



How will the takeover premium differ from the option premium in M&As before and after the introduction of IFRS?

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Supervision: Taylan Mavruk

Authors:

Carl-Johan Jansson 830413

Thomas Kliger 851016



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Carl-Johan Jansson

Thomas Kliger



ABSTRACT

This master thesis studies the effects of the implementation of the International Financial Reporting Standards on the valuation of mergers and acquisitions. The takeover premium paid and the premium suggested by option-based theory in European M&As is compared before and after 2005.

Overall, it is found that the valuation process does not seem to have been made more efficient, as were one of the purposes with introducing new accounting standards. According to option pricing, the deals examined have not been overpaid.

The massive failure rate of M&As is, according to the findings in this report, not caused by a misvaluation by the acquiring firm. The differences between the premiums paid and the premium suggested by option theory are widely dispersed.

1. INTRODUCTION

This section is an introduction to the area of mergers and acquisitions (M&As) that is commonly used to create synergy effects and growth. It also contains a discussion about the problems involved in the valuation process and short description of the purpose and distinctions of this paper.

1.1 BACKGROUND

The general main motives of firms around the world are profit, sales and to maximize managerial utility (Jones 2004). However, when taking time into consideration and to maintain or increase the competitive advantages, there are many motives for the firm to also undertake growth (Jones 2004). Some motives for growth are to raise the total profits, increase efficiency, increase the market share and market power, reducing managerial costs and to reduce the risk and uncertainty involved in the firm (Jones 2004).

One way of undertaking growth is by mergers and acquisitions, commonly referred to as M&As (Kinnunen et al. 2009). M&A means that an acquiring firm buys either the whole target firm or parts of a target firm (Bild et al. 2002). The two terms “merger” and “acquisition” have different definitions. A merger is the process when two or more firms are combined in a voluntary process, whence an acquisition or takeover is when one firm buys the assets of another firm (Jones 2004).

M&As is not a new phenomenon in world economy. During the turn into the 20th century there was the “Great Merger Movement” (Lamoreaux, 1985). During a ten year period approximately 1800 smaller firms in the U.S. merged, mainly to increase their market share which would lead to synergy and diversification effects (Lamoreaux, 1985). Large U.S. companies such as DuPont, US Steel and General Electric all undertook mergers during these years and could establish a dominant position in their respective industry, which they have succeeded to maintain. Meanwhile, firms that had a dominant position during this era were successively outcompeted due to smaller firms merging together and receiving several competing advantages due to this. Most of these mergers were horizontal mergers, meaning that two firms in the same market merge (Jones 2004).

Several reports state that mergers occur in waves and at certain times, depending on the general economic environment (Thijssen 2007). Factors that affect the rate of mergers include technological innovations, fluctuations in the oil price etc. A number of these factors are positive whence others have a negative affection on the profitability. Furthermore, mergers tend to occur at different times depending on type of industry. There is evidence that mergers occur in cycles (Jones 2004).

There are several motives for merging. The most prominent of these include growth, increase of market power, diversification, synergy effects, cost savings and acquiring competences (Baker et al. 2011).

Despite the obvious benefits with M&As, evidence shows that most of the M&As actually fail or are at best value neutral. There are several studies on the M&A outcome, indicating that 60 – 80% of all of the M&As fail (Bruner 2001). This might pose a serious threat to the merging firm's existence since resources, both managerial and financial, are locked into the merged firm (Baker et al. 2011). Therefore it is important from the acquiring firm's point of view to evaluate the merger in a proper way to avoid a bad decision and to estimate the true market value of the merger (Herath et al. 2002). Furthermore, a good valuation technique can monitor the different opportunities in the merged entity and also estimate the value and the flexibility to estimate the future growth potential (Baker et al. 2011).

Roll (1986) states that there often is a takeover premium paid by the acquirer in order to take over a large amount of the target companies' stocks. The takeover premium can be defined as the difference between the market capitalization and the actual takeover price paid (Baker et al. 2011).

Traditional approaches for the valuation of mergers need to be studied further since the performance of mergers to present date is poor (Bruner 2001). A contribution to the concept of M&As could be to include real options in the evaluation process. Earlier reports state that the value of managerial flexibility is not taken into account when making traditional valuation of M&As (Herath et al., 2002). This can be seen with the aid of a real options lens, with the opportunity for the management to delay, expand, contract or abandon certain projects. The managerial flexibility and a proper valuation of it, is important when considering M&As (Herath et al 2002). By implementing real options in the M&A process, the firm has the potential to strengthen or reevaluate their decision (Kinnunen et al. 2009).

Another factor that has the potential to affect the takeover premium in M&As is the International Financial Reporting Standards. These new standards became mandatory in the European Union January first, 2005. The standard facilitates the comparison between firms in different countries which can affect the takeover premium after a country has adopted these rules (Herath et al., 2002). The IFRS standard will help induce positive effects on financial estimates and statements, also improving fair valuation of companies in different countries (Holt et al. 2008)

1.2 PROBLEM DISCUSSION

As stated in our background, to acquire a firm or to merge with another firm is often looked upon as a growth strategy and a strategy for increased profits (Jones, 2004). The purpose of increased growth and increasing profits is according to classical corporate finance theory a mean to maximize shareholder value (Berk and DeMarzo, 2010; Jones, 2004; Friedman 1970).

There is a problem involved in M&As concerning publicly traded companies. If there is an efficient market, the future value of assets and expectations, including options, is already embedded in the present stock price. According to Buckley et al. (2002) this is one of the key explanations why most M&As fail; there is no opportunity for arbitrage or profit from an M&A since the market has already included the future possibilities in the stock price. In order for an M&A to add value for the shareholders, the acquirer must outperform pre-acquisition expectations made by the market and in the future perform even better than non-acquisitioning firms competing in the same market (Bild et al., 2002).

Pickering (1983) and Meeks (1977) have a slightly different point of view on M&As as a value creating strategy. They state that the majority of all M&As perform poorly, at least from the acquiring firm's point of view. Between 1992 and 2006 the average M&A created a net loss of 1,2 percent for the acquiring firm, although the target firm's investors had a positive return of 1,8 percent (Boston Consulting Group, 2007). The BCG report supports the findings made by Pickering (1983) and Meeks (1977); the real winners in M&As are the shareholders being bought out. The profitability of the acquiring company is often smaller than the markets and the industry average (Jones, 2004).

The valuation of a company is a very complex issue since it is hard to establish the fundamental firm value. According to Christensen et al. (2001), all valuation models are based upon assumptions about the future with emphasis on profitability, finance and growth. The models that are most commonly used are earnings-multiples based on comparisons with similar M&As, and discounted cash flow analysis (DCF) (Sevenius, 2003). The latter have been widely criticized since it is based on vague assumptions and can easily be manipulated. The main motive for using methods based on comparisons is the simplicity (Sevenius, 2003).

According to Bowman and Hurry (1993), strategy choices and investments decisions are very closely connected since the investments create the platform from which strategies are launched and that strategy often enables new investments. A good way to investigate these two variables together is to adopt option theory (Bowman and Hurry, 1993). In recent years researchers have started to focus on

real option's usefulness in the valuation of M&As, claiming that real options in fact can explain the occurrence and deviations on the returns of acquisitions (Smit, 2001).

However, Dunis and Klein (2005) compared the takeover premium in M&As in the European financial sector with the option premium calculated with the Black and Scholes pricing model and found that the target firms were not over-valued, i.e. the option premium were higher than the takeover premium paid by the acquirer. But nevertheless, the options framework in M&As has not yet been fully understood and in theory it is a powerful tool in estimating the value of investments (Baker et al. 2011). There are many options that are suitable for being included in the M&A evaluation and therefore option pricing can help improve the failure ratio (Baker et al. 2011).

The IFRS accounting standards became mandatory in Europe in 2005, and might also have affected the way investors look at investment opportunities such as M&As (Holt et al. 2008). There are several advantages with IFRS (Ball, 1995). First of all, it provides a more accurate and comprehensive financial statements, which should lead to better informed valuation and lower the risk for investors. The improvements of the financial reporting allow small investors to better compete with professionals. The adoption of IFRS also reduces the cost for investors to "translate" the accountings to a similar standard. This will also lead to efficiency in the stock market since the cost of processing financial information is lower. Finally, the reduction in international differences in accounting standards assists to enhance the valuation in M&As. This can lead to an increased takeover premium (Ball, 1995).

There are disadvantages with IFRS that cannot be ignored. The major one being that the standards might ignore the different countries' economical and political factors that affect the audit firms (Ball, 1995). Another common concern is that investors might be misled to assume that there is more homogeneity than there actually is (Ball, 1995). The implementation of the standards is an important issue that has the potential to affect the transparency between countries and that can be a problem concerning global M&As with different accounting rules (Ball, 1995). To conclude, the adoption of IFRS can pose an advantage of the valuation of investments, but there are also problems involved in this area which can create threats for investors.

1.3 PURPOSE & RESEARCH QUESTION

The purpose of this report is to compare the actual takeover premium in M&As with an option premium. The option premium will be calculated with both the Black and Scholes formula and with binomial lattices. The comparison will also be extended to examine if there is any difference on the



premium by looking before and after the IFRS accounting standards became mandatory in Europe. These new standards could possibly have affected the takeover premiums, which will be examined in this report. The question that we intend to answer in this report is:

How will the takeover premium differ from the option premium in M&As before and after the introduction of IFRS?

