

Chair of Equity Markets and Alternative Investments

**EXTRAORDINARY CORPORATE EVENTS: A STUDY ON STOCK
MARKETS REACTION TO M&A ANNOUNCEMENTS**

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ABSTRACT

This study seeks to analyse the causes and consequences which the announcement of a Mergers and Acquisitions (M&A) deal has on the stock prices of acquiring firms, using a dataset of 3,602 M&A deals occurred in the US between the years 2013 and 2023 and carrying out an event study at the date of the announcement of such deals. In the study three main findings have been identified. The findings reveal that the stock's market reaction to the announcement of the deal depends on the nature of the target being acquired (private or public company). When private the market's reaction is overall positive, generating positive cumulative abnormal returns (CARs) while when public the CAR generated is negative generally due to the method of payment. The second finding reveals that there is a relationship between the stock's market volatility and the market's reaction the M&A deal announcement: higher volatility correlates with a lower number of deals and negative CAR mainly due to higher scepticism towards deals taking place during uncertain periods. The last finding highlights the negative correlation between the acquiring firm's size and the CAR generated at the moment of the announcement: small firms usually generate positive CARs while as the acquiring firm increases the CAR becomes negative. The study's results generally highlight the complex dynamics behind the market reaction to M&A deals.

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1 Introduction

Extraordinary corporate events can simply be defined as those events which are not part of the regular business of a company, and which often lead to substantial changes in the company's activities and overall governance and which, in some cases, can even lead to disruption. Mergers and Acquisitions (in short M&A), that is the process by which a given company chooses to either purchase or merge with another company, do indeed fall into the category of such extraordinary corporate events.

It is therefore quite obvious that, given the extraordinary nature of such transactions, the entire environment surrounding the parties involved in deals of such nature might in some way react to such events. The surrounding environment can be intended to be the stock market where the shares of either one or both parties involved are traded between market participants and a reaction to such corporate events can be essentially represented by a sharp (upward or downward) movement in the companies' stock price once the market is made aware of such event.

M&A deals involve two parties, one is the acquiring company, and the other is the target company – namely the company being acquired. In case both parties involved are public companies, it has been extensively demonstrated that, at the time of the announcement of the deal (that is once the stock market is first made aware of the extraordinary event), the stock price of the target company witnesses a sharp increase, therefore also leading to a value creation effect for its shareholders.

On the other side, for what concerns the market's reaction on the acquiring firm's stock price and the consequent effects for its shareholders, the findings of previous studies on the matter are not as unanimous and most of them also date back to much earlier decades. It is for this reason that the current study seeks to analyse what is the impact on the acquiring firms' stock prices and which are the various factors which might have an impact on the stock's market reaction and the consequent effects on shareholders.

To attain this scope a pool of 3602 M&A deals which have taken place in the US in the decade 2013-2023 has been used as the data set of analysis. To measure the market's reaction an event study method analysis has been carried out as a way to

quantify the excess return, if any, generated by the stock market once the deal is announced.

Chapter 2 begins by introducing the more theoretical factors behind every M&A deal. The chapter starts off by explaining that the driving reason which leads a company's choice to pursue a M&A deal is to boost its activity and eventually its revenues pursuing what is generally referred to as an external growth strategy. The chapter also illustrates the five phases which usually characterize an M&A deal, the necessary documents required in the process and lastly the key differences between deals involving a private or public target firm.

Chapter 3 introduces the first out of the three research questions of the study. This first research question seeks to investigate what the short-term effect on the acquiring company's stock price is once the deal is announced. The results obtained highlight that in case the acquiring company purchases an unlisted target, for every year under analysis, the stock market reacts positively to the announcement – that is the average cumulative abnormal return (CAR) generated is always positive. On the contrary, in case of a listed target, in most instances the average generated CAR is negative. The leading cause behind such striking difference is attributable to the method of payment employed by the acquirer. It has been demonstrated that when the method of payment only involves a cash consideration, the stock market reacts positively at the deal's announcement. While in case part of the deal is financed by means of equity financing (which is the preferred method in case of a listed target), the market does not react as positively considering the implications which an equity issue has on the acquiring company and its shareholders.

Chapter 4 explores the second research question of the study; it seeks to investigate whether there is an existing relationship between the stock's market reaction to the announcement of a given M&A deal and the overall level of market volatility at the time of the announcement. The chapter begins by explaining the widely discussed phenomenon of M&A waves which consist in the negative correlation between the level of the stock's market volatility and overall M&A activity – that is, when stock's market volatility is higher, M&A activity (in terms of number of deals) is lower. Given this phenomenon, the study attempted to identify a relationship between the level of stock's market volatility (measured by using the VIX index as a proxy) and the overall average CAR generated at the time of the deal announcements. It has been found that

at times of higher market uncertainty (i.e. higher volatility) not only is number of deals announced drastically reduced but also the average CAR is negative. The reason behind such value destruction trend can be identified in an overall heightened level of scepticism towards deals taking place at these times. The chapter's findings lead to the conclusion that M&A deals should be carried out in periods of lower perceived volatility as a way to safeguard value for shareholders.

Chapter 5 discusses the last research question of the study, which seeks to examine whether there is an existing relationship between the acquiring firm size measured in terms of market capitalization and the value creation at the time of announcement. It has been found that as the acquiror firm size increases, the average CAR generated shifts from positive to negative. Once again, the cause behind this phenomenon can be led back to the method of payment employed: smaller companies usually only purchase targets by means of cash financing, while as the acquiring company's size increases, equity starts to be introduced thereby leading to a decrease in the value created for shareholders. Lastly the chapter deep dives into the top four deals (by acquiring firm's market capitalization) taken place in the years under analysis as to analyse the stock's market reactions and the causes behind.

2 M&A Transactions: Key Phases and Players

Established companies, that is those companies which have reached a stable state in terms of customer base, productivity, revenues and overall organic growth might still wish to improve their productivity, boost their earnings and generally continue to grow. To achieve this goal, such companies might choose to turn to mergers and acquisitions, which represent the most common method for a firm to pursue inorganic growth¹. Mergers and acquisitions transactions, which hereinafter will mostly be referred to as *M&A transactions*, can broadly be defined as “*all kinds of deals in which companies [...] are bought and sold*” (D. Schoenmaker et al., 2023, p.542).

The term merger is usually employed to refer to those instances in which two distinct firms combine as to create a wholly new entity, to the contrary an acquisition consists in one company purchasing another thereby “absorbing” it without the need to create a completely new entity. Given this difference between the two types of transactions it is evident that in both cases two companies integrate to form one and, as previously mentioned, the leading strategic motive which pushes a firm to pursue an M&A transaction is that of growing.

In this light, M&A transactions can be split into two macro-categories: horizontal and vertical integrations. It must be noted that in some cases, such integrations might also involve only a given division of the target company for which the acquiring company gains full control. The former consists in acquiring another company which belongs to the same industry and is located at the same stage of the supply chain as to increase production while also reducing costs by achieving economies of scale. Much to the contrary, the latter is a strategy for which a given firm chooses to acquire another firm located either at an earlier or later stage of the supply chain, with the aim of having as much control as possible on several stages of the supply chain thereby reducing costs and increasing marginality.

¹ In general terms, organic growth is associated with the use of a firm’s own resources as to boost growth from within the business while inorganic growth relies on “acquiring growth from the outside” by purchasing or merging with another company

It is apparent that in every M&A transaction there are two parties involved, one is the company wishing to acquire another, which is generally referred to as “*the acquiror*” or “*buy-side*”, while the other party is the company being acquired which is either termed “*target*” or “*sell-side*”. It is important to mention that buy-side parties in an M&A transactions can usually be split into two main categories which highlight their different nature and motives which lead them to embark in an M&A deal: one category are the so-called “*strategic buyers*” while the others are commonly addressed to as “*financial buyers*”.

The afore mentioned companies which purchase another company as to boost their growth, fall in the category of strategic buyers as their main interest is that of being able to create and exploit the synergies which the combination of the two companies can generate. For this reason, compared to the other category of buyers, strategic buyers in terms of acquisition price usually tend to pay higher premia when purchasing the target company thereby being somewhat preferred to financial buyers by some sellers.

Much to the contrary, financial buyers are usually private equity firms which specialise in acquiring, as the name suggests, private companies which are considered to be promising not only from a productive point of view but are also viewed as financially sound, meaning their leverage level can enable them to take on more debt – considering that such buyers usually finance much of the acquisition with debt and their main aim is that of increasing the target’s enterprise value as to repay the initial debt and generate a return for their initial investment. Such transactions are usually referred to as leveraged buyouts (LBOs). It must be noted that such LBO transactions are very far from the scopes of the analyses which will be presented in the upcoming sections of the study.

2.1 The M&A Process

Extraordinary corporate events like M&A deals are intense processes which require time and resources, the current section of the study aims at describing the main phases which characterise a typical deal. Most acquisitions usually take place by means of an auction which essentially represents a process for which the company, which is for sale, namely the target, is presented to multiple potential buyers. Auctions can be split into two categories, targeted and broad auctions, and the choice between one of the two depends in most cases on the needs of the seller involved. A broad auction, as the name suggests, consists in reaching as many potential buyers as possible (both of strategic and financial nature) and the main reason which might lead sellers to choose such auction is the attempt to maximise competitive tension between potential acquirors as to obtain the best possible consideration for the sale of the company. Conversely when choosing targeted auctions, sellers only aim at proposing the sale to strategic buyers, the main reason behind the choice of such sale process is to maintain a higher degree of confidentiality thereby minimising the risk of leakage of sell-side company's information while also reducing the risk of potentially not closing the deal and thereby remaining tainted by a failed auction process.

As the figure below suggests, the process for the sale of a company can be formalized, in purely theoretical terms, in five subsequent phases. The time it takes to close a deal is usually dependent on a series of factors spanning from the length of the auction process to regulatory and shareholders' approval. It must be made clear that not all M&A deals follow the structure which will be analysed in detail in the following pages of the study as buyers and sellers might wish to adapt the deal structure to their specific needs nevertheless the steps which will be analysed can give a general understanding of the key milestones necessary in order to complete a deal.

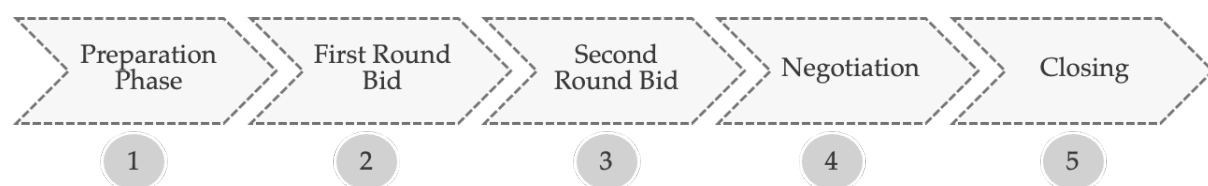


Figure 1 - Phases of M&A Process

2.1.1 Phase One: Preparation

The initial step of the process, for both buy-side and sell-side parties is that of selecting their advisors which will guide them in the following stages of the deal. Once selected, the sell-side advisor immediately starts a preliminary due diligence on the seller in order to fully understand the company's business and to also have a clear understanding of the valuation methods which will be employed to value the business as to prepare an initial valuation benchmark.

