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ABSTRACT

Although previous results are mixed, most research indicates that companies adjust their capital structure after the occurrence of a credit-rating downgrade. Specifically, firms adjust their debt-to-asset ratio downward and typically within a period of three years following the downgrade. However, the research typically has not included downgraded companies from less developed countries. We re-examine the impact of credit-rating downgrade on capital structure using five sub-samples of companies from Russia, Brazil, Spain, Germany, and the US. We control for size and liquidity of company and, in the case of Russian companies, for the presence of government ownership. For ratings downgrades occurring since the turn-of-the-century, we find few differences and scant significance of differences in magnitude or speed of adjustment between these countries. We find modest evidence of an increase in the speed of adjustment for downgrades subsequent to the fall of Lehman Brothers, but only for companies outside the US. We attribute our results, first of all, to the paucity of reported credit ratings in less developed countries, as well as the restrictions placed on downgraded firms by credit markets in general.
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SECTION I. INTRODUCTION

The credit–rating industry has developed and evolved over a long period of time. From its beginning in 1859, the number of functions performed by credit agencies was quite limited, but step by step the amount has increased significantly and as a result credit agencies now play a significant role – although not without controversy – in financial markets.

Nowadays companies understand that maintaining or improving the credit rating has significant consequences for the attraction of new investors, obtaining particular sources of financing, as well as bringing other forms of benefits (Kisgen, 2007). In addition, many institutional investors face restrictions against investing in firms which do not have an acceptable credit rating, and thus stock market liquidity can be impacted.

Research from 392 Americans firms (listed and non-listed) demonstrated the significance of credit ratings for CFOs while they determine financial decisions about debt in their capital structure (Graham and Harvey, 2001). The picture is similar in Europe – a study of 87 CFOs (Bancel and Mitto, 2004) showed their significant concern about credit ratings during their capital structure decisions. Both papers (Graham and Harvey; Bancel and Mitto) highlight the importance of credit ratings for CFOs when they make capital structure decisions.

Kisgen was the first who checked the dependence between credit rating and capital structure (CR-CS), in 2006. He tested the CR-CS hypothesis concerning the influence of credit–rating changes on capital structure adjustment. The research showed that firms near credit rating changes usually make debt-to-equity adjustment measures for preventing (for negative notch companies) or reinforcing (for positive notch firms) changes. Downgraded firms usually act as companies near credit rating change and take some adjustment actions for rating’s rehabilitation. In contrast, upgraded companies do not have to adjust debt-to-equity ratio but they often chose to do so.
In the next paper, in 2009, Kisgen looked deeper into the relationship between credit rating and capital structure and demonstrated exactly how firms adjust capital structure – reduce debt/equity, issue debt/equity according to downgrade or upgrade situation.

Later researchers (e.g., Rauh, Sufi) investigated this topic from the perspective of “fallen angels” – companies which have been downgraded below investment line (i.e., speculative grade). These firms appear to enthusiastically endeavor to adjust capital structure, much more so than recently downgraded firms which are still within investment grade.

All studies demonstrated the strong influence of capital rating on capital-structure decisions. The next question related to this is, how quickly do firms make these capital structure adjustments? Usually firms make approximately one-third of the necessary target capital structure adjustment per year (Flannery and Rangan, 2006). In the present research, we look into the issues of speed of and adjustments to capital structure from the perspective of firms from different countries.

This research supports the idea of Kisgen’s CR-CS hypothesis and is directed to firms’ comparison between several countries – Russia, Spain, Brazil, Germany and US. We imply that firms will make adjustment measures with the purpose of improving their credit rating within 36 months after downgrade. Moreover, the main assumption is the firms from developed countries (US and Germany) will be quicker than companies from developing countries (Brazil and Russia) or countries with economic crisis (e.g., Spain) in adjustment speed and magnitude of adjustment. There are some probable explanations for this assumption.

First, America and Germany have more stable financial markets that have evolved significantly over many years. As a result of this – and somewhat independent of credit rating – American and German firms have a better access to capital. In contrast, Russia appeared as a separate country and economy in 1991 (after the USSR’s breakdown). The capital market
more or less stabilized at the beginning of 2000 and it still can be considered as developing, on a par with Brazil. Spain has had a weak and unstable economy for several years. Thus American and German companies can attract capital or find new ways for investment easier than companies in Russia, Brazil, or Spain so it will lead to quicker changes in capital structure.

Second, the Russian government has a state ownership in some companies and for that reason those firms may not worry about credit ratings (they sense that they can always receive money or support from the government). In this case adjustment of capital structure will be very slow and perhaps incomplete.

The related data is downloaded from Bloomberg and includes information on approximately 143 listed companies in all samples from five countries in total. We will look deeper into companies’ behavior after downgrade and see how quickly they adjust capital structure as a result of the downgrade. In addition to downgrades, we will test for comparison the influence of variables such as size, liquidity, government ownership on capital structure adjustment and time of downgrade.

The remainder of this paper is organized as follows. Section II presents the literature review. Section III describes our hypotheses, the data and our empirical methodology. The empirical results are reported and discussed in section IV. Section V concludes.
SECTION II. LITERATURE REVIEW

2.1 History and Overview of Credit Rating

The credit-rating industry has a rich history since the first credit agency’s establishment in 1859. The most famous American credit rating agencies – Moody’s, S&P, and Fitch – were established in 1909, 1923 and 1922 respectively, and continue to exist. All three agencies received Security and Exchange Commission (SEC) designation in 1975.

