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US Dollar denominated bond issuers and the effects of the increase in federal interest rates: evidence from emerging market companies

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ABSTRACT

We use the increase on federal interest rates that started in the end of 2015 to study the effect of external interest rates changes on emerging market companies. We use the outstanding US Dollar denominated debt of companies as an identification strategy to determine the companies that were more susceptible to changes on US interest rates. To do this a Difference-in-Difference analysis, an event study methodology, and a matching estimator approach were used. The findings of this research indicate that companies in emerging markets reduce investment spending after the increase of federal interest rates. This reduction is stronger for companies with US Dollar denominated debt, that significantly decreased investment spending around 4 percent more than the other companies. We also analyzed the impact that these changes had on the short and long run performance of companies. We concluded that in the short run, performance (measured by stock returns) of companies with outstanding US Dollar denominated debt, decreased between 0.5 and almost 2 percent after the announcements of the interest rate increases. This result is significant around one of the two events conducted. We were unable to conclude on the effects of federal interest rate increases on long run performance of companies (measured as accounting profitability).

This research sheds light on the consequences that increasing the interest rates in a strong economy have in companies of emerging market economies. Even though these economies have been growing fast in the past years, these are also vulnerable to external changes, and it is important to keep this effect under consideration when changing monetary policy in advanced economies due to spillover effects and negative consequences on EMEs.

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1. Introduction

External debt financing of firms in emerging markets has been a known situation for the past years. It is appealing for firms to finance themselves with external debt when interest rates are lower in those countries compared to domestic interest rates. Moreover, companies in EM commit the "original sin" (not only the countries themselves) which is the inability of firms to finance themselves in local currency, and the need of those to go to foreign markets to find financing. Finally, foreign investors interested in Emerging Market companies do not want to invest their money in weak and volatile currencies, which is an incentive for companies to issue debt in foreign and stronger currencies such as the dollar. Since almost all emerging markets issue external debt in foreign currency, firms from these countries become vulnerable to exchange rate and interest rate shocks, something that is out of the control of the EME's and the firms themselves. According to the Bank of International Settlements (BIS), in 2018, the US Dollar denominated debt held by emerging market economies totaled around 3.7 trillion dollars out of the total 11.4 trillion dollars outstanding (for non-banks).

After almost seven years of low US Dollar interest rates, in December 2015, the US Federal Reserve increased interest rates from 0.25% to 0.50%. The same happened 8 more times between 2016 and 2018. We chose to analyze these announcements in our study because these serve as exogenous shocks to emerging market economies (in the sense that these companies were not involved in the decision of increasing federal interest rates). This way, we can grasp the true effects of the interest rate changes on emerging market companies, without many endogeneity issues. The rates have changed because of the positive economic growth of the United States during that time and as that happened, the country started diverging from the era of extremely low interest rates that came after the 2009 Financial Crisis. The previous levels of interest rates incentivized companies to invest, as debt was cheap, but as rates started to increase, companies had to revise their financing choices. When interest rates increase, companies must pay more to finance themselves, and when interest rates are lower, it is cheaper to borrow and to pay back the loans. Companies that issued a lot of debt at low interest rates, might have difficulties dealing with higher costs of debt.

The focus of this research is on the increase of interest rates, more specifically the increase of dollar interest rates, and the impact it has on developing economies. Policies initiated by developed countries can produce significant effects in the economics of emerging markets, making this a very interesting case study. Policies especially linked to changes in interest rates impact economies that have a large amount of debt denominated in that specific currency. Because of time constraints, it was impossible to collect bond and company specific data from all emerging market economies. Therefore, we chose eight countries to be part of this study, which we considered to be both important economies and economies that have strong relations with the United States. The "Fragile Five"[1] which are the emerging market economies that rely the most on foreign investment

[1] This was a term first created by a financial analyst at Morgan Stanly back in 2013 to describe the five emerging market economies that rely heavily on foreign investment to finance their growth

to finance themselves, will be part of the research. The countries that belong to these group are Brazil, India, Indonesia, South Africa and Turkey. Additionally, we included Mexico, Argentina and Chile in the research since these hold large amounts of US denominated debt. Mexico holds around 60 percent of its gross external debt in dollar denominated currency while Argentina holds around 80 percent of its gross debt in dollar denominated currency and, finally, Chile holds around 36 percent dollar denominated debt as a proportion to GDP.

For companies in countries that are facing uncertainty regarding their own economy and politics, to have an additional external pressure on their financing decisions can change companies' financial outlook for the next years. Emerging markets growth is much stronger than the growth of developed economies, and it is important to understand which factors put this growth in danger, and which policies make these countries more vulnerable, limiting them from achieving full development.

Currently, there is a large amount of literature on foreign debt financing by emerging market companies and on the effects of interest rates on companies. But literature is lacking on the impact of changes in interest rates in companies of developing economies especially with relation to their large foreign denominated bonds. Following the research on the impact of the federal interest rate increases that started on 2015 on emerging market companies studied by Wu (2019) and the research on the connection between US monetary policy and EME credit cycles by Bräuning (2018), we try to determine in this study by which channel companies become vulnerable when foreign interest rates increase. Further research on the topic is of extreme importance from an economic, political, and social perspective. Hopefully, shedding light on the impacts that economic decisions by developed economies have on developing countries can make politicians more aware of the consequences that their countries' policies can have on other economies.

To research the impact of changes in interest rates by the US on companies of emerging markets we used two different identification strategies and three different methods. The impact of interest rates on companies differs depending on their balance sheets and financial decisions. This means that emerging market companies with no relations to the United States will likely face less changes when US Dollar rates start increasing compared to companies that have deep relations to the United States and have large part of the balance sheet in dollar terms.

Therefore, the identification strategies used take these differences between companies into consideration and try to identify the companies that are more susceptible to changes in dollar interest rates. The first identification strategy is whether a company has outstanding dollar denominated debt and the second one is whether a company has above or below median share of outstanding dollar denominated debt before the announcements of the interest rate increases.

We chose to use two different identification strategies in order to grasp better the true effects of interest rate increases in companies of emerging markets. This is because the behavior of companies that hold foreign denominated debt can be different from the one of companies that do not hold any foreign denominated debt, but also companies that hold

a larger share of foreign denominated debt act differently compared to companies that hold only one percent of their debt in foreign currency.

Regarding the methods used to analyze these effects, a Difference-in-Difference is conducted to measure the impact of the increase in federal interest rates on investment spending of the companies that have/ have above median share outstanding US Dollar denominated debt versus the ones that do not have this debt. Afterwards, we want to analyze whether the federal interest rate increases also impact the performance of companies, motivated by investment spending changes.

To measure short run performance, an event study is conducted to investigate the changes in stock returns of companies around the announcement dates of the increase in federal interest rates. We used two different announcements of interest rate increases which are considered surprising, on the 16th December 2018 and 21st March 2018, to compare the abnormal returns of companies belonging to the different treatments. To measure changes on medium/long run performance of companies, a Difference-in-Difference analysis on accounting profitability of companies belonging to different treatments is used (the same comparisons between US Dollar bond issuers versus non US Dollar bonds issuers and above median versus below median share of US Dollar bonds are performed).

The results are as follows: Regarding the Difference-in-Difference analyses related to investment spending, we find that the companies that are susceptible to interest rate changes (in both identification strategies) reduce investment spending more than other companies. We found significant results using the first identification strategy which leads us to conclude that companies with outstanding dollar denominated bonds decreased investment spending around 4 percent more than other companies, after the increase in federal interest rates. The analysis of the parallel trends on investment spending of the treated and non-treated/control companies gives more strength to these results. These investment changes of companies are likely to impact performance of companies. Therefore, we also analyze short and medium/long run performance of companies after the increases on federal interest rates.

Regarding short run performance, in the two event studies conducted, the companies that belong to the groups that are more susceptible to increases in interest rates, which are the companies with outstanding dollar denominated debt/with above median share of outstanding dollar denominated debt before the increase in interest rates, show negative abnormal returns after the announcements, which means the markets react negatively to these announcements. These groups decrease returns between 0.5 and almost 2 percent in the different event studies conducted. We found significant results around the announcement of an increase in interest rates on 21st March 2018. The other set of groups that we consider as less susceptible to interest rate changes show different behaviors. While we cannot conclude anything regarding the companies that do not have outstanding dollar denominated debt because these have different behaviors in the two event studied, companies that had below median share of outstanding dollar denominated debt showed always negative abnormal returns after the announcements, between 0.4 and 0.8 percent. This leads us to conclude that having an outstanding dollar denominated debt appears to

have a negative impact on stock returns after the announcements of the increases of federal interest rates.

Regarding long run performance of companies, in the Difference-in-Difference analyses, conclusions related to accounting profitability changes are hard to grasp because of the unclear results and the non-parallel trends that different groups follow.

We also perform several robustness checks in order to get a better understanding of the veracity of the results we report. First, we perform the two Difference-in-Difference analyses without financial companies in the sample and conclude that the results are likely not biased by these companies. Second, we use a different caliper width on the matching procedure and conclude that the results from the Difference-in-Difference analyses and event studies are not impacted by this change. Third, we perform a non-surprising event check, which is an event study around a non-surprising increase on the federal interest rate. Around this event, the stock prices of the companies in our sample behaved very differently than in the surprising events, which is an indicator that "surprising events" were correctly defined. Four, we use another accounting profitability measure on the Difference-in-Difference analyses and conclude the results do not improve or become clearer with this change.

In this thesis we examined the effects that interest rates of developed economies have on emerging markets, and specifically, we analyzed the effects of the changes of interest rates on companies of EMEs. The results showed that companies reduced their investment levels after the increases of interest rates, and this impacted negatively short run performance.

The use of the amount of US Dollar denominated bonds to distinguish companies in emerging markets was a method chosen to better understand the possible effects that external interest rate increases have on those companies. Because emerging market data is not of high quality, we could not get a large sample of companies that are US Dollar bond issuers in the sample. We believe that this limited the finding of more significant results on the analyses conducted. This implies further research on the theme is important in order to conclude with certainty on how the monetary changes of developed economies impact companies of emerging markets.

This paper serves as another indicator of how reliable EMEs are on stimulus of developed economies and how important it is to take emerging markets into consideration when changing policies, especially monetary policies, that have a global impact. These countries represent around 57 percent of the world's population and it is of extreme importance to understand how the monetary policy changes of developed economies will impact the fast-growing countries. From a macroeconomic perspective, the negative impact of the monetary policies on EMEs will also impact indirectly developed economies through investment flows, imports and exports.

The sections of the paper are divided as follows: Section 2 presents the literature review related to the topics discussed, Section 3 explains the empirical designs used in this paper, in Section 4 the summary statistics and results are presented and discussed, in Section 5 we conduct several robustness checks and in Section 6 we conclude the paper.

2. Literature Review

External debt financing of firms in emerging markets has been a known situation for the past years. Literature has shown, through different arguments, why countries and firms may want to issue debt in foreign denominated currency, the effects that this might have in their financials and growing outlook and the relation between these debt and interest rate changes.

The lack of monetary policy credibility of developing countries is one of the explanations of the problem, Calvo (1996) and Bohn (1990) have showed that external debt financing is a way to discipline policymakers that may be interested in inflating prices in order to decrease the current level of debt. Jeanne (2003) presents and explains a model in which companies choose their debt currency composition in order to minimize the probability of default. Meaning that if their countries have a lack of monetary credibility, the companies will choose to switch to a dollarization of their liabilities. In this paper, Jeanne has showed that stronger and more credible monetary policy in emerging economies leads to an increase of borrowing in domestic currency by domestic firms and thus reduces the reliance on foreign currency debt issued abroad.

Also, foreign debt financing can be caused by the moral hazard created by bailout guarantees, as described by McKinnon and Pill (1998) (although for individual firms this argument is not as strong as it is for banks and for the public sector). If the country does not have enough financial developments which will mean also less foreign credit lines, this can be a reason why firms choose to issue debt in foreign currency, Caballero and Krishnamurthy (2003). Another conclusion that these authors arrived at was that underdeveloped countries would have underinsurance against the possibility of international collateral being threatened and this is a reason why developing countries issue dollar denominated debt.

In *Other People's Money*, Eichengreen (2005) argues that the "Original Sin" is the main reason why countries borrow in foreign currencies and at short maturities. That is, the countries are forced to issue debt in foreign currencies because of the international financial system itself and not because of the domestic policies. In this book, the authors explain that besides currency decomposition, other characteristics of debt and of the economy matter, such as the maturity structure and financial imperfections. Also, the book explains that amongst other reasons, a lack of domestic monetary policy can lead to countries borrowing more in foreign currencies, because as these do not have credible exchange rate policies, it becomes expensive to borrow in domestic currency. The authors conclude that the solution for countries that suffer from the original sin involves intervention of the international spectrum in order to improve the debt market of emerging market economies.

Going from general country issues to firm specific decisions, companies may prefer to issue debt in foreign currency as it may be cheaper to do so, for taxes purposes and capital controls imposed by the domestic governments, Shapiro (1984) and Rhee (1985). Also, R. Gaston Gelos (2003) studied the determinants of the share of foreign currency denominated debt in total debt using a sample of Mexican companies. Gelos showed that larger companies and companies with higher exporting and importing levels

issue more debt in foreign currency while the level of financial distress of companies (Debt to Assets ratio) did not seem to matter in determining the share of foreign denominated debt. Also, Keloharju (2001) using data from Finland between 1985 and 1991, showed that firms in which exports are a large part of the net sales chose to issue more debt in foreign currency and that firms tend to borrow more in times when the interest rate of the loan currency is lower than other currencies. This is evidence that firms issue in foreign denominated currencies for hedging purposes and that these decisions are affected by speculative motives.

