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ΣΧΟΛΗ ΔΙΟΙΚΗΣΗΣ ΕΠΙΧΕΙΡΗΣΕΩΝ
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The impact of Mergers & Acquisitions on CDS, Equity and Options Markets

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ABSTRACT

Credit Default Swaps have been the latest financial innovation of the century and during the financial crisis they became the fastest growing derivative product. Their valuation provides information on the credit risk of a corporate entity. The purpose of this study is to examine the impact of mergers and acquisitions on the CDS market and examine the relationship of the market with the equity and options market through the news of M&As announcements and the announcement of their completion or withdrawal. We conduct event study methodology on M&A events that took place in Europe or the United States from 2005 until 2018. The overall findings showed that the CDS and the equity market react before the news announcement of the M&A. The acquirer presents negative cumulative abnormal stock returns and positive abnormal CDS spread changes. The target exhibits the opposite results in a larger magnitude for both markets. On either the date of deal completion or deal cancellation, the acquirer did not show significant results. On the contrary, the target presented negative CARs only in the equity market after either deal outcome. In general, there was a lead lag relationship from equity market to CDS market and the options market did not exhibit any significant results. Insider trading was more often observed in the equity market, however during the financial crisis period, the credit default swap market exposed more information, significant results prior to the announcement and the lead-lag relationship between equity and credit default swap market was reversed.

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1. Introduction

This research paper aims to examine the impact of Mergers and Acquisitions on Credit Default Swaps and the relationship of the CDS market with equities and stock options. CDS have been the latest financial innovation of the century and during the financial crisis became the fastest growing derivative product and its liquidity has increased. Still the people that trade in the CDS market are basically financial institutions. Therefore, it is very interesting to investigate what impact could mergers and acquisitions have on CDS because a merger could change the credit risk of a company which could affect the value of a CDS contract. Moreover, the advisors of the corporations are the financial institutions that also trade in the CDS market. This could reveal information revelation or potential insider trading activity. Insider trading is the selling or buying of securities that result to abnormal returns in the market without a logical explanation based on the available public information. There are two views on insider trading. The positive view states that insider information is reflected onto shares prices, thus representing the fundament value of the firm (Meulbroek, 2007). On the contrary, the opposite view supports that insider exploitation creates huge loss for liquidity traders which upon their knowledge of insider information presence would discourage their investment activity and lead to an asymmetric market (Leland, 1992) M&As have been increasing the recent years in the corporate world even though there are merger waves relating to them depending on merger momentum and the state of the economy (Rosen, 2003). Since there are many reasons why merger and acquisitions take place regarding the intent of the company, there are many researches concerning the benefits and adverse effects of a merger whether it refers to the acquirer or the target corporate entity. The point of interest is how this affects the credit line of the firm relating to the CDS spread. Also, concerning information asymmetries we want to study if there is information leakage through abnormal returns in the CDS market before the announcement of the merger. This insider trading opportunity is important to know because the advisors of the companies are usually the ones that also trade in the CDS market. Efficient market hypothesis states that if we observe abnormal returns before an event occurs, then there is insider trading and market anticipation of the event. If prices react at the time of the event, then we have consistency with efficient market hypothesis. However if markets are slow in reaction and we observe abnormal returns after the event then we have a slow and illiquid market. Most of the research has been conducted on the reaction of

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stocks to mergers and it showed there is anticipation of merger announcement in the stock market. Mergers are important to study because they include a certain risk that could have an impact on the debt-holders of the company. In this research paper, we use event study methodology on US and European acquirer or target entities in order to examine the price impact on CDS, equity and options market around the events of a M&A announcement, around the date that the M&A was completed and around the date it was withdrawn. The dataset covers a period from March 2005 until August 2018 and the event window used was 5 days prior to the announcement and 5 days after the announcement (11 days in total). The overall findings showed that the CDS and the equity market react before the news announcement of the M&A. The acquirer presents negative cumulative abnormal stock returns and positive abnormal CDS spread changes. The target exhibits the opposite results in larger magnitude for both markets. On either the date of deal completion or deal cancellation, the acquirer did not show significant results. On the contrary, the target presented negative cumulative abnormal returns only in the equity market after either deal outcome. In general, there was a lead lag relationship from equity market to CDS market and the options market did not exhibit any significant results. Insider trading was more often observed in the equity market, however in examples where credit risk was an important issue like during the financial crisis period, the credit default swap market revealed more information, significant results prior to the announcement and the lead-lag relationship between equity and credit default swap market was reversed. In the remainder of this paper, we present related literature with our research, followed by the hypothesis setting. Afterwards, we describe our data and event study methodology followed by the empirical findings and the overall conclusions.

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2. Literature Review

2.1 Credit Default Swaps

CDS has been the latest innovation of the century in the financial markets and are part of the OTC market since they are not traded on an organized exchange. They are financial contracts similar to insurance contracts that offer credit protection against adverse credit events of an entity. Alan Greenspan (2004) in the HM Treasury Enterprise Conference in London stated that credit derivatives can offer stability and flexibility and make the financial market more resilient. They were introduced in the mid-1990s and they became popular in the late 1990s as a way to make it easier for Wall Street to bundle and package an ever more complex array of debt securities.

Their purpose is to allow market participants to trade risk associated with certain credit related events. (Longstaff et al., 2005) They are basically insurance type contracts where the protection buyer, who is also a holder of bond (corporate or sovereign) pays a fee (CDS spread) to a third counterparty (protection seller) every three months until the maturity of the CDS contract. The protection seller in case of the occurrence of certain events is obliged to pay back the notional of the underlining security. Such events constitute the case of bankruptcy, a debt restructuring or failure to pay financial obligations. The underlining securities are corporate and sovereign bonds. Credit Default Swaps are more likely to appear in reference entities with bonds fragmented into separate issues which is why they are also considered more standardized compared to bonds (Oehmke and Zawadowski, 2017). In the language of credit derivatives, you would purchase CDS protection on a company, the reference entity, for example, and if that company failed to meet its obligations for any of a predetermined set of its debt claims, default would be triggered and the payout would occur. More specifically, the CDS contract usually comprises a specific class of the firm's capital structure, such as the senior, unsecured, or junior debt obligations of the company, and references a particular amount of the insured debt, defined as the notional amount (Augustin, 2014). CDS or Credit Protection Contracts can be used to isolate the credit risk from other types of risks of the security and are also helpful for hedging long positions of securities. In addition, they can be used for liquidity purposes due to the separation between the two types of risks. They can also be used for speculative purposes which have been accused for destabilizing the economy of the past years of the financial crisis since they can speculate on whether a reference entity is going to perform well or worse with a

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consequence of affecting the price and the credit view of the firm. Over the past years, CDS market has been very opaque with Over the Counter standards. Moreover, trading on credit derivatives was confidential and the notional value of the contracts was also not recorded on the balance sheets of the financial institutions involved in the transactions. Consequently, the notional value of the CDS contracts was much higher than those of the securities they were protecting. The major players in the CDS market are financial institutions such as banks, hedge funds or insurance companies and dealers. The use of credit derivatives was trading, risk management, hedging or money-making activities.

2.2 Advantages and Disadvantages of Credit Default Swaps

In the credit derivatives market usually the most liquid contracts are those with an investment grade issuer (corporate entity) rating. CDS contract close to default are considered high yield, hence they have a very high fee which is reflected on the high CDS spread. So, investment grade CDS are issued and traded not necessarily because the holders of the underlining security are in need of protection in case of certain losses.

Reasons, why credit derivatives are performed in trading, could be that banks would like to improve their credit lines in order to provide loans for a firm and the CDS market can grant this liquid capacity. The opposite can also happen by selling credit protection when the corporate credit line is not being taken advantage of. In general, what the CDS market does is to allow traders to go short and transfer credit risk more easily. CDS can also be a risk management tool. If a bank cannot bear the burden of a loan with a firm or has been already too much exposed to the industry of the firm, then she can minimize the credit risk by buying CDS (Weistroffer, Deutsche Bank, 2009). Therefore, CDS contracts lead to lower transaction costs for a bank or downside risks. In addition, the high discretion of the market cannot harm the relationship of a financial institution with its clients. In other words, credit derivatives provide liquidity as banks can provide more loans or firms can issue more bonds since the risk from bankruptcy can be allocated elsewhere. The liquidity shocks generated by credit events are further amplified by the large concentration of the CDS market on intermediaries. Indeed, in the CDS market, a few protection sellers concentrate the large majority of transactions. These protection sellers will immediately face a liquidity shortage if the spreads of reference entities across a given sector move up or down at the same time (Cont and Minca, 2016). Other beneficial qualities of this financial product are that traders can avoid other types of

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risks such as interest rate risk and the CDS market is relative liquid in times of financial distress, when other security markets suffer for this. Lastly, it can be an accurate measure of pricing credit risk.

