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CONTRARIAN INVESTMENT STRATEGY AND CREDIT RATINGS

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## **Abstract**

Contrarian Investment Strategy is an investment philosophy that has been gaining more followers in the last 30 years. With this academic paper, we intend to apply an investment strategy based on this philosophy in the Portuguese market for recent data (2001-2016) relying in the methodology of De Bondt and Thaler (1985, 1987) and Soares and Serra (2005). Furthermore, it is our goal to study the impact that credit ratings have in the contrarian profitability. We observed contrarian effect only in the pre-crisis period (2001-2006) and for the samples containing all firms and for the one containing only unrated firms – in fact rated stocks have a negative impact in the overall sample. We also concluded that our results are in accordance with the literature, in the sense that extreme portfolios have stocks rated in similar credit rating classes and also that have a low number of rated stocks.

Key words: Contrarian Strategy; Credit Rating; Portfolio Investment; Overreaction.

JEL codes: G11, G14, G40

## Abstrato

Estratégia de Investimento *Contrarian* é uma filosofia que tem vindo a ganhar um conjunto cada vez mais alargado de seguidores ao longo dos últimos 30 anos. Com este trabalho académico, pretendemos aplicar uma estratégia de investimento baseada nesta filosofia no mercado português para dados mais recentes (2001-2016), baseando-nos nas metodologias de De Bondt and Thaler (1985, 1987) e Soares and Serra (2005). Adicionalmente, temos como objetivo estudar o impacto que os ratings de crédito das empresas têm na rentabilidade desta estratégia. Apenas observámos efeito *contrarian* no período antecedente à crise (2001-2006) e somente para a amostra que contém todas as empresas e para a mostra que contém empresas sem ratings – aliás, empresas com ratings tiveram um impacto negativo no efeito *contrarian*. Também concluímos que os nossos resultados estão em concordância com a literatura, pois observámos que os portfolios *loser* e *winner* continham empresas com classes de rating similares e também continham poucas empresas com ratings.

Palavras-chave: Estratégia *Contrarian*; Ratings; Portfolios de Investimento; Sob reação.

Códigos JEL: G11, G14, G40

# Index

1. Introduction .....	1
2. Literature Review.....	3
2.1. Evidence around the world .....	4
2.2. January Effect, Size Effect and Asymmetric Profits .....	8
2.3. Credit Rating as an explanatory factor of Momentum and Contrarian Effect .....	10
3. Data and Methodology.....	13
3.1. Data .....	13
3.2. Methodology.....	14
4. Evidence .....	18
5. Conclusions .....	23
7. Bibliography .....	25
8. Appendix .....	28

# 1. Introduction

A contrarian investor is the one who does not follow the stereotyped investment strategy to bet in the good stocks. In other words, the investor buys the assets that are viewed as bad ones because of bad news released about them or as a result of poorly past performance. This way of investing presupposes the investment in companies in which the majority of the investors had already given up. This form of investing has been gaining more followers in the last three decades, since the evidence of positive results got more support. Examples of this are the works of Keeffe and Gallagher (2017), Soares and Serra (2005), Forner and Marhuenda (2003).

Studies about this investment philosophy are more accentuated in the US market, the main and most important works are from De Bondt and Thaler (1985, 1987). However, they have been implemented in other countries around the world, such in the U.K. with Gregory, Harris, and Michou (2001) and Germany in the paper by Schiereck, De Bondt, and Weber (1999).

In the case of Portugal, the studies are scarce, however Soares and Serra (2005) and Pereira (2009) studied it with positive conclusions regarding this effect in the Portuguese stock market. These studies are performed for an earlier pre-crisis period. Hence, it is our intention to make the study in a more recent period, from 2001 until 2016.

There are some variables that impact this strategy's profitability. The main ones studied are the January effect and the size effect. The first is the evidence that a loser portfolio earns higher returns in January and the second one refers to the evidence that loser portfolios containing smaller stocks (in terms of market cap) than the winners tend to earn higher returns. Nevertheless, there is one other variable, less studied, which has impact in the profitability of this strategy, which is credit ratings.

Credit ratings influence the investor's decisions when choosing when and in what to invest. Therefore, it is expected that a contrarian strategy would be impacted due to credit rating since these can be an indicator for the investor to choose the stocks to invest.

The main study is the one of Avramov, Chordia, Jostova, and Philipov (2007) for US market, where they compared the returns of the momentum strategy with the stocks' credit rating. They found statistically significance in the impact of ratings in momentum.

For contrarian strategies, there is the work of Sasaki and Miyazaki (2012) in Japan. They also showed evidences of the impact of ratings.

Hence, and since there is no studies regarding the credit ratings and contrarian strategies for the Portuguese market, this dissertation has two main pillars of study. First, study the contrarian profitability for a more recent period (2001 – 2016), and to test the impact of credit ratings in loser and winner portfolios of a contrarian investment. This aims to fill the gap in the literature and also to complete it with more recent data.

Therefore, to measure these two effects, we based our methodology in the works of De Bondt and Thaler (1985, 1987) and Soares and Serra (2005) for the study of the contrarian profitability, which in fact is the main methodology used in the literature, and in the work of Avramov et al. (2007) to test the impact of credit ratings.

This dissertation is structured as follow: section 2 we present the literature review, in section 3 we display the data used and the detailed description of the methodologies applied. In section 4 we expose our findings and in section 5 the conclusions and final remarks.

## 2. Literature Review

As a contrarian investor, one buys stocks that have been performing poorly in the last years and sells the ones that have been performing well. This philosophy assumes the investment on value stocks, that are characterized by low price-to-book ratio, low P/E ratio and high dividend yield. Also, these stocks are associated with companies inserted in distressed economies, with low growth potential. In more simplified words one buys loser stocks and sells winner stocks.

In this way, the investor would profit due to the evidence of price reversal<sup>1</sup>. Evidence suggests that this price reversals happen in the long term, Fama and French (1988) found that the returns of a strategy of five year period presents a serial correlation more negative than the returns of one year period strategy.

The first explanation of this price reversal, lies in psychological bias, for instance the one proposed by Kahneman, Slovic, and Tversky (1982), in which they state that investors tend to overreact to unexpected and dramatic news, or in other words, when the investors revise their projections they tend to overweight recent information and underweight past information.

This can also be interpreted as a violation of the Efficient Market Hypothesis (hereafter EMH) – stocks are traded at their fair value and market prices are the best estimation of their value, incorporating all the available information at any given time. Since prices reflect all information, any attempt of beaten the market would be just a game of odds. Thus, the contrarian strategy can be seen as a disruption of this hypothesis since there is evidence that loser outperform winner portfolios, and such pattern is not tolerable under the EMH.