US investors' preference for strong and own currency denominated bonds is also a reason why companies chose to issue US Dollar denominated bonds. Burget et al. (2017) showed that while US investors did not have home bias towards countries' US Dollar denominated bonds, these had a familiar home bias towards local currency bonds. Moving from the reasons why companies issue debt in foreign currency to the amount of foreign denominated debt that companies choose to issue, Barry, Steven and Vassil (2008) have shown how companies in the US decreased the amount of debt issued when the corporate yield of the US was high, and how they increased the debt issued when the yield was low, during the 30 years of data collected. This means that when interest rates increased, the researchers found a significant decrease on debt issuance of the companies studied. The same can be expected for emerging market companies issuing bonds in dollar terms, even though the interest rates on high yield bonds are different, the relationship is expected to be maintained.

Regarding the effects of foreign debt financing, foreign currency mismatch is one of them. This mismatch concept is defined as *the differences in the values of the foreign currency denominated assets and liabilities on the balance sheets of households, firms, the government and the economy as a whole* and for firms this can be seen as the relation between foreign currency denominated liabilities and the domestic currency denominated assets, Eichengreen (2003). Chuit, Kuruc and Turner (2016) explain how the policy rates that led to large expansion in Central Banks' balance sheets since 2010, have benefited financing conditions in EME companies. This caused a sharp increase in the foreign currency mismatches of those companies. External debt financing is more difficult to manage compared to internal debt, especially for companies that do not have a large part of their assets on foreign currency, Al-Saffar et al (2013). This is because a currency mismatch means there is net debt denominated in foreign currency and consequently, a real exchange rate depreciation of the national currency (real appreciation of the foreign currency) leads to an increase in value of the net debt in comparison to the assets in national currency. This will create adverse balance sheet effects.

It is also relevant to explain the literature available related to the effects of interest rate changes in companies, especially in emerging markets. Brauning and Ivashina (2018) explained in detail the direct connection between the United States monetary policy and the Emerging Market Economies credit cycles. In fact, the authors estimated that during monetary easing, that is, when the US economy faced lower levels of interest rates, emerging markets increased the volume of loans from foreign banks more than developed economies. When there was a reversal of the monetary policy, towards higher levels of interest rates, EMEs experienced a fast credit contraction of the same magnitude as the

increase. The paper explains the strong relation between the United States' monetary policy and the financial decisions of emerging markets, which is something we explore in detail in this thesis. The US monetary policy is a "push factor" for the credit cycles in the EMEs' economies. Especially by determining the federal funds rate, the US monetary policy sets the short end of the dollar yield curve, which affects the supply of credit by changing the funding cost of banks, Bernanke (1995).

Burger (2017) showed that when US long-term interest rates were low, emerging market economies issued more foreign currency bonds and that US investment in these bonds also increased during this time. Fratzscher et al. (2018) studied how the financial crisis and quantitative easing policies in the United States and European Union led to an outflow of investment from the developed economies into the emerging markets. International capital flows towards developing markets can result in an increase in investment spending and economic growth (Henry 2000, 2003). This means that a shift towards higher levels of interest rates in developed economies, will also change the benefits of investing in emerging markets and possibly switch the investment direction back to developed economies. Wu (2019) studied how interest rate increases by the US Federal Reserve changed the capital outflows of many emerging economies. In fact, it was described in the paper that financial risks increased during the US interest rate hikes, although developing countries with better infrastructure and a sound banking system were less exposed to these risks.

Regarding the effects of interest rate changes in companies, different economic theories propose explanations for this, and the Keynesian model and the Classical model are amongst them. In "The General Theory of Employment, Interest and Money" Keynes discussed, the economical definitions of investment and savings, and how these change with shifts in the rate of interest. The equality between savings and investment is fully recognized, and in this model, even below full employment levels, this equality is fulfilled. When interest rates are low, because it is cheaper to invest, investment increases, and this leads to an increase in output/income. In the classical economic model, savings and investment are functions of the interest rates. In periods below full employment, the interest rates change so that savings and investment are brought back to equality. In this model, when interest rates rise, savings increase and investment declines.

The modern macroeconomic theory has also explained the effects of interest rate changes on companies' financial decisions. It presents the inverse relation between interest rates and investment spending of companies, Blanchard (2017). Even though this theory has been an important theoretical framework, empirical evidence of this relation has been hard to establish because of sticky rates of return of companies. Hambur (2018) was able to find a significant and inverse relation between investment spending and company specific interest rates, using a hand collected set of Australian companies.

While the effect of interest rate changes on profitability of companies is something literature has not fully covered yet, this is a relation we can conclude indirectly. In the last paragraph we explained the literature supporting the inverse relation between interest rates and investment spending of companies. In a different paper, Hanel (2002) studied the effects of R&D Spillovers on the profitability of firms, and the results support the hypothesis that research and development have a direct and positive effect on

profitability. Taking into consideration the conclusions from both papers, it is reasonable to infer that there is a negative indirect relation between interest rate changes and the profitability of companies, motivated by investment changes. This is something we test in this thesis, the impact of the increase in the Federal interest rate on accounting profitability of companies in emerging markets.

Regarding the effects of interest rates on stock prices, a negative causality between these two is expected because higher interest rates lead to a lower present value of future dividend incomes which leads to lower stock prices. Also, like previously explained, lower interest rates stimulate investments which increases economic activity and in turn leads to an appreciation of stock prices. While the evident links between interest rates and stock prices have been identified and accepted in the literature, there have been conflicting empirical results on the causality between both. Lee (1997) used rolling regression to try to determine the relation between interest rates and stock prices. By forecasting the excess returns on the S&P 500 with the short-term interest rates, the author found a changing relation over time, from negative to positive. Uddin (2009) studied the relationship between interest rates and stock prices using data from both developed and developing countries between 1988 and 2003. The author found significantly negative relation between interest rates and stock prices for all countries in the dataset, and for six out of the fifteen countries studied there was a significant and negative relation between changes in interest rates and changes in stock prices.

The literature presented throughout this section allows us to understand why emerging market companies are interested in issuing US Dollar denominated bonds, and the possible negative consequences that these have, especially when interest rates change. In this research, we develop in more detail the impact of dollar interest rates on emerging market companies, guided by the predictions that, in general, these companies will have a negative reaction to the interest rate increases. As seen in the literature, this negative reaction is specifically linked to investment changes of companies which, in turn, impacts performance.

3. Empirical Design

This section starts by explaining in more detail the experimental design and matching procedure used in this research. It concludes with the data collection and sample characteristics.

3.1. Experiment

This research aims at understanding the impact of the increases in Federal interest rates that started in the end of 2015 on companies in emerging markets. The experiment is divided in three parts: a Difference-in-Difference procedure to measure the impact of increase in federal interest rates on the investment of companies belonging to different treatments; an event study to investigate the changes in short run performance of companies around the announcement dates of the increase in federal interest rates; and a Difference-in-Difference procedure to measure the impact of increase in federal interest rates on medium/long run performance of companies belonging to different treatments.

In each of these procedures two different identification strategies are used based on whether companies have outstanding dollar denominated bonds or not and on their share of outstanding dollar denominated bonds. Both identification strategies are crucial to a better understanding of the impact of changes in interest rates on companies in emerging markets, since it is not only important whether a company issues US dollar denominated bonds or not, but the dimension of these issuances is also very important. This is because a company with a 90% share of outstanding dollar denominated bonds is more susceptible to changes in federal interest rates compared to a company with only a 5% share of outstanding dollar denominated bonds.

3.1.1 The increase in Federal interest rates from 2015 to 2018

The Federal Open Market Committee (FOMC) is the entity responsible for the monetary policy executed by the Federal Reserve System, the Central Bank of the United States of America. The Committee conducts eight meetings per year and reviews the current economic conditions, deciding on whether to use a contractionary or expansionary monetary policy. The FOMC does this by setting a target federal funds rate, which is the interbank interest rate for overnight loans (banks use these loans to meet the overnight reserve requirements determined by the Central Bank). In a contractionary monetary policy, the target fed funds rate increases. This happens because the Federal Reserve starts selling securities to banks (for example US Treasuries) which decreases the cash in the reserves of banks, and this leads to an increase in the interbank interest rate for overnight loans - the federal funds rate. Higher interest rates incentivize saving and decrease consumption and borrowing. In an expansionary monetary policy, the opposite happens.

In 2015 the federal interest rate was at 0.25%, a rate set by the Federal System on the beginning of the financial crisis of 2009. After 7 years of low interest rates, the US economy was starting to show once again stronger growth, and good levels of employment and inflation (change in real GDP was projected to be of 2.1%, unemployment was at a 5% level and Core PCE inflation was around 1.3%). On the 16th of December, the FOMC announced that it would raise the federal funds rate by 0.25% to a value of 0.5%. The FOMC did the same one year later, on December of 2016, three times in 2017 (in March, June and December) and four times in 2018 (in March, June, September and December). Table 1 presents the dates of the announcements of the increase in the federal funds rate, by how much this rate changed, and other relevant indicators of the type of monetary policy: Maintained Reserves and two types of inflation measures (Core PCE Inflation and US CPI YOY Index). Table 1 also presents whether an event is considered unexpected or not. The reason for the creation of this measure and how we arrive to it will be explained in the next section.

3.1.2. Difference-in-Difference

The first method to determine the effect that the increase in US interest rates had on emerging market is a Difference-in-Difference analysis. This method is used to determine the effect of a treatment, by comparing the changes in the outcomes before and after the treatment takes place, on the treated and on the control group.

Announcement date	Federal funds rate	Maintained Reserves	Core PCE Inflation	US CPI YOY Index	Unexpected Event
Before 16th December 2015	0.25%	2521386	1.40%	0.00%	-
16th December 2015	0.50%	2472068	1.30%	0.70%	Yes
14th December 2016	0.75%	2080653	1.70%	2.10%	No
15th March 2017	1.00%	2352061	1.90%	2.40%	No
14th June 2017	1.25%	2242268	1.70%	1.60%	No
13th December 2017	1.50%	2310863	1.50%	2.10%	No
21th March 2018	1.75%	2118454	1.90%	2.40%	Yes
13th June 2018	2.00%	2014626	2.00%	2.90%	No
26th September 2018	2.25%	1856198	2.00%	2.30%	No
19th December 2018	2.50%	1717339	1.90%	1.90%	No

Table 1- Federal Open Market Committee announcements of increase in federal interest rates between 2015 and end of 2018

This table presents the dates of the announcements of the increase in federal interest rates, the level of federal interest rates, the levels of Maintained Reserves, Core PCE inflation, CPI YOY Index and whether an event is considered surprising or not at the time of the announcements. Maintained Reserves are the total amount of cash that banks keep at hand (it is composed by Required Reserves, an amount determined by the Central Bank, and by Excess Reserves, which is additional cash that banks keep and decline to loan out). This measure is taken from Bloomberg. Core PCE inflation is the yearly percentage rate change in the price index for personal consumption expenditures excluding food and energy. The numbers showed are the monthly projections for the Core PCE inflation in a specific year. This measure is taken from the Federal Reserve's projections. US CPI YOY Index is the consumer price index year on year and it measures the price of a basket of consumer goods and services. This measure is taken from Bloomberg. Surprise event column presents whether an event is surprising or not. An event is considered surprising when the S&P 500 return is negative in the announcement date and in the day after.

We use the first increase of federal interest rates, on the 16th December 2015, as the beginning of the treatment to then compare the differences in outcomes of the treated and control groups before and after 2015. We used Almeida and Campello (2011) as a benchmark paper to perform the Difference-in-Difference analysis.

Two Difference-in-Difference analyses are performed, the first one using investment spending as the outcome, and a second one using accounting profitability as the outcome. Both of these measures were chosen because, first, we are interested in understanding the impact that the interest rate changes had on a variable that is directly liked to these rates: investment levels. Second, we are also interested in analyzing the impact that these changes had on medium/long run performance of companies. It is likely that, motivated by investment level changes, medium run performance of companies is also affected when interest rates increase. In fact, Lin and Wang (2018) showed that the structure of interest rates had first-order effects on both investment and value of companies (measured in the paper as Tobin's q).

The same two identification strategies used on the event study are used in the Difference-in-Difference analyses. The first one is the amount of outstanding dollar denominated bonds a company has before 2015. If a company does not have dollar denominated bonds on its balance sheet before the treatment, it will be allocated to the

control group, and the opposite for the treatment group. The second identification strategy is the share of outstanding dollar denominated bonds out of total outstanding bonds. If a company has above median share of outstanding dollar denominated bonds out of total in 2015 it is allocated to the treatment group, and if a company has below median share of outstanding dollar denominated bonds it is allocated to the control group.

The Difference-in-Difference command on Stata is used to perform the analyses on accounting profitability and investment spending. We chose to measure the average treatment effect on the treated group (ATT). In the first identification strategy, where matching is performed, we account for the propensity score results in the analysis. Standard errors clustered by country are also used in the analysis. This choice was motivated by the fact companies from different countries are subject to different economic pressures that can alter the results if not properly accounted for.