The research will be based on M&As in Europe, because the target company must follow the European accounting standards and IFRS (Holt et al. 2008). All of the companies that are part of this study must also be listed, and their historical stock prices must be available. This information is needed for the calculation of a market capitalization that is needed as one input parameter in our calculations.

2. THEORY

This section is conducted to create a deeper understanding of the processes involved in M&As and the tools that are applied in the valuation process. It also describes methods that are not so commonly used but are advocated by theory, namely option-based pricing. Finally it describes the framework of IFRS and its affection on the valuation.

2.1 MERGERS AND ACQUISITIONS

Mergers and acquisitions are often mentioned as one term and can therefore be miss-interpreted as if they are synonyms, which is not the case. The term merger actually means that two or more companies merge into one entity where one company survives and the other ceases to exist. A common mix-up is that a merger means that two or more companies together create a new entity; this is actually called a consolidation. An acquisition on the other hand means that one company takes over the control of another company by buying preferred assets or shares (Baker et al., 2011).

Even though M&As do not always mean increased shareholder value, they are described as vital to any well-functioning economy because they enable wealthy companies to grow even further by taking over smaller or less wealthy companies, and by doing so reducing efficiency losses due to poor use of resources. *“Through M&As a company can grow rapidly without having to create another business entity”* (Baker et al., 2011, p.2).

2.1.1 Why firms merge?

The main reason for undertaking a merger is to achieve synergies between the merging firms. The two main synergy effects are economies of scale and economies of scope. Economies of scale incorporate the benefits of cost reduction after the merger, for example when two headquarters are reduced to one but still manages to maintain the same efficiency. Economies of scope refer to increased revenues. An example is if two companies together can offer their customers a more complete product, then there is an increased potential that the total revenues will increase (Jones 2004; Baker et al., 2011).

Another reason why firms merge is that the total volatility of the merged company can be reduced by a merger of two companies uncorrelated to each other (Lewellen 1971). This statement is however disputed by Porter (1987), who argues that companies should do what they do best. If shareholders are interested in a more diversified business they can achieve that through a well-diversified portfolio.

Smith and Kim (1994) argue that a good reason to acquire a firm is by uniting the financial slack in a mature firm with the growth options of a growing firm. Evidence show that value creation is more probable if a firm with high financial slack and low growth rate acquires a firm with low financial slack and high growth rate. Although, evidence proves that in mature firms with high financial slack, managers have a tendency to commit value-destroying acquisitions. Managers tend to seek a shareholder satisfaction by evening out the results from good and bad times and therefore they seek diversification (Tricker, 2008). A similar type of inefficient managerial behavior has been detected when managers face a rational stock market and try to mislead the market about the firm's value. Managers forsake a good investment to boost current earnings (Stein, 1989). This concept is called managerial myopia. It can occur when managers hold a little share in their companies or when they cannot understand the drivers of the stock price (Stein, 1989).

Amihud and Lev (1981) discuss risk aversion in mergers in managerially controlled companies. They conclude that in companies controlled by managers, the proportions of risk averse investment decisions are more concentrated than in owner-controlled companies. Risk avert investment decisions are not preferable from a stockholders point of view, since they can diversify their own portfolio (Amihud et al. 1981; Porter 1987). These types of risk avert decisions are however very common in managerially controlled firms due to the fact that those managers thrive to reduce their risk to get dismissed.

2.1.2 Effects on the Stock prices

It is common for the stock price for the target firm to increase rapidly after an M&A has been announced (Fuller et al., 2002). This increase consists of two effects, the takeover premium effect and the effect of a reassessment of the new value of the firm. More interestingly and much more difficult to explain, is the stock price of the acquiring firm. Fuller et al. (2002) have studied takeovers among differently structured firms and found that the most positive stock price effect of an acquiring firm comes from a public firm taking over a relatively large privately owned firm. This can be explained by two things; first, the owners of the privately owned firm gets offered liquidity and second, by using stock to pay for the target, the acquiring firm gets a block holder who has incentives to try to effect the firm in a positive direction (Baker et al., 2011).

2.2 Valuation methods for firms

To value a firm is a very complex issue and the value of the firm should not be confused with the price the buyer ends up paying. The price is a negotiation process between the buyer and the seller.

There is a takeover premium involved in M&As, meaning that the final takeover price is higher than the market capitalization of the target, in order to take over a large amount of shares (Roll, 1986).

Depending on the purpose of purchase the firm can be valued very differently between different buyers. The buyer makes an estimation of the maximum amount he is willing to pay, based on what use and advantage the possessing of the target firms assets is worth. The seller calculates the minimum amount he is willing to sell its assets for, often based on the value those assets can create on its own. The price usually ends up somewhere between the value set by each party (Baker et al., 2011).

2.2.1 Balance sheet-based methods

Balance sheet-based methods are simply based on the valuation of the company's assets. Future possibilities and the time value of money are ignored in these methods. Since they ignore future possibilities, these methods do not consider trends that may affect the industry as whole nor organizational aspects (Baker et al., 2011).

2.2.1.1 Book Value

The booked value of the company's assets (also referred to as net worth) is perhaps the most simplistic balance sheet-based method. The calculation is also non-complex; the booked value of the company is "*the surplus of the company's total goods and rights over its total debts with third parties*" (Baker et al., 2011, p. 129). The fallacy of this method is that there is often a difference between the subjective valuations made by the company and the market's valuation of the company. The difference of the booked value of company's assets and the market's valuation of the company is often referred to as book-to-market ratio or price/book value (Berk and DeMarzo, 2010; Baker et al., 2011).

2.2.2 Income statement-based methods

This is the most commonly used valuation method (Sevenius, 2003). This method tries to evaluate the company through the size of earnings, sales or other values from the income statement. This is often done using multiples, for example earning-multiples. The multiple is an estimation of similar companies and therefore the use of multiples is also referred to as relative valuation (Baker et al., 2011).

2.2.2.1 Value of earnings

In this method the company's PE-ratio (price over earnings) is used to estimate the value of the equity by using the formula: $PE \times Net\ income$. The PE-ratio is used to make use of the market's

valuation of the company, sometimes even prognosis of future EPS (earning per share) are used in this method. Investors sometimes use the PE ratio as an industry benchmark and make a relative valuation of the company based on market average (Baker et al., 2011).

2.2.2.2 Value of dividends

The dividends paid out by a company contain information about expected future performance, which is known as dividend signaling. If a company increases or decreases the dividend yield, they send out a message to the market saying “we expect increased/decreased earnings in the future”. For that reason, dividends paid out to investors are often smoothed out and does not fluctuate to a big extent (Berk and DeMarzo, 2010). Dividends are the only regular cash flow investors can expect from a company, therefore this method estimates the NPV (net present value) investors can expect being paid out. Depending on if the company is in a growth phase or a mature phase, different assumptions about the dividend can be made (for example constant dividend yield or constant growth rate). The formula is seen below in equation 1:

Equity value = D_0/K_e , where D_0 = the dividend paid out at time zero and K_e = the discount rate.

Equation 1: The Equity value (Baker et al., 2011)

2.2.2.3 Sales multiples

Sales multiples are also a relative, industry-specific way to value a company. This method often take two ratios into consideration, Price/sales = PE (earning/sales). By combining those two you get what is commonly known as return on sales.

2.2.3 Discounted cash flow methods

Discounted cash flow (DCF) methods are the second most commonly used method to value a company. These methods are criticized for making very vague assumptions about detailed parameters affecting future cash flows and for using a constant discount rate (Sevenius, 2003; Copeland et al., 2005).

$$V = \frac{CF_1}{(1+k)} + \frac{CF_2}{(1+k)^2} + \frac{CF_3}{1+k^3} + \dots + \frac{CF_n + RV_n}{(1+k)^n} = \sum \frac{CF_n + RV_n}{(1+k)^n}$$

Equation 2: The basic formula for Discounted Cash Flow methods (Baker et al., 2011)

$$RV_n = CF_n(1+g)/(k-g)$$

Equation 3: The residual value of the company (Baker et al., 2011)

When applying discounted cash flow methods, there are three different types of cash flows that need to be considered; the free cash flow, the equity cash flow and the debt cash flow.

2.2.3.1 Free cash flow (FCF)

When talking about FCF one is often referring to the cash flows generated by the firm's operations after taxes. To be able to calculate the FCF for different periods, forecasting regarding cash inflows and outflows must be made. This process is not that different from drawing cash budgets, however it is more complex since it requires forecasting further into the future (Baker et al., 2011).

2.2.3.2 Equity cash flow (ECF)

As the formula below shows, ECF is calculated by subtracting the interest payments, the amortization (minus the tax shield) and adding newly issued debt. In short, one can say that ECF is the cash flow available for the shareholders (Baker et al., 2011).

$$ECF = FCF - Interest\ payment \times (1 - T) - Principal\ repayments + New\ debt$$

Equation 4: The equity cash flow (Baker et al., 2011)

2.3 REAL OPTION VALUATION

A real option means that a company has the right to undertake a certain business decision, in this case undertaking an M&A. The main difference between a real option and financial option is that a real option, including the underlying assets, cannot be traded in competitive markets (Baker et al., 2010). However, there are similarities between financial options and real options and the major one that also is applied to M&A valuation is the potential to choose the optimal alternative with different information (Baker et al., 2010). The inclusion of these alternatives in the evaluation process affects the valuation, which in turn affects the outcome of an M&A (Baker et al., 2010).