Nevertheless, we should consider some of the negative consequences of CDS. The fact that CDS contracts are a hedging instrument and offer credit protection against default and potential losses discourages the banks from monitoring the firms they are giving loans to (Acharya and Johnson, 2007). This limits the chances of resolving the problems of an entity and creates indifference on whether the firm should remain healthy or not. Moreover, CDS increase the cost of capital because the risk of default determined by the banks is based not only on short term interest rates but also on the spread of the credit default swaps. Also, their speculative nature can cause many problems because it creates an incentive to destroy value since the protection buyer could bet on the default of the entity. This problem can also cause a liquidity issue since in case of a financial crisis or recession the defaults and bankruptcies will exacerbate leaving the credit protection sellers with the inability to pay the CDS contracts. Banks hold more than a trillion dollars worth of CDS and many consider them a ticking time bomb. As the economy turned from boom to bust, credit markets froze and corporate bankruptcies began to increase, and the housing market collapsed and foreclosures began to escalate. A third disadvantage is the opacity of the market which it is gradually being solved in our days since contracts have been more standardized and information on CDS can be more easily accessed.

CDS markets are still very discreet so that banking relationships with clients are not harmed. There is a relative discretion on the whereabouts of traders and dealers of the market. Also, this type of form along with the fact that CDS can be traded and traded again and again causes counterparty risk it is unknown if the counterparty will be able to pay back its obligations in case of an adverse event (Partnoy and Skeel Jr, 2006). There is the danger of counterparty risks where the company on the other side of the contract won't or can’t pay up. Banks and insurance companies are regulated, but the Credit Default Swap market is not. Contracts can be traded and traded again, in the well-developed secondary market, without anyone ensuring that the buyer has the resources to cover the losses in case of default. In other words, although a CDS is set up to look like insurance, it is something completely different. Insurance companies are required to set aside sufficient reserves of capital to cover losses on their obligations.

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This is not the case with the CDS. There is no requirement that money be set aside to ensure payment of financial obligations. It is a promise to transact only and no one regulates or monitors the amount of additional financial liability of any of the market participants or whether they have the financial reserves to make good on their promises (McCord et al., 2011). Problems in the Credit Default Swap market could have a greater impact on the economy than the subprime meltdown. If bond insurance disappears or becomes more expensive, lenders may become more risk averse and lending standards tighten further. During the financial crisis, the CDS contract nature allowed the traders to bet on bankruptcies, even though the financial product was designed to protect from that. Due to the unregulated nature of the market, the contracts were trading continuously without providing the assurance that the counterparties could meet the obligations. This led to the bankruptcy of many insurance companies (McCord et al., 2011). The extensive use of leverage by swap dealers contributed to significant declines in their net worth as asset prices fell during the crisis. In response to severe capital losses, dealers actively adjust their balance sheets to manage their risk. Swap dealers can reduce risk through their trading activity in CDS by decreasing their sales and increasing their purchases of credit protection (Aragon et al., 2018). Due to this situation, nowadays, CDS have become more standardized, electronic processing and central clearing have increased and more research on CDS for this purpose has been conducted (Iosco, 2012).

The particularity of the CDS market is the fewer amounts of noise traders because of the nature of the product (credit risk) that is done mainly by banks or hedge funds (Acharya and Johnson, 2007). This can also relate to insider information because banks closely monitor their borrowers who are also their clients. Banks who shall have an earlier prediction of events could more easily incorporate this information in the CDS market and at an earlier point compared to the stock market, which leads to information leakage in the CDS market before the stock market (Norden and Weber, 2004). However, counterarguments state that CDS valuation depends on equity or option market implied volatility. According to Acharya and Johnson (2007), “informed traders might prefer CDS market over other types of market due to less danger of detection, easier to hedge credit in CDS instead of using corporate bonds or performing dynamic rebalancing of stocks that incurs higher transaction costs”. This lets Acharya and

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Johnson (2007) to make the suggestion that the CDS market leads the stock market. However, his research showed that it is valid only in the case of adverse credit events.

2.3 Relationships between markets

This was different in the research of Micu Et al. (2007) that performed an event study on CDS and credit announcements. They found that both positive and negative announcements affect CDS spreads. However, CDS spreads in negative types of events had a greater effect and mainly for entities with a speculative grade. They also referred to the relationship between the markets. They support that even though in negative announcements CDS rise and equity prices fall, we could have an opposite relationship in case of adverse announcements related to decrease in leverage. The rise in leverage transfers wealth from debt holders to equity-holders. So, it could cause both equity and CDS to increase, even though in majority there is a negative relationship between credit default swap market and equity market (Micu et al., 2007). Also, the type of announcement plays an important role. Micu Et al. (2007) proved that usually announcement for outlooks or reviews cause a significant effect instead of the actual rating announcement because reviews and outlooks usually precede the actual rating changes, hence the information has already been reflected in the market. Regarding the reviews for downgrades, similar results with those of Micu Et al. (2007) were documented from Norden and Weber (2004) and Hull Et al. (2004). Norden & Weber (2004) found that in negative credit rating announcements we have an anticipation of the information, since positive abnormal returns in the CDS market take place before the announcement window. Also, in positive announcements, there are significant results. Moreover, if two announcements are related, then we observe abnormal and statistically significant returns in the first one, just like Micu Et al. (2007) supported. Lead relationship was found in the pricing of the stock market (Fung et al., 2008). Informed investors tend to trade mainly in the stock market and that maybe informed traders use the equity market and liquidity traders the CDS market (Hilscher et al., 2013). Relative to the information flow, Berndt and Ostrovnaya (2007) states that we have to recognize the type of news that widen the credit spread and the impact they have on equity in order to decide whether the equity leads CDS market or not. We should also consider the adversity of the events and the volatility in the option market because this could crucially affect the CDS pricing (Berndt and Ostrovnaya, 2007). Hilscher Et al. (2013) found that that equity returns lead the market of CDS contracts,

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and supports that informed trading occurs in equity rather than CDS markets. This could be caused because some CDS are not traded every day. Berndt and Ostrovnaya (2007) found that the "conditional spillover from CDS and option to equity happens for mainly volatile and debt-deteriorating news". Berndt and Ostrovnaya (2007) also emphasize on the nature of an LBO (leverage buyout) because it increases both equity and CDS spread and CDS anticipates the information before the stock market and the result of the abnormal return is positive. In many studies, we do not have a clear relationship on which market leads. Norden and Weber (2004) found that the stock market leads the CDS market. Longstaff Et al. (2005) found also that there is no clear relationship between stock market and CDS market, but they both lead the corporate bond market. Acharya and Johnson (2007) highlighted on the importance of lead-lag relationships because they affect prices and liquidity. They find that changes in CDS spreads negatively predict stock returns. The information flow from the CDS market to the bond market is restricted to firms that experience adverse credit news and to days with negative information. Further, they show that the intensity of the information flow is stronger if the company has a greater number of bank relationships. The authors interpret this evidence in favor of insider trading in the CDS market by banks that exploit their private information obtained from bank-lending relationships. When negative credit announcements take place, Norden and Weber (2004) and Berndt and Ostrovnaya (2007) found that CDS leads the stock market and the option market (Berndt and Ostrovnaya, 2007) and the corporate bond market (Hull et al., 2004). Hull Et al. (2004) also supported that as the credit rating of the company is lower, the degree of anticipation is greater relative to the magnitude of the abnormal return. Ni and Pan (2011) also find that changes in CDS spreads can predict stock returns over the following few days. However, the pattern of predictability is asymmetric and driven mostly by those stocks that experience negative information in the CDS market (Ni and Pan, 2010). In addition to the level of CDS spreads, the slope of the term structure of CDS spreads, measured as the difference between the five-year and one-year CDS spreads, negatively predicts stock returns. Moreover, the predictability is more persistent than that of changes in the levels of spreads (Han et al., 2011). Boehmer et al. (2015) focus on the effect of CDS trading on equity market characteristics such as market liquidity and price efficiency. From an ex-ante perspective, CDS contracts may improve equity market liquidity because they represent efficient tools for risk sharing. CDS protection sellers can dynamically hedge their positions in equity markets through

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a delta hedging strategy. Thus, trading in the CDS market increases trading in the equity market. In addition, the ability to hedge may endogenously attract more investors into both markets. Alternatively, investors may choose the CDS market instead of the equity market to express negative views, thereby decreasing liquidity in the equity market (Boehmer et al., 2015).