3.1.3. Event Study

Event studies are a very popular statistical technique used in the Finance field to measure the effects of an event on the stock price of a company. This technique uses the market model to adjust the stock price reaction on the date of the event. To do this, first the daily returns of the stocks on scope are calculated and then the "normal" daily returns are predicted by regressing the stock returns on the market returns (we use country indexes to measure market returns). After this, to calculate the abnormal daily returns of the stocks during the event date, the predicted daily stock returns are subtracted to the actual daily returns. The estimation and event windows are crucial to an event study and changes to these can significantly affect the results of the event study. While in the estimation window the predicted "normal" daily stock returns are calculated, in the event window the abnormal daily returns are calculated. There is no consensus on the literature regarding the size of the estimation window. While in MacKinlay (1997), a standard literature on event studies, the author uses an estimation window of 120 days, in Park (2004), the author uses an estimation window of 250 trading days ending 10 days before the event occurred. In fact, Krivin and Patton (2003) argue that the choice of the estimation window should not have a large impact on the results of event studies.

We chose an estimation window of 30 trading days ending 30 days before the event occurred, and a 5-day event window, 2 trading days before and after each event. We decided to have a short estimation window because of two reasons. First, we wanted to minimize the impact of country and company specific risks on the "normal" returns of companies. The larger the estimation window is, the more likely it is to incorporate spontaneous and country specific shifts in policies. Second, we did not want the multiple increases in federal interest rates to affect the normal returns of emerging market companies. This is because these announcements happened eight times between 2015 and 2018 and in some cases, there was less than three months difference between one announcement and the next one.

One important assumption of the event study methodology is that an event is unexpected, and that its occurrence has not been factored yet into the stock price. Since the FOMC often shares its intentions to increase the fed rates, some announcements of federal interest rate increases are expected, and therefore not eligible to be a part of an

event study. Expected interest rate increases are likely to impact the markets less compared to unexpected ones. Hence, we use daily returns of the *S&P 500*[2] on the announcement dates and one day after the announcements to determine whether a federal interest rate increase is expected or not. If the returns of the index in these days are negative, an event is considered unexpected/surprising. It is concluded that two out of the nine interest rate increases are surprising, in the sense that the market prices down these announcements.

The event study uses the unexpected/surprising events, 16th of December 2015, 21st of March 2018 and 10th of December 2019, to measure the abnormal returns of companies around the announcement dates. The abnormal returns of the different treatment groups are compared in order to get a better understanding of the impact of the increases in US interest rates to companies in emerging markets. First, we compare the abnormal returns of companies with outstanding dollar denominated bonds before the announcement with companies that do not have any outstanding dollar denominated bonds. Second, we compare the abnormal returns of companies that have above median share of outstanding dollar denominated bonds out of total with companies that have below median share of outstanding dollar denominated bonds out of total before the announcements.

3.1.4. Propensity Matching Estimator

Since the study of the relation between federal interest rate changes and company performance (using either the Difference-in-Difference analysis or the Event Study) is threaten by selection bias, caused by the fact that our sample is not random, it is necessary to build an identification strategy that takes into consideration the non-experimental characteristics of the data. This is because companies belonging to the treatment and control groups can have different characteristics, which can lead to changes in the outcomes, unrelated to the changes in federal interest rates. To address this problem, we used an event study methodology and Difference-in-Difference analysis in combination with a matching procedure. The research of Almeida and Campello (2011) also uses this combination in order to overcome data sampling problems.

We used a standard propensity score matching procedure, recommended by Austin (2011) in "Optimal Caliper width for propensity score matching" to match treatment and non-treatment observations in the first identification strategy. Propensity score was defined by Rosenbaum and Rubin in 1983 as *conditional probability of assignment to a particular treatment on a given vector of observed covariates.* This type of matching was chosen since its main goal is to derive unbiased estimates of the treatment effect taking into consideration the influence of specific factors (called covariates) in a non-randomized and observational based studies. We chose a 1:1 matching between treatment and control observations without replacement (which decreases the variance) in a descending order. In this matching procedure we also used a caliper of 0.6 of the pooled standard deviation of the logit of the propensity score. Wang

[2] S&P 500 is used to determine the reaction of the US market to the federal interest rate announcements since this index represents the biggest cap. companies from the United States, which are very likely to be affected by the changes in dollar interest rates.

and Xia (2013) concluded that the optimal caliper width was around 0.2 of the pooled standard deviation of the logit of the propensity score. We chose to increase the caliper width to guarantee that we had the maximum amount of matches possible while still assuring that the treatment and control groups were similar enough in the covariate variables. To guarantee that the results are not biased by the choice of caliper, in Section 5 we test the robustness of the results using a caliper of 0.2 of the pooled standard deviation of the logit of the propensity score. Almeida and Campello (2011), one of the papers used as guidance in this research, follows a different type of matching procedure. The authors use the Abadie and Imbens estimator (2006) which is a specific type of propensity score approach, in which controls can serve as matches more than once. This type of matching decreases the bias compared to the matching without replacement (used in our research) but it also increases the variance.

In order to match treatment and control observations, we focused on choosing covariates that could affect the selection into treatment and control groups and bias the results of the experiment. The quantitative covariates chosen were Firm Size, Leverage and Cash Holdings. The qualitative covariates chosen were the Industry Classification Code and the Country. In fact, these variables account for a large part of firm's heterogeneity in terms of profits, meaning that they are a good level playing field prior to the experimental shocks that started occurring in late 2015.

The matching procedure is only used in the first identification strategy, that is, on whether a company has outstanding US Dollar denominated bonds or not at a specific time of the study period. We chose not to use matching in the second identification strategy, that is, on the share of outstanding dollar denominated debt at a specific time of the study period, because we have a small sample of companies with outstanding dollar denominated bonds making it difficult to match the treated and control groups. Also, it is likely that these companies are more similar to each other. It is relevant to notice that we performed different matchings in the Difference-and-Difference analysis on investment spending, in each event study and in the Difference-and-Difference analysis on accounting profitability. For both Difference-in-Differences analyses, on investment spending and accounting profitability, we used yearly averages of the covariates (data between 2013-2015) to perform the matching. For the event studies, when the event occurred in the first half of a year, we used the previous year numbers to perform the matching. This is because the same year values do not reflect the current state of the companies. When the event study occurred in the second half of the year, we used the same year numbers to perform the matching. In the first event study, of 16th of December of 2015, we used 2015 values of the covariates to perform the matching. In the second event study, of 21st of March of 2018, we used 2017 values of the covariates in the matching procedure.

It is relevant to mention that in the event studies we used accounting profitability as the outcome variable to perform the matching between treated and non-treated companies. This is because stock return cannot be the matching outcome variable, since it is variable subject to market volatility and taking a yearly average is not accurate. Accounting profitability is a related measure with which matching can be performed. Also, since accounting profitability is used as the matching outcome in the first

Difference-in-Difference analysis, for consistency purposes we decided to use the same variable as the outcome.

After the matching procedure (for the first identification strategy), a Difference-in-Difference analysis is performed on investment spending of companies, followed by two event studies around the surprising announcements of Federal interest rate increases and by a Difference-in-Difference analysis performed on the accounting profitability, to try to determine the true effects of the increase in US Dollar interest rates on investment decisions and on performance of emerging market companies.

3.2. Data collection and Sample Characteristics

Our study period is between the 1st of January of 2013 and the 31st of December of 2018. For this period, we collected data regarding outstanding bonds of companies, stock prices and company specific information of the 8 countries in study (Argentina, Brazil, Chile, India, Indonesia, Mexico, South Africa and Turkey). Regarding bond data, we used Capital IQ in WRDS database while for stock price information and company specific information we used Datastream Worldscope. We used Datastream navigator to find lists of companies belonging to the countries of interest. From this platform ISIN codes of the companies were downloaded, which we then used to extract the bond data, stock price data and company specific information.

From Capital IQ, we collected debt information between 1997 and 2019 of 8,030 companies. This debt information included all types of debt, including Term Loans, Revolving Credit, Bank Loans, amongst others. Since we are interested in studying companies with outstanding dollar denominated bonds, only debt with the description Bonds was kept, and this resulted on a total of 463,533 rows of bond information. Since we needed to construct dollar denominated bond variables, we dropped bond information without currencies. We kept the last month of bond information in each year of each company and debt ID. The bonds with maturities smaller than 2014 were deleted, since these do not belong to the study period. Bonds with Amount Outstanding equal to zero were also dropped. In this dataset it was calculated the outstanding amount of US dollar denominated bonds and the total outstanding amount of bonds (in any currency) to then calculate the percentage of outstanding dollar denominated bonds out of total of each company per year. To calculate the outstanding amount of dollar denominated bonds per company and year, we summed the outstanding amount of bonds with dollar currency that have a year smaller or equal to the year under consideration and that have a maturity larger or equal to that year. To calculate the total outstanding amount of bonds per company and year, we summed the outstanding amount of bonds (regardless of the currency) that have a year smaller or equal to the year under consideration and that have a maturity larger or equal to that year. The percentage of dollar denominated bonds out of total per company each year was calculated by dividing the amount outstanding of dollar denominated bonds by the total amount outstanding of bonds in each year. From our sample a total of 400 companies had outstanding dollar denominated bonds between 2014 and 2018. (while 1,667 companies did not have outstanding dollar denominated bonds during that time). The companies that did not have outstanding dollar denominated bonds were dropped from the sample. In this dataset, a “Bond Issuer” variable related to

whether the company issues dollar denominated debt or not was created (all companies were given a 1 to this variable).

In table 2 panel A, the distribution of companies with outstanding dollar denominated bonds and the median percentage of dollar denominated bonds out of total per year are presented. In panel B of the same table, the distribution of companies with above or below median percentage of dollar denominated bonds throughout the years are showed. It is relevant to notice in the table, that the percentage of dollar denominated bonds decreases after 2015, which coincides with the increases in federal interest rates by the US.

In order to perform the matching between companies that belong to the treatment and to control groups and to do the Difference-in-Difference analysis it was necessary to collect company specific information. We used Datastream Worldscope to collect yearly data for the following measures: Total Assets, Total Debt, Revenues, Net Income, EBITDA, Cash and cash equivalents, CAPEX and Property, Plant and Equipment. We chose to use yearly data instead of quarterly data, like in Almeida's paper, because of several reasons. First, the three shocks under analysis are either at the beginning of the year (21st of March of 2018), or at the very end of the year (16th of December of 2015 and 18th of December of 2018), meaning that we can easily use the previous year and current year figures, respectively, to perform the matching procedure. Second, even though in the Difference-in-Difference analysis the first interest rate increase (of 16th of December of 2015) is used as the threshold between pre-treatment and post-treatment, it is relevant to analyze the behavior of the companies a couple of years after the treatment began, and not only 3 quarters after, which was the approach followed in the paper by Almeida and Campello. For consistency purposes, it was used yearly company specific data for both the Difference-in-Difference analyses and the event studies.

In order to clean the company specific data, we dropped observations with missing values for any of the previously stated variables (Total Assets, Total Debt, etc).

Panel A: Share of outstanding US dollar denominated bonds per year

	2013	2014	2015	2016	2017	2018
Median	0.51	0.52	0.55	0.50	0.47	0.44
Std. Dev.	0.39	0.39	0.39	0.39	0.39	0.40
Total	362	368	370	367	364	362

Panel B: Companies with above/below median share of outstanding US dollar denominated bonds per year

	2013	2014	2015	2016	2017	2018
Below Med.	180	184	184	185	182	179
Above Med.	182	184	186	182	182	183

Table 2- Share of outstanding US dollar denominated bonds throughout the years and number of companies with above and below median percentage of outstanding US Dollar denominated bonds per year

In Panel A, the medians of the share of outstanding US dollar denominated bonds per year are presented. There is an increase on the median share between 2013 and 2015, and a decrease in the median share after 2015. In Panel B, the total number of companies with above or below median share of outstanding US Dollar denominated debt per year are presented.

Observations with negative values of Total Assets, Cash and Cash equivalents or Property, Plant and Equipment were also deleted from the sample. We dropped observations in which Cash and cash equivalents are bigger than Total Assets, in which Capex is bigger than Total Assets and in which Property, Plant and Equipment is bigger than Total Assets. Since the sample consists of yearly data, we dropped the duplicates of companies per year. Even though it is usual to disregard observations from financial institutions, which in our sample are the companies with Industry Classification Codes 4, 5 and 6, we chose not to do this since we do not have a large sample of emerging market companies that are US Dollar issuers, and therefore we did not want to eliminate more. We eliminate the financial companies as a robustness check and conduct the two Difference-in-Difference analyses again in order to understand whether those companies affect the outcome or not.

As previously discussed, the quantitative covariates used for the propensity score matching are size, leverage and cash holdings. Firm size is calculated as the logarithm of Total Assets, leverage is calculated as the ratio between Total Debt and Total Assets and cash holdings is defined as the ratio of cash and short-term investments to total assets.

In order to analyze the effects of the US Dollar interest rate increases on investment spending of companies, we must define the outcome variable. Following Almeida and Campello (2011), the outcome variable is the change in investment spending, and investment spending is defined as the ratio between yearly capital expenditures and the lag of property, plant and equipment (it was used yearly data while Almeida and Campello used quarterly data). In order to analyze the effects of US Dollar interest rate increases on accounting profitability we defined profitability as Return on Assets which is calculated as the ratio between Net Income and Total Assets and it aims at understanding whether a company is profitable compared to its total assets. A second accounting measure is used in Section 5 for robustness purposes. In that section, the results using the alternative profitability measure are discussed. In order to minimize the impact that outliers can have on the results of the experiment (especially when comparing variable means), we chose to winsorize the company specific data used for matching at the top and bottom 5 percent.