A business opportunity can be seen as a call option that gives the holder the right to stop, start or change a project at a future date (Mathews 2009). Since these real options are temporary, the investments can be strategic instead of tactical.

Investment decisions, including M&As contain real options. However, these are firm or project specific, meaning that it can be difficult to standardize the process and make it applicable to all situations (Baker et al., 2010). The most common options in M&As are the option to expand, the option to contract and the option to abandon (Bruner, 2001).

The real option analysis as a valuation tool can be way more powerful and incorporate more dimensions than a simple NPV analysis can take into account (Mun, 2006). By monitoring different scenarios that can be dependent or independent of each other, for example by looking at the options to invest more, that is expansion, the option to wait or even the option to divest and sell the property when new information has been collected. The sensitivity to all these alternatives and the creation of a decision tree that shows all possibilities and their values, gives a highly powerful tool compared to the NPV technique (Leslie and Michaels, 1997).

The value of learning is also included in the option valuation. This is an important thing since strategic decisions are rarely one-time events, especially in investment-intensive industrial sectors. Traditional valuation techniques do not properly recognize the value of learning before a full commitment is made and it is for that reason insufficient (Leslie and Michaels, 1997).

Traditional valuation tools assume a fixed multi-year investment model and in a way create a way of thinking that risks to be narrowing the vision of the management. Furthermore, once an investment has been undertaken, it can be hard to abandon it or even to change course. By using real options instead, one can be prepared for more dynamics in the decision process and encourage new ways of thinking (Leslie and Michaels, 1997).

2.3.1 Real options: valuing flexibility in strategic mergers and acquisitions

The valuation of projects or firms can with the concept of real options include the valuation of growth or synergy (Baker et al., 2010). The future is uncertain (Sevenius, 2010), and therefore it can be hard to estimate the cash-flows. This means that the valuation process is important and the usage of real options can be incorporated to this process (Mathews, 2009).

Earlier reports state that the value of managerial flexibility is not taken into account when making traditional valuation of M&As (Herath et al., 2002). This can be seen with the aid of a real options lens, with the possibility for the management to delay, expand, contract or abandon certain projects. The managerial flexibility and a proper valuation of it, is important when considering M&As (Herath et al 2002).

Herath et al. (2002) define the theoretical value of an acquisition as “the deal value based on a fixed exchange ratio”. This value will differ depending on the stock price at consummation. The stock price will as a consequence change the theoretical deal value both up and down. The acquiring firm wants

to minimize the deal cost and can therefore buy a real call option that ensures a minimum deal value (Herath et al. 2002).

2.3.2 The Real Options process

The steps in a real options process are important to know for the management. This is especially true when these calculations will end up in an M&A decision for the board of a company (Mun, 2006). It further provides insight into the methodology itself and how it differs from other evaluation techniques that can be used for M&As (Mun, 2006). According to Mun (2006), a real option analysis of a firm or an investment in general can be divided into eight different phases.

Qualitative Management Screening is the first part of a real options analysis. In this phase it is the management's task to decide which projects, investments or acquisitions that are interesting and should be analyzed further (Mun, 2006). These projects shall be in line with the firm's missions, goals or procure synergy effects in an M&A (Herath et al. 2002).

To forecast the future, time-series analysis or multivariate regression analysis is conducted, if historical data exists. If not, other forecasting methods need to be undertaken (Mun, 2006).

For each project or investment that needs to be examined further, a discounted cash flow model is created. The purpose for doing this is to estimate both the cash-flows and the net present value of the investment using the risk-free rate (Mun, 2006).

The next step in the process is to estimate the volatility, which according to Mun (2006) is made through a Monte Carlo simulation. This method enhances the prediction of future cash-flows by inserting historical parameters and data about the company. The first step in this process is to make a sensitivity analysis, a Tornado chart. By doing this, it is easy to see which parameters that affect the end result the most (Mun, 2006). The end result of the Monte Carlo simulation is the volatility and a distribution of the net present values.

Real Options Problem framing follows the Monte Carlo simulation. It monitors the different strategic alternatives that become obvious through the real options process (Mun, 2006). Examples of options that can occur are the option to expand, option to contract or the option to abandon an investment.

The next step is to optimize the different outputs in the previous process (Mun, 2006). The discounted cash flow model will have a range of different values so it is central to make binomial lattices and simulate the outcomes.

The next step of the process can be excluded. Portfolio and Resource Optimization is about allocating the right amount of resources to each investment, and if several investments exist, demanding different amounts of resources, the right ones need to be estimated (Mun, 2006). The purpose of this analysis is to allocate exact the right amount of resources and to make correct choices.

The final step of the real options process is the reporting and updates analysis (Mun, 2006). The results should be presented, as well as the process. It has to be understandable and convince the board of the firm making the right decisions. If the real option process is not reported in an understandable way, it is not likely that the decision makers of the firm will accept the investment even though it is economically favorable (Mun, 2006).

2.3.3 Real Option value drivers

The factors that affect the option value the most are the stock price, exercise price, volatility, the time to maturity and dividends.

Since the value of a call option is calculated by subtracting the exercise price from the share price, the proportion between these two parameters is an important value driver.

According to option theory a higher volatility increases the option price (Berk and DeMarzo, 2010). The reason is that option theory values uncertainty in a positive way in a semi-variance pattern. Through an option lens, the decision-makers of a company can enjoy the benefits of a volatile asset without facing the downside part of a volatile investment. Therefore, the higher the volatility, the bigger the up-side part while downside remains limited (Pape et al. 2004).

The time to maturity is important for the option value. The longer the time to maturity, the higher the option price (Mun, 2006). This is due to the fact that there is an increased flexibility; critical decisions can be procrastinated to the future without the opportunity being lost (Pape et al. 2004).

Dividends affect the option value in a negative way, due to the fact that regular cash outflows lower the value of the option. The underlying asset has a value leakage that decreases the value of the stock price (Pape et al. 2004).

2.4 BLACK & SCHOLES

The Black & Scholes pricing formula was created in the 1970s and is an equation that is widely used to value European put and call options (Berk and DeMarzo, 2010). There are several assumptions for the model to work (Mun, 2006). First of all there cannot be any arbitrage opportunity. The risk-

free rate must be constant. There is a possibility to buy and sell any amount of stock and these transactions shall not incur any cost. Finally the stock shall have constant volatility. If all the input parameters are known and the restrictive assumptions are met, the calculation can be easily made and the option price can easily be compared to values derived from Black & Scholes calculators (Mercer Capital, 2004).

2.5 BINOMIAL LATTICES VS. BLACK & SCHOLES

There can be differences between the binomial value and the option value derived from the Black & Scholes formula. Each model has its advantages and disadvantages and no one is superior in all cases.

The binomial model is easy to monitor and can be more suitable for dividend paying stocks (Mun, 2006). Furthermore it can be complemented with additional options such as abandon, contraction and expansion options. For non-dividend paying stocks, there is merely a little difference between the generalized Black & Scholes and the binomial value (Mun, 2006). When there is dividend involved, the binomial option value is higher by allowing early exercise.

In the binomial model, it is possible to exercise the option if it is optimal. When early exercise is optimal, the binomial call value will be higher than the Black & Scholes value (Mercer Capital, 2004). When increasing the time steps, the theoretical option value for a non-dividend paying stock shall be the same as for the Black & Scholes value (Mercer Capital, 2004). This scenario will occur when using an infinite amount of time steps.

The major limitation to the binomial model is that it takes time to complete and analyze, whereas the Black & Scholes model is fast and lets the user calculate a large amount of option prices in a short time.

2.6 INTERNATIONAL FINANCIAL REPORTING STANDARDS (IFRS)

In January 2005, it became mandatory for European Union firms to use International Financial reporting Standards (IFRS). The purpose of this introduction of the previously voluntary IFRS rules, was mainly to lower capital costs (Mavruk 2010). In the case of M&As, it improves both pre- and post valuation of the target company, making the auditing easier since it has to follow the same rules as the acquiring firm (Holt et al. 2008). The IFRS standard will help induce positive effects on financial estimates and statements, also enhancing fair valuation of companies in different countries (Holt et al. 2008). A striking example is for example when a US firm competes with a European firm to acquire the same target, neither of the bidders will gain any advantage from its accounting framework.

The IFRS framework encourages a fair valuation of assets and the recognition in the income statement of transaction costs. In short terms, it increases the transparency leading to both acquiring and target companies to better estimate the goodwill and making the information more visible (Holt et al. 2008). It also enhances capital mobility between firms from different countries (Holt et al. 2008).

It is important to state that accounting considerations should not drive M&As. Other important consequences shall be taken into account when considering M&As (Holt et al. 2008). Furthermore, it is hard to estimate the time frame for closing the deal due to an unknown negotiation process, that can affect the share prices and hence the valuation of the companies involved (Holt et al. 2008). Looking solely at the accounting of the target will most likely increase the risk of a poor outcome of the M&A (Holt et al. 2008). Instead, by the adoption of IFRS, investors have greater opportunities to look beyond their domestic markets and easier valuate firms in different countries (Holt et al. 2008).

A study by Mavruk (2010), states that “foreign ownership has increased following the mandatory adoption of IFRS”. Moreover, the ownership has changed in different ways for different investors. Compared to countries without the adoption of IFRS, investors in European Union tend to increase their ownership in foreign countries.