At this stage, the advisor also takes care of the preparation of the marketing material which will be presented to the potential buyers in the following stages of the deal, two documents have to be prepared: one is generally referred to as the *teaser* which, as the name suggests, is a brief synopsis of the target firm containing key insights about the sell-side firm. The aim of such document is to generate sufficient interest in potential buyers as to push them to submit a bid. The other document drafted at this stage is the *confidential information memorandum* (CIM) which instead is a longer document containing more extensive information about the firm such as historical and projected financials, an executive summary and details about the industry and market sector in which the company is active.

This stage is also characterised by the choice of the potential buyers to which the sale must be proposed, buyers are usually evaluated on the basis of a series of characteristics such as: their strategic fit with the target and the subsequent possibility to generate synergies as a result of the integration of the two companies; their financial capacity which is a good proxy to evaluate how much they would be able or willing to pay for acquiring the target.

The first phase of the M&A process ends with the preparation and signing of the *confidentiality agreement* (CA), a legally binding document which must be signed between the seller and each perspective buyer to which the sale is proposed. The scope of such agreement is that of making sure that no confidential information about the sell-side company is diffused.

2.1.2 Phase Two: First Round Bid

The second phase of the process begins with delivering to each of the previously selected potential buyers the teaser and the CA. Following its execution sell-side advisors distribute the CIM and the *initial bid procedure letter*, this last document essentially indicates to each potential buyer the last possible date by which those interested in the deal must submit their initial non-binding bids.

At this stage, perspective buyers start reviewing the CIM which contains all the information made available to them so far and serves as the basis of preparation for their preliminary valuation of the target as to prepare their initial bid. At the same time, sell side advisors initiate the preparation for the following phases by setting up the data room and start gathering all the necessary insight for the upcoming management presentation.

The first round bid phase ends when the first round non-binding bids by potential buyers have been received and at this point sell side advisors review such bids as to identify those buyers which seem to be indeed interested in the deal and present their evaluation of such bids to the target firm on the basis of which the target's management will choose which potential buyers to invite to the following second round auction.

It must be noted that both the first and the second round of the auction process are arguably the most crucial phases of an M&A deal as it is at these stages that initial bids start being presented to the target therefore it is of crucial importance for sell-side advisors to maintain a generally perceived level of high competition among potential buyers as to attempt to increase their proposed bids.

2.1.3 Phase Three: Second Round Bid

The subsequent stage of the deal is mostly centred around facilitating potential buyers in conducting a detailed and final due diligence on the target firm considering that, once completed, potential buyers will have to submit their final binding offer for their potential acquisition. Bidders which have been selected for taking part in the second-round auction will be granted access to the data room as to enable them to perform the necessary due diligence, data rooms usually provide

all the necessary information to potential buyers spanning from the target's organisation structure, audited financial statements, industry reports etc.

The time necessary for the due diligence process to be concluded depends also on the type of buyer: usually strategic buyers, which are much more informed on the specifics of the market and industry in which the company operates, are mainly focused on analysing the data about the target company while financial buyers might be less knowledgeable about the industry specifics and therefore tend to carry out a more detailed review of all the information made available in the data room.

During this phase the management presentation also usually takes place, the presentation is meant to make sure that the top management of the sell-side firm meets with each potential buyer to provide an overview of the company and answer any potential questions. Once these preliminary steps are concluded, the bidders are expected to hand in their final bid procedure letters which represent their final binding offer for the purchase of the company being sold. Such letter must not only contain the final offer proposed by each potential acquirer but also a series of other pieces of information such as: the method of payment to be employed (cash, stock or a combination of both), proof of board of directors' approval of the purchase, available financial resources for the payment of the deal or proof of any committed financing.

2.1.4 Phase Four & Five: Negotiation and Closing

Once the final binding bids and the attached deal details have been received, the target firm starts reviewing them, at this stage the aim is that of identifying the most "interesting" offers both in terms of offered price and deal conditions. Once identified, the sell-side advisor starts a negotiation process with such potential buyers as to attempt getting the best condition and consideration for the sale – this is perhaps the stage where potential buyers must perceive the maximum level of competition as to persuade them at closing the deal quickly and at the desired conditions.

Once the final winning bid is identified, the two parties will sign a *Sale and Purchase Agreement* (SPA) which represents a legally binding document indicating

the substantial sale of the company but still subject to the approval of the Board of Directors of the selling firm. The SPA essentially outlines the terms and conditions of the sale: it identifies the parties involved in the transaction, the purchase price, any covenant regarding specific conditions which must be met by either the selling or acquiring party or both before the deal is concluded and finally it specifies the timeline to follow for closing the deal (i.e. due date for payment, delivery of closing documents etc.).

The target's board of directors before approving the deal, usually requires what is commonly referred to as a *fairness opinion* – a third party external advisors is called to analyse the price offered by the buyer for the purchase and the sale conditions and to evaluate whether or not such elements are indeed fair.

It is indeed once the fairness opinion has been rendered and the board has approved of the deal that the two parties involved come together to make a formal announcement of the transaction, this is usually made through a press release or a joint statement by the two parties to the media. An M&A announcement is usually meant to inform the public of the general terms of the deal, the rationale behind the transaction such as the synergies which are expected to be created and also gives a general overview of the parties involved – namely the target and the acquiror. Usually, the stock market reacts to such announcements, with both the target and acquiring companies' stock prices experiencing some variations as an initial response of the investors to the news.

Prior to the official closing of the deal two more parties must approve of the transaction, namely shareholders and regulatory (antitrust) approval must be obtained before deeming the M&A deal officially concluded.

2.2 Key Differences between Private and Public Deals

In general terms, M&A deals can be split into two categories: private and public deals. Private transactions are defined as those deals where there is a known and identifiable seller, in fact in a private deal the selling party is usually a single or small group of shareholders. In terms of the sale and purchase agreement, which is signed in occasion of a private deal, there are always identifiable parties which become "liable" in case the obligations inscribed in the agreement are not met. To the contrary,

in case of a transaction involving a public company, the ownership is much more dispersed meaning that there is not an easily identifiable party to stand behind the obligations inscribed in the sale and purchase agreement.

In case of a private deal the transaction documents, including the SPA, are usually signed directly between the buying party and the selling shareholder(s) – which are in some cases also the managers of the target company. While in case of a public deal the documents are initially negotiated and signed only between the acquiring and selling company's management teams and only after the management's signing and approval of the deal, the target shareholders are called to express their opinion on the deal.

In case of a public deal, after a definitive agreement between the management of both companies, the shareholders are called to express their consent or dissent of the deal by means either of a "two-step tender offer" or a "one-step merger".

A two-step tender offer is usually considered to be the fastest way by which a company can close a public deal, in such offer the acquiring company offers to purchase the target firm's shares directly from the shareholders at the price agreed upon and detailed in the SPA. The target firm shareholders are usually made aware of such tender offer by means of announcements in financial newspapers or direct communication, usually the offer made by the acquiror must remain available for the selling party shareholders for a maximum number of days. If at the end of the tender offer's time window, at least 90% of the overall outstanding shares of the company are sold, then the deal is seen as to be agreed upon by the selling company's shareholders and can be officially executed.

In case the tender offer does not receive the 90% approval on behalf of the selling party's shareholders, then a proxy statement must be mailed to the selling company's shareholders as a way for them to directly express their opinion on the matter of the deal. This is why this procedure is usually referred to as a two-step merger.

In case of a one-step merger, the proxy statement is directly mailed to the target firm's shareholders (without the acquiring company previously offering to purchase their shares). The recipients have a pre-defined time window to express their opinion on the merger, in most of the cases the majority vote in favour of the sale is required for the deal to be completed and in others the supermajority.

It must also be noted that in those cases in which the acquiring company is issuing more than 20% equity on its part in order to finance the acquisition then it must also obtain the approval of its shareholders in order to continue with the deal².

² This is a specific requirement by the US legislation as has been reported as the current study will be all centered around US based acquiring companies.

3 M&A Transactions and Value Creation

The reasons which drive a company to embark in an M&A deal can be diverse. In purely theoretical terms the main drivers can be split in the following categories: diversification, which can be both in terms of product and services offered to customers or in terms of geographical location; synergies, that is either cost synergies which enable the company to reduce production costs or revenue synergies which enable the company to boost their income; accelerated growth; increased market share and elimination of competitors.

It is evident that such M&A drivers all have a common goal, namely enhancing the company's performance and consequently its ability to generate revenues. Behind this broad-scope goal is a common objective shared, at least in the Anglo-Saxon world, by all firms, that is: maximising shareholders' wealth. This is indeed a fiduciary duty which the companies' board of directors have towards the company's shareholders who are indeed the rightful owners of the firm.

This being said, it is evident that when attempting to assess the successfulness or failure of an M&A deal the focus should not only be on the actual realization of the initial M&A motives as these may depend on various factors such as managers' capabilities but most importantly on its ability to create shareholders value. A deal is to be deemed to be successful "if it does anything but destroy value for shareholders" (Robert F. Bruner, 2001, p.3). In simple financial terms, this idea can be explained as follows: taken a given firm's shareholder, value for shareholder is destroyed whenever the stake owned in the company under analysis yields a lower return compared to an investment of similar risk, conversely value is created when the investor's share in the company yields a greater return while value is conserved whenever the two returns roughly equalise.

In practical terms, for companies whose shares are publicly traded on the market, the phenomenon of value creation for shareholders in case of an M&A transaction can be analysed by taking into consideration the stock market's reaction to an M&A deal, such reaction is clearly represented by changes in market prices. The first instance in which the stock market can react to a given M&A deal is when this is announced, market prices tend to fluctuate in this instance, either

by witnessing a spike or a plunge, as investors react to the new information made available to them and to their understanding and expectations of the deal. This rapid movement in stock prices right after the deal's announcement can be interpreted as the investors' immediate assessment of the acquisition and its potential impacts on the company's upcoming performance.

It must be noted that also in case the shares of the companies involved in the transaction are not publicly traded on the market, the M&A deal can have an impact on the overall value of the shareholders' investment in the company. Unlike the case of public companies and specifically public acquiring companies, the effect of the acquisition on the stock price and the consequent value creation or destruction is not as easily measurable given that no market exists for such shares thereby the impact of the announcement has no mean to be immediately reflected.

The most common method, to assess the effect of deal announcements on the company's stock price is the so-called event study method. In general terms this method aims at measuring what is the impact on a given company's stock price as a consequence of the occurrence of an event. In this context the aforementioned approach, which has widely been adopted also in the preceding literature on this subject, essentially consists in assessing the deal's performance by measuring the abnormal returns generated by the company's stock price in a pre-set timeframe which includes the date of the deal's announcement.

At the very core of the event study method for assessing deal performance, is the market efficiency theory, such theory essentially states that companies' stock prices reflect all publicly available information, including expectation on future performance of the company following the M&A deal. Therefore, estimating the abnormal stock returns generated around the deal announcement date, should supposedly be an indicator of the company's future performance.

Nevertheless, it is widely accepted in finance that markets are not fully efficient, therefore there might be some information which is not reflected in stock prices mainly due to the fact that investors do not have access to all information about the deal, causing them not to act in a fully rational manner at the moment of the M&A announcement. Thereby some might argue that short-term event studies are not reliable for assessing the deal's performance and its overall value creation,

considering that changes in market valuations at the time of the M&A announcement could also be influenced by other factors and that performance variations which will influence the true long-term performance of the M&A deal might not materialise in the instance of the deal's announcement.