CDS markets can also be dependent on options markets since CDS contracts are like an out-of the money put option. Carr and Wu (2010) discuss the similarities between put options and CDS, and point out a simple link between deep out-of-the-money put options and CDS contracts. Following such a logic, they show that CDS and options can be jointly priced (Carr and Wu, 2010). Implied volatility can be considered a valid determinant of the CDS spread (Cao et al., 2009), (Cremers et al., 2008). The forward looking character of options was validated by the research of Donders Et al. (2000) that volatility increases before earnings announcement dates (Donders et al., 2000). This has also been supported by the event study on split announcements and options volatility, conducted by Gharghori (Gharghori et al., 2017). Therefore, option trading can have access to insider information. On the contrary, Muravyev Et al. (2012) showed that the option implied volatility cannot predict or contribute to the price discovery in the equity market (Muravyev et al., 2012). There are several notable differences between those two types of derivatives. First, options typically have a shorter maturity. The most frequently traded options have a 3-month maturity while 5-year CDS contracts are the most liquid. Second, options are exchange-traded but CDS are traded OTC. Third, the CDS market consists purely of institutional investors while both institutional and individual investors trade options. The introduction of CDS may also impact the option price, liquidity, and market efficiency (Augustin, 2014).

2.4 Mergers and Acquisitions

Over the last several decades, cross-border merger and acquisition activities have increased sharply and become an important tool for capital reallocation of multinational entities. While financial liberalization, government policies and regional agreements have provided an impetus for multinationals to expand overseas, at least three reasons stand out for cross-border M&As: 1) efficiency gains, resulting from increased economies of scale or scope; 2) strategic gains, which arise if M&As change the market structure and thus a company's competitive position and profit level; and 3) cash flow diversification, which improves a firm's probability of covering fixed charges in

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varying market conditions. In all cases, firms will engage in M&A activity if it results in increased shareholder wealth for the acquiring company (Ismailescu and Col, 2016). Recent studies indicate that, on average, cross-border acquisitions experience an increase in the value of the combined firms relative to their pre-acquisition value. However, a big fraction of the combined gains, at least in domestic M&A transactions, accrue to target-firm shareholders, while acquirers' returns are generally either immaterial or significantly negative. The asymmetry in the distribution of gains in favor of target-firm shareholders is an unsolved puzzle for the shareholder wealth maximization theory (Ismailescu and Col, 2016). Mergers usually represent reallocation of assets either within or across industry. Many research questions are composed on whether they create or destroy value and for whom. For this reason, many studies have been conducted on the stock market reaction to mergers. Some evidence on mergers show that if the equity price of the acquiring company falls after the merger announcement, it implies that the market participant doubt the benefits of this merger. In addition, stock financing of the merger signals a pessimistic view of the prospects of the events, hence usually the equity price of the corporate entity declines when stock financing is announced. Mergers also depend on the effect of previous mergers causing momentum. Also the rationality of the shareholders plays an important role to the prices after the announcement has happened. In most cases, when M&A is announced the acquirer's price falls and the target's price rises. In merger events we could have cases of insider trading. Also, when a merger is anticipated, then the price of the target company is overvalued (positive returns are observed). According to Levy and Yoder (1997), significant abnormal pre-announcement (two days prior to the event) returns are observed only in the case for the targeting entity on both the option-implied standard deviation and the equity returns (Levy and Yoder, 1997). The bidding firm shows no significant results. Ascioglu Et al. (2002) found that before a merger announcement we have an increase in the trading volume of stocks and no narrowing in the bid-ask spread that could indicate use of private information in order to trade especially for the target of the deal (Ascioglu et al., 2002). More generally, we observe that there is an increase in volatility mostly for target firms because they have more to gain by a merger (Dodd, 1980), (Asquith et al., 1983).

One of the benefits of mergers is that it lowers the borrowing costs; hence it lowers the cost of capital because when two companies merge then the other firm can guarantee

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the debt of the other firm. This is favorable for the debt-holders but the equity holders have nothing to gain from it. Scholtens and De Wit (2004) in his study showed that targets in the banking sector realize significantly higher returns than bidder banks do but the proportion of the target and bidder returns is not the same for US and EU (Scholtens and de Wit, 2004). With respect to the US, there are important differences in target and bidder abnormal returns. US acquirer banks realize negative abnormal returns, whereas target banks earn very high returns in the period of a merger announcement. Same results are supported by Hagendorff, Et al. (2008) who states that European acquirer firms gain because their targets dwell on a weaker investor-protection environment (Hagendorff et al., 2008). Dodd (1980) takes further talking about the targets and the outcome of the merger stating that in target will have negative returns only in cases of deal withdrawal. For bidding firm, either in the event of completion or cancellation the returns are negative.

According to Gropp Et al. (2011), the credit rating has an effect on the impact that M&A has. Gropp Et al. (2011) supported that investment grade acquirers have negative CARs but high yield corporations have positive CARs and unrated firms achieve even higher results. This is justified as the support credit rating agencies to bondholders. Nevertheless, S&P stated that huge investment firms can bear the disadvantages of M&A, while smaller firms may be hurt by credit deterioration. This is also based on the market position, the operating performance and product diversification. "U.S. M&A volume grew to more than $1.1 trillion in 2006 from about $277 billion in 2003 before dropping precipitously during the financial crisis in 2008 and 2009. The boom during 2006-2007 resulted from a low-interest-rate environment, narrow corporate borrowing spreads, and lofty equity valuations. Moreover, investors had grown more comfortable with aggressive leverage. Since the Great Recession of 2008-2009, the pace of recovery has been relatively muted, with 2011 being the strongest year for M&A" (S&P Rating Services, 2013).

Besides the effects of M&A in the stock market, there is significant research in options as well. Significant increase in the trading activity of call and put options occurs for companies involved in a takeover prior to the announcement of an acquisition or merger. The increased trading suggests that there is a significant level of informed trading in the options market prior to the announcement of a corporate event. In addition, abnormal trading activity in the options market appears to lead abnormal

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trading volume in the equity market (Jayaraman et al., 2001). The reason that option markets lead the stock market is due to its benefits. It offers low transaction costs and highly leverage positions that cannot be easily replicated elsewhere with the same pay-offs. These conditions make informed traders to prefer the options market (Jayaraman et al., 2001). According to Levy and Yoder (1993), information goes first in the options market and then in the stock market due to the presence of arbitrageurs. In particular, when we have an upcoming merger there is insider trading due to the large number of people participating in the negotiating process.

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3. Hypothesis Construction

Based on previous research, we believe that markets are efficient and the reaction on the news on the day of the announcement and before. Meanwhile, we hypothesize that neither the bidding firm nor the target firm exhibit any significant results after the date effective but it will show significance reaction after the incident of a withdrawn deal. Furthermore, we believe that the equity and the credit derivatives are inversely related. Meanwhile, we expect that when the CDS abnormal changes are positive, then the changes in implied volatility will also be positive. As a result, the following hypotheses are constructed:

H1a: Prior to the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the announcement of the Merger and Acquisition but react after the event.

H1b: During the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the announcement of the Merger and Acquisition but react after the event.

H1c: After the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the announcement of the Merger and Acquisition but react after the event.

H2: We do not except any significant returns on the days around the date effective of the deal for all the markets.

Since the Merger and Acquisitions was already announced, the completion of the deal should not convey any new information for none of the three markets.

H3a: Prior to the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the withdrawal of the Merger and Acquisition but react after the event.

H3b: During the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the withdrawal of the Merger and Acquisition but react after the event.

H3c: After the Financial Crisis of 2007-2012 CDS, Equity and Option markets do not anticipate the withdrawal of the Merger and Acquisition but react after the event.

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Moreover, regarding the sub-sampling by the region, we consult previous researches and we hypothesize that in the case of European acquirers we expect them to have gains hence negative spread change after the announcement of an upcoming merger and acquisition. Also, we expect that the high yield rating companies will have a greater effect on the CDS market and that this magnitude should also be reflected on the other markets.

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4. Description of the Data Set & Methodology

4.1 Data Set

The data set is comprised of corporate CDS spreads and information on Merger and Acquisition events related to the reference entities of the CDS spreads. The dataset also included corresponding equity stock prices and implied volatility data from the stock options market. The M&A deal events were downloaded from the Thomson Reuters database. Our interest focused on the announcement date of an upcoming deal and the announcement date of the deal outcome either that included the completion of the deal or its cancellation. Therefore, we have to examine three different events: the announcement, the date effective (the completion of a successful deal) and the date withdrawal (cancellation of the deal with termination of negotiations. Meanwhile, data on CDS, equity and options market were formed by using the Thomson Reuters Datastream database.

The credit default swaps data consisted of 614 reference entities (single name CDS contracts) located on either the United States or Europe. Some of the mains sectors the entities are involved in are the financial (excluding banks) sector, the banking sector, manufacturing and services.