To conclude the discussion of IFRS affecting M&A deals, there are two main ways in how M&As can be affected by the new rules. The first way is that firms across countries that adopt the IFRS rules can be easily compared when it comes to their operating performance (Holt et al. 2008). Secondly, the quality of the accounting might increase for firms in IFRS countries, leading to an investment becoming more attractive (Holt et al. 2008).

2.7 EARLIER STUDIES

Bild et al., (2002) have studied 386 takeovers in UK (all public companies) during the period 1985 to 1996. When applying the traditional accounting approach most of the acquisitions have been successful. However, valuing M&As through an accounting approach have several major fallacies. Bild et al. (2002) criticize the accounting method for only considering pre- and post merger performance rather than comparing the marginal return to the acquiring firms cost of capital or looking for positive NPV.

One of the key players in the acquisition advisory market seems to be aware of the problem with the lack of value creation in M&As. According to their study *World Class Transactions* (2001), only 24

percent of the acquisitions in Europe and 35 percent of the acquisitions in the US created an additional value. This poor performance does not seem to be widely perceived. 75 percent of the acquiring firm's board of directors thought their deal had been successful. Cook and Spitzer (2001) explained this with the fact that many firms often have other goals than creating shareholder value. Increased market share and entering new markets are reported to be more prominent goals than creating shareholder value.

One of the key arguments for acquiring a firm is to get a hold of resources that cannot be purchased on the market, such as intangibles, licenses and core competencies that the target firm possesses. In most cases a substantial number of key persons leave the company after the acquisition. This can be one explanation for poor performance (Ernst and Vitt, 2000).

The use of real options in M&As has been examined in earlier reports (Herath et al. 2002). The book "Real options: valuing flexibility in strategic mergers" (Herath et al. 2002) gives a good insight in the M&A process and issues. It further concludes articles in the area, some of whom are about real options. The book has been a good source of information to this report.

Additional information was collected from several articles in the M&A area. Out of these, fourteen were of greater interest since they considered real options in M&As. One of these articles viewed operating synergies as real options in the post—acquisition M&A process (Kinnunen, 2010). In the article the author developed a framework for operational synergy and the paper focused on cost reducing activities and proposed further studies within this area.

Kinnunen and Collan (2009) also presented a study to determine different strategic level real options play in acquisitions. They found that real options can be useful in the acquisition strategy and identified five strategic level real options available for the acquirer. They posed evidence for the broad existence of real options in M&As. This article follows a study conducted by Triantis (1999) that described the M&A as a growth option, and real options can be seen as a way to extend the time to maturity in M&As. By increasing the time to maturity, the option value will also become higher (Triantis 1999).

It is important in the valuation of M&As to have the appropriate knowledge about the target in order to make a profitable acquisition (Herath et al. 2002). Warner, Fairbank and Steensma (2006) study how technical knowledge affects the timing of M&As. Firms with poor relevant knowledge tend to acquire earlier than firms with more knowledge.

The valuation part of the M&A with real options was best described in the article by Dunis and Klein (2005), “Analyzing mergers and acquisitions in European financial services: An application of real options”. This article compares the actual takeover premium with an option premium calculated with Black and Scholes. The article is further described in the methodology, since it plays a crucial part of the calculations in this report.

The deals from the study of Dunis & Klein (2005) were all completed before 2005 and could therefore be used as a complement. The deals in the study by Dunis & Klein (2005) were all bank mergers which actually could mean their values differ from the ones examined in this study that included both related and unrelated firms in different industries. The deals from their report are all listed below in Table 1.

<u>Deal no</u>	<u>Acquirer</u>	<u>Target</u>	<u>Completion</u>
D1	Dresdner (Ge)	Kleinwort Benson (GB)	1995-06-01
D2	Lloyds (GB)	TSB (GB)	1995-10-01
D3	Swedbank (Se)	Föreningsbanken (SE)	1997-02-01
D4	Bayer Vereinsbank (Ge)	Hypotheken- und Wechselb. (Ge)	1997-07-01
D5	Allianz (Ge)	AGF (FR)	1997-11-01
D6	ING Group (NL)	Banque Bruxelles Lambert (BE)	1997-11-01
D7	San Paolo SpA (It)	IMI (It)	1997-11-01
D8	Union Bank of Switzerland (CH)	Swiss Bank Co (CH)	1997-12-01
D9	Banco Santander (Es)	Banco Central Hispano (Es)	1999-01-01
D10	BNP (FR)	Paribas (FR)	1999-07-01
D11	Banco Bilbao Vizcaya (Es)	Argentaria (Es)	1999-10-01
D12	Royal Bank of Scotland (Gb)	National Westminster Bank (GB)	2000-01-01
D13	Bipop (It)	Enrium (Ge)	2000-06-01
D14	HVB (Ge)	Bank Austria (Au)	2000-07-01
D15	DAB (Ge)	Self Trade (FR)	2000-12-01

Table 1: Deals in the study by Dunis & Klein (2005).

The premiums for the Dunis & Klein study are monitored in Table 2 below. The mean takeover premium was 36,34%, and with Black & Scholes 83,85% with a standard deviation of 89,38% and 144,43% respectively.

Dunis & Klein deal data	Takeover	Black & Scholes
Mean Value	13,98%	106,21%
Standard deviation	10,82%	159,97%
Median	9,07%	48,01%

Table 2: The mean premiums, standard deviation and median for the takeover premium and Black & Scholes of the values in the study of Dunis & Klein (2005).

3. METHOD

The methodology section describes the methods used to derive our results, the input parameters in each model and the formulas used to calculate these parameters. It also describes the Black and Scholes and real options calculation process and the test models used for statistical significance.

As a starting point to this report, earlier studies have been collected and examined to monitor the problems involved in M&As. The foundation of this report also lies in studying the application of real options in M&As to improve the success ratio. Approximately twenty reports, that all conclude that M&A outcomes in a majority of the cases are financially poor, have been studied and compose the foundation to this report and the framework.

As the second step in the information gathering process, we have been attending a seminar with IMAP, one of the leaders on the global M&A market. To further deepen our understanding of the whole M&A process and the actors involved, we have had a discussion with specialists on M&A processes on PWC Norway and CitiGroup. These employees wish to be anonymous.

The main foundation of the methodology in this report, has its origin in the report “Analyzing Mergers and Acquisitions in European Financial Services: An application of Real Options” by Dunis and Klein (2005). The authors investigated if the takeover premium for acquisitions in the European financial sector is too high, by comparing the takeover premium with an option premium. The result of this study is that the option premium exceeds the actual takeover premium suggesting that the acquisitions of 15 European banks were not overpaid. The method used by Dunis and Klein (2005) was Black and Scholes and the input parameters were described. Since their study was on M&As in the end of the 20th century and only on banking M&As, there was a potential to develop the framework that this report started.

This report will take this process one step further. By the usage of real options, the deal values before and after 2005 will be compared. The decision of using 2005 as a breakage is due to the new European accounting standards framework, IFRS, that became mandatory in Europe in 2005 (Mavruk 2010).

All the data about the M&As were gathered mainly from *the Zephyr database* and *the Thomson Reuters Database*. In order to be compatible with our calculations, the M&As had to meet several criteria. First the target must be from a European country. The target must be acquired in one entity, in other words the deal must incorporate 100% of the shares or assets in the company. The reason for this is that the stock price will fluctuate both for the acquirer and the target once an acquisition is

revealed (Baker et al. 2011). By acquiring a target in parts and in different time periods, the target can maximize its EBITDA in order to maximize the deal value and therefore the valuation of such a deal can become higher and therefore different takeover premiums cannot be compared to each other (Baker et al. 2011). M&A deals that are not included in the Zephyr database and Thompson Datastream will not be included in this report.

Both the target and the acquirer must be listed in order to estimate the market value. Finally all relevant data to calculate the input variables in table 3 must be available. Out of these criteria, 42 deals were found. However, out of these deals, an amount of 27 deals could be used for our calculations.

The benefits that can derive from the M&A are seen as a European call option on the market value of the merged company. The exercise price is defined as the expected future stand-alone market value. The valuation of this option is with binomial lattices and the option premium was calculated through simple Excel calculations. All calculations are in Euro.

3.1 Calculus

The input variables for the real option analysis are as follows in Table 3.

Option Variable	Data	External Source
Share Price	Cumulated market value of target and acquirer prior to announcement (4-week average)	Thompson Reuters
Exercise price	Hypothetical future market value of the separated entities forecast by the beta	
Standard deviation	Annualized standard deviation	
Dividend yield	Dividend yield in the year following the merger	Annual Reports Yahoo Finance
Risk Free Rate	Domestic risk free rate to the acquirer	Trading Economics
Time to maturity	1 year	
Time steps	12 time steps	

Table 3. Input parameters for the option calculations.

A closer look at each of these variables is needed to deepen the understanding of the methodology used for the calculations.

The share price is the cumulated market value of the separate firms 4 weeks prior to announcement. This time period is chosen to avoid information leakage that potentially can affect the share price and hence the valuation of the company. The announcement date was found in the *Zephyr database*. The market value was calculated by taking the average share price times the number of shares.