On this matter, a recent study by M.L. Sirowen and J.M. Weirens published in the Harvard Business Review, which analysed the abnormal returns for acquiring companies' shareholders generated by M&A deal announcements, found that short term market reaction does indeed matter by stating that "deals that initially received positive market reactions [...] on average remained strongly positive a year later; and the deals that initially received negative market reactions, on average, were viewed strongly negative a year later"³. Nevertheless, it must be made clear that the assessment of long-term M&A deals' performance is beyond the scope of this study which is only focused on assessing the short-term market reaction to M&A deal announcement and the subsequent short term value creation for shareholders.

3.1 Value Creation for Main Parties Involved in M&A

As extensively explained in the preceding chapter, there are two main parties involved in all M&A deals: one is the acquiring company the other is the company being acquired, namely the target. It is evident that in case both parties involved in the deal are companies whose shares are publicly traded, both parties' shareholders could be affected in terms of value creation by a given M&A deal announcement.

For what concerns the shareholders of the target companies, it is of general understanding, and also supported by the existing literature on the subject, that the share price of the target company witnesses a sharp increase around the day of the deal's announcement which leads to positive abnormal returns and thereby generates a wealth effect for target's shareholders.

³ Sirower, M.L and Weirens J.M. (27th April 2022), *The Success of Your M&A Deal Hinges on How You Announce It*, Harvard Business Review.

One of the most relevant studies which proves this phenomenon, took under consideration a pool of almost 4000 deals occurred in the US between the 70's and the 90's and it was found that *"target firm shareholders are clearly winners in merger transactions [...] the average three- day abnormal return for target firms is 16%"* (Andrade et al., 2001, p 10). Another study which analysed a sample of 1305 companies revealed that *"on average, the equity value of a target firm appreciates 21.2%, in the three days around the initial announcement of the acquisition"* (Mulherin & Boone, 2000, p.17) while another study based on a sample of 204 US firms which engaged in M&A transactions in the 80's found that *"target-firm shareholders earn an average abnormal return of 23.4%"* (Huang & Walkling, 1987, p.14).

In summary there is enough evidence to show that *"target shareholders receive average abnormal returns in the 20-30% range"* (Bruner, 2001, p.5). For the sake of completeness, it must be noted that all the above-mentioned studies have used the same method of analysis to reach the mentioned results, that is the above-mentioned event study method mostly using a time frame of three days prior and after the M&A announcement day.

In general terms, such price ramp-up could be motivated by the fact that in virtually every M&A deal the acquiring company pays a premium to the target's shareholders as to incentivise them to agree to the acquisition. Usually, *"about half the premium associated with the acquisition is already incorporated in the price by the time the acquisition is announced"* (Damodaran, 200, p.39) and consequently, other market participants which identify a clear gain opportunity in such shareholding, given that the target's shares are trading at a price which is known to be higher than their intrinsic value, will push the demand for the shares thereby causing a further increase in the price.

Shifting the focus on the acquiring company's shareholders, in this case the existing literature and its findings are not as optimistic under the point of view of value creation for the shareholders of the acquiring firms. Different studies found that M&A activity for listed companies in the US tends to destroy value instead of creating it or, in the "best" case, value is only conserved – that is, abnormal returns average around zero. In the above-mentioned study by Andrade et al, the same analysis was also carried out on acquiring companies' stock and it was found that *"the average three-day abnormal return for acquirers is -0.7%"* (G. Andrade et al., 2001,

p 10) in general it can be said that, “*half of all bidding firms earn negative returns [...] suggesting that shareholders are sceptical [...] in a significant number of cases*” (Damodaran, 2000, p.40). Another key factor must be highlighted, mostly all of the existing literature on the subject seems to be united on one other fundamental point “*bidder shareholders gain when the bidding firm buys a private firm [...] and lose when the bidder buys a public firm*” (Fuller et al, 2002, p.30).

3.2 Short Term Value Creation for Acquiring Shareholders

As previously anticipated, the choice to focus solely on short term value creation for acquiring shareholders has been driven by the fact that, unlike the case of target firms’ shareholders, the existing literature has not reached an overall agreement on effects of a deal announcement on value creation. Furthermore, the previously mentioned literature, is entirely related to older decades (generally the 1980s and 1990s).

In light of this, the purpose of the current section of the study is that of verifying whether the results established in the previously mentioned literature are also valid in more recent years. To attain this scope, the analysis of this section of the study will be carried out on a set of acquisitions announced between the years 2013 and 2023. Furthermore, to maintain comparability with the previous studies’ findings the analysis will be carried out only on deals occurred between US based companies.

It must be noted that the fundamental method of analysis employed will be the same employed in most of the previously mentioned studies, namely the afore mentioned event-study method, refer to *Appendix 1 – Event Study Method* where the theoretical functioning of the method is presented.

3.2.1 Data Set Description and Event Study Method Application

The deals taken into consideration in the dataset include target companies which are both publicly listed and privately held companies or specific business divisions for which the acquiring company acquires full control. The choice behind considering both private and public targets, as it will be explained in the following sections, is driven by the fact that very different conclusions can be drawn in the two different cases.

The deals have been selected for the study only if they were confirmed, that is if both parties have agreed to the transaction and had also been completed between the 1st January 2013 and the 31st December 2023.

Furthermore, de-SPAC deals⁴ have been excluded from the dataset as, even if they represent by all means an acquisition, they are not considered to be meaningful for the scopes of the study.

The acquiring firms in the data set are all US-based companies whose shares are traded on the US stock market.

On the basis of these criteria, the data regarding M&A deals has been downloaded entirely from Orbis M&A while market data has been retrieved both from Refinitiv and Yahoo Finance obtaining a total of 3602 deals.

After applying the event study method to the chosen set of M&A deals, for all the years of analysis, 634 of the obtained *cumulative abnormal returns*⁵ (hereinafter CAR) have been found to be statistically significant, which represents around 18% of the initial data set.

For the scope of the analysis the event-study method has been applied using the following parameters, the estimation window has been assumed to be 250 days large and T_1 always corresponds to the day which marks 15 days before the event.

⁴ A de-SPAC deal refers to the process by which an already listed special purpose acquisition company (SPAC) merges with a private company, thereby taking a private company public without the traditional initial public offering (IPO) process.

⁵ The cumulative abnormal return (CAR) can be defined as the sum of the abnormal returns generated by the stock in the event window, refer to Appendix 1 for further details.

While the event window is -1;+1 days around the event day ($\tau_1 = \tau - 1$; $\tau_2 = \tau + 1$)⁶.

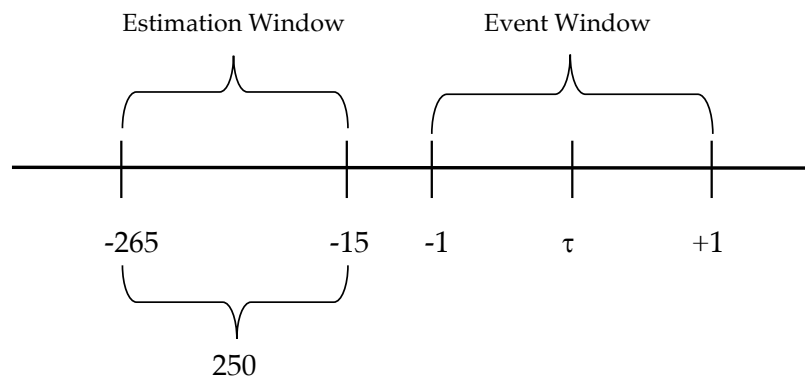


Figure 2- Event Study Time Windows in Use

The choice of an estimation window containing arguably a rather large number of days prior to the event is driven by the intent to isolate as much as possible the effect on the stock price of the M&A announcement from any other type of market perturbations. For the same reason, the estimation window ends fifteen days before the event date, in the attempt to minimise as much as possible, the risk that the CAR generated at the time of the announcement might be influenced by any type of market variation in the days before the event – also considering that in some cases there might be some leakage of information about the deal prior to its official announcement. For the same reason a narrow window (-1;+1) has been chosen.

Two other key elements must be highlighted, as previously mentioned the index used as a proxy for the overall stock market employed in the study is S&P 500 and the test of significance on the data obtained has been carried out using a 95% level of confidence.

⁶ Even if most of the literature conducting the same type of study generally uses an event window -3;+3 wide, it has been chosen to keep such a short time-frame as to only take into consideration the most immediate stock market reaction to the announcement.

3.3 M&A Announcement Value Creation Hypothesis: Results and Interpretation

After the implementation of the previously described model the results presented in the following table have been obtained:

Year	Total Number of Deals	CAR	Number of Statistically Significant	% of Statistically Significant	CAR when Listed Target	CAR when Unlisted Target
2013	314	3.02%	64	20.38%	-2.12%	3.10%
2014	375	4.02%	68	18.13%	0.46%	4.13%
2015	362	1.07%	70	19.34%	- (*)	1.07%
2016	302	1.70%	54	17.88%	- (*)	1.70%
2017	297	1.30%	57	19.19%	-0.32%	1.33%
2018	278	0.77%	71	25.54%	-1.97%	0.81%
2019	296	-0.03%	59	19.93%	-1.68%	0.00%
2020	269	5.00%	45	16.73%	-10.93%	5.74%
2021	518	3.83%	56	10.81%	-17.29%	4.21%
2022	325	1.42%	41	12.62%	- (*)	1.42%
2023	266	2.84%	49	18.42%	-2.60%	2.95%

(*) no statistically significant CARs available for this year

Table 1 - 2013-2023 Acquiring Firm CAR

At first sight it is evident that, also in the more recent years which the analysis seeks to take into consideration, the results are in line with the previous literature. The obtained results prove that also in the years between 2013 and 2023 there is indeed value destruction (i.e. negative CARs) for those cases in which an acquiror purchases a public target while there is value creation in case of a deal with a private target firm involved.

It must be noted that for what concerns the CARs generated in the years 2020 and 2021 these results seem to be well above the general trend of the results obtained for the other years being analysed. The cause behind this trend is assumed to be the general market turmoil caused by the Covid-19 pandemic. Refer to *Chapter 4* of the study where a more in-depth analysis of the existing relationship between overall market turmoil and CARs is explained.

With the above results at hand, the final step of the analysis is that of identifying the causes which lead to negative abnormal returns when companies acquire public targets and vice versa to positive abnormal returns when unlisted targets are acquired. The leading “cause” behind this difference can be identified

in the methods of payments used by the acquiring firms to purchase the sell-side companies.

Generally acquiring companies, when purchasing a private target, do so paying its price only using cash – this is generally the preferred method as the target's shares are not listed on the stock exchange making them much more difficult to be valued in the first place and liquidated by the acquiror when needed. Much to the contrary public target firms are usually acquired by means, not only of cash financing but also of equity financing or in some cases solely by means of stock-financing.

It is generally agreed upon by previous studies on the method of payments used to finance acquisitions in M&A deals, that *“cash-financing bidding firms [...] earn “normal” rate of returns at the announcement period”* (Travlos, 1987, p961) while *“stock exchange offers are associated with negative abnormal returns”* (Travlos, 1987, p961).

In purely theoretical terms, financing an acquisition with stock compensation means either carrying out a stock-for-stock transaction where the acquiring company offers its own (newly issued) shares to the shareholders of the target company on the basis of a pre-set exchange ratio.

The acquiring company can also choose to use a combination of both equity and cash financing. It is evident that such method of payment can only be employed in transactions which involve both a listed target and acquiror. One of the reasons which lead a company to choose to finance an acquisition not only by means of a cash consideration is to partially reduce the risk associated with the transaction.