In order to conduct the event study, it was necessary to collect information regarding the daily stock returns of companies and the market returns. Therefore, to calculate the daily stock returns, we downloaded daily information from Datastream Worldcope for following variables: Closing Prices, which are adjusted for subsequent capital actions; Dividends, which are the adjusted dividend rates; and Return Indexes (since the change in these indexes are equal to the total return from holding the stocks including capital gains and dividends) for all stocks of our sample, between the 1st of September of 2015 and the 28th of February of 2019. We followed the approach of Ince and Port on the "Individual Equity return data from Thomson Datastream: handle with care!" (2006) in order to clean the daily price data collected from Datastream. We first dropped observations with missing values of the closing prices, return index and dividends. Then, we dropped observations when the end-of-previous-month price was less than 0.10 euros. This is done because it is Datastream practice to round prices to the nearest cent and this can lead to unrealistic differences in calculated returns when prices

are small (in the paper its used 1$ limit, but it is stated that price screens of 0.10 and 0.25 also work). Afterwards, the daily stock returns were calculated using two different methods, first, by dividing the closing stock price plus the daily dividends by the stock price of the previous day minus one and, second, by dividing the return index by the return index of the previous day minus one. In case the two methods produce difference results, we used the returns calculated using the price and dividend data. Also, in case there are missing values or zeros on returns calculated using the price and dividend data, we substituted them for the returns calculated using the return index. We dropped observations that had missing values of the daily returns.

To determine the daily market returns, we downloaded, from Datastream Worldscope, the daily prices of the main indexes of the eight countries in study. We downloaded daily prices for the following indexes: ARGMERV (from Argentina), BRBOVES (from Brazil), IGPAGEN (from Chile), MXIPC35 (from Mexico), ICRI500 (from India), JAKCOMP (from Indonesia), JSEOVER (from South Africa) and TKNAT30 (from Turkey), between the 1st of September of 2015 and the 28th of February of 2019. We calculated the market returns by dividing the index prices by the index prices of the previous day minus one. We dropped observations that had missing values of the market returns.

For the two Difference-in-Difference analyses it was necessary to merge company specific information with bond data. Since the final bond dataset only had companies with US Dollar denominated debt, the other companies with company specific information were considered non-US Dollar bond issuers. For the two event studies in both treatments, it was necessary to merge stock return data from Datastream with bond data from WRDS. In the first treatment, because matching was required, the datasets were also merged with company specific information from Datastream. To merge the data sets throughout the years we used the ISIN identifier. Since the bond data from Capital IQ only had Company Key identifiers, it was necessary to convert these into ISIN codes using a converting tool available in Capital IQ. Companies that did not have an ISIN were dropped from the sample. Observations that were not merged were also dropped (except the companies with company specific information and no bond data, since these are assumed to be non-US Dollar bond issuers).

4. Baseline Results

This section starts by providing summary statistics of the data used for conducting the different experiments. It also presents the results of the matching procedure between treated and control groups (if applicable). Afterwards, the results from the Difference-in-Difference related to changes in investment spending, from the two event studies and the Difference-in-Difference estimations related to changes in accounting profitability of the treatment and non-treatment/control groups are presented.

4.1. Summary Statistics

4.1.1. Difference-in-Difference: Investment Spending

In this section we examine the characteristics of the variables used in the Difference-in-Difference analysis of investment spending before and after the matching procedure. Like in the previous Difference-in-Difference, this procedure matches companies during the pre-shock period, between 2013 and 2015.

In the first treatment scenario, there is a total of 235 companies that belong to the treatment group and 4,221 companies that belong to the non-treatment group. The difference between the number of observations of this analysis compared to the previous Difference-in-Difference analysis is due to the different number of observations that have all relevant variables necessary to conduct the experiment. In this case, there were less observations with the covariate variables and investment spending than with accounting profitability.

Table 3 reports the pre-shock median values of the relevant variables before and after the matching procedure. The Pearson X^2 statistic is used to compare the differences between the median values of the treated/non-treated companies and treated/control companies.

From panel A we conclude that treated companies are larger, have more leverage and cash holdings compared to the non-treated companies before the first increase in the US Dollar interest rates (the differences are statistically significant at a 1% significance level).

From panel B, we can see that the differences between treated and non-treated companies disappear after the matching procedure, when comparing treated and control companies. This means that the matching procedure was successful.

In the second treatment scenario, there are a total of 131 treated companies and 104 non-treated companies. Panel C of table 3 reports and compares the median values of the variables across treated and non-treated companies. We conclude that companies that belong to the treatment, that is, companies that have above median share of outstanding dollar denominated debt in 2015, are similar to the non-treated companies, which have below median share of outstanding dollar denominated debt in 2015, on all characteristics except in terms of size. Treated companies appear to be statistically smaller than non-treated companies (at a 1% significance level).

	Firm Size	Leverage	Cash Holdings	Investment
Panel A: Medians for the treated and non-treated companies between 2013-2015 – Treatment 1				
Treated	14.387	0.360	0.071	0.136
Non-Treated	11.360	0.269	0.051	0.162
Difference	3.027	0.091	0.020	-0.026
Median test p-value	0.000	0.000	0.000	0.081

Panel B: Medians for the treated and control companies between 2013-2015 – Treatment 1				
Treated	14.387	0.36	0.071	0.136
Control	14.336	0.369	0.067	0.151
Difference	0.051	-0.009	0.004	-0.015
Median test p-value	1.000	0.712	0.580	0.580
Panel C: Medians for the treated and non-treated companies between 2013-2015 – Treatment 2				
Treated	13.968	0.358	0.071	0.147
Non-Treated	15.001	0.365	0.069	0.127
Difference	-1.033	-0.007	0.002	0.020
Median test p-value	0.000	0.650	0.942	0.549

Table 3- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. The sample of 4,456 companies was divided in treated and non-treated companies. The treated companies are defined as those that have outstanding US dollar denominated bonds before the first increase in federal interest rates in the 16th of December of 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds before the 16th of December of 2015. In Panel A there are 235 treated companies and 4,221 non-treated companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. Panel C divides companies based on the share of outstanding US Dollar denominated debt they had in 2015. There are 131 treated companies and 104 control companies in Panel C. The test used to compare the medians of the covariates was the Pearson X^2 statistic. The p values of the test can be found on the last row of each panel.

Interpretation: Regarding the first identification strategy, in Panel A we can see that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 1% significance level. In Panel B we understand that these differences disappear when the comparison is done between the medians of the treated and control companies. Regarding the second identification strategy, in Panel C we see that treated and non-treated companies are similar to each other except on size. This difference in size is significant at a 1% significance level.

4.1.2. Event Study 1: 16th December 2015

In the first identification strategy, matching between treated and non-treated companies is performed. The matching was done using 2015 data. Table 4 presents the pre-treatment median values of the variables used in the matching procedure for the treated and non-treated/control groups and the difference between the two groups. Following Almeida and Campello (2011), we use the Pearson X^2 statistic to test the differences between the two groups' medians of the covariate and outcome variables.

Panel A reports the medians for treated and non-treated firms in 2015. There is a total of 204 treated companies and 3,430 non-treated companies in the sample. From the table we understand that treated companies are larger, have higher leverage and more cash holdings. As previously discussed, these differences are expected since we are not conducting a true experiment. Therefore, the matching procedure tries to control for the differences between the treatment and non-treatment groups.

Panel B reports the medians for treated and control firms in 2015. There is a total of 204 treated and 204 control companies. These are all unique companies since we compute a 1 to 1 matching without replacement.

	Firm Size	Leverage ratio	Cash Holdings	Acc. Profit
Panel A: Medians for the treated and non-treated companies in 2015				
Treated	14.335	0.388	0.071	0.013
Non-Treated	11.347	0.254	0.044	0.024
Difference	2.988	0.134	0.027	-0.011
Median Test p-value	0.000	0.000	0.000	0.052
Panel B: Medians for the treated and control companies in 2015				
Treated	14.335	0.388	0.071	0.013
Control	14.165	0.412	0.060	0.015
Difference	0.170	-0.024	0.011	-0.002
Median Test p-value	0.766	0.373	0.373	0.692

Table 4- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. The sample of 3,634 companies was divided in treated and non-treated companies. The treated companies are defined as those that have outstanding US dollar denominated bonds before the first increase in federal interest rates in the 16th of December of 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds before the 16th of December of 2015. In Panel A there are 204 treated companies and 3,430 non-treated companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage ratio, Cash Holdings, Industry and Country. There are 204 treated companies and 204 control companies in Panel B. The test used to compare the medians of the covariates was the Pearson X^2 statistic. The p values of the test can be found on the last row of each panel.

Interpretation: This table shows that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 5% significance level. These differences disappear when the comparison is done between the medians of the treated and control companies.

When we compare the two panels, can see that the differences that were previously found in the covariate variables become statistically insignificant.

The second treatment allocates companies to the treatment based on whether these have above or below median share of outstanding US dollar denominated bonds in 2015. We chose not to compare pre-treatment median values of the covariates (firm size, leverage and cash holdings) of the treated and control groups as was done with the first treatment. Since we did not perform matching between the two groups using company specific information, we did not want to merge the stock price dataset with the company specific information in order to avoid losing more observations in the matching.

There is a total of 281 treated and non-treated companies, in which 132 companies are part of the treatment and 149 are part of the non-treatment group. It is relevant to note that the treatment, in the event study of 16th of December of 2015, consists of companies with above median share of outstanding dollar denominated debt out of total in 2015, and the median share ratio in 2015 was 0.55, which is presented in table 2 panel A.

4.1.3. Event Study 2: 21st March 2018

In this event study, the companies are allocated to the treatment or to the control groups based on the amount of outstanding US Dollar Denominated bonds they had in 2017. Regarding the first type of treatment, matching between the treated and non-treated groups was required, and this matching was done using the yearly data of 2017. We considered this the best strategy since using values of the end of 2018 would not reflect

	Firm Size	Leverage ratio	Cash Holdings	Acc. Profit
Panel A: Medians for the treated and non-treated companies in 2017				
Treated	14.567	0.352	0.069	0.029
Non-Treated	11.498	0.254	0.047	0.033
Difference	3.069	0.098	0.022	-0.004
Median test p-value	0.000	0.000	0.001	0.204
Panel A: Medians for the treated and control companies in 2017				
Treated	14.567	0.352	0.069	0.029
Control	14.523	0.376	0.062	0.027
Difference	0.044	-0.024	0.007	0.002
Median test p-value	0.918	0.606	0.606	0.757

Table 5- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. The sample of 3,651 companies was divided in treated and non-treated companies. The treated companies are defined as those that have outstanding US dollar denominated bonds before the increase in federal interest rates in the 21st of March 2018. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds before the 21st of March 2018. In Panel A there are 188 treated companies and 3,463 non-treated companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage ratio, Cash Holdings, Industry and Country. There are 188 treated companies and 188 control companies in Panel B. The test used to compare the medians of the covariates was the Pearson X^2 statistic. The p values of the test can be found on the last row of each panel.

Interpretation: This table shows that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 5% significance level. These differences disappear when the comparison is done between the medians of the treated and control companies.

the true value of the companies at the time when the event study occurred. There is a total of 188 treated companies and 3,463 non-treated companies in the sample. The number of treated companies is smaller than the total number of companies with outstanding dollar denominated debt presented in table 2 panel A (362 companies in 2017) because some firms did not have company specific data necessary for matching. Others did not have enough stock price information around the event, including the event estimation and the event window.

Table 5 presents the comparison of pre-treatment median values of the quantitative covariates used in the matching procedure. Like in the previous event study, the Pearson X^2 statistic is used to compare the medians of the relevant variables of the treated and non-treated/control companies.

Panel A reports the medians of the treated and non-treated companies. The panel indicates that before matching, treated companies were larger, had higher leverage and more cash holdings than non-treated companies, similarly to the previous event study. These differences were statistically significant at 1 percent significance level.

Panel B reports the medians for treated and control firms. There is a total of 188 treated and 188 control companies. We can see that the matching procedure is effective since the differences between companies disappear after the matching procedure (the differences become statistically insignificant).

Regarding the second treatment of the experience, like in the previous event study, we chose not to compare the pre-treatment median values for the covariates of the treated

and control groups. There is a total of 283 treated and control companies, in which 136 companies are part of the treatment and 147 are part of the control group. It is relevant to note that this treatment consists of companies with above median share of outstanding dollar denominated bonds out of total in 2017, and the median share that year was 0.47, as presented in table 2 panel A.

4.1.4. Difference-in-Difference: Accounting Profitability

In this section we examine the characteristics of the variables used in the Difference-in-Difference analysis of accounting profitability. In order to get a better image of the type of companies that are a part of the sample, we analyze the division of companies by country and industry.

In table 6, panels A and B, the total sample of 5,603 companies is divided by country and industry, respectively. Panel A shows that the sample has around 80 percent industrial companies and 10 percent financial companies. From panel B, we can understand that the sample has around 60 percent of companies from India, and the rest of the companies are more or less distributed evenly amongst other countries. This demonstrates that the sample is biased by a specific industry and country (industrial companies and Indian companies, respectively). Even though we perform matching between companies in order to guarantee companies are similar to each other, the sample is still biased by industrial and Indian companies and these might behave differently from other companies.

In this Difference-in-Difference, a subset of the dataset is used in the analysis because companies are allocated to the treatment or to the control groups based on the amount of outstanding US Dollar denominated bonds they have in 2015.