The exercise price is a hypothetical future market value of the separate firms without the merger. To estimate this value, first the beta for each stock was calculated by applying equation 5. This was multiplied with the market value of the firm and multiplied with the return on the market. The return on the market was calculated taking the geometrical average on the logarithmical daily returns for a two-year period. The hypothetical future market value was calculated for one year ahead. The exercise price was the cumulated hypothetical market value of the acquirer and the target.

$$\beta = \frac{Cov(R_i, R_j)}{Var(R_j)}$$

Equation 5: The Beta formula (Sharpe, 1964)

The time to maturity was T equals 1 (the effects of this are analyzed in the discussion section). The reason for using one year as time to maturity was that with efficient markets, future M&A benefits will be incorporated even though accounting data does not reflect these gains.

Volatility was calculated as the geometric average of the logarithmic return of the stock from the date of the announcement and one year back in time using Microsoft Excel. Daily returns were used.

The dividend yield is the average dividend yield of the merged entity the year following the merger. The yields are taken either from the companies' annual reports or from *Yahoo Finance*.

The risk-free rate used in the calculations was taken from *Trading Economics* (www.tradingeconomics.com). We assumed that government bonds are as risk-free as can be and used 10year government bonds for the country of the acquirer.

The option premium was calculated using real options and the Microsoft Excel add-on Lattice Maker.

S= The cumulated market value of two entities using the geometric average of the stock price the day of the announcement and four weeks back in time.

X= Hypothetical future market value of the two entities at time t+1 using inputs known at time t.

$$R = e^{rf \cdot \Delta t}$$

Since our results were compared to the findings made by Dunis and Klein (2005) and they used the Black and Scholes pricing model to estimate the option premium, we also used this model for valuation.

The Black and Scholes pricing model for European call options:

$$c = Se^{-div(T)}N(d_1) - Xe^{rf(T)}N(d_2)$$

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(rf - div + \frac{1}{2}\sigma^2\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

Equation 6: Black & Scholes formula where C= Call option value.

Where S is the present value of both companies cumulative market value, X is the hypothetical future market value, rf is the risk free interest rate (defines as government bonds), div is the dividend yield, σ is the stock price's volatility, T is the time to maturity and N(.) is the cumulative normal distribution.

3.1.1 The Real Options calculation using Binomial Lattices

Calculating the real option of an investment or an M&A can be made both by the Black and Scholes formula and by the use of binomial lattices (Mun, 2006). The first mentioned gives the theoretical option value but is harder to explain for management. The latter needs a lot of time steps to give the exact value, but it is more understandable and is easy to build. Binomial lattices can also be changed to become more flexible. The input parameters in a binomial lattice are:

S	-	The present value of the underlying asset
X	-	The present value of implementation cost of the option
σ	-	The volatility of the logarithmical returns on the cash-flows
T	-	Time to expiration in years
Rf	-	Risk-free discount rate

b - Continuous leakage or dividends

These inputs will first be needed to calculate the up (u) and down (d) values and also the probability (p). The time steps are simply the time scales between steps (Mun, 2006).

By having these inputs the first step is to construct a binomial lattice. By multiplying the S_0 with both the up (u) and down (d) value, the tree will get different branches as seen in figure 1 below

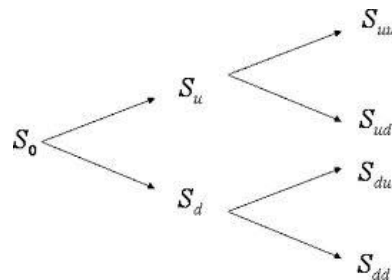


Figure 1: A binomial lattice with two time steps.

By looking at the tree above one can see that the different branches are not recombined but they can as well be recombining (Mun, 2006). If the uncertainty would be zero, that is the volatility would be zero, then the tree would simply be a straight line. When the volatility increases, so does the distance between the S_u and S_d values.

The values generated in the different parts of the tree can be calculated backwards using the risk-neutral probability and can also be compared with other alternatives. Examples on alternative options are the option to expand, option to contract and option to abandon. In each node, it can easily be seen what alternatives are the best ones in each occasion (Mun, 2006). The optimal decision values is calculated backwards to $T=0$ where we get the elastic option value. By subtracting the S_0 value the value of the option can be estimated. Finally all the values were set up in tables and compared to each other. The values were also used as inputs in SPSS as a Mann-Whitney U Test to explore if our findings had any significance. We chose to do Mann-Whitney U sign test because our data sample was too small to make a regression analysis (the risk of being biased was too large). Our data was non-parametric, which also is the reason why we measured the median value instead of the mean value.

Out of the limitations, there were 42 deals that matched our criteria, of which there were 27 deals where all the data inputs were available on either Datastream, www.bloomberg.com, Zephyr, www.financialtimes.com or finance.yahoo.com. The deals found that matched our criteria are listed



in table 13 in appendix. Due to data unavailability, there were only six deals before 2005 and twenty-one deals after 2005 for further examination. However, the deals from the study by Dunis & Klein (2005) could be used as well since our study used the same methodology and assumptions.

First, we calculated the actual takeover premiums, both in absolute terms and as a percentage as stated in Table 4. The values were then compared to the Black & Scholes and Binomial values. Out of these calculations, there were five deals that gave abnormally high option premiums. By using the IBM SPSS statistics function for detecting outliers, we created a limit of 1900% as a separation of normal and abnormal returns. These deals were removed, since they would otherwise highly affect our values. As seen in Table 4 on page 28, this was the case for the deal 1, 12, 15, 19, 22.

4. EMPIRICAL FINDINGS

In this section we will present our findings regarding takeover premiums in our sample. We also make a comparison between our findings and the findings made by Dunis and Klein (2005) and show the result of our attempt to distinguish the drivers of higher and lower takeover premiums paid and suggested by the option theory based framework. In this section we only present the findings with statistical significance. Findings and hypotheses without statistical significance are entailed in appendix. Our opinion of the reasons to our findings will be discussed in our discussion (section 5).

As a starting point, we conducted interviews with employees on some of the firms in Europe that are involved in the M&A process. A lot of information was classified, especially exact data about the valuation of the companies. Although, we were able to get information about which methods that were most commonly used. According to these firms, all used traditional valuation methods such as value of earnings and sales multiples. These methods are assumed to be used to calculate the takeover premiums in Table 4-11.

In total there were 27 M&As to be examined further, plus the ones from the study by Dunis & Klein (2005). All the 27 deals are listed in the Table 4 below.

<u>Deal no</u>	<u>Acquirer</u>	<u>Target</u>	<u>Takeover premium</u>	<u>Black & Scholes premium</u>	<u>Binomial premium</u>
1	Smiths News PLC (GB)	Dawson Holdings PLC (GB)	24,37%	88317,49%*	88402,61%
2	Fimatex SA (Fr)	Boursorama SA (FR)	13,92%	129,97%	129,98%
3	Wecan Electronics OY (Fi)	Scanfil OY (FI)	64,17%	31,67%	32,67%
4	Carnival Corporation (US)	P&O Princess Cruises PLC (GB)	-53,02%	28,04%	28,27%
5	Gjensidige Nor Asa (No)	DNB Holding ASA (No)	-24,80%	83,42%	106,68%
6	ISIS Asset Management (GB)	Foreign & Colonial Investment Trust (GB)	35,00%	32,13%	33,30%
7	Avanquest Software SA (FR)	Emme SA (FR)	5,52%	152,91%	153,32%
8	Wise Group AB (SE)	Dagon AB (SE)	-34,50%	17,25%	17,33%
9	Investinmedia PLC (GB)	Avesco PLC (GB)	32,70%	114,78%	118,63%
10	Aryzta AG (CH)	A Hiestand Holding AG (CH)	29,31%	195,82%	199,44%
11	Sodexo SA (FR)	James Concepts AB (SE)	13,10%	224694,20%*	232696,26%
12	Masters SA (PL)	Wikana (PL)	65,44%	168,65%	169,75%
13	Wichford PLC (GB)	Redefine Intl PLC (GB)	50,86%	12,26%	12,53%
14	Nibe Industrier AB (SE)	Schulthess Group (CH)	-10,06%	114,71%	116,15%
15	Greeneking PLC (GB)	Capital Pub Company PLC (GB)	-42,00%	76,48%	80,39%
16	OGK-2 OAO (Ru)	OGK-6 OAO (Ru)	11,64%	2,85%	4,75%
17	Avisen PLC (GB)	1Spatial Holdings PLC (UK)	-16,14%	28,42%	28,35%
18	UGL LTD (AUS)	DTZ Holdings PLC (GB)	6,64%	189,80%	195,76%
19	TT Hellenic Post Bank SA (GR)	T Bank SA (GR)	53,72%	1972,81%*	1985,86%
20	Investec PLC (GB)	Evolution Group PLC (GB)	-10,80%	44,34%	47,73%
21	Premier Oil PLC (GB)	Encore Oil PLC (GB)	52,48%	9565,95%*	9393,98%

22	SDL PLC (GB)	Alterian PLC (GB)	8,70%	43072,54%*	43064,84%
23	Wärtsilä OYJ (FI)	Hamworthy PLC (GB)	-58,28%	254,38%	268,66%
24	Alpcot Agro AB (SE)	Landkom International PLC (GB)	90,30%	84,15%	84,40%
25	Société Vermandoise de Sucre. (Fr)	Société Sucrière de Pithivers (FR)	-16,80%	151,21%	153,95%
26	Canaccord Financial Inc. (Ca)	Collins Stewart Hawkpoint (GB)	133,10%	345,40%	349,89%
27	Vestjysk Bank AS (DK)	Aarhus Lokalbank AS (DK)	-12,92%	576,04%	576,19%

*Table 4: Takeover premiums, compared to the Black & Scholes and binomial premiums. Abnormal values that have been filtered out are marked with **

The mean value of the different premiums were calculated and also adjusted for the abnormal values that were erased (deal 1, 11, 19, 21, 22). Since we used the median values and not the mean, the outliers would probably not affect our results to a higher degree. By first looking at the actual takeover premiums, they range from -58,28% in deal 23, to 133,1% in deal 26. By making an adjustment for the abnormal values, the Table 5 shows the mean, the standard deviation and median for the three different premiums.