In general, *“equity issues are associated with reliably negative abnormal returns of around 22 to 23 percent during the few days surrounding the announcement”* (Andrade et al.,2001, p.111). An equity issue tends to generate negative returns since once the issue is announced the market perceives such event as a negative signal of the company needing to go to the market to finance its operations.

The negative abnormal returns associated with financing the acquisition with equity can be explained by the fact that such acquisitions can be viewed as two

simultaneous events: on one side the acquisition of the target company and on the other side an equity issue necessary to generate the “acquisition currency”.

Thus, it is evident that in case of an M&A deal financed by equity a negative cumulative abnormal return can be expected.

On the basis on what has been said so far, the data in *Table 1* can be further split into on the basis of the payment method employed to conduct the M&A deal.

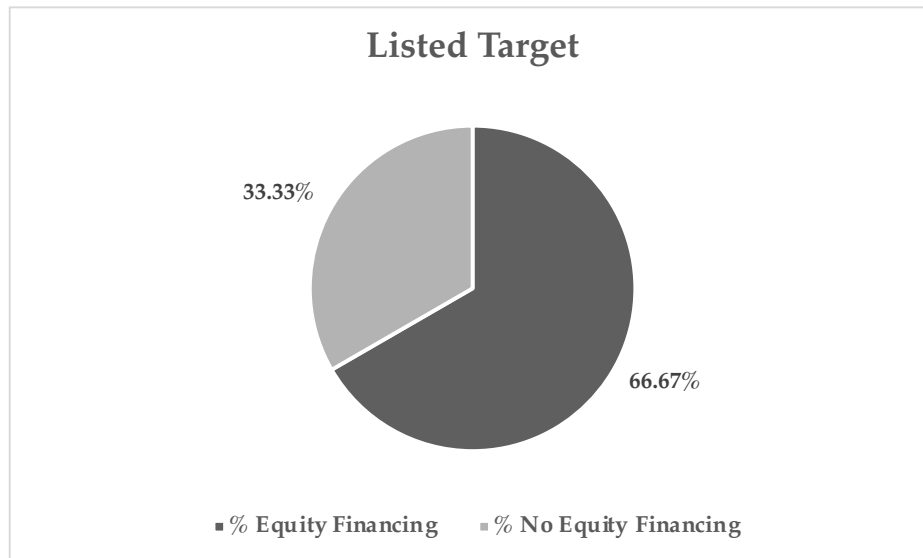


Figure 3 – Payment Method Breakdown – Listed Target

It is evident that in case the acquiror chooses to purchase a listed target company, in most of the cases, more precisely 66,7% it does so by equity financing and considering all that has been said above this explains why for the years under analysis these deals have generated on average negative CARs for all the years under analysis.

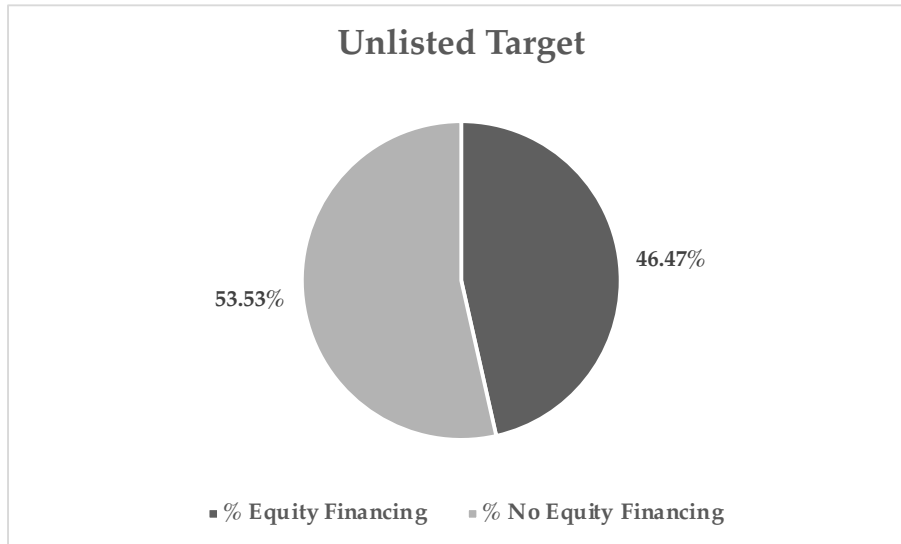


Figure 4 - Payment Method Breakdown - Unlisted Target

On the other hand, most of the deals involving an unlisted target are paid not using equity financing – that is mostly using cash. As a result, the CARs generated for all the years under analysis is on average positive.

In conclusion it can be said that even in the more recent years under analysis, the results obtained confirm those of the previous literature: value is destroyed (i.e. negative CAR) when an acquiror purchases a public target while value is created in case of a private target. Furthermore, the leading cause behind value destruction in case of a public target is the choice of the acquiror to purchase the target, in most cases, by means of equity financing.

4 M&A Value Creation and Stock Market Volatility

Volatility in the stock market represents a measure of the fluctuations in the price of a given asset trading on a given stock market, consequently causing unpredictability on the returns which such asset can generate for a given investor. The higher the volatility, the higher the unpredictability of assets' prices and their returns as a result it is evident that volatility can be intended as a measure of risk for a given investor possessing a certain asset.

4.1 Stock Market Volatility: Causes and Measures

Overall stock market volatility is affected by three main factors: one is unsystematic risk, that is the risk proper of the industry and overall sector to which the assets belong – this is also commonly referred to as diversifiable risk since any given investor can create a well-diversified portfolio containing assets of various type as to reduce this type of risk.

The second factor is systematic risk, or undiversifiable risk, which as the name suggests is the risk belonging to the overall system where the assets belong – namely, the stock market. Such risk can't be diversified as it affects the overall market, not only a given stock or a given industry as a result there is no way a given investor can balance its portfolio in a way as to mitigate such risk as it systematically affects all assets.

One last factor which does indeed have an effect on the overall stock prices variation is investors' behaviour: when there is positive market sentiment towards a given asset this can of course lead the prices to rapidly increase or vice versa. Another behavioural factor which can lead to sharp variations in prices and consequently increase volatility is, as discussed extensively in the previous chapter, investors' expectations with regards to future earnings, growth or in the specific case of this study the overall outcome of an M&A deal.

Stock market volatility can be split into two categories: short-term and long-term volatility. By short-term stock market volatility is intended every sharp drop or peak in stock prices, the main causes behind such movements are not to relate to the overall economic and market conditions but more to how the securities are traded at that specific moment in time. Trading volume and general trading activity by investors is one of the leading causes of short-term stock market volatility, it has been shown that when many market participants seek to simultaneously carry out the same trade on the same stock (in simpler terms, when all investors want to buy or sell at the same time) this causes higher volatility. Generally, what causes an increased number of investors to want to execute the same trade at the same time is an inflow of new information about a given stock (e.g. earnings reports, analysts' upgrading or downgrading of the stock etc), as demand shifts so rapidly also prices change accordingly thereby causing an increase in volatility.

On the other hand, long-term volatility refers to changes in prices which last for longer periods of time be it weeks or months. One of the leading causes behind long term volatility can be identified in overall economic conditions: if the economy falls into recession and general economic conditions become more severe, this leads to a decrease in overall demand thus firms – more specifically those with higher operating leverage (i.e. high fixed costs compared to variable costs) might suffer in terms of revenues and overall profitability leading to more volatile stock in terms of returns. In general, whenever macroeconomic conditions are more uncertain, when interest rates are increased or decreased by central banks, often in response to other events such as geopolitical tension or changes in government policies, overall volatility in the stock market tends to increase.

The main difference between short- and long-term volatility lies in the fact that while short-term volatility is caused by sudden events which cause just as sudden market shifts, long term volatility is in turn caused by events which might take place just as rapidly but the consequences which these events cause might take more time to unfold completely.

4.1.1 Measures and Indexes of Stock Market Volatility

To measure market volatility the standard deviation of stocks returns is generally used, it is commonly represented by the symbol σ and it is calculated by means of the following formula:

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (r_i - r_{avg})^2}{n - 1}}$$

where:

- r_i represents the return generated by the stock at a specific point in time i ;
- r_{avg} represents the average rate of return generated by the stock over a given time frame prior to time i ;
- n represents the number of trading days observed.

Overall market volatility can also be evaluated on the basis of indexes, one of the most recognised indexes for measuring volatility is the CBOE Volatility Index, hereinafter referred to as VIX. The VIX index is computed by combining the weighted prices of put and call options on the S&P 500 index for the next 30 days. The index essentially attempts to represent the expected price changes of the S&P 500 market index for the upcoming 30 days, it essentially measures how much investors expect the S&P 500 to fluctuate in the following days. It is evident that in periods of high market uncertainty the VIX tends to rise as market participants are unsure about what to expect from the market while in times of stability, when the market is more predictable, VIX tends to be lower.

It is important to point out that VIX and S&P 500 stock prices are negatively correlated. When investors expect a period of high volatility, the demand for hedging instruments such as call and put options rises thereby increasing their price and leading to an increase in the VIX index. While in more stable times, investors become less risk adverse and start selling their securities leading to a decrease in market prices.

4.2 Level of M&A Activity and M&A Waves

M&A activity throughout history, and still to this day, is not constant but rather it tends to fluctuate, it is for this reason that it is widely accepted to say that M&A comes in waves, therefore there are relevant oscillations between periods of high and low merger activity.

The peak of an M&A wave is characterised by an increased number of M&A deals taking place at that specific time but also in an overall increase in the value of the deals taking place.

Merger waves are a widely studied phenomenon and even if most of the studies focus on deals which have taken place between US based companies and consequently on US merger waves, some studies have shown that *“merger waves occurred in three areas [...] – the USA, UK and Continental Europe, waves were almost exclusively confined to companies listed on stock exchanges in all three areas”* (Guler et al., 2012, p.2). Nevertheless, for the scopes of the current study, only merger waves which have taken place in the US, their causes and consequences, will be taken into consideration.

M&A waves are not to be considered a recent phenomenon; the first M&A wave identified in the US stock market dates back to more than 100 years ago. As it clearly depicted in the graph below, since the 1900s a series of M&A waves have occurred in history. Some key facts will be briefly discussed in the following lines which will also attempt to identify the driving causes of such M&A waves.

