Asset Pricing Anomalies and the Effect of Different Credit Ratings

Clarice Carneiro Martins[a]

Faculdade de Administração, Economia e Contabilidade
Universidade de São Paulo

José Roberto Securato[b]

Faculdade de Administração, Economia e Contabilidade
Universidade de São Paulo

Eduardo Kazuo Kayo[c]

Faculdade de Administração, Economia e Contabilidade
Universidade de São Paulo

Joelson Oliveira Sampaio[d]

Faculdade de Administração, Economia e Contabilidade
Universidade de São Paulo

ABSTRACT

We use anomaly-based trading strategies to investigate the impact of financial distress on the expected return of companies in lowest credit rating group. We find evidence that the subsample of rated firms have abnormal returns different from that of all firms. These results are statistically significant, negative and persistent across all specifications. We also find some evidence that for companies in the lowest tercile of credit rating, the reversal effect is present and with positive and statistically significant abnormal returns. This gives some evidence that credit deterioration could have an impact on the risk-adjusted return required by investors.

Key words: Asset pricing anomalies. Financial distress. Credit rating. Reversal effect.

[a] Departamento de Administração, FEA-USP, CEP 05508-900, São Paulo-SP, Brasil
Email: Martins.clarice@gmail.com
[b] Departamento de Administração, FEA-USP, CEP 05508-900, São Paulo-SP, Brasil
[c] Departamento de Administração, FEA-USP, CEP 05508-900, São Paulo-SP, Brasil
[d] Departamento de Economia, FEA-USP, CEP 05508-900, São Paulo-SP, Brasil

1 Introduction

For over half a century, the academic circles have been investigating the validity of the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965). Given that the CAPM is a one-factor model and it explains the excess return of an asset in relation to a market return only, many other alternative models have been researched and empirically tested. Some of these studies point to CAPM anomalies, variables that present statistically significant empirical results. For instance, we can cite the size effect presented by Banz (1981), or the value effect of Fama and French (1992). Titman, Wei and Xie (2004) discovered that companies with high investment in capital expenditures (capex) have lower returns. Hence, firms' size, book-to-market ratio (book value of equity over market value of equity) and capex are examples of documented anomalies.

An important question nowadays, which has been gaining interest in the academy, is the effect of credit ratings in asset pricing models. Various studies have been using different measures of credit risk to test its effect in asset returns. Nevertheless, this line of testing is still very new in the Brazilian market. Given this scenario, this research intends to contribute to this gap. Our objective is to examine the impact of financial distress over the stock returns of firms using anomaly-based trading strategies, for a group of Brazilian stock market firms.

Our results show that, for a company, having a credit rating has a significant role in the determination of abnormal returns. This effect was determined by the presence of significant and negative variable dummies, used to explain the variation of returns between firms with credit rating and firms without a credit rating. This result was persistent for all specifications tested. The negative effect is easily explained by the size effect, given that the companies with credit rating in the Brazilian market are mostly of large size and this explains a lower return in relationship to the overall companies' sample.

In an broad sense, our work contributes to the academic literature in two ways: first, we can see evidence of different expected excess returns for firms with credit rating, suggesting the importance of a firm to have a rating. The second contribution was to provide a research interacting credit rating and CAPM anomalies.

This article is organized as follows: in chapter 2, we present a brief history of asset pricing theory and the main empirical tests which are relevant for this work; next, in chapter 3, we present the methodology, the data and the variables; chapter 4 presents our results; and in chapter 5, we make some closing remarks.

2 Theory and hypothesis

Since its inception, the CAPM model has been vastly discussed with both validating and refuting empirical research published about it. Some of the work which found evidence of its validity, with data of its time, were Black, Jensen e Scholes (1972) e de Fama e MacBeth (1973). Later on, other empirical work demonstrated the existence of anomalies, variables with statistical significance that affect the expected returns of assets, and with this, refute the validity of the beta as the only explaining variable in asset returns.

In this line of work, some of the research with most relevancy to our study are: Banz (1981), Reinganum (1981), Lakonishok e Shapiro (1986), Fama e French (1993) Titman, Wei e Xie (2004). Banz (1981) tests the relationship between the size of a firm and its stock returns. The size of the firm, measured by its total market value, according to Banz, adds explicative value to the regression done with the CAPM beta. This work demonstrates that small size firms, on average, have higher excess returns than big firms.

Fama and French (1993) introduced the three-factor model using beta, size and book-to-market ration. They find a strong positive relationship between stock returns and the size effect and the book-to-market ratio, known as the value effect. The stronger relationship captured by their studies is that when the stock betas are not correlated to size, then the relationship of beta and stock returns is stable,

reducing the explicative power of beta and emphasizing the size effect, and in the same study they also show that the book-to-market effect is still stronger than the size effect (FAMA; FRENCH, 1992).

Similarly, many asset-pricing studies have been pursued for the Brazilian stock market, in order to test the validity of CAPM or the three-factor model. Securato and Málaga (2004) study the validity of the Fama and French three factor model in Brazil. The main results indicate that the three factor model is superior to CAPM in explaining stock returns variation also in the Brazilian stock market. Lucena and Pinto (2008), and Chague (2007) also introduce work about the validity of this model and their results corroborate with the previous one. Nevertheless, as we can find in the international environment, researches here also have conflicting results. Rogers and Securato (2009), although their work confirm the predicting power of the three factor model over the CAPM in Brazilian stock market, they capture that the true factors driving explicative power are size and beta.