Adjusted, 22 deals	Takeover	Black & Scholes	Binomial
Mean Value	13,70%	128,85%	132,19%
Standard deviation	44,65%	129,48%	130,08%
Median	9,14%	99,43%	111,42%

Table 5: The mean premiums, standard deviation and median for the takeover premium, Black & Scholes and binomial when removing the deals with abnormal option values.

It is evident that the option premium suggested by Black and Scholes is almost ten times higher than the actual takeover premium. The premium suggested by binomial lattice is higher than the one suggested by Black and Scholes. Table 5 makes this relationship clear. The binomial option value is in average slightly higher than the Black and Scholes value and this is also the case for the standard deviation. When comparing our deals with the deals from Dunis and Klein (2005) in Table 6, we see that our average takeover premium is almost the same but the option value is slightly higher.

When combining the values from Dunis and Klein (2005) and the values from our calculation, we derive values as presented below in Table 6. The average takeover premium is 12,16% and the Black & Scholes average is 94,32%.

Average values before 2005	Takeover	Black & Scholes
Mean Value	12,16%	94,32%
Standard deviation	23,54%	140,27%
Median	9,90%	35,06%

Table 6: Average premiums before 2005, including the values from Dunis & Klein (2005). Since their study did not include binomial values, these could not be included in this table.

The average values after the adoption of IFRS (2005) are seen below in table 7. The average takeover premium has increased compared to before the introduction of IFRS. The average takeover premium has increased to 15,66% and the Black & Scholes has increased to 148,79%. The average binomial value is slightly higher (151,60%). The standard deviation is around 140% both before and after 2005, which is true both for the Black & Scholes and for the binomial values. However, the standard deviation of the average takeover premium has increased from 23,54% to 45,29%.

Average values after 2005	Takeover premium	Black & Scholes	Binomial
Mean Value	15,66%	148,79%	151,60%
Standard deviation	45,29%	139,54%	140,23%
Median	6,64%	114,78%	118,63%

Table 7: Average premiums after 2005.

Median takeover premium before and after 2005				
Valuation method	Before	After	Before and after	Significance
Takeover premium	9,90%	6,64%	9,07%	0,778
Black and Scholes	35,06%	114,78%	71,13%	0,071
Binomial	33,3%*	118,63%	111,42%	N/A
*Binomial calculations not available for Dunis' and Klein's sample				

Table 8: Median takeover premiums before and after 2005.

H_0 = the distribution of premiums actually paid is the same across categories of before and after 2005.

H_1 = the distribution of premiums suggested by the Black and Scholes pricing model is the same across categories of before and after 2005.

To study if the mandatory introduction of IFRS has had an impact on the valuation of firms and the premiums paid, we separated the deals made before and after 2005 in Table 13. Since only five deals in our sample were made before 2005 we added the 15 deals in the study of Dunis and Klein (2011), since they used the same formula to calculate the Black and Scholes pricing model premium as we did. However, they did not make any comparison with binomial lattice and therefore, those values

are only available for the deals from our calculations. The median of the takeover premiums paid before and after 2005 were very similar and what median that was higher could not be proven with statistical significance therefore H_0 is retained. We found the difference between the premiums suggested by Black and Scholes pricing model before and after 2005 to be bigger. However, this connection could not be proven with the help of the Mann-Whitney U Test, H_1 is retained. The premiums suggested by the binomial lattice seem to follow the same pattern as Black and Scholes but the significance of this pattern was not comparable since the before sample only contained binomial calculations for the deals in our sample.

Median premium paid subtracted from premium suggested by Black and Scholes			
Before	After	Before and after	Significance
35,78%	124,77%	63,38%	0,146

Table 9: Gap between median premium paid and Black & Scholes premium.

H_0 = the distribution of the gap between the takeover premium paid and premium suggested by the Black and Scholes pricing model is the same across categories of before and after 2005.

The premiums suggested by the Black and Scholes pricing model have been consistently higher than the premiums actually paid by the acquirer throughout this study. As seen in table 9 the difference between the takeover premium and the premium suggested by the Black and Scholes pricing model has increased vastly after 2005, but the difference is not significant and therefore H_0 is retained.

Median takeover premium if the target firm's volatility is above the median volatility			
Valuation method	Median	Deviation from sample	Significance
Takeover premium	5,52%	-39,60%	0,020
Black and Scholes	168,65%	100,40%	0,585
Binomial	169,75%	52,40%	N/A

Table 10: Median takeover premium if target firm's volatility is above the median volatility.

H_0 = the distribution of premiums paid is the same across categories of target firm volatility is above or below the median volatility

H_1 = the distribution of premiums suggested by the Black and Scholes pricing model is the same across categories of target firm volatility is above or below the median volatility

In cases where the target firm's volatility were higher than the median volatility for all target firms in our sample the takeover premium paid were 39,6 percent lower than the median premium paid. The Mann-Whitney U Test confirmed our observation by rejecting H_0 . In our sample we also found that

the Black and Scholes pricing model suggested a takeover premium 100,4 percent higher than the median premium in cases where the target firm's volatility were higher than the median. The sign-test (Mann-Whitney U) showed that this finding did not have significance by retaining H_1 .

Median takeover premium if the acquiring firm has a policy of paying dividends			
Valuation method	Median	Deviation from sample	Significance
Takeover premium	13,80%	50,98%	0,015
Black and Scholes	99,07%	0,36%	0,385
Binomial	111,42%	0,00%	0,688

Table 11: Median takeover premium if acquiring firm has a dividend policy.

H_0 = the distribution of the takeover premium is the same across categories if both sides pays out dividends or not

H_1 = the distribution of the premium suggested by Black & Scholes is the same across categories if both sides pays out dividends or not

H_2 = the distribution of the premium suggested by a binomial lattice is the same across categories if both sides pays out dividends or not

In total there were 15 acquiring firms that paid dividends. The actual takeover premium paid is significantly higher in cases where the acquiring firm pays out dividends. Our sample showed that the median takeover premium paid out was 50,98 percent higher in those cases and the Mann-Whitney U Test confirmed this with a high significance-level, thus the H_0 is rejected, H_1 and H_2 are retained. The premiums suggested by the Black and Scholes pricing model and the binomial lattice did not deviate from the sample median in cases where the acquiring firm paid out dividends.

5. DISCUSSION

The analysis section discusses and examines the results derived from the findings. In this section the findings in this study are compared to earlier research and theories. Also, an attempt to make a contribution to this field of study is made through a sort of extrapolation of the findings made by Dunis and Klein (2005).

Due to the limitations and the need for certain historical data of the deals, our sample was reduced to 27 deals. Even though the sample was relatively small, there seem to be evidence for some tendencies. This type of studies narrows the sample size, according to Dunis and Klein (2005) since there are several criteria that need to be met. The deal values that are referred to as actual takeover premiums are assumed to be calculated using traditional valuation methods. This assumption is based upon the interviews that were conducted in the creation of this report.

There are several potential reasons for the wide range of takeover premiums. Companies with a performance that is not satisfying or that in other ways perform poorly might be underpaid by the acquirer. That is why one deal had a premium of -58,28% (deal 23 in Table 4). Furthermore, the target's management might also receive other benefits that are not stated as a direct cost of the merger. This might have been affected by the IFRS standard in Europe. Another possible reason for a negative takeover premium might be that a rumor about the M&A has reached the market before it gets officially announced. As mentioned earlier, it is common for the stock of the acquiring firm to drop in value after announcement. The stock price might drop when a rumor reaches the market before the announcement date, but the acquirer is still obligated to pay the amount negotiated. Our sample only contains deals where both the acquiring and target firms are public, and it is more common for the stock of an acquiring firm to react positively if the target firm is private (Fuller et al., 2002).

Rumors affecting the stock prices might also be an explanation for the fact that the option price exceeds the actual takeover price in the majority of the cases (exception for deal 3, 6, 13, 16, 24). The deal value is the price paid on the completion date and since these deals include publicly traded firms, the market could already have been including the future options in the stock price. The difference between the market value and the deal value decreases. This can be the reason why the actual takeover premium is lower than the option premium. This assumption about perfect markets is also discussed by Buckley et al. (2002).

One main purpose with the IFRS accounting standards is that the valuation and comparison between firms in different countries should become easier. This would in theory lead to a "better" estimation

of a firm's true value. However, the final deal value is a negotiation between the acquirer and the target firm and they often have different points of view regarding the value of the firm's assets (Baker et al., 2011).

There are small tendencies of differences between the takeover premium before and after 2005, for example the average takeover premium shows sign of increment yet the median takeover premium shows signs of decrement. However, neither one of these trends have any statistical significance and it is our opinion that in order to shed some light upon this dilemma a much bigger sample is needed and the comparisons should be industry specific. A bigger sample would make it possible to make a regression analysis (instead of a sign-test).