(Insert Table 1)

For the CDS market, we downloaded the daily mid spread 5-year quote of modified restructuring type and senior unsecured since they are considered the most liquid of the market. Modified restructuring refers to the types of restructuring that can trigger a credit event. In this form, not all debt restructuring are considered credit events and the activation depends on the time it happens compared to the contract's maturity. In Europe, the restructuring types are called "modified modified" which uses more flexible terms compared to the MR of US corporations. With regards to seniority, we use the senior unsecured type which means the seniority of the creditor has priority to be paid in case of default. The unsecured nature of the contract means that in case of bankruptcy there is no specific asset collateral for claim. The currency of CDS was either euro or US dollar and it corresponded to the origin of the firm, even though currency did not

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play a crucial role on the spread. Moreover, we categorized the single name CDS based on their credit rating to investment grade and high yield. We consulted the Moody's ratings for this sub-grouping. Data on the ratings was used from Thomson One database. Long term ratings from Aaa to Baa3 are considered investment grade ratings and those of Ba1 and below are speculative grade ratings.

The time period we took into consideration started on March 21st, 2005 and lasted until August 31st, 2018 for the majority of the credit derivatives. An important note on the dataset for our CDS sample is that Thomson Reuters Datastream uses two sources for the CDS market. For January 1st, 2004 until December 14th, 2007 it uses the CMA database. Afterwards, it merged with CMA and it has its spread quotes extracted by the prices formed by major market markets. Therefore, data before December 14th, are from the CMA database however not all firms have data, so we excluded any deal events with entities that did not have the corresponding data. The indices used for our analysis are the European iTraxx continuous series of a five year tenor. iTraxx includes two indices: the "iTraxx Europe" which includes 125 most liquid and investment grade European companies and the "iTraxx Crossover" that is comprised of 30 European entities with a speculative grade. For US entities we used the DJ North America 5-year index for High Yield and Investment Grade companies obtained by Markit through the Datastream database. For all the CDS indices, besides the Markit North America High Yield Index, the dataset starts for March 21st, 2005 while on US HY yield rating starts from March 28th, 2006. As a result, the events earlier of this date that involved American high yield firms were excluded from the sample.

For the M&A events we downloaded data regarding the date that the deal was announced, the date that was completed and the date it was withdrawn if such event was applicable. Further information included the acquirer and target names, their sectors, their location and the form of the deal. Our data set is consisted of 3291 events of M&A announcements either completed or withdrawn download from Thomson Reuters Database for the time period of 21st March, 2005 until August 31st, 2018. This final number was formed by a tedious process of data cleaning based on the sources available, the index dataset for each market category that could have a different start date of data. Consequently, our events for the initial announcement of the deal are less due to lack of data on dates preceding the date effective or the date withdrawal. As it

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was mentioned before CDS quotes start dates are not the same and the high yield North American CDS index starts on the end of March 2006.

In general, our sample regarding the bidding firm is composed of 3274 M&A announcement events, 1070 announcements during the pre-crisis period (2005-2007), 1538 announcements during the crisis period (2008-2012) and 666 announcements during the post crisis period (2013-2018). Moreover, during the pre-crisis period we had 896 deal completion events and 50 withdrawn deals, during the crisis period we had 1519 deal completion events and 95 withdrawn deals and during the post crisis period we obtained 688 completed deals and 43 withdrawn deals. Events involving the target include 470 deal announcement dates, 101 announcements during the pre-crisis period, 176 announcements during the crisis period and 193 announcements during the post crisis period. During the pre-crisis period we had 59 deal completion events and 16 withdrawn deals, during the crisis period we had 149 deal completion events and 29 withdrawn deals and during the post crisis period we obtained 172 completed deals and 32 withdrawn deals.

The firms involved in the deals are active in various industry sectors. As we can observe, most of them participate in the financial sector, the technological sector or in the industrials area (see table 2 below). Please see below the number of events performed in each industry whether it refers to deal completion or deal withdrawal.

(Insert Table 2)

Furthermore, the deals include the following forms: Mergers, Acquisitions, Acquisitions of Majority Interest, Acquisitions of Minority or Remaining Interest, Buybacks and Exchange offers. In the event dataset, we discover that most of the M&A events take place in the United States and fewer in Europe. See the followings tables for the deal form and region of the M&A events:

(Insert Tables 3a & 3b)

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The previous data are important for performing an event study on CDS. For equity markets we downloaded the corresponding stock prices on event sample utilized for the CDS event study. It is important to highlight that initially more deals were downloaded; however the data set went through some cleaning. We took out equities that had few data on stock prices or had records of zero log returns for a great period of time. This was critical in order not to have data that would implicate with our sample and result in biased finding. We downloaded the stock price from Thomson Reuters Datastream. Regarding equity indices we used the S&P500 composite index for US firms and the Euro Stoxx 50 for European entities.

For the options market, we used the interpolated implied volatility of one month constant maturity and the corresponding volatility for the delta 25 put option. The time series of this dataset was far more eliminating compared to CDS or equity since many firms have data starting on different dates. This shrunk the event sample to 1539 events. More precisely, for the bidding firm we had 1458 announcement events in total, 10 announcements in the pre-crisis period, 934 announcements during the crisis period and 514 announcements during the post-crisis period. During the pre-crisis period we had 11 deals completed and 1 deal withdrawn, during the crisis period 894 of deals were completed and 47 cases of deals withdrawn, while in the post-crisis period we obtained 544 completed events and 42 deals were withdrawn. Meanwhile, the target event for options are composed of 159 deal announcements, 143 effective M&As and 44 withdrawn mergers. The small data sample does not allow us to make much analysis for different groups and we must also conduct a separate comparison for the other markets (CDS and Equities) too. The indices used for this purpose were the options of the equity indices (S&P 500 and Euro Stoxx 50). Data on the US option started on December 5th, 2007 and on the European option index on June 16th 2006.

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4.2 Methodology

We will study the impact on each market around three events. One event is the date that a deal is announced. Afterwards, we have one of the two possible outcomes: either the completion of the deal which is the date effective or the cancellation of deal which is date withdrawn. For the event study, we will use a time period window of five days prior to the event and five days after the event. In other words, we will study an eleven day window period around each announcement. In order to avoid data contamination, we will study only cases where the time period between the two dates (date announced and date effective or withdrawn) exceeds 11 days. In this case, we isolate the effect of the post-event period and the pre-event period of the dates co-existing. This problem was also resolved in the researches of Hull Et al. (2004), Norden and Weber, (2004) and Micu Et al. (2007) (Hull et al., 2004), (Norden and Weber, 2004), (Micu et al., 2007). Please find below an example of an event study methodology

(Insert Figure 1)

Overall, we will use the cumulative abnormal result for each market (credit derivatives, equities and options). For equities, we will calculate the abnormal returns using the single index market model as Norden and Weber (2004) performed in his event study. With the stock price data set the logarithmic returns are calculated. Afterwards, a regression is performed based on the single index market model, as follows:

$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ (1)

R_{it} =log return of $stock_i$ on time t

R_{mt} =log return of market index m on time t

α_i & β_i are the estimates of the regression for stock i.

With returns of each stock and the returns of the index we will use a regression to calculate the betas (β_i) and alphas (α_i). It is essential to highlight that the estimation

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period used in this event study is the whole time period covered in the data set. This method is different than previous event studies that use a long time period before the event period, because the goal is to use a stable beta that could reduce any bias. Afterwards, we will calculate the expected returns during the event study period [-5, 5] with the estimated alphas and betas and the return of the market index for the given time. Then, we will subtract the realized (actual) return from the expected to find the abnormal.

$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$ t=-5,-4,-3,-2,-1,0,1,2,3,4,5 (2)

AR_{it} is the abnormal return at time t where t refers to one of the days prior to the event, on the event or after the event. Then, we add the abnormal returns of the each day to the sum of the previous time to find the cumulative abnormal returns.

$CAR_i, (t_0, t_i) = \sum AR_i(t_i)\ t_i\ t_0$ t_0 =-5 & t_i =-5,-4,-3,-2,-1,0,1,2,3,4,5 (3)

For the CDS abnormal spread changes we use absolute spread change of the given CDS. So we subtract the spread of the previous trading day from today's date and we do the same from the index according to the origin of the CDS (US or European) and its rating (investment or speculative grade). To find the abnormal spread change we subtract the change of the index from the change of the single name CDS. Then we proceed just like on the equity CARs to calculate cumulative abnormal spread change for the each day on the event window. The formulas utilized for the process are written below:

$ASC_{it} = (CDS_{it} - CDS_{it-1}) - (IND_{it} - IND_{it-1})$ t=-5,-4,-3,-2,-1,0,1,2,3,4,5 (4)

$CASC_i, (t_0, t_i) = \sum ASC_i(t_i)\ t_i\ t_0$ t_0 =-5 & t_i =-5,-4,-3,-2,-1,0,1,2,3,4,5 (5)

In the options market, we execute the same procedure as in the credit derivatives spread changes. We use the option implied volatility for the delta 25 out-of-the-money put. Then, we do the same for the put option skew. In order to calculate the skew we subtract

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the At-the-money delta implied volatility of the put option from the Out-of-the-money 25 delta put implied volatility with a 30-day constant maturity both deltas. The next steps are followed in order to derive the implied volatility cumulative abnormal changes:

Implied Volatility Abnormal change

$AIVC_{it}$ =IV(OTM PUT)$_{it}$ –IV(OTM PUT)$_{it-1}$ -((INDIV(OTM PUT)$_{it}$ –INDIV(OTM PUT$_{it-1}$))

t=-5,-4,-3,-2,-1,0,1,2,3,4,5 (6)

$CAIVC_i, (t_0,t_i)= \sum AIVC_i(t_i)\ t_i\ t_0$ t_0 =-5 & t_i =-5,-4,-3,-2,-1,0,1,2,3,4,5 (7)

Volatility $Skew_t$ = IV(OTM PUT)$_{it}$ –IV(ATM)$_{it}$ (8)

The next step in our research is to statistically test all the cumulative abnormal returns or changes during the 11-day event period to determine their significance. We will conduct standardized cross sectional t-tests to test whether the mean is statistically significant from zero or not, Wilcoxon non-parametric test to test the median and rank sum test to test the distribution between the different group categories just like Norden and Weber (2004) performed in their study (Norden and Weber, 2004).