2.1 Financial Distress

The characteristic financial distress of a firm has been explored in many ways in the asset pricing research. Many authors have been used to support this research: CAMPBELL; HILSCHER; SZILAGYI, 2008; CHAN; CHEN, 1991; DICHEV; PIOTROSKI, 2001; HAND; HOLTHAUSEN; LEFTWICH, 1992. The theory has taken as a premise the idea that some companies have high probability of failing in their financial obligations, and these firms are generically called financially distressed companies. The stocks of these firms tend to move together. And, that is the reason why the risk of distress cannot be diversified away and rational investors should demand a premium to take such risk. The degradation of company fundamentals can be correlated to many reasons, and in this case, this risk cannot be captured by the CAPM and therefore, we have a situation where distress risk could help explain the anomalies found in the empirical research (CAMPBELL; HILSCHER; SZILAGYI, 2008).

There is empirical evidence of low abnormal returns for firms in financial distress. For these firms, the stock returns is lower than that of a company with low risk of failing, but, these financially distressed firms present high beta and high risk factors loadings for the size effect and value effect. This is inconsistent to the idea proposed by Fama and French (1992, 1993) that the size and value effects would compensate for the distress risk, suggesting that this risk is still not priced correctly by the stock market (CAMPBELL; HILSCHER; SZILAGYI, 2008).

In order to empirically test the financial distress effect on stock returns, authors choose different types of measurements. Dichev and Piotroski (2001) study long-run returns of firms which had their bonds ratings changed. The authors find no evidence of abnormal returns when bonds suffered upgrades. Nevertheless, they find evidence of abnormal negative returns in the magnitude of 10% to 14% per year, in the first year, after a bond rating downgrade. These results are still of greater magnitude to small firms and firms of low credit quality. The authors defend the use of changes in bond credit ratings, first because these changes in ratings are common information, very well disseminated. And also, because studies suggest that these changes capture actual changes in companies' economic conditions.

In a novel line of work, Avramov, Chordia, Jostova, and Philipov (2013) explore the relationship of anomalies already consecrated in the academic literature with financial distress of firms represented by long-run companies ratings. The objective of their study is to identify the implications of distress in the profitability of anomaly-based strategies. In this work, the authors show that all but one of the anomaly-based strategies are significant for the lower credit rating companies and that some of them are profitable and derive this profitability from taking short positions in firms that have deteriorating credit conditions. With these results, the authors have established a relationship between anomalies and financially distressed firms. According to Avramov *et al* (2013, p. 140), the implications of financial distress haven't been completely explored in academic studies for the North-American market. We verified that the same is true for the Brazilian market.

3 Method

For this research, we will apply the concepts used by Avramov et al (2013) to the Brazilian market, adapting it and adding to it content that has been proven to be specific of our local market. We will analyze the relationships of some anomalies with the characteristic financial distress, represented here by the long-run credit rating. Besides using some of the anomalies used by the authors, we add to our study an anomaly which is present frequently in empirical studies in Brazilian stock market, that is the **reversal effect**. Therefore, the anomalies tested are: the momentum effect, the earnings momentum, idiosyncratic volatility, asset growth, capex investment and the reversal effect. This research uses two different procedures in order to achieve its objective. First, we will conduct an analysis of portfolio sorts and then we will perform univariate and multivariate regressions in the cross section of stock returns in order to verify (or refute) the behavior of anomalies in the pricing of asset. According to Fama and French (2008), this method serves as a verification of portfolio sorts.

Anomaly-based strategies are the process used to estimate the profitability of an anomaly on the companies' stock returns. For this we use traditional long-short strategies. In this strategy, we divide the sample in quintiles portfolios, from P1 to P5. The stock returns will be classified into theses portfolios accordingly with the anomaly being tested. The portfolio P1 will be always the portfolio with the lowest value of the anomaly in question. And similarly, portfolio P5 will have the highest values. Depending on which anomaly is tested, one of the portfolios, highest or lowest, will be purchased (long side of strategy), and the other will be short-sold (the short side of strategy).

3.1 Sample

The data used are daily stock price, market value, trading volume, earnings per stock (EPS) and credit rating of companies listed at Bolsa de Valores de São Paulo (Bovespa). All data was gathered from a Bloomberg, L.P. terminal. We adjusted stock returns for size and book-to-market risk effects, using Fama-French three-factor model (1993). For adjusted factors, we used data provided by FINBRAX, research group of Fundação Instituto de Pesquisas Econômicas (FIPE). The sample period was July, 2000 through June, 2012.

The credit rating used for this research are long-run ratings. Avramov et al (2013) used an S&P overall company rating, which represents a general opinion of the credibility of the company, not representing the capacity of payment of any specific debt issue. Nevertheless, Dichev and Piotroski (2001) use a different approach. These authors chose ratings for long run issues. If the firm has more than one debt issue, they chose the one with the longest maturity. Given that our objective is to capture the financial stability of the company, we gather that both lines of thinking are valid. But, we chose to follow Dichev and Piotroski (2001) approach, since this will provide a bigger sample for our research. With this approach, we will have 90 companies with long run ratings in our sample.

4 Results

4.1 Portfolio sorts

By the results of Avramov *et al* (2013, p. 143-157), we can gather that the profitability of anomaly-based strategies diminishes with the improvement of credit conditions, or we may say, with the reduction of financial distress risk. This is easily perceived when we look at the relationship between anomalies and firms with the lowest rating. The regressions in their research corroborate to the results of the portfolio sorts.