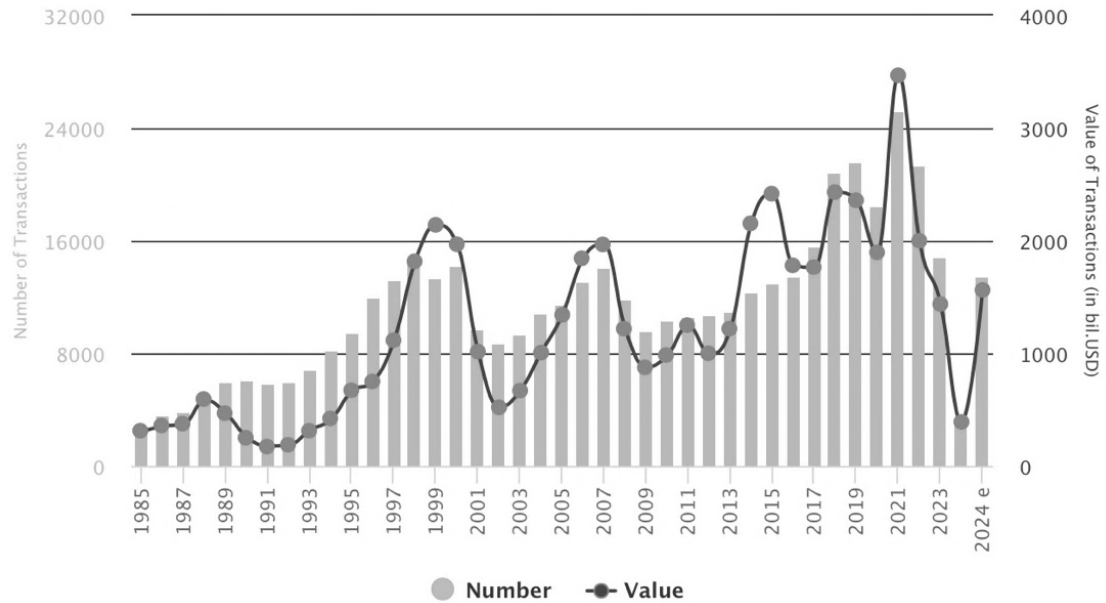


Figure 5 - M&A Waves in the US (Source: IMAA Institute)

The first peak in M&A activity can be identified in the years between 1887 and 1904, the leading cause behind such boost in M&A activity can be identified by an overall improvement in the technology employed by industries at the time as they started drifting away from steam powered engines.

A boost in horizontal mergers between the newly born networks of utilities and railroad industries led to the second peak in the years between 1920 and 1929. In general, it must be pointed out that most of the neoclassical literature on the matter on merger waves identifies technological and industrial reasons as the causes of the earliest peaks in M&A waves.

Another, more recent, example of a merger wave can be identified in the years between 1998 and 2000, which reached its end in the subsequent years of the dot-com bubble burst. The wave was mainly led by a great number of mega deals involving tech companies which in turn was mainly driven by a general overvaluation of such companies. Indeed, it has been shown that another driving cause of M&A waves, especially in more recent times, is a general market overvaluation. At the time of the peak of the market wave, the stocks of most technological companies were greatly overvalued compared to their underlying fundamentals which meant that most of the bidding firms (considering that at the time most of the M&A deals involved tech companies) could use their overvalued

stock as their preferred mean of payment – thereby causing such a peak in the M&A wave.

When the dot-com bubble burst, which in simple terms means that the stock prices of such overvalued companies met again with their fundamental value, as it can be clearly seen in *Figure 5*, the number of deals drastically reduced marking to the end of the M&A wave.

Not only in the instance of the 90's merger wave, but in general term it has been shown that M&A is deeply affected by share prices. *“Some firms' share prices become overvalued during stock market booms and merger waves occur, because the number of overvalued companies increases during a stock market boom.”* (Shleifer et al., 2003, p11). Stock market booms might occur for several reasons but in general terms it can be said that stock markets are strong when also overall macro-economic conditions are favourable, in fact it has also been shown that *“M&A deals cluster when economic conditions are favourable for business and that clustered M&A deals create more value than no clustered ones that occur under less favourable conditions”* (Kim et al., 2019, p.2).

It is clear that the general characteristic of merger waves is that they tend to occur during times of economic expansion, as demand increases and companies look to grow while they end when the economy slows down.

The link between merger waves and volatility is somewhat evident at this point: periods of economic expansion, overall strong stock market performances and optimistic expectations for the future are clear signals which can altogether be considered determinants of high M&A activity but also of periods of low volatility. It is straightforward to understand that when the opposite conditions verify, that is – poor stock market performance and uncertainty towards macroeconomic conditions which indeed cause higher overall market volatility are also those factors which cause M&A activity to reach its lowest levels.

Such general trend can be identified in the following graph which shows for most of the presented years a negative correlation between volatility levels and M&A activity.

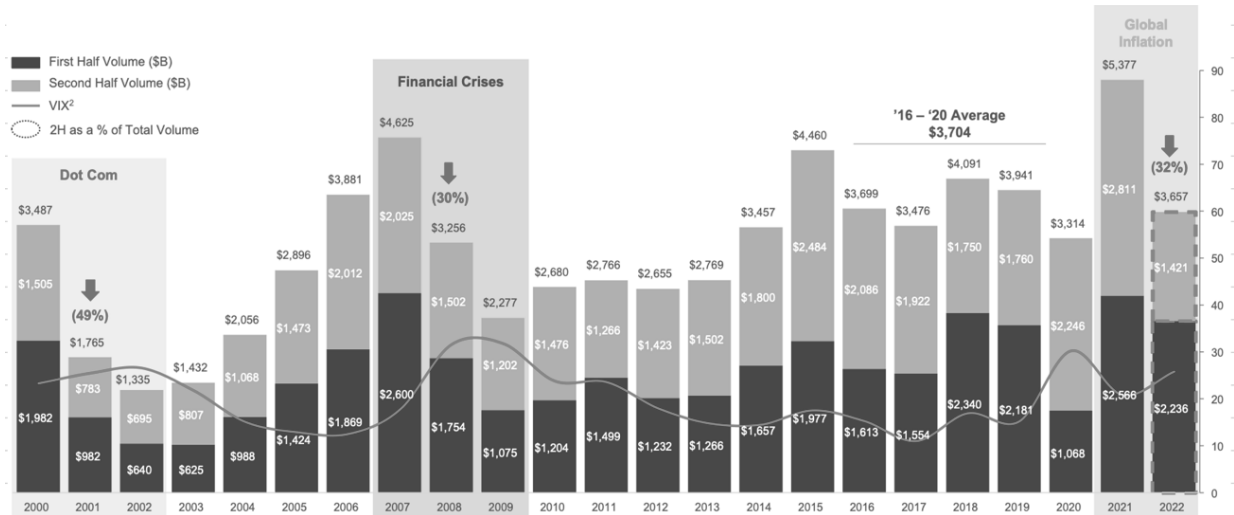


Figure 6 - M&A Activity and VIX levels - Source: Dealogic

4.3 M&A Deal Announcements, Volatility Levels and Value Creation Hypothesis

The current section of the study, taken into consideration all that has been discussed above, initially seeks to test whether a similar trend of M&A activity and its correlation to volatility levels can also be detected in the data employed in the previous chapter of the study.

Employing the same data outputs used in the previous chapter, the following results have been obtained:

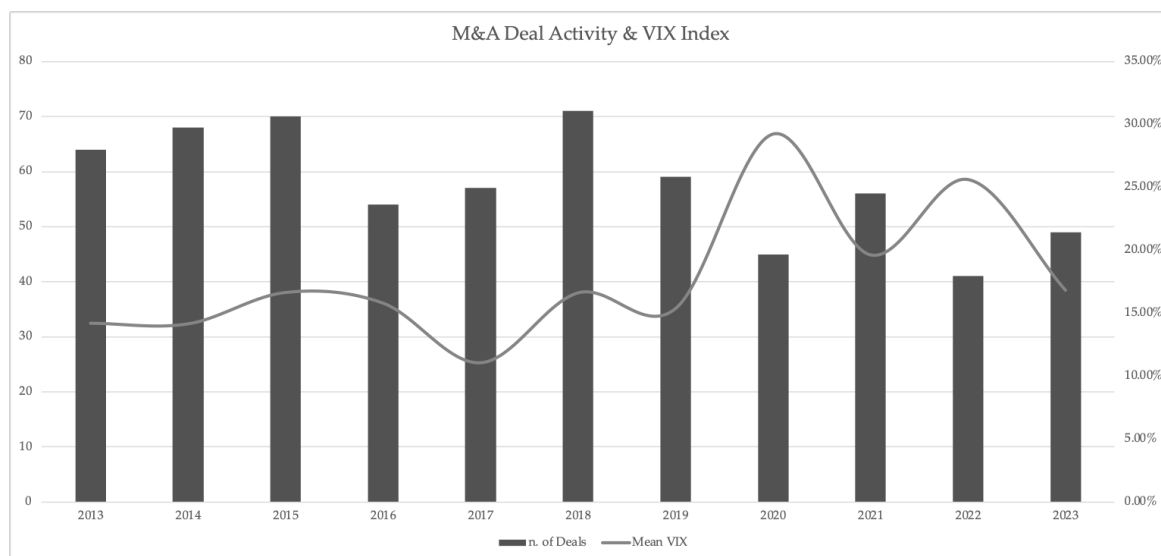


Figure 7 - Data Elaboration of 2013 - 2023 M&A Activity and VIX Index

specifically, the bars represent the number of statistically significant which have taken place in a specific year of the 2013-2023 timeframe of analysis while the line represents the level of volatility which has been obtained by computing the average level of the VIX index for each year under analysis.

From the graph it is immediately evident that the previously highlighted negative relationship which exists between M&A activity and volatility level (clearly depicted in *Figure 6*), still holds true as a general trend also on the basis of the 634 statistically significant deals taken into consideration in this study.

Given the aforementioned finding, the second research question of the study can indeed be introduced. Considering the existence of such M&A waves in terms of deals activity, the scope of the current section of the study is to test whether there is also a difference in terms of created (or destroyed) value for acquiring firm shareholders between times of increased volatility compared to those of more average volatility.

To conduct such test, the previously analysed 634 statistically significant deals have been split into two macro categories: those deals which have been announced in a period of higher uncertainty and those which have taken place in “normal” market conditions. To measure the overall level of volatility, the VIX index has been employed as a proxy, and a deal has been considered to have taken place in a period of market

uncertainty if the average value of the VIX index in the 40 days prior to the announcement was half a standard deviation higher compared to its annual mean.

The findings of the analysis can be summarised as follows:

	Number of Deals	Avg CAR
Normal uncertainty	532	2.69
Higher uncertainty	102	-0.35
Total	634	2.20

Table 2 - Average CAR at Different Volatility Levels

The table summarises striking results: those deals which have taken place in periods of higher market volatility have on average failed to be value accretive for the acquiring firm shareholders, rather they have on average generated negative returns for investors.

These results essentially show that when an M&A deal is announced at times of greater market uncertainty towards the future, the stock market tends to react more negatively towards the announcement.

The reasons behind such value destruction tendency can be many but in general it can be easily understood that whenever there is a higher level of uncertainty in the market, which can be caused by some of the previously discussed reasons, there is an overall heightened level of scepticism towards M&A deals taking place as the market is even more unsure towards the prospects of the deal being successful.

The results in *Table 2* are comprehensive of both public and private target companies as the scope of such section of the study is to show that in periods of higher market volatility value tends to be destroyed for acquiring companies' shareholders.

Nevertheless, referring back to *Table 1*, which instead summarises the findings of the previous research question of the study another trend can be identified – this is especially true for the year 2020 which is indeed the clearest example of a period of increased market volatility. Comparing the results in *Table 1* with *Figure 7*, periods of higher volatility can be translated into higher value destruction in case of public targets but also, in case of private targets, of lower value creation. For the year 2020 value destruction (i.e. negative CAR) amounted to -17.29 % in case of a public target

while the CAR generated in case of a private target amounted to 4.21%, compared to -10.93% and 5.74% in 2019.

In summary, what can be understood from such data is that acquiring companies should overall prefer to carry out M&A deals in periods of higher perceived market stability in the attempt to safeguard the interests of their shareholders.

5 Acquiring Firm Size, Growth Strategies and M&A Value Creation

5.1 Acquiring Company Size and Value Creation Hypothesis

The current section of the study seeks to examine whether there exists a relationship between the acquiring firm size and the value created or destroyed at the moment of the M&A announcement by the bidding firm.