Total number of companies per Industry and Country

Panel A: Total number of companies per Industry

Industry	1	2	3	4	5	6	Total
# Companies	4,662	227	131	3	2	578	5,603

Panel B: Total number of companies per Country

Country	1	2	3	4	5	6	7	8	Total
# Companies	112	327	193	3,375	608	193	360	435	5,603

Table 6- Distribution of the emerging market companies in the sample per industry and country.

This table presents the distribution of the total dataset of companies per country and industry. In Panel A, the distribution of companies per industry is presented. The industry code used is the General Industry Classification found in Worldscope database and it is divided in 6 sectors: Industrial, Utility, Transportation, Bank/ Savings and Loans, Insurance, and Other Financial. In Panel B, the distribution of companies per country is presented. The country codes represent the following countries: Argentina, Brazil, Chile, India, Indonesia, Mexico, South Africa and Turkey, respectively.

Interpretation: This table shows that the dataset is composed mainly by industrial companies (industry code 1) and by Indian companies (country code 4).

In the first identification strategy of the Difference-in-Difference analysis, there is a total of 257 treated companies, 4,555 non-treated companies before matching, and a total of 257 treated and 257 control companies after the matching procedure. Table 7 presents the pre-shock median values of the relevant variables before and after the matching procedure. The Pearson X^2 statistic is also presented in the table to test the difference in medians for the relevant variables of the analysis.

Panel A compares the medians of the treated and non-treated companies. Similar to the characteristics of treated companies in the event studies, these companies are larger, have higher leverage and more cash holdings compared to the non-treated companies.

	Firm Size	Leverage	Cash Holdings	Acc. Profit
Panel A: Medians for the treated and non-treated companies between 2013-2015 – Treatment 1				
Treated	14.271	0.377	0.067	0.015
Non-Treated	11.228	0.274	0.047	0.024
Difference	3.043	0.103	0.020	-0.009
Median test p-value	0.000	0.000	0.000	0.005
Panel B: Medians for the treated and control companies between 2013-2015 – Treatment 1				
Treated	14.271	0.377	0.067	0.015
Control	14.447	0.384	0.065	0.018
Difference	-0.176	-0.007	0.002	-0.003
Median test p-value	0.597	1.000	0.378	0.597
Panel C: Medians for the treated and non-treated companies between 2013-2015 – Treatment 2				
Treated	13.802	0.385	0.066	0.014
Non-Treated	15.036	0.367	0.068	0.017
Difference	-1.234	0.018	-0.002	-0.003
Median test p-value	0.000	0.848	0.954	0.577

Table 7- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. The sample of 4,812 companies was divided in treated and non-treated companies. The treated companies are defined as those that have outstanding US dollar denominated bonds before the first increase in federal interest rates in the 16th of December of 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds before the 16th of December of 2015. In Panel A there are 257 treated companies and 4,555 non-treated companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. There are 257 treated companies and 257 control companies in Panel B. The test used to compare the medians of the covariates was the Pearson X^2 statistic. The p values of the test can be found on the last row of each panel.

Interpretation: Regarding the first identification strategy, in Panel A we can see that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 1% significance level. In Panel B we understand that these differences disappear when the comparison is done between the medians of the treated and control companies. Regarding the second identification strategy, in Panel C we see that treated and non-treated companies are similar to each other except on size. This difference in size is significant at a 1% significance level.

Panel B compares the medians of the treated and matched control companies. We can see that the differences that existed between treated and non-treated companies become statistically insignificant, at a 1% significance level, after the matching procedure.

In the second treatment, there is a total of 138 treated companies and 119 non-treated/control companies. Even though in this treatment we do not perform matching between treated and non-treated companies, it is still relevant to compare company specific characteristics of the two groups, to understand whether companies that issue above median share of outstanding dollar denominated bonds are statistically different from the companies that issue below median share.

In panel C, the pre-shock median values of the relevant variables of the treated and non-treated groups are reported. We can conclude from this panel that the treated companies are similar to the non-treated companies except in terms of size: companies that have above median share of outstanding dollar denominated bonds in 2015 seem to be smaller compared to the other companies. This difference is statistically significant at the 1% significance level.

4.2. Results

In this section, we will present and discuss the results of the Difference-in-Difference analyses and Event Studies.

4.2.1. Difference-in-Difference: Investment Spending

The increase of US Dollar interest rates in the 16th of December of 2015 was the first interest rate increase in the United States following the 2008 financial crisis. This worldwide crisis led to the largest Central Banks (the Federal Reserves and the European Central Bank) to start unconventional monetary policies that caused interest rates to drop to negative values. In table 8, the results for the Difference-in-Difference analysis on investment spending of companies following this increase in federal interest rates are presented. The clustered standard errors are in parenthesis.

In panel A, we compared investment spending levels of treated with non-treated companies, using the first identification strategy. Before the shock, treated companies had around 22 percent investment spending, while non-treated companies had around 26 percent investment spending; the difference between the two values is statistically significant at a 1 percent significance level. After the announcement of the increase in federal interest rates, both groups decreased the investment spending levels, but while treated companies decreased 5.3 percent, non-treated companies decreased only 1.5 percent. The difference between both groups is around 3.8 percent, significant at 5 percent significance level.

In panel B, we compare investment spending level before and after the shock of treated and control companies (using the first identification strategy, like in the previous panel). Control companies show slightly more modest values of investment spending compared to non-treated companies. Before the shock occurred, while treated companies still had around 22 percent investment spending levels, control companies had 22.7 percent, and the difference between the investment of the two groups becomes insignificant.

Yearly Investment/Capital Stock (in percentage points)			
Panel A: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	21.9	16.6	-5.3
Non-Treated Firms	26.3	24.8	-1.5
Difference (T-NT)	-4.4*	-8.2***	-3.8**
	(2.0)	(2.3)	(1.4)
Panel B: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	21.9	16.6	-5.3
Control Firms	22.7	21.1	-1.6
Difference (T-C)	-0.8	-4.5***	-3.7**
	(2.1)	(1.2)	(1.4)
Panel C: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 2			
	Before	After	After-Before
Treated Firms	20.8	13.8	-7.0
Non-Treated Firms	23.4	20.1	-3.3
Difference (T-NT)	-2.6	-6.3**	-3.7
	(6.9)	(4.1)	(3.4)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 8- Difference-in –differences of firms' Investment Spending before and after the increase in US Dollar Federal interest rates in the end of 2015 (16th of December of 2015).

This table presents estimations of the changes in investment spending of companies from the three years before the first increase in federal interest rates in 16th December 2015 to the first three years after it. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2015. In this panel there are 235 treated companies and 4,221 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this Panel there are 235 treated and 235 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2015. In this panel there are 131 treated companies and 104 non-treated companies. In parenthesis the standard errors clustered by country are presented.

Interpretation: This table shows one of the main results of this paper. Companies that have outstanding US dollar denominated bonds in the end of 2015/companies with above median share of outstanding US dollar denominated

bonds in the end of 2015 (the treated companies) have around 3.7 percent lower levels of investment spending compared to the other companies. This decrease in investment spending is statistically insignificant.

After the increase in federal interest rates, both groups decreased their investment spending levels, but similarly to the previous panel, treated companies decreased more investment than control companies. Specifically, treated companies after the shock occurred, decreased 3.7 percent more compared with control companies. This result is significant at a 5 percent significance level. When comparing both panels, we can confirm that using the non-treated or the matched control set of companies does not change the significance of the results or the behavior of the two groups after the increase on interest rates. This is very positive since it gives us more confidence on the true impact of interest rate changes on investment spending of emerging market companies.

In panel C, the investment spending of treated companies and non-treated companies of the second identification strategy are compared. The results are similar to the ones of the previous panels, but the values of investment spending before and after the shock occurred are smaller for both groups of companies. Significance is lost using this identification strategy.

One of the key assumptions of the Difference-in-Difference analyses is that in absence of the treatment, the difference in the outcome of the treated and non-treated companies is constant over time, this means that the treated and the non-treated companies would behave similarly in case the treatment would not be in place. In case the parallel trends assumption does not hold, it is difficult to capture the true effect of the treatment on the treated, since the relation between both groups has varied over time.

From table 3, panels B and C, we understand that the differences between investment spending of the treated and non-treated/control companies are statistically insignificant 2 years prior to 2015, between 2013 and 2015. Even though these differences are insignificant in the short run, it is uncertain whether in the long run the same holds. Therefore, we use a parallel trend check to understand whether it is possible to make conclusions based on the Difference-in-Difference analyses on investment spending.

Table 9 presents the trends of investment spending for the past 10 years. In the first two columns of each panel, the means and medians for yearly change in investment spending of the control and treated companies are presented and, in the last column, the t-test for equality of means, and the Pearson X^2 for equality of medians are shown. The first row of the panels in the table reports the statistics for change in investment spending going back 3 years prior to 2015. The second row reports the statistics for the change in investment spending going back 4 years prior to 2015. The same happens for the next rows which show that only the years prior to 2015 increase.

Panels A and B of the table present the trends of investment spending for the past 10 years of the first and second identification strategies, respectively. The structures of the panels are similar, the only difference being that while the first column of panel A reports values for the control companies using the first identification strategy, the first column of panel B reports values for the non-treated companies using the second identification strategy.

From both panels one can infer that the investment spending trends of treated companies and control/non-treated companies have not been statistically different over time. Going back a decade, we conclude that the difference of means and medians between control/non-treatment and treatment groups remained statistically insignificant at all significance levels.

Investment Spending Trends			
Panel A: Investment Spending trends of control and treatment groups – Treatment 1			
Time Horizon	Control Mean [Median]	Treatment Mean [Median]	P-value of Difference t-test [Pearson X^2]
3 years prior to 2015	-2.779 [-1.491]	-1.254 [-0.730]	0.163 [0.135]
4 years prior to 2015	-2.074 [-1.353]	-1.261 [-0.680]	0.433 [0.112]
5 years prior to 2015	-2.620 [-1.442]	-2.670 [-0.86]	0.960 [0.185]
10 years prior to 2015	-1.831 [-0.667]	-1.530 [-0.291]	0.718 [0.259]
Panel B: Investment Spending trends of non-treatment and treatment groups – Treatment 2			
Time Horizon	Non-Treat. Mean [Median]	Treatment Mean [Median]	P-value of Difference t-test [Pearson X^2]
3 years prior to 2015	-0.877 [-0.687]	-0.868 [-0.694]	0.994 [0.975]
4 years prior to 2015	-0.596 [-0.316]	-1.183 [-0.714]	0.565 [0.348]
5 years prior to 2015	-2.1 [-0.707]	-1.774 [-0.638]	0.432 [0.770]
10 years prior to 2015	-0.693 [0.002]	-1.321 [-0.038]	0.742 [0.468]

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 9- Trends in Investment Spending for control and treated companies: Mean and Median comparisons.

This table presents the means and medians of the yearly change in investment spending for companies of the treatment and non-treatment/control groups. In Panel A, it is compared treated and control companies using the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. In Panel B, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. The first row of each panel compares changes in yearly investment spending of companies going back three years before the first increase on federal interest rate. In the second row the same is performed but comparing changes in yearly investment spending of companies going back four years before the shock. The next rows have the same logic going back more years. The means of the variables are shown first, and the medians are shown in brackets. The last column reports the standard t-test and the Pearson X^2 is reported in brackets.

Interpretation: This table presents the long run trends in investment spending of the different groups used on our analyses. We can see that the different groups followed similar trends in investment spending over time, before the increase on federal interest rates.

Using the Difference-in-Difference analyses on investment spending, we understand that the increase of US Dollar interest rates impacts negatively emerging market companies, especially their investment spending levels. This effect is, as predicted, stronger for companies that have US Dollar denominated bonds and companies that have above median share of US Dollar denominated bonds. The results are according to our prediction, and we can find significance in one of the identification strategies used.

4.2.2. Event Study 1: 16th December 2015

The announcement of the increase of US Dollar interest rates on 16th December 2015 caused the S&P 500 value to decrease by 1.50% and 1.78% on the two following days. Table 10 reports the results of the event study around this surprising announcement of increase in federal interest rates. The table presents the cumulative abnormal returns, that is, the difference between the actual daily returns and the predicted normal returns of the treated companies versus the non-treated/control companies, and the respective standard deviations and the t-test to determine whether these abnormal returns are statistically significant and different from zero. In the third row of each panel the differences between groups are also presented.

In panel A, the abnormal returns of the treated, non-treated companies and of the total sample are presented. While treated companies, that is, companies that have outstanding US Dollar denominated debt before the event occurred, appear to have returns 0.6 percent lower than predicted, this result is insignificant. Companies that were not a part of the treatment group had about 0.7 percent higher returns compared to normal. This result is significant at a 1 percent significance level. The difference between these two group is around 1.3 percent, which is significant at 10 percent significance level. The total group composed by both treated and non-treated companies has about 0.6 percent higher returns after the announcement of the interest rate increase (significant at the 1 percent significance level).

In panel B, while the treated companies have the same results as in the previous panel, the significance related to the above normal returns of the treated and of the total group found in that panel is reduced. The difference between the two groups remains fairly unchanged compared to the previous panel.

In panel C, both the treated and non-treated companies have negative abnormal returns of around 0.4 percent after the event occurred, but these results are not statistically significant.

Around this event study it is difficult to infer with a reasonable degree of confidence that the increase of interest rates on the 16th December 2015 had a negative impact on companies of emerging markets. While in both identification strategies the treated companies have negative abnormal returns after the event occurs, these results are not significant.