In our market, the results are not as uniform as in that above cited work. We will look at each anomaly variable individually, given the information that can be gathered from this individual analysis. In the following table (table 1), we will see the results for our portfolio sorts.

Table 1 – Portfolio sorts results (*p<0,05, **p<0,01, ***p<0,001)

Sample	Portfolio	Momentum	SUE	IV	Growth	Investment	Reversal
Full Sample	P1	**-0.0116*** **	**-0.0103*** **	0.0597	**-0.164*** **	**-0.0957** **	0.00182
		(-4.27)	**(-4.72)**	-0.91	**(-4.46)**	**(-3.81)**	-0.69
	P5	**-0.0108*** **	**-0.00969*** **	-0.0000626	**-0.144** **	**-0.135*** **	**-0.0201*** **
		(-3.86)	**(-4.34)**	(-0.01)	**(-4.37)**	**(-5.33)**	**(-8.72)**
	Strategy	0.000841	0.000615	0.0598	-0.0201	0.0398	**0.0220*** **
		-0.24	-0.23	-0.91	(-0.85)	-1.38	**-6.26**
	n	137	125	142	12	11	131
Rated firms	P1	**-0.0122*** **	**-0.0104*** **	**-0.0156*** **	**-0.106** **	-0.0803	-0.00296
		(-3.49)	**(-4.32)**	**(-4.61)**	**(-3.63)**	(-1.82)	(-0.95)
	P5	**-0.00788** **	**-0.00942*** **	**-0.0140*** **	**-0.0807* **	**-0.112* **	**-0.0157*** **
		(-2.86)	**(-3.47)**	**(-3.63)**	**(-2.36)**	**(-2.38)**	**(-5.29)**
	Strategy	0.00433	0.001	-0.00157	-0.0254	0.0315	**0.0127** **
		-1.03	-0.31	(-0.51)	(-0.94)	-1.49	**-2.74**
	n	137	125	142	12	11	131
Best *rated*	P1	**-0.0132** **	**-0.00820** **	**-0.0112** **	-0.0364	-0.0728	-0.00551
		(-3.19)	**(-3.26)**	**(-3.08)**	(-1.07)	(-1.90)	(-1.91)
	P5	**-0.00727* **	**-0.00780** **	**-0.0110** **	-0.0865	-0.0623	**-0.0170*** **
		(-2.16)	**(-3.33)**	**(-2.70)**	(-2.17)	(-1.51)	**(-3.47)**
	Strategy	0.00593	0.000399	-0.000159	0.0501	-0.0105	**0.0115* **
		-1.12	-0.13	(-0.04)	-1.07	(-0.32)	**-2.06**
	n	137	125	142	12	11	131
Worst *rated*	P1	**-0.0162* **	**-0.0147** **	-0.0144	**-0.230** **	-0.125	-0.00832
		(-2.46)	**(-2.79)**	(-1.46)	**(-3.27)**	(-1.60)	(-1.11)
	P5	-0.0123	-0.0118	-0.0139	-0.05	**-0.260** **	**-0.0300*** **
		(-1.10)	(-1.33)	(-1.69)	(-0.30)	**(-3.74)**	**(-3.47)**
	Strategy	0.00386	0.00291	-0.000502	-0.18	**0.135* **	**0.0217* **
		-0.34	-0.32	(-0.05)	(-1.72)	**-2.46**	**-2.17**
	n	115	89	125	10	10	103
Big Companies with *rating*	P1	**-0.0102* **	**-0.00898*** **	**-0.00938* **	-0.0434	-0.0605	0.0000894
		(-2.33)	**(-3.72)**	**(-2.56)**	(-1.22)	(-1.32)	-0.03
	P5	-0.00463	**-0.00765** **	**-0.0102** **	-0.0297	-0.0824	**-0.0123*** **
		(-1.58)	**(-2.80)**	**(-2.64)**	(-0.88)	(-1.55)	**(-3.98)**
	Strategy	0.00557	0.00133	0.000779	-0.0137	0.0219	0.0123*
		-1.11	-0.41	-0.25	(-0.36)	-0.93	-2.6
	n	137	125	142	12	11	131
Samall Companies with *rating*	P1	**-0.0351*** **	**-0.0282*** **	**-0.0317** **	-0.197	-0.271	-0.0182
		(-4.35)	**(-5.10)**	**(-2.90)**	(-1.90)	(-3.18)	(-1.53)
	P5	**-0.0410*** **	**-0.0476*** **	**-0.0399*** **	-0.258	**-0.271** **	**-0.0327** **
		(-5.30)	**(-5.62)**	**(-4.73)**	(-1.74)	**(-7.86)**	**(-3.32)**
	Strategy	-0.00583	**-0.0194* **	0.00825	0.0604	0.000665	0.0145
		(-0.59)	**(-2.21)**	-0.77	-0.67	-0.01	-0.8
	n	55	58	59	5	4	48

4.2 Momentum effect

Differently from the result of Avramov et al (2013), and more aligned to the work of Bonomo e Dall'Agnol (2003), in our sample, the long-short strategy for the momentum effect does not show evidence of its presence in the Brazilian market, given that none of the strategy results were statistically significant. This was expected, since the Brazilian stock market behaves differently than the American stock market. As we can see in Table 1, some of the P1 portfolios had significant but negative results. P1 is the portfolio for companies with lower 6-month returns and P5 is the portfolio for companies with

higher 6 month returns. The momentum column already indicates a reversal effect since the portfolio P5 has the lowest significant returns, -3,02% a.m. (-30,8% a.a.).