In the beginning, credit-rating agencies had only one responsibility – to rate the long-term bonds issued by US corporations. But the world tendency in capital flows has moved from the banking sector to capital markets (Canton and Packer, 1994). As a result of this, credit ratings have to expand abroad and make wider evaluations (not just rating bonds). Credit ratings are currently used in both developed and emerging markets (Dale and Thomas, 1991). Credit agencies also provide ratings of municipal bonds, asset-backed securities, medium-term note programs, preferred stocks, shelf registrations, private placements, bank certificates of deposit, commercial paper programs and other debt instruments (Cantor and Packer, 1994).

Gradually ratings have come into usual business life and have become a type of signaling of a company’s financial “health.” Moreover, companies which maintain a specific credit rating can receive particular benefits. To be precise it is “the opportunity to issue commercial paper, access to investors otherwise restricted from investing in the company’s bonds, reduced investor capital reserve requirements, lower disclosure requirements, improved third-party relationships, and access to interest rate swaps or Eurobond markets” (Kisgen, 2007).

Access to the commercial paper (CP) market is very important for companies because it is one of the main sources of financing for certain firms. CP has its own credit ratings,
based on which investors make decisions about whether to invest in specific firms. There are three main categories of ratings for CP – A1, A2, and A3 by S&P or accordingly P1, P2, and P3 by Moody’s. The majority of potential investors are restricted in investing. For example “money market funds cannot hold more than 5% of their assets in A2 or P2 because of SEC requirements (in Rule 2a-7), nor can they invest exclusively in A1 or P1-rated CP.” (Kisgen, 2007).

Investors are also restricted with regard to investing in firms with lower-rated bonds. This practice began in 1936 when the US Treasury department adopted a rule which prohibited banks from investing money in speculative (later referred to as “junk”) bonds. In 1951, the National Association of Insurance Commissioners (NAIC) opened a special subdivision for controlling investments made by insurance companies. Subsequent to this, insurance firms could own only “investment grade bonds.” In 1975, the SEC created a special requirement for broker-dealers, which determined the percentage reduction in the value of their bonds according to credit ratings with the idea of using this information in calculating their capital requirements. In 1940, the Investment Company Act made a limitation for mutual funds for investments in bonds with ratings lower than A+. The Eurobond and Asset Backed Securities market offers permissions to access markets only to firms possessing specific minimum credit ratings (Kisgen, 2007).

In addition to restrictions on investing money by investors (i.e., implemented as a decrease in financing for companies), firms with lower credit ratings face problems with less liquidity. As a result, firms have to pay higher interest rates on debt whether or not their default risk is actually greater. We would like to highlight that credit rating is based on a large variety of different factors such as diversification/portfolio effect, financial policy,
liquidity, management governance, capital structure, country risk, industry risk, et cetera.¹

For that reason, the situation is possible where two firms have the same default risk, but one company has better rating as a result of high diversification and positive financial policy. This is the situation where companies with worse credit ratings have to pay more in interest than a firm with a better rating, despite similar risk.

An additional reason as to why companies care about credit ratings is ratings triggers (Kisgen, 2007). In the case of a rating downgrade, firms may face extra costs, for example an increase in bond rate, loss of contracts, or required repurchase of bonds. As experience (Enron, Tyco, Aquila Inc.) demonstrates, not all organizations have coped effectively with these problems.

Credit ratings can have a material influence on the relationship with third parties such as managers and employees, suppliers, financial counterparties or customers of the firm (Kisgen, 2007). Employees might not be inspired to work for companies with lower grades. Suppliers may not sign long-term contracts with firms with credit rating below certain levels.

As a result of all reasons mentioned above, firms have begun to pay more attention to credit ratings. According to a survey of 392 CFOs of listed and non-listed American companies by Graham and Harvey (2001), credit rating is the second highest concern for CFOs when determining their capital structure. Specifically, their survey results showed that credit ratings and financial flexibility are extremely important criteria for financing choices related to debt. At the same time, equity capital structure decisions are determined by market timing and earnings per share dilution.

Similar research was provided by Bancel and Mittoo (2004) across sixteen European countries and encompassing 87 CFOs of listed firms. The results demonstrate the same

¹ According to Standard and Poor’s website: http://www.standardandpoors.com/prot/ratings/articles/en/us?articleType=HTML&assetID=1245367512383
evidence as Graham and Harvey (2001) – credit ratings and financial flexibility play a strong role in determining capital structure decisions with regard to debt. In contradiction to Graham and Harvey (2001), however, Bancel and Mittoo (2004) found that all decisions related to equity are determined by a target debt-to-equity ratio and earnings per share dilution.

More recently, Brounen, de Jong and Koedijk (2006) surveyed 313 CFOs of listed and non-listed companies in four countries (France, Netherlands, United Kingdom and Germany). This research, as with the two previously mentioned papers, highlights CFOs’ concerns about credit ratings. The results suggest that listed companies are more concerned about credit ratings than non-listed companies, and that geography does not play a role – at least between the US and Europe. This evidence gives us an opportunity to hypothesize that:

\( H_{01} \): Russian CFOs will have similar concern about credit ratings, on par with other countries, as displayed in their speed of balance-sheet adjustment.

The restrictions and requirements related to credit ratings push firms and their CFOs to increase their concern about ratings. Consequently, companies try to improve their credit rating or prevent possible downgrades. But downgrades still happen. As a result, we can reasonably expect:

\( H_{02} \): companies which have experienced a reduction in credit rating will subsequently exhibit a strengthened Debt-to-Asset ratio.

