolio without any dividend reinvestment and, hence, receiving no interests over dividends. Scenario B represents a portfolio whose dividends are reinvested in the risk-free asset and, hence, receiving interests over all the dividends received. Scenario C represents a portfolio whose dividends are reinvested in the same stock that issued the dividends.

	Scenarios		
	A	**B**	**C**
		Equal-Weighted	
β	0.80	0.79	0.92
Jensen's Alpha	2.68 %	2.81 %	3.76 %
Sharpe Ratio	0.66	0.67	0.70
		Value-Weighted	
β	0.68	0.67	0.80
Jensen's Alpha	0.97 %	1.14 %	1.62 %
Sharpe Ratio	0.56	0.57	0.58

If we look to the beta, all portfolios present a value lower than 1, which means that the portfolio systematic risk is lower than the market. The systematic risk for the portfolios without dividends reinvestment and with dividends reinvestment in the risk-free asset is almost the same with 0.80 and 0.79 in the equal-weighted portfolio, respectively, and 0.68 and 0.67 in the value-weighted portfolio, respectively. On the other hand, reinvesting the dividends in the stock leads to higher systematic risk when compared to the previous two scenarios –the systematic risk rose to 0.92 and 0.8 in the equal and value-weighted portfolios, respectively, being the equal-weighted portfolio the one with higher systematic risk as discussed before.

The Jensen's Alpha, as explained before, measures the capability of an investor to outperform the market and is positive for all portfolios, suggesting that an investor investing in the Dividend Aristocrats between 2005 and 2020 would have achieved an excess return above the S&P 500 TR, after controlling for systematic risk. The Jensen's Alpha is higher when the investor reinvests his dividends mainly in the same stock that issued them. In the equal-weighted portfolio, reinvesting the dividends in the stock would generate a Jensen's

Alpha of 3.76% against 2.81% when dividends are reinvested in the risk-free asset and 2.68% when dividends aren't reinvested. Regarding the value-weighted portfolio, the investor would achieve a Jensen's Alpha of 1.62% if it had reinvested his dividends in the same stock, opposed to 1.14% if he had reinvested in the risk-free asset and 0.97% if he hadn't reinvested at all.

Regarding the Sharpe Ratio, it evaluates the excess return for any additional unit of risk. The results show a low Sharpe Ratio, inferior to 1 in all cases and, it is generally accepted that the Sharpe Ratio is good when superior to 1. A Sharpe Ratio lower to 1 is sub-optimal since it means that any additional unit of risk results in less than a unit of excess return. The Sharpe Ratio increased between the scenarios of not reinvesting dividends and reinvesting dividends in the same stock, although this increase is small. In the equal-weighted portfolio, the Sharpe Ratio increased from 0.66 when dividends weren't reinvested to 0.70 when dividends were reinvested in the same stock, while in the value-weighted portfolio, it increased from 0.56 to 0.58, respectively.

This data suggests that, although the systematic risk is inferior to the market and that Jensen's Alpha indicates that all portfolios outperformed the market, there may be better alternatives to invest instead of the Dividend Aristocrats since the Sharpe Ratio is sub-optimal. Nonetheless, dividend reinvestment impacted positively every portfolio by increasing the Jensen's Alpha and the Sharpe Ratio when dividends were reinvested, despite, it also increased the systematic risk.

6. Conclusion

The objective of this study was to determine the impact of dividend reinvestment as an investment strategy.

The results suggest that investing in the Dividend Aristocrats is a good investment strategy and that dividends are indeed a signal of financial stability over the long term. Moreover, this study showed that dividend reinvestment is a good investment strategy as it would allow the investor to achieve abnormal returns. Consequently, an investor would be able to achieve better returns if he/she could reinvest its dividend even if the company doesn't offer a Dividend Reinvestment Plan.

The results at the stock level showed that, on average, Dividend Aristocrats presented a higher standard deviation than the benchmark, being even higher in the case of dividend reinvestment. Nonetheless, the decision to reinvest the dividends led to higher abnormal returns and, it was a crucial factor in the number of companies that clinched positive abnormal returns.

Investing individually in the Dividend Aristocrats is different from investing in a portfolio composed by them. Through a portfolio, the investor is diversifying his risk and, consequently, reducing the volatility of his investment. Results have shown that the investment in individual stocks resulted in a standard deviation higher than the S&P 500 TR, while the standard deviation of any of the constructed portfolios was every time lower than the benchmark.

This study has shown that investing in an equal-weighted portfolio constituted by the Dividend Aristocrats would allow the investor to achieve better results than the benchmark with higher returns, lower volatility, lower systematic risk and, accompanied by a positive abnormal return in all portfolios created (without dividend reinvestment, with dividend reinvestment in the risk-free asset and with dividend reinvestment in the same stock).

Regarding the value-weighted portfolios, results aren't as straightforward. Two out of the three portfolios (without dividend reinvestment and with dividend reinvestment in the risk-free asset) presented negative abnormal returns, which means that this portfolios were outperformed by the S&P 500 TR. However, when the three value-weighted portfolio returns are controlled by their risk, the portfolios present a lower systematic risk than the

market, and the positive Jensen's Alpha suggests that the results were, in fact, better than the market.

Although the positive Jensen's Alpha suggests that all the six portfolios outperformed the market and, hence, that they may be a good investment strategy, the Sharpe Ratio inferior to 1 in all cases suggests that may be better alternatives in the market.

Regarding dividend reinvestment, the results showed that it is a good and viable option since the results were even better and presented higher abnormal returns, higher Jensen's Alpha and higher Sharpe Ratios when the investor decided to reinvest his dividends (compared to not reinvesting dividends), mainly when dividends were reinvested in the same stock that issued them. Therefore, we can conclude that dividend reinvestment leads to better returns, even after controlling for the higher volatility.

Overall, the results of this study allow us to advise Finantech to seriously implement this dividend reinvestment functionality.

6.1. Limitations and future research

Although this study goes beyond the current state of knowledge regarding the winning edge of the automatization of dividend reinvestment, readers should account for its limitations.

Firstly, this internship report used past returns, which aren't a guarantee of future earnings.

Secondly, this study didn't take into account transaction costs, which may, in many cases, be high enough to overcome the benefits brought by dividend reinvestment.

Thirdly, although the number of companies used is large enough to set appropriate conclusions, future research may use another type of companies. This study focused on the Dividend Aristocrats assuming the importance of dividends as a signal of prosperity and financial stability. However, it may be wise to extend this database to include other dividend-paying firms.

7. References

Amorim, M., Pimentel, C., & Rosa, M. J. (2012). IEM Graduates Transition to the Labour Market: The importance of Internships *International Journal of Industrial Engineering and Management (3*(2), 83-92.

Authority, E. S. a. M. (2016). *Guidelines transaction reporting, order record keeping and clock synchronisation under MiFID II.* Retrieved from https://www.cmvm.pt/pt/Cooperacao/esma/DocumentosESMACESR/Documents/2016-1452_guidelines_mifid_ii_transaction_reporting.pdf

Baker, M., Nagel, S., & Wurgler, J. (2006). The Effect of Dividends on Consumption. *National Bureau of Economic Research Working Paper Series, No. 12288*. doi:10.3386/w12288

Barber, B. M., & Lyon, J. D. (1997). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics, 43*(3), 341-372. doi:https://doi.org/10.1016/S0304-405X(96)00890-2

Benartzi, S., Michaely, R., & Thaler, R. (1997). Do Changes in Dividends Signal the Future or the Past? *The Journal of Finance, 52*(3), 1007-1034. doi:10.2307/2329514

Berkman, H., & Koch, P. D. (2017). DRIPs and the Dividend Pay Date Effect. *Journal of Financial and Quantitative Analysis, 52*(4), 1765-1795. doi:10.1017/S0022109017000394

Bhattacharya, U., & Galpin, N. (2011). The Global Rise of the Value-Weighted Portfolio. *The Journal of Financial and Quantitative Analysis, 46*(3), 737-756. Retrieved from http://www.jstor.org/stable/23018546

D'Abate, C. (2010). Developmental Interactions for Business Students: Do They Make a Difference? *Journal of Leadership & Organizational Studies 17*(2), 143-155. doi:10.1177/1548051810370795

Dammon, R. M., & Spatt, C. S. (1992). An Option-Theoretic Approach to the Valuation of Dividend Reinvestment and Voluntary Purchase Plans. *The Journal of Finance, 47*(1), 331-347. doi:10.2307/2329100

Deng, X., & Li, R. (2008, 18-18 Dec. 2008). *Some Research on Value Range of Equal Weight Portfolio Risk.* Paper presented at the 2008 International Seminar on Future BioMedical Information Engineering.

Fama, E. F., & French, K. R. (1996). Multifactor Explanations of Asset Pricing Anomalies. *The Journal of Finance, 51*(1), 55-84. doi:https://doi.org/10.1111/j.1540-6261.1996.tb05202.x

Fama, E. F., & French, K. R. (2001). Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Applied Corporate Finance, 14*(1), 67-79. doi:https://doi.org/10.1111/j.1745-6622.2001.tb00321.x

Feito-Ruiz, I., Renneboog, L., & Vansteenkiste, C. (2020). Elective stock and scrip dividends. *Journal of Corporate Finance, 64*, 101660. doi:https://doi.org/10.1016/j.jcorpfin.2020.101660

Frankfurter, G., & Vertes, P. (1990). Some empirical evidence of bias in random, market-value-weighted portfolios. *Journal of Economics and Business, 42*(3), 213-223. doi:https://doi.org/10.1016/0148-6195(90)90047-G

Jabłoński, B. (2020). Dividend Aristocrats – A Comparative Analysis of Polish and American Dividend Companies During the Period of 2009–2017. *Folia Oeconomica Stetinensia, 20*, 190-205. doi:10.2478/foli-2020-0011

Jensen, M. C. (1968). The performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance, 23*(2), 389-416. doi:https://doi.org/10.1111/j.1540-6261.1968.tb00815.x

Jensen, M. C. (1969). Risk, The Pricing of Capital Assets, and The Evaluation of Investment Portfolios. *The Journal of Business, 42*(2), 167-247. Retrieved from http://www.jstor.org/stable/2351902

Kaustia, M., & Rantapuska, E. (2012). Rational and behavioral motives to trade: Evidence from reinvestment of dividends and tender offer proceeds. *Journal of Banking & Finance, 36*(8), 2366-2378. doi:https://doi.org/10.1016/j.jbankfin.2012.04.015

Lintner, J. (1956). Distribution of Incomes of Corporations Among Dividends, Retained Earnings, and Taxes. *The American Economic Review, 46*(2), 97-113. Retrieved from http://www.jstor.org/stable/1910664

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics, 47*(1), 13-37. doi:10.2307/1924119

Lyon, J. D., Barber, B. M., & Tsai, C.-L. (1999). Improved Methods for Tests of Long-Run Abnormal Stock Returns. *The Journal of Finance, 54*(1), 165-201. doi:https://doi.org/10.1111/0022-1082.00101

MacKinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature, 35*(1), 13-39. Retrieved from http://www.jstor.org/stable/2729691

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance, 7*(1), 77-91. doi:10.2307/2975974

Marquit, M. (2020). How to invest in the Dividend Aristocrats *Forbes, 2020(10 of November)*. Retrieved from https://www.forbes.com/advisor/investing/dividend-aristocrats/

Miller, M. H. (1986). Behavioral Rationality in Finance: The Case of Dividends. *The Journal of Business, 59*(4), S451-S468. Retrieved from http://www.jstor.org/stable/2352774

Miller, M. H., & Modigliani, F. (1961). Dividend Policy, Growth, and the Valuation of Shares. *The Journal of Business, 34*(4), 411-433. Retrieved from http://www.jstor.org/stable/2351143

Miller, M. H., & Scholes, M. S. (1982). Dividends and Taxes: Some Empirical Evidence. *Journal of Political Economy, 90*(6), 1118-1141. Retrieved from http://www.jstor.org/stable/1830941

Mossin, J. (1966). Equilibrium in a Capital Asset Market. *Econometrica, 34*(4), 768-783. doi:10.2307/1910098

O'Neill, B. (2007). Overcoming Inertia: Do Automated Saving and Investing Strategies Work? *Journal of Family and Economic Issues, 28*, 321-335. doi:10.1007/s10834-007-9063-x

Pae, Y., & Sabbaghi, N. (2015). Equally Weighted Portfolios vs Value Weighted Portfolios: Reasons for differing Betas. *Journal of Financial Stability, 18*. doi:10.1016/j.jfs.2015.04.006

Rubin, H., & Spaht, C. (2011). Financial Independence Through Dollar Cost Averaging and Dividend Reinvestments. *Journal of Applied Business and Economics, 12*(4).

Scholes, M. S., & Wolfson, M. A. (1989). Decentralized investment banking: The case of discount dividend-reinvestment and stock-purchase plans. *Journal of Financial Economics, 24*(1), 7-35. doi:https://doi.org/10.1016/0304-405X(89)90070-6

Schwert, G. W. (1983). Size and stock returns, and other empirical regularities. *Journal of Financial Economics, 12*(1), 3-12. doi:https://doi.org/10.1016/0304-405X(83)90024-7

Sharpe , W. (1963). A Simplified Model for Portfolio Analysis. *Management Science, 9*, 277-293. doi:10.1287/mnsc.9.2.277

Sharpe , W. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance, 19*(3), 425-442. doi:10.2307/2977928

Sharpe , W. (1994). *The Sharpe Ratio.*

Shefrin, H. M., & Statman, M. (1984). Explaining investor preference for cash dividends. *Journal of Financial Economics, 13*(2), 253-282. doi:https://doi.org/10.1016/0304-405X(84)90025-4

Skinner, D. (2008). The evolving relation between earnings, dividends, and stock repurchases. *Journal of Financial Economics, 87*(3), 582-609. doi:https://doi.org/10.1016/j.jfineco.2007.05.003

Skinner, D., & Soltes, E. (2009). What Do Dividends Tell Us about Earnings Quality? *Review of Accounting Studies, 16*, 1-28. doi:10.1007/s11142-009-9113-8

Steinbart, P. J., & Swanson, Z. (1998). 'No-load' dividend reinvestment plans. *Review of Financial Economics, 7*(2), 121-141. doi:https://doi.org/10.1016/S1058-3300(99)80149-9

Watts, R. (1973). The Information Content of Dividends. *The Journal of Business, 46*(2), 191-211. Retrieved from http://www.jstor.org/stable/2351363

8. Appendix

8.1. Appendix 1: Dividend Aristocrats companies and information

Ticker	Nº of shares* (2016)	Close Price	Market Cap* (USD)	% value-weighted portfolio
XOM	5 728 702	50.09	286 950 683.180	13.19%
T	6 238 746	25.59	159 649 510.140	7.34%
PBCT	298 620	12.12	3 619 464.024	0.17%
CVX	2 164 558	50.90	110 176 006.529	5.06%
BEN	759 748	23.17	17 608 425.640	0.81%
FRT	55 321	51.13	2 828 562.785	0.13%
LEG	178 000	27.72	4 934 159.822	0.23%
WBA	1 007 862	40.38	40 697 468.568	1.87%
ED	257 456	43.30	11 147 844.543	0.51%
ADM	643 585**	21.96	14 133 125.956	0.65%
MMM	734 363	82.40	60 511 512.669	2.78%
NUE	300 949	25.23	7 591 438.525	0.35%
CINF	173 000	42.33	7 323 666.436	0.34%
EMR	804 694	34.35	27 641 237.291	1.27%
CAH	410 800	57.18	23 489 544.000	1.08%
ESS	23 416	82.77	1 938 142.250	0.09%
KO	4 636 000	20.77	96 289 720.000	4.43%
RTX	995 700	32.41	32 270 955.624	1.48%
GPC	170 531	43.62	7 438 562.049	0.34%
SYY	618 896	37.26	23 060 063.722	1.06%
AFL	985 100	19.86	19 559 160.500	0.90%
PEP	1 638 000	51.94	85 077 718.362	3.91%
KMB	455 600	61.89	28 196 529.535	1.30%
CAT	645 808	47.54	30 698 483.280	1.41%
GD	405 792	51.01	20 699 449.108	0.95%

TROW	264 960	30.83	8 168 716.800	0.38%
VFC	448 739	12.82	5 751 845.408	0.26%
JNJ	2 893 230	62.90	181 984 172.786	8.37%
EXPD	213 080	27.42	5 842 653.600	0.27%
MCD	1 203 700	31.82	38 301 734.000	1.76%
MDT	1 155 237	49.43	57 103 364.910	2.62%
ADP	561 400	34.78	19 523 167.804	0.90%
ITW	558 750	46.08	25 747 201.118	1.18%
PG	3 178 841	55.19	175 440 231.611	8.06%
CB	326 455	42.33	13 818 840.803	0.64%
ATO	81 740	26.61	2 175 101.482	0.10%
CL	1 025 317	25.01	25 643 178.170	1.18%
PPG	328 164	33.63	11 034 514.500	0.51%
SWK	81 842	47.93	3 922 687.060	0.18%
TGT	859 771**	51.80	44 536 136.940	2.05%
ALB	94 860	19.03	1 804 711.500	0.08%
DOV	204 316	27.60	5 640 025.085	0.26%
GWW	84 068	65.10	5 472 826.632	0.25%
APD	217 251	53.70	11 666 439.313	0.54%
AOS	167 558	4.89	818 800.149	0.04%
CLX	151 298	58.36	8 829 751.431	0.41%
HRL	549 360	7.65	4 202 604.000	0.19%
LIN	320 861	43.98	14 111 466.780	0.65%
PNR	99 777	28.88	2 881 404.407	0.13%
WMT	4 131 000	53.35	220 388 841.738	10.13%
O	100 746	25.02	2 520 664.920	0.12%
ABT	1 537 243	22.39	34 422 352.625	1.58%
LOW	1 525 000**	28.98	44 194 500.000	2.03%
MKC	260 200	18.99	4 939 897.260	0.23%
BDX	245 468	56.01	13 748 662.189	0.63%
BF.B	520 758	10.25	5 338 116.846	0.25%
ECL	251 337	34.60	8 696 259.697	0.40%

SHW	400 700	44.12	17 678 883.599	0.81%
SPGI	353 959	45.03	15 937 004.683	0.73%
CTAS	163 182	43.16	7 042 935.120	0.32%
ROP	87 779	30.03	2 636 003.458	0.12%

* In thousands

** The number of shares outstanding used for these companies were from 2007 instead of 2006 since it was the most recent available information

8.2. Appendix 2: US Government Bonds for the period considered

US Government Bonds

Initial Date	Maturity	Rate
3-Jan-05	1 Year	2.79%
3-Jan-06	1 Year	4.38%
2-Jan-07	1 Year	5.00%
2-Jan-08	1 Year	3.17%
2-Jan-09	1 Year	0.40%
4-Jan-10	1 Year	0.45%
3-Jan-11	1 Year	0.29%
3-Jan-12	1 Year	0.12%
2-Jan-13	1 Year	0.15%
2-Jan-14	1 Year	0.13%
2-Jan-15	1 Year	0.25%
4-Jan-16	1 Year	0.61%
3-Jan-17	1 Year	0.89%
2-Jan-18	1 Year	1.83%
2-Jan-19	1 Year	2.60%
2-Jan-20	1 Year	1.56%
Annualized Risk-Free Rate		1.55 %

8.3. Appendix 3: Individual stocks results

Scenario A represents a portfolio without any dividend reinvestment and, hence, receiving no interests over dividends. Scenario B represents a portfolio whose dividends are reinvested in the risk-free asset and, hence, receiving interests over all the dividends received. Scenario C represents a portfolio whose dividends are reinvested in the same stock that issued the dividends.

	Scenarios											
	A				**B**				**C**			
Ticker	**Return**	**Buy-and-hold return**	**Abnormal return**	**Standard deviation**	**Return**	**Buy-and-hold return**	**Abnormal return**	**Standard deviation**	**Return**	**Buy-and-hold return**	**Abnormal return**	**Standard deviation**
XOM	5.19%	3.02%	-7.28%	21.46%	5.40%	3.28%	-7.02%	21.28%	5.44%	2.05%	-8.24%	26.17%
T	6.45%	5.45%	-4.84%	16.44%	6.75%	5.77%	-4.53%	16.21%	8.90%	6.78%	-3.52%	21.99%
PBCT	6.72%	4.32%	-5.97%	22.18%	6.79%	4.59%	-5.70%	21.90%	9.03%	4.94%	-5.36%	29.01%
CVX	9.42%	7.00%	-3.29%	23.01%	9.52%	7.24%	-3.06%	22.77%	11.63%	7.56%	-2.73%	28.97%
BEN	8.33%	3.73%	-6.57%	30.66%	8.58%	3.93%	-6.36%	30.44%	9.91%	3.55%	-6.74%	35.17%
FRT	10.43%	6.73%	-3.56%	27.79%	10.54%	6.96%	-3.33%	27.44%	13.12%	7.18%	-3.11%	34.37%
LEG	8.54%	5.60%	-4.69%	24.96%	8.63%	5.78%	-4.52%	24.66%	12.64%	7.60%	-2.69%	31.86%
WBA	5.37%	2.24%	-8.05%	25.13%	5.47%	2.38%	-7.91%	25.01%	6.01%	2.03%	-8.26%	28.12%
ED	7.21%	6.60%	-3.69%	14.23%	7.40%	6.84%	-3.45%	14.01%	9.80%	8.48%	-1.81%	18.82%
ADM	11.37%	7.41%	-2.88%	28.62%	11.44%	7.53%	-2.77%	28.49%	13.24%	8.31%	-1.98%	31.57%

MMM	8.57%	7.00%	-3.30%	19.61%	8.66%	7.12%	-3.17%	19.45%	10.42%	8.17%	-2.12%	22.76%
NUE	12.98%	7.85%	-2.44%	32.16%	13.09%	8.07%	-2.22%	31.87%	16.61%	8.82%	-1.48%	38.73%
CINF	9.54%	6.96%	-3.33%	23.83%	9.60%	7.12%	-3.18%	23.52%	13.56%	9.33%	-0.96%	29.69%
EMR	10.40%	7.75%	-2.54%	24.27%	10.48%	7.89%	-2.40%	24.05%	13.21%	9.17%	-1.12%	29.07%
CAH	4.73%	2.38%	-7.91%	21.96%	4.87%	2.57%	-7.73%	21.82%	7.71%	4.07%	-6.22%	27.09%
ESS	12.75%	9.46%	-0.83%	26.72%	12.82%	9.62%	-0.67%	26.45%	16.14%	11.19%	0.90%	31.82%
KO	9.42%	8.69%	-1.61%	15.82%	9.53%	8.83%	-1.46%	15.69%	11.36%	10.18%	-0.12%	18.65%
RTX	9.42%	7.21%	-3.08%	22.47%	9.50%	7.34%	-2.95%	22.29%	11.13%	7.99%	-2.30%	26.08%
GPC	9.34%	7.79%	-2.50%	19.75%	9.44%	7.94%	-2.35%	19.53%	11.97%	9.38%	-0.92%	24.35%
SYY	8.32%	6.22%	-4.07%	21.79%	8.37%	6.34%	-3.96%	21.55%	11.26%	7.99%	-2.30%	26.51%
AFL	12.94%	7.09%	-3.21%	33.81%	12.96%	7.18%	-3.12%	33.59%	15.76%	8.09%	-2.20%	38.24%
PEP	9.60%	8.89%	-1.40%	15.68%	9.69%	9.01%	-1.28%	15.56%	11.52%	10.43%	0.14%	18.23%
KMB	8.25%	7.49%	-2.80%	15.47%	8.37%	7.65%	-2.64%	15.33%	10.49%	9.23%	-1.06%	18.73%
CAT	14.35%	10.73%	0.44%	27.97%	14.38%	10.83%	0.53%	27.78%	17.53%	12.50%	2.21%	32.16%
GD	10.89%	8.98%	-1.31%	21.59%	10.97%	9.09%	-1.20%	21.47%	12.42%	9.90%	-0.39%	24.15%
TROW	17.58%	12.53%	2.23%	32.28%	17.62%	12.61%	2.32%	32.14%	20.55%	14.20%	3.91%	35.58%
VFC	17.72%	14.79%	4.50%	26.33%	17.75%	14.88%	4.58%	26.16%	20.68%	16.58%	6.29%	30.03%
JNJ	8.56%	7.95%	-2.34%	14.76%	8.66%	8.07%	-2.22%	14.64%	10.54%	9.59%	-0.70%	17.29%
EXPD	13.36%	9.33%	-0.97%	29.17%	13.39%	9.56%	-0.73%	29.12%	14.41%	9.98%	-0.32%	30.42%
MCD	15.85%	15.04%	4.75%	18.27%	15.92%	15.14%	4.85%	18.18%	18.31%	17.07%	6.78%	20.72%

MDT	9.06%	7.00%	-3.29%	21.70%	9.10%	7.08%	-3.22%	21.60%	10.66%	8.11%	-2.18%	23.87%
ADP	13.90%	12.51%	2.22%	20.17%	13.94%	12.59%	2.29%	20.06%	16.27%	14.38%	4.08%	22.66%
ITW	13.63%	11.50%	1.21%	22.99%	13.66%	11.57%	1.28%	22.86%	16.06%	13.23%	2.94%	25.79%
PG	8.71%	7.96%	-2.33%	15.61%	8.80%	8.08%	-2.21%	15.49%	10.78%	9.64%	-0.65%	18.26%
CB	13.21%	10.36%	0.07%	25.36%	13.26%	10.46%	0.17%	25.21%	15.27%	11.59%	1.30%	28.20%
ATO	11.49%	10.59%	0.30%	17.32%	11.58%	10.73%	0.44%	17.13%	14.64%	13.08%	2.79%	21.02%
CL	10.89%	10.03%	-0.26%	16.95%	10.97%	10.14%	-0.15%	16.84%	12.50%	11.26%	0.96%	19.26%
PPG	13.53%	11.22%	0.93%	23.61%	13.56%	11.30%	1.01%	23.41%	16.26%	12.98%	2.69%	27.21%
SWK	13.92%	10.29%	0.00%	27.95%	13.93%	10.38%	0.09%	27.72%	16.99%	11.90%	1.61%	32.30%
TGT	12.77%	9.44%	-0.85%	26.96%	12.80%	9.51%	-0.79%	26.85%	15.25%	11.12%	0.83%	29.66%
ALB	21.12%	15.33%	5.04%	34.25%	21.11%	15.38%	5.09%	34.11%	23.61%	16.54%	6.25%	37.21%
DOV	14.67%	11.62%	1.32%	26.28%	14.70%	11.68%	1.39%	26.14%	17.10%	13.15%	2.86%	29.25%
GWW	16.52%	13.95%	3.66%	25.03%	16.56%	14.02%	3.73%	24.92%	18.51%	15.25%	4.96%	27.47%
APD	14.88%	12.56%	2.27%	23.87%	14.91%	12.63%	2.34%	23.73%	17.45%	14.38%	4.09%	26.69%
AOS	22.24%	18.26%	7.97%	29.92%	22.25%	18.31%	8.01%	29.81%	24.23%	19.50%	9.21%	31.99%
CLX	10.84%	9.98%	-0.31%	16.94%	10.92%	10.08%	-0.21%	16.83%	13.14%	11.88%	1.59%	19.45%
HRL	14.84%	13.80%	3.51%	18.98%	14.89%	13.87%	3.57%	18.91%	16.40%	15.07%	4.77%	20.58%
LIN	15.80%	13.66%	3.37%	23.46%	15.84%	13.73%	3.44%	23.35%	17.85%	15.15%	4.86%	25.69%
PNR	8.99%	5.36%	-4.94%	27.31%	9.03%	5.45%	-4.84%	27.13%	11.08%	6.36%	-3.93%	30.77%
WMT	9.15%	7.98%	-2.31%	17.95%	9.21%	8.06%	-2.23%	17.86%	10.90%	9.37%	-0.92%	20.09%

O	12.27%	9.30%	-1.00%	25.69%	12.36%	9.51%	-0.78%	25.30%	17.92%	12.32%	2.03%	33.64%
ABT	13.24%	12.06%	1.77%	19.10%	13.28%	12.14%	1.85%	18.97%	15.76%	14.10%	3.81%	21.69%
LOW	16.55%	12.72%	2.43%	28.85%	16.56%	12.76%	2.46%	28.77%	18.46%	13.98%	3.68%	30.78%
MKC	13.29%	12.22%	1.93%	18.64%	13.33%	12.28%	1.99%	18.54%	15.29%	13.88%	3.58%	20.61%
BDX	12.67%	11.38%	1.09%	19.43%	12.71%	11.45%	1.15%	19.35%	14.07%	12.47%	2.18%	21.03%
BF.B	16.91%	15.41%	5.12%	21.37%	16.94%	15.47%	5.18%	21.25%	19.06%	17.04%	6.75%	23.67%
ECL	15.54%	13.55%	3.26%	22.89%	15.56%	13.59%	3.30%	22.82%	16.74%	14.42%	4.12%	24.25%
SHW	23.48%	21.02%	10.73%	25.74%	23.48%	21.05%	10.76%	25.65%	25.50%	22.56%	12.27%	27.41%
SPGI	18.36%	14.69%	4.40%	28.66%	18.35%	14.73%	4.44%	28.51%	21.32%	16.64%	6.35%	31.64%
CTAS	17.92%	15.45%	5.15%	24.91%	17.91%	15.47%	5.18%	24.81%	19.79%	16.87%	6.58%	26.59%
ROP	22.71%	19.68%	9.39%	27.42%	22.71%	19.69%	9.40%	27.38%	23.42%	20.19%	9.90%	28.09%
Annualized Average	**12.33%**	**11.03%**	**0.74%**	**23.34%**	**12.39%**	**11.12%**	**0.83%**	**23.18%**	**14.63%**	**12.46%**	**2.17%**	**26.77%**

* Returns are annualized