Another interesting evidence to highlight is that, for the sample with all companies, there were no statistical significance at all, but when we reduce the sample with only rated companies, we have a few significant results. This pattern with be reproduced in other anomalies tested and this is suggestive of a coercive group, when we reduce the sample to those companies with credit rating.

4.3 Earnings momentum

In the work of Avramov *et al* (2013), we see statistical significance for the strategy of earnings momentum, which suggests that, buying stock of companies with higher surprise in earnings (portfolio P5) and selling stock of companies with lower surprise in earnings (portfolio P1) would be a profitable strategy. In our research, we had some negative and significant results for portfolio P1, those of companies with lower surprise in earnings, the portfolio that will be short-sold. These results appear in four out of six samples. We would like to highlight the presence of negative and statistically significance for the strategy for the group of small companies with rating (Table 1). This evidence indicates that, even with returns adjusted for risk, when we test the earnings surprise anomaly, the excess returns for small companies with rating still has something unexplained.

Nevertheless, differently from the North-American stock market results, this strategy shows a negative reaction of the local market to companies with higher variation in earnings. This result indicates an investor preference to buying stocks of companies with lower variation in earnings and selling stocks with higher variation in earnings.

4.4 Idiosyncratic Volatility (IV)

Classical finance theory tells us that more volatility means more risk and that investors should be rewarded for taking more risk with higher returns. Ang *et al* (2006) identify an empirical relationship negative and significant between idiosyncratic volatility (IV) and the stock returns, that is, more volatility would mean less expected returns.

The IV long-short strategy mandates buying the portfolio P1, that of lower volatility stocks, and short-selling the portfolio P5, the one with higher volatility stocks. In our research, we find no pattern or evidence to be analyzed for this anomaly. Two of the P5 portfolios had significant results, but one was positive e the other was negative, indicating that this might be a spurious result. We identify that the calculation of our IV variable may have a fragility, since this was calculated using the Bovespa index, and it is well know that this index is heavily biased toward large companies, making this not highly representative of the local market.

4.5 Asset growth

The asset growth anomaly is represented by the percentage variation in total assets. This strategy mandates buying the portfolio P1, that of lower asset growth, and short-selling the portfolio P5, the one with higher asset growth. In Avramov et al (2013), the authors find evidence of positive returns to this strategy. Again, we do not find evidence of this anomaly-based strategy in the sample used.

4.6 Capex investment

In Avramov *et al* (2013), the authors find evidence of a positive and significant effect of the investment in capex in the expected returns of a company. For that market, this strategy has this impact in the sample of all rated companies and in sub-samples for small companies and lower rated companies. Our evidence is not so. But, there is some indication of the presence of this anomaly when we observe the sub-sample of lower rated companies. This anomaly-based strategy mandates buying the portfolio P1, that of lower capex investments, and short-selling the portfolio P5, the one with higher capex

investments. This P5 portfolio was positive and significant with abnormal returns in the magnitude of 14.2% per month (table 1).

So far, this is our only significant result for the sub-sample of lowest rated companies, this gives indication of the relationship that we intuitively expected to see: firms with the lowest rating with unexplained excess returns.

4.7 Reversal effect

The reversal effect anomaly-based strategy mandates buying the portfolio P1, the one with lower returns, and short selling the portfolio P5, the one with higher returns. We included this anomaly to the research given the previous evidence of its presence in the Brazilian market. We have the work of Costa Jr. (1994), and, Bonomo and Dall'Agnol (2003) that documented this evidence in local market. Similarly to what was documented previously, our research finds strong evidence of the presence of the reversal effect in our market, with four out of six strategies tested presenting positive and statistically significant results. The average accumulated monthly excess returns varied from 1.39% per month (18.02% per year) to 2.20% per month (29.84% per year) (Table 1).

It is important to highlight that to the whole sample (companies with and without rating), we have evidence of the highest average accumulated monthly excess returns: 2.20% per month (29.84% per year), statistically significant at 0.1%. When we reduce the sample to our interest group, only rated companies, we see a reduction in the magnitude of the excess returns of the strategy, but this is still statistically significant at 0.1%. Nevertheless, this reduction in returns makes economic sense, given that when we reduce the sample to only those that have a credit rating, at the same time we reduce the sample to those companies that are on average bigger and the size effect of Banz (1981), tell us that this effect reduce returns with size.

Since we ordered and divided the sample of rated companies in tercile and the literature suggests we analyze the extreme groups, we have a sub-sample of best rated and a sub-sample of worst rated companies which will be analyzed. By doing this, we may be able to identify evidence of the distress risk on the excess returns of the lowest rated companies.

Our results show that the anomaly-based strategy for the reversal effect was equivalent to zero for the best-rated companies sample. And for the worst rated companies, the results were positive and statistically significant, in the magnitude of 2.02% per month (27.12% per year). This gives some evidence that the degradation of credit could have an impact on the risk premium demanded by investors to accept this lowering of credit conditions, observed here by the significant excess return of this sample.