2.2 Research about Credit Rating and Capital Structure

Several studies have been conducted concerning the impact of credit rating on capital structure decisions. One of the first papers on this topic was published by Kisgen in 2006. This research presented the credit rating-capital structure (or CR-CS) hypothesis, which implies that companies will take purposeful actions to adjust their capital structure after credit-rating downgrades or when organizations are near credit-
rating changes (with a negative or positive notch value2). Adjusting capital structure refers to adjusting the debt-to-equity ratio, which refers to issuance or reduction of net equity and net debt. It is an important fact that companies do not have to provide adjustment of capital structure after credit rating upgrades.

Moreover, Kisgen’s work (2006) is focused on a comparison of companies’ capital-structure behavior when the company is near or not near the rating change. According to their results, firms with a credit rating designated with a plus or minus (near rating change) issue less debt relative to equity than companies that are not near a plus or minus rating.

A few years later, Kisgen revisited this topic but from another point of view – how changes occurred in leverage behavior after rating changes. Kisgen (2009) indicates a significant relationship between changes in rating and subsequent leverage decisions, specifically changing the adjustment behavior for downgraded or upgraded companies. Downgraded firms are more likely to reduce debt and less likely to issue debt, and less likely to reduce equity, compared to non-downgraded firms. Simultaneously, upgraded firms are more likely to issue debt and more likely to reduce equity than non-upgraded firms. The conclusion about downgraded firms was confirmed in Drobetz and Heller (2014).

Drobetz and Heller (2014) researched the impact on capital structure of companies in US and Germany (divided into listed and non-listed firms) of changes in credit ratings. In the sample of US firms, credit-rating upgrades did not display significant impact on capital-structure decisions of publicly-listed firms. The influence is much stronger for downgraded companies, especially when downgraded to speculative level (i.e., not within investment-grade level). German publicly-listed firms displayed a tendency to increase net debt relative to net equity issuance in the case of downgrade. In contrast, German non-listed companies with high ratings at the investment-grade level are not sensitive to changes of

2 By positive and negative notch value Kisgen (2006) means a rating within one level (for example BB) either a "+" or a "-" sign (BB- or BB+).
creditworthiness. Companies at the non-investment grade level react on downgrade as well as upgrade.

An additional test about capital structure behavior before and after downgrades for “fallen angels” was made by Rauh and Sufi (2010). They took 140 “fallen angels” – firms that were downgraded by Moody’s from investment grade to speculative between 1994 and 2006. The research implies existence of different types, sources and priorities of debt (i.e., bank debt, straight-bond debt, convertible-bond debt, program debt, mortgage debt and other debts). In general there are no economically significant changes in debt to equity structure from two years before to the year before the downgrade. However, changes become very evident from one year before downgrade to the one year after. During this period “fallen angel” firms incur a steep increase in subordinated and secured debt, to the point that 16% of their capital is refinanced into these two kinds of debt (9% and 7% respectively). At the same time, senior unsecured debt decreases by 23% of total debt and 7.4% of total capital – from one year before downgrade to two years after. Those figures might be considered as evidence of the relevance of the CR-CS hypothesis – companies try to eliminate unsecured debt after downgrades with the purpose of improving their credit rating.

Kisgen (2012) looked one more time at the CR-CS hypothesis through evidence from Moody’s ratings adjustment in his latest research. He discovered a strong relationship between changes in Moody’s ratings and firms’ adjustment (debt decisions) of capital structure. In the case of Moody’s increasing a company’s rating, firms are less likely to issue debt and more likely to pay down debt during following year (the same evidence was found for all companies by Kisgen, 2009). A company usually decreases net debt issuance by 0.6% the next year after 1% increase of Moody’s rating for companies close to the investment-grade border.
Kisgen (2009) suggests that capital structure decisions are more affected by a firm’s credit rating, if the company was downgraded the previous year, than by changes in profitability, bankruptcy probability, leverage or z-score. However, not everyone agrees with this statement. For example, Kemper and Rao (2013) provided evidence that marginal behavior related to the CR-CS model is not systematically associated with a company’s current rating, with the exception of “B”-rated firms. That means marginal financing behavior for a company is generally not dictated by rating’s maintenance despite the current company’s rating. Kemper and Rao (2013) also found that all companies in different rating groups (except “B”-rated) reduce debt financing when faced with a potential threat of losing rating.

2.3. Speed of Adjustment

As all relevant research (Kisgen, 2006, 2009, 2012; Rauh and Sufi, 2010) has demonstrated, companies which are impacted by credit-rating changes alter their behavior after upgrades or downgrades by adjusting their capital structure. Further, the speed of adjustment implies the rapidity with which a company provides adjustment for their current debt ratio to the target debt ratio (to eliminate deviation from a target ratio).

Flannery and Rangan (2006) researched the speed of adjustment behavior on the way to a target-capital structure. They demonstrated the existence of a target-capital structure and also demonstrated that the typical company achieves approximately one-third of the necessary adjustment each year toward the target leverage ratio. More recently, Kisgen (2009) found a similar adjustment speed. In his work, Kisgen showed the existence of a minimum target credit rating, through splitting firms into several categories (upgraded, downgraded and without change). His research highlighted the fact that downgraded
companies have much quicker speed of capital-structure adjustment than companies which are upgraded or without change.

In contrast to Kisgen (2009), Drobetz and Heller (2014) show the opposite results – downgraded firms have a lower speed of adjustment than upgraded companies. Their work admits easier access to external financing for upgraded organizations as a result of this stable financial performance, which allows companies to redeem outstanding debt. Their research further suggests that the gap between actual and target leverage ratio can be easily overcome for many companies. At the same time, downgraded companies do not have a wide access to external financing for redeeming debt as a result of low credit ratings. They face more restrictions, which is why the speed of adjustment is much lower than for upgraded firms.