	Cumulative Abnormal Returns (%)	p-value (t-test)
Panel A: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 16th December 2015 – Treatment 1		
Treated Firms	-0.628 (0.612)	0.306
Non-Treated Firms	0.719*** (0.192)	0.000
Difference (T-NT)	-1.347* (0.800)	0.092
Total	0.643*** (0.184)	0.000
Panel B: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 16th December 2015 – Treatment 1		
Treated Firms	-0.628 (0.612)	0.306
Control Firms	0.818* (0.467)	0.081
Difference (T-C)	-1.446* (0.770)	0.061
Total	0.095 (0.386)	0.805
Panel C: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 16th December 2015 – Treatment 2		
Treated Firms	-0.412 (0.706)	0.566
Non-Treated Firms	-0.437 (0.716)	0.537
Difference (T-NT)	0.025 (1.008)	0.981
Total	-0.425 (0.503)	0.398

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 10- Event Study analysis around the announcement of increase in federal interest rates on the 16th December 2015.

This table presents the estimates of abnormal returns around the increase in federal interest rates on the 16th December 2015. The daily stock returns of the companies and index returns determine the "normal" stock returns and the difference between the actual returns and the "normal" returns determines the abnormal returns of companies around that announcement date. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2015. In this panel there are 204 treated companies and 3,430 non-treated companies. In Panel B, it is used the first identification strategy and

it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2015. In this panel there are 132 treated companies and 149 non-treated companies. In parenthesis the robust standard errors are presented.

Interpretation: This table reports an important result of this paper. Companies that are more susceptible to interest rate increases, the treated companies, show negative abnormal returns after the announcement of the increase on federal interest rates. This is true for both identification strategies. The behavior of the non-treated/control companies is different in both identification strategies: for the first one, the non-treated/control companies show positive and significant abnormal returns around the announcement, for the second one, the non-treated companies show negative abnormal returns around the announcement. In general, the results are not statistically significant.

4.2.3. Event Study 2: 21st March 2018

The last event study conducted is around the sixth consecutive US Dollar interest rate increase in less than four years. The announcement of this interest rate change led to a decrease of the S&P500 value of 2.10% on the same day.

Table 11 presents the cumulative abnormal returns of the treated and non-treated/control companies, the standard deviations and p-values around the increase in federal interest rates on 21st March 2018. Similar to the results presented in the previous event study, in the third row of each panel the differences between groups are also presented.

In panel A, the results of the treated and non-treated companies related to the first identification strategy are presented. From the panel, we can see that companies that had US Dollar denominated bonds before the announcement experienced negative stock returns, of -1.85 percent after the announcement occurred. Companies that did not have outstanding dollar denominated bonds also had negative stock performance after the announcement. While this impact was smaller compared to the treated companies the difference between both groups is statistically insignificant. The total group of companies had a negative response to the announcement of interest rate increases by the US. The average stock prices of companies in the sample decreased by about 1.5 percent and these results are significant at a 1 percent significance level.

In panel B, the results of the treated versus control companies are presented. The results indicate that the control companies have, on average, more moderate negative stock returns after the announcement of the interest rate increase by the US, when compared to the non-treated companies, and the result is significant at a 1 percent significance level. The difference between both groups is larger than in the previous panel, but it is still statistically insignificant. The total sample abnormal returns remained fairly unchanged compared to the previous panel.

In panel C, the second identification strategy is used, in which the treatment is allocated based on the share of outstanding US Dollar denominated bonds a company has before the event occurs. In this panel we can see that the treated companies had negative abnormal returns after the announcement of the increase in interest rates of about -1.8 percent. This result is significant at a 1 percent significance level. Looking at the non-treated companies, these appear to have negative abnormal returns of around -0.9 percent, significant at a 5 percent significance level. The difference between both groups is around -0.9 percent but this result is statistically insignificant.

	Cumulative Abnormal Returns (%)	p-value (t-test)
Panel A: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 21st of March 2018 – Treatment 1		
Treated Firms	-1.850*** (0.392)	0.000
Non-Treated Firms	-1.469*** (0.133)	0.000
Difference (T-NT)	-0.381 (0.578)	0.510
Total	-1.489*** (0.128)	0.000
Panel B: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 21st of March 2018 – Treatment 1		
Treated Firms	-1.850*** (0.392)	0.000
Control Firms	-1.130*** (0.426)	0.004
Difference (T-C)	-0.720 (0.579)	0.214
Total	-1.490*** (0.290)	0.000
Panel C: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 21st of March 2018 – Treatment 2		
Treated Firms	-1.792*** (0.505)	0.001
Non-Treated Firms	-0.864** (0.344)	0.013
Difference (T-NT)	-0.928 (0.603)	0.125
Total	-1.310*** (0.302)	0.000

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 11- Event Study analysis around the announcement of increase in federal interest rates on the 21st March 2018.

This table presents the estimates of abnormal returns around the increase in federal interest rates on the 21st March 2018. The daily stock returns of the companies and index returns determine the "normal" stock returns and the difference between the actual returns and the "normal" returns determines the abnormal returns of companies around that announcement date. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2017. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2017. In this panel there are 188 treated companies and 3,463 non-treated companies. In Panel B, it is used the first identification strategy and

it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. There 188 treated companies and 188 control companies in this panel. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2017. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2017. In this panel there are 136 treated companies and 147 non-treated companies. In parenthesis the robust standard errors are presented.

Interpretation: This table reports one of the main results of this paper. Companies that are more susceptible to interest rate increases, the treated companies, show negative abnormal returns after the announcement of the increase on federal interest rates. This is true for both identification strategies and the results are statistically significant at a 1% significance level. The non-treated/control companies for both identification strategies also show negative abnormal returns around the announcement of the increase in federal interest rate, but the impact is smaller for these companies compared to the ones that have/have above median share of outstanding US Dollar denominated debt in 2017. The results are statistically significant at 5% significance level.

While in the previous event study it was hard to make conclusions about the responses of the stock prices of emerging market companies to the announcement of the US Dollar interest rate increase, in this event study it becomes clearer. Using either one of the identification strategies it is evident that the announcement of increases in interest rates had a negative impact on emerging markets companies.

Companies that had outstanding dollar denominated bonds or that had above median share of outstanding dollar denominated bonds before both announcement of the increase in federal interest rates appear to have worse abnormal returns compared to other companies, even though the significance of this result is not strong. This difference is in line with the reasoning that companies that have outstanding dollar denominated bonds or above median share of outstanding dollar denominated bonds are more susceptible to interest rate changes and therefore the effect of these announcements on the stock returns of those companies is larger.

4.2.4. Difference-in-Difference: Accounting Profitability

In this section we present and discuss the results for the Difference-in-Difference analyses on accounting profitability. While the calculation for investment spending is straight-forward there are different accounting measures for profitability. Table 12 reports the yearly profit average (measured as Return on Assets) before and after the first increase in interest rates by the US on the 16th December 2015 and the change in accounting profitability after the announcement for the treated and non-treated/control companies. The clustered standard errors are reported in parenthesis.

In panel A, we compare the accounting profitability of the treated and control companies, before and after the first increase on federal interest rate in 2015 (related to the first identification strategy). In this panel we can see that treated companies both before and after the occurrence of the event have lower profitability levels compared to the non-treated companies. In this panel we compare mean values of accounting profitability, and the treated companies had an average profitability before the event of around 0.7 percent. This is significantly different from the median profitability value of 1.5 percent found in table 6. The difference between the mean and median values for the treated companies can reflect the existence of outliers in the sample that can alter and bias the results. According to this panel, before the event occurred the difference between treated and non-treated companies was around 1.6 percent, this difference is significant at a 1 percent significance level. After the event, the difference was reduced to 1.3 percent

Yearly Net Income/Total Assets (in percentage points)			
Panel A: Accounting Profit before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	0.7	0.7	0.0
Non-Treated Firms	2.2	2.1	-0.1
Difference (T-NT)	-1.6***	-1.3***	0.3
	(0.3)	(0.5)	(0.8)
Panel B: Accounting Profit before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	0.7	0.7	0.0
Control Firms	1.9	1.9	0.0
Difference (T-C)	-1.3**	-1.2*	0.10
	(0.5)	(0.5)	(0.4)
Panel C: Accounting Profit before and after the first increase in US federal interest rates in the end of 2015 – Treatment 2			
	Before	After	After-Before
Treated Firms	-0.1	0.6	0.7
Non-Treated Firms	1.5	0.9	-0.6
Difference (T-NT)	-1.5*	-0.3	1.2
	(0.9)	(0.9)	(0.8)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 12- Difference-in–Difference of firms Accounting Profitability before and after the increase in US Dollar Federal interest rates in the end of 2015 (16th of December of 2015).

This table presents estimations of the changes in average yearly accounting profitability of companies from the three years before the first increase in federal interest rates in 16th December 2015 to the first three years after it. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2015. In this panel there are 257 treated companies and 4,555 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this Panel there are 257 treated and 257 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2015. In this panel there are 138 treated companies and 119 non-treated companies. In parenthesis the standard errors clustered by country are presented.

Interpretation: This table shows an important result of this paper. We cannot conclude that companies with outstanding US dollar denominated bonds in the end of 2015/companies with above median share of outstanding US dollar denominated bonds in the end of 2015 (the treated companies) reduce accounting profitability after the

announcement of the interest rate increases in 16th December 2015 more than the non-treated/control companies. This table shows contradicting results to our predictions, but these are statistically insignificant.

which means there was a positive effect of the treatment on the treated of around 0.3 percent after the shock.

In panel B, the accounting profitability of the treated companies and the control companies, related to the first identification strategy, are compared. The same argument related to the difference between the mean and median of the treated companies is applied to this sample. In this panel, we see that the behavior of companies within the control group is different from the behavior of non-treated companies as those do not change the accounting profitability levels after the event occurred. The difference between treated and control companies was, before the event occurred, -1.3 percent. After the event occurred, as both treated and control groups did not change the levels of accounting profitability, the Difference-in-Difference between treated and control companies was around 0.1 percent. The results presented in the panel are not significant.

In panel C, we compare treated companies and non-treated companies used in the second identification strategy. The results seem to indicate that the treated companies responded better to the increase in interest rates compared to other companies. According to this panel, treated companies after the shock occurred, have 1.2 percent higher profitability compared to control companies. The results found in this panel are not significant.

The results from the three Difference-in-Difference analyses on accounting profitability are inconclusive, as these contradict the initial hypothesis of the effects of interest rate increases on emerging market companies. However, these are not significant. We argue that the results are likely to be motivated by noise around the selection of the companies into the treatment and control groups, on the fact that we have a small sample of companies and because it is difficult to measure accurately profitability of a company. Since we are not able to understand the true impact of federal interest rate changes on accounting profitability of emerging market companies, it is relevant go further in depth on this topic in order to understand the source of the problem.

Following the reasoning used in the previous Difference-in-Difference analyses, it is relevant to test the assumption of parallel trends on accounting profitability changes, to understand whether we can take conclusions from the results in this section or not. Table 13 presents the trends of accounting profitability for the past 10 years. The structure of the table is similar to the one of table 9.

This is another important check that makes us understand the accurateness of the accounting profitability results presented in table 10. For the first identification strategy, four and five years prior to 2015 the differences between the control and treatment groups are statistically significant at the 10 percent significance level. For the second identification strategy, the differences between non-treatment and treatment groups five and ten years prior to 2015 are statistically significant at the 10 percent significance level. From this analysis we conclude that the trends of the control/non-treatment and treatment groups are not parallel, which implies that the difference between the two groups has varied over time. This means that we cannot conclude about the differences between the two groups after the treatment occurs.

Accounting Profitability Trends			
Panel A: Acc. Profitability trends of control and treatment groups – Treatment 1			
Time Horizon	Control Mean [Median]	Treatment Mean [Median]	P-value of Difference t-test [Pearson X^2]
3 years prior to 2015	-0.814 [-0.289]	-0.728 [-0.396]	0.688 [0.269]
4 years prior to 2015	-0.755 [-0.310]	-0.779 [-0.476]	0.898 [0.077]*
5 years prior to 2015	-0.545 [-0.200]	-0.500 [-0.359]	0.800 [0.097]*
10 years prior to 2015	-0.45 [-0.191]	-0.468 [-0.306]	0.894 [0.146]
Panel B: Acc. Profitability trends of non-treatment and treatment groups – Treatment 2			
Time Horizon	Non-Treatment Mean [Median]	Treatment Mean [Median]	P-value of Difference t-test [Pearson X^2]
3 years prior to 2015	-0.538 [-0.188]	-0.854 [-0.316]	0.256 [0.207]
4 years prior to 2015	-0.557 [-0.197]	-0.839 [-0.364]	0.247 [0.109]
5 years prior to 2015	-0.358 [-0.139]	-0.6 [-0.290]	0.279 [0.084]*
10 years prior to 2015	-0.343 [-0.085]	-0.44 [-0.207]	0.573 [0.065]*

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 13- Trends in Accounting Profitability for control and treated companies: Mean and Median comparisons.

This table presents the means and medians of the yearly change in accounting profitability for companies of the treatment and non-treatment/control groups. In Panel A, it is compared treated and control companies using the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. In Panel B, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. The first row of each panel compares changes in yearly accounting profitability of companies going back three years before the first increase on federal interest rate. In the second row the same is performed but comparing changes in yearly accounting profitability of companies going back four years before the shock. The next rows have the same logic going back more years. The means of the variables are shown first, and the medians are shown in brackets. The last column reports the standard t-test and the Pearson X^2 is reported in brackets.

Interpretation: This table presents the long run trends in accounting profitability of the different groups used on our analyses. We can see that in general the different groups did not follow similar trends in accounting profitability over time, before the increase on federal interest rates.