For this anomaly, all P5 portfolios, the ones to be shorted, presented negative and significant returns which varied from 0.92% per month (10.48% per year), for the whole sample, to 3.00% per month (30.62% per year) for small firms with rating. This result makes economic sense, since, for this anomaly, the shorting portfolio is the one with the winner stocks and it is the one we expect to perform poorly in the future. This tendency of the anomaly-based strategy deriving its gains form the short side of the strategy is also seen in the work of Avramov *et al* (2013, p. 147).

Still looking at the short sale side of the strategy, we find clear evidence of the differences between both groups of firms with best and worst ratings and smaller and larger rated firms. For both groups, the P5 portfolios have abnormal returns that are negative and statistically significant. Looking at these, we have another evidence that firms with worst ratings are expected to have higher returns given its deteriorating financial conditions. But, taking into consideration that we are using returns adjusted for risk (size and value), there should not be any excess returns, indicating that the reversal effect still captures an anomaly not capture with the risk-adjusting model used.

4.8 Reversal effect and Momentum effect

From previous works, we can see that the reversal effect and the momentum effect are affected by the formation period and testing period chosen to construct the strategy. We decided to test a few of the

most common strategies used in previous work to verify if the reversal effect persists. De Bondt and Thaler (1985) show the presence of the reversal effect in longer periods, like one to three years, and in Jegadeesh and Titman (1993), we see the presence of the momentum effect in shorter periods, up to six months. Bonomo and Dall'Agnol (2003) show the presence of the reversal effect in the Brazilian market for the period between three and 12 months and find no evidence of the momentum effect for the same periods.

In order to show robustness in our work with the expected behavior in the local market, we test four scenarios, with different formation and testing period, to verify if the momentum effect is present in any of these. These results are presented on Table 2 below.

Table 2 – Portfolio sorts testing reversal effect in different scenarios (*p<0.05, **p<0.01, ***p<0.001)

Sample	Portfolio	3x3	6x6	6x3	12x12
All firms	P1	0.0045	-0.0012	-0.0007	0.0128***
		(-1.52)	(-0.37)	(-0.21)	(-4.3)
	P5	-0.00199	-0.00038	-0.00039	-0.00918***
		(-0.64)	(-0.13)	(-0.13)	(-3.74)
	Strategy	0.0065	-0.0008	-0.0003	0.0220***
		(-1.79)	(-0.25)	(-0.09)	(-6.83)
	n	140	137	137	131

As a robustness check, we ran the tests above, checking for the presence of statistically significant returns in the portfolio sorts for four different scenarios, formation period and testing period varying between three and 12 months. If the P1 (P5) portfolio, the one with the lowest (highest) returns has positive (negative) returns this would indicate the presence of the reversal effect, and if this portfolio has negative returns, we have indication of the momentum effect. As we can see in the table above, the only results that are statistically significant is for the strategy 12/12, formation and testing period of 12 months, and the result shows a portfolio P1 which is positive, a portfolio P5 which is negative and a positive strategy, reinforcing the presence of reversal effect only.

4.9 Cross-sectional regressions of size- and BM-adjusted returns on anomaly variables

As mentioned before, it is desirable that the results of the cross section regressions corroborate with the results of the portfolio sorts. This was not always the case in our research. Some of these results are conflicting with the ones gathered with the portfolio sorts, especially when there is evidence that the short sale side is generating the profit of the strategy. Nevertheless, we were able to find meaningful results. We will discuss the results presented below on Table 3.

The most meaningful result for these regressions can be seen in the second specification. In this specification, we use a dummy variable to indicate firms with rating, looking to capture a difference in expected returns between firms with and without credit rating. The results are expressive; five of six anomaly-based regressions have dummies, which are statistically significant and negative. These negative dummies coefficients indicate that firms with a credit rating have lower expected returns (adjusted) in reference to all firms sample. Corroborating with what was seen in the portfolio sorts, this makes economic sense, since this group (rated firms) is relatively small (approximately 25% of total number of firms) and the firms in this group are mostly large ones.

Table 3 – Cross-sectional regressions of size- and BM-adjusted returns on anomaly variables (*p<0.05, **p<0.01, ***p<0.001.)