Byoun (2008) divided all companies into two categories: with and without an outstanding credit rating. The results indicate the positive impact of credit rating on adjustment spend for above-target debt firms. However, the impact also demonstrates a higher cost of maintaining the current debt level and/or smaller cost of reducing debt in case of comparison with non-rated companies.
SECTION III. HYPOTHESES, DATA AND EMPIRICAL METHODOLOGY

3.1 Hypotheses

In this research, we test the impact of credit-rating changes on a company’s capital structure and the consequences of it. Based on previous research, we suggest that companies after experiencing a downgrade will take action with the purpose of improving their credit rating within 36 months after rating decline. We selected the 36-month interval as a result of Flannery and Rangan (2006). Their research gave a result that the typical company requires approximately one year for one-third of the necessary adjustment toward the target leverage ratio. Our paper will observe and compare firms from five countries – the Russian Federation, Spain, Brazil, Germany and the United States.

Our a priori belief is that countries with more developed economies (America, Germany) will demonstrate more rapid speed and magnitude of adjustment than developing countries (Russia, Brazil) or countries with economic crises (Spain).

Several reasons can explain this belief. First of all, there could be better access to capital markets for companies in countries with more developed economies. It is an obvious fact that financial markets are more developed and established in the US and Germany than in Russia, Brazil or Spain. For instance, in the Russian Federation financial markets did not appear at all until after the USSR’s breakdown. The stability of financial markets in Russia more or less appeared at the beginning of 2000. Brazil is still developing their economy and Spain has not yet recovered from the economic crisis in 2008; the economy exhibits stagnation. Another possible reason is that, in the case of downgrade, American and German companies can more easily find new sources of investment and methods of financing which may result in quicker adjustment of capital structure.
Another reason can be the size of the companies. The larger companies can make a larger effort in terms of magnitude and speed of adjusting the capital than small firms as a result of larger amounts of available resources of financing. For example a larger firm can reduce one item of expense and save money for capital structure adjustment without experiencing any troubles for final production. At the same time a small company cannot do the same without damaging their production output. In this case, an internal method of financing is available for large companies but not for the small ones. This suggests small firms take their time for researching alternatives to internal financing and their capital-structure adjustment requires more time.

One more reason can be the time of downgrade – before or after the beginning of financial crisis in 2008. It is possible that crisis affected on the magnitude and speed of capital structure’s adjustment.

The final reason why American, German, Brazilian and Spanish firms might have a more rapid improvement in their downgraded capital structure than Russian firms is the appearance of state ownership in some Russian companies. As a result of the government’s support, companies are not as concerned about downgrades in credit ratings because they have certainty that, when necessary, they will receive financing or required support from the Russian government. The government ownership can have an effect on the speed and magnitude of capital structure adjustment.

3.2. Data Sources/ Description

Our data is taken from the Bloomberg database. The observed dates cover the period from 1997 until the present (2014), quarterly. The rationale for this specific period is primarily because of Russia, which had a very weak economy after the break-up of the USSR in 1991. Step-by-step, the Russian economy gained momentum and by the beginning of new century it had achieved a new level, where firms actually made
decisions about business expansion and the attraction of new investments. Since that period of time, companies have actively started to provide IPOs. As a result of this, all samples have to cover the same period of time.

The American sample of companies includes 52 publicly-traded firms. The German sample of companies includes 30 publicly-traded firms. The Brazilian sample of companies includes 27 publicly-traded firms. The Spanish sample of companies includes 20 publicly-traded firms. The Russian sample is the smallest and includes only 14 companies.\(^3\) However Russian selection involves not only publicly-traded companies but also listed firms with some government ownership. Unfortunately we cannot include in the sample non-listed companies from all countries because there is no access to their financial information and consequently no existence of credit ratings. This would especially be true for firms in Russia. Information about the companies’ credit ratings will be obtained from the Bloomberg database, where access exists to Moody’s, Standard & Poor’s, and Fitch ratings. For each firm in the sample, information is provided about changes in ratings since the first appearance of the firm on the market (i.e., subsequent to IPO).

All samples of companies have faced a downgrade in ratings during the period 1999 – 2011. All downgraded companies are randomly selected. We referred to lists of companies under national ownership\(^4\) from the Internet, from which firms were randomly selected and then a determination was made as to the availability of the rating, downgrade and availability of financial data.

\(^3\) The small size of the Russian sample is explained by the lack of firms which have credit ratings and also experienced a downgrade by credit-rating agencies. This constraint on availability of ratings information also impacts the Spanish and Brazilian samples but to a lesser extent.

\(^4\) [http://companylist.org/Russia/](http://companylist.org/Russia/)
[http://companylist.org/Spain/](http://companylist.org/Spain/)
[http://companylist.org/Brazil/](http://companylist.org/Brazil/)
[http://companylist.org/United_States/](http://companylist.org/United_States/)
[http://companylist.org/Germany/](http://companylist.org/Germany/)
Summing up the selection process: we take a randomly-selected number of companies for each sample (52 for US, 30 for Germany, 27 for Brazil, 20 for Spain and 14 for Russia), which are publicly traded and which experienced a rating downgrade during 1999-2011. In addition, in the case of the Russian sample, firms may have a specified percentage of government ownership.

According to our hypothesis, we expect companies to adjust favorably their capital structures within the next 36 months following downgrade. No public information exists on the Moody's, S&P or Fitch websites about specific aspects of capital structure necessary to achieve the certain rating.