The three different methods used help us understand specifically how emerging market companies are affected by the US Dollar interest rate changes. We can conclude that, in general, there is a reduction in investment spending of firms. This impact is stronger in companies that had outstanding dollar denominated bonds before the announcements of the interest rate increases. Also, we see that the short run performance of companies is affected. In general, emerging market stock prices reacted negatively to the announcements of federal interest rate increases.

5. Robustness

In this section we will present the different robustness tests used to guarantee the veracity, strength, and certainty of our results. We used four different tests to do this: first, an analysis on the results without the financial companies in the sample; second, an analysis on the results using another caliper width in the matching procedure; third, a non-surprising event check and four, a Difference-in-Difference analyses using a different profit measure.

5.1. Removing financial companies from the sample

A relevant robustness check is to understand whether the results change if we delete financial companies from the sample. Like we explained in the data collection section, we chose not to drop financial companies from our sample because of sample size issues. The decision to keep financial companies in the sample is different to what the literature followed, for example, Almeida and Campelo chose to these companies from the sample. Because we are diverging from the literature in this aspect, it is important to check whether the results change when we drop financial companies from the sample. Because we got weaker and more contradicting results on the Difference-in-Difference analyses compared to the event studies (especially on the accounting profitability analysis), we chose to analyze only the changes in the results of the Difference-in-Differences. The industry classification codes used were from Datastream, and we deleted companies that were Bank/Savings and Loans, Insurance, and Other Financial companies (codes 4, 5 and 6, respectively) from the sample. We performed a similar analysis to the one from the results section with this sample. The results from the Difference-in-Difference analysis are displayed in tables A1 and A2.

Table A1 presents the Difference-in-Difference results for investment spending. Comparing this table with table 8, we conclude that the differences are fairly small, which means that just as for accounting profitability, the results associated with investment spending are also not affected by financial companies in the sample. Table A2 presents the Difference-in-Difference results for accounting profitability. When we compare this table with table 12, we understand that the differences are almost non-existent, which means financial companies are not changing or biasing the results described in Section 4, related to accounting profitability.

This robustness check allows us to conclude that in the two Difference-in-Difference analyses, the financial companies did not shape the results. We can infer that the same is likely to be true for the event studies conducted, since the sample of US Dollar denominated debt holders almost did not change and the decrease in the amount of non-treated companies was not significant.

5.2. Reducing caliper width used in matching

In this research we matched treated and non-treated companies using a caliper width of 0.6 of the pooled standard deviation of the logit of the propensity score. Previous papers have determined that the optimal width of a caliper was around 0.2 of the pooled standard deviation of the logit of the propensity score. Therefore, it is relevant to analyze whether the results of the Difference-in-Difference and of the event studies would change if we used the caliper width 0.2. Tables A3 and A4 present the results of the Difference-in-Difference on investment spending changes and the event study around the 21st of March 2018 using the alternative caliper, respectively. In these tables only the first identification strategy is showed since we do not perform matching in the second one.

Comparing table A3 to table 8, we can see that the results are still significant only the magnitude of the investment spending difference between groups is slightly lower. Using these tables, we conclude that companies with US Dollar denominated bonds outstanding decreased investment spending between 3 to 4 percent more than other companies.

Comparing table A4 to table 11 we can understand that the differences between both are minimal. The significance is similar in both tables and the effects of interest rates on the treated and non-treated/control groups is fairly unchanged. The treated companies have around -1.9 percent abnormal returns and the non-treated/control companies have around -1.5 to -1.1 percent abnormal returns after the announcement of interest rate increase.

From these analyses we conclude that the results are robust to the change of caliper width used in the matching procedure. This is because the results do not show large deviations using an alternative caliper width.

5.3. Non-Surprising Event

One of the assumptions of the event study is that the event itself must be surprising. The post reaction of the S&P 500 to the announcement of interest rate increases was used to measure this. We concluded that two announcements of interest rate increases were surprising, the one of 16th December 2015 and 21st March 2018 while the others were not.

Even though we found coherent results with the initial hypothesis in these two events, it is important to understand if the determination of a surprising event or non-surprising is well done, otherwise the results are not robust. To do this we perform an event study around an event which we considered non-surprising. We expect that around this event, the stock return of companies does not change significantly because this event is anticipated by people, and therefore it will already be priced into the stock market. If this is not the case, there is a problem with the determination of whether an event is surprising or not: either both events are non-surprising, and the information about these have been disclosed to the stock market before the announcements, making the CAR around the events incorrectly measured. Or both events were surprising, and our allocation strategy incorrectly allocated events into the different categories. Either way, we believe it is relevant to judge the accuracy of the allocation of events into surprising or non-surprising in order to make the results robust.

The second announcement of increase in interest rates, on the 14th December 2016, was used to conduct the event study for robustness purposes. Around this event, the S&P 500 almost did not move, and because of that we allocated this event into the non-

surprising event group. The same analysis is performed for this event as for the previous two events discussed in Section 4.

For the first treatment, we perform matching between treated and non-treated companies. There are 194 treated and 3,472 non-treated companies. Before matching, treated companies were statistically bigger, had higher leverage and more cash holdings. After matching, when we compare the 194 treated versus the 194 control companies these differences become statistically insignificant. Table A5 in the appendix presents the medians of the covariates used for matching, before and after the matching procedure. For the second treatment matching is not performed. There is a total of 281 companies in this sample, from which 134 are treated companies, and 147 are non-treated companies. In table 14 we present the cumulative abnormal returns around the announcement of increase in interest rates on 14th December 2016. Panels A and B are related to the first identification strategy while panel C is related to the second identification strategy.

In panel A, the cumulative abnormal returns of the treated and non-treated companies are presented. Treated companies after the announcement of the interest rate shift, seem to increase their returns by 0.74 percent, a statistically insignificant increase, while non-treated companies decrease returns by 0.32 percent, statistically significant at the 5 percent significance level. The total set of companies show a 0.26 percent decrease in returns after the shock occurred. In panel B, the cumulative abnormal returns of the treated and control companies are presented. The control companies behave similarly compared to the other panel, but significance is lost. The total set of companies now shows a 0.14 percent increase in returns after the shock occurred.

In panel C, the cumulative abnormal returns of the treated and non-treated companies of the second identification strategy are presented. Treated companies appear to have 0.66 percent higher returns after the announcement of the increase in interest rates, this is a statistically insignificant change, and non-treated companies have 0.79 percent higher returns after the shock; this is significant at a significance level of 5%.

With this event study it is difficult to infer any relation between the announcement of interest rate increases and stock returns of companies in emerging markets. This is in line with our prediction because this event is classified as a non-surprising event. These types of events should not play a strong role in the stock returns of companies as the capital markets have already priced them in before the shock occurred. Therefore, we can conclude with this robustness check that the allocation strategy used to determine whether an event is surprising or not seems to be accurate, and only with the surprising events one can make inferences about the true relation between the shock and its effect on the stock returns.

	Cumulative Abnormal Returns (%)	p-value (t-test)
Panel A: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 14th of December of 2016 – Treatment 1		
Treated Firms	0.736 (0.576)	0.203
Non-Treated Firms	-0.315** (0.133)	0.018
Difference (T-NT)	1.051* (1.051)	0.070
Total	-0.260 (0.130)	0.046
Panel B: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 14th of December of 2016 – Treatment 1		
Treated Firms	0.736 (0.576)	0.203
Control Firms	-0.453 (0.370)	0.222
Difference (T-C)	1.188* (0.685)	0.084
Total	0.142 (0.343)	0.680
Panel C: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 14th of December of 2016 – Treatment 2		
Treated Firms	0.663 (0.772)	0.392
Non-Treated Firms	0.791** (0.380)	0.039
Difference (T-NT)	-0.128 (0.837)	0.878
Total	0.730 (0.417)	0.081

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 14- Event Study analysis around the announcement of increase in federal interest rates on the 14th December 2016.

This table presents the estimates of abnormal returns around the increase in federal interest rates on the 16th December 2016. The daily stock returns of the companies and index returns determine the "normal" stock returns and the difference between the actual returns and the "normal" returns determines the abnormal returns of companies around that announcement date. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2016. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2016. In this panel there are 194 treated companies and 3,472 non-treated companies. In Panel B, it is used the first identification strategy and

it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this panel there are 194 treated companies and 194 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2016. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2016. In this panel there are 134 treated companies and 147 non-treated companies. In parenthesis the robust standard errors are presented.

Interpretation: This table reports one of the robustness checks performed in the paper. Around the announcement of increase in federal interest rate on 14th December 2016, treated companies seem to have positive abnormal returns while the other companies behave differently in both identification strategies. The results are very different from the two event studies presented in Section 4, which is a strong indicator that the distinction between surprising and non-surprising events was performed correctly.

5.4. Difference-in-Difference using a second profit measure

The previous sections made us understand that there were ambiguous results on the Difference-in-Difference analysis for accounting profitability using Return on Assets as the profitability measure. Therefore, we considered relevant to analyze whether the results would change and become more coherent, using another accounting profitability measure. We chose Net Profit margin, that is, Net Income divided by Revenues as the second profitability measure, as this differs from the other profitability measure in the denominator, that uses Revenues instead of Total Assets. While Return on Assets measures a company's ability to make investments in assets and to generate profits from these, Net Profit margin measures how well a company can generate profit from its revenues after all expenses are taken into account. We follow the same steps as in the previous Difference-in-Difference analyses.

For the first identification strategy, matching is performed, using the same quantitative and qualitative covariates as before. Table A6 in the appendix, presents the pre-treatment results of both identifications strategies. Panels A and B compare the results of the two groups of companies before and after the matching for the first identification strategy.

The differences between treated and non-treated companies found in panel A, become statistically insignificant after the matching procedure, in panel B. Panel C presents the characteristics of the treated and non-treated companies used in the second identification strategy. The companies are similar in all aspects except size, in which non-treated companies are statistically bigger than the others.

Table 15 presents the results of the Difference-in-Difference analyses using the alternative profitability measure. In the first identification strategy, panel A compares treated and non-treated companies and panel B compares treated and control companies. Using the second identification strategy, panel C compares treated and non-treated companies. From the different panels of table 15 we conclude that Net Profit margin as an alternative profitability measure to Return on Assets does not bring clarity to the effects of interest rates on companies of emerging markets. This is because the results in the different panels are in general not significant, and the sign of the Difference-in-Difference varies depending on the identification strategy used and on whether we are comparing non-treated or control companies. It is still ambiguous whether companies that had dollar denominated bonds decreased their profitability levels or not. Similar to the results using Return on Assets as the accounting profitability measure, we believe these results are strongly biased by outliers, which is why there are differences amongst panel results. The effects of outliers are also visible in the large differences between medians

Yearly Net Income/Revenues (in percentage points)			
Panel A: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	-2.0	-2.9	-0.9
Non-Treated Firms	0.3	-1.1	-1.4
Difference (T-NT)	-2.3	-1.8	0.6
	(1.7)	(1.9)	(2.5)
Panel B: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	-2.0	-3.0	-1.0
Control Firms	0.7	0.7	0.0
Difference (T-C)	-2.8	-3.7	-0.9
	(2.2)	(2.4)	(3.2)
Panel C: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 2			
	Before	After	After-Before
Treated Firms	-6.2	-3.3	2.9
Non-Treated Firms	2.8	-2.4	-5.2
Difference (T-NT)	-9.0***	-0.90	8.1*
	(3.2)	(3.7)	(4.9)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table 15- Difference-in–differences of firms' alternative Accounting Profitability before and after the increase in US Dollar Federal interest rates in the end of 2015 (16th of December of 2015).

This table presents estimations of the changes in average yearly accounting profitability of companies from the three years before the first increase in federal interest rates in 16th December 2015 to the first three years after it. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2015. In this panel there are 253 treated companies and 4,513 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this Panel there are 253 treated and 253 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2015. In this panel there are 135 treated companies and 118 non-treated companies. In parenthesis the standard errors clustered by country are presented.

Interpretation: This table reports an important robustness check conducted. Using an alternative measure of accounting profitability does not change a lot the results found on the previous section. We are still unable to conclude on the impact of the increase in federal interest rates on accounting profitability of emerging market companies.

(presented in table A2 in appendix) and means (presented in the first column of table 15) of treatment and non-treatment/control groups.

This robustness check is the final assessment to try to capture the true effect of the increase in interest rates on emerging markets. This test does not allow us to make conclusions about the relation between interest rates and profitability of companies, and whether bond issuers are more susceptible to the increases or not.

6. Conclusion

The goal of this thesis was to shed light on the possible consequences of interest rate changes by the United States on companies in developing economies. We used the increases in Federal interest rates, that started in 2015 and lasted until 2018, as an exogenous shock to measure the consequences of this in terms of stock returns, investment spending and accounting profitability of companies in emerging markets. Because companies are affected differently by the changes in international interest rates, we divided them into two different groups, one of which was more susceptible to these changes and another that was less susceptible. We used the companies' outstanding amount of US Dollar denominated bonds as a measure of the susceptibility to interest rate changes.

We wanted to understand whether there were specific channels by which companies were more affected by interest rate changes or not and whether companies were affected differently by these changes. We conclude that the channel through which companies are affected by interest rate increases is mainly investment spending. Companies reduce considerably investments, which we believe has a short run impact on performance, measured by stock prices.