	Momentum	SUE	IV	Growth	Investments	Reversal
Specification 1: all firms						
b	0.0004	**0.0020*** **	-0.0080	-0.0042	0.0062	0.0018
t-test	0.07	4.04	-0.08	-1.03	0.89	0.47
constant	0.0003	-0.0002	0.0319	0.0014	0.0034	0.0008
t-test	0.09	-0.07	1.07	0.48	1.25	0.25
N	26427	21892	27829	22442	21199	24603
Specification 2: rated firms						
B	-0.00004	**0.0021*** **	-0.0295	-0.0015	0.0044	0.0017
t-test	-0.01	4.1	-0.26	-0.4	0.6	0.45
d_rated	**-0.010*** **	**-0.0071* **	-0.0560	**-0.0084** **	**-0.009** **	**-0.0073* **
t-test	-2.91	-2.07	-1.32	-2.72	-2.71	-2.13
constant	0.0032	0.0023	0.0504	0.0035	0.0057	0.0030
t-test	0.75	0.57	1.14	1.03	1.77	0.81
N	26427	21892	27829	22442	21199	24603
Specification 3: best-rated firms						
b	**0.0272* **	**0.0033** **	-0.1700	-0.0092	0.0054	0.0106
t-test	2.50	3.10	-1.15	-1.17	1.05	1.50
D_best	-0.0005	-0.0018	-0.0011	-0.0038	-0.0032	-0.0014
t-test	-0.14	-0.41	-0.31	-0.88	-0.74	-0.36
constant	-0.0034	-0.0043	-0.0054	-0.0009	-0.0006	-0.0025
t-test	-0.85	-0.95	-1.36	-0.22	-0.14	-0.66
N	8111	7579	8520	6984	6736	7571
Specification 4: worst-rated firms						
b	**0.0235* **	**0.0031** **	-0.1463	-0.0109	0.0092	0.0082
t-test	2.20	2.95	-1.19	-1.40	1.49	1.22
d_worst	0.0050	0.0050	0.0059	0.0100	0.0118	0.0037
t-test	0.80	0.68	0.96	1.22	1.45	0.60
constant	**-0.0048* **	**-0.0068** **	**-0.0072** **	**-0.0045**	**-0.0040* **	**-0.0040**
t-test	-2.08	-2.65	-2.66	-1.84	-2.04	-1.92
N	8111	7579	8520	6984	6736	7571
Specification 5: all firms before/after 2008 crisis						
b	-0.00002	-0.00001	0.00000	0.00000	0.00003	-0.00006
t-test	-0.2	-1.79	-0.05	-0.85	0.94	-0.88
d_rating	**-0.0169*** **	**-0.0163*** **	-0.1122	**-0.0157*** **	**-0.0162*** **	**-0.0142*** **
t-test	-4.35	-4.15	-1.18	-4.2	-4.27	-3.77
d_crisis	**-0.0185*** **	**-0.0199*** **	-0.1126	**-0.0163*** **	**-0.0168*** **	**-0.0173*** **
t-test	-6.43	-6.68	-1.57	-6.11	-6.12	-6.31
d_rating*crisis	**0.0166** **	**0.0179*** **	0.1117	**0.0162** **	**0.0157** **	**0.0139** **
t-test	3.17	3.55	0.86	3.33	3.19	2.79
constant	**0.0125*** **	**0.0123*** **	**0.1067* **	**0.0115*** **	**0.0129*** **	**0.0119*** **
t-test	6.04	5.2	2.1	5.77	6.27	5.95
N	26427	21892	27829	22442	21199	24603

We can see some summary statistics about this group, rated firms, on Table 4 (below): 88% of observations fall into the category of big firms, represented by the letter B, and the average market value of these big firms is 38 times larger that the average market value of small firms. By the documented size effect, the negative dummies make economic sense here.

Table 4 – All rated firms - size and market value statistics
(*p<0,05, **p<0,01, ***p<0,001.)

Size	# obs.	% of obs.	Market value (average)	Market value (min.)	Market value (max.)
B	6729	88%	19,520,000,000	122,800,000	429,900,000,000
S	932	12%	513,300,000	22,372,300	1,210,000,000
Total	7661				

Analyzing individually each anomaly, for the whole sample of firms, the regressions validate the results of the portfolio sorts for momentum, IV, asset growth and capex investment, with results that are statistically equal to zero. Nevertheless, the regression results go against the results for earnings momentum and reversal effect. It is important to reinstate here that the regressions do not have the differentiation effect between long-short positions and the short sales derived part of the profitability for the strategies.

Once again, validating portfolio sorts' results, the earnings momentum anomaly shows statistically significant results for the specification two, for best rated companies. But, looking at the regression results for IV, asset growth and capex investment, we have corroborating results, reinforcing that these anomalies might not be present in the Brazilian stock market.

For the specification five above (table 3), we used the procedure diff-in-diff. With this we expected to capture statistical difference between expected returns before and after the 2008 crises, rated and not rated companies, and the interaction between both characteristic and time. The result is fairly consistent, where the coefficient of interest, d_rating*crisis, is statistically significant for all anomalies but one. With this procedure, we can tell once again the negative effect of the dummy for rated companies, consistent with specification two, same table. We can also capture a consistent negative and significant effect on returns from 2008 and on. And we can see the presence of a positive and significant effect on expected returns for rated firms after 2008.

4.10 Cross-sectional regressions of adjusted returns – dividing by P1 and P5

Taking into consideration the strong evidence seen on portfolio sorts of the derived profitability from the short sale side of strategy, both in our research and in Avramov et al (2013), we chose to run the cross section regressions on the separate P1 and P5 portfolios, to attempt to pick up on this difference between long and short side. The results from this new specification, is presented below on Table 5, and as we will see, these results approximate better what we saw in the portfolio sorts. Given that now we can observe the short sale side of the strategy, equally as we did on the sorts, this could be a better approximation of the tests done with the sorts.

First, let's observe the results for the reversal effect. As we can see, we have the statistical significance in P1 that we had in the portfolio sorts. The interpretation of the magnitude is different, since the variable measure the return for the previous 12 months (formation period) and the return for the future 12 months (testing period). For all firms sample, P1, the portfolio of lower past returns, has future expected returns of 10% for the next 12 months at 1% statistical significance. For the rated firms sample, P1 maintains positive and significant expected future returns.