We understand that the rationale for the company’s credit rating is not based entirely on capital structure; it also includes other modifiers. According to the Standard & Poor’s website, there are a number of factors that affect credit ratings, such as diversification/portfolio effect, financial policy, liquidity, management governance, capital structure, country risk, industry risk, et cetera. All of these variables can equally affect a firm’s credit rating, but for purposes of this research we will focus only on capital structure as the determinant of a credit rating.

The determining factor of having better access to the capital markets will be assessed by companies’ liquidity. The higher the liquidity, the higher will be assumed to be the access to capital markets and the greater the opportunity to attract new investment in case of problems. In this case, the liquidity ratio will be calculated as total number of shares traded daily divided by number of shares outstanding in the stock.

The determining factor of a company’s size will be its total revenues by the moment of downgrade.

5 http://www.standardandpoors.com/prot/ratings/articles/en/us?articleType=HTML&assetID=1245367512383
3.3. Methodology

There are several variables which can impact the speed of capital-structure adjustment in our regression: firms’ liquidity, firm’s size, firm’s domicile, government ownership and time of downgrade. By time of downgrade, we compare the date of downgrade to September 15, 2008 – the date of Lehman Brothers’ demise – to determine whether the environment has changed regarding adjustments in capital structure. For the determination of domicile and time of downgrade, we will utilize dummy variables in the regression analysis.

In general, the multiple-regression model can be represented as:

\[ DA_{(i,t+n)} = \beta_0 + \beta_1 \text{Revenue}_{(i,t)} + \beta_2 \text{Liquidity}_{(i,t)} + \beta_3 \text{TimeofDowngrade}_{(i,t)} + \beta_4 \text{Domicile}_{(i,t)} + \beta_5 \text{PartialOwnership}_{(i,t)} + e_{(i,t)}, \]

where \( DA_{(i,t+n)} \) = ratio which demonstrates a trend in capital structure changes from the moment of downgrade and is calculated as D/A ratio at the moment of downgrade minus D/A ratio in N-years after downgrade. In our regressions, we will see D/A ratio changes in one, two and three years after downgrade;

Revenue = a company’s revenue per quarter, as of the time of downgrade;

Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;

Time of downgrade = a dummy variable which compares the date of downgrade to the perceived onset of the Great Recession; i.e., September, 15 2008, the day of the Lehman Brothers bankruptcy. If a company’s downgrade occurred in the fourth quarter of 2008 (inclusively) or later, this value equals 1; if a firm’s downgrade happened before, this value equals 0.

Domicile = a dummy variable for companies from different countries;
Partial Ownership = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. A value of 1.00 means a firm with 100% government ownership and 0 for firms with no government ownership;

\( e = \text{error term}; \)

\( i = \text{firm subscript}; \)

\( t = \text{time subscript}. \)
SECTION IV. RESULTS

Table 1 contains the descriptive statistics of variables. Note that the mean values for the D/A ratio are increasing, on average, by 0.57% in the one year after downgrade, then D/A ratio is also increasing, on average, by 0.38% in the two years subsequent to downgrade compared with the capital structure at the moment of downgrade. However the situation changes in three years after downgrade: D/A ratio is decreasing, on average, by 0.34% compared with the D/A ratio at the moment of downgrade. We would like to highlight that, for the D/A ratios two or three years subsequent to downgrade, we are referring to cumulative changes in D/A ratio. The mean Revenue at the moment of downgrade is 5941.99 million dollars, suggesting that, on average, our samples are dealing with companies that might be classified as mid-capitalization. The mean Liquidity at the moment of downgrade is 0.009, indicating that 0.9% of shares outstanding trade in a typical day.

Moreover we calculated the average changes in D/A ratio by countries after one, two and three years after downgrade. Table 2 displays the results of these D/A averages. Russian companies increase, on average, their D/A ratio in one year after downgrade, but then gradually decrease it and in three years we can see the best improvement of capital structure compared to other countries. At the same time, Spanish companies display the opposite situation: in one year, on average, firms decrease the D/A ratio by 0.36%, but then D/A ratio increases by 2.87% compared to D/A at the moment of downgrade. The change in capital structure is less predictable for downgraded companies in Germany: D/A ratio increases, on average, by 1.13% in one year, then it decreases, on average, by 0.54% in two years after downgrade, and at the end of third year after downgrade German firms decrease debt in their capital structure, on average, by 0.7%. Brazilian companies in one year after downgrade, on

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6 As indicated by the average ratio of Price-to-Sales for the S&P 500, as of September 2014, of 1.79 (http://www.multpl.com/s-p-500-price-to-sales). We assume that non-US companies may have a slightly smaller ratio. While this ratio is not constant over time, it is moderately stable.
average, decrease D/A ratio, then slightly (0.1%) increase debt in the capital structure, but finally in three years after downgrade we can see the average improvement of 0.7% compared to the moment of downgrade. In one year after downgrade US firms increase the D/A ratio, on average, by 1.15%, in two years the tendency to increase continues but by a smaller amount (0.3%), however in three years we can see a large average D/A improvement by 1.5% (the second observation of capital structure improvement after the Russian results).

Additionally, we provided the tests for differences in means between all variations of the D/A variables which were mentioned in Table 2. For each country we compared the means and checked significance between the average D/A ratio changes in one year after downgrade and the average D/A ratio changes in two years after downgrade, then between the average D/A ratio changes in two years after downgrade and the average D/A ratio changes in three years after downgrade. There are 10 tests in total and none of the tests demonstrated significance. We then made a series of tests with the purpose of checking the significance between different countries (by pairs) within each period after downgrade – within 1, 2 and 3 years after downgrade. There are 30 tests in total and, again, none of the tests showed significance.