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5. Empirical Findings

In this section, we monitor the market reaction of each event type in the CDS, equity and options market. We conduct a separate analysis on the cumulative abnormal returns of the acquirer and the target for the eleven day event window [-5,+5]. At first, we conduct a comparison of the CDS and the equity market because their datasets consists of more events, followed by the analysis on the options market.

From the sample we excluded the deals involving buybacks, exchange offers and acquisitions of partial and remaining interest. By isolating buy-backs, exchange offers and acquisition of partial or remaining interest we found out that those results do not offer a lot of information to the sample, especially in the CDS market. Moreover, buybacks and exchange offers have the same target and acquirer in each event which could cause a bias in our sample. When their significance was tested, we found no significant returns on the credit derivatives or equity market. Therefore, for robustness purposes we decided to eliminate them from the remaining research.

Our results regarding the total image do not differ compared to before the exclusion of the form types mentioned above however we can have a better picture since the forms we are examining are mergers and acquisitions of a huge or the whole share of the target firm. Nevertheless, this new smaller dataset limits the analysis on the target regarding some group categories.

5.1 M&A Announcement and Outcome Overall Effect

On the CDS market during the period that the M&A was announced, there is significant information around the entire event window [-5,5] for the acquirer during the crisis and the post-crisis periods. During the crisis period, for Day (-4) the cumulative abnormal spread change was 0.84 while during the period [-3,1] the average cumulative ASC was 2.97 with a significant change from the day before the announcement until the day after the announcement. The most significant information is seen on the post event window with an average cumulative spread change of 4.69 basis points. In general, the days after the announcement day are more significant compared to the previous days. Also, the Wilcoxon non-parametric tests prove that the post event effect is stronger. During the post-crisis period, we do not observe as significant changes as during the years 2008-2012.

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On the target side, during the crisis period we observe that for the period [-5,2] the cumulative ASC are positive an insignificant. From the date before the announcement and afterwards the CASCs become negative reflecting the theory and from the announcement date until Day (5) the results have a one percent significance level. On day zero the ASC is -26.26 basis points and after that day the average cumulative ASC is -37.20 bps and significant at 1% level. The same results are present during the post-crisis period, after the announcement day the average cumulative spreade change is -21.73 bps, significant at 5% level. These results show the absence of insider trading on the CDS market regarding the target entity.

(Insert Tables 4a, 4b, 4c, Figures 2a, 2b & 2c)

On the equity market, the results are different. For the acquirer, during both pre-crisis and crisis periods, there are negative returns just as we predicted, even though the negative CARs do not surpass the -0.51% but they are significant at 1%, 5% and 10% level for the event period of [-4,5] for pre-crisis period and [-4,-2] for the crisis period. This proves the presence of insider trading on the equity market. On the target side, just like on CDS we see that the sign changes from one direction to another on the day of the event. Here, the CARs turn from negative to positive and become 1% significant for the period [0,5]. During the crisis period from Day (-5) until Day (-1) the average CAR is -3.64% while afterwards the average CAR is 6.80% and during the post-crisis period we can observe that from Day (0) until Day (5) the average CAR is 14.42%. In other words, we see a huge reaction of the market during the day of announcement; no information was leaked into the market previously.

(Insert Tables 5a, 5b, 5c, Figures 3a, 3b & 3c)

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Regarding the date that a deal is completed we observe no significant results neither for the acquirer not the target side on the CDS market. Our sample is composed of 757 biding firms and 11 target entities during the pre-crisis period. On average, acquirer side achieves an average of -1.43 bps cumulative ASC, while the target is experiencing an average of 11.17 cumulative ASC. During the crisis period we observe 1220 biding firms and 41 target entities. On average, acquirer side achieves an average of 2.08 bps cumulative ASC, while the target is experiencing an average -4.59 bps cumulative ASC. Finally, during the post-crisis period these numbers are -0.77 bps and-0.68 bps respectively for 475 acquirers and 21 targets. On the equity markets, the returns are interesting on the target side. On the acquirer, we have insignificant results and slightly negative which agrees with the theory.

On the case of withdrawn deals we do not discover many significant results. The sample includes 143 acquirers and 43 targets. On the CDS market we find negative cumulative ASCs and only on the day before the event the ASC is significant and at -2.56 basis points. On the target firm, spread changes are positive and insignificant and only on day (-4) the cumulative ASC is significant at 5% level and at 5.32 bps. When we watch the equity market, there are slightly positive but insignificant returns regarding the acquirer firm, but for the target entity the CAR after day zero are negative and statistically significant with an average CAR of 2,54%. This proves that the event of withdrawal has a much greater impact on the target entity but there is no information before the withdrawal announcement.

5.2 Analysis by Region

For the acquirer we have 503 events that concern US acquirers during the pre-crisis period, 776 events during the crisis period and 297 events during the post-crisis period, while the events concerning the European acquirers for those three periods are 373, 468 and 34 respectively. However, in the CDS market only the US originating firms have significant returns throughout the period examined. In particular, the result becomes stronger after day zero reaching its highest point on Day 4 with cumulative ASC of 4.21 basis points. On average during the period [-5,5] we had a cumulative ASC of 2,33 bps. On the contrary, the European group is insignificant and the effect on the CDS market is much smaller with an average cumulative ASC of 0.39. Targets are separated into 84 US events and 35 European events. From this side, we observe the result of negative

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CASCs and significant findings on the post event effect window for both groups. On the US, the results are significant at 1% level with an average of -22.64 for the event period [0,5]. On the EU group, spread changes are significant at a 5% level on the event day (-18.57 bps) and the day after (-30.75 bps) and at 10% level the third day after the event announcement (-25.53 bps). On the equity market, we see that both groups are significant through most of the entire studying period. US acquirers exhibit 1% significant CARs from Day (-4) until Day (5). Meanwhile, European acquirers show small but positive returns (5% significant CAR on Day (-2) and 1% significant CAR during the period [-1,5] and small but negative returns on the US group. This is an interesting finding. On average from day (-4) until day (5) the US group faces -0.50% CAR while the EU group faces a 0,57% CAR from day (-3) until day5. Overall, comparing the two markets, there is evidence of the equity market preceding the CDS market when we analyze the US acquirer and for European acquirers only the stock market contains very significant information.

(Insert Table 6a & 6b)

5.3 Option Implied Volatility and Put Option Skew Analysis

The sample, referring to option market data, is smaller. On the date announced we have 1196 acquirer events and 46 target cases. For the date effective is 1171 and 28 accordingly and for the date withdrawn we have 58 and 16 likewise. As a result, there was performed a separate comparison on the three markets for the data set that applied to options. Since the sample is too small, the analysis was focused only on the acquirer and the target on the announcement date. On the analysis of the CDS markets and the stock market, the event window effects or the significant findings did not deviate from what we documented on the larger sample. On the options market the results are inconclusive due to this small sample. The majority of cumulative abnormal changes in implied volatility for the OTM put option were insignificant. Moreover, the option volatility skew does not show anything significant information. What we can only deduct that the majority of the findings show a positive cumulative abnormal skew change for the acquirer but the results are insignificant in all events. There could also

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be a potential pre event window effect on the date announced since some days before the event present significant results. More precisely, around the event of the date announced of the M&A, the acquirer exhibits 5% significant cumulative change on the fourth day before the announcement (0.70%) and two days before the announcement the result (0.98%) is also significant. The limited significant results do not allow us to derive any lead lag relationships with the other markets and our hypothesis that the options market reacts to the events concerning a Merger and Acquisition are not supported by the empirical analysis. Overall, option volatility is considered a forward-thinking measure that facilitates in the prediction of the direction of the underlining asset. In our sample there are some significant results before event, however they are so limited that cannot produce any valid outcomes. The conclusion is that option implied volatility cannot contribute to price discovery of the equity or the credit derivative market.