Table 5 – Cross-sectional regressions of adjusted returns on anomaly variables – dividing by P1 e P5
(*p<0.05, **p<0.01, ***p<0.001)

	Momentum	SUE	IV	Asset Growth	Investments	Reversal
P1: all firms						
b	**0.116****	0.002	-0.489	-0.072	0.000	**0.100****
t-test	3.35	0.94	-1.92	-1.88	-0.01	3.39
constant	**-0.323*****	-0.005	**-0.007****	-0.007	-0.002	**-0.443*****
t-test	-28.12	-1.14	-3.23	-1.06	-0.27	-27.36
N	3586	4508	5518	2430	2348	2374
R^2	6%	3%	6%	12%	8%	6%
P1: rated firms						
b	**0.112****	0.001	-0.459	-0.071	-0.002	**0.087****
t-test	2.91	0.64	-1.8	-1.85	-0.09	2.66
d_rating	**0.023****	-0.004	0.001	0.002	**-0.012***	0.021
t-test	2.96	-0.72	0.76	0.39	-2.29	1.73
constant	**-0.331*****	-0.006	**-0.007****	-0.007	0.001	**-0.453*****
t-test	-25.90	-1.08	-3.55	-0.92	0.18	-25.27
N	3586	4508	5518	2430	2348	2374
R^2	11%	7%	10%	16%	14%	12%
P5: all firms						
b	**0.174*****	-0.004	0.059	---	---	-0.001
t-test	4.03	-1.65	0.97	---	---	-0.01
constant	**0.447*****	**0.022***	**0.040****	---	---	**0.749*****
t-test	12.19	2.13	3.55	---	---	10.42
N	3431	4410	5280	---	---	2170
R^2	10%	4%	11%	---	---	8%
P5: rated firms						
b	**0.160****	-0.004	0.059	---	---	-0.033
t-test	3.52	-1.58	0.99	---	---	-0.23
d_rating	**-0.132****	**-0.017****	-0.005	---	---	**-0.244****
t-test	-3.27	-2.99	-0.47	---	---	-3.26
constant	**0.481*****	**0.029***	**0.041*****	---	---	**0.803*****
t-test	11.42	2.53	3.59	---	---	10.59
N	3431	4410	5280	---	---	2170
R^2	14%	8%	13%	---	---	12%

Another point to highlight about the reversal effect anomaly is that, for P5, we can see statistical significance for the dummy variable, when we test this specification to asses the different effect of the anomaly on rated firms. To contribute even further to this point, we can also highlight that the rated firms dummy is significant and negative in three out of four anomalies presented, when segregating portfolio P5. This evidence also corroborates with previous results.

We have similar results for momentum as we had for reversal effect. It is important to notice that despite the statistical significance, the signs of the returns are indicating a reversal effect not a momentum effect. For the momentum to be present, the portfolio P1, portfolio of lower past returns, had to be negative, and portfolio P5, portfolio of higher returns should be positive.

As we also had in previous regressions, the constant for several anomalies remain negative and statistically significant, indicating that there is still part of the returns that are not fully explained by the risk adjusted or the anomaly used.

4.11 Joint cross sectional regressions

When all anomalies are tested together in a multivariate cross sectional regression, we notice different results, which is expected. We show these results on Table 6 below.

For specification 1, with all firms, the only anomaly to have statistical significance is earnings momentum, corroborating with the regression seen in Table 3. When we add a dummy variable to capture the effect of rated firms, the same anomaly, earnings momentum, remains with significance, but now capex investments shows statistical significance as well. The rated firms dummy is negative, reaffirming what was seen with the univariate regressions.

When we subdivide the sample in best and worst rated firms, the earnings coefficient retains significance, and corroborates with previous results. The effect of constants statistically different from zero, seen before on the other regressions, dissipates here, indicating that possibly this set of anomalies together are capturing the remained unexplained risk that we had seen on the univariate regressions, or that they proxy for the real variables that cause the risk.

Table 6 – Joint cross sectional regressions with size- and BM- adjusted returns for all anomaly variables
(*p<0.05, **p<0.01, ***p<0.001)

	Momentum	SUE	VI	Growth	Investment	Reversal	Rating d_rated	Rating Best	Rating Worse	Size	constant
Specification 1: full sample											
b	-0.0041	**0.0026*** *	0.0937	-0.0030	**0.0094**	**0.0116**				0.0004	-0.0090
t-test	-0.55	4.78	1.27	-0.46	1.96	1.91				0.43	-0.44
N	18752		R^2	12%							
Specification 2: companies with rating											
b	-0.0032	**0.0025*** *	0.0922	-0.0004	**0.0098***	**0.0104**	**-0.0085***			0.0014	-0.0269
t-test	-0.43	4.71	1.24	-0.07	2.05	1.81	-2.48			1.35	-1.22
N	18752		R^2	13%							
Specification 3: companies with best rating											
b	-0.0028	**0.0031*** *	0.0717	0.0048	0.0022	0.0124		0.0026		-0.0007	0.0071
t-test	-0.21	2.83	0.47	0.6	0.44	1.3		0.83		-0.61	0.29
N	6685		R^2	26%							
Specification 4: companies with worse rating											
b	-0.0070	**0.0031*** *	0.0821	0.0011	0.0067	0.0111			0.0031	0.0003	-0.0125
t-test	-0.51	2.93	0.54	0.15	1.01	1.18			0.42	0.31	-0.6
N	6685		R^2	27%							

5 Conclusion

In this work, we show that there is some evidence that, for a firm with a credit rating, indicating the presence or not of financial distress, has a significant role in predicting abnormal returns. This could be perceived by the presence of significant and negative dummies, used to differentiate the whole

sample of firms and the rated firms. This result was persistent in most of the different tested specifications. The negative effect of this dummy is easily explained by the size effect. The spectrum of companies that have a credit rating in our sample are mostly big firms, which explains the negative coefficients.