To carry out the current analysis, the same data set employed in the previous two chapters has been taken into consideration. The proxy used to measure the size of the acquiring firms is the market capitalisation of such companies. In simpler terms, market capitalisation is the product between the number of a company's outstanding shares and the current trading price of one share.

The current section of the study has been limited to analysing 572 out of the 634 statistically significant deals identified in *Chapter 2*⁷, and for the 572 acquiring firm under analysis, the deals have been clustered on the basis of their size (i.e. their market capitalisation).

As it is evident from the graph in *Figure 8*, ten clusters have been identified reaching a maximum market capitalisation of \$45B. It must be noted that the numbers reported in the graph are all expressed in Billions of USD\$.

⁷ At the moment of sourcing the relevant market capitalization data for the acquiring firms involved, Orbis M&A did not provide data for some of the companies under analysis. To maintain continuity in terms of the data sources employed between the previous and current chapters of the study, it has been chosen to reduce the number of statistically significant deals taken into consideration in the current analysis to those for which the market capitalisation was available.

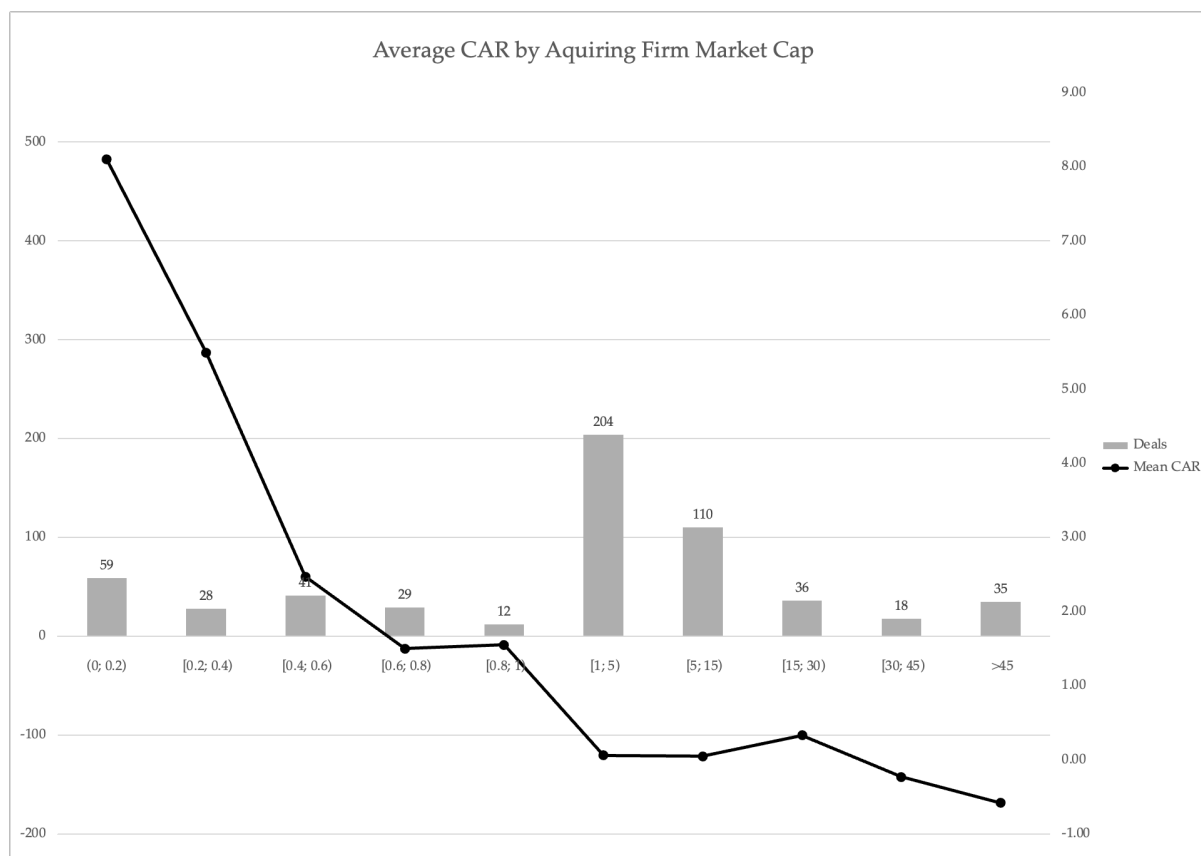


Figure 8 – Average CAR by Acquiring Firm Size

In terms of value creation or destruction for the acquiring firm shareholders at the moment of an M&A announcement, it is immediately evident from *Figure 8* that there is negative relationship between the CAR generated at the moment of the announcement and the acquiring firm size. That is, when the acquiring firm size is at most equal to \$0.6B, an M&A announcement involving such company does indeed create value for its shareholders while as the firm size increases further, value is in turn destroyed for the company’s shareholders.

One of the possible explanations behind the trend which has emerged from the current analysis can be linked back to what has been already discussed in *Chapter 2*, that is – the method of payment employed at the moment of the acquisition. Smaller companies are generally not likely to acquire a larger company and even less likely to acquire a listed company. Therefore, in terms of the method of payment employed to pay for acquiring their chosen target, in most cases their acquisition is financed solely by means of cash. It has already been shown that companies which target private firms and do not use any equity to finance their acquisitions are generally able to create value for their shareholders.

On the matter of small firms being able to create value for their shareholders at the moment of the M&A announcement, another aspect might be taken into consideration: the firm's governance. In general, it has been found that "*managers in small firms typically have more firm ownership than managers in large firms*" (S.B. Moeller et al., 2004, p.203) meaning that the interests of small companies' managers tend to be "more" aligned with those of the shareholders thereby pushing them to pursue better investment opportunities which can have a positive effect on the value created for the shareholders and consequently also for the managers themselves.

It is evident from *Figure 8* that as the firm size increases, the trend of value creation for acquiring firm shareholders indeed transforms into value destruction, that is – negative CARs generate at the moment of the announcement of the deal. This trend, perfectly in line with the findings in *Chapter 2* can be explained by the fact that as the acquiring firm size increases said firm is more likely to finance the acquisition of a target company partially or fully employing equity financing thereby, leading to the generation of a negative CAR at the announcement of the M&A deal.

Another element which might have an impact on the negative reaction by the market when a large firm announces an M&A deal is linked to the premium paid at the moment of the acquisition. It has been shown in previous studies that "*premiums are larger for acquisitions by large firms than for those by small firms*" (S.B. Moeller et al., 2004, p.220) this might be caused by the fact that generally larger firms are involved in acquisitions of target firms which are more likely to require higher premium, this is because of their market positioning, the strategic fit or because of the competitive bidding between potential acquirors. This essentially means that "*large firms pay more because they acquire targets or enter deals that require a large premium rather than because they are large firms*" (S.B. Moeller et al., 2004, p.220), nevertheless the market and its participants might not be aware of this thereby might react negatively to the M&A announcement of a deal where a larger premium is involved as this is perceived as an overpayment by the acquiror to purchase the target company.

5.2 Large Cap Acquirors: Analysis of Deals and Shareholders Impact and Growth Strategy

Considering what has been highlighted in the previous section, the current section seeks to analyse in more detail the deals which do indeed fall in the higher market capitalisation clusters as to further analyse the details of such deals and their implications in terms of value creation (or perhaps destruction) for the acquiring firm shareholders.

As it is evident in *Table 3*, for the scope of the current analysis the top 35 deals on the basis of the acquiror's market capitalisation have been selected. The first result which is worth pointing out is that, for most of the deals involving such large companies, when a deal is announced the market generally does not react at all. Such phenomenon is demonstrated by the fact that, out of the total 35 deals, only 4 have generated a CAR (be it positive or negative). This in much simpler terms means that out of 35 instances only 4 times in the 10 years timeframe did the market react to the announcement of an M&A deal.

It is worth pointing out that such sharp distinction on whether or not the market reacts to a given M&A deal announcement is solely based on the outputs of the event-study method employed throughout this study. It is therefore quite unlikely that most of these acquisitions, involving some of the most worldwide renowned companies, did not generate any type of market reaction. Nevertheless, such reactions might have not been "detected" by the model due to structural reasons, i.e. the chosen event-window might not be wide enough to capture the market's reaction.

No matter such limitation it has been chosen, as to maintain continuity with the previous results, for the scopes of the following analysis to only take into consideration those deals for which the event-study method (with the same conditions previously applied) has indeed detected a statistically significant CAR.

	Acquiring Company	Ticker	Market Cap (\$B)	Date Announced	Target Company	CAR
1	Amazon.Com Inc.	AMZN	916.15	Dec 17, 2019	Net Insight Ab's Sye Consumer Streaming Business	-
2	Microsoft Corporation	MSFT	757.64	Jun 4, 2018	Github Inc.	-
3	Amazon.Com Inc.	AMZN	563.54	Jun 28, 2018	Pillpack Inc.	-
4	Nvidia Corporation	NVDA	486.47	Sep 7, 2023	Inceptiv Inc.	-
5	Unitedhealth Group Inc.	UNH	472.94	Mar 29, 2022	Lhc Group Inc.	-
6	Exxon Mobil Corporation	XOM	454.25	Jul 13, 2023	Denbury Inc.	-
7	Apple Inc.	AAPL	433.13	May 28, 2014	Beats Electronics Llc	-
8	Johnson & Johnson	JNJ	414.31	Nov 1, 2022	Abiomed Inc.	-
9	Microsoft Corporation	MSFT	402.22	Jun 13, 2016	Linkedin Corporation	-
10	Berkshire Hathaway Inc.	BRKB	389.74	Mar 21, 2022	Alleghany Corporation	-
11	Visa International Service Association	V	376.85	Jun 24, 2021	Tink Ab	-
12	Johnson & Johnson	JNJ	375.36	Oct 23, 2018	Ci:Z Holdings Co., Ltd	-
13	Exxon Mobil Corporation	XOM	374.28	Jul 21, 2016	Interoil Corporation	-
14	Exxon Mobil Corporation	XOM	374.28	Jan 17, 2017	Bass Family'S Companies	-
15	Visa International Service Association	V	369.58	Jun 28, 2023	Pismo Holdings	-
16	Microsoft Corporation	MSFT	357.15	Sep 8, 2015	Adallom Inc.	-
17	Amazon.Com Inc.	AMZN	356.31	Jun 16, 2017	Whole Foods Market Inc.	2.34%
18	Mastercard Inc.	MA	350.23	Dec 31, 2021	Dynamic Yield Ltd	-
19	Eli Lilly And Company	LLY	347.61	Jun 20, 2023	Dice Therapeutics Inc.	-
20	Eli Lilly And Company	LLY	347.61	Oct 3, 2023	Point Biopharma Global Inc.	-
21	Broadcom Inc.	AVGO	347.26	May 26, 2022	Vmware Inc.	-
22	Chevron Corporation	CVX	347.07	May 22, 2023	Pdc Energy Inc.	-
23	Johnson & Johnson	JNJ	346.11	Aug 19, 2020	Momenta Pharmaceuticals Inc.	-
24	Unitedhealth Group Inc.	UNH	332.73	Jan 6, 2021	Change Healthcare Inc.	-
25	Pfizer Inc.	PFE	331.44	Dec 13, 2021	Arena Pharmaceuticals Inc.	4.78%
26	Pfizer Inc.	PFE	331.44	May 10, 2022	Biohaven Pharmaceutical Holding Company Ltd	-
27	Pfizer Inc.	PFE	331.44	Aug 8, 2022	Global Blood Therapeutics Inc.	-
28	Jp Morgan	JPM	324.63	Jul 16, 2019	Weichai Power Co., Ltd	-
29	General Electric Company	GE	314.9	Apr 14, 2016	Neuco Inc.	-
30	Westmountain Alternative Energy Inc.	CBNT	294.09	Apr 26, 2018	C-Bond Systems Llc	-
31	Microsoft Corporation	MSFT	288.49	Sep 3, 2013	Nokia Devices And Services Division	-4.90%
32	Pfizer Inc.	PFE	287.63	Mar 13, 2023	Seagen Inc.	-
33	General Electric Company	GE	283.59	Jan 21, 2014	Cameron International Reciprocating Compression Division	-
34	Abbvie Inc.	ABBV	278.95	Nov 30, 2023	Immunogen Inc.	2.75%
35	Visa International Service Association	V	266.66	Feb 8, 2019	Earthport Plc	-

Table 3 - Top 35 Deals by Acquirors' Market Capitalisation

From *Table 3* the four deals which have generated a CAR have been selected, as reported in the table below and have been further studied to attempt to identify the main causes and consequences of such M&A deals.