The fact that the majority of our sample before 2005 contains M&As within the European financial sector and the sample after 2005 comes from vastly different industries may be one explanation to why the standard deviation in the sample after 2005 is almost twice as high as in the sample before 2005. We further believe that the reason the premium has increased can be due to the new IFRS standard. The standard should increase the firms' transparency which would make the attractiveness of the target higher and counteract uncertainty about its accountings (Ball, 1995). Therefore, investors might be willing to pay more for a target. Another factor that can affect the premium is that the accounting costs will be lower for the merged entity since both the target and the acquirer adopt the IFRS standard. This would lead to a lower cost for accounting and affect the value of the merger. The target firm can as a consequence demand a higher takeover premium. According to Ball (1995), a higher takeover premium is a probable consequence with IFRS.

The option premium in almost every case exceeds the actual takeover premium paid. This might be due to our timing of the option. The higher the time to maturity, the higher the option value. By decreasing the time to maturity, the option value would decrease (Triantis 1999; Berk and DeMarzo, 2010). With efficient markets, the future M&A benefits would be incorporated even though accounting data does not reflect these gains. Therefore our assumption of experiencing merger benefits of one year might be a too long assumption.

Our study shows that there is statistical significance that the takeover premium paid decreases as the target firm's volatility increases. The reason for this can partly be explained by the fact that managerial investors are risk averse and unwilling to pay more for a higher volatility (Amihud et al. 1981). In our sample, all the firms are publicly traded; therefore it is a reasonable assumption that they also are managerially controlled. The option premium on the other hand, rises with an

increased volatility and the gap between the option premium and takeover premium increases with a higher volatility. According to option theory, as the volatility increases, the option price rises (Berk and DeMarzo, 2010).

Another finding that is statistically significant is that when the acquiring firms pays a dividend, the takeover premium increases. This is explained by Berk and DeMarzo (2010), who state that dividends contain information about expected future performance. When there are dividend payments, the acquiring firm is willing to pay a higher premium since it has a financial slack. As discussed earlier, the companies in our sample are assumed to be managerially controlled, with the consequence that the people making the decisions are not the ones benefitting from this financial slack in terms of dividend payments. From the target's point of view, this might also be a motive to increase the accepted takeover premium. Evidence proves that in mature firms with high financial slack, managers have a tendency to commit value-destroying acquisitions, especially unrelated ones, due to the principal-agency problem (Smith and Kim, 1994). A type of inefficient managerial behavior has been detected when managers face a rational stock market and try to mislead the market about the firm's value. Managers forsake a good investment, to boost current earnings (Stein, 1989).

This report only studied the difference between the actual takeover premiums and option premiums, but there is a potential to include other type of options in the binomial lattices. The information can with this method be easily monitored and the different beneficial option alternatives can be selected in a chooser option. An example would be the inclusion of the abandonment option, which is the option to dispose the target company. This would theoretically mean that if the merger is unsuccessful, the acquiring firm can sell the target firm for the book value of the assets.

Other alternatives would be an expansion option, for example after acquiring a target, one could expand this firm's output for a fixed cost. This option can also highly affect the output from the binomial lattice. However such data highly concerns firms' investment opportunities and are mostly confidential for the public. Therefore it is especially a technique that can be used for the firms involved in a merger. As a consequence the valuation can differ from the result in our study since there are other options to incorporate.

6. CONCLUSIONS

From this study, we can see many interesting findings even though there is a small data sample and there are restrictive assumptions. There was of course also heterogeneity among the firms in the sample when considering the industry where they operate. Within the sample, there were major differences in the premiums and a bigger sample could bring different results. To make a better comparison of the premiums before and after 2005, this report included the results from the similar study made by Dunis & Klein (2005). Regardless, there were several interesting findings that could be made that lay the foundation for our conclusions.

The takeover premium has not changed vastly before and after the introduction of IFRS (2005). One of the IFRS's purposes was to enhance the valuation of companies leading to a better estimation of the true value, but this was nothing this report could shed light upon.

Even though many M&As fail to create increased shareholder value, it does not seem to be related to the acquiring firm overvaluing the target firm, our study indicates the opposite. According to our findings; through an option lens, firms are not overpaid. This might depend on the fact that the market is efficient hence expectations about the future are already incorporated in the current market value of firms. It can also indicate that M&As do not fail due to miss-valuation but instead management issues.

Albeit option pricing is advocated by theory as a valuation tool in M&As, option theory in mergers has not been extensively studied and the area is still in its infancy. Further research need to be conducted for a better understanding of the impact of option theory in M&As. A study similar to this one but with a larger sample could possibly give a more extensive understanding of the impact of options and furthermore general conclusion could also be drawn.

After all, an M&A process is first and foremost a negotiation process between a seller and a buyer and a company is not worth more than the highest bidder is willing to pay. In our opinion, in order for option-based theory to be adoptable in M&As, it needs to be adjusted and more market-oriented.

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APPENDIX

Earlier Studies

Author / Year	Title	Purpose	Method	Results
Kinnunen J. 2010	<i>Valuing M&A Synergies as Real Options</i>	Viewing operating synergies as real options in the post-acquisition M&A process.	Valuing targets using probabilistic pay-off distributions. The “fuzzy” mean of the probabilistic distribution is used.	M&A process framework for operational synergy creation. Synergy was defined broadly, but the focus of the paper has been on revenue enhancing and cost reducing activities.
Collan M. & Kinnunen J. 2009	<i>Acquisition strategy and Real Options</i>	Determine the strategic level real options play in acquisitions.	Uses real options to be able to value both economic and strategic capital. Literature study. $S = PV$ of revenues, $X = PV$ of costs, $\sigma =$ Standard deviation of the stock, synergies should be valued separately, if not public use models that analyses the	There are five strategic level real options available for the acquirer: <ol style="list-style-type: none"> 1. Option to postpone acquisition and option to stage acquisition 2. Synergies as options 3. Option to split the company 4. Option to



			cost-benefit of waiting	divest 5. Option to postpone divestment
Smit H., van den Berg W. & De Maeseneire 2006	<i>Real Options Bidding Games</i>	Study of how the price gets effected by the bidding processes	The due diligence costs are denoted as the cost of the option. Econometric modeling process.	The price does not strictly decrease as an effect of the correlation of the bidders. If the due diligence process is extensive the bidders are not likely to be that similar.
Dunis C. & Klein T. 2005	<i>Analyzing Mergers and Acquisitions in European Financial Services: An Application of Real Options</i>	To investigate if the takeover premium for acquisitions in the European financial sector is too high.	Focuses on M&As in the European financial sector. Quantitative survey.	In the scope of real option analysis, the option premium exceeds the actual takeover premium suggesting that the acquisitions of 15 European banks were not overpaid. Assuming the option premium equaled the takeover premium, shows that either the assumed volatility was too low, the assumed time to maturity was very short or/and the



				assumed subsequent market performance was too optimistic.
Triantis A. 1999	<i>Creating and Managing Shareholder Value: A view through a Real Options Lens</i>		Feels more like a discussion on how option theory can be applied in business decisions	Describes M&As as a growth option. Real options can be seen as a way to extend the time to maturity in M&As.
Warner A., Fairbank J. & Steensma H. 2006	<i>Managing Uncertainty in a Formal Standards-Based Industry: A Real Options Perspective on Acquisition Timing</i>		Focuses on formal-standard, technologies and R&D. Also, on acquisitions as a way to minimize the time to get a hold of new information and technical knowledge.	Firms with poor relevant technical knowledge tend to acquire earlier than firms with more knowledge. Firms with relevant patents tend to get acquired earlier.
Thijssen J. 2007	<i>Optimal and Strategic timing of mergers and acquisitions motivated by synergies and risk diversification</i>	To investigate a real options model of merger and takeovers between two firms experiencing different, but correlated, uncertainty.	Studies two different scenarios of M&A: 1. One exogenously determined firm has the option to	An M&A activity is more likely to occur in cases where the bidder and the target roles are endogenous and firms can preempt each other

			<p>take over the other firm.</p> <p>2. The roles of the bidder and target are determined endogenously</p> <p>Also discusses the strategic timing.</p>	
Herath H. & Jahera J. 2002	<i>Real Options: Valuing flexibility in strategic mergers and acquisitions as an exchange ratio swap</i>	Develop a theoretical model, based on option pricing theory to value managerial flexibility in stock for stock exchanges.	Usage of the real options model with binomial trees, then valuing the swap. By using a M&A as an example and compare the different values with each other.	The paper shows how M&As may be optimally structured as a real options swap. This includes both managerial flexibility of both the acquiring and target firms when stock prices are volatile.
Pape U. & Schmidt-Tank S. 2004	<i>Valuing Joint Ventures Using Real Options</i>	Examine whether real options can contribute to a better valuation of joint ventures. The article also	Black and Scholes valuation, binomial valuation technique.	Real Options can reflect some critical value drivers in the valuation that traditional DCF models overlook. The strategic value of a joint venture and the



		studies the power of real options in the valuation process.		value of flexibility that stems from a less than full commitment can be determined using options valuation.
Baldi Francesco 2004	<i>Valuing a Leveraged Buyout: Expansion of the Adjusted Present Value by Means of Real Options Analysis</i>	Valuation of a leveraged buyout (LBO) with the aid of real options analysis.	Studying a company and its cash flows, and incorporate binomial lattices in the calculations.	Valuation of an LBO ma by strongly enhanced when the flexibility, that the buyer-investor is willing to bring in managing the target firm through the post-merger value creation initiatives is assessed with the integration of the traditional APV aiming at capturing each managerial course of action.
Hackbarth Dirk and Morellec Erwan 2008	<i>Stock Returns in Mergers and Acquisitions</i>	Developing a real options framework to analyze the behavior of stock returns in M&As.	A large sample of control transactions in US. It produces a dynamic model of calculations for valuation.	The timing and terms of takeovers are endogenous, results from value-maximizing decisions. The model generated new predictions regarding the dynamics of firm-level betas.