(Insert Tables 7a & 7b)

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6. Conclusion

In summary, the announcement of Mergers and Acquisitions has an impact on both the acquiring firm and the target company of the deal. Investors expect the bidding firm to have losses; hence the findings indicate negative CARs in the equity market and positive cumulative ASCs in the credit derivatives market. Overall, the impact on the target firm is larger on either direction compared to the acquirer. In the majority of the cases there is a stronger effect after the notification of the event. Nevertheless, we detect that there could be insider trading in the equity market before the merger announcement.

Moreover, the significant results are first detected in the equity market and they are presented afterwards on the credit defaults swaps market. Therefore, there is a lead-lag relationship between the equity market and the CDS market. However, this relationship weakens or is reversed in the case of credit related categories. More precisely, the empirical findings indicate that during the period of the financial crisis the credit derivatives market offers more information as opposed to the equity market. This is in agreement with Acharya and Johnson (2007) who supported that in case of adverse credit event CDS lead the stock market (Acharya and Johnson, 2007). Besides the equity and CDS, an analysis was performed on the implied volatility of put stock options. Our findings show no significant impact around the announcement of a merger which leads us to the conclusion that stock options do not play a role in the price discovery of either the CDS or the stock market.

The analysis conducted separately for each region (United States and Europe) showed that there is still a lead-lag relationship present from the equity market to CDS. However, in the United States the information around the deal event is more significant compared to events taken place in Europe. Moreover, on the equity market for the bidding firm we documented similar results as Hagendorff, Collins & Keasey (2007) and Khasawneh (2012) (Hagendorff et al., 2008), (Al-Khasawneh and Essaddam, 2012).

In conclusion, the current research offered valuable insights on the effect that an M&A could have on the CDS, equity and options markets. A further step in this research would be to examine the effect of a merger and acquisition using a regression based event study model with event dummy variables in order to confirm the validity of the findings on the current event study. Furthermore, we could consider as variables the

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size of the acquisition or the transaction value of the merger in order to study how the market responds based the aforementioned variables. Finally, we could conduct an event study based on the credit rating of the acquirer and the target firm in order record how the market responds to M&A news based on the firms rating.

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8. Tables and Figures

Table 1: Industry Sector of Single Name CDS

Sector	Number of Entities	Sector Share
Industrials	79	12.87%
Financials	100	16.29%
High Technology	37	6.03%
Materials	62	10.10%
Real Estate	33	5.37%
Energy and Power	76	12.38%
Healthcare	41	6.68%
Consumer Products and Services	36	5.86%
Consumer Staples	46	7.49%
Telecommunications	30	4.89%
Media and Entertainment	38	6.19%
Retail	36	5.86%
Total	**614**	

Source: Thomson Reuters Datastream

Table 2: Industry Sector for M&A Events either Completed or Cancelled

INDUSTRY SECTOR	ACQUIRER	TARGET
Healthcare	341	46
High Technology	416	28
Materials	242	36
Financials	621	85
Retail	102	28
Industrials	373	58
Energy and Power	369	66
Real Estate	126	15
Media and Entertainment	158	28
Telecommunications	238	24
Consumer Products and Services	155	21
Consumer Staples	150	22
TOTAL	3291	457

Source: Thomson Reuters

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Table 3a: Deal Type of M&A Events

	Deal Form	Date Announced	Date Effevtive	Date Withdrawn
	Mergers	946	846	87
	Acquisitions	1508	1480	45
	Acq. Of Majority Interest	233	223	11
	Buybacks/Exchange Offers	215	192	30
Bidding Firm	Acq. Of Part./Rem. Interest	372	362	15
	TOTAL	3274	3103	188
	Mergers	217	153	43
	Acquisitions	2	2	0
	Acq. Of Majority Interest	3	3	0
	Buybacks/Exchange Offers	214	192	30
Target Firm	Acq. Of Part./Rem. Interest	34	30	4
	TOTAL	470	380	77

Table 3b: Nation of Bidders and Targets on M&A Events

	NATION	Date Announced	Date Effective	Date Withdrawn
Bidding Firm	US	1945	1846	76
	EU	1329	1257	112
	TOTAL	**3274**	**3103**	**188**
Target Firm	US	359	293	50
	EU	111	87	27
	TOTAL	**470**	**380**	**77**

Table 4a: CASCs around M&A Announcement Day during Pre-Crisis Period (2005-2007)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean	0.14	-0.42	-0.61	-0.4	-0.28	-0.43	-0.15	0.91	0.82	0.82	0.71
	Sign Test p-value (Null: CASC<=0)	30.28%	62.01%	70.61%	35.45%	36.74%	45.96%	35.48%	28.26%	54.05%	12.49%	13.94%
	n	876	876	876	876	876	876	876	876	876	876	876
TARGET	Mean	1.02	0.91	0.00	-0.07	-0.22	-0.54	-0.37	6.07	6.22	5.77	5.22
	Sign Test p-value (Null: CASC>=0)	66.12%	72.94%	34.50%	34.50%	50.00%	72.94%	88.52%	65.50%	65.50%	94.61%	94.61%
	n	25	25	25	25	25	25	25	25	25	25	25
	Under the t-test, the null for the Acquirer is CASC<=0 and for the target >=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 4b: CASCs around M&A Announcement Day during Crisis Period (2008-2012)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
	Mean	0.42**	0.84**	2.13***	2.76**	2.92**	3.20***	3.86***	4.06***	4.69***	5.15***	4.84***
ACQUIRER	Sign Test p-value (Null: CASC<=0)	29.29%	43.24%	37.75%	57.87%	20.55%	0.29%	0.23%	0.35%	2.05%	0.17%	1.44%
	n	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244
TARGET	Mean	-0.02	1.36	3.10	5.46	-4.73	-26.26***	-40.08***	-36.42***	-39.25***	-34.22***	-36.01***
	Sign Test p-value (Null: CASC>=0)	65.56%	60.09%	69.55%	50.00%	50.00%	1.98%	0.22%	1.02%	1.98%	10.00%	4.62%
	n	61	61	61	61	61	61	61	61	61	61	61
	Under the t-test, the null for the Acquirer is CASC<=0 and for the target >=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 4c: CASCs around M&A Announcement Day during Post-Crisis Period (2013-2018)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
	Mean	-0.17	0.37**	0.40**	0.27*	0.24	-0.32	0.49**	-0.12	0.48	0.08	-0.03
ACQUIRER	Sign Test p-value (Null: CASC<=0)	46.16%	16.88%	3.71%	38.60%	1.44%	1.76%	0.14%	46.17%	11.34%	17.86%	19.35%
	n	446	446	446	446	446	446	446	446	446	446	446
TARGET	Mean	0.50	-0.32	-1.97	-2.27	-2.37	-9.37**	-15.80**	-18.72**	-20.52**	-20.52**	-33.07**
	Sign Test p-value (Null: CASC>=0)	89.98%	57.00%	57.00%	43.00%	43.00%	5.51%	5.51%	5.51%	1.75%	4.01%	8.14%
	n	33	33	33	33	33	33	33	33	33	33	33
	Under the t-test, the null for the Acquirer is CASC<=0 and for the target >=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

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Table 5a: CARs around M&A Announcement Day during Pre-Crisis Period (2005-2007)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean	-0.04%	-0.16%***	-0.19%***	-0.20%**	-0.28%***	-0.34%***	-0.30%**	-0.36%**	-0.41%***	-0.37%**	-0.51%***
	Sign Test p-value (Null: CAR>=0)	2.69%	0.31%	0.81%	2.69%	0.56%	0.10%	0.67%	3.65%	0.81%	2.30%	4.22%
	n	874	874	874	874	874	874	874	874	874	874	874
TARGET	Mean	-0.26%	-1.34%	-0.94%	-1.23%	0.27%	5.67%***	6.32***	6.93%***	6.67%***	6.11%**	5.67%**
	Sign Test p-value (Null: CAR<=0)	65.50%	94.61%	88.52%	88.52%	78.78%	0.20%	0.73%	0.73%	5.39%	5.39%	5.39%
	n	25	25	25	25	25	25	25	25	25	25	25
	Under the t-test, the null for the Acquirer is CAR>=0 and for the target <=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 5b: CARs around M&A Announcement Day during Crisis Period (2008-2012)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean	-0.01%	-0.16%*	-0.22%**	-0.19%*	-0.17%	-0.09%	-0.11%	-0.22%	-0.18%	-0.21%	-0.12%
	Sign Test p-value (Null: CAR>=0)	93.74%	80.28%	11.66%	50.00%	69.53%	96.95%	97.95%	98.84%	99.84%	99.27%	98.45%
	n	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244
TARGET	Mean	-0.47%	-3.76%	-4.11%	-5.04%	-4.83%	6.75%**	8.59%***	7.33%**	6.57%**	5.58%*	6.00%**
	Sign Test p-value (Null: CAR<=0)	77.87%	98.02%	99.51%	99.51%	96.39%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	n	61	61	61	61	61	61	61	61	61	61	61
	Under the t-test, the null for the Acquirer is CAR>=0 and for the target <=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 5c: CARs around M&A Announcement Day during Post-Crisis Period (2013-2018)												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean	0.03%	0.03%	0.04%	0.13%	0.21%	0.32%	0.22%	0.33%	0.38%	0.40%	0.46%
	Sign Test p-value (Null: CAR>=0)	86.26%	5.52%	27.83%	59.95%	93.48%	98.22%	97.81%	97.34%	98.22%	99.54%	99.26%
	n	567	567	567	567	567	567	567	567	567	567	567
TARGET	Mean	0.07%	0.10%	0.48%	0.85%*	1.40%***	11.84%***	14.41%***	14.84%***	15.15%***	15.13%***	15.15%***
	Sign Test p-value (Null: CAR<=0)	94.85%	46.59%	53.41%	33.41%	27.43%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	n	136	136	136	136	136	136	136	136	136	136	136
	Under the t-test, the null for the Acquirer is CAR>=0 and for the target <=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