	Acquiring Company	Ticker	Market Cap (\$B)	Date Announced	Target Company	CAR
1	Amazon.Com Inc.	AMZN	356.31	16 June 2017	Whole Foods Market Inc.	2.34%
2	Pfizer Inc.	PFE	331.44	13 December 2021	Arena Pharmaceuticals Inc.	4.78%
3	Microsoft Corp	MSFT	288.49	09 March 2013	Nokia Hardware Division	-4.90%
4	AbbVie Inc.	ABBV	278.95	30 November 2023	Immunogen Inc.	2.75%

Table 4 – Top CAR Generating Deals by Acquiring Firm Market Capitalisation

A common trend which can be identified and will be further detailed in the subsequent sections, is that virtually all deals presented in the table have been carried out by the acquiring company following a common strategy, that is the growth by acquisition strategy. Before entering into the details of the deals presented in *Table 3*, a brief theoretical introduction of the growth by acquisition strategy will be presented in the following section.

5.2.1 Acquiring Companies and Growth Strategy

A common trend which can be identified and will be further detailed in the subsequent sections of the current chapter is that virtually all deals presented in *Table 3* have been carried out by the acquiring company following a common strategy, that is the growth by acquisition strategy.

It has been mentioned in the preceding pages of this study that companies can choose to grow either by internal growth or by external growth, that is by acquiring other companies.

If a company chooses to grow internally – for example by developing a new product, it has to make a significant investment in terms of resources (e.g. financial resources, time, workforce etc.). Moreover, it may take time for such investment to be fully developed and therefore generate an overall return for the company.

Conversely, for a company looking to expand, external growth might be seen as a better option in terms of resources and time, as the acquiring company can simply purchase an already cash generating asset – i.e. the target company (or part of it). This strategy is commonly referred to as *growth by acquisition*.

M&A deals involving this type of growth strategy can in some cases cause a negative impact on the acquiring company's stock price. The reason behind such market reaction could be simply explained by the fact that the stock market participants, which in general do not have access to the same information as the company, can perceive such acquisition as an unjustified cost. To the contrary, excluding the cases in which managers might pursue acquisition for other interests other than those of the company and its shareholders, the rationale behind such choice is that the company has already evaluated a growth by acquisition strategy to be the best option in terms of cost and return.

Even though any business could, in theory, follow this kind of growth, in practice, companies following an inorganic growth usually have some common traits. This strategy is especially common in highly competitive industries as it is used as a mean to maintain market position, absorb possible competitors, and quickly adjust to technology and market changes. This approach is also commonly used by businesses which largely rely and require high levels of investment in research and development. It is for this reason that the most common industries to which the companies carrying out this kind of strategy belong are technological companies, such companies instead of using their own resources to develop new technologies prefer to have access to such new technologies in a timelier manner by acquiring companies which have already developed them. The same rationale is also applied to the healthcare and pharmaceutical sector: companies in these industries are much more prone to acquiring an external and already fully operating business for its patents and products portfolios rather than developing them on their own.

Another common trait of companies involved in this type of acquisitions is that the acquiring companies tend to be established businesses. A company is considered to be established when it has been operating for an extensive period of time thereby acquiring market share, reaching consistent levels of profitability and thereby a strong cash flow generation. It is indeed required for a company to pursue such a strategy to have strong financial resources to employ both at the moment of the acquisition and also for the subsequent integration of the company being acquired.

Considering all that has been said above, it is evident at first sight that the acquiring companies listed in *Table 3* do indeed "meet" all the requirements necessary for carrying out such types of acquisitions.

5.2.2 Amazon. Com Inc. acquisition of Whole Foods Market Inc. (2017)

Amazon.com, Inc. has grown to become the global leader in the e-commerce industry. In the years Amazon has profoundly revolutionised the online shopping industry with its customer-centric approach and its focus on offering varied and efficient delivery options to its customers also thanks to its logistics network which includes fulfilment centres and advanced delivery systems as to ensure rapid and reliable order fulfilment.

In recent years Amazon has focused on expanding itself also by diversifying the services offered to its customers as perhaps distancing itself from the consumer goods online retail industry. An example of such attempt is its launch of the Prime Video service which made the company gain some market share also in the entertainment industry. Such strategy also enabled the company to diversify its revenues sources and reach an overall increased level of growth

Whole Foods Market, Inc., is a supermarket chain focused on offering natural and organic high-quality options and unique customer experience. The company has been active since the 1980s and has established itself as a leader in the organic foods industry thanks to its focus on quality standards, ethical sourcing practices, and a commitment to sustainability. The chain operates numerous stores across the United States, Canada, and the United Kingdom.

Amazon's attempt to enter into the grocery business started with the launch with its food delivery service, Fresh. Whole Food's acquisition serves as an example of an attempt to further diversify the offerings to its customers, strengthening its presence in the grocery business therefore further boosting Amazon's growth.

Whole Food's acquisition also made it possible for Amazon to gaining way to the physical retail segment thanks to Whole Foods' well established physical retail stores. Amazon's scope is that of integrating its two lines of business as much as possible as it is declared in the press release following the announcement of the acquisition which states that *"customers can have products shipped from Amazon.com to their local Whole Foods Market store for pick up or send returns back to Amazon during a trip to the store"*.

The deal, announced on 16th of June 2018, generated a positive CAR of 2.34%, even if this result might be seen as not in line with the general trend presented in the

previous pages of the chapter, the reasons attributable to the generation of a positive CAR can be linked to the method of payment employed by Amazon for the completion of the deal.

The \$13.7B acquisition was financed solely using cash as the method of payment, Amazon offered Whole Foods \$42 per share in cash, with a 27% bid premium over Whole Foods closing share price of \$33.1 on June 15, the last trading day prior to the announcement. In line with what has been extensively explained in the previous sections, the cash consideration for the deal does indeed justify the phenomenon of value creation at the time of the announcement.

5.2.3 Pfizer Inc. acquisition of Arena Pharmaceuticals Inc. (2021)

Pfizer Inc is one of the most influential multinational pharmaceutical corporations in the world, it specialises in the development and manufacturing of several healthcare products including medicines for different therapeutics needs and it has become even more renowned in recent years for the sale of vaccinations against the Covid-19 virus.

Pfizer is overall a leader company in its sector also thanks to its continuous commitment to innovation, improving the product offerings for its customers, thereby putting a strong emphasis on research and development and overall product innovation. It has generally been recognised as company with an history of acquiring smaller pharmaceutical companies involved in the development of specific treatment which they were looking to further develop and finally offer to their customers.

In the acquisition presented in *Table 3*, the target company involved, Arena Pharmaceuticals, is an American company specialised in the development of innovative treatments for several immuno-inflammatory diseases. It is therefore evident that this acquisition is perfectly in line with Pfizer's overall goal of increase the portfolio of treatments offered to its customers.

The deal, announced on 13th of December 2021, generated a positive CAR of 4.78% which might be seen as not in line with what has been previously discussed in the current chapter. Nevertheless, the leading cause behind such value creation for Pfizer's shareholder at the moment of the announcement of deal can be linked back to

what has been discussed in *Chapter 2*, that is – the method of payment employed for the acquisition.

According to the press release published at the announcement of the deal “Pfizer will acquire all the outstanding shares of Arena for \$100 per share in an all-cash transaction for a total equity value of approximately \$6.7 billion”. The reason behind Pfizer’s choice to pay for the deal solely using cash as the payment method can be led back to the fact that following the Covid – 19 pandemic and the consequent revenues generated from the sale of the vaccines which they had developed, the company had a substantial quantity of cash at hand to reinvest for the business’s growth. As previously highlighted, the choice of a company to solely use cash as the payment method generally leads to value creation for the acquiring company’s shareholders and this appears to be a deal which confirms this trend.

5.2.4 Microsoft Corp. acquisition of Nokia’s Hardware Division (2013)

Microsoft Corp is widely known to be one of the most influential companies in the tech industry, it focuses on developing both software and hardware products and on providing several different cloud computing services. Through its years of activity, Microsoft has carried out its product diversification strategy also by means of a series of acquisitions strategically aimed at further developing its market reach.

In turn, Nokia Corp. is a multinational company active in the telecommunications industry, starting from the late 80’s the company became leader in the mobile phones market until the start of its decline around the 2010s due to the entry of competitors such as Apple and others such as Google and Samsung.

The 2013 acquisition of the Nokia mobile phones production and development business unit does represent an example of the implementation of a growth by acquisition strategy: Microsoft’s aim was that of gaining market share in the cell-phone industry and chose to acquire the business line of a company expert in the selected sector. On the occasion of the announcement of the deal on the 9th of March 2013, Microsoft declared that “*in addition to their innovation and strength in phones at all price points, Nokia brings proven capability and talent in critical areas such as hardware design and engineering, supply chain and manufacturing management, and hardware sales,*

marketing and distribution". The statement clearly shows that the rationale behind the acquisition carried out by Microsoft is that of "acquiring" the expertise they required from outside the company rather than developing it inside.

As it is evident from the negative CAR of -4.90% generated at the announcement of the deal, the market did not react positively to such event. Notwithstanding the fact that the deal was actually an all-cash deal, the leading cause of such reaction might be attributable to the fact that the deal represented the second biggest deal (in terms of purchase price) carried out by Microsoft but the division being acquired belonged to a company which shares had been underperforming in the market for quite some time as a consequence of the overall poor performance of the division and the overall company.

This is a clear example of how the market can react negatively to the announcement of an M&A deal whenever it is unsure of the potential success of the deal being entered into and how this can have a negative impact on value creation for the acquiring firm's shareholders.

One last point must be highlighted, even if the long-term performance of the M&A deals under analysis is beyond the scopes of the current study it has been reported in *Chapter 2* that "deals that initially received positive market reactions [...] on average remained strongly positive a year later; and the deals that initially received negative market reactions, on average, were viewed strongly negative a year later", in other terms this means that when a deal is initially seen by the market as not promising, on the long-term, it turns out to be true (on average).

Microsoft's acquisition of Nokia's division is a clear example of this and between the years 2015 and 2016 Microsoft had started recognising the challenges posed by the acquisition. In 2015, the acquiring company has to write-off \$7.6B related to the capitalized cost of the acquisition carried out, this substantial write off in the immediate years after the acquisition was a clear indicator for the market of the difficulty which Microsoft had found in integrating Nokia's business division in its operations. The climax of the failure of the deal was reached in 2016 when Microsoft decided to sell off the division to FIH Mobile, the sale marked Microsoft's exit from the mobile phones market and its intention to focus on other market segments.