Before discussing the regression results, we recognize that the F-statistic for each regression is higher than what is traditionally deemed to be desirable. However, as it appears that some researchers consider it difficult to select a specific level which separates real effects from the appearance of such effects, we will continue to report the regression results in hopes of further understanding the relationship between credit-rating downgrades and subsequent adjustment of D/A ratios.

Table 3 includes the full results for the first regression, which includes all countries and all variables and determines D/A ratio changes in one year after downgrade. Only one independent variable from this regression exhibits significant results, specifically the “After
09152008” variable. This dummy variable suggests that: if downgrade happened after the beginning of the crisis, the D/A ratio will change (i.e., decrease) by 0.01% more than the D/A ratio of firms which have been downgraded before the crisis. However, we also note that the F-statistic for this regression is 0.40, which suggests that the results of the equation are not reliable.

To test whether the insignificant F-statistic was a function of a specific subset of countries, we separated the dataset into two sub-samples and repeated the regression analysis. Table 4 includes the regression results for the sub-sample of non-US countries – Russia, Spain, Brazil and Germany. Table 5 includes the regression results only for the US sub-sample. As we can see from these tables (4 and 5), the only variable that was previously showing significance (After 09152008) has now lost the significance. However, it is important to note that, similar to the results in Table 3, the F-statistic for the regressions in Tables 4 and 5 are 0.53 and 0.96 respectively, and cannot be considered as reliable.

The next regression involves all countries, all variables and determines D/A ratio changes in two years after downgrade and are displayed in the Table 6. Again we can see the significance on the “After 09152008” variable. If the downgrade happened after the beginning of the crisis, the D/A ratio will change (i.e., decrease) by 0.009% more than the D/A ratio of firms which have been downgraded before the crisis. The F-statistic for this regression is 0.19, and thus the regression results may not be reliable. Once again, we divided our regression into two sub-samples. Table 7 shows the regression of non-US countries and Table 8 demonstrates the result for US firms. Both tables display no significance for any variables. The F-statistic for both regressions from Tables 7 and 8 is 0.76 and 0.19 respectively, thus they cannot be considered as reliable.

The last set of regression results is similar to the previous ones, but demonstrates D/A changes in three years after downgrade: one regression for all countries (Table 9), one for
non-US countries (Table 10) and one for the US (Table 11). No variables display significant results (At the same time F-statistics are not trustworthy, at 0.44, 0.72 and 0.31, respectively).
SECTION V. CONCLUSIONS.

This paper examines the behavior of companies’ capital structures after a credit-rating downgrade and the consequences of it for five different countries (Russia, Spain, Brazil, Germany and USA). Our *a priori* belief was that developed countries such as Germany and the USA will make adjustments in capital structure quicker and in larger magnitude than developing countries (Russia, Brazil) or countries with economic difficulties (Spain). Contrary to our hypothesis, the level of country’s economic development does not play a role in speed of capital structure adjustment.

We run several regressions for all countries and in two cases out of three, we find significance for only one variable. Specifically, it is the time of downgrade variable. If firms have been downgraded after the beginning of the crisis (September 15, 2008), they adjust (i.e., improve) their capital structure by an incrementally larger amount, compared to downgrades occurring prior to the crisis. As a matter of observation, the adjustment of D/A subsequent to downgrade is so small that, despite its statistical significance, the time of downgrade does not appear to indicate economic significance.

While our regression results are disappointing for the impact of the independent variables, the results are equally disappointing in F-statistics. All nine regressions demonstrate non-reliable results. We attribute this lack of reliability, or stated differently, lack of model fit, to the surprising result that many firms increase their D/A ratio subsequent to downgrade, and sometimes by a sizable magnitude. Note the range of values for our D/A ratios, whether observed in year 1, 2, or 3. We hypothesize that the positive changes in D/A ratio are being cancelled out by the negative changes. Accordingly, we alter our view that D/A ratio may be the most important factor in attempting to recover from a downgraded
credit rating. Our results are in opposition to Flannery and Rangan (2006), who find a significant reduction in the D/A ratio in the three years subsequent to downgrade.

Additionally, with the purpose of better understanding of changes in D/A ratio, we made a separation by countries and calculated the average changes in one, two and three years after downgrade. Surprisingly, Russia demonstrated the largest average decrease of D/A ratio in the three years after downgrade, ahead of the adjustment by US firms, in percentage terms. In contrast to a decrease of debt in the capital structure, Spain demonstrated an increase in the D/A ratio, on average, by 2.89% in the three years after downgrade.

Our results suggest that downgraded firms do not decrease significantly their D/A ratio in the three years following downgrade. Our rationale for this result is similar to that of Drobetz and Heller (2014), who concluded that downgraded firms have slower capital-structure adjustments due to the additional restrictions which these companies face. By restrictions they refer to limitations on a wide access to external financing for redeeming debt as a result of low credit ratings. The results in both papers are similar, and this explanation seems the most plausible.