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Table 6a: CASCs around M&A Announcement Date												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean (US)	0.22	0.44	1.13*	1.84	2.00*	2.04*	2.69**	3.43**	3.93**	4.21***	4.04**
	Mean (EU)	0.19	0.11	0.57	0.27	0.41	0.24	0.71	0.44	0.48	0.55	0.29
	n(US)	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576	1576
	n(EU)	875	875	875	875	875	875	875	875	875	875	875
TARGET	Mean (US)	0.04	1.38	3.40	3.45	0.30	-15.17**	-22.61***	-23.79***	-24.08***	-24.24***	-25.92***
	Mean (EU)	1.06	-0.59	-4.61	-0.95	-11.35	-18.57*	-30.75**	-19.70	-25.53*	-16.69	-27.99
	n(US)	84	84	84	84	84	84	84	84	84	84	84
	n(EU)	35	35	35	35	35	35	35	35	35	35	35
	Under the t-test, the null is CASC=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 6b: CARs around M&A Announcement Date												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean (US)	-0.06%	-0.25%***	-0.35%***	-0.36%***	-0.40%***	-0.37%***	-0.50%***	-0.60%***	-0.68%***	-0.74%***	-0.79%***
	Mean (EU)	0.07%	0.10%	0.18%*	0.28%**	0.34%***	0.41%***	0.57%***	0.62%***	0.79%***	0.90%***	1.01%***
	n(US)	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696	1696
	n(EU)	990	990	990	990	990	990	990	990	990	990	990
TARGET	Mean (US)	-0.08%	-1.28%	-1.15%	-1.20%	-0.80%	9.77%***	11.93%***	11.82%***	11.81%***	11.50%***	11.48%***
	Mean (EU)	-0.32%	-0.31%	0.19%	0.07%	1.50%	9.63%***	11.73%***	12.23%***	12.02%***	11.46%***	11.94%***
	n(US)	187	187	187	187	187	187	187	187	187	187	187
	n(EU)	35	35	35	35	35	35	35	35	35	35	35
	Under the t-test, the null is CAR=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 7a: Skew changes around M&A Announcement Date for Option 25 Delta Put												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER	Mean	0.35*	0.70**	0.36*	0.98**	0.45	0.27	0.39	0.40	0.38	0.52*	0.38*
	Sign Test p-value (Null: AbSKEW change <=0)	88.12%	20.88%	50.00%	66.78%	86.44%	24.36%	12.36%	46.54%	25.30%	12.36%	25.30%
	n	1196	1196	1196	1196	1196	1196	1196	1196	1196	1196	1196
TARGET	Mean	-2.05*	-0.73	-0.40	-0.13	-0.10	4.32	2.64	-1.32	0.23	3.71	-2.00
	Sign Test p-value (Null: AbSKEW change >=0)	8.21%	27.57%	11.63%	72.43%	6.76%	61.70%	81.44%	6.76%	18.56%	61.70%	3.62%
	n	46	46	46	46	46	46	46	46	46	46	46
	Under the t-test, the null for the Acquirer is AbSKEW change<=0 and for the target AbSKEW change>=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

Table 7b: Skew changes around M&A Outcome Date for Option 25 Delta Put												
		DAY -5	DAY -4	DAY -3	DAY -2	DAY -1	DAY 0	DAY +1	DAY +2	DAY +3	DAY +4	DAY +5
ACQUIRER - Completion	Mean	0.12	0.18	0.41*	-0.11	-0.42	0.41	0.53*	0.58*	0.32	-0.13	-0.58
	Sign Test p-value (Null: AbSKEW change <=0)	96.81%	6.38%	37.38%	48.83%	18.24%	19.83%	36.29%	2.33%	3.27%	1.53%	0.70%
	n	1171	1171	1171	1171	1171	1171	1171	1171	1171	1171	1171
ACQUIRER - Withdrawal	Mean	-0.13	0.40	-0.14	-0.40	1.24	-0.95	1.31	1.03	0.69	1.21	0.80
	Sign Test p-value (Null: AbSKEW change >=0)	5.56%	25.59%	34.70%	44.78%	90.76%	17.91%	74.41%	82.09%	65.30%	70.17%	44.78%
	n	58	58	58	58	58	58	58	58	58	58	58
	Under the t-test, the null for the Acquirer is AbSKEW change<=0 and for the target AbSKEW change>=0											
	***1% level significance											
	**5% level significance											
	*10% level significance											

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Figure 1: Example of M&A Event

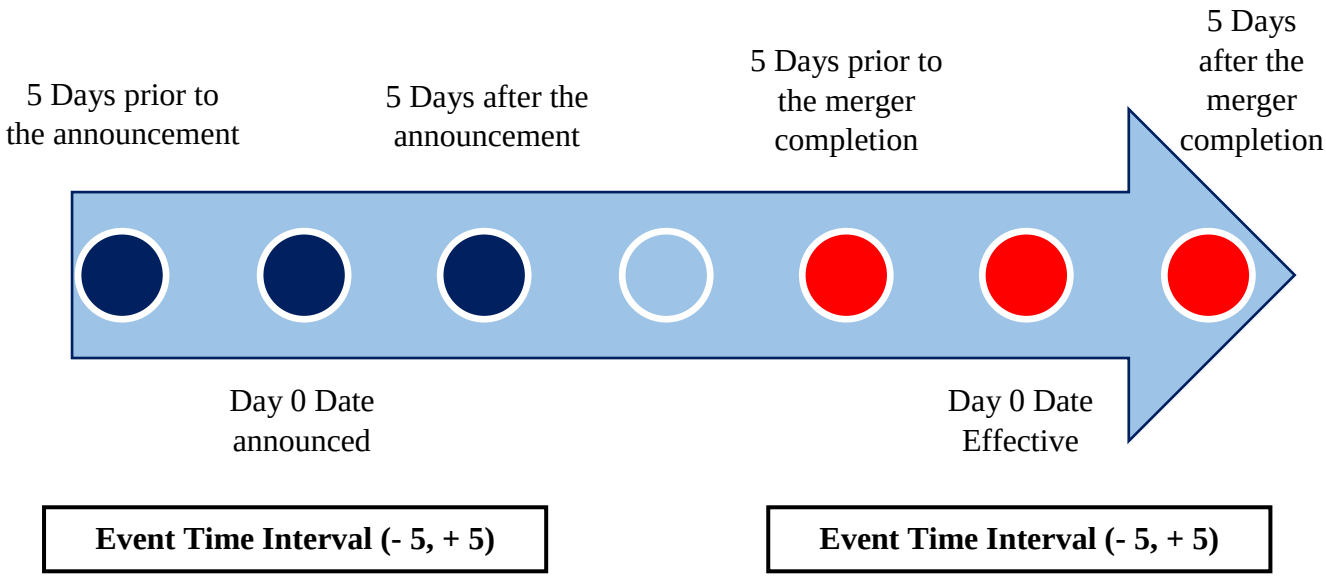

Figure 2a: Cumulative Abnormal Spread Changes (2005-2007)