The reversal effect anomaly is another point that deserves attention in this work. The tests showed that there is a strong evidence of this effect in the Brazilian stock market, and this is a very important difference between local market and the North-American market, where this anomaly is only identified in the short run. We find evidence of the reversal effect for a formation period of 12 previous months and the testing period for the next 12 months. Given that this is an important result for our market, it is important to highlight that we had evidence of variation between the whole sample and the sample of only rated companies, and between firms of best and worst credit ratings. This last distinction is a crucial information for our main objective. With this information, we can infer that financially distressed firms do have an association with, or tend to have higher excess returns, which a demanded by investor to take the added risk of financial distress.

Results from the reversal effect anomaly show that firms from the best rating tercile do not present abnormal returns, and firms of the worst rating tercile did present abnormal returns. This difference suggests that credit deterioration may have an impact on the premium demanded by investors to bear the added risk.

Although we see some evidence of this credit deterioration relationship with the expected returns, probably the composition of the sample did not aid in making better inferences. The number of rated companies in Brazil is still very small, approximately only a quarter of the total listed companies, and there is a high concentration of ratings in good quality rated companies. This means that the characteristics that we want to test, financial distress, is poorly represented on the universe of Brazilian companies by credit rating. In this market, the evaluations of the agencies are still new, made mostly on demand and by companies in good standing. One suggestion for future work is to use another measure of financial distress.

We used risk adjusted by Fama-French three-factor model. But, when we separate the sample into lower rated firms or smaller firms, we could see that the constant was significant point to the existent of an explained factor not yet captured by the risk adjusted model.

REFERENCES

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006). The cross-section of volatility and expected returns. *The Journal of Finance*, *LXI*(1), 259–299.

Avramov, D., Chordia, T., Jostova, G., & Philipov, A. (2013). Anomalies and financial distress. *Journal of Financial Economics*, *108*(1), 139–159. doi:10.1016/j.jfineco.2012.10.005

Banz, R. (1981). The relationship between return and market value of common stock. *Journal of Financial Economics*, *9*(1), 3–18.

Black, F., Jensen, M. C., & Scholes, M. S. (1972). *The capital asset pricing model: Some empirical tests*. (M. C. Jensen, Ed.)*Studies in the Theory of Capital Markets*. Praeger Publishers Inc.

Bonomo, M. A. C., & Dall'Agnol, I. (2003). Retornos anormais e estratégias contrárias. *Revista Brasileira de Finanças*, *1*(2), 165–215.

Campbell, J. Y., Hilscher, J., & Szilagyi, J. (2008). In search of distress risk. *The Journal of Finance*, *63*(6), 2899–2939.

Chague, F. D. (2007). *The CAPM and Fama-French models in Brazil: a comparative study*. *Economia*. Fundação Getulio Vargas.

Chan, K. C., & Chen, N.-F. (1991). Structural and return characteristics of small and large Firms. *The Journal of Finance*, *46*(4), 1467–1484.

Costa Jr., N. C. A. (1994). Overreaction in the Brazilian stock market. *Journal of Banking and Finance*, *18*, 633–642.

De Bondt, W. F. M., & Thaler, R. (1985). Does the stock market overreact? *The Journal of Finance*, *40*(3), 793–805.

Dichev, I. D., & Piotroski, J. D. (2001). The long-run stock returns following bond ratings changes. *The Journal of Finance*, *56*(1), 173–203.

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, *47*(2), 427–465.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56. doi:10.1016/0304-405X(93)90023-5

Fama, E. F., & French, K. R. (2008). Dissecting anomalies. *The Journal of Finance*, *63*(4), 1653–1678.

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: empirical tests. *Journal of Political Economy*, *81*(3), 607–636.

Hand, J. R. M., Holthausen, R. W., & Leftwich, R. W. (1992). The effect of bond rating agency announcements on bond and stock prices. *The Journal of Finance*, *47*(2), 733–752.

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.

Lakonishok, J., & Shapiro, A. C. (1986). Systematic risk, total risk, and size as determinants of stock market returns. *Journal of Banking and Finance*, *10*, 115–132.

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.

Lucena, P., & Pinto, A. C. F. (2008). Anomalias no mercado de ações brasileiro: uma modificação no modelo de Fama e French. *RAC-Eletrônica*, *2*(3), 509–530. Retrieved from http://www.anpad.org.br/rac-e

Reinganum, M. R. (1981). A new empirical perspective on the CAPM. *The Journal of Financial and Quantitative Analysis*, *16*(4), 439–462.

Rogers, P., & Securato, J. R. (2009). Estudo comparativo no mercado brasileiro do Capital Asset Pricing Model (CAPM), modelo 3-fatores de Fama e French e reward beta approach. *RAC-Eletrônica*, *3*(1), 159–179. Retrieved from http://www.anpad.org.br/rac-e

Securato, J. R., & Málaga, F. K. (2004). Aplicação do modelo de três fatores de Fama e French no mercado acionário brasileiro – um estudo empírico do período 1995-2003. In *28o ENANPAD* (pp. 1–16). Curitiba.

Sharpe, W. F. (1964). Capital asset prices: a theory of market equilibrium under conditions of risk. *The Journal of Finance*, *19*(3), 425–442.

Titman, S., Wei, K. C. J., & Xie, F. (2004). Capital investments and stock returns. *The Journal of Financial and Quantitative Analysis*, *39*(4), 677–700.