This paper demonstrates the lack of influence of several factors on capital structure adjustment after downgrade. Specifically, we observe little improvement in D/A ratio, unpredictable changes in D/A ratios between developed and less developed countries, no impact from size of firm (at least for the sizes of firms appearing in our sample), and no influence based on partial government ownership. We speculate that the results are due to the small amount of companies for each country in the non-US sample, as well as credit-market restrictions faced by downgraded firms. Unfortunately credit-rating agencies do not provide a rating for a large amount of companies except for companies from more developed countries such as the US. For future research it may be necessary to wait a sufficient length of time
until credit ratings receive wider use in merging or less developed countries. When this occurs, samples may be of sufficient size to lead to new results of the same test.
REFERENCES


APPENDICES

Table 1. Descriptive Statistics of Variables

<table>
<thead>
<tr>
<th></th>
<th>DA_downgrade_DA_1 year after</th>
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<th>DA_downgrade_DA_3 years after</th>
<th>Rev_downgrade</th>
<th>Liquidity_downgrade</th>
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Table 2. The Average Changes in D/A Ratio by Countries

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Table 3. Regression Results One Year After Downgrade: All Countries

\[
DA_{i(t+1)} = \beta_0 + \beta_1 \text{Revenue}_{i(t)} + \beta_2 \text{Liquidity}_{i(t)} + \beta_3 \text{Time of Downgrade}_{i(t)} + \beta_4 \text{Domicile}_{i(t)} + \beta_5 \text{Partial Ownership}_{i(t)} + e_{i(t)},
\]

where \(DA_{i(t+1)}\) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
Revenue = a company’s revenue per quarter, as of the moment of downgrade;
Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
Domicile = a dummy variable for companies from different countries, with US companies not assigned a dummy;
Partial Ownership = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
e = error term;
i = firm subscript;
t = time subscript;
t + 1 = time + one year.

<table>
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Table 4. Regression Results One Year After Downgrade: Non-US Countries

\[ DA_{(i,t+1)} = \beta_0 + \beta_1 \text{Revenue}_{(i,t)} + \beta_2 \text{Liquidity}_{(i,t)} + \beta_3 \text{Time of Downgrade}_{(i,t)} + \beta_4 \text{Domicile}_{(i,t)} + \beta_5 \text{Partial Ownership}_{(i,t)} + e_{(i,t)}, \]

where

- \( DA_{(i,t+1)} \) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- Revenue = a company’s revenue per quarter, as of the moment of downgrade;
- Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- Domicile = a dummy variable for companies from different countries, with US companies not assigned a dummy;
- Partial Ownership = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
- \( e \) = error term;
- \( i \) = firm subscript;
- \( t \) = time subscript;
- \( t + 1 \) = time + one year.

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<tr>
<td>After 09152008</td>
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<td>Brazil</td>
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Table 5. Regression Results One Year After Downgrade: US Only

\[ DA_{(t+1)} = \beta_0 + \beta_1 \text{Revenue}_{(t)} + \beta_2 \text{Liquidity}_{(t)} + \beta_3 \text{Time of Downgrade}_{(t)} + e_{(t)}, \]

where

- \( DA_{(t+1)} \) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- Revenue = a company’s revenue per quarter, as of the moment of downgrade;
- Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- \( e \) = error term;
- \( i \) = firm subscript;
- \( t \) = time subscript;
- \( t + 1 \) = time + one year.

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<th>Coefficients</th>
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<tr>
<td>After 09152008</td>
<td>2.758383582</td>
<td>1.032240784</td>
<td>0.307132464</td>
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Significance 0.49438844

30
Table 6. Regression Results Two Years After Downgrade: All Countries

\[
DA_{i(t+2)} = \beta_0 + \beta_1 \text{Revenue}_{i(t)} + \beta_2 \text{Liquidity}_{i(t)} + \beta_3 \text{Time of Downgrade}_{i(t)} + \beta_4 \text{Domicile}_{i(t)} + \beta_5 \text{Partial Ownership}_{i(t)} + \epsilon_{i(t)},
\]

where

- \(DA_{i(t+2)}\) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- Revenue = a company’s revenue per quarter, as of the moment of downgrade;
- Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- Domicile = a dummy variable for companies from different countries, with US companies not assigned a dummy;
- Partial Ownership = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
- \(e\) = error term;
- \(i\) = firm subscript;
- \(t\) = time subscript;
- \(t + 2\) = time + two years.

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Table 7. Regression Results Two Years After Downgrade: Non-US Countries

\[
DA_{(i;t+2)} = \beta_0 + \beta_1 \text{Revenue}_{(i;t)} + \beta_2 \text{Liquidity}_{(i;t)} + \beta_3 \text{Time of Downgrade}_{(i;it)} + \beta_4 \text{Domicile}_{(i;t)} + \beta_5 \text{Partial Ownership}_{(i;t)} + \epsilon_{(i;t)}
\]

- \(DA_{(i;t+2)}\) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- \(\text{Revenue} = \) a company’s revenue per quarter, as of the moment of downgrade;
- \(\text{Liquidity} = \) a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- \(\text{Time of downgrade} = \) a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- \(\text{Domicile} = \) a dummy variable for companies from different countries, with US companies not assigned a dummy;
- \(\text{Partial Ownership} = \) a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
- \(\epsilon = \) error term;
- \(i = \) firm subscript;
- \(t = \) time subscript;
- \(t + 2 = \) time + two years.