The Difference-in-Difference analysis resulted in the conclusion that, in general, companies from emerging markets decreased investment spending in the years after the increase of federal interest rates. Companies that are more susceptible to interest rate fluctuations, especially the companies with outstanding US Dollar denominated bonds, showed significantly stronger decreases in investment spending compared to other companies. These companies decreased investment spending around 4 percent more than the others.

Using two different event studies, we concluded that, in general, the stock prices of companies in the studied sample were negatively impacted by the announcements of US Dollar interest rate increases. This impact is stronger when we consider only companies that are more susceptible to interest rate fluctuations. These companies had drops in stock returns between 0.5 and almost 2 percent after the announcements of the interest rate increases.

Different robustness checks were conducted in order to give more strength to the results. First, we concluded that the results were not impacted by financial companies in the sample or by the caliper width used in matching. Second, we concluded that the event studies were correctly defined as surprising or not, since the non-surprising event did not have a large impact on share prices of companies. This was another indicator that the results from the event studies seemed to be accurate. Third, we understood using an alternative measure, that the results from accounting profitability were not robust.

We can find significance in the results for the Difference-in-Difference analyses on investment spending changes and the event studies (primarily the event study around

21st March 2018). However, we cannot find any significance for the medium/long run performance analysis, measured as accounting profitability of companies. We believe this was a problem related to the data quality of the sample. Before starting this research, we were aware of the difficulties of working with emerging markets data. Amongst other limitations, we highlight the following aspects that we think were the ones that might have biased the results: lack of company lists from emerging markets, poor quality of company specific information and a dataset predominated by industrial and Indian companies. These problems resulted in a small sample of companies from emerging markets that issued and had US Dollar denominated bonds outstanding, which meant results were biased by outlier companies and some significance was lost. In fact, in a sample of around 4,500 companies, only 250 appeared to issue US Dollar denominated debt, which represents around 5.5 percent of the total sample.

Extensions to this research by collecting better company specific data and using other databases are important, in order to get a more accurate picture of the US Dollar issuers in emerging markets. We believe that having a better sample of companies can lead to stronger and more significant results, that are not biased by outliers which are visible in the differences between medians and means of the variables.

The goal of this research was to comprehend the changes in the behavior of companies in emerging markets when responding to increases in dollar interest rates. Even though there were data quality issues, we were able to conclude that, in general, companies must adapt to the increases in US Dollar interest rates. This effect is more extreme for companies that have larger amounts of outstanding US Dollar denominated bonds in their balance sheets before the announcements. Companies that have stronger international relations and that carry more business outside their countries are more likely to issue US Dollar denominated debt (the investors are also international) and these are the companies that are affected the most by the increases in interest rates.

Globalization keeps changing the way business is conducted which is positive for companies and consumers since there is more access to products and services everywhere. However, since monetary policies are decided at a national level, financing of companies can be affected by external factors that are out of the control of these companies. In fact, we see in this research that emerging market companies are impacted by the monetary policies that the United States conducts. This impact is seen through the reduction in investment spending of companies which impacts short run performance, measured by the stock price reactions.

The changes in monetary policy happen for the benefit of the country that conducts them and for the welfare of the own economy, but when these monetary alterations occur, it is relevant to understand the effects that these might have on other countries, especially the impact on vulnerable growing economies.

We try to shed light on the consequences that increasing the interest rates in a strong economy have on companies of emerging market economies. Even though these economies have been growing fast in the past years, and many business opportunities have been created, motivated by cheaper costs and less legislation, these economies are also vulnerable to external changes, and it is important to keep this effect under consideration when changing monetary policy in advanced economies due to spillover effects and negative consequences on EMEs.

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Appendix

Yearly Investment Spending (in percentage points)			
Panel A: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	20.1	15.4	-4.7
Non-Treated Firms	24.5	23.1	-1.4
Difference (T-NT)	-4.5**	-7.7***	-3.2**
	(1.4)	(1.6)	(1.3)
Panel B: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	20.1	15.4	-4.7
Control Firms	23.2	21.8	-1.4
Difference (T-C)	-3.2	-6.4***	-3.2*
	(2.1)	(1.2)	(1.4)
Panel C: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 2			
	Before	After	After-Before
Treated Firms	20.3	13.9	-6.4
Non-Treated Firms	19.7	17.1	-2.6
Difference (T-NT)	0.6	-3.2	-3.9
	(4.4)	(2.8)	(2.5)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table A1- Difference-in–Difference of firms' Investment Spending, excluding financial firms, before and after the increase in US Dollar Federal interest rates in 2015 (16th of December of 2015).

This table presents estimations of the changes in average yearly investment spending of non-financial companies from the three years before the first increase in federal interest rates in 16th December 2015 to the first three years after it. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. In this panel there are 219 treated companies and 3,847 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. In this Panel there are 219 treated and 219 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. In this panel there are 118 treated companies and 101 non-treated companies. In parenthesis the clustered standard errors are presented.

Interpretation: This table shows a robustness test conducted on this research. We conclude that dropping financial companies from our sample does not change the results. This is because these are similar to the results found in table 8 of Section 4.

Yearly Accounting Profitability (in percentage points)			
Panel A: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	0.6	0.6	0.0
Non-Treated Firms	2.2	2.0	-0.2
Difference (T-NT)	-1.6**	-1.4	0.1
	(0.6)	(1.3)	(0.8)
Panel B: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	0.6	0.6	0.0
Control Firms	1.2	1.0	-0.2
Difference (T-C)	-1.6	-0.4	0.2
	(0.5)	(0.9)	(0.6)
Panel C: Accounting Profitability before and after the first increase in US federal interest rates in the end of 2015 – Treatment 2			
	Before	After	After-Before
Treated Firms	-0.3	0.4	0.7
Non-Treated Firms	1.6	0.8	-0.8
Difference (T-NT)	-1.9	-0.4	1.5
	(1.0)	(1.1)	(1.0)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table A2- Difference-in–Difference of firms' Accounting Profitability, excluding financial firms, before and after the increase in US Dollar Federal interest rates in 2015 (16th of December of 2015).

This table presents estimations of the changes in average yearly accounting profitability of non-financial companies from the three years before the first increase in federal interest rates in 16th December 2015 to the first three years after it. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. In this panel there are 235 treated companies and 4,142 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. In this Panel there are 235 treated and 235 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2015. In this panel there are 128 treated companies and 107 non-treated companies. In parenthesis the clustered standard errors are presented.

Interpretation: This table shows a robustness test conducted on this research. We conclude dropping financial companies from our sample does not change the results. This is because these are similar to the results found in table 12 of Section 4.

Yearly Investment/Capital Stock (in percentage points)			
Panel A: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	21.3	16.4	-4.9
Non-Treated Firms	26.3	24.8	-1.5
Difference (T-NT)	-5.0**	-8.4***	-3.4**
	(1.6)	(1.6)	(1.4)
Panel B: Investment Spending before and after the first increase in US federal interest rates in the end of 2015 – Treatment 1			
	Before	After	After-Before
Treated Firms	21.3	16.4	-4.9
Control Firms	24.1	22.0	-2.1
Difference (T-C)	-2.7	-5.6*	-2.9*
	(1.9)	(2.5)	(1.4)

***,**,* indicates significance at 1%, 5% and 10% respectively

Table A3- Difference-in–Differences of firms' Investment Spending before and after the increase in US Dollar Federal interest rates in the end of 2015 (16th of December of 2015) using alternative caliper width.

This table presents estimations of the changes in investment spending using the alternative caliper width of 0.2 of the pooled standard deviation of the logit of the propensity score. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2015. In this panel there are 236 treated companies and 4,220 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this Panel there are 236 treated and 236 control companies. In parenthesis the clustered standard errors are presented.

Interpretation: This table shows that companies that have outstanding US dollar denominated bonds in the end of 2015 (the treated companies) have around 3 to 3.5 percent lower levels of investment spending compared to the other companies. This decrease in investment spending is statistically significant at 10 percent significance level. We conclude from this analysis that the results presented in table 8 Section 4 are robust to changes in caliper width used in the matching procedure.

	Cumulative Abnormal Returns (%)	p-value (t-test)
Panel A: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 21st of March 2018 – Treatment 1		
Treated Firms	-1.937*** (0.424)	0.000
Non-Treated Firms	-1.465*** (0.132)	0.000
Difference (T-NT)	-0.472 (0.579)	0.415
Total	-1.489*** (0.127)	0.000
Panel B: Cumulative AR and t-test of zero mean around the announcement of increase in federal interest rates on 21st of March 2018 – Treatment 1		
Treated Firms	-1.937*** (0.424)	0.000
Control Firms	-1.528*** (0.468)	0.001
Difference (T-C)	-0.409 (0.632)	0.518
Total	-1.732*** (0.316)	0.000

***,**,* indicates significance at 1%, 5% and 10% respectively

Table A4- Event Study analysis around the announcement of increase in federal interest rates on the 21st March 2018 using alternative caliper width.

This table presents the estimates of abnormal returns around the increase in federal interest rates on the 21st March 2018. The daily stock returns of the companies and index returns determine the "normal" stock returns and the difference between the actual returns and the "normal" returns determines the abnormal returns of companies around that announcement date. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2017. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2017. In this panel there are 187 treated companies and 3,525 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. There 187 treated companies and 187 control companies in this panel. In parenthesis the robust standard errors are presented.

Interpretation: This table shows that companies that have outstanding US dollar denominated bonds before the event occurs have negative abnormal returns of around -2 percent after the announcement of the increase on federal interest rates. The non-treated/control also show negative abnormal returns of around 1.5 percent after the announcement of the increase in federal interest rate. These values are statistically significant at 1% significance level. These analyses have similar results to the ones presented in table 11 of Section 4 which implies that the results are robust to changes in caliper width used in the matching procedure.

	Firm Size	Leverage	Cash Holdings	Acc. Profit
Panel A: Medians for the treated and non-treated companies in 2016				
Treated	14.513	0.372	0.059	0.012
Non-Treated	11.439	0.254	0.042	0.027
Difference	3.074	0.118	0.017	-0.015
T-test p value	0.000	0.000	0.000	0.022
Panel B: Medians for the treated and control companies in 2016				
Treated	14.513	0.372	0.059	0.012
Control	14.343	0.396	0.056	0.022
Difference	0.170	-0.024	0.003	-0.010
T-test p value	0.361	0.761	0.919	0.128

Table A5- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. In Panel A, it is used the first identification strategy that allocates companies to the treatment group based on whether these companies had outstanding US dollar denominated bonds in 2016. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds in 2016. In this panel there are 194 treated companies and 3,472 non-treated companies. In Panel B, it is used the first identification strategy and it is compared treated and control companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. In this panel there are 194 treated companies and 194 control companies. In Panel C, it is used the second identification strategy that allocates companies to the treatment group based on whether these companies have above median share of outstanding US dollar denominated bonds in 2016. Non-treated companies are defined as those that had below median share of outstanding US dollar denominated bonds in 2016. In this panel there are 134 treated companies and 147 non-treated companies. In parenthesis the robust standard errors are presented.

Interpretation: This table shows that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 1% significance level. These differences disappear when the comparison is done between the medians of the treated and control companies.

	Firm Size	Leverage	Cash Holdings	Acc. Profit
Panel A: Medians for the treated and non-treated companies between 2013-2015 – Treatment 1				
Treated	14.231	0.369	0.067	0.024
Non-Treated	11.231	0.274	0.047	0.028
Difference	3.000	0.090	0.020	-0.004
Median test p-value	0.000	0.000	0.000	0.605
Panel B: Medians for the treated and control companies between 2013-2015 – Treatment 1				
Treated	14.258	0.377	0.067	0.024
Control	14.306	0.382	0.075	0.037
Difference	-0.048	-0.005	-0.008	-0.013
Median test p-value	0.722	1.000	0.374	0.477
Panel C: Medians for the treated and non-treated companies between 2013-2015 – Treatment 2				
Treated	13.831	0.376	0.067	0.022
Non-Treated	14.818	0.367	0.067	0.038
Difference	-0.987	0.009	0.000	-0.016
Median test p-value	0.000	0.953	0.953	0.491

Table A6- Pre increase in federal interest rates tests of Treated, Non-Treated and Control companies between 2013 and 2015.

This table compares the medians of the various covariates used to match the treated companies with non-treated companies. The sample of 4,766 companies was divided in treated and non-treated companies. The treated companies are defined as those that have outstanding US dollar denominated bonds before the first increase in federal interest rates in the 16th of December of 2015. Non-treated companies are defined as those that did not have outstanding US dollar denominated bonds before the 16th of December of 2015. In Panel A there are 253 treated companies and 4,513 non-treated companies. Control companies are a sub-set of the non-treated companies and were the closest match with the treated companies using the following company characteristics: Firm Size, Leverage, Cash Holdings, Industry and Country. There are 253 treated companies and 253 control companies in Panel B. In Panel C, the identification strategy used is based on the share of outstanding US Dollar denominated debt that a company has. The treated companies are defined as those that have above median share of outstanding dollar denominated debt before the shock occurred. The other companies are allocated to the non-treated group. There are a total of 135 treated and 118 non-treated companies in this panel. The test used to compare the medians of the covariates was the Pearson X^2 statistic. The p values of the test can be found on the last row of each panel.

Interpretation: Regarding the first identification strategy, in Panel A we can see that the medians of the covariates for the samples of treated and non-treated companies are statistically different, at a 1% significance level. In Panel B we understand that these differences disappear when the comparison is done between the medians of the treated and control companies. Regarding the second identification strategy, in Panel C we see that treated and non-treated companies are similar to each other except on size. This difference in size is significant at a 1% significance level.