5.2.5 AbbVie Inc. acquisition of Immunogen Inc. (2023)

AbbVie Inc. is another example of a leading company in the pharmaceutical industry, specialised in the development of various medications across several therapeutic areas. In turn the target company, Immunogen Inc., is a biotechnology company focused on the development of specific cancer treatments.

It was declared by AbbVie that the acquisition, which took place on 30th of November 2023, was intended to further extend its portfolio of cancer treatments, *“the acquisition accelerates AbbVie’s commercial and clinical presence in the solid tumour space”*. This acquisition represents once again an example of a growth by acquisition strategy, AbbVie’s intention was that of further developing its product offerings in terms of cancer treatments and instead of developing them internally, found a better alternative to directly purchase a company specialised on their development.

The CAR generated at the time of the announcement amounted to 2.75% which represents another example of value creation for acquiring firm’s shareholders. It was declared that AbbVie acquired *“all outstanding Immunogen common stock for \$31.26 per share in cash”* thereby it is evident that such positive market reaction might be once again attributable to the method of payment employed for the completion of the deal.

Furthermore, it has been declared by financial analysts which commented the deal that even though AbbVie was acquiring Immunogen’s shares at nearly double their market price (which might be seen as an overpayment for the *“assets”* being acquired), there is more behind the deal and its compensation. Much of the compensation might be attributable to fact that *“Immunogen has been researching for decades and will bring this knowledge to AbbVie, which spent \$6.5 billion in 2022 alone on R&D”* (B. Guichard, Nasdaq) and also to the fact that *“Immunogen has several drugs in various stages of approval, including phase 3 (the final stage)”*.

These elements do indeed make for a very promising target and overall deal and might explain why, in addition to the method of payment employed, the deal did indeed create value for AbbVie’s shareholders.

6 Conclusions

The essential aim of this work was that of evaluating the immediate short-term effects which an M&A deal has on the acquiring firm's stock market price and ultimately the impact of the deal for the shareholders. It is widely accepted in finance that the main purpose of any given company's management is that of creating value for the shareholders who represent the ultimate owners of the company. Nevertheless, the results achieved in the study are not universally in line with this idea, in fact, it has been found that in many instances value is not created but instead actually destroyed.

In brief the major findings of the study point out to that when a given acquiring company involved in an M&A deal chooses to purchase a listed target company, once the deal is announced the reaction of the market tends in most cases to be negative on average (that is, the cumulative abnormal return generated is negative) while in case the target is categorised as a private company the return generated is on average positive. The leading cause of such phenomenon is to be attributable to the method of payment employed for the acquisition: listed targets tends to be acquired by a mix of cash and equity financing. Issuing equity, even if for an acquisition, is perceived negatively by the market and therefore leads to negative returns for shareholders.

Moreover, when an M&A deal is announced in period of higher general market uncertainty (i.e. higher volatility), not only is the number of deals taking place drastically reduced but also the average return generated for shareholders at the time of the announcement is on average negative.

Lastly it has been found that a drastic difference exists between the returns generated on the basis of the acquiring firm's size (i.e. its market capitalisation). When the acquiring firm is smaller, the return generated at the time of the announcement tends to be positive on average while as the size of the acquiror increases the return decreases and even becomes negative.

With these results at hand, one might wonder why managers still chose to pursue these deals notwithstanding the potential adverse consequences for shareholders. In some cases, the reason behind such behaviour is that the real prospects of the deal and

the true reasons behind it might not be immediately observable by the market which may not be completely aware of the rationale behind the deal.

While in most cases managers do carry out deals with the interests of shareholders in mind and the negative market reaction (besides the reasons observed in the study) is to be attributable to a misalignment in the level of information available to market participants, in other cases managers are not as committed to the shareholders' interest.

In the latter case managers might be so fascinated by prospects of their own gains that they oversee the negative impacts that deals they choose to pursue might have on the shareholders. In some cases, managers are tempted to purchase given companies, which might not be a good fit, only because they see the deal as a potential way to show off their skills or retain their position or because they might overestimate their capabilities to integrate the two companies together notwithstanding the original mismatch in terms of strategic fit.

One last point which must be underlined is that no matter how much the study has attempted to standardize and model the market's reaction to the announcement of any given M&A deal, part of the reasons behind such market reactions are more difficult to grasp. This is because they depend on several factors which go beyond the simply measurable method of payment or level of market volatility and might also be so specific to any single case that they might require a more in-depth analysis of the specifics of deal taken in consideration.

Appendix 1 – Event Study Method

This section aims at describing the event-study method and its implementation for the scope of the current analysis.

The beginning step of the event-study is that of identifying the event of interest, which for the scope of this work is always the announcement of a given M&A transaction.

The following step is that of defining both the *event window* and the *estimation window*.

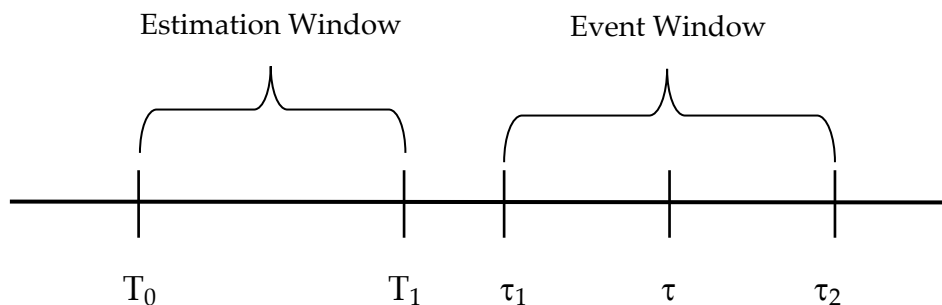


Figure 9 – Event Study Time Windows

The estimation window is a given period of time, prior to the event of interest, which is employed to estimate the normal performance of the acquiring company's stock. The timeframe is chosen in a way as to make sure that the performance of the stock is surely not influenced by the stock price's reaction to the event taking place.

In turn, the *event window* represents the period of time over which the variation of the acquiring firm's stock price will be examined, it must be noted that such event window must also necessarily include the day of the occurrence of the event.

The measure employed to evaluate the impact of the occurrence of the event on the stock price is the *abnormal return*, which represents the return of the security over the event window minus the normal return of the security over the estimation window. The normal return can be defined as the expected return of a given security in a given period of time, unaffected by the extraordinary event which we seek to consider.

$$\text{Abnormal Return} = \text{Return}_\tau - E(\text{Return}_\tau | X_\tau)$$

Where:

- Return_τ represents the actual return at time τ , which represents the event date;
- $E(\text{Return}_\tau | X_\tau)$ indicates the expected normal return at time τ , in other words the expected return at time τ in case the event of interest does not occur.

Another consideration must be made on the computation of stock returns, it is of general understating in finance that stock prices do not have a normal distribution, but it can be assumed for them to have a lognormal distribution. Therefore, in order to calculate the return on the stock price the following formula is to be employed:

$$\text{Return}_t = \log\left(\frac{\text{Price}_{t+1}}{\text{Price}_t}\right) \approx \frac{\text{Price}_{t+1}}{\text{Price}_t} - 1$$

in the study, the returns have been computed using the presented approximation⁸.

For the sake of completeness, it must be mentioned that there are two common methods generally used to model the normal return, the first is the *constant mean return model* and the second is the *market model*. In the first model, the expected return is a constant while in the second method the expected return is assumed to be linearly dependent with the overall market return. The latter method will be employed in this study, the fundamental reason behind this choice is that the scope of the analysis is that of identifying the returns generated solely by the occurrence of the event (which in this case is the M&A deal announcement), in other words

⁸ The key assumption for the approximation is that the ratio between the two consecutive days' stock prices is a small number smaller therefore this applies: $\log(x) \approx x-1$

any stock price variations influenced by other events or market trends are not to be considered as abnormal returns.

The market model essentially is a statistical model which aims at relating the return of a security with the return of the market portfolio, in analytical form it can be expressed as:

$$Return_{stock,t} = \alpha + \beta * Return_{mrk,t} + \varepsilon_t$$

Where:

- $Return_{stock,t}$ represents the security's return at time t;
- $Return_{mrk,t}$ represents the market's return at the same time t;
- ε_t represents the error term and: $E(\varepsilon_t) = 0$; $Var(\varepsilon_t) = \sigma_{\varepsilon_t}^2$

Alpha (α) and beta (β) can be estimated as follows:

$$\beta = \frac{\sum_{t=T_0}^{T_1} (Return_{stock,t} - \mu)(Return_{mrk,t} - \mu_{mrk})}{\sum_{t=T_0}^{T_1} (Return_{mrk,t} - \mu_{mrk})^2}$$

$$\alpha = \mu_{stock} - \beta \mu_{mrk}$$

Where:

$$\mu_{stock} = \frac{1}{(T_1 - T_0)} \sum_{t=T_0}^{T_1} Return_{stock,t}$$

$$\mu_{mrk} = \frac{1}{(T_1 - T_0)} \sum_{t=T_0}^{T_1} Return_{mrk,t}$$

For the application of the model, the market portfolio is generally represented by a *stock market index* which is generally considered to be a proxy for overall market movements, in this study the market index employed is the S&P 500.

Given the market model parameters, the stock's abnormal return at the event date, is defined as:

$$Abnormal\ Return_{stock,\tau} = Return_{stock,\tau} - (\alpha + \beta * Return_{mrk,\tau})$$

In other words, the abnormal return measures how much the actual stock price at the event is different from the estimated value of the stock at the same date. Assuming that the Market Model is a good proxy for the stock price estimation in relation to the market trend, any large difference between the actual stock price and the estimated price is an indication that the event (M&A announcement) had an impact on the stock's price.

The *Cumulative Abnormal Return* in the Event Window (τ_1, τ_2) is defined as:

$$Cumulative\ Abnormal\ Return_{stock} = \sum_{t=\tau_1}^{\tau_2} Abnormal\ Return_{stock,t}$$

Once the cumulative abnormal return (CAR) has been computed the last step of the analysis is that of testing for its statistical significance. In analytical terms, a test for statistical significance can be expressed as follows:

H_0 : $CAR = 0$, the null hypothesis H_0 essentially states that the event did not have any effect on the security's return.

H_1 : $CAR \neq 0$, the alternative hypothesis H_1 states that the event did indeed have an effect on the security's return.

In order to assess whether or not the null hypothesis can be rejected, meaning testing if the obtained CAR value is indeed statistically significant the first step is to compute the t-statistic for the cumulative abnormal return by means of the following formula⁹:

$$t_{CAR_i(t_1, t_2)} = \frac{CAR_i(t_1, t_2)}{\sigma_i * \sqrt{t_2 - t_1}}$$

if the obtained t-statistic has a value greater than a pre-set critical value then the null hypothesis can indeed be rejected, that is – the CAR is statistically significant. The critical value depends on the defined level of confidence. In the study the critical value is 1.96 which corresponds to a 95% confidence level. In much simpler terms, testing for statistical significance and possibly rejecting the null hypothesis means being assured that the obtained CAR is not only a product of chance but is indeed caused by the event under analysis.

⁹ The formula is used as mean to “standardise” the obtained CAR value, as to give it a normal distribution since the test of significance to be applied can only be carried out on normally distributed variables.

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