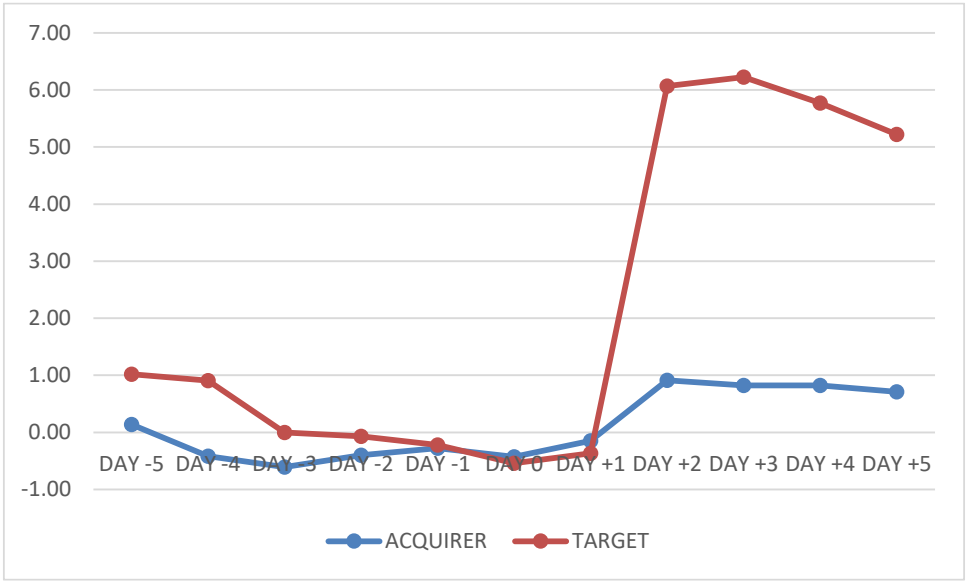

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Figure 2b: Cumulative Abnormal Spread Changes (2008-2012)

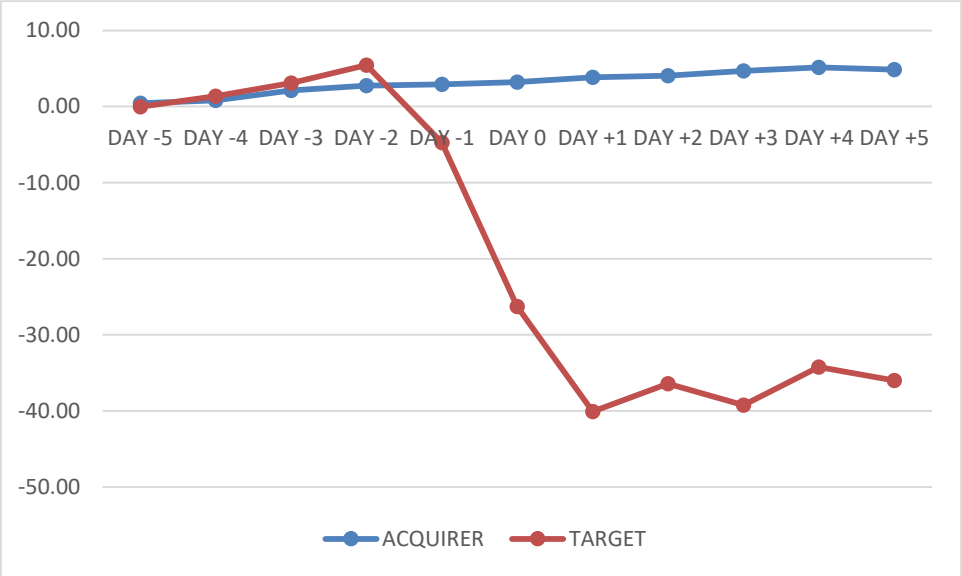

Figure 2c: Cumulative Abnormal Spread Changes (2013-2018)

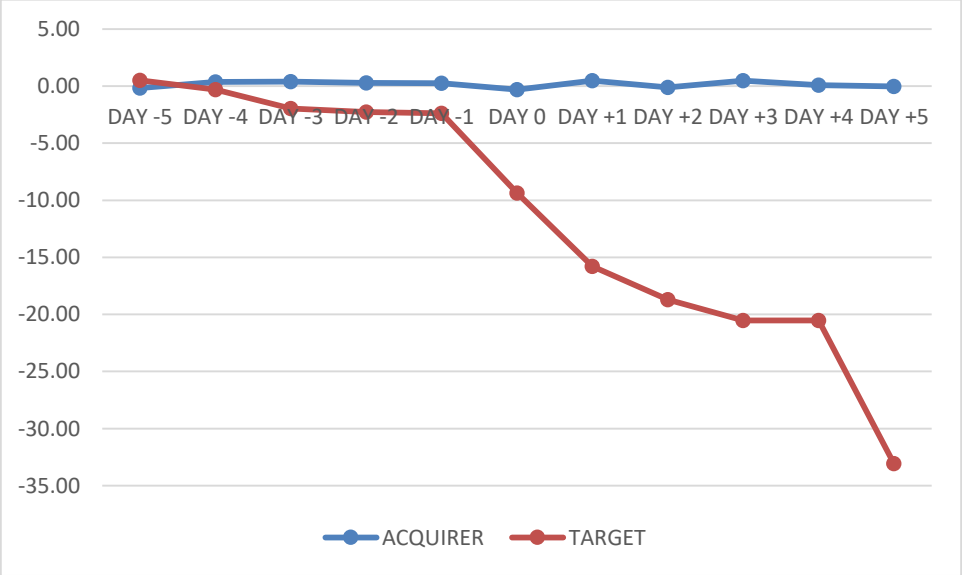

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Figure 3a: Cumulative Abnormal Returns (2005-2007)

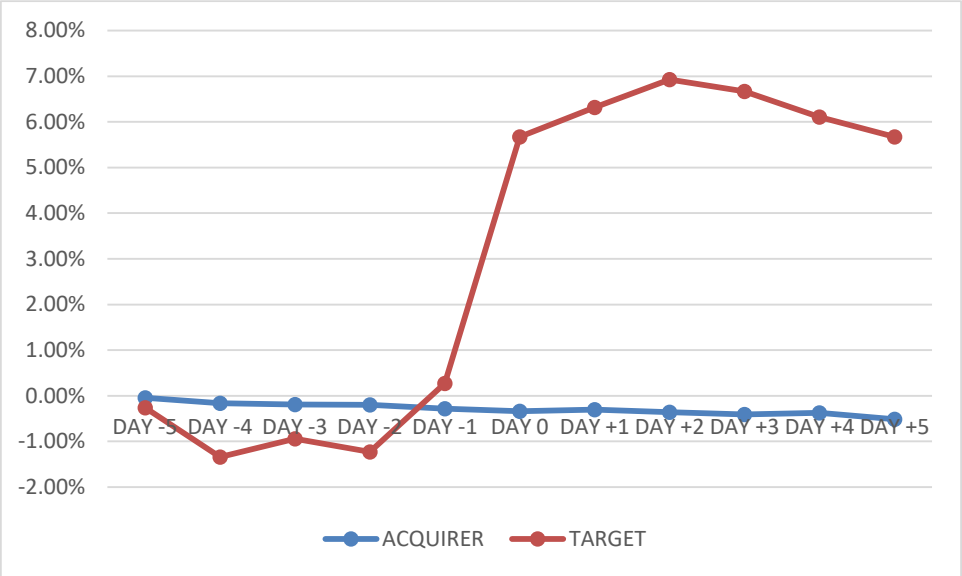

Figure 3b: Cumulative Abnormal Returns (2008-2012)

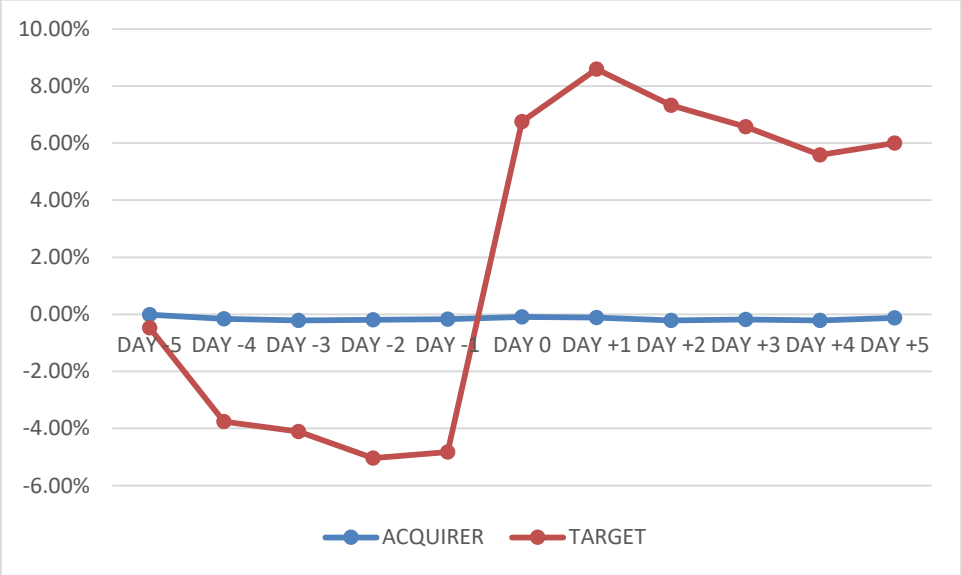

Figure 3c: Cumulative Abnormal Returns (2013-2018)