

St. Petersburg State University
Graduate School of Management
Master in Corporate Finance

**Reaction of the bondholders to the M&A deals:
evidence from American oil & gas market**

Master's thesis by the 2nd year student

Vladimir Kadnikov

Research advisor:

Vitaly Okulov, Associate professor

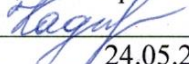
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АННОТАЦИЯ

Автор	Владимир Андреевич Кадников
Название магистерской диссертации	Реакция держателей облигаций на сделки слияния и поглощения на примере американского рынка нефти и газа
Факультет	Высшая Школа Менеджмента
Направление подготовки	Корпоративные финансы
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Научный руководитель	Виталий Леонидович Окулов
Описание цели, задач и основных результатов	<p>Целью данного исследования ставился анализ реакции долгового рынка на сделки слияния и поглощения, а также исследование реакции с позиции гипотезы перетекания ценности между участниками сделки. Мы использовали метод разность разностей для оценки реакции долгового рынка и метод оценки собственного капитала как опциона кол для оценки эффекта перетекания ценности между держателями облигаций и акционерами поглощающей компании. На данных американских компаний нефтегазового сектора была обнаружена реакция кредиторов: стоимость облигаций поглощающих компаний в среднем упала на 4,37 единиц сильнее, чем в среднем упала стоимость облигаций компаний, не участвующих в сделках слияния и поглощения. Для 84% поглощающих компаний, имевших негативную тенденцию стоимости облигации, был найден эффект перераспределения ценности от держателей облигаций к акционерам компании. Этот эффект может объяснять снижение стоимости облигаций: держатели облигаций стремились компенсировать потери посредством предъявления больших требований к доходности облигаций, что впоследствии снизило цену облигации. Принимая эффект перераспределения ценности между акционерами и кредиторами поглощающей компании за объясняющий фактор реакции долгового рынка на сделку, авторы выявили влияние риска на сам эффект: обнаружено повышение общего риска для 91% компаний с эффектом перераспределения ценности. Повышение риска происходило посредством покупки более рискованной компании-цели. Данная цепочка «риск-перераспределение ценности» согласуется с теорией оценки опционов.</p>
Ключевые слова	Реакция долгового рынка, держатели облигаций, сделки слияния и поглощения, рынок нефти и газа, эффект перетекания ценности, разность разностей, модель Мертона, оценка опциона

ABSTRACT

Master Student Name	Vladimir A. Kadnikov
Master Thesis Title	Reaction of the bondholders to the M&A deal: evidence from the American oil&gas market
Faculty	Graduate School of Management
Main field of study	Management in Corporate Finance
Year	2016
Academic Advisor's Name	Vitaly L. Okulov
Description of the goal, tasks and main results	<p>The aim of this study is to analyze of debt market reaction to M&A deal as well as to identify the debt market reaction from the perspective of the hypothesis of the wealth redistribution between the participants of the deal. We used the difference in differences method for the evaluation of the debt market reaction and option pricing theory for estimation of the effect of the wealth redistribution between bondholders and shareholders of the acquiring company. On the basis of data of US oil&gas companies the reaction of creditors to the M&A deal was detected: the value of the bonds of acquiring company on average falls by 4.37 units, which is greater than the average bond price drop of the companies that did not participate in any M&A deal. For 84% of the acquiring companies that have negative trend in their bond prices the effect of wealth redistribution from bondholders to shareholders was found. This effect can explain the decline in the bonds prices: bondholders seek to compensate for the loss by claiming for higher yield, which subsequently reduces the bond price. Considering the effect of the wealth redistribution between shareholders and creditors of the acquiring company the explanatory factor of the debt market reaction to the deal, we found the impact of the risk on the effect itself: the risk increases for 91% of the companies with the wealth redistribution effect. The increased risk occurs due to the purchase of riskier target. Such link "risk – redistribution effect" is consistent with the option pricing theory.</p>
Keywords	Debt market reaction, bondholders, mergers and acquisitions, oil&gas market, wealth redistribution, difference in differences, Merton model, option pricing

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Introduction

Mergers and acquisitions (hereinafter M&As) field was always important in the economic and financial science and even nowadays, in a time of financial crisis, it attracts the attention of researchers. Generally, researchers are interested in positive effects of M&A activity as a source of the growth for companies. In particular, such effect as creation an additional value for shareholders is the most important factor for being M&A bargain successful. The performance of each private company in capitalistic world must bring profit and, consequently, create value for shareholders. Thus M&A activity, as an essential part of the performance of growing companies, should also create additional value. In reality, even though there are many concerns on whether M&As bring or destroy the real value it remains the main source of companies' growth.

Alongside the creation of value in M&A deal the effect of value redistribution from shareholders to creditors or vice versa can be observed. Managers are supposed to increase shareholder value by leading the company in a proper way. Thus, such value redistribution during M&A deal should be thoroughly tracked by managers in order to protect shareholders' interests. The debt market reacts to M&A deal, in particular – to the characteristics of the target in the deal, by changing creditors' required yield. Such yield volatility enables creditors to capture additional profit or at least hold the wealth. For managers it is essential to know what target's characteristics are important for creditors to be able to predict the credit rate for the current obligations of the parent company.

The object of this study is bond prices of the companies participating in M&A deal. Followed by the research object, the following research subject is identified: the influence of M&A deal announcement on the bond prices

Thesis main goal is to analyze the debt market reaction to the M&A deal and investigate the reaction from the perspective of wealth redistribution effect

To reach the main goal of this research the following **objectives** are stated:

1. To analyze theoretical background of stock and debt market reaction to M&A deals and identify factors, which influence the marker reaction to the deal;
2. To analyze prior researches on conflict of interest between shareholders and creditors;

3. To analyze the empirical methods of measuring the reaction of stock and debt markets to M&A deals;
4. To collect the data for empirical analysis on the American market and restructure that data for proper application of the chosen methodology;
5. To conduct an empirical study using Difference-in-differences approach to identify debt market reaction to the M&A deal;
6. To estimate the effect of welfare redistribution between the stakeholders using Merton model;
7. To identify the interconnection between welfare redistribution in M&A deal and the bondholders reaction to M&A deal;
8. To identify the factor influencing the welfare redistribution between shareholders and bondholders.

To complete the analyses the following **research questions** are set:

- What are the factors that influence the market reaction to the M&A deal?
- In what way the conflict of interest between shareholders and creditors affects the gains and losses of both counterparties?
- In what way the debt market reacts on the M&A deal on the oil&gas market?
- To what extent the acquiring companies are exposed to welfare redistribution effect?
- How the welfare redistribution effect and the debt market reaction are interconnected?
- What factors do influence the welfare redistribution effect?

The primary method for the analysis is Difference-in-Differences method. This statistical method is widely used for catching an effect difference between different groups. Option pricing model (Merton model) is the second method used in this study for catching the welfare redistribution effect. The complete methodology of our research is described in detail further in this paper.

As a final result of our research we will consider the answers on all research questions as well as explicit managerial implications. The results of the empirical part can be useful for the agents of the deal – both strategic management, who decides on the essentiality of the potential deal in terms of potential effects for the company in relation to its bondholders, and bondholders of the acquiring company in respect to their interests.

The paper is divided into 5 main parts: introduction, 3 chapters, and conclusion. The first chapter is devoted to the theoretical issues related to M&A deal, bondholders yields, conflict of interest between shareholders and bondholders that influences their positions in the M&A deal, and literature review of key papers and previous researches in this field as well as determination of the

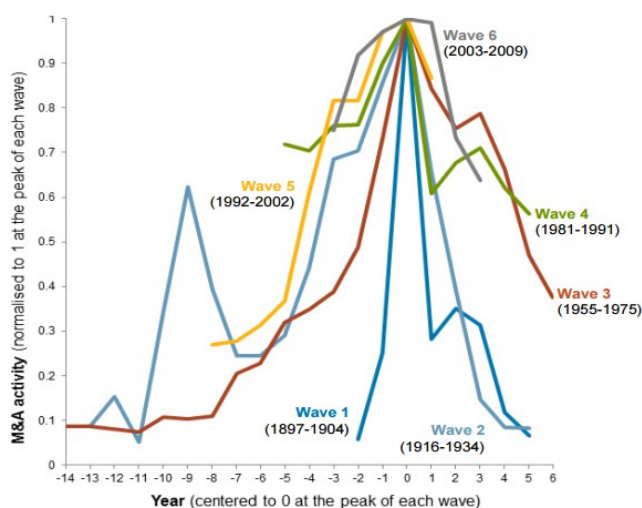
research gap, which we are aiming to fulfill by our study. In the second chapter we explicitly define the research problem and described the research design and the chosen research method. The third chapter is a description of the empirical part of our research – data collection process as well as main findings are shown there. Finally, in conclusion we summarized the whole logic of the paper – there we derive with main managerial implications on the bondholders' reaction on M&A deal.

Chapter 1. Theoretical grounds of the market reaction on M&A deal

1.1 Motives of M&A

Mergers and acquisitions are extremely popular as a growing strategy for business both nowadays and in the past century: from the very beginning of the XX century there were 6 so called M&A “waves” (Bruner, 2009). The last M&A wave occurred just before the international financial crisis in 2007-2009 due to easy access of the multinational firms as well as SME¹ to the capital and funding.

Graph 1.1.1 M&A waves²



Definitely, there should be reasonable motives for companies to engage in mergers and acquisitions. Then, the question “Why do companies participate in M&A?” arises. We define 3 major motives why firms engage in M&A activity: the potential for synergy, the agency motive, and the hubris motive (Berkovitch and Narayanan, 1993).

The synergy motive for M&A is possible because in some cases the combined entity (acquirer) have greater market value than the sum of premerge market value of counterparties. In other words, combining the two companies creates synergies. Under this motive it is assumed that managers of both bidding and target firms aim to increase the shareholders’ wealth and then engage in M&A only in case of win-win deal, where the shareholders of both entities gain additional wealth. To make the abovementioned statement reasonable, the hostile acquisitions are not considered for

¹SME – small and medium enterprises

²M&A activity: Where are we in the cycle

explaining the synergy motive. However, the synergy resulting from the deal does not mean that both parties get the fair amount of wealth (or that the so called “synergy” wealth, which is the difference between the combined entity market value and the sum of the market values of both M&A parties just before the deal): the bargaining power of one of the firms engaging in the deal leads to a bigger amount of wealth gaining.

All synergies can be divided into two categories: operating and financial synergies. Operating synergies is that that is achieved by obtaining the economy of scale and/or economy of scope by creating advantage of combined entity in production, distribution and marketing activities, the transfer of skills and expertise by acquirer’s management team, or the acquisition of new technology or intangible assets (e.g. acquisition of knowhow of new markets). Operating synergies tend to arise primarily when both firms are from the same industry or their business somehow connected: either in horizontal or vertical value-chains. Financial synergies are those that are achieved basically in conglomerate acquisitions, when the businesses of the deal parties are not interconnected. Mostly they arise as a part of diversifying strategies. The good results in such deals are possible due to cheaper access to capital, an internal capital market, cash flow stability or a lower bankrupt probability (Martynova and Renneboog, 2006). Financial synergies aim to lower the cost of capital: 9 out of 10 of the acquirers or the target used to achieve the lower cost of capital (Frommelt, 2004).

The second motive is the agency motive, which suggests that it is the self-interest of the bidding firm management that is a major driver and the main motivation for M&As. According to this theory, M&As primarily take place when the bidding managers are willing to increase bidding firm market value and then the bidding firm management welfare at the cost of target’s value and its shareholders. There are several studies supporting this theory. Amihud and Lev (1981) mentioned the aim of diversification of management’s personal portfolio. Jensen (1986) showed that managers use free cash flow in order to increase the size of the bidding firm instead of the increasing of firm value because of the mismatch of the private benefits of the management and the shareholders of the bidding company. Shleifer and Vishny (1989) concluded that acquiring assets can increase the dependence on the bidding management and that is a motive for M&A incentives from the management perspective. For example, specialist managers acquire assets in their own line of business so that the company depends even more on them (Berkovitch and Narayanan, 1993). The idea is that the bidder’s management extract the value from the bidder’s shareholders. Target shareholders in such deals try to gain as much welfare as possible by exploiting their bargaining power. Therefore, the more severe the agency problem is the higher the target shareholders gain.