<p>Brouthers Keith D., Dikova Desislava 2010</p>	<p><i>Acquisitions and Real Options: The Greenfield Alternative</i></p>	<p>To determine if and when acquisitions are the best strategic choice when making an investment in order to create growth.</p>	<p>Hypothesis 1: Greater demand uncertainty is negatively associated with the use of acquisitions. Hypothesis 2: Greater acquisition-based strategic flexibility is positively associated with use of acquisitions. Hypothesis 3a: The negative relation between demand uncertainty and acquisition choice is stronger for larger investment than for smaller investments. Hypothesis 3b: The positive relation between acquisition-based strategic flexibility and</p>	<p>Acquisitions are a good choice only when firms enter markets containing low demand uncertainty and when these firms possess acquisition-based strategic flexibility. Greenfield ventures are often less costly than acquiring a firm. By using real options reasoning the authors suggest that creating a subsidiary may be a better choice in some cases because of the increased flexibility. Greenfield ventures can provide a real option alternative to firms when making international investment decisions.</p>
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			<p>acquisition choice is weaker for larger investments than for smaller investments. Quantitative mail survey, study conducted on West European companies investing in eastern Europe.</p>	
<p>Yu Jing, Xu Bin 2011</p>	<p><i>The game analyses to price the target enterprise of merger and acquisition based on the perspective of real options under stochastic surroundings</i></p>	<p>Discusses how to determine the equilibrium price of the target enterprise of M&A under stochastic surroundings based in the perspective of real option.</p>	<p>Divides the value of the target enterprise into two part; the intrinsic value and the corresponding implied value. The first can be calculated based on forecasts on future cash flows, the latter can be measured by using real options. Future cash flows are expected to follow GBM.</p>	<p>Rubinstein theorem is used to find the offer-counteroffer equilibrium.</p>

			Numerical simulation.	
Tong Tony W., Li Yong 2011	<i>Real Options and Investment Mode: Evidence from Corporate Venture Capital and Acquisition</i>	To investigate under which conditions firms prefer CVC over acquisitions and vice versa.	Compares CVC with acquisitions using real option theory and the effects of uncertainty, irreversibility, growth opportunities and competition.	Under extensive uncertainty, firms tend to prefer CVC's over acquisitions, due to the more extensive flexibility. The same relationship was found in the parameters of irreversibility.

Table 12: Concluding table of earlier studies in the field of option pricing in M&As

<u>Deal no</u>	<u>Acquirer</u>	<u>Target</u>	<u>Completion</u>
1	Smiths News PLC (GB)	Dawson Holdings PLC (GB)	2001-09-26
2	Fimatex SA (Fr)	Boursorama SA (FR)	2002-03-28
3	Wecan Electronics OY (Fi)	Scanfil OY (FI)	2002-10-01
4	Carnival Corporation (US)	P&O Princess Cruises PLC (GB)	2003-03-17
5	Gjensidige Nor Asa (No)	DNB Holding ASA (No)	2003-12-04
6	ISIS Asset Management (GB)	Foreign & Colonial Investment Trust (GB)	2004-10-11
7	Avanquest Software SA (FR)	Emme SA (FR)	2007-04-05
8	Wise Group AB (SE)	Dagon AB (SE)	2007-04-18
9	Investinmedia PLC (GB)	Avesco PLC (GB)	2007-05-17
10	Aryzta AG (CH)	A Hiestand Holding AG (CH)	2008-08-22
11	Sodexo SA (FR)	James Concepts AB (SE)	2008-12-11
12	Masters SA (PL)	Wikana (PL)	2009-01-30
13	Wichford PLC (GB)	Redefine Intl PLC (GB)	2011-08-23
14	Nibe Industrier AB (SE)	Schulthess Group (CH)	2011-10-03
15	Greeneking PLC (GB)	Capital Pub Company PLC (GB)	2011-10-03
16	OGK-2 OAO (Ru)	OGK-6 OAO (Ru)	2011-11-01
17	Avisen PLC (GB)	1Spatial Holdings PLC (UK)	2011-11-28
18	UGL LTD (AUS)	DTZ Holdings PLC (GB)	2011-12-05
19	TT Hellenic Post Bank SA (GR)	T Bank SA (GR)	2011-12-17
20	Investec PLC (GB)	Evolution Group PLC (GB)	2011-12-22
21	Premier Oil PLC (GB)	Encore Oil PLC (GB)	2012-01-17
22	SDL PLC (GB)	Alterian PLC (GB)	2012-01-30

23	Wärtsilä OYJ (FI)	Hamworthy PLC (GB)	2012-01-31
24	Alpcot Agro AB (SE)	Landkom International PLC (GB)	2012-01-31
25	Société Vermandoise de Sucreries (Fr)	Société Sucrière de Pithivers (FR)	2012-03-15
26	Canaccord Financial Inc. (Ca)	Collins Stewart Hawkpoint (GB)	2012-03-22
27	Vestjysk Bank AS (DK)	Aarhus Lokalbank AS (DK)	2012-03-30

Table 13: Deals for examination in this study. Deal no 1-5 are before 2005 and the rest are from 2005 and onwards.

Deal no	Acquirer	Target	Takeover	Black & Scholes
D5	Allianz (Ge)	AGF (FR)	5,39%	67,30%
D11	Banco Bilbao Vizcaya (Es)	Argentaria (Es)	0,74%	25,01%
D4	Bayer Vereinsbank (Ge)	Hypotheken- und Wechselb. (Ge)	2,50%	19,60%
D13	Bipop (It)	Entrium (Ge)	356,02%	25,91%
D10	BNP (FR)	Paribas (FR)	8,23%	3,99%
D15	DAB (Ge)	Self Trade (FR)	28,32%	580,80%
D1	Dresdner (Ge)	Kleinwort Benson (GB)	4,16%	12,29%
D14	HVB (Ge)	Bank Austria (Au)	31,51%	178,28%
D6	ING Group (NL)	Banque Bruxelles Lambert (BE)	3,19%	74,95%
D2	Lloyds (GB)	TSB (GB)	20,96%	14,82%
D12	Royal Bank of Scotland (Gb)	National Westminster Bank (GB)	8,00%	10,98%
D7	San Paolo SpA (It)	IMI (It)	28,20%	63,98%
D3	Swedbank (Se)	Föreningsbanken (SE)	1,60%	60,95%
D8	Union Bank of Switzerland (CH)	Swiss Bank Co (CH)	9,90%	35,06%

Table 14: The deals from Dunis & Klein (2005) and their takeover premiums and Black & Scholes premiums.

Deal no	Acquirer	Target	Takeover	Black & Scholes
D5	Allianz (Ge)	AGF (FR)	5,39%	67,30%
D11	Banco Bilbao Vizcaya (Es)	Argentaria (Es)	0,74%	25,01%
D4	Bayer Vereinsbank (Ge)	Hypotheken- und Wechselb. (Ge)	2,50%	19,60%
D13	Bipop (It)	Entrium (Ge)	356,02%	25,91%
D10	BNP (FR)	Paribas (FR)	8,23%	3,99%
D15	DAB (Ge)	Self Trade (FR)	28,32%	580,80%
D1	Dresdner (Ge)	Kleinwort Benson (GB)	4,16%	12,29%
D14	HVB (Ge)	Bank Austria (Au)	31,51%	178,28%
D6	ING Group (NL)	Banque Bruxelles Lambert (BE)	3,19%	74,95%
D2	Lloyds (GB)	TSB (GB)	20,96%	14,82%
D12	Royal Bank of Scotland (Gb)	National Westminster Bank (GB)	8,00%	10,98%
D7	San Paolo SpA (It)	IMI (It)	28,20%	63,98%
D3	Swedbank (Se)	Föreningsbanken (SE)	1,60%	60,95%
D8	Union Bank of Switzerland (CH)	Swiss Bank Co (CH)	9,90%	35,06%
2	Fimatex SA (Fr)	Boursorama SA (FR)	13,92%	30,02%
3	Wecan Electronics OY (Fi)	Scanfil OY (FI)	64,17%	34,43%
4	Carnival Corporation (US)	P&O Princess Cruises PLC (GB)	-53,02%	129,97%
5	Gjensidige Nor Asa (No)	DNB Holding ASA (No)	-24,80%	168,06%
6	ISIS Asset Management (GB)	Foreign & Colonial Investment Trust (GB)	35,00%	36,85%

Table 15: Deals before 2005 including Dunis and Klein (2005) deals, denoted D(number).

All 27 deals	Takeover	Black & Scholes	Binomial
Mean Value	15,25%	14157,86%	14016,73%
Standard deviation	43,60%	47134,63%	46589,40%
Median	11,64%	152,91%	129,98%

Table 16: Mean premiums, standard deviation and median for the takeover premium, Black & Scholes and binomial.