<table>
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<td>12.14885</td>
<td>0.37329</td>
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</table>

Significance F: 0.76181
Table 8. Regression Results Two Years After Downgrade: US Only

\[
DA_{(i,t+2)} = \beta_0 + \beta_1 \text{Revenue}_{(i,t)} + \beta_2 \text{Liquidity}_{(i,t)} + \beta_3 \text{Time of Downgrade}_{(i,t)} + \beta_4 \text{Domicile}_{(i,t)} + \beta_5 \text{Partial Ownership}_{(i,t)} + e_{(i,t)},
\]

where \( DA_{(i,t+2)} \) is the ratio which demonstrates a trend in capital structure changes from the moment of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;

Revenue = a company’s revenue per quarter, as of the moment of downgrade;

Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;

Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;

e = error term;

i = firm subscript;

t = time subscript;

t +2 = time + two years.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.989562887</td>
<td>1.673424241</td>
<td>1.188917214</td>
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<td>Rev_downgrade</td>
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<td>Liquidity_downgrade</td>
<td>100.7501619</td>
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<tr>
<td>After 09152008</td>
<td>3.656875837</td>
<td>3.116952283</td>
<td>1.17322163</td>
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</tbody>
</table>
Table 9. Regression Results Three Years After Downgrade: All Countries

\[ \text{DA}_{(i;t+3)} = \beta_0 + \beta_1 \text{Revenue}_{(i;t)} + \beta_2 \text{Liquidity}_{(i;t)} + \beta_3 \text{Time of Downgrade}_{(i)} + \beta_4 \text{Domicile}_{(i;t)} + \beta_5 \text{Partial Ownership}_{(i;t)} + e_{(i;t)}, \]

where

- \( \text{DA}_{(i;t+3)} \) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- \( \text{Revenue} \) = a company’s revenue per quarter, as of the moment of downgrade;
- \( \text{Liquidity} \) = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- \( \text{Time of Downgrade} \) = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusive) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- \( \text{Domicile} \) = a dummy variable for companies from different countries, with US companies not assigned a dummy;
- \( \text{Partial Ownership} \) = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
- \( e \) = error term;
- \( i \) = firm subscript;
- \( t \) = time subscript;
- \( t + 3 \) = time + three years.

<table>
<thead>
<tr>
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<th>Standard Error</th>
<th>t-Statistic</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>2.040431885</td>
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<td>After 09152008</td>
<td>4.199416172</td>
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<td>Germany</td>
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<td>1.007473702</td>
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<tr>
<td>Brazil</td>
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<td>0.296078032</td>
<td>2.750920899</td>
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<td>Spain</td>
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<td>Russia</td>
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<td>1.025392284</td>
<td>4.359369638</td>
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<td>1.887960662</td>
<td>10.75506468</td>
<td>0.175541544</td>
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</tbody>
</table>
Table 10. Regression Results Three Years After Downgrade: Non-US Countries

\[
DA_{i(t+3)} = \beta_0 + \beta_1 Revenue_{i(t)} + \beta_2 Liquidity_{i(t)} + \beta_3 TimeOfDowngrade_{i(t)} + \beta_4 Domicile_{i(t)} + \beta_5 PartialOwnership_{i(t)} + e_{i(t)},
\]

where

- \( DA_{i(t+3)} \) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade;
- Revenue = a company’s revenue per quarter, as of the moment of downgrade;
- Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade;
- Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0;
- Domicile = a dummy variable for companies from different countries, with US companies not assigned a dummy;
- Partial Ownership = a limited-value independent variable which can take values from 0 to 1 depending on the percentage of State’s ownership. 1 means a firm with 100% government ownership and 0 for firms with no government ownership;
- \( e \) = error term;
- \( i \) = firm subscript;
- \( t \) = time subscript;
- \( t + 3 \) = time + three years.

<table>
<thead>
<tr>
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<th>t-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>-0.31913</td>
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<td>Rev_downgrade</td>
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<td>Liquidity_downgrade</td>
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<td>107.28287</td>
<td>0.09027</td>
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<tr>
<td>After 09152008</td>
<td>-0.08443</td>
<td>0.11303</td>
<td>-0.74695</td>
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<tr>
<td>Brazil</td>
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<td>3.69123</td>
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<tr>
<td>Spain</td>
<td>-0.05993</td>
<td>3.87857</td>
<td>-0.01545</td>
</tr>
<tr>
<td>Russia</td>
<td>6.15348</td>
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<td>State</td>
<td>-0.9874</td>
<td>11.90176</td>
<td>-0.08296</td>
</tr>
</tbody>
</table>
Table 11. Regression Results Three Years After Downgrade: US Only

\[ DA_{(i,t+3)} = \beta_0 + \beta_1 \text{Revenue}_{(i,t)} + \beta_2 \text{Liquidity}_{(i,t)} + \beta_3 \text{Time of Downgrade}_{(i,t)} + \beta_4 \text{Domicile}_{(i,t)} + \beta_5 \text{Partial Ownership}_{(i,t)} + e_{(i,t)}, \]

where \( DA_{(i,t+3)} \) = ratio which demonstrates a trend in capital structure changes from the moment total of downgrade and calculates as D/A ratio at the moment of downgrade minus D/A ratio in 1 year after downgrade; 
Revenue = a company’s revenue per quarter, as of the moment of downgrade; 
Liquidity = a ratio calculated as the total number of shares traded daily divided by total number of shares outstanding in the stock, as of the time of downgrade; 
Time of downgrade = a dummy variable for separation of downgrades occurring before or after the financial crisis of 2008, with September 15, 2008 set as the line of demarcation. If company’s downgrade happened in fourth quarter of 2008 (inclusively) or later this value equals 1, if firm’s downgrade happened before, this value equals 0; 
e = error term; 
i = firm subscript; 
t = time subscript; 
t +3 = time + three years.

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<th>t-Statistic</th>
<th>P-value</th>
</tr>
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<tbody>
<tr>
<td>Intercept</td>
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<tr>
<td>After 09152008</td>
<td>5.393490326</td>
<td>3.656635386</td>
<td>1.474987183</td>
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</tbody>
</table>