Such behavior of the acquirer's managers leads to high agency costs, which in turn reduce the total shareholder value.

The third motive is the hubris hypothesis, which suggests that the target valuation mistakes of the bidding firm management are the reason of many mergers and acquisitions. For this reason many companies engage in M&As and get no benefits including synergies. According to this theory, M&As are the result of overvalued synergies and overconfident managers (Frommelt, 2004). Under the assumption that there is an equal probability of overestimation and underestimation of the synergy from the bidder's management perspective, transaction is a case of overestimation. If not, then the target shareholders will accept underestimated synergy and corresponding underestimated offer, but it does not hold in the reality as they rationally reject such economically disruptive deals. As the synergies under hubris hypothesis are zero, the deal itself is basically a transfer of wealth from the bidder to the target: the higher the gain of the target the greater the loss to the bidder. Consequently, while bidders lose their value, the net economic gain of the transaction is zero.

According to theory, mergers and acquisitions are value increasing events for target shareholders in all three motives. However, for acquirers, both hubris and agency motivated acquisitions will have a negative impact on their shareholder value.

1.2 M&A deal: the consequences for stakeholders of bidding and target companies

Even though M&A activity is very popular among relatively large companies and corporations, still the conclusions on its benefits, both short-term and long-term, for the shareholders are controversial. On the one hand, there are many researches that prove the existence of value creation during the M&A, on the other hand, some empirical researches catch the value disruption in the M&A deals. As it was discussed in the previous paragraph, the shareholders of bidding and the target companies may have different results from the deals. In this section we observe literature on the field of benefits and losses for the stakeholders of the M&A deal parties.

Every time when economic agents face with information, the problem of information asymmetry arises: the same is true for M&A deals. Information asymmetry can destroy the market by making good agents leave the market (Akerlof, 1970). When two counterparties have different information, the market is stagnating – Akerlof called such markets as “markets of lemons”. Even though the M&A market is also exposed to the information asymmetry, still this market is very active: probably shareholders and managers eager to succeed with the deal, thus, overconfidence and

belief in the M&A success make the market of mergers and acquisitions active. Anyway, the success of the deal depends on various factors: the growth prospects of the counterparties, the nature of their business and their interdependence, type of the deal, mean of payment, capital structure of acquiring and target firm, management decisions, financial stability, the economic cycle, etc.

Kirchhoff and Schiereck (2011) on the basis of pharma market show that combined entity does not have significant announcement effects and moreover the acquirers destroy the value of their shareholders. Moeller, Schlingemann and Stulz (2005) massively analyzed M&A deals with no reference to a specific industry: they found that for the period 1998-2001 the shareholders of acquiring companies on average lost 12 cents around acquisition announcement per dollar spent on acquisition. A bunch of papers concludes that the shareholder value resulting in M&A is negative: Lyroudi et al. (1999), Eckbo and Thorburn (2000), Bruner (2002).

Morck, Schleifer and Vishny (1990) analyze the M&A from the view of managers and state that value destroying is caused by managerial objectives of acquiring firm. Their results corresponds with the agency theory (agency motive for M&A from previous paragraph) when managers and shareholders have different objectives and that results in value-destroying deals for the bidding companies.

Datta et al. (1992) conducted meta-analysis of M&A deals to answer the question what factors influence the wealth creation from mergers and acquisitions. Using multivariate framework they concluded that while the target's shareholders gain significantly from mergers and acquisitions, those of the bidding firm do not. They found that mean of payment, the presence of multiple bidders, and the type of acquisition have a direct impact on the wealth creation prospects but still majority of the deals are value destroying from the viewpoint of acquirers' shareholders.

This finding about benefits for targets firms support many researchers: Jensen and Ruback (1983), Bruner (2002), Eckbo and Thorburn (2000), Jarrell (1988).

Fuller et al. (2002) found the conditions of the deal, which on average lead to the gain of the bidding firms: bidder shareholders gain in case of buying a private firm whereas public target can lead to their losses. This conclusion is important for us because we can compare our findings on wealth gaining/losing/redistribution wealth in case of private/public target. Moreover, authors state that the return is greater if the bidder uses stocks as a mean of payment.

As for the combined entity, targets benefits lead to the overall significantly positive effects according to Bruner (2002) and Andrade et al. (2001). However, these positive effects remain in magnitude below the targets' gains.

So far shareholders' wealth changing in M&As was discussed. At the same time the interests bondholders are considered important for our research as we further study the reaction of the bondholders of the acquirer on the M&A deal. Decisions favorable for shareholders do not always increase the value of the company and can cause economic damage for bondholders. The reason for that is different objective functions of agents. Hilscher and Sislí-Ciamarra (2013) supported this view and stated that some announcements of M&A are associated with lower shareholder value, higher creditor value, and lower overall firm value when a creditor is present. In other words, conflicts of interest or if not conflict then just one of classical agency problems "creditors vs shareholders" can result in destroying the value (from the viewpoint of shareholders) of acquisitions. The authors developed the idea of different objective functions of creditors and shareholders – the former prefer diversifying acquisitions whereas the latter are interested in cash-financed industry specific mergers and acquisitions. Even though authors primarily looked at the conflicts on corporate boards of directors, they found significant causal link between the existing of creditors in the company and its success in M&A in terms of value generating – the corporate governance mechanism works in the interest of those who are the part of the board of directors: creditor-director approves the deals with negative value for shareholders while shareholder-director does the same for creditor. The same conclusion is made by Jensen and Meckling (1976).

We can conclude that value creation potential of a certain M&A for the bidder, target and the combined entity is under the great uncertainty taking into account issues of information asymmetry and conflict of interest between shareholders and creditors. Still, researchers try to find the determinants of the success deal like mean of payment, organizational form, industry belonging, and different characteristics of the bidding and target companies. We discuss these characteristics on the next paragraph.

1.3 Market reaction to the M&A deal

In order to analyze the effect of M&A announcement on the debt market certain characteristics of the deal and target involving in the deal should be specified. To do so a bunch of research papers, both theoretical and empirical, devoted to the market response on M&As were

analyzed. First, we need to distinguish the stock market reaction and the debt market reaction. Previously we discussed that shareholders and creditors have different objective functions. Thus, we conclude that in some cases the shareholders and the bondholders can react differently on the same M&A deal.

Many researchers evaluate the stock market reaction or the synergy effect of M&A by calculating abnormal returns. Generally, abnormal returns are the returns that are greater than those predicted by the statistical methods (often Event studies approach) on the basis of the historical data. The existence of abnormal return means that the particular stock beat prediction of own price behavior based on the historical data and the market index, which is usually taken in the models as a benchmark.

Jansen and Stuart (2014) analyzed the factors that can help CEOs to predict the stock market reaction on the deal announcement. According to them, the acquisitions can be positive net present value projects, especially those leading to the economies of scale/scope or lowering the cost of capital, still can cause a negative stock market reaction. They used the concept of CAR (cumulative abnormal returns) in estimation of the reaction on the announcements and stated that average M&A announcement has a positive CAR but the volatility of stock reaction is very big. According to the researchers, the great portion of such reaction variation can be explained by 3 factors:

- Size of the bidder: defined by firm market value, small firms have the market capitalization below 25th percentile of all firms trading on NYSE (at the end of 2012 this cutoff was around \$335 million);
- The ownership status of the target: public or private;
- The method of payment: cash or shares of stocks.

The authors stated that these factors have immediate influence on the company's market value when the acquisition is announcing. They reported evidence on the stock price reaction on the M&A from the point of bidder: the data set of almost 17 M&A 000 announcements for the period 1980 – 2008 was used. Regarding the abnormal stock returns measured with CAR methodology, the factor analysis was used:

- Small bidders had average CAR of 1,74%, while large firms gained negative return -0,08%;

Prior studies provided several possible explanations for why firm size matters and concluded that the most likely reason is managerial overconfidence: CEOs and executives of the acquirers

generally overestimate their ability to manage the target and thus overpay for it. In 1986 Roll introduced the hubris hypothesis of corporate takeovers: he stated that acquiring firms infected by hubris first overvalue and then overpay for the target. Roll empirical evidence supported his view of hubris hypothesis. Moreover, he argued that overconfidence of the bidders is as much significant as other explanation factors such as synergy, inefficient target management, and taxes. Other authors support the view of managerial overconfidence as an important factor for M&A announcement success – Jansen et al.(2013), Moeller et al. (2004).

- Private targets bring much more for the bidder in contrast with those of publicly traded: acquisitions of private targets result a positive abnormal return of 1.37%, while acquirers of public targets lose due to a negative abnormal return of -1.20%;

Certain market expectations about the private companies may lead to inadequate or biased valuation of them, which in turn lead to overpayment and negative return during M&A announcement. Fuller et al. (2002) provided the most recent and complete explanation of the relation between ownership status of the target and the abnormal returns. They argued that because of much less liquid market for the shares of private companies, their negotiation position is weaker than that of the public companies. Public targets use their relatively stronger negotiation power to get the higher bidding price: on average the value left to the bidders' shareholders is less than the bidding price, thus they are left with the negative CAR.

- Cash acquisitions on average bring 1,01% CAR, the mix of cash and shares results in 0,8% CAR, stock deals bring negative -0,01% CAR.

Here signaling hypothesis works: the issuing of equity for the deal is a bad signal to the market that means for investors that the share price is too high and the bidder is trying to take advantage from such overvaluation. The existence of such signal is possible due to the information asymmetry: the shareholders and managers know more about their business than the external agents (investors, analysts, creditors, etc). Myers and Majluf (1984) described this signal hypothesis in detail.

Shams et al. (2013) confirmed the findings of Jansen and Stuart by researching the influence of organizational form and the method of payment on the possibility of gaining abnormal returns in M&A in case of public, private, and subsidiary acquisitions on Australian market. They concluded that both factors are relevant for determine abnormal returns.

Apart from the abovementioned factors, other influential factors, which can help to predict or explain the market reaction, exist. Such characteristic as company efficiency is also valuable for catching response effect. Al-Khasawneh and Essaddam (2012) found that mergers combining low efficiency acquirers and targets create significant market returns following the merger event, while mergers combining the least efficient acquirers with moderately efficient targets diminish the acquirer's wealth more than any other type of merger.

Jansen and Ivo (2015) studied the volume reaction to M&A announcements. They found that for acquiring firms such factors as method of payment, target ownership, firm size and the relative size of acquisitions are statistically significant for market response.

Shah and Arora (2014) found that the target and the bidding firms are affected by the reaction differently: the target firms depict that the post announcement returns are significantly greater than the pre-announcement returns, indicative of the immediate market reaction to the information disclosure, while the bidding firm do not show statistically significant abnormal returns.

Bouzgarrou and Louhichi, (2014) aimed to fill the gap of research of distinguishing between the method of payment and the means of financing in M&A deals and tests if the financing means has incremental information beyond that contained in the payment means. One of the findings of this research is the fact that market reaction depends on legal environment (common law vs. non common law) on acquisition characteristics such as deal size and on acquirer specific factors such as size and growth opportunities.

Along with the choosing of characteristics of the target and the deal in general, the proper using of methodology is important. Palmucci and Caruso (2011) analyzed Italian market of M&A of banks and they found that event period should be extended by the “rumor date” – this is important to catch full effect of market response. They showed that not all the effect of market reaction can be measured if the event date is taken as announcement date. It was stated in the research paper that using wider event window including so called “rumor date” bigger portion of market reaction to M&A is captured.

So far we observed the stock market reaction on mergers and acquisitions. In fact, most of researchers' attention is devoted to stock reaction rather than bond market reaction. The reason of such massive interest to the market reaction is clear shareholder and managerial implication – by

determine the factors of market reaction on the M&A deal companies' governors can have a power to predict the reaction and/or influence it and/or decide whether to engage or not in a particular deal.

Still, the debt market reaction (in our case bondholders' reaction) exists and it is in our interest to observe the relevant literature.

Penas and Unal (2004) analyzed mergers in the banking sector and pay attention fully to the bond market reaction. They used cross-sectional analysis and found out that the determinants of the bondholder gains during M&A process are diversification gains, gains associated with achieving too-big-to-fail status, and synergy. Corporate banking mergers can influence bondholders differently. In case of synergistic merger, both bondholders and shareholders win because of the possibility of achieving economies of scale and scope by the combined entity through M&A. Another reason of synergistic M&A participants gain is elimination of less-efficient management. The second reason is well developed by Jensen and Ruback (1983). Further, in nonsynergistic mergers, bondholders gain in case of reducing the cash flow volatility resulting from M&A. The lower the cash flow volatility the lower the default risk. Other researchers support this idea as well: Higgins and Schall (1975), Galai and Masulis (1976).

Some researchers argue that bondholder may gain wealth in M&A deals through coinsurance effect: Shastri (1990) analyzed cases of different risk levels, leverage ratios, and debt maturities of the bidders. He argues that the acquirer's bondholders either gain from coinsurance effects or lose from expropriation effects: the resulting effect depends on the deal, bidder and target characteristics. The author shows that wealth redistributions from stockholders to bondholders (or vice versa) or within securityholder classes occur frequently, depending upon the covariance between the returns of the merging firms.

1.4 Conflict of interest between shareholders and creditors

In this section we discuss the issues related to the interest of different stakeholders of the company. We argue that shareholders and creditors (as well as shareholders and managers) have different objective functions. Thus, their decisions are biased by their personal preferences and interests, which can lead to a potential loss of the counterparty's welfare.

There are several types of conflict of interest. In business these types are:

- Managers Vs Shareholders
- Shareholders Vs Managers

Conflicts of interests arise in the firm when the incentives of counterparties are different and mutually exclusive. For example, generally managers tempt to not participate in risky projects to preserve the job position whereas shareholders can be interested in risky projects that bring higher returns. On the other hand, in leveraged firms managers tend to maintain high level of risk by investing in risky projects. This phenomenon is known as asset substitution, when less risky assets are substituted by the assets with higher risk. Managers choose the riskiest investment alternative and that is not in the interest of shareholders – again we observe the conflict of interest. In general, any separation of control and managing rights creates the agency problem or conflict of interests between shareholders and managers.

Shareholders and creditors have different incentives as well. Bondholders may suffer from aggressive investment politics of the company, because such politics brings additional risk to the company's profile, which in turn is not in the interest of the creditors. Here and after by conflict of interest we mean the conflict between shareholders and creditors (bondholders).

We exploit the idea of conflict of interests and base on that idea the possibility of welfare redistribution in M&A deal. Option theory gave the researchers the powerful technique of pricing assets. Damodaran (1995) showed how option theory can be applied to illustrate conflict of interest between shareholders and creditors (agency problem) in case of M&A. He stated that decisions favorable for shareholders do not always increase the value of the company and can cause economic damage for bondholders. Presenting the firm value as the sum of the equity and the debt market values, we can argue that even if the value of the firm is reducing the value of the equity can increase by conquering some value of debt.

Conflicts of interest between shareholders and creditors can result in value-destroying acquisitions, when stockholders invest in negative NPV projects (M&A deal) that leads to higher volatility of the firm free cash flow and, as a consequence, higher value of equity. So, it appears that investors in equity or stockholders win due to higher equity value, while overall firm value reduces due to negative NPV of a project. The enterprise value is a sum of equity and outstanding debt values. So, in our example, the firm value decreases and the equity value increases at the expense of bondholders, because the debt value reduces. Such simultaneous increase of equity and decrease of debt is the welfare redistribution from bondholders to stockholders. Below an example of wealth redistribution is provided.

Table 1.4.1 The numerical example of wealth redistribution between stakeholders

	Auto corp	Costmetics corp	Joint entity (result of M&A)
The value of equity	75,94	134,48	207,58
The value of debt	24,06	15,52	42,42
Enterprise value	100	150	250

Here we can see that two companies participated in M&A deal. The value of combined entity is just the sum of premerger values of counterparties ($250=100+150$). At the same time, we cannot say the same about the equity and debt values:

- Combined entity's equity value is lower than the sum of premerger values of equities: 207,58 against 210,42 (the absolute change is -2,84);
- Combined entity debt value is higher than the sum of premerger values of companies' debt: 42,42 against 39,58 (the absolute change is +2,84);

So, the welfare of creditors has increased by the same amount as the welfare of shareholders has decreased. In this case we conclude that the deal led to welfare redistribution from shareholders to bondholders. In order to catch such welfare redistribution effect, option pricing model is used for estimation equity and debt values.

Even though option methodology for pricing equity has its limitations – the calculated price is relevant basically for the distressed business – it is still a good instrument for explaining why M&A can make creditors more wealthy and shareholders – less. Damodaran contends that good M&A deal leads to a less variable cash flow and, as a circumstance – less variable value of the firm. The lower the dispersion the lower the price of option and the value of equity. Thus, during M&A process new firm has a value of equity lower than the sum of parent's and target's equities.

1.5 Research gap

In the previous paragraphs certain aspects of M&A deal were discussed: in particular, motives of M&A deal, wealth gains and losses of shareholders of both the acquirer and the target, and finally the stock and bond markets reactions on the M&A deal. The topic of this research paper is the credit market reaction on the deal. The choice of the topic was determined by the number of

relevant studies that is much less than the number of studies devoted to the market reaction on the M&A deal. As we mentioned earlier, such split of researchers' attention is reasonable – the most concerns regarding M&A success or failure are about shareholder's welfare creation or destruction. It is indeed very important to realize the M&A success determinants to predict the M&A effects on the shareholders, to predict the market reaction, which can contribute to the gain or losses of the shareholders, and finally to decide whether engage or not in the deal taking into account all essential information (target characteristics, potential results, potential for synergy, etc.), information asymmetry, and uncertainty. From the perspective of managerial implications all mentioned above is clear. However, the debt market reaction is interesting for us from the perspective not the wealth creation and destruction, but the wealth redistribution. By redistribution we mean the conflict of interest between shareholders and bondholders, which is a classic example of agency problem. In case of zero synergy effect, we predict the potential welfare redistribution between shareholders and bondholders: the former can gain at the expense of the latter or vice versa.

Here is what makes our research especially valuable and topical – the field of research lies on the intersection of debt market reaction and wealth redistribution between shareholders and bondholders.

First, we not only aim to find out how debt market reacts on M&A deal but in additions try to check the hypothesis whether the debt market reaction can be explained from the perspective of welfare redistribution between stakeholders of the acquiring firm.

Second, we use a novel method of study – a mix of difference-in-differences (DD) method and option pricing method or Merton model of equity valuation. Almost all research papers that aim to find and explain the market reaction, both of stocks and of bonds, base their empirical part on the Event studies, which can be biased by inappropriate estimation of parameters and thus give inadequate results, biased by external factors. DD method eliminate such problems. Next, option pricing theory can help to explain the peculiarity of the welfare redistribution. More detailed information is provided in the paragraphs related to the methodology in the second chapter.

1.5 Summary and important considerations

So far we analyzed the questions regarding M&A deal and its participants. Namely, we defined the motive of M&A: synergy effect, agency and hubris motives. We found out that depending on the motive of M&A the benefits of the bidding and the target companies' shareholders

vary: in case of synergy motive both the acquirer and the target gain additional wealth, while in case of agency and hubris motives most probably only the target gains considerably at the expenses of the acquiring company.

We found out that the potential for wealth creation or destruction varies according to the characteristics of the deal: counterparties characteristics, their business interrelation, motive of M&A, etc. Important observation is that bondholders can gain or lose in the same manner as shareholders gain or lose. Thus, it is possible to research debt market reaction.

The review of relevant literature reveals the determinants of the market reaction such as mean of payment, organizational form, size of the entities and business interrelation, motive of M&A and others.

This study aims to analyze debt market reaction on M&A deal in the American oil&gas market by using the methodology of difference-in-differences and option pricing methods.

Chapter 2. Research methodology

2.1 Research problem

In this research we aim to find out whether the debt market on behalf of the creditors of the acquiring company reacts to the M&A: namely, how the prices of bonds issued before the deal's announcement are changing due to the potential redistribution of the wealth between the parent's shareholders and bondholders. We study American oil&gas industry just for the ease of data collection: in order to conduct a study we observed 270 companies that made 935 bond issues from 2000 to 2015. We had an access to CBONDS database where we observed the behavior of bond prices of the chosen companies.

The oil&gas U.S. industry was chosen inventively: America is located far from the main oil consumers such as China and Europe. Exporting crude oil from the U.S. for decades was largely illegal due to legislation ban for export. Only in 2016 U.S. oil was introduced on the European market (Italy) after the 4 decades of the strict ban. Thus, probably U.S. oil&gas industry was independent from world crude oil price fluctuations and crisis. Such independence is an essential factor to be sure that at least world's market features do not influence the prices of stocks in the American oil&gas sector: in our case potential debt market reaction on the M&As is "cleared" from the exogenous factors outside the U.S. But still market and different macro factors, which are the features of U.S. market itself, can bias our results – in order to prevent result biasness we will use Difference-in-Differences method accompanied with rigorous data collection in terms of companies' similarities.

At the current stage of research, we are focusing on the bond prices in 2 time periods: 1 year before and 1 year after the M&A deal announcement. There is no theoretical justification of such choice of observation. Rather, prior empirical studies shown the market reaction several months in advance of the deal announcement: such reaction is based on the rumors and inside information. To mitigate such influential factor we have decided to take observation in a year before the event.

Our objective is to investigate whether the bond prices before and after the announcement of M&A are statistically different within a sampling frame.

2.2 Research design

The type of this research is quantitative: final conclusion on research questions is made by working with financial data and building statistical model. The research design is explanatory one because empirical part aims to set casual links between factors and dependent variable. The empirical part of the research is based on Difference-in-Differences method and Merton model of option pricing. Two methods have been chosen due to the nature of the problem: first, we would like to observe the debt market reaction on the deal; second, we would like to prove the hypothesis that the bondholders react in response to the wealth redistribution due to the M&A deal from the prospective of changing the riskiness of the assets.

To conduct our study we accomplished the following steps:

1. The collection of the data on M&A deals of oil&gas American companies for the period of 2000-2015 from Thompson Reuters Eikon database;
2. The collection of the data on the bond issues of oil&gas American companies for the period of 2000-2015 from CBONDS database;
3. The creation of new dataset by matching the two datasets from previous points so that the final set meets the following requirements:
 - a. All M&A deal announcements took place during the same year;
 - b. The acquiring company has a bond debt, which was issued at least a year before the deal announcement
 - c. The acquiring company has the same bond debt (from the point b), which will be repaid not earlier than a year after the M&A deal announcement;
 - d. The number of companies that satisfy a-c criteria is the biggest possible from the initial dataset;This dataset is a treatment group in term of DD methodology.
4. The creation of new dataset, which is a control group in DD methodology: companies that had bond issues for the same period as companies from the treatment group;
5. The collection of bond prices of the companies from both groups mentioned above for two periods: 40 days before the earliest M&A announcement and 40 days after the latest M&A announcement of the companies in the treatment group – from the CBONDS database;
6. The statistical analysis of bond prices fluctuation with Difference-in-Differences methodology:
 - a. Calculating the average bond prices for both groups, treatment and control, for two time periods, before and after M&A announcement (described in the 5th point);

- b. Calculating the bond prices difference between the groups for 2 period;
 - c. Calculate the changes in bond prices over a time period for each group;
 - d. Calculating the treatment effect;
7. The checking of the hypothesis of wealth redistribution due to the M&A deal with Merton model of option pricing for each chosen company separately:
- a. The collection of the enterprise value;
 - b. The collection of the par value of all debt outstanding;
 - c. The collection of risk-free rate;
 - d. The calculation the firm value standard deviation on the annual basis;
 - e. Estimation the average duration of outstanding debt;
 - f. Calculation of the value of equity before the M&A deal as a call option;
 - g. Calculation of the debt value before the M&A deal;
 - h. Repeat steps f and g for the period after M&A deal;
 - i. Compare the changes of enterprise value with the changes of equity and debt value in order to try to catch the redistribution effect between the bondholders and the shareholders.

2.3 Research method

In our research two methods were used in order to achieve main goal of the thesis: Difference-in-Differences method and Merton model. The nature of the research problem and the research design make us use two methods consequently: first, we need to obtain results on debt market reaction in general, second, we try to understand the nature of that reaction – namely, we are trying to explain the reaction as redistribution of the wealth between stockholders from the prospective of option price theory. Thus, there are 2 stages of the empirical part and correspondingly 2 different research methods.

2.3.1 Difference-in-Difference method

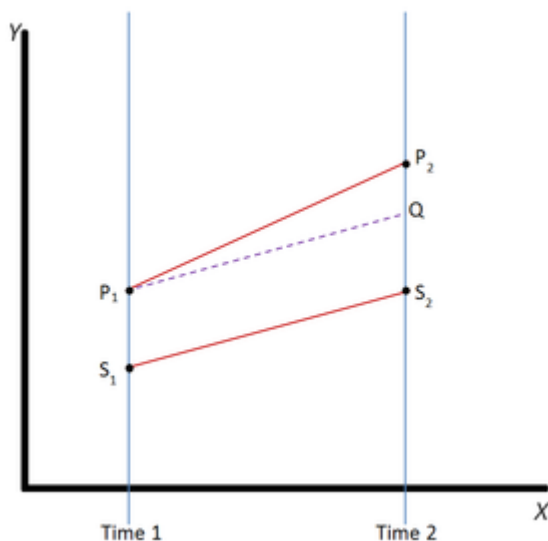
Difference in differences (DD) is a statistical technique used in econometrics and quantitative research in the social sciences that attempts to mimic an experimental research design using observational study data, by studying the differential effect of a treatment on a 'treatment group' versus a 'control group' in a natural experiment³. Generally this method is used during the drug approval stages when the effectiveness of a new drug is under analysis. The explanatory or independent variable in this method is the effect of a so called treatment and the response or dependent variable is an outcome of the experiment. Basically, DD method compares the average changes over time in the outcomes of the treatment and the control groups. Even though this method

³ Angrist, J. D.; Pischke, J. S. (2008)

helps to mitigate the exogenous effects and selection bias, it is still a subject of the certain biases such as reverse causality. Unlike the time-series estimation of the effect over a time and the cross-section estimation of the effect between groups at a certain time point, DD method uses panel data and thus measures the differences between the treatment and control group of the changes in the outcome that occur over time.

Difference in differences requires data set for both a treatment and a control groups for two or more different time periods, which are time before and after a 'treatment'. Below is the graphical representation of the basic logic behind DD method.

Graph 2.3.1.1. Graphical representation of DD logic



On the graph above the basic idea behind DD method is provided. There are two groups: S – control group, P – treatment group. Before the treatment, at time 1, group P had a group average P_1 , while group S – S_1 . DD method does not provide any explanation why the averages of the groups are different – this information is taken as granted. The focus of the methodology is to explain the future changes of averages. From the graph above, with time and after the certain treatment that occurred in-between of time 1 and time 2, S_1 increased up to S_2 , P_1 – up to P_2 . The differences $(P_2 - S_2)$ and $(P_1 - S_1)$ are not the same just because of the treatment effect P_2Q – the treatment group was exposed to a some treatment, while the control group did not, thus P_2Q exists.

So, having the outcomes for 2 time periods, before and after treatment, and 2 groups, control and treatment, we can determine the treatment effect by comparing the differences in the outcomes of the groups at time 1 and time 2.

Not all of the difference between the treatment and control groups at time 2 (P_2S_2) can be explained as an effect of the treatment: partly the difference is explained by initial difference P_1S_1 at time 1. Assuming the parallel trend⁴, DD calculates the "normal" difference in the outcome variable between the two groups by generating normal outcome for the treatment group P_1Q : the treatment effect is the difference between the observed outcome and the "normal" outcome (P_2Q).

Formal definition is as follow:

$$y_{ist} = \alpha + \lambda_s + D_s + \delta + \varepsilon_{ist} \quad (1),$$

which is the main equation of the model, where:

y_{ist} is the dependent variable for individual i , given s (group) and t (time);

α and λ_s are then the vertical intercept for s and t respectively;

D_s is a dummy variable indicating treatment status;

δ is the treatment effect;

ε_{ist} is an error term.

Taking into account that:

$$\bar{y}_{stst} = \frac{1}{n} \sum_{i=1}^n y_{ist} \quad (2)$$

$$\bar{y}_{kst} = \frac{1}{n} \sum_{i=1}^n y_{ikt} \quad , \quad (3)$$

$$\bar{\lambda}_{st} = \frac{1}{n} \sum_{i=1}^n \lambda_{st} \quad , \quad (4)$$

$$\bar{DD}_{stst} = \frac{1}{n} \sum_{i=1}^n D_{stst} \quad , \quad (5)$$

⁴In addition to all OLS assumptions, DD requires a parallel trend assumption – the difference of group averages is stable over a time.

$$\bar{\varepsilon}_{st} = \frac{1}{n} \sum_{i=1}^n \varepsilon_{st} \quad (6),$$

δ in statistical terms can be interpreted as the treatment effect of the treatment (D_s).

D_{st} is a dummy variable of treatment status, which means that it is a binary variable with 2 meanings: 1 for the treatment group at time 2 (after treatment), and 0 for all other cases (treatment group at time 1, control group at times 1 and 2).

For our purposes we use DD method to catch the differences in pricing fluctuations for the bondholders of two groups of the companies: the first group aggregates the firms with bond issues that participate in the deal (not as a target), the second group aggregates the firms with bond issues but that did not engage in any M&A deal. The “treatment” as an essential part of DD methodology is M&A deal announcement, while the treatment effect – the exceeding scale welfare change of the acquirer’s bondholders in comparison to those of ordinary firms (with no M&A during the analysis period). The welfare of bondholders directly reflects in their bonds’ prices – thus, we use bond prices adjusted for the accrued coupon income in DD method.

Table 2.3.1.1 The implementation of DD method

Y_{st}	S=1	S=2	Difference
T=1	Y ₁₁	Y ₂₁	Y ₁₁ -Y ₂₁
T=2	Y ₁₂	Y ₂₂	Y ₁₂ -Y ₂₂
Change	Y ₁₁ -Y ₁₂	Y ₂₁ -Y ₂₂	(Y ₁₁ -Y ₂₁)-(Y ₁₂ -Y ₂₂)

Let us go back to our paper goal –estimation of the debt market reaction. In our case, T1 is time before the M&A deal announcement, while T2 – the time after that. The treatment effect between these two time periods is the M&A deal announcement itself. Two potential states of the companies in our case are (S1) non-engagement in the M&A deal but having corporate bonds issued, and (S2) engagement in the M&A deal and having corporate bonds issued. Y_{st} is a averages

for the bond prices: for example, Y_{1t} is an average of bond prices in the group of companies, which did not take part in any M&A deal, for the time period 1.

So, we will have two groups of the companies, and the bond prices observations for all those companies for two time periods. By comparing the groups' average bond prices along the time we can estimate the effect of M&A deal announcement on the bond price or, in other words, how the bondholders of the acquiring firm react to the M&A deal.

DD method is a strong statistical method but still it has its own imperfections and limitations. The great appeal of DD estimation comes from its simplicity as well as its potential to circumvent many of the endogeneity problems that typically arise when making comparisons between heterogeneous individuals, according to Bertrand et al. (2004) who quoted Meyer (1995). Nevertheless, the problem of the method is the possible endogeneity of the treatment, when ideally it should be random and exogenous. Along with biases in estimating the treatment effect, some researchers claim about statistical imperfection as well: Bertrand et al. (2004) argue that the main equation (1) in practice contains the serial correlation problem.

Another limitation – is the method assumption of “parallel trend”, which means that within 2 periods 2 periods model the changes of the treatment group over time would have the same as the changes of the control group in case of no treatment exposure. We agree with this limitation, but still think that the advantages of the model (biasness to the external factors, which are not caught by the classical techniques as Event studies or CAPM, and relative easiness of the usage) still outweigh the disadvantages. Moreover, in this paper DD method is not the only empirical method, thus we can at some extent be tolerant to its imperfections.

2.3.2 Merton model

The second method of our empirical research is option pricing model or Merton model. The model itself is just a formula for calculation of the fair value of the European call option. The researchers of finance Fisher Black and Myron Scholes first published their model in their paper “The Pricing of Options and Corporate Liabilities” of 1973. They introduced the formula, or a partial differential equation, which enables to estimate the option price over time. The idea behind the formula is that the option itself can be presented as the combination of long and short positions of underlying and risk-free asset. Such strategy of replication is called hedging strategy or delta hedging.

Merton was the one who generalized the model, introduced the concepts of risk-neutral probabilities, no-arbitrage bounds, and made the usage of the option-pricing model very popular on the Wall-Street.

In this paragraph and further in the paper we will use the terms “option-pricing model”, “Black-Scholes model”, “Merton model” and “option-pricing theory/formula” interchangeably.

Before we introduce the concept of option pricing applicable to the equity valuation, we would like to answer the question “Why the option pricing model can be applicable in such cases as corporate valuation”. The classic model of free cash flows discounting as a method of asset valuation has its own limits: when the cash flows are negative for a long period of time the company can still have positive economic value, but according to free cash flow method, it should not. So, discounting of future or expected cash flows can lead to inadequate valuation in some cases. Option pricing can solve this problem. In fact, option pricing of distressed companies as a method has an advantage over a DCF method. By distressed companies we imply those with high leverage ratio and negative cash flows.

Investors in equity of distressed firms⁵ have the call option on liquidation and paying the debts. Such call option with strike of the debt amount is able to enlarge the value of equity: for example, in case of big uncertainty about the value of assets.

This phenomenon, equity value reflection in call option, is possible due to two characteristics of the equity of public companies.

First, investors in the equity or shareholders are able to manage the company and anytime can make a decision of selling the assets out and repaying the debt obligations.

Second, shareholders in public companies have limited liabilities. Their liabilities cannot exceed the amount of their investment in the company (the size/amount of equity). So, if the company goes bankrupt, the shareholders will cover the debt only by the amount of the equity and thus they do not risk by their personal welfare.

Such combination of the option of liquidation of the company and limited liabilities of the shareholders gives the equity of the features of call option. From the perspective of option theory we can derive the value factors of the equity. Below we will shortly summarize them.

⁵ Basically, the theory can be applicable on any firm, distressed or not, from the methodology perspective we will use original conceptual link between option pricing and distressed companies as Brealey, Myers, and Allen (2011) and Damodaran (2008) do

Under the DCF method it can be argued that the company is worth nothing if its liabilities are greater than its assets. But at the same time, the first conclusion from consideration of the equity a call option is that equity has positive value even if the firm value is less than the nominal debt value.

Similarly, options that are deep "out of the money" (the price of underlying asset is much less than the strike price) have value just for the reason of non-zero probability of underlying asset to grow in price in the future – it is a time value of option. So, equity have its value for a time determinant of option price, which is a time of corporate bond expiration, and the probability of increasing of assets' value more than the nominal value of the debt (bonds) before the maturity date.

Another interesting phenomenon of equity as a call option is the direct relation between the risk (uncertainty) and the option (equity) price. In DCF method, abnormal risk leads to a reduced cost of investing in equity. In option theory, when equity has the characteristics of the option, things are opposite – the higher risk leads to benefits of equity investors. The fluctuation of the firm value results in two variants for shareholders: either they lose the fix amount of their initial investment in the equity or gain significantly because the upside brunch is unlimited.

Application of option theory to pricing the equity includes several assumptions (Damodaran, 2011):

1. There are only two types of claims to the company: stock and bond;
2. There is only one issue of debt (corporate bonds), which can be repurchased at its nominal value before the maturity date;
3. The issued bonds have no coupon payments (zero-coupon bonds) and there are no specific characteristics of the bond (such as convertibility, covenants, etc.);
4. The value of the firm and its dispersion are estimable.

Each of these restrictions or assumptions of the model have its reason. Mostly they are taken just for the ease of calculating and maximizing the accuracy of the estimation under the option pricing model.

So far we discussed the theoretical background behind the option pricing theory. Now we would like to discuss how we are going to apply it in our paper.

Most firms do not fit the above mentioned severe restrictions, such as the presence of only a single issue of bonds with zero coupons. So, certain compromises are necessary for proper use of the option model for pricing the equity.

1. **The firm value.** There are 3 methods for obtaining the firm value:
 - a. To sum up the market values of the firms' equity and debt. Then, the firm should be public; its bonds should be tradable. In this case the option model redistributes value of firm between debt and equity. This approach is simple in its implementation, but it has internal contradictions: it starts with one set of the market values of debt and equity and completes completely different values of debt and equity as a result of option pricing.
 - b. To use DCF for proper firms' assets pricing, as a discount rate WACC⁶ should be used. One important consideration here that we need to keep in mind is that the value of company obtained by the option is the value that shareholders will get after potential firm liquidation. That means that we should only consider existing investments if we estimate the value of the company using a DCF model.
 - c. Use value multiples. Need to consider the healthy firms in the same business or industry, of comparable size and state of development. For example, applying the revenue multiple to the revenue of the target firm. Here the value estimation is based on the implicit assumption that in case of the firm liquidation the potential buyer will pay the exact amount of the calculated estimation of the firm value.
2. **The firm value volatility.** There are several possible ways of calculating the firm value dispersion:
 - a. To calculate it from the variants of stock and bond, if both are publicly tradable.

Define the variance of stock as σ_e^2 and the variance of bond as σ_d^2 , we need to use the following formula:

$$\sigma_{firm}^2 = w_e^2 \sigma_e^2 + w_d^2 \sigma_d^2 + 2 \rho_{ed} w_e w_d \sigma_e \sigma_d \quad (1),$$

Where:

w_e is a weight of the market value of equity;

w_d is a weight of the market value of bond issue;

ρ_{ed} is the correlation between the prices of stock and bond;

⁶WACC – weighted average cost of capital

When companies begin to experience financial difficulties, this approach can give incorrect results, because the volatility of prices of stocks and bonds increases.

- b. To use the industry average volatility of the firm values from one sector;

This approach compared to the previous one usually gives less biased estimations.

- c. To use the variance of similar stocks and bonds with similar ratings on the market if the firm is private and there is no public estimations of its stock and bond values.
 - d. To use the historical approach and calculate the variance of the firm's assets and imply that the firm value variance is equal to the firm assets variance.
3. **The maturity of the debt.** The majority of firms has more than one issuing debt, much of which goes with the coupon. Because the option pricing model allows only one item of input data to time before the expiration of the term, we must transform these several bond issues and coupon payments into one equivalent bond with a zero coupon. Below the potential ways of such debt "transformation" are described:
- a. Take into account both the coupon payments and the bonds maturity by estimating the bonds' duration and calculating the weighted average duration, which is implied as the maturity term for the option;
 - b. Use the option model and weight the obtained estimation from the model by the par value of duration of zero-coupon bonds (Damodaran, 2008).
4. **The par value (nominal) of debt.** In case of multiple bond issues there are 3 ways to determine the nominal debt value for option model:
- a. To sum up the par value of all bond issues and consider this sum a nominal for debt in option model. The restrictions of this approach is that we do not take into account all debt service payments that company makes before the maturity date in a form of coupon payments.
 - b. To sum up all the payments for the debt: both the par value and the coupon payments within the whole period of bond term. By doing so, we are mixing cash flows related to different time periods. Nevertheless, this way of considering the interim interest payments is the easiest one.
 - c. To sum up the par value of all bond issues and consider this sum a nominal for debt in option model, while the coupon payments for the bonds are determined as percentage of the firm value and considered a dividend yield in a option model. By doing so, we get the decreasing of the firm value by the amount the annual coupon payments.

So far we discussed the questions “Why” and “How technically” we should use option pricing model. Now we would like to concentrate on the question how the option theory relates to the agency problem and the conflict of interests of stakeholders. We exploit the idea of conflict of interests and base the possibility of welfare redistribution on that idea.

We will use option pricing model (OPM) and Merton model as interchangeable titles of the method. Under the OPM the value of equity is a fair price of a call option with a strike equals to the level of debt – the shareholders get the residual value after paying all creditors of the firm.

The formal representation of the model is as following:

$$C(S,t) = S e^{-r(T-t)} N(d_1) - K e^{-r(T-t)} N(d_2) \quad (1)$$

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)(T-t)}{\sigma\sqrt{T-t}}, \quad (2)$$

$$d_2 = d_1 - \sigma\sqrt{T-t} \quad (3)$$

where:

$C(S,t)$ – the fair value of the European call option, which is estimation of the equity value;

S – the spot price of underlining asset, which is the current value of the firm;

$N(X)$ – distribution function of standard normal distribution,

K – strike price of the option, which is a debt level;

r – risk-free rate, which is a 30 years T-bills yields;

$T - t$ – time of option expiration;

σ – return volatile of the underlining asset, which is the volatility of the firm value;

So, in our study option value $C(S,t)$ is a value of equity of the acquiring firm, strike (K) is the level of debt of the acquiring firm, and σ is a volatility of the firm value (or its assets, depending on the case).

By calculating the value of equity of the combined entity we can compare, we can derive with the estimation of the company's fair value from the perspective of OPT. Equity value can be as greater as well as smaller of the initial number (the equity before the deal) – any difference may be attributed to the wealth redistribution between shareholders and bondholders of the bidding firm.

For example, the shareholders have the opportunity to invest in the project with the negative net present value. If the project is very risky it makes the standard deviation the firm's value to increase. In this case the equity value calculated as a call option increases. Thus, equity increases, the firm value decreases by the amount of the negative NPV of the project, while the debt value also decreases. In other words, by investing in the risky projects (or participating in the risky M&A deal) the shareholders can increase their wealth at the expense of debtholders of the firm (acquiring company).

Chapter 3. Measuring the reaction

3.1 Data collection

In order to conduct the empirical research financial data is needed. We are trying to set a link between M&A deal and the reaction of the debt market: namely, in what way the wealth of the bondholders of the bidding firm is changing due to the announcement of the M&A deal.

Secondary financial data from financial databases is used. As the empirical work of this research consists of two parts then the data collection is made for each part consequently.

First, we collected the data about all mergers and acquisitions from Thompson&Reuters Eikon database for the period from 2000 till 2015. The further selection process is based on the following criteria:

1. Region – USA
2. Deal type – merger, acquisition
3. Deal status – completed
4. Minimum deal value – \$ 100 ml
5. Industry for both companies – Oil&Gas
6. Date of announcement is available

There are 1273 deal, which meet the abovementioned requirements.

For debt market reaction we need the data of corporate bond prices, issued in the period from 2002 to 2014. We use the CBONDS database. The selection process is based on the following criteria:

1. Region – USA;
2. Industry – Oil&Gas;
3. Type of security – bond, eurobond;
4. Rating – the issue is rated by at least 1 rating agency;
5. Maturity – no more than 10 years;
6. Status of issue – in circulation, repaid;

There are 935 issues, which meet the abovementioned requirements.

Following the logic of the research, we created 2 groups of companies:

1. Companies participating in M&A and having bonds issued (102 companies);
2. Companies with bonds issued but not participating in any M&A during the period of our analysis (833).

102 companies engaged in M&A deals in the period 2000-2015, but for the purpose of DD method use we need to have a group of companies, M&A deals of which took place in one year. To avoid the disturbing effects of financial crises 2007-2009 we were looking for announcements in

post crisis period 2010-2015 or precrisis period 2000-2006. This is done intentionally for less biased results, but still the period 2007-2009 was not rejected from the analysis.

The most numerous group of companies participating in the M&A is that one of 2014 year. In the table below those companies and the date of their M&A deal announcement are presented.

Table 3.1.1 The distribution of the M&A announcements of the oil&gas American firms

Firm's name	M&A announcement date
QEP Resources	30.01.2014
Diamondback Energy	18.02.2014
DCP Midstream Partners	25.02.2014
Gulfport Energy	19.03.2014
Baker Hughes	24.03.2014
Martin Midstream	05.05.2014
Cimarex Energy	06.05.2014
Devon Energy	06.05.2014
Legacy Reserves	06.05.2014
Rice Energy	07.07.2014
Whiting Petroleum	13.07.2014
SM Energy	29.07.2014
Tesoro	30.07.2014
Linn Energy	04.08.2014
Murphy Oil	06.08.2014
Boardwalk Pipeline	03.09.2014
SandRidge Energy	04.09.2014
Vanguard Natural Resources	16.09.2014
National Oilwell Varco	30.09.2014
Enterprise Products	01.10.2014
EnLink Midstream Partners	22.10.2014
BreitBurn Energy Partners	24.10.2014
Forum Energy Tech	27.10.2014
ONEOK Partners	27.10.2014
Western Gas Partners	28.10.2014
Halliburton	14.11.2014
Paragon Offshore	17.11.2014
Superior Energy Services	11.12.2014
Memorial Production	18.12.2014
Southwestern Energy	23.12.2014

As we can from the table above, the earliest M&A deal announcement was on 31st of January while the latest – on 23rd of December. Thus, for the DD method the time periods will be determined in relation to these dates: comparing of the bonds' prices should be conduct for 2 time periods,

before 31st of January and after 23rd of December. In the relevant literature where abnormal returns are found the estimation window for a potential rumor effect is 1-40 days, thus we should eliminate this potential bias by excluding these days. Finally, we compare the bonds' prices for 2 days: 20/11/2013 (40 days earlier the date of the first M&A announcement on 31st of January) and 02/02/2015 (40 days later the day of the last M&A announcement on 23rd of December). The overall time difference is 439 days.

Bond prices were taken from CBONDS database⁷. The prices of the bonds of two groups of the companies and for 2 time points, 20/11/2013 and 02/02/2015, are provided in tables in Appendices 1 and 2.

For Merton model we need collect the data for each company individually. We have 21 out of 26 companies from the list presented in the Table 3.1.1 above, because 5 companies announced M&A deal and thus were included in DD dataset but have not participate in the deal yet and thus are excluded from Merton model dataset.

Each piece of company specific data was gathered or calculated for two time periods, which are exactly the same as those used in DD: 20/11/2013 and 02/02/2015. The following company specific data was obtained:

1. Enterprise value (EV):
Directly gathered from Thompson & Reuters Eikon database for two time periods;
2. The par value of outstanding debt:
Balance value of outstanding debt is taken for 2014 and 2015, where the pre-merge debt par value was equal to the balance debt value of 2014 and the for post-merge debt par value the number is calculated as:
$$\text{Debt par value}_{\text{post-merge}} = \text{Debt par value}_{2014} + (\text{Debt par value}_{2015} - \text{Debt par value}_{2014}) * 439/365.$$
 So, by using this formula we make an assumption that the debt value is linearly changing over the 2015 year;
3. Average duration of outstanding debt:
Calculated in basis of debt term structure of companies from Thompson & Reuters Eikon databases;
4. Standard deviation of the firm value:
Calculated for each company on the basis of its belonging to a particular oil&gas subindustry. We divided oil&gas industry into 4 subindustries: producing and extraction (176 firms in the subindustry), oilfield equipment and services (81), distribution (12), and integrated subindustry (26). For each subindustry we have

⁷The internet site is cbonds.ru

estimations of industry averages of firm value standard deviations. These estimations are calculated and regularly updated by Damodaran at his website⁸.

The subindustries mentioned above have the following averages of standard deviations of the firm value⁹:

1. Oil&gas integrated: 43,13%;
2. Oil&gas production and exploration: 43,96%;
3. Oil&gas distribution: 24,60%;
4. Oilfield services/equipment: 50,06%.

In addition, non-company specific data was needed:

- Risk-free rate: as a proxy the yield of 10 years T-bills in 2014 year was taken.

The data for Merton model is presented in Appendix 4.

3.2 Empirical analysis results

3.2.1 Bond market reaction

After thorough data extraction from Thompson database and CBONDS we face the problem of companies' likeness. Indeed, for DD method the groups of companies, on the basis of which the differences are calculated, should be comparable. In our case, the company and bond issues should possess certain characteristics.

For the companies these characteristics are:

1. Belonging to one industry – American oil&gas industry;
2. Credit rating: all companies have credit ratings from at least 1 credit rating agency;

For the bond issues such characteristics are:

1. The term of bonds: all bonds are 10 years ones;
2. All bonds have investment grades from at least 1 credit rating agency;

We neglect the differences of coupon payment.

Below we present the table of DD results. For simplicity we call the group of companies that were engaged in M&A deal and had bond issue on a time of the deal announcement as “M&A+bonds”, the group of companies, which were not engaged in any M&A deal during the

⁸<http://pages.stern.nyu.edu/~adamodar/>

⁹Estimations of Damodaran for the end of 2015 year

period of analysis, we call “Only bonds”. “M&A+bonds” group is our treatment (experimental group), while “Only bonds” group is a control group.

Table 3.2.1.1 DD results: the averages of the bond prices

	Average bond price in “M&A+bonds” group	Average bond price in “Only bonds” group	Difference
20/11/2013	101,93	100,87	-1,06
02/02/2015	97,52	100,83	3,31
Change	-4,41	-0,04	-4,37

The results are as follows:

- The treatment group had higher group average price on 20/11/2013, before all M&A deals announcements: 101,9 against 100,87 of the control group.
- The treatment group had lower group average price on 02/02/2013, after all M&A deals announcements: 97,52 against 100,83 of control group;
- Even though both groups showed the downward trend in bond prices, if the control group’s average price was pretty stable over a analysis period – only 0,04 drop –then the treatment group’s averages plunged in a greater scale – 4,41 price drop over time;

Initial difference between the groups on 20/11/2013 were 1,06. Under an assumption of parallel trend, which is essential for DD methodology, the difference should be the same over a period of time without external interruption (experiment, treatment). So, we assume that if no M&A occurred between 20/11/2013 and 02/02/2015 then the treatment group’s average price should be just 1,06 higher than the control group’s average price, which was 100,83 on 02/02/2015. Thus, we have calculated average for the treatment group 101,89 as if no M&A occurred and real average 97,52. The difference between these two numbers, empirical and implied ones, is 4,37 – this is a treatment effect of the M&A deal announcement.

This means that the bonds of the companies, which were engaged in the M&A activity in 2014, were underperformed by 4,37 each. This is how bond market reacts to the deal:

1. The M&A deal can lead to a welfare redistribution: if the creditors (bondholders) lose their welfare they will claim higher yields to compensate the ;
2. The higher yield drives the bond prices to decline;
3. The higher the welfare loses from the perspective of the bondholder, the higher the yield claims and then the more significant a price drop.

The drop of price of the bonds can be explained by various factors. We do not have objective to provide the full set of explanations, but we hypothesize that such bond price drop can testify the welfare compensation for bondholders. They could compensate the lost welfare in three cases:

1. It corresponds the overall market trend: all bonds on the American market of oil&gas companies could lose their value.

We believe that this is not the case because we have a control group where the price drop is almost insignificant – only minus 0,04. So, the treatment effect is pretty significant, thus we reject the first possible reason for bondholders compensation.

2. The M&A deal occurred to be value destroying one, both shareholders and bondholders lose their value.
3. The shareholders captured the greater amount of value than the deal was able to generate, as a result of these shareholders gain at the expenses of bondholders.
4. The shareholders gained at a higher extent than the bondholders did.

We cannot distinguish the last 3 variants at this point. To do so we apply option pricing model further.

3.2.2 Wealth redistribution effect

After calculating the values of equity as a call option and the value of debt, we found the differences in these values over a period of time from 20/11/2013 to 02/02/2015 (equity change and debt change in the table below). The results are presented below.

Table 3.2.2.1 Results of Merton model application by companies

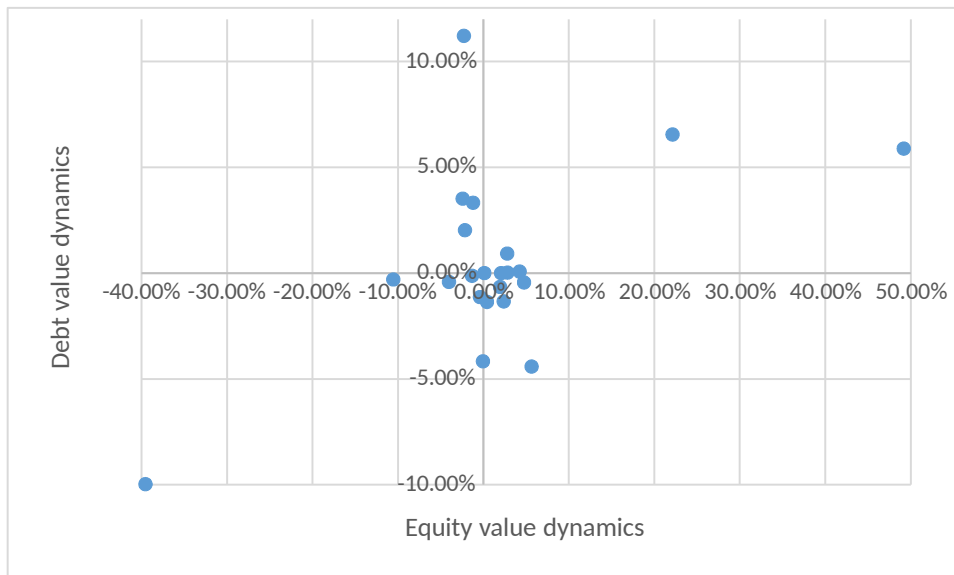
#	Company name	Bond price change	Equity value change	Debt value change
1	Baker Hughes	3,67%	-1,33%	-0,13%
2	Boardwalk Pipeline	-5,33%	2,07%	0,00%
3	BreitBurn Energy Partners	-36,14%	49,19%	5,88%
4	Cimarex Energy	-0,77%	0,11%	0,00%
5	DCP Midstream Partners	2,73%	4,76%	-0,44%
6	Devon Energy	6,92%	-1,21%	3,33%
7	EnLink Midstream Partners	1,10%	2,82%	0,02%
8	Enterprise Products	1,83%	-2,16%	2,03%
9	Gulfport Energy	-6,54%	4,24%	0,07%
10	Legacy Reserves	7,30%	-2,43%	3,52%
11	Linn Energy	-22,13%	2,38%	-1,34%
12	Linn Energy 2	-22,13%	-0,40%	-1,13%

13	Martin Midstream	-5,85%	-0,05%	-4,17%
14	Memorial Production	-12,17%	0,42%	-1,36%
15	National Oilwell Varco	4,94%	-2,28%	11,21%
16	ONEOK Partners	0,51%	-4,03%	-0,42%
17	Rice Energy	-3,09%	22,13%	6,55%
18	SM Energy	-7,75%	-10,54%	-0,30%
19	Southwestern Energy	-5,33%	5,64%	-4,42%
20	Tesoro	5,69%	1,95%	-0,65%
21	Western Gas Partners	-10,32%	2,79%	0,92%
22	Whiting Petroleum	-6,99%	-39,54%	-9,97%

Having the results of prices dynamics, we can compare them and find the cases of wealth redistribution between shareholders and bondholders. According to option pricing theory, such phenomenon of value stream from bondholders to shareholders or vice versa is possible in 2 cases:

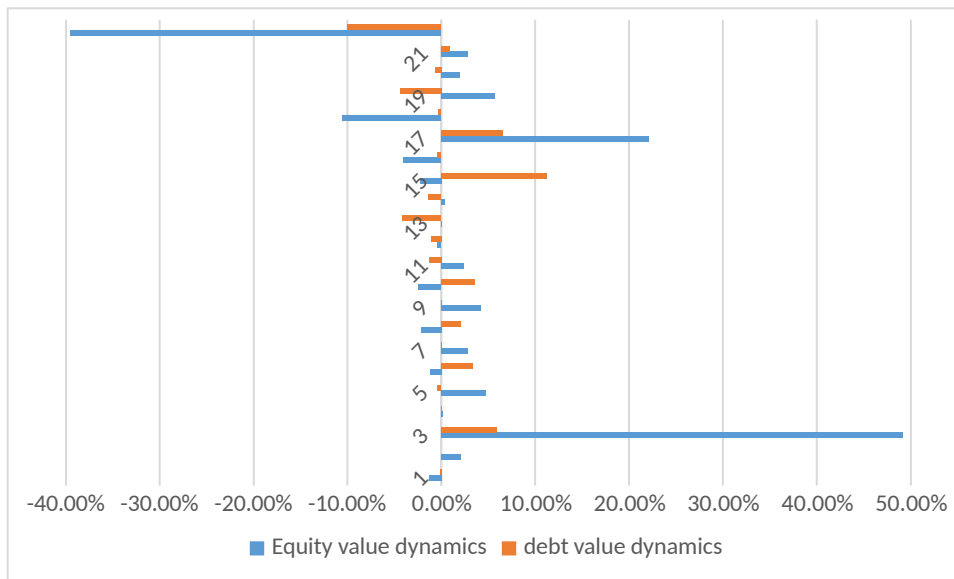
1. Negative dynamics of debt value (debt value change in the table above is less than zero) and positive dynamics of equity value (equity vale change is greater than zero): this is the case for the companies 5, 11, 14, 19, and 20 from the table above;
2. The growth of debt value is relatively lower than the growth of equity value: this is the case for the companies 2, 3, 4, 7, 9, 12, 13, 16, 17, and 21 from the table above.

Graph 3.2.2.1 Equity and debt values dynamics



On the graph above each blue dot represents the acquiring company's equity and debt characteristics. The dynamics of values are the change of the value occurred due to the M&A deal.

Graph 3.2.2.2 The scale of equity and debt values dynamics



On the graph above the wealth redistribution is easily noticeable: every case where the debt grows slower than the equity. For each company of the sample such comparison can be made from the graph above.

In total 15 companies out of 22 have the conditions for welfare redistribution from bondholders to shareholders. Creditors who are losing their wealth response to that by increasing the required yield of return. The yields for creditors and the bond price have an inverse relationship. Thus, increasing yields for bondholders lead to decreasing of bond price. We can check whether this effect appears in our data. The data of 11 companies (2, 3, 4, 9, 11, 12, 13, 14, 17, 19, and 21 in the table above) shows the existence of this effect: bond prices dropped meaning that bondholders yields increased, while at the same time bondholders wealth estimated with Merton model decreased. So, bondholders react and try to compensate their loses in 73,3% cases (11/15) by asking for higher yields, which lead to the price drop of bonds.

On the other hand, there are 15 companies of the whole group, the bonds of which showed the reduction of price for the period of analysis. As we just discussed above, we found 11 companies with wealth redistribution effect. Thus, we can conclude that in 84,6% of cases of corporate bond price reduction the wealth redistribution occurs and may be the main reason of such price drop.

Let us interpret the results on the case of one of those 11 companies with wealth redistribution effect. Southwestern Energy (19th in the table above) is a growing independent energy company primarily engaged in natural gas and crude oil exploration, development and production. The initial data as inputs in Merton model are presented below:

- Before the deal
 - ✓ Enterprise value (in option pricing model - Stock price, S_0) is equal to 12 002 \$ mln;
 - ✓ Outstanding debt par value (Strike price, K) is equal to 6 967 \$ mln;
 - ✓ Average duration of outstanding debt (option expiration period, t) is 3 years;
- After the deal
 - ✓ Enterprise value (in option pricing model - Stock price, S_0) is equal to 12 104 \$ mln;
 - ✓ Outstanding debt par value (Strike price, K) is equal to 6 552 \$ mln;
 - ✓ Average duration of outstanding debt (option expiration period, t) is 3 years;

The calculation of option gave the following results:

1. The option price before the deal $C(S_0,t)=4\ 681,66$ \$ mln, which is the value of equity at time 5/09/2014
2. The option price after the deal $C(S_1,t)=4\ 311,6$ \$ mln, which is the value of equity at time 20/11/2014.

Below the table of results for Southwestern Energy is presented.

Table 3.2.2.2 Results summary for Southwestern Energy

	Value of equity as a call, \$ mln	Value of outstanding debt, \$ mln	Bond price, \$
5/09/2014	6 287,9	5 713,6	119,78
20/11/2014	6 642,6	5 461,3	113,40
Change	354,7 (5,64%)	-252,3 (-4,42%)	-6,38 (-5,63%)

Here we see that shareholders gain, while the creditors lose. Because we attribute these wealth fluctuations to a certain event – M&A deal in which Southwestern Energy participated as an acquirer firm – we argue that that M&A deal led to the benefits of shareholders at the expense of the bondholders. The gain of shareholders due to the deal is greater in absolute than the loss of the bondholders: 354,7 against -252,3. That means that shareholders also captured the full amount of synergy value created due to acquisition. So, here we see the wealth redistribution effect: simultaneous impoverishment of bondholders and enrichment of shareholders. The former responded to that by claiming for higher yields for the bonds. Higher yields made the bond price decrease from 119,78 before the deal to 113,40 after the deal: this is the way how bondholders react and try to compensate their losses.

3.2.3 Factors influencing wealth redistribution

So far we have estimated the effect of bondholders reaction to M&A deals: DD approach showed us that on average bonds from the treatment group (“M&A and bonds”) decrease in price from 101,93 to 97,52 which gives us $-4,41$ change. At the same time, the bonds from the control group (“Only bonds”) on average stay almost at the same price level $-100,87$ before the deal against 100,83 after the deal, which gives us $-0,04$ change.

Then concentrate our attention to the treatment group (“M&A+bonds”). At this stage, we used Merton model to calculate the equity value as a call option and estimate debt value for each company from the group individually and for two periods – before and after the deal completed. There are 22 out of 26 companies left in the dataset, because 4 companies announced the M&A deal and thus were included in the treatment group for DD analyses, but these 4 companies still have not completed the deal, thus we cannot apply Merton model for them and they excluded from the dataset. 13 out of 22 companies experienced bond price reduction for the period of analyses (2014 year): 11 out of these 13 companies (84,6%) showed the effect of wealth redistribution from creditors to shareholders.

According to option pricing theory, if managers decide to invest in risky project they can earn money for shareholders even in case of negative NPV project – in this case wealth redistribution arises and shareholders gain at the expenses of creditors, while the overall value of the firm reduces for the amount of negative NPV of the project. The reason for this is added risk of the project: it increases the firm’s cash flows volatility¹⁰, which leads to the equity value increase from the perspective of pricing the equity as a call option (Merton model).

In our analysis, all firms are from one industry, but still there are discrepancies in the risk profiles for several reasons:

1. Different subindustries;

Oil&gas industry is traditionally divided into extraction, distribution, oil&gas equipment and services, and integrated subindustry (includes the companies that participated in every step of value chain). The volatility of the firms from different subindustries of oil&gas industry significantly differs from each other (see the data provided in data collection section). Thus, if the acquirer buys the company from different subindustry and the

¹⁰In fact, volatility of the firm’s cash flows is the same as the volatility of the firm value

average firm value volatility of target's subindustry is higher than that of acquirer's subindustry, then this deal is risky for the acquirer: more volatile assets of target make the combined firm's assets also more volatile compared to the volatility of the acquirer value.

6 companies (2, 4, 9, 11, 14, 21 in the table 3.2.2 above) out of 11, which experience wealth redistribution effect, have acquired the firms from different subindustry with higher average firm value volatility. It led to a higher firm value volatility of the acquirer itself.

2. Different capital structure.

The acquirer and the target may have different debt structures. If the company acquires the target with significantly greater leverage ratio, then the credit risk increases for the acquirer. 4 companies (3,12, 13, 17) acquired the firms with higher leverage, which increased the risk and thus increased the combined firm value volatility.

Higher risk profile of acquirer as a result of M&A transaction makes the creditors of the acquirer impose higher yields. This corresponds with the option theory and Merton model: option value increases with the rise of the volatility of the underlying asset. In corporate world, such option feature leads to a conclusion that the firm's equity has a greater value in cases of high volatility (risk) of the firm value. So, we found that 10 out of 11 companies with proved wealth redistribution effect have had the risk profile increased due to M&A deal.

4.3 Managerial implications

This paper examines the debt market reaction and welfare redistribution between shareholders and bondholders. So far, we found the effect of market reaction by using DD method, and support the found reaction with the idea of welfare redistribution by using Merton model (equity as a call option): shareholders of 84,6% of the companies, the bonds of which experienced the price drop, relatively gained at the expense of bondholders. In other words, the hypothesis that wealth redistribution from bondholders to shareholders leads the bondholders to compensate their losses with higher yields fits 84,6% of cases.

The debt market reaction in a form of bond price reduction leads to increasing of yield to maturity – the indication of intention of the debt market to compensate the losses, occurred during the M&A deal. We hypothesize that such losing of value can be a signal of welfare redistribution: wealth flow from bondholders to the shareholders.

For the managers our paper reveals the effect of bond price reduction due to M&A deal in the oil&gas industry. We found that risk factor was essential in 91% cases of wealth redistribution: the acquiring company increases its risk profile in M&A deal by participating in a relatively risky project of acquiring the company with higher volatility of the firm value.

Managers should consider potential debt depreciation before the decision whether to enter the M&A deal or not is made. Strategic management responsible for such high-level decision-making needs to reconsider the valuation of the deal from the prospective of the consequences for shareholders' welfare: value destroying M&A as well as welfare outflow to bondholders are possible ways of losing the wealth in the deal. At the same time, they need to estimate the riskiness of the target – how it can influence the overall riskiness of the acquirer in terms of firm volatility. Risky target can bring value to the acquirer's shareholders from bondholders through redistribution effect. The debt market response to such effect results in decreasing of the bond market price – so, in addition the company may repurchase the bond issue at a lower price to reduce the debt level and financial burden in a form of coupon payments in the future.

For the creditors and the bondholders of acquiring firms in particular, it is useful to know the existence of debt market reaction and to be ready to take part into decision-making process of M&A negotiation. We found the debt market reaction, other researchers, for example Hilscher and Sislí-Ciamarra (2013), found that the existence of creditors in the board of directors reduce the probability of company's engagement in value destroying M&A deals. In fact, a private bondholder probably will not become a member of the board of directors just to influence the decision regarding M&A deal, which is potentially beneficial only for shareholders and not for creditors. Still, the knowledge of negative effects of M&A deal for the bondholders of the acquiring company may prevent the potential creditors to buy the bonds of company that actively participate in acquisitions of risky targets.

Creditors should always take into account the idea that value-destroying deals can be purposefully taken by shareholders: redistribution of the wealth from bondholders to shareholders can outweigh the losses from value distortion M&A.

3.4 Research limitations

This research has several objective imperfections, which limit the explanation power of the results. Below we describe the limitations of our research conclusions.

First and foremost, the sample of the companies for DD analysis is not ideal from qualitative and quantitative perspectives:

- Qualitative flaws. For DD method the dataset should consist of relatively similar objects. The similarity of the companies in our case was proven by: a) belonging to oil&gas industry, b) the same credit rating of companies and bond issues, c) the same bond issues maturity of 10 years. Still, there are factors that make the sample of companies not ideally homogenous:
 1. Different businesses within one industry: oil producing, oil distribution, oil equipment producing, and oilfield services;
 2. Different coupons;
 3. Different level of business development: mature Vs developing companies;
- Quantitative flaw: the number of companies in the sample is small (26), thus the results and conclusions can be biased and thus further research on the same topic and with the same goal but on the different dataset is needed in order to check the validity of the results obtained in this paper.

Second, the calculation of equity and debt values within the option pricing model is partially based on the factors, which were estimated by us or taken from outside sources. These factors are:

- The firm value volatility of the firms from dataset for Merton model: we take average firm value volatility for different subindustries of oil&gas industry and by proper weighting¹¹ of these averages we calculate for each company individually; By proper weighting of these factors, the total firm value volatility was obtained for each firm of the sample individually. So, such industry averages also bias the results;
- The par value of outstanding debt: this is a balance indicator, calculated at the end of financial year, but the deals occurred within the 2014 year, thus we estimate the interim outstanding debt values for Merton model by using the balance values;

The sample for Merton model is a part of dataset for DD method and is also short – only 22 companies. The calculations were done for each company from the sample individually, the results on individual basis are not biased, however, the conclusions about the welfare redistribution effect on the basis on 22 companies may be not accurate.

¹¹ Weight of a particular oil&gas subindustry firm value volatility average is calculated according to the company's business operations: the weight of revenue attributable to the subindustry is the weight of this subindustry in the total volatility of the firm value

Still, we believe that the quality of dataset, gained by rigorous elimination of the companies from initial data set of 102 M&A deals, enables us to argue that the conclusions made from the analysis of such short datasets are significant.

Conclusion

M&A activity sometimes results in losing value of the deal participants. There are many papers analyzing the success factors of the deal. Such papers identify features of the deal, the acquirer and the target, which can help to predict the value creation during the M&A deal. Apart from studying the value formation in the deal, many researchers are interested in the market reaction – how the markets, debt and stock ones, react to the deal. There are plenty papers about the stock market reaction, but a limited number of debt market reaction studies. The focus of this research paper is the reaction of the bondholders of acquiring company to the M&A deal on American oil&gas market. The main goal we set at the very beginning of the research is to analyze the debt market reaction to the M&A deal and investigate it from the perspective of wealth redistribution effect.

We have conducted two parts of analysis. First, we have estimated the acquirer bondholder's reaction to the M&A deal. Using DD methodology, we gathered data for two groups of the companies: the control group of companies that did not participate in any M&A deal but had bond issues and the treatment group of companies that participated in the deal as acquirer and had bond issues. The period of analysis was 2014 year: we compare the bond prices before and after the M&A deal. We found that on average the bond price from the treatment group fell in price at 4,41 points, while the bond price from the control group fell insignificantly at 0,04 points. The companies from both groups were relatively similar: all are from oil&gas industry, the credit rating and the tenor of bonds are the same. In addition, DD method mitigates all exogenous factors such as market exposure, external shocks, etc. Thus, we concluded that the bondholders react to M&A deal and the reaction is measured as bond price change.

Second, we have identified the welfare effect in those companies of treatment group, the bond's prices of which showed downward trend. We used Merton model, which presents the equity of the firm as a call option to the firm value with a strike equal to the level of outstanding debt. For each company we calculated the option price individually. We found that 84% of the firms with downward trend in bond's price have the effect of welfare redistribution: the shareholders gain at the expense of the bondholders or value loss of the shareholders is relatively smaller compared to that of the bondholders.

So, negative trend in bond's price of the companies from the treatment group was mostly driven by 60% of the bonds, 84% of which are the bonds of companies with wealth redistribution effect from the bondholders to the shareholders.

We analyzed the companies with proved wealth redistribution deeper and found that 91% of these companies enhanced their risk profile due to M&A deal by acquiring target with either higher volatility of the firm value or more leveraged capital structure. This additional risk made the acquirer firm value more volatile and it led to higher equity value – this result directly corresponds with the theory of option pricing: the higher the volatility of the underlying asset is the greater the price of the option is. So, the risk factor is essential for wealth redistribution effect, which in turn influence the debt market reaction to the M&A deal: because of losing the wealth in a welfare redistribution process, the bondholders try to compensate their losses by claiming for higher yields, this in turn leads to a lower prices of the bonds.

There are clear managerial implications for strategic management, which is responsible for decision-making process regarding M&A activity of the firm. Managers should reconsider the valuation of the deal from the prospective of the consequences for shareholders' welfare: value destroying M&A as well as welfare outflow to bondholders are possible ways of losing the wealth in the deal. They always need to pay attention to riskiness of the deal – risky target in terms of its debt structure or highly volatile cash flows may cause increase in the risk profile of the company. To some extent, such risk adding is beneficial to shareholders because they can gain at the expense of the bondholders exploiting the welfare redistribution effect.

Creditors should always take into account the idea that value-destroying deals can be purposefully taken by managers in order to satisfy the shareholders: redistribution of the wealth from bondholders to shareholders can outweigh the losses from value distortion M&A.

The results provided in this paper are obtained on the basis of American oil&gas market for the year 2014. To prove the consistency of these results further studies are needed with different sample and time of analysis.

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Appendices

Appendix 1. The bond price of “M&A+bonds” group

#	Company name	Bond price on 20.11.2013	Bond price on 01.02.2015
1	Baker Hughes	100,42	104,11
2	Boardwalk Pipeline	111,99	106,02
3	BreitBurn Energy Partners	101,00	64,5
4	Cimarex Energy	105,75	104,94
5	DCP Midstream Partners	101,72	104,5
6	Devon Energy	95,17	101,76
7	Diamondback Energy	106	104,25
8	EnLink Midstream Partners	114	115,25
9	Enterprise Products	111,21	113,24
10	Forum Energy Tech	104	93,75
11	Gulfport Energy	107	100
12	Halliburton	119,1	118,62
13	Legacy Reserves	27,96	30
14	Linn Energy	101,06	78,7
15	Martin Midstream	102,5	96,5
16	Memorial Production	102,75	90,25
17	Murphy Oil	99,77	97,1
18	National Oilwell Varco	92,45	97,02
19	ONEOK Partners	104,72	105,25
20	QEP Resources	106	104,96
21	Rice Energy	97	94
22	SM Energy	108	99,63
23	Southwestern Energy	119,78	113,4
24	Tesoro	97,5	103,05
25	Western Gas Partners	110	98,65
26	Whiting Petroleum	103,22	96

Appendix 2. The bond prices of “Only bonds” group

#	Company name	Bond prices on 20.11.2013	Bond prices on 01.02.2015
1	Air Products and Chemicals	92,64	99,58
2	Airgas	95,73	101,71
3	Albemarle	104,86	100,03
4	ATP Oil & Gas	65	66
5	Berry Plastics	100,19	102,76
6	Black Elk Energy Offshore Operations	93,38	82,56
7	CenterPoint Energy Resources	107,53	111,94
8	CMS Energy	108,74	115,18
9	Commonwealth Edison	101,63	107,17
10	DuPont	105,45	107,98
11	Eastman Chemical	102,01	102,14
12	EOG	117,32	115,36
13	Hess	99,88	92,87
14	Hillenbrand	106,66	108,1
15	Huntsman International	98,96	77,75
16	Laclede Gas	98,93	101,74
17	Mosaic	99,7	109,73
18	Noble Corp	104,17	88,32
19	Phillips 66	101,62	108,83
20	PolyOne	98	102,62
21	Praxair	105,83	110,41
22	Rockwood Specialtie	102,75	105,62
23	RPM International	114	116,7
24	Unit Corp	105,25	94,25
25	Williams Cos	91,73	91,48

Appendix 3. Inputs for Merton model: acquiring companies before the deal

Company	EV	outstanding DV	EV volatility	average duration
1	33 821 718 223	4 381 000 000	50,06%	7,44
2	7 999 787 121	3 683 000	24,60%	3,91
3	4 223 502 804	3 352 160 000	43,96%	4,44
4	13 491 371 486	1 500 000 000	43,96%	4,5
5	7 193 135 829	2 424 000 000	24,60%	4,48
6	31 972 338 000	11 262 000 000	43,96%	7,63
7	9 707 298 059	2 022 500 000	24,60%	7,84
8	85 888 635 628	21 363 800 000	33,87%	7,1
9	5 381 074 995	703 564 000	43,96%	4,24
10	2 580 547 457	938 876 000	43,13%	4,06
11	19 800 051 729	10 295 809 000	43,96%	3,98
12	19 969 233 645	10 295 809 000	43,96%	3,99
13	1 748 017 712	888 887 000	37,33%	3,5
14	2 464 369 834	1 574 147 000	43,96%	5,42
15	29 514 935 947	3 166 000 000	50,06%	7,47
16	17 719 073 659	7 067 178 000	43,13%	7,2
17	3 436 976 613	900 680 000	43,13%	4,81
18	7 266 493 488	2 332 445 000	43,96%	5,27
19	12 001 615 416	6 967 000 000	43,96%	3
20	12 083 341 029	4 161 000 000	43,96%	4,33
21	9 191 672 850	2 422 954 000	24,60%	6,56
22	11 600 594 531	5 602 389 000	43,96%	3,67

Appendix 4. Inputs for Merton model: acquiring companies after the deal

Company	EV	outstanding DV	EV volatility	average duration
1	33 412 778 117	4 133 000 000	50,06%	7,44
2	8 165 179 305	3 683 000	24,60%	3,91
3	5 328 348 705	3 245 150 811	43,96%	4,44
4	13 504 636 795	1 500 000 000	43,96%	4,5
5	7 422 731 357	2 411 890 411	24,60%	4,48
6	31 939 972 000	11 746 931 507	43,96%	7,63
7	9 934 381 631	2 022 500 000	24,60%	7,84
8	84 764 832 238	21 854 534 247	33,87%	7,1
9	5 583 040 548	703 564 000	43,96%	4,24
10	2 565 005 279	978 722 795	43,13%	4,06
11	19 969 233 645	10 090 154 315	43,96%	3,98
12	19 829 907 369	10 165 561 033	43,96%	3,99
13	1 715 840 787	888 298 079	37,33%	3,5
14	2 455 786 237	1 640 740 490	43,96%	5,42
15	29 176 091 327	3 562 945 205	50,06%	7,47
16	17 183 340 310	7 094 230 986	43,13%	7,2
17	4 079 010 422	949 472 723	43,13%	4,81
18	6 691 811 676	2 361 417 397	43,96%	5,27
19	12 104 018 751	6 551 783 562	43,96%	3
20	12 228 523 170	4 121 339 726	43,96%	4,33
21	9 409 527 098	2 444 771 216	24,60%	6,56
22	8 367 455 849	5 438 297 548	43,96%	3,67

Appendix 4. The pivot table of results+

Output	Bond prices dynamics				Equity value dynamics			debt value dynamics		
Company name	Bond price before M&A deal	after	change (abs)	change (rel)	before	after	change	before	after	change
1	100,42	104,11	3,69	3,67%	30 449 238 232	\$30 044 578 139,58	-1,33%	3 372 479 991	3 368 199 977	-0,13%
2	111,99	106,02	-5,97	-5,33%	7 996 441 809	8 161 833 993	2,07%	3 345 312	3 345 312	0,00%
3	101,00	64,50	-36,5	-36,14%	1 977 622 285	2 950 332 329	49,19%	2 245 880 519	2 378 016 376	5,88%
4	105,75	104,94	-0,81	-0,77%	12 156 432 754	12 169 676 363	0,11%	1 334 938 732	1 334 960 432	0,00%
5	101,72	104,50	2,78	2,73%	5 029 403 846	5 268 554 854	4,76%	2 163 731 983	2 154 176 503	0,44%
6	95,17	101,76	6,59	6,92%	24 152 334 402	23 859 950 119	-1,21%	7 820 003 598	8 080 021 881	3,33%
7	106,00	104,25	-1,75	-1,65%						
8	114,00	115,25	1,25	1,10%	8 043 979 866	8 270 663 684	2,82%	1 663 318 193	1 663 717 947	0,02%
9	111,21	113,24	2,03	1,83%	68 498 556 328	67 022 143 280	-2,16%	17 390 079 300	17 742 688 958	2,03%
10	104,00	93,75	-10,25	-9,86%						
11	107,00	100,00	-7	-6,54%	4 751 873 276	4 953 377 027	4,24%	629 201 719	629 663 521	0,07%
12	119,10	118,62	-0,48	-0,40%						
13	27,96	30,00	2,04	7,30%	1 788 397 899	1 744 982 168	-2,43%	792 149 558	820 023 111	3,52%
14	101,06	78,70	-22,36	-22,13%	11 686 024 570	11 963 788 437	2,38%	8 114 027 159	8 005 445 208	-1,34%
14	101,06	78,70	-22,36	-22,13%	11 963 788 437	11 791 578 523	-1,44%	8 005 445 208	8 038 328 846	0,41%
15	102,50	96,50	-6	-5,85%	988 361 827	959 065 615	-2,96%	759 655 885	756 775 172	-0,38%
16	102,75	90,25	-12,5	-12,17%	1 399 285 500	1 362 006 368	-2,66%	1 065 084 334	1 093 779 869	2,69%
17	99,77	97,10	-2,67	-2,68%						

18	92,45	97,02	4,57	4,94%	27 037 481 721	26 420 872 513	-2,28%	2 477 454 226	2 755 218 814	11,21%
19	104,72	105,25	0,53	0,51%	12 782 318 514	12 267 151 977	-4,03%	4 936 755 145	4 916 188 333	-0,42%
20	106,00	104,96	-1,04	-0,98%						
21	97,00	94,00	-3	-3,09%	2 675 390 823	3 267 537 844	22,13%	761 585 790	811 472 578	6,55%
22	108,00	99,63	-8,37	-7,75%	5 396 591 516	4 827 557 977	-10,54%	1 869 901 972	1 864 253 699	-0,30%
23	119,78	113,40	-6,38	-5,33%	6 287 963 832	6 642 684 501	5,64%	5 713 651 584	5 461 334 250	-4,42%
24	97,50	103,05	5,55	5,69%	8 613 590 585	8 781 437 387	1,95%	3 469 750 444	3 447 085 783	-0,65%
25	110,00	98,65	-11,35	-10,32%	7 137 596 625	7 336 484 867	2,79%	2 054 076 225	2 073 042 231	0,92%
26	103,22	96,00	-7,22	-6,99%	7 021 697 151	4 245 238 179	-39,54%	4 578 897 380	4 122 217 670	-9,97%
	101,89	96,82								