Complementing this, Daniel, Hirshleifer, and Subrahmanyam (1998) and based on the work of De Bondt and Thaler (1985), found that price reversion may be due to “biased self-attribution” investors and “overconfidence”, meaning that those who become wealth thanks to successful investments tend to become overconfident, therefore, they see themselves as more able to value stocks, than what they really are. This finding is not exclusively for the financial area; it has been shown that people, in general, tend to overestimate their own abilities.

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<sup>1</sup> Price reversal is associated with a negative serial correlation in returns, i.e., positive returns are more likely to follow negative returns and vice-versa.

The second explanation is that reversion is a result of the combination of “conservatism bias” – this phenomenon is referred to investors that update their views insufficiently when they are confronted with new public information – and “representative heuristic bias” – where investors tend to look for patterns even though the events are stochastic – proposed by Barberis, Shleifer, and Vishny (1998) corroborating with Kahneman et al. (1982).

One of the most important works developed about the contrarian strategies, is the one made by De Bondt and Thaler (1985), for the US market. They created two portfolios, one with 35 stocks performing badly in the last years, and other with 35 stocks performing well, and examined the returns obtained for the next sixty months after the creation of the portfolios. They found that losers outperformed winners by about 25% in the cumulative abnormal returns, confirming the price reversion theory. In fact, the loser portfolio outperformed the market by approximately 20%. De Bondt and Thaler used both observation and holding period of 3 years and 5 years, concluding that the 3-year strategy performed better than the 5-year strategy. The authors called this as Overreaction Effect.

De Bondt and Thaler also reached the same conclusion of Kahneman et al. (1982), in which stocks that went through more (less) extreme return experiences in the observation period, the subsequent price reversals will be more (less) pronounced. In other words, large price movements in one direction it will be followed by large price movements in the opposite direction.

Thus, an important implication of this is that reversals may be predicted from past information, which contradicts, as mentioned above, the EMH.

Therefore, these authors also confirmed the psychological factors suggested by Kahneman et al. (1982), because in their study they found changes in returns’ directions and this can also be interpreted as an evidence of investors’ irrational behaviour.

## **2.1. Evidence around the world**

The majority of studies on the contrarian strategies are performed in the US market, such as the works of De Bondt and Thaler (1985, 1987) and Lakonishok, Shleifer, and Vishny

(1994), that used a sample of stocks listed on NYSE and AMEX, both studies showing positive results when applying this strategy.

However, in the last thirty years, the value investing has been performing a key role in the investment strategies, gaining more followers. Thus, in order to enlarge the veracity of profits in this strategy, not only for the US market, more studies have been executed in other countries.

In the UK market, Gregory et al. (2001), using data from January 1975 to December 1998, found that value stocks beat significantly the glamour stocks, using a holding period of 5 years. They used four indicators to classify stocks into value and glamour (book-to-market value of equity, earnings yield, cash flow yield and average sales growth over the previous three years), and for all the four measures the value stocks outperformed the glamour stocks.

In Brazil, Da Costa (1994), using stocks listed in São Paulo Stock Exchange, applying the same methodology of De Bondt and Thaler (1985), they found the overreaction effect within the period 1970-1989. In fact, the difference in returns of the loser and the winner portfolio is 25.69% ( $t$ -stat = 2.92) with a holding period of 12 months. For a holding period of 24 months, the authors concluded that the loser outperformed the market by 17.63% ( $t$ -stat = 2.62), while the winner underperformed by 20.25% ( $t$ -stat = -2.98).

However, an interesting fact arises comparatively to the US and UK market. The reversal happens after 2 years of portfolio creation, which is a shorter term than the evidence for those two markets. This effect was also found in other countries: Mun, Vasconcellos, and Kish (1999) concluded that for France and Germany, the 1-year contrarian portfolios tend to earn higher returns than the 2-year, and this one than the 3-year. More recently, Doan, Alexeev, and Brooks (2016) in the Australian stock market, found that contrarian strategies perform better in the short term, in this case for holding periods of 12 weeks or less.

Schiereck et al. (1999), tested the profitability of the contrarian strategy using German companies listed in the Frankfurt Stock Exchange for the period of 1961 to 1991, using winner and loser portfolios composed by 20 stocks each, and found an excess return of 21.70% ( $t$ -stat = 1.32) for a holding period of 5 years. An interesting fact noticed in this study was the inverse relation between the number of stocks in the portfolio and the excess returns. When the authors increased the number of stocks from 20 to 40 the excess return decreased to 16.66%, and when they reduced to 10 stocks the returns augmented to 26.84%.

However, these studies are performed for big economies, mainly for USA, but also for German market and UK market. Henceforth, Antoniou, Galariotis, and Spyrou (2005) mentioned a noteworthy fact, they stated that this strategy would be more profitable in small economies, since these markets “(...) are characterised by more predictability, thin trading and are dominated by small and less sophisticated investors that do not instantaneously respond to information.” Antoniou et al. (2005, p. 72). Therefore, these authors, using weekly data for all the stocks listed in the Athens Stock Exchange, applied the strategy of short the previous week’s winner and goes long on the previous week’s losers, and found positive and economically significant excess returns for the period January 1990 – August 2000.

More recently, Keefe and Gallagher (2017), conducted an interesting study and also one of the most recent studies in this field, for the period from 1989 to 2015, using as well stocks listed in the Athens Stock Exchange. In here they included two distinct economic periods: before crisis and during the crisis. Most studies are performed considering a sample from a tranquil period or predominately bull markets, thus there are no recent studies that show how a contrarian strategy would behave in a period of crisis. Therefore, this authors split the sample in two, 1989-2006 (pre-crisis) and 2007-2015 (crisis), and in each they ranked the stocks based on the previous 6 to 36 months, creating two portfolios (winner and loser) and holding them for 6 to 36 months. To estimate the abnormal returns the authors used three models – CAPM, Market Model and Adjusted Market Model – and since all produced similar results, we will refer to the results from the Adjusted Market Model. Using the methodology of De Bondt and Thaler (1985) for the pre-crisis, crisis, and all the sample, the authors found positive excess abnormal returns for the pre-crisis period and for the entire sample, 48.3% ( $t$ -stat = 2.43) and 17.5% ( $t$ -stat = 0.64) respectively. However, this is not verified when performed for the crisis period, that fails to show positive abnormal returns, -43.2% ( $t$ -stat = -1.13).

Soares and Serra (2005) used a sample period between 1988 to 2003 (16 years), using monthly data for stocks traded on the Portuguese Stock Exchange – a total of 82 stocks. They applied the same methodology used in the works of De Bondt and Thaler (1985, 1987), creating two periods, the observation one and the test/holding one. For each stock in the observation period they calculate its cumulative abnormal return (CAR) and ranked the stocks on the CAR basis. Then, these are sorted in quintiles, creating a top 20% best performance and a bottom

20% worst performance, thus, the winner and the loser portfolio, respectively. They found supportive evidence for the overreaction hypothesis 24 months after portfolio creation, i.e., the loser portfolio outperformed the winner portfolio, in fact the average abnormal return of the loser portfolio is 8.62% ( $t$ -stat = 0.40) versus -5.64% ( $t$ -stat = -0.35) of the winner portfolio. The authors performed this strategy for different holding periods (6, 12, 18 and 24 months) however they concluded that a strategy up to 24 months would yield positive abnormal returns, however not statistically significant.

Moreover, Pereira (2009), using stocks listed on Euronext Lisbon from January 1994 to December 2008, found the same results as Soares and Serra (2005).

Alonso and Rubio (1990) and Forner and Marhuenda (2003) performed the study of Contrarian Strategies in the Spanish stock market, being the second a complement of the study made by Alonso and Rubio.

Alonso and Rubio (1990) tested for the period of 1967 – 1984, creating a winner and a loser portfolio composed by five stocks each. The results obtained were positive and statistically significant for a time horizon of three years, in which the difference in the average cumulative excess returns between loser and winner was 36.9% ( $t$ -stat = 1.47). They repeated the experiment increasing the number of stocks from five to ten and concluded that the difference between the losers and the winners was softened. Another important evidence found was the direct relation between time horizon and the power of overreaction, i.e., the longer the observation and holding periods the stronger is the overreaction.

Forner and Marhuenda (2003) in order to complement and further investigate the study mentioned above, they enlarged the period in analyse (January 1963 – December 1997), using the methodology of De Bondt and Thaler (1985, 1987), they created portfolios of five stocks each analysing 6, 12 and 60 month strategies in addition to the 3-year strategy already made. The results obtained were slightly different, they found a fall in the significance of the contrarian profitability, although this does not happen when it is considered a time horizon of five years, which has positive and significant results.

Concerning the Italian market, there is a lack of studies regarding the contrarian studies that focus this market by itself. The Italian market has been included in international studies that analyse a pool of different countries in the same sample, which is the case of Baytas and Cakici

(1999) that studied the performance of long-term contrarian strategy for different countries, such as Japan, France, UK, Germany, Italy and Canada. In their work, the authors found that for the Italian market this strategy had an average return of 21.6% ( $t$ -stat = 0.053).

However, the most important study is the work made by Mengoli (2004). Despite he focused his work solely in the Italian market, the author does not focus only in the contrarian strategies but also in momentum strategies. He used a sample of all the securities listed in the *Milano Indice di Borsa* (MIB), from January 1950 to June 1995. He used the methodology of Jegadeesh and Titman (1993), called the J-K methodology. They denominated the winner and loser portfolios sorting the stocks on the past performance basis on the past J-months ( $J = 3, 6, 12$ ) using quintiles, and tested the performance of the portfolios in the following K-months ( $K = 3, 6, 12, 36$ ). The authors concluded that the losers had higher returns the bigger the observation period, and the returns of the winners decreased. However, the authors found that the reversion effect is not stronger.

Therefore, although there are few studies of contrarian strategies in countries with feeble economic structures, such as Italy, Portugal, Spain and Greece, the ones that exist show positive results.

## **2.2. January Effect, Size Effect and Asymmetric Profits**

Despite the confirmation of the contrarian profits worldwide, there are some caveats that several authors use as a justification of these profits.

These caveats overemphasize the returns obtained from the loser portfolio, which are important to bear in mind when dealing with the overreaction effect, such as the so-called January effect and Size effect. The first effect is referred to the evidence that the loser portfolios earn higher returns in January than in other month of the year. There are some reasons pointed to the evidence of this effect. One is that there is a tax-loss selling by investors, in the sense that investors sell the stocks in December that have been performing poorly, and then they buy back the same stocks in January (Sias & Starks, 1997). Other explanation has to do with the fact that investors may earn some bonuses in the end of the year and invest them in the beginning of the next year, causing the abnormal returns (Ritter, 1988).

In order to complete their previous studies and also to test the caveats referred above, De Bondt and Thaler (1987) confirmed the existence of January effect (and also the size effect) since it is in this month that the loser portfolio earned all its excess returns. Yao (2012), using portfolios composed with stocks listed in NYSE and AMEX, found that the contrarian strategy in the long term is entirely due to the January Effect. Barone (1990) also showed that the mean rate of change in the MIB (*Milano Indice di Borsa*) in January was approximately 33% for the period of January 1975 to August 1989, presenting a strong influence of the referred effect.

Despite the findings of these authors concerning the January Effect, some studies found that this effect is not significant in other countries. Mun et al. (1999) found no significance in January returns for Germany and France, which is a confirmation of the previous work of Huu Minh (1995) to the French stock market. This last author stated that there was a strong positive evidence just in the first two days of negotiation of the year and not for the whole month. Soares and Serra (2005) corroborated this showing that actually the loser portfolio earned less than the winner portfolio in January, in the Portuguese stock market. In the case of China, Chen, Hua, and Jiang (2015) found no evidence of January seasonality as well, concluding that the differences in the performance of both portfolios are not very different between January and the other months.

The second caveat is referred to the evidence that when the stocks of the loser portfolio are smaller (in terms of market cap) than the ones of the winner portfolio, the loser portfolio tend to outperform the winner portfolio. There is more evidence that size effect enlarges the profits of contrarian strategies. As a matter of fact, Zarowin (1990) claimed that the overreaction effect is purely a manifestation of the size effect.

The main reason for this phenomenon is due the fact that the transaction costs of the small stocks are higher comparatively with the large stocks, and since these are riskier stocks, in the sense that there is less information available, consequently their premium will be higher.

Ising, Schiereck, Simpson, and Thomas (2006) and Schmidt (2017) in their studies for the German stock market found evidence of size effect, observing an average market capitalization outstandingly smaller in the loser portfolios when comparing with the winner. Regarding the Australian market, Doan et al. (2016), show that the smallest stocks predominate in the loser portfolio. The same results are obtainable for the Greece Stock market (Antoniou et al. (2005)), and Soares and Serra (2005) state that for the case of Portugal the median stock

presented in the winner portfolio is almost 5 times the market cap of the median stock presented in the loser portfolio.

Although this effect is presented in a variety of studies, Chopra, Lakonishok, and Ritter (1992) stated that the overreaction effect is presented even when portfolios are adjusted for size.

Another interesting pattern found in the literature is that there is evidence that the contrarian profits are asymmetric. This arises from the overreaction hypothesis – large price movements in one direction will be followed by a large price movement in the opposite direction. In fact, there is evidence that when the initial movement is strong the next opposite movement will also be prominent.

De Bondt and Thaler (1987) found this evidence and concluded that the return of the loser portfolio was approximately three times more than the return of the winner, in the US market. Forner and Marhuenda (2003) also found asymmetric returns in the Spain stock market; Baytas and Cakici (1999) concluded that this effect is strongly pronounced in some cases, for instance, in Japan the price reversal is more accentuated for the winners than for the losers, while the winner earned about 69% less than the market, the loser earned approximately 26%. However, these authors found that this effect is softened in countries such as U.K., Germany and France.

However, Da Costa (1994) concluded that the Brazilian market is symmetric, which is in contrast with the results of De Bondt and Thaler (1985). Soares and Serra (2005), in the case of Portugal, found that the asymmetric effect is weak.

### **2.3. Credit Rating as an explanatory factor of Momentum and Contrarian Effect**

In the last section, we exposed some of the most studied variables that have been pointed out as explanatory variables of contrarian profits – January effect and size effect. However, there is one variable few studies concern in studying, but we believe it is important when investing in the markets: credit rating. It is known that this indicator influences market agents during their investment decisions, for instance, institutional investors categorize rating grades as investment

grade and non-investment grade, and hence it can be considered as a screen in the capital allocation.

Studies have been showing that credit risk follows the tendency of the business cycles, and it reflects the economic environment. Moreover, there is evidence that either momentum and contrarian profits behave accordingly with the different phases of the economy. For instance Keeffe and Gallagher (2017) concluded that for the period of crisis the returns of the contrarian strategy were statistically insignificant, and Chordia and Shivakumar (2002) for the momentum effect in the US market, both studies reaching the conclusion that economic expansions and recessions affect the profits of both anomalies. Therefore, following both premises, we can ask whether credit rating affects the profitability of these effects.

The literature concerning this subject is scarce. The most important study is the one performed by Avramov et al. (2007) regarding only the momentum effect. First, using the methodology of Jegadeesh and Titman (1993), for the NYSE, AMEX and NASDAQ, using monthly data, the authors constructed the loser and winner portfolios, ranking the stocks accordingly its abnormal returns in the observation period of six months. This technic was executed for three sample sets: rated firms, unrated firms and all firms, in order to analyse the momentum profitability in the different categories. The authors reached some interesting conclusions. The extreme loser portfolio (P1) had an average rating of BB-, while the extreme winner (P10) had an average rating of BB+. Therefore, it is in the extreme portfolios that are presented the lowest and the next-lowest credit rating, respectively. However, the middle portfolios, such as P6 for instance, contains firms with a high investment grade, an average of BBB+. Therefore, there is evidence that credit rating forms a U-shape across momentum portfolios, meaning that this strategy (buy winners, sell losers) consists in taking long and short positions in firms with high credit risk (low rating grades). Also, this shows that momentum profitability is restricted to firms with high credit risk.

Another interesting aspect that the authors pointed out was that while the momentum profitability does not always arise from the small stocks (size effect mentioned in the previous section), it arises among the high credit risk stocks.

And finally, the authors found that within the extreme portfolios there are more unrated firms than rated, and among the rated ones in these portfolios there are more firms with a noninvestment grade rating.

Concerning the contrarian effect, and similarly to the momentum, there is a lack of studies. The authors that tested the relationship between contrarian profits and credit rating were Sasaki and Miyazaki (2012) for the Japanese equity market. They implemented a contrarian strategy for the period of June 1998 to May 2008 using monthly data. In order to test the impact of the credit rating in the profits of this strategy, the authors divided the sample in three groups accordingly with its rating score (AAA/AA, A and BBB/BB group), and for each the stocks were sorted in portfolios based on its past performance. The main conclusion of this study is that the better the credit rating group the higher the contrarian return, i.e., the contrarian returns on AAA/AA and A groups are larger than that on the BBB/BB group. However, the statistical significance appears only in the groups with high credit rating. The loser portfolio earned an average monthly return of 1.56% and 0.52% on AAA/AA and BBB/BB group, respectively, and the winner portfolio earned an average monthly return of -0.05% and 0.88%.

### **3. Data and Methodology**

In this section, we will present the data used in this study and the methodology applied to build the portfolios within the contrarian strategy in the Portuguese market as well as the procedure to test the impact of credit ratings in this investment strategy.

#### **3.1. Data**

The data used was collected from Thomson Reuters DataStream. It is composed by monthly stock prices for all the stocks traded in Lisbon Stock Exchange, from January 2001 to December 2016 summing a total of 192 months.

In order to avoid the survivorship bias we considered all the stocks that have been traded throughout all the sample period including the ones that had been delisted during this period. Thus, there are 97 stocks traded, which are dispersed along the period of analysis, starting with 74, whereas in the end of the period there are 60 stocks, reaching a maximum of 83 stocks.

Thereby, for a given stock to be included in the investor's portfolio, it must have traded continuously during all the observation period and at least one time in the holding period. This criteria was based on the work of De Bondt and Thaler (1985).

We collected, as well from the DataStream, the companies' ratings for the same period of analysis. Based on the work of Avramov et al. (2007), it was collected the Standard & Poor's Long-Term Domestic Issuer Credit Rating, summing a total of 12 rated firms.

In addition to this data it was also collected the industry sectors of each company, as shown in Table 3-1, to better understand if the results obtained happen across the sectors or in some specific one. This is an important variable since the Portuguese market is small, and the listed companies are concentrated in some specific sectors.

Table 3-1 - Sectors

Sectors	Number of Firms	Number of Rated Firms
Consumer Goods	12	-
Banking and Investment Services	18	7
Computing and Electronic	7	-
Travel & Leisure	12	-
Industry, Manufacturing and Construction	32	2
Pharmaceutical and Chemicals	3	-
Electricity	3	2
Telecommunications	10	1
<b>TOTAL</b>	<b>97</b>	<b>12</b>

### 3.2. Methodology

The methodology used was the one based on De Bondt and Thaler (1985), which was also used for the Portuguese stock market in the work of Soares and Serra (2005). This methodology is applied for different sub-periods within all the sample, which are split in two – observation period and holding period. Stocks are ranked accordingly with its past performance in the observation period and they will be holding in the subsequent period. The strategy used was a 24 month/24 month, *i.e.*, observation period and holding period of 24 months each. Starting the sample in 2001 and ending in 2016 and implementing the referred strategy, there is 7 non-overlapping observation/holding sub-periods. Therefore, for the observation periods of 2001-2002, 2003-2004, and so forth until 2013-2014, there will be the holding periods of 2003-2004, 2005-2006, and so forth until 2015-2016, respectively.

For each of the 7 non-overlapping periods we calculated the cumulative market-adjusted log returns (CAR) in the observation period for each stock. Despite there are other methods to estimate the abnormal returns, for instance the CAPM model, we chose the Adjusted Market Model used on the work of Soares and Serra (2005) and also because Keeffe and Gallagher (2017) concluded that both models produced similar results, as mentioned in the previous section.

Thus, to calculate the CAR it was used the following formula:

*Equation 3-1*

$$CAR_{i,t} = \sum_{t-24}^t (R_{i,t} - R_{m,t})$$

where  $R_{m,t}$  is the market return on each month  $t$ , calculated as an equally weighted average return of all the stocks presented in the sample, and  $R_{i,t}$  is the log return for the stock  $i$  on month  $t$ , calculated as follows:

*Equation 3-2*

$$R_{i,t} = \log(P_{i,t}) - \log(P_{i,0})$$

After these calculations, each stock will be sorted accordingly its CAR in each observation period, and ranked into quintiles. Therefore, there will be a top and a bottom portfolio, defined as the 20% best performing stocks and the 20% worst performing stocks, respectively. Thus, the top portfolio will be called from now on as Winner Portfolio (or P5) and the bottom as Loser Portfolio (or P1).

Now that the stocks are sorted and ranked in the observation period, it is necessary to evaluate the behaviour of the portfolios. Therefore, we calculated the average Cumulative Abnormal Return in the holding period as follows:

*Equation 3-3*

$$CAR_{p,z} = \sum_t^{24} \left[ \frac{1}{N} \sum_{i=1}^N (R_{i,z,t} - R_{m,z,t}) \right]$$

Since we are considering all firms that traded in the analysed period even those that were delisted or dead, this procedure involves a rebalancing in the portfolios each month. Using an equally weighted strategy, when a stock is no longer available in one month the average

cumulative return is rebalanced considering only the stocks available. Thus,  $p$  denotes the portfolio,  $\tau$  is the holding period and  $N$  refers to the number of stocks available in each month.

The next step is calculating the Average Cumulative Abnormal Return for each portfolio for all the seven holding periods as:

*Equation 3-4*

$$ACAR_p = \frac{\sum_{z=1}^7 CAR_{p,z}}{7}$$

As mentioned in the literature, the evidence of price reversal is associated to a negative serial correlation in returns. This is verified from Equation 3-4 when the loser portfolio earns positive average returns and the winner portfolio earns negative average returns. In other words, when the  $ACAR_L > 0$  and  $ACAR_W < 0$ .

In order to assess the statistical significance of the  $ACAR$  of each portfolio it is calculated the  $t$ -statistic as follows:

*Equation 3-5*

$$t_p = \frac{ACAR_p}{S_p / \sqrt{7}}$$

where  $S_p$  is the sample standard deviation of the loser and winner portfolios, computed as:

*Equation 3-6*

$$S_p^2 = \frac{\left[ \sum_{z=1}^7 (CAR_{W,z} - ACAR_W)^2 + \sum_{z=1}^7 (CAR_{L,z} - ACAR_L)^2 \right]}{2(7 - 1)}$$

The profitability of the contrarian strategy is verified by subtracting the profits of the winner to the profits of the loser, i.e.,  $ACAR_L - ACAR_W$ , since this strategy involves taking a long position in the loser portfolio and a short position in the winner. Thus, to calculate the statistical significance we used the following  $t$ -statistic:

*Equation 3-7*

$$t_{L-W,z} = \frac{(ACAR_{L,z} - ACAR_{W,z})}{\sqrt{2S^2/7}}$$

This method is applied three times for different sub-samples: the first includes all the firms, the second only includes the rated firms and the last one contains solely the unrated firms. This is implemented in order to test the impact of ratings in the profitability of the contrarian strategy and it is based on the work of Avramov et al. (2007).

Concerning the ratings, they were converted in a numerical scale, thus an AAA rating corresponds to number 1 and a D rating corresponds to number 22.<sup>2</sup> Therefore, when a portfolio presents a high (low) numerical score it means that it contains more firms with a lower (high) credit rating – higher (lower) credit risk, using an equally weighted average. Regarding all the rated companies, the equally weighted average rating is 7.04 which reflects an A- grade. For a more detailed information regarding the amounts of firms in each credit rating consult Graph 7-1 and Table 7-1 on the Appendix.

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<sup>2</sup> The complete scale is: AAA = 1, AA+ = 2, AA = 3, AA- = 4, A+ = 5, A = 6, A- = 7, BBB+ = 8, BBB = 9, BBB- = 10, BB+ = 11, BB = 12, BB- = 13, B+ = 14, B = 15, B- = 16, CCC+ = 17, CCC = 18, CCC- = 19, CC = 20, C = 21, and D = 22

## 4. Evidence

In this section, we will present the results obtained from the applied methodology, and discuss the conclusions withdrawn from the evidences observed. First, this chapter will focus on the application of the methodology mentioned above in order to check the presence of contrarian profitability. After that it will be performed the right procedures to analyse the impact of ratings in this strategy. Reported in Table 4-1 there is the Average Cumulative Abnormal Returns concerning the period in analysis for the three samples.

*Table 4-1 - Average Cumulative Abnormal Returns (2001-2016)*

This table represents the ACAR from the Loser (P1), Winner (P5) portfolio and also for the difference between both portfolios. The stocks were ranked in the 20% best and worst performance based on their past performance in the last 24 months, and a stock to be included in the portfolio it must be traded all the months in the observation period and at least one time in the holding period. Afterwards, the stocks were held in the following 24 months and the portfolio is monthly rebalanced when a stock is delisted or dead. Below each ACAR and in parenthesis are presented the *t*-statistics

Number of Firms	All Firms 97	Rated Firms 12	Unrated Firms 85
Loser (P1)	-0.83% (-0.181)	-1.49% (-0.282)	-0.33% (-0.081)
Winner (P5)	2.16% (0.706)	-1.19% (-0.346)	1.58% (0.546)
L-W	-2.99% (-0.580)	-0.30% (-0.051)	-1.90% (-0.410)

The first observation withdrawn from the above table is the inexistence of the reversion effect, *i.e.*, no evidence of contrarian effect, since for all the three samples it is verified that the Loser portfolio had negative ACAR and the Winner had the opposite. In fact, any of the values presented in the above table have statistical significance. Despite this conclusion, it is verified that the difference between both portfolios is less negative among the rated sample, however it is not possible to conclude anything concerning the impact of ratings in the contrarian strategy because this does not occur in the period analysed.

Therefore, the next step of this study is to find a way to understand in a smaller range of time whether there are or not price reversion. Thus, based on the work of Keeffe and Gallagher (2017) that found different results when applying the contrarian strategy before and after crisis, the samples were divided accordingly with their study: pre-crisis and crisis. Hence, from 2001 until 2006 is considered the pre-crisis and from 2007 until 2014 is considered the crisis period, regarding the observation periods.

*Table 4-2 – Average Cumulative Abnormal Returns for Pre-Crisis and Crisis Periods*

This table represents the ACAR from the Loser (P1), Winner (P5) portfolio and also for the difference between both portfolios, for all the three types of samples in the two periods – pre-crisis and crisis. The calculations for these portfolios were the same as the previous table. Below each ACAR in parenthesis are presented the *t*-statistics where \* denotes statistical significance at 10% level.

	All Firms		Rated Firms		Unrated Firms	
	Pre-Crisis	Crisis	Pre-Crisis	Crisis	Pre-Crisis	Crisis
Loser (P1)	1.99% (0.297)	-2.94% (-0.371)	0.52% (0.198)	-2.99% (-0.270)	2.32% (0.299)	-2.31% (-0.404)
Winner (P5)	-2.68% (-0.555)	5.79% (1.517)*	1.78% (0.720)	-3.42% (-0.504)	-2.71% (-0.604)	4.79% (1.245)
L-W	4.67% (0.666)	-8.73% (-1.039)	-1.26% (-0.421)	0.43% (0.038)	5.03% (0.662)	-7.10% (-1.070)

Table 4-2 shows the results obtained. Analysing in a first moment the pre-crisis period, it is showed that when considered all firms there is evidence of price reversion, since the average cumulative abnormal return of the loser is positive (1.99%) and negative for the winner portfolio (-2.68%). Also, the contrarian effect is found in the Unrated Firms sample, in fact with a higher  $ACAR_{L-W}$  than the one considering all firms (5.03% against 4.67% respectively). However, this effect it is not observable in the sample containing only the rated firms.

The first conclusion withdrawn from these evidences is that when splitting the sample containing all firms in rated and unrated, it is observable that the returns have an increase in the unrated firms sample comparing with all firms (5.03% against 5.67%, respectively) than the rated firms' sample which in fact had a negative return of -1.26%. Therefore, this means that rated

firms have a negative impact in the contrarian strategy when considering the all firms' sample whereas the unrated firms have a positive impact.

Regarding the crisis period, it is not observable the contrarian effect in any of the three samples. Despite the  $ACAR_{L-W}$  is positive for the rated firms sample, which could be a sign of this effect, when considering in detail the two portfolios it is perceptible that both got a negative return and this is a violation of the premise of contrarian investment, i.e., the losers outperforming the winners.

Henceforward the study of the impact of ratings will be performed for the three samples and for all the periods just for control purposes, however the conclusions will be only concerning the pre-crisis period, since it is only in this one that the contrarian effect is present.

Thus, to study the impact of credit ratings in the performance of contrarian strategies, first for the entire sample of firms, for each observation period and for each portfolio (P1 and P5) we checked whether there were rated companies or not. After that and using the scale mentioned in the previous section, the ratings within each portfolio were converted in a scale number in order to access easily the average credit score. The results obtained are presented in the table below:

*Table 4-3 - Credit Ratings of the Loser and Winner Portfolios*

In this table are represented the average credit rating for all the firms sample and for the sample containing only rated firms. The study was performed for all the three periods but only the one in bold has evidence of contrarian effect, this means that only this one has interest in the study. The first line represents the average credit score for each portfolio and the line below corresponds to the respective credit rating.

	All Firms			Rated Firms		
	All Period	<b>Pre-Crisis</b>	Crisis	All Period	Pre-Crisis	Crisis
Loser (P1)	11.43 BB+	<b>3.33</b> <b>AA</b>	17.50 CCC	13.57 B+	12.67 BB-	14.25 B+
Winner (P5)	3.86 AA-	<b>5.67</b> <b>A</b>	2.50 AA	14.57 B	11.33 BB+	17.00 CCC+

According to the above table, it is noticeable that the average credit rating has no pattern in the different periods within each portfolio. In a superficial analysis, for all firms' sample there

are more evidence of firms rated in an A category than in the rated firms' sample where there are more firms rated in a B category.

Considering now the period where the contrarian strategy is present, this is the pre-crisis in the all firms' sample, the results are in accordance with the literature, since the extreme portfolios – loser and winner – have a similar credit rating class, AA and A respectively.

Another point of the literature that we found in our study is the evidence that loser and winner portfolios do not contain a great amount of rated firms. This evidence is presented in Table 4-4. In Panel A we show the number of rated firms within each extreme portfolio in all the holding periods in comparison with the total amount of stocks. Hence, it is visible that for all the periods we see a low volume of rated firms for both portfolios. In Panel B we show the average percentage of rated firms in each portfolio for the three sub-periods, which also confirms the evidence of low volume of rated firms in the extreme portfolios.

*Table 4-4 - Amount of rated firms in each portfolio*

PANEL A:

In this first table, it is showed the number of rated stocks presented in each holding period for the loser and the winner portfolio relatively with the total stocks contained in each.

		I	II	III	IV	V	VI	VII
P1	Number of rated firms	2	0	0	2	0	2	4
	Total Stocks	16	16	14	14	14	13	13
P5	Number of rated firms	2	0	1	0	1	0	0
	Total Stocks	16	15	14	11	14	9	13

PANEL B:

In this table, it is represented the average percentage of rated firms in each portfolio, for the three periods in consideration for this study. In bold is the period where there is evidence of contrarian profitability.

	All Period	<b>Pre-Crisis</b>	Crisis
Loser (P1)	10%	<b>4%</b>	15%
Winner (P5)	4%	<b>7%</b>	2%

Another interesting investigation is to observe the industry sectors of the listed companies, in order to see whether this is somehow related with contrarian profitability. Portuguese market has a low number of listed companies, and the majority are concentrated in one economic sector “Industry, Manufacturing and Construction”, as seen in Table 3-1. Despite this sector represents the main slice of the listed companies, it is not the one that has the most rated firms.

Table 4-5 concentrates the number of rated firms per industry sector for all the three periods in analysis, divided in All Firms and Rated Firms for the extreme portfolios.

*Table 4-5 - Number of rated firms per sector*

This table represents the amount of rated firms in each extreme portfolio for the three periods in analysis per industry sector. In bold is emphasized the period where there is evidence of price reversion.

		Banking and Investment Services	Industry, Manufacturing and Construction	Electricity	Telecommunications
<b>All Firms*</b>	All Period	6	1	1	1
	P1 <b>Pre-Crisis</b>	<b>1</b>	-	<b>1</b>	-
	Post-Crisis	5	1	-	1
	All Period	2	1	-	1
	P5 <b>Pre-Crisis</b>	<b>2</b>	<b>1</b>	-	-
	Post-Crisis	-	-	-	1
Rated Firms	All Period	5	-	1	1
	P1 Pre-Crisis	3	-	1	1
	Post-Crisis	5	-	-	-
	All Period	4	2	1	1
	P5 Pre-Crisis	3	1	1	-
	Post-Crisis	2	1	1	1

\* See Graph 7-2 in Appendix

The main concentration of rated firms is in the Banking and Investment Services industry, for all the periods. However, when focusing only in the period where effectively we had contrarian profitability (pre-crisis – all firms), albeit we see that in fact this is the most populated industry with rating firms, the amount is not high (1 firm in the loser portfolio and 2 in the winner). This is in accordance in the previous evidence that extreme portfolios are not the ones populated with a high amount of rated firms.

## 5. Conclusions

Our work aimed to test the profitability of a contrarian strategy applied in a recent sample (2001-2016) for the Portuguese market, and also to analyse the influence of the stocks' credit rating in the outcome of this strategy. Basing our work in previous ones, such as Soares and Serra (2005) and Avramov et al. (2007), we reached some interesting conclusions.

The first main conclusion is that when considering the full period there is no evidence of contrarian profits for the three samples (all firms, rated firms and unrated firms).

Based in previous studies, we split our sample in two observation periods: pre-crisis (2001-2006) and crisis (2007-2014). We reached the conclusion that is only in the pre-crisis that the contrarian strategy is profitable. However, this does not happen for all the samples. When considering a sample containing only rated firms, we see that there is no profitability, unlike the sample containing all firms and the one containing only unrated, the first with an ACAR of 4.67% and the second with 5.03%. Looking at these values, it is perceptible that credit rating had a negative impact in the overall sample, i.e., when considering, for the same period, a sample with all firms and other with unrated firms, we see an increase in the profitability of the contrarian strategy in the unrated.

Focusing only in the pre-crisis period for the sample with all firms, we see that our results are in accordance in the literature. First, both loser and winner portfolios have similar credit rating classes (in our study, AA and A respectively). And second, extreme portfolios do not have a great amount of rated stocks. We see low volumes of rated firms for all the observation periods in both portfolios – only 4% (7%) are rated firms in the loser (winner).

Our last conclusions focus on the industry sectors of the Portuguese companies. We see that despite the majority of the listed companies are in the “Industry, Manufacturing and Construction” sector, the rated ones do not belong to this sector but belong to “Banking and Investment Services Industry”. However, when focusing in the pre-crisis period for the sample containing all firms, we see that both loser and winner portfolios do not have a high amount of these stocks, in fact we see that only one rated stock of this sector in the loser and two rated stocks of this sector in the winner. This can also be interpreted as an effect of the previous evidence that extreme portfolios do not have a great amount of rated stocks.

Despite our conclusions are in accordance with the literature, we are facing a small sample since the Portuguese market has not a great amount of listed companies. Furthermore, within the listed ones, there are only 12 that have credit ratings.

In future studies, it would be interesting to build all the 5 portfolios and not only the loser and the winner, in order to have a full picture of the behaviour of a contrarian strategy through all portfolios.

## 6. Bibliography

- Alonso, A., & Rubio, G. (1990). Overreaction in the Spanish equity market. *Journal of Banking & Finance*, 14(2), 469-481.
- Antoniou, A., Galariotis, E. C., & Spyrou, S. I. (2005). Contrarian Profits and the Overreaction Hypothesis: the Case of the Athens Stock Exchange. *European Financial Management*, 11(1), 71-98.
- Avramov, D., Chordia, T., Jostova, G., & Philipov, A. (2007). Momentum and Credit Rating. *The Journal of finance*, 62(5), 2503-2520.
- Barberis, N., Shleifer, A., & Vishny, R. (1998). A model of investor sentiment. *Journal of financial economics*, 49(3), 307-343.
- Barone, E. (1990). The Italian stock market: Efficiency and calendar anomalies. *Journal of Banking & Finance*, 14(2), 483-510.
- Baytas, A., & Cakici, N. (1999). Do markets overreact: International evidence. *Journal of Banking & Finance*, 23(7), 1121-1144.
- Chen, Q., Hua, X., & Jiang, Y. (2015). Contrarian strategy and herding behaviour in the Chinese stock market. *European Journal of Finance*.
- Chopra, N., Lakonishok, J., & Ritter, J. R. (1992). Measuring abnormal performance: do stocks overreact? *Journal of financial Economics*, 31(2), 235-268.
- Chordia, T., & Shivakumar, L. (2002). Momentum, business cycle, and time-varying expected returns. *The Journal of finance*, 57(2), 985-1019.
- Da Costa, N. C. (1994). Overreaction in the Brazilian stock market. *Journal of Banking & Finance*, 18(4), 633-642.
- Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor psychology and security market under- and overreactions. *The Journal of finance*, 53(6), 1839-1885.
- De Bondt, W., & Thaler, R. (1985). Does the stock market overreact? *The Journal of finance*, 40(3), 793-805.
- De Bondt, W., & Thaler, R. (1987). Further evidence on investor overreaction and stock market seasonality. *Journal of Finance*, 557-581.

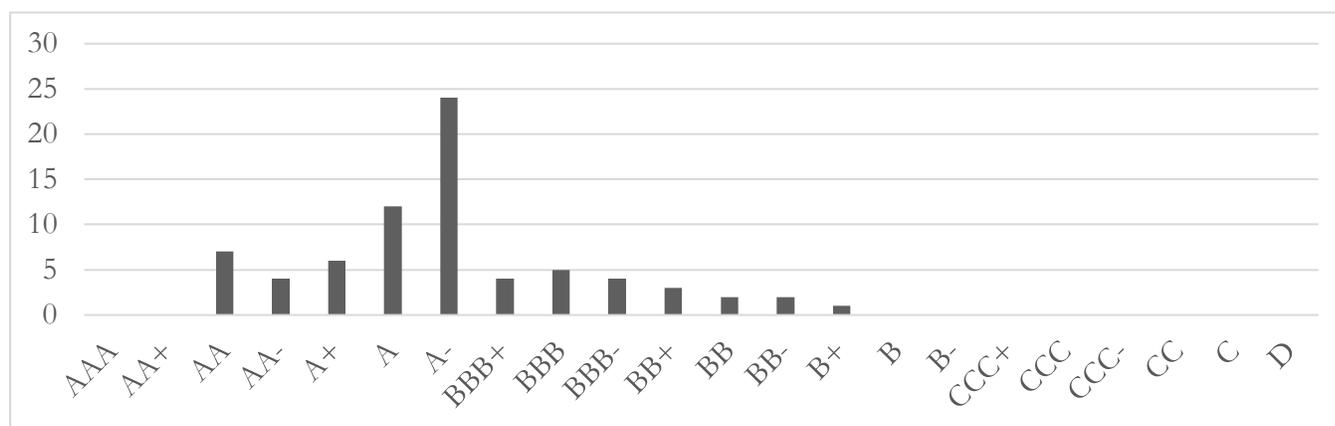
- Doan, M. P., Alexeev, V., & Brooks, R. (2016). Concurrent momentum and contrarian strategies in the Australian stock market. *Australian Journal of Management*, 41(1), 77-106.
- Fama, E. F., & French, K. R. (1988). Permanent and Temporary Components of Stock Prices. *Journal of Political Economy*, 96(2), 246-273.
- Forner, C., & Marhuenda, J. (2003). Contrarian and Momentum Strategies in the Spanish Stock Market. *European Financial Management*, 9(1), 67-88.
- Gregory, A., Harris, R. D. F., & Michou, M. (2001). An analysis of contrarian investment strategies in the UK. 28(9-10), 1193-1193 - 1228.
- Huu Minh, M. (1995). Sur-réaction sur le marché français des actions au Règlement Mensuel 1977-1990. 16(1), 113.
- Ising, J., Schiereck, D., Simpson, M. W., & Thomas, T. W. (2006). Stock returns following large 1-month declines and jumps: Evidence of overoptimism in the German market. 46(4), 598.
- Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of finance*, 48(1), 65-91.
- Kahneman, D., Slovic, P., & Tversky, A. (1982). *Judgment Under Uncertainty: Heuristics and Biases* (Vol. 36): Cambridge University Press.
- Keeffe, C., & Gallagher, L. A. (2017). The winner-loser anomaly: recent evidence from Greece. *Applied Economics*, 49(47), 4718-4728.
- Lakonishok, J., Shleifer, A., & Vishny, R. W. (1994). Contrarian Investment, Extrapolation, and Risk. *The Journal of finance*, 49(5), 1541-1578.
- Mengoli, S. (2004). On the source of contrarian and momentum strategies in the Italian equity market. *International Review of Financial Analysis*, 13(3), 301-331.
- Mun, J. C., Vasconcellos, G. M., & Kish, R. (1999). Tests of the Contrarian Investment Strategy Evidence from the French and German stock markets. *International Review of Financial Analysis*, 8(3), 215-234.
- Pereira, P. (2009). *Momentum and Contrarian Strategies in the Portuguese Stock Market*. (Master in Finance), ISCTE.
- Ritter, J. R. (1988). The buying and selling behavior of individual investors at the turn of the year. *The Journal of finance*, 43(3), 701-717.

- Sasaki, D., & Miyazaki, K. (2012). Credit Rating Matters In Contrarian Return: Evidence From The Japanese Equity Market. *Journal of the Operations Research Society of Japan*, 55(2), 107-124.
- Schiereck, D., De Bondt, W., & Weber, M. (1999). Contrarian and Momentum Strategies in Germany. *Financial Analysts Journal*, 55(6), 104-116.
- Schmidt, M. H. (2017). Trading strategies based on past returns: evidence from Germany. *Financial Markets and Portfolio Management*, 31(2), 201-256.
- Sias, R. W., & Starks, L. T. (1997). Institutions and individuals at the turn-of-the-year. *The Journal of finance*, 52(4), 1543-1562.
- Soares, J. V., & Serra, A. P. (2005). “Overreaction” and “Underreaction”:-Evidence for the Portuguese Stock Market. *Caderno de Valores Mobiliários*, 22, 55-84.
- Yao, Y. (2012). Momentum, contrarian, and the January seasonality. *Journal of Banking & Finance*, 36(10), 2757-2769.
- Zarowin, P. (1990). Size, seasonality, and stock market overreaction. *Journal of Financial and Quantitative analysis*, 25(1), 113-125.

## 7. Appendix

*Graph 7-1 - Number of firms in each credit rating*

This graph represents the number of firms rated in each credit rating through all the sample period. This means that this graph does not take in consideration companies that had an upgrade or a downgrade.



*Table 7-1 - Number of firms in each credit rating by Observation Period*

This graph represents the amount of firms rated in each credit rating according the observation period.

	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
AAA	-	-	-	-	-	-	-
AA+	-	-	-	-	-	-	-
AA	2	1	1	1	1	1	-
AA-	1	1	-	1	1	-	-
A+	2	1	2	-	1	-	-
A	2	2	1	3	3	1	-
A-	3	5	5	3	2	5	1
BBB+	1	1	1	-	-	1	-
BBB	-	-	-	1	2	1	1
BBB-	-	-	-	1	1	2	-
BB+	-	-	-	-	-	-	3
BB	-	-	-	-	-	-	2
BB-	-	-	-	-	-	-	2
B+	-	-	-	-	-	-	1
B	-	-	-	-	-	-	-
B-	-	-	-	-	-	-	-
CCC+	-	-	-	-	-	-	-
CCC	-	-	-	-	-	-	-
CCC-	-	-	-	-	-	-	-
CC	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-

Graph 7-2 - Rated firms per portfolio and sector

This graph shows the amount of rated companies per sector and portfolio for the three periods in analysis. This represents only the sample